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The Microstructure of Government Securities Markets

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Abstract

This paper applies the "market microstructure" literature to the specific features of government securities markets and draws implications for the strategy to develop government securities markets. It argues for an active role of the authorities in fostering the development of efficient market structures.

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Summary

This paper argues that the authorities (debt manager, monetary, and regulatory) should play an active role in fostering the development of efficient market structures for government securities markets and discusses the factors to consider in this endeavor. Debt managers should seek to encourage efficiently functioning markets with a high degree of liquidity, thereby minimizing debt-service costs; efficient interest rate determination is an important element in the transmission mechanism of central bank monetary operations; and regulators aim to foster sound and fairly functioning markets. The common goals linking these authorities are efficient price discovery, and liquid and deep government securities markets.

According to the market microstructure literature and as supported by evidence, achieving these goals requires efficient market structures. The paper provides a detailed taxonomy of various market structures for government securities markets, including call (periodic) auction, dealer, auction-agency, and electronic market structures, it also describes how the organization and functioning of each structure contributes to price discovery and liquidity. Choosing a market structure is shown to depend on the institutional characteristics of the market, in particular the stage of development, the type of trader, the type of security, the level and location of trading expertise, the degree of capitalization and competition, and the objectives and special needs of the authorities. The art of market architecture involves weighing these considerations; these weights may vary depending on the tastes and needs of the responsible agents for market structure. Appropriate market structures for stylized country examples are provided.

The authorities can foster the development of efficient market structures, once selected, through various measures and actions. They can establish an appropriate regulatory framework supporting the market structure, organize key aspects of the market structure, establish transitional and supporting arrangements promoting market development, and adopt debt-management strategies that promote the efficient functioning of the market structure. A variety of country examples are given that underscore different approaches taken to develop government securities markets. The paper also provides an overview of the "primary dealer" system, characterized in many European countries by special arrangements with dealers that support debt and monetary operations.

Encouraging a transition from nascent to well-developed markets may call for transitional and market-supporting arrangements that include a direct role of the authorities in the market as dealer (in forming a discount house), market maker (in establishing a secondary market window), broker (in establishing a brokerage system) and price stabilizer (in participating in an auction-agency market as an active auctioneer). The paper discusses the role and design of these arrangements and provides examples of their use.

I. Introduction

This paper applies the market microstructure literature to the specific features of government securities markets and draws implications for the strategy to develop government securities markets. It argues for an active role of the authorities in fostering the development of efficient market structures.

During the 1980s and 1990s, significant reforms to develop government securities markets have been undertaken in many countries--industrialized, developing, and economies in transition. In many of those countries, the authorities have played an active role in fostering the development of the institutional structure of the market, acting on the premise that an appropriate structure is needed for the efficient functioning of markets. Providing a clear statement of this principle, the National Treasury Management Agency of Ireland (NTMA) writes: 1/

"the structural market changes now proposed by the Agency are based on the premise, which is well supported by authoritative research on market mechanisms, that the structure of markets is not just a channel to an inevitable outcome but actually affects the trading price itself and therefore the cost at which the Agency raises funds in the bond market."

The expression "authoritative research on market mechanisms" refers to the market microstructure literature, which is the study of the process as well as the results of exchanging assets under explicitly specified trading mechanisms. A central proposition of this literature is that the pricing of assets cannot be determined independently from the institutional structure of the market (particularly the organization and mechanics of trading). If the structure of the government securities market affects prices (interest rates), by extension it affects the cost of the national debt, providing the *raison d'être* for the authorities' involvement in matters of market structure.

The relationship between market structure and the goals of the authorities--the debt manager, the monetary authority, and the regulatory authority--is multifaceted:

- as agent of the taxpayer, debt managers have an obligation to assure that the government securities market is functioning smoothly and efficiently, generally characterized by liquid and deep markets, so as to minimize debt service costs;

- as monetary policy authority, a goal of central banks is to promote efficient price discovery (interest rate determination) as an important element in the transmission mechanism of monetary policy. In addition, as central banks typically intervene through government securities markets, its organization is an important consideration in linking the use of monetary instruments with the achievement of operating targets;

1/ See National Treasury Management of Ireland (June 1994).

- as regulator, the government or its agency (often the central bank) is responsible for the sound and fair functioning of government securities markets. Rule-making influences key aspects of the market structure, including the class of intermediaries that operate in the market, their capitalization, the scope of their activities, the degree of investor protection, etc.;

- as provider of infrastructure, the central bank can play an important role in supporting the market structure of government securities markets, which often includes forming a central depository; providing trade comparison or matching systems; and providing delivery versus payment systems; and

- as agents of the financial liberalization process, the central bank, regulatory authority, and fiscal authority share joint interests in the promotion of efficient government securities markets to best achieve objectives of macroeconomic stabilization, liberalization of interest rates, and the formation of capital markets. 1/

Following from the above, the common goals shared by the authorities are efficient price discovery and liquid and deep government securities markets. Achieving those goals requires efficient market structures. Can the development of efficient market structures be left solely to the private sector? Not always. First, vested interests of intermediaries (or groups of intermediaries) may support less-than-efficient market structures. As existing market structures tend to be self-perpetuating, given network externalities, 2/ actions may be needed to promote a change in market structure.

Second, certain elements of market structure, for example electronic trading networks, clearing and settlement systems and information systems may be overly costly for market participants to provide. Providing these elements may be viewed as a public good, benefiting taxpayers (through lower debt service costs) and the financial sector as a whole (promoting safe and efficient channels for savings and investment).

Third, in the case of developing countries and economies in transition where financial markets are less-developed, an active role of the authorities in encouraging efficient market organization and supporting its functioning can be a powerful catalyst in the development of government securities markets.

1/ See Sundararajan, Dattels, McCarthy, Castello-Branco, and Blommestein (1994).

2/ The larger the number of traders that use a trading system (network) the greater the benefits (i.e., liquidity) that system can provide to traders.

Fourth, as users of government securities markets, the authorities' objectives and preferences require considering in the design of the market structure. ^{1/}

The above argues for an active role of the authorities in fostering the development of efficient market structures. This paper discusses the factors to consider in this endeavor, and provides detailed information on the organization of government securities markets. It is structured as follows:

Section II presents the arguments for why market structure matters for the efficient functioning of markets, highlighting the main propositions of the market microstructure literature. Section III briefly presents the types of market structure and discusses the salient features and pros and cons of various market structures. Section IV, discusses the suitability and selection of various market structures with respect to the institutional make-up of the national market. Section V draws the implications for the strategy to develop government securities markets, discussing the measures and actions that can be taken by the authorities. Section VI presents the conclusions.

Appendix I details the organization of various market structures, and the role of intermediaries in price discovery, liquidity, and price stabilization. Appendix II provides a comparison of the major characteristics of primary dealer system in selected countries. Appendix III discusses the organization of transitional and market supporting arrangements sponsored by the authorities; in particular, a secondary market window, discount house, and brokerage system.

II. Market Structure and Efficient Markets: The Main Propositions of the Market Microstructure Literature

Classical price models generally characterize markets by a Walrasian auction process where the demand and supply of the universe of buyers and sellers is revealed to the auctioneer, who sets equilibrium prices. Many of the assumptions underlying asset pricing models--such as the Capital Asset Pricing Model (CAPM)--include zero trading costs, continuous participation in the market by all traders, and full information available to all traders having homogenous and rational expectations. Taken together, these assumptions imply that the organization of the market is irrelevant for the determination of asset prices. The microstructure literature relaxes these assumptions and examines the implications for both asset pricing and the structure of the market. Some of these implications are discussed below.

^{1/} Unlike in equity markets where the issuer is restricted by a choice of which exchange to list its securities, the government exercises considerable discretion as to the organization of the government securities market given its monopoly position as issuer.

A central proposition of the microstructure literature is that trading costs have an important influence on market efficiency; while this is no news to investors, most asset pricing models assume transaction costs are unimportant. When trading costs are high, investors will trade less as trading would reduce portfolio returns. In turn, lower trading volume may reduce the efficiency of price discovery of the market. Importantly, trading costs--both explicit (the bid-ask spread, order handling charges, commissions, taxes, etc.) and implicit (such as adverse price movements as a result of thin markets)--distort market prices from their equilibrium value. Trading costs, and in particular the bid-ask spread, are, among other things, a function of the market structure.

A second proposition of the microstructure literature is that traders are fragmented both spatially and temporally: it is impossible to represent the universe of traders in a single market, on a continuous basis. In such real world circumstances, orders arriving in the market will be sporadic and uneven and thus not fully representative of underlying supply and demand conditions. Addressing fragmentation of traders and order flow and its consequences is therefore an important issue in market design. For example, Demsetz (1968) was first to elucidate the role of intermediaries (dealers) in providing a bridge between orders arriving in the market at different times by offering immediacy for buyers or seller at a cost (bid-ask spread). Various market structures tackle this problem in different ways as discussed in Section III and in greater detail in Appendix I.

A third key proposition of the microstructure literature is that market structure determines the way in which information becomes incorporated into prices. Information is costly to acquire--it does not pay every investor to be informed on all aspects important to a security's valuation. Hence, there exists two kinds of traders in the market--informed or informationally motivated traders and uninformed or liquidity traders (Bagehot 1971). The interaction of these two types of traders is influenced by the market structure, and affects price determination and the bid-ask spread. For example, the bid-ask spread might reflect compensation for possible losses due to trading with more informed traders (Glosten and Milgrom 1985). This issue is discussed in the context of designing electronic dealer markets (Section IV, 1,c).

A fourth proposition of the market microstructure literature is that a security's price is "discovered" in the secondary market through the interaction of supply and demand, just as with other economic goods. 1/ Otherwise, traders could rely on an accepted pricing model giving the fundamental value at which securities could be exchanged in the market. 2/

1/ In the case of government securities and in countries with undeveloped secondary markets, price discovery may occur in the primary market (for example, by primary auctions of securities).

2/ Traders may also have heterogenous expectations (different valuation models).

Thus, price discovery is a major function of a market. Appendix I discusses in detail the trading mechanism for price discovery of various market structures.

A fifth proposition of the microstructure literature is that deviations of market prices from their underlying equilibrium values may be caused by such factors as the size of the trader, the thinness of the market, the timing of arrival of orders, etc. In turn, their effects on price volatility is influenced by the market structure, including trading rules, disclosure of information, clearing frequency of the market, the existence of intermediaries, etc. Appropriate selection of market structure is therefore important for market efficiency, as discussed in detail in Section IV.

In summary, the microstructure literature relaxes many of the assumptions of classical price models and examines the elements of the security trading process. This concerns: *"the arrival and dissemination of information; the generation and arrival of orders; and the market architecture which determines how orders are transformed into trades. The analysis also explicitly takes into account the behavior of specific types of market participants: nonprofessional investors, institutional investors, speculators, dealers, and specialists"* (Cohen, Maier, Schwartz, Whitcomb 1986). The central proposition of the market microstructure literature is that *"the pricing function of the capital markets, which is of critical importance to the allocation of investment, cannot be separated from the institutional structure of the market itself"* (Blume and Seigel 1992). For a survey of market microstructure theory, see O'Hara (1995).

III. Features of Different Market Structures

This Section provides a taxonomy of market structure and discusses the salient features of various market structures. These features are important in determining the suitability of different market structures for the national securities market discussed in Section IV.

1. Types of market structure

There is a wide range of possible structures for government securities markets. The taxonomy used in this paper to classify different market structures is presented in Chart 1. The detailed organization and functioning of each of these structures is found in Appendix I.

2. Features of market structures

This Section discusses the salient features of different market structures at a broad level examining in particular: (a) periodic versus continuous markets; (b) dealer markets versus auction-agency markets; and (c) electronic versus floor-based markets.

As underscored in the preceding Section, the market microstructure literature examines the treatment of order flow by different market structures. Following Demsetz (1968), D_i and S_i in Chart 2 represent the (aggregate) demand and supply of buyers' and sellers' *trade flows per unit of time* for security X_i . Due to the intertemporal fragmentation of order flow (orders may not arrive to the market at the same time), at a point in time, a buyer may exist but no seller (or vice versa). Thus, trades at the equilibrium price E_i are generally not possible.

In periodic markets, as the name suggests, trading occurs at periodic (or discrete) intervals. Between trading intervals, buying and selling interest is allowed to build, increasing the number of traders present during each trading session (intertemporal consolidation of order flow), thereby improving liquidity and adding to market depth. The execution of trades (multilateral) at a uniform price (represented by E_i in Chart 2 in the special case where the underlying demand and supply curves are stable overtime) reduces transaction costs (i.e., the bid-ask spread associated with continuous markets, discussed below, is eliminated), which is another important benefit of periodic markets (see Economides 1993). By centralizing trading, periodic markets provide economies of scale in order handling. The single (uniform) price outcome gives the same execution to all traders (fair treatment) and simplifies the clearing and settling of transactions, reducing costs and the possibility of errors.

In continuous markets, as the name suggests, trading is continuous. Continuous trade execution permits more flexible trading strategies than periodic markets. The continuous price discovery process provides contemporaneous information on prices, transactions, and market conditions. There are two basic types of continuous markets--dealer markets and auction-agency markets.

In dealer markets, the random arrival of orders to the market is bridged by intermediaries--dealers--that maintain continuous market conditions. Dealers provide two-way (bid and offer) quotations, supplying a high degree of immediacy to traders that may either buy or sell against those quotations. 1/ Dealer markets are often described as "quote-driven" markets, underscoring the dealer's function in maintaining continuous markets. Covering the cost of providing "immediacy," an intermediary is willing to buy and sell against public orders at prices represented by the demand and supply curve D_i' and S_i' in Chart 2, which gives rise to the bid-ask spread (profits to dealers and transactions costs to traders), equal to the difference between A_i and B_i .

Auction-agency markets facilitate the interaction of buying and selling interest of public traders through a centralized auction and agency process (see Appendix I). Reflecting this characteristic, they are often referred

1/ In a pure dealer system, one public order does not have an opportunity to be exposed to another public order which is the essence of auction-agency markets.

Chart 1: Market Structure Classification

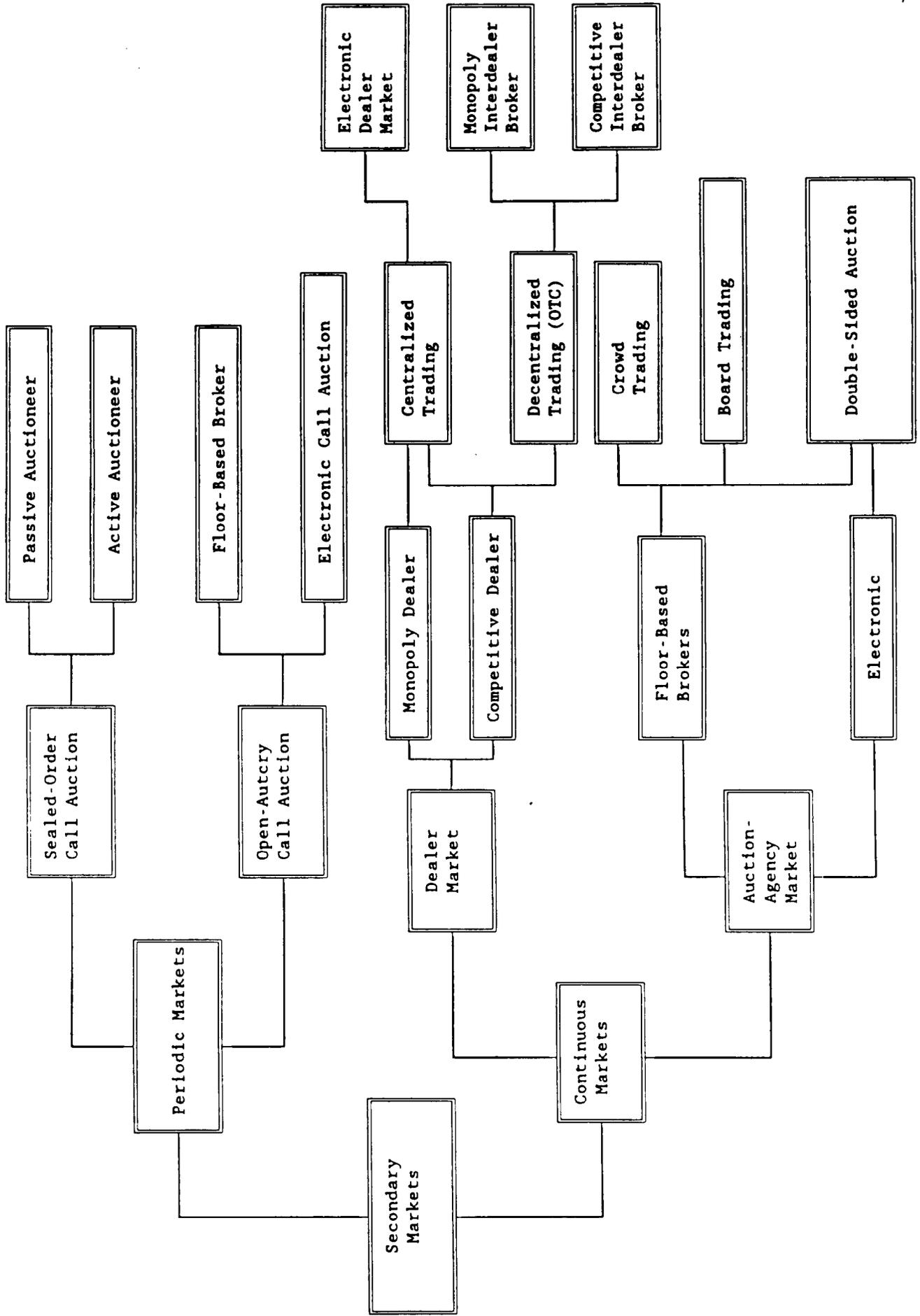
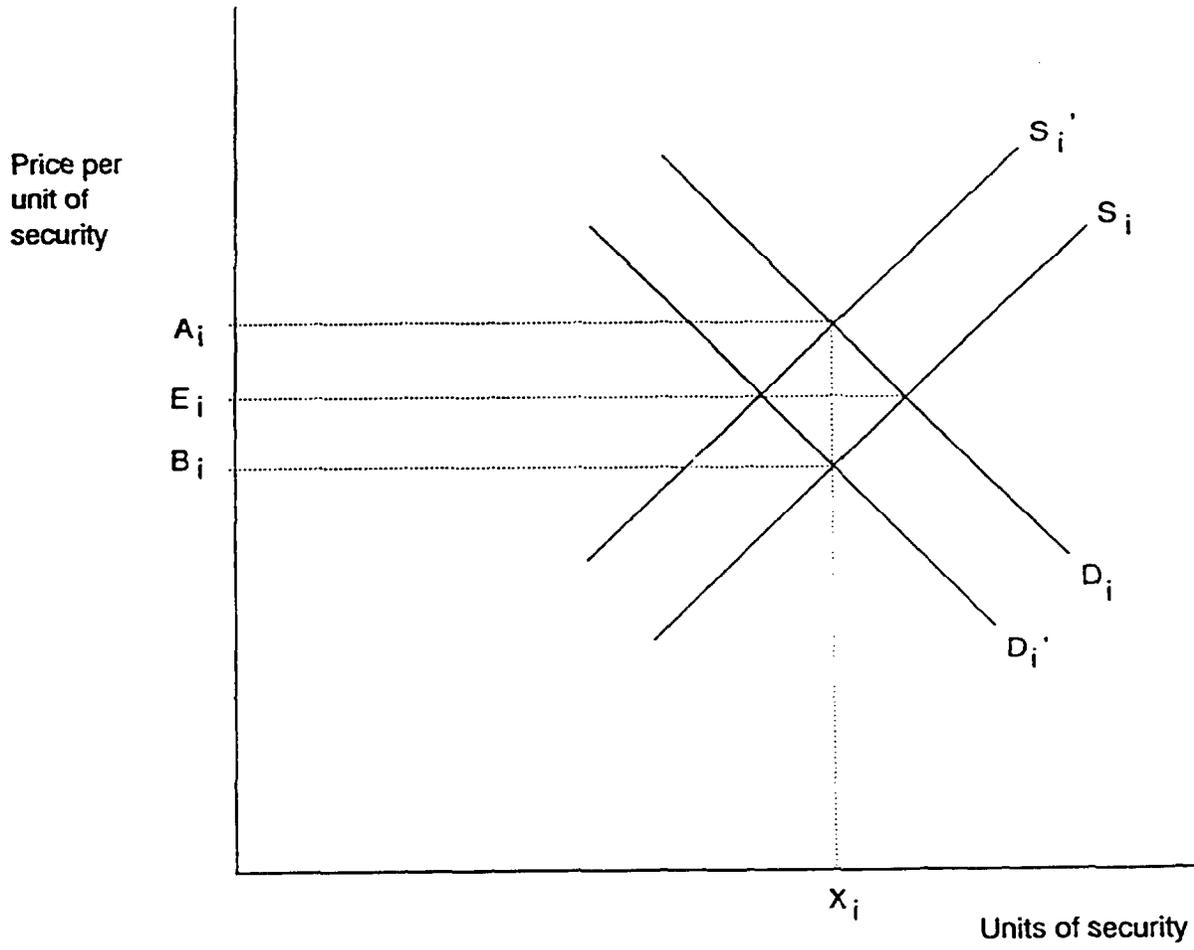


Chart 2
THE SUPPLY OF IMMEDIACY



to as "order-matching" or "order-driven" markets. Cohen, Maier, Schwartz, and Whitcomb (1986) argue that Demsetz's analysis, discussed above, can be extended to auction-agency markets where public traders can compete as "suppliers of liquidity" by submitting limit orders while those "demanders of liquidity" can execute immediately by submitting market orders. 1/ In this case, the demand and supply curves D_i' and S_i' in Chart 2 represent the limit order book (the consolidation of all limit orders) in an auction market. Importantly, auction-agency markets offer traders opportunities for price improvement, thereby lowering transaction costs--i.e., the possibility of executing trades at a price somewhere in between A_i and B_i in Chart 2, inside the representative dealer's bid-ask spread. 2/

On the other hand, auction-agency markets rely on natural order flow to maintain continuous market trading: liquidity and market depth depends on the random arrival of orders from traders and speculators. If order flow is uneven, the market may become one-sided or imbalanced--illustrated in Chart 3 by arrows representing the size of buy and sell orders and their arrival during a trading session--and spurious price volatility (deviations of the market price from the underlying equilibrium value) may result--represented in Chart 3 by the dashed line. It follows that individual orders will be subject to execution risk as the size of that order increases relative to the depth of the market. Therefore, the average price at which a large order is executed depends on the depth or elasticity of the order book at the time of trade execution. 3/ In contrast, dealers insure traders against execution risk by setting quotes in advance. 4/ 5/ Thus, Pagano and Röell (1991) distinguish between auction-agency and dealer markets by the absence of execution risk in the latter.

Electronic technology (computers, telecommunications, etc.) is rapidly changing all market structures. In general, it has improved the efficiency of markets by: (a) replacing the mechanical aspects of trading functions--order routing, order ticket writing, and processing, etc.--thereby increasing the operational efficiency of markets; (b) providing instantaneous information dissemination (real-time information) on market

1/ A limit order is an order to buy or sell contingent on price. A market order is an order to execute a trade of a certain size at the best prices available in the market.

2/ The New York Stock Exchange (NYSE) publicizes "price improvement" as a feature of their market structure.

3/ Execution risk might be measured as the difference between the best limit price before the trade is executed and the actual average price at which the market order is filled.

4/ This does not mean that in a dealer market there is no price volatility; only that the execution price is known in advance.

5/ In general, dealers will provide this service efficiently, if they are less risk-averse than traders and/or enjoy a comparative advantage in hedging risk.

prices and transactions, thereby improving the transparency of markets and increasing competition; and (c) creating new market structures offering automated trade execution, thereby replacing some traditional functions of intermediaries.

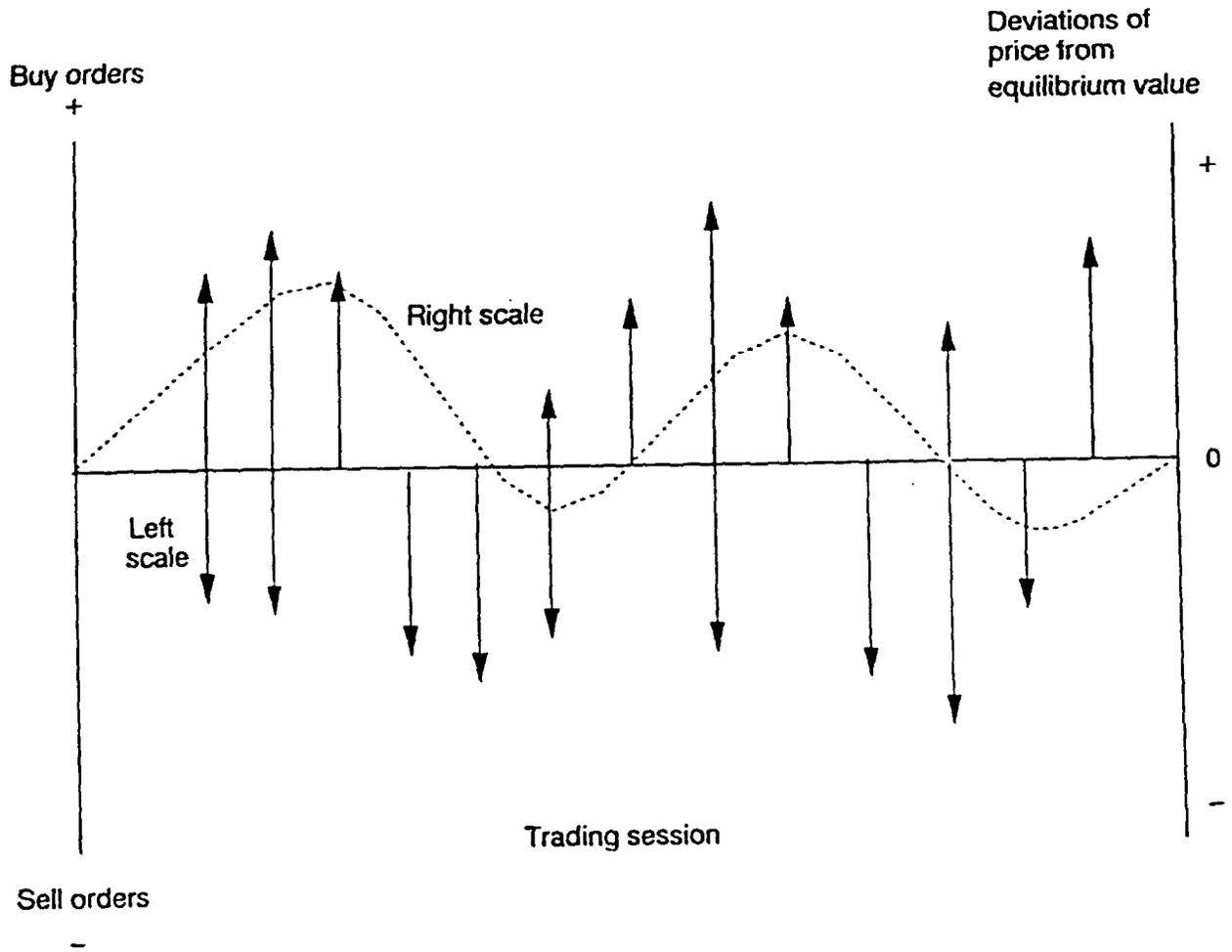
So-called electronic market structures are those in which trade execution is automated (see Domowitz 1992). Features of different electronic markets--periodic and auction-agency, on the one hand and dealer markets on the other hand--are briefly discussed below.

Electronic call and auction-agency market structures potentially enhance market deepening and liquidity. In floor-based auction-agency or call auction markets, very short-run trading in response to order flow (interactive price discovery) is generally confined to the traders on the floor of the exchange (typically called the crowd). By removing the spatial limitations of physical trading floor arrangements, electronic trading expands the potential size of the "crowd," promoting deeper and more liquid markets with more efficient price discovery. Taking full advantage of this possibility, however, requires a sophisticated investor base that participates directly in the trading process. Some argue (for example Massimb and Phelps 1994) that the access to order flow information by public traders and their ability to trade anonymously may discourage the active participation of intermediaries (the crowd) and therefore reduce overall liquidity in the market. Nevertheless, there is a distinct trend away from floor-based call auction and auction-agency markets and towards electronic markets for these types of market structures.

In electronic dealer markets, dealer quotations are centralized onto a screen-based network. Market orders are entered onto the network and executed automatically against those quotations. Compared to decentralized over-the-counter (OTC) market structures they offer the following advantages: (a) increased transparency of price and transaction information; (b) provides price and time priorities to public traders--trades are executed on a first-in basis, against the best dealer price; (c) eliminates the need for interdealer brokers (discussed in Appendix I) whose "information" and "intermediary" functions are replaced by the centralized quotation system; and (d) facilitates real-time auditing of transactions for market surveillance.

However, an electronic dealer market also changes the nature of traditional OTC dealer markets in a number of subtle ways. Centralized trading with transparent trade reporting reduces opportunities for dealers to compete for internalized (dealer-client) order flow and profit from that information (by transacting with other less well-informed dealers). This may lower incentives for dealers to participate in the market, thereby reducing the supply of dealer services. In addition, dealers are unable to differentiate between uninformed and informed traders as trading is anonymous (impersonal). As a result, dealer quotations may be for smaller size and bid-ask spreads may be wider in an electronic market, so as to guard against being adversely selected by informed traders.

Chart 3
ORDER IMBALANCE AND PRICE VOLATILITY



In summary, each market structure contributes to price discovery and liquidity in different ways (explored in detail in Appendix I). Examining the features and pros and cons of each market structure does not lead to definitive conclusions about the general superiority of one market structure over another. Supporting this view is the variety of market structures in different countries, as highlighted in Table 1. It follows that the efficient market structures is a function of the institutional characteristics of the national market. This approach to determining the suitability of market structures is discussed in detail in the following Section.

IV. Suitability and Selection of Market Structure

This Section identifies the institutional characteristics that bear an influence on the suitability of various market structures for the national market and discusses the selection of market structure based on those influences giving stylized country examples.

1. Suitability criteria

The following are the institutional characteristics identified as being important for the suitability of market structure:

- Stage of market development
- Type of security
- Type of traders
- Degree of capitalization and competition
- Level and location of trading expertise
- Objective function of the authorities

a. Stage of market development

(1) Optimal clearing frequency

The optimal clearing frequency is an important consideration in market design. ^{1/} By lowering the clearing frequency, order flow arriving overtime to the market is consolidated, increasing the number of traders and deepening the volume and value of orders per trading session. This reduces the risk of spurious price volatility. However, lowering the clearing frequency lengthens the time interval between trading sessions. This increases the risk of equilibrium price changes occurring between trading sessions (i.e., market risk). Thus, the optimal clearing frequency of a

^{1/} This analysis follows Garbade and Silber (1979).

Table 1. Market Structures in Selected Countries

Periodic Markets	
Sealed-order call auction	Sealed-order call auction with active auctioneer
Kazakhstan (pre 1995) (treasury bills)	Open-outcry call auction
	Norway (bonds at open)
	Israel (treasury bills)
	Italy (retail bonds)
	Israel (treasury bills and bonds)
	Electronic call auction
Auction/Agency Markets	
Double-sided auction-agency	Board trading
Ireland (bonds)	Many developing countries
Greece (bonds)	
Malta (bonds)	
	Crowd trading
	U.S. (futures & options)
	U.K. (futures & options)
	U.K. (pre 1986-- government bonds)
	Electronic order-matching
	Denmark
	Spain (retail)
	India (wholesale debt market)
Dealer Markets	
Single (monopoly) dealer	Over-the-counter (OTC)
India (pre 1995) (Money market)	Many developing countries' treasury bill markets
	OTC with Interdealer brokers
	Electronic dealer
	Competing Monopoly
	U.K.
	France
	U.S.
	Poland
	Spain
	Canada
	Italy (bonds)

market is that which minimizes total liquidity risk from these two sources as illustrated in Chart 4. 1/

The optimal clearing frequency of markets will depend on the stage of development. For reasons discussed below, a transition from low to high clearing frequency and from periodic to continuous market structures may be experienced by economies liberalizing their financial sector.

Nascent financial markets are mostly thin and illiquid owing to the few participants. Execution risk is therefore high and periodic markets with low clearing frequency may be efficient. As markets develop with more participants and higher trading volumes, execution risk diminishes. At the same time, more liberalized interest rates, more open capital accounts, and greater integration of foreign exchange and money markets, increases the number of factors that influence the equilibrium price. The market risk associated with periodic markets of low clearing frequency therefore rises. These factors suggest a transition in market structure to higher clearing frequencies, and from periodic to continuous markets at later stages of development.

Markets in many economies in transition, for example Russia and the other countries of the FSU, are in the early stages of development. Of those which are developing their secondary market, markets with low clearing frequency and periodic markets are in evidence at the outset, progressing to higher clearing frequencies as markets develop. For example, although MICEX in Russia has a continuous trading mechanism for treasury bills, it began trading on only a couple of days of the week and for limited periods of time and could therefore be considered a periodic market. In the spring of 1995, trading sessions were increased to four days of the week. 2/ Another example is Kazakhstan where in 1994 the central bank initiated the secondary market for treasury bills by organizing several ad hoc call (periodic) auctions. Trading on a more frequent basis is beginning in the OTC market while the exchanges are organizing themselves to compete as trading volumes increase.

Evidence of transition from periodic markets to continuous markets is provided by some G-7 countries. For many of them, the 1980s was a period of financial market liberalization, expanding debt stocks (Table 2), and growing participation of foreign investors (Table 3) in the domestic market. These factors contributed to more rapid changing market conditions and a greater volume of trading, for instance, as shown by data for France, the U.K., and the U.S. market highlighted in Table 4. In response, periodic

1/ Total liquidity risk equals the sum of: (i) the variance of transient random differences between transaction prices and contemporaneous equilibrium values (spurious price volatility); and (ii) the variance of equilibrium price changes between clearing intervals (market risk).

2/ There is no secondary market trading on Wednesdays when primary auctions take place.

Table 2. G-7 Government Debt Outstanding

(In billions of U.S. dollars)

	1980	(Percent of GDP)	1986	(Percent of GDP)	1990	(Percent of GDP)
U.S.	738	(27.2)	1,813	(42.5)	2,548	(46.1)
Japan	450	(37.5)	1,267	(54.1)	1,587	(50.5)
United Kingdom	254	(48.9)	298	(48.3)	345	(36.1)
Germany	120	(16.0)	217	(21.9)	401	(24.7)
France	93	(14.9)	185	(23.6)	348	(27.5)
Canada	73	(25.2)	177	(43.6)	269	(46.5)
Italy	229	(54.9)	566	(85.4)	1,147	(98.8)
Total	1,957		4,523		6,645	

Source: International Capital Markets: Developments, Prospects, and Policy Issues, IMF 1994.

Chart 4
OPTIMAL CLEARING FREQUENCY

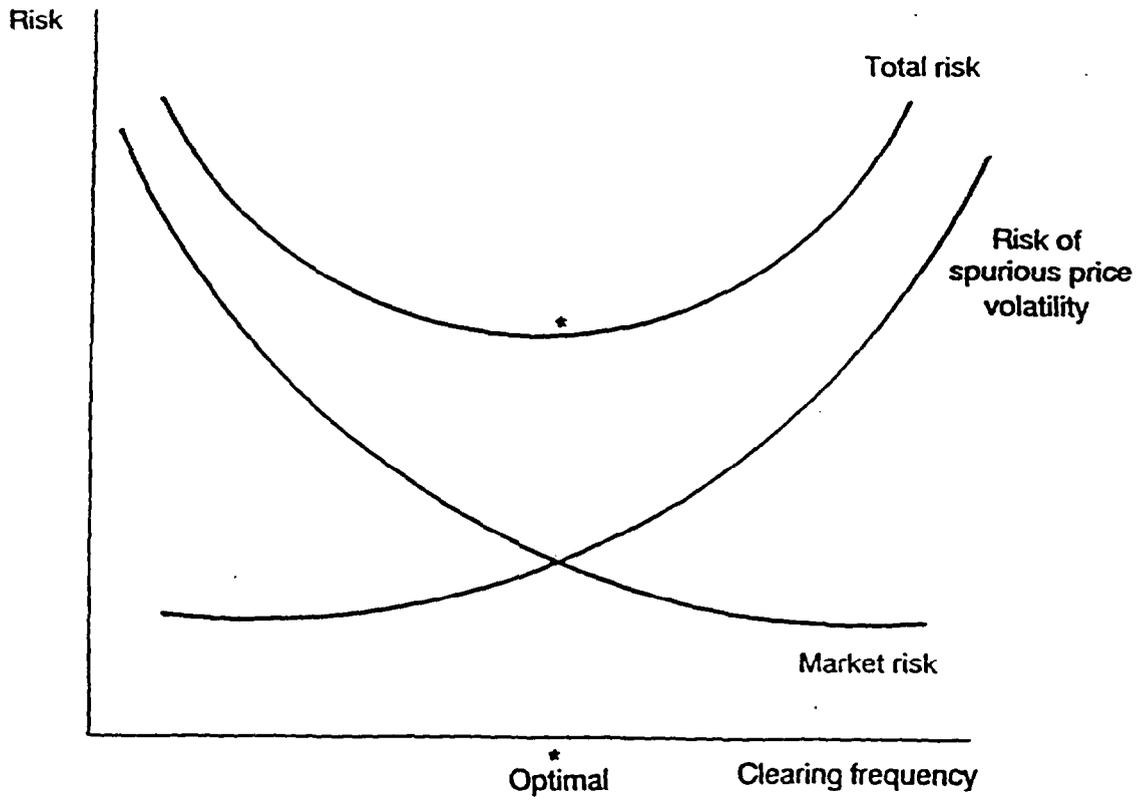


Table 3: Transaction Volume of Foreigners in Domestic Bond Markets

(Aggregate purchase and sales in billions of U.S. dollars)

	1980	1990	Compound Annual Growth Rate (%)
European Investors' Transactions in U.S. bond market	60.7	1,578.2	38.5
Japanese Investors' Transactions in U.S. bond market	6.8	1,476.0	71.2
U.S. Investors' Transactions in European bond market	18.7	375.3	35.0
U.S. Investors' Transactions in Japanese bond market	4.0	80.2	35.0

Source: Abken (July/August 1991).

Table 4. Secondary Market Trading Volume

(Average daily volume in billions of U.S. dollars)

	1980	1986	1990
U.S. Treasury securities	13.78	68.82	76.72
U.K. Gilt-edged securities	1.39	2.46	6.75
France short-and-medium term securities	--	0.24	2.88

Source: International Capital Markets: Developments, Prospects, and Policy Issues, IMF 1994.

trading offered in some European exchanges shifted from periodic to continuous markets. For example, government bonds ceased to be traded on a call auction market on the Paris Bourse after 1987, while the Frankfurt stock exchange introduced continuous trading in government bonds after 1988, although it still holds price fixing sessions integrated with continuous markets.

(2) Form of market organization

The stage of development may also influence the form of market organization. At an early stage the need for sophisticated trading systems may be low (especially in small markets); the market may then evolve towards more sophisticated structures and systems. For instance, periodic markets might evolve from the simplest form of a sealed-order call auction to auctions with interactive price discovery. Floor-based or telephone-based markets might evolve to electronic market structures.

Often, nascent treasury bill markets begin as OTC markets (the simplest competing dealer market form). Initially treasury bills tend to be held by a narrow group of institutions, mainly banks. That creates natural counterparts for trading, which reduces search costs and the need for elaborate and sophisticated trading systems. A relatively low level of transparency may actually encourage dealers to seek arbitrage opportunities. Later as the market develops, however, specialized intermediaries such as interdealer brokers would need to emerge to improve transparency and trade execution (as highlighted in Appendix I) and broaden participation in the market; alternatively an electronic dealer market may be suitable (as was developed in Italy).

b. Type of security

The characteristics of the type of government security--treasury bills, bonds and futures--may influence the choice of market structure. Two important characteristics--volatility and fragmentation--are discussed below.

(1) Volatility

Following the analysis described above in Section 1.a. (1), the higher the security's variance of equilibrium price change, the higher the optimal clearing frequency of the market it is traded in. As a result of random fluctuations in the monetary base, external influences transmitted to money markets through foreign exchange channels, and active monetary policy operations, short-dated government securities (treasury bills) tend to be subject to greater yield volatility than longer-dated government securities (bonds). The optimal clearing frequency of markets for treasury bills may therefore be higher than for bonds.

(2) Fragmentation

The degree of security fragmentation may also influence the suitability of market structure for the type of government security. ^{1/} A unique feature of "cash" government securities in comparison with futures or equities is the fragmentation of outstandings into different issues, each with a unique maturity date. In particular, treasury bills tend to be highly fragmented as they are normally issued with high frequency (weekly auctions) and across the maturity spectrum (for example, with original maturities of 3, 6 and 12 months).

In general, auction-agency markets, which rely on the consolidation of order-flow to function efficiently, are less well-suited than dealer markets to mitigate the negative effects on liquidity of security fragmentation. In contrast, dealers, as part of their market making business, accommodate switches by public traders into and out of maturities of the same security, maintaining a so-called "book" of long and short positions of outstanding maturities.

Examining type-of-security criteria only, treasury bills, as compared to bonds, would tend to trade in markets with higher clearing frequencies--due to their higher degree of variance--and in dealer markets as opposed to auction-agency markets--due to their higher degree of security fragmentation. These, among other factors, are at play in some European countries, such as Denmark and Germany, where bonds are successfully traded on exchanges (auction-agency markets), while treasury bills tend to trade in over-the-counter dealer markets. One reason why auction-agency markets are more common for government futures and options markets than the cash market is the absence of security fragmentation, which allows liquidity to be more easily concentrated.

c. Type of trader

Traders can be classified into different types. The influence of these types on market structure is discussed below.

(1) Patient versus impatient traders

Patient traders--those willing to wait for the arrival of a counterparty--tend to prefer periodic markets over continuous markets, because the former market type has lower transaction costs. In government securities markets, small retail or household investors, whose trading is motivated for longer term employment of funds or raising liquidity, are representative of this type of trader.

^{1/} The microstructure literature generally focusses on spatial and intertemporal fragmentation of traders reflecting its almost exclusive concentration on equity markets.

Impatient traders, on the other hand, tend to prefer continuous markets: they willingly pay a higher intermediation (bid-ask) spread in return for immediate trade execution (see Harris 1993). In government securities markets, institutional traders are representative of this type of trader having shorter investment horizons and trading strategies that are time and information sensitive--for example, dynamic hedging, market arbitrage, or spread trading strategies.

(2) Block-size versus small traders

Block-size traders tend to prefer dealer markets which provide insurance against execution risk. Small traders have less need for insurance and therefore tend to prefer auction-agency markets with lower transaction costs.

Type-of-trader considerations may be factors in market structure selection. For instance, in Italy where the retail (household) and wholesale (institutional) market is formally segmented by the size of the trade, the former is supported by a periodic electronic call auction market (Rome stock exchange) while the latter by a continuous electronic dealer market (Mercato Telematico Secondario). 1/ In Germany, retail traders tend to participate in the fixing session (call market) for government securities while wholesale traders tend to deal in the continuous auction-agency or OTC market.

(3) Uninformed versus informed traders

Uninformed or liquidity traders (those who transact to either raise or employ cash) prefer to disclose their identity, advertising that their orders carry no information about a security's valuation. In turn, market intermediaries supply liquidity to them more willingly and at fine spreads. Liquidity traders therefore tend to build direct relationships with dealers or participate in auction markets on a limit-order basis to expose their orders to the market.

Informed traders (those who transact on the basis of superior information or understanding of a security's valuation in order to earn profits) may be disadvantaged if their identities are disclosed resulting in poorer execution as prices adjust in response. Thus, they prefer market structures that allow their identities to remain anonymous. 2/ 3/ In

1/ The minimum size of a wholesale transaction is 5 billion lire.

2/ Large traders are sometimes taken for information traders. This is one reason for the growth of so called "crossing networks" in equity markets that permit large institutions to transact blocks of stock with each other at prices established in the primary (auction) markets, without exposing the order to that market.

3/ Informed traders sometimes attempt to masquerade as liquidity traders by, for example, breaking orders into small pieces.

OTC dealer markets, informed traders attempt to keep their identities unknown by working through agency brokers (in the case of public traders) or through interdealer brokers (in the case of dealers): nonetheless, their identities may be difficult to disguise. In contrast, "electronic markets," offer a high degree of anonymity to informed traders.

Efficient market selection and design may need to take into consideration the existence of informed and uninformed traders. For example, electronic call auction markets balance considerations of trader-type by offering a high degree of anonymity to all types of traders, with opportunities for order revision and disclosure of trial market clearing prices, and same-price execution of all trades. Special consideration may need to be given to the choice for and design of electronic dealer markets when markets are dominated by informed traders. That structure, by preventing dealers from differentiating between informed and uninformed traders, may result in wider bid-offer spreads for a smaller size as compared to a decentralized dealer market. In part to address this finding, recent reforms (1994) to the Italian electronic dealer market include establishing a category of a small number of better capitalized market makers (specialists) with greater obligations to maintain quotations on the screen-based market, for larger size--for example, specialists must quote for a minimum size of lire 25 billion as compared to lire 5 billion for primary dealers. The better capitalized dealers should be less risk averse in managing block-size trades from informed traders (see Stoll (1978(a)) while their smaller number should permit specialists to more easily recoup losses from liquidity traders, also dealing in block size (see Glosten and Milgrom 1985). Finally, these specialists are compensated by commensurate privileges in line with their market making obligations (for example, specialists have a line of credit with the Bank of Italy of lire 100 billion, twice that of primary dealers). ^{1/}

d. Degree of capitalization and competition

Issues of capitalization and competition may influence the appropriate selection and design of market structure, as discussed below.

The suitability of a competing dealer market structure will depend on preconditions of capitalization and the scope for competition in the market. When conditions of adequate capitalization and competition are not met, auction-agency market structures are more suitable.

Competing dealer market structures require a network of institutions with sufficiently strong capital positions to support market-making and the positioning of securities (market risk); absorb counterparty risk (arising from failed or defaulted trades); and create conditions for efficient interdealer trading (quote-driven trading and trading on an anonymous basis

^{1/} See Appendix II for an overview of the Italian electronic dealer market.

require well-capitalized counterparties). Adequate numbers of such well-capitalized dealers are needed to create competitive conditions leading to narrow bid-offer spreads, lowering the cost of providing immediacy to the public.

Auction-agency markets, on the other hand, inherently reduce the need for dealer capital--as orders cross between public traders directly--and for adequate numbers of dealers--these markets rely on competition among orders rather than competition among dealers. With respect to counterparty risk, exchange members or a clearing house provide trade guarantees, absorbing or pooling this risk.

There is some evidence suggesting that small countries (for example, Cyprus, Malta, and Slovenia) that lack sufficient numbers of well-capitalized institutions to support competing dealer markets tend to rely on auction-agency markets. In some cases, when there is insufficient volume of trade to support a competing dealer market, some countries have established a discount house(s) to act as market maker (discussed in Section V.3.a).

When competition is low, opportunities for collusion among market participants increase, affecting the appropriate design of market structure. For example, such a situation may argue for sealed-order rather than open outcry auctions or electronic markets that offer a greater degree of anonymity to traders. Those designs make enforcing collusive arrangements among participants more difficult. It may also argue for the authorities to participate directly in secondary market trading--for example as an active auctioneer--to safeguard against price distortions caused by collusion.

e. Level and location of trading expertise

The level of trading expertise and its location may influence the design and selection of market structure.

Market structures with interactive price discovery and speculative stabilization of prices require highly developed trading expertise. ^{1/} Insofar as trading expertise is not well developed, floor-based market structures may be more suitable than electronic market structures. Face-to-face trading (or over the telephone) can contribute to developing trading expertise and encourage dynamic trading as compared to electronic trading which is impersonal. As expertise develops, electronic trading may be more readily adopted. This was a factor in the transition from floor-based to electronic market structures in Slovenia.

^{1/} Note that the term trading expertise is distinguished from portfolio management expertise skills. The latter reflects longer term policies based on asset mix, while the former reflects very short-term strategies based on market conditions.

The location of trading expertise is an important determinant of efficient market structure. For example, in Pakistan, the trading expertise of the several stock exchange brokers--acting as interdealer brokers in the government securities market--played an important role in the development of an efficient dealer market. When trading expertise resides with sophisticated financial institutions (such as in Israel), then market structures which demand more professional input into the trading process (such as called for by an electronic call auction market) are possible.

f. Objective function of the authorities

As users of the government securities markets, the authorities--debt managers, monetary authorities, and regulators--have their own special needs, preferences, and objectives that influence the suitability of market structure.

(1) Debt managers

(a) Primary issuance. Debt managers that tend not to adjust the size (or timing) of their funding program in response to market conditions may be described as impatient traders with a high demand for immediacy. Those with large financing requirements also face execution risk (like block-size traders).

As market conditions vary, the market's absorptive capacity at a particular time may be tested--i.e., by a shortfall in auction demand--placing upward pressure on interest rates and adding to debt service costs. To insure against this possibility, many debt managers have built a commitment among a group of dealers--typically called a primary dealer group--to provide varying levels of underwriting support to primary (periodic) auctions of government securities (detailed in Appendix II for several countries). This commitment of capital resources by "primary dealers" has contributed to the debt manager's ability to auction large amounts of government securities at periodic auctions (for example, primary dealers take down approximately 70 percent of U.S. Treasury auctions 1/), with dealers providing pre- and post auction distribution of debt (intertemporal distribution of debt).

In contrast, debt managers that rely to a lesser extent on dealers and to a greater extent on auction-agency markets (such as in Ireland and Denmark) tend to manage primary issuance into the secondary market using continuous selling techniques. This technique allows the authorities to time and tailor issuance according to market demand conditions so as to minimize execution risk. These debt managers may be described as patient traders with a lower demand for immediacy. They believe that lower average

1/ See Joint Report on the Government Securities Market (1992).

funding costs result by minimizing market disruption and execution risk, taking advantage of market conditions, and avoiding costly primary dealer arrangements (see Skafte 1995).

(b) Cash management. Government cash balance management objectives tilts the choice of market architecture in favor of dealer markets and away from auction-agency markets. Like any corporate treasurer, the debt manager attempts to minimize the average level of treasury cash balances as the return on those balances is usually less than the cost of debt. The volatility of government net disbursements means that debt issuance must be actively managed to maintain a broadly constant level of cash balances. This argues for greater use of a well capitalized dealer network to support the active management of primary issuance. Even though dealer "transactions costs" result, savings arising from a lower average level of cash balances compensate.

(2) Monetary authority

As a user of the government market--central bank monetary operations are carried out using instruments closely linked with the market for government securities--the central bank is not indifferent as to its structure. Central banks tend to prefer continuous dealer markets for the reasons discussed below.

First, central banks prefer continuous markets as: (i) those markets provide real-time information about market liquidity and market expectations (the shape of the yield curve). In turn, this information is valuable input for designing the central bank's intervention strategy--for example, most central banks gather extensive information as the market opens and develops during the morning, which serves as an input into the intervention decision; (ii) continuous markets give the option to intervene at any time to react to sudden developments; and (iii) they make it easier to integrate the government securities market with the foreign exchange market (which is also continuous) which improves the effectiveness of operations in government securities as a monetary instrument.

Second, central banks tend to prefer to conduct open market operations in a dealer market, which provides immediacy of execution and therefore a fast monetary effect.

Third, the central bank, unlike other "informed" traders, prefers well-advertised intervention to maximize the effect of its intervention. Dealers spread information and adjust market conditions rapidly by taking speculative (principal positions) in response to open market operations. Auction-agency markets, with fewer professional dealers, may be slower to adjust to central bank intervention. As well, central banks tend to build a close relationship with dealers which provide them information and useful insights into market developments.

(3) Regulators

Regulators are primarily interested in promoting market integrity--fair markets that are mostly free of fraud. Markets that disadvantage traders or are susceptible to fraud tend to limit trader participation and may degenerate causing serious problems for the government's access to market financing. Such was the case in India where a \$1.4 billion securities scandal in April 1992 caused a virtual breakdown of the market. 1/ So too was the integrity of the U.S. government securities market threatened by the Salomon scandal (1991)--the submitting of fraudulent primary auction bids so as to amass tender winnings in sufficient size to create and profit from a "short squeeze" in the secondary market--and the Drysdale debacle (1982) 2/--involving fraudulent activity in the market for repurchase agreements. As a result, significant regulatory and infrastructure changes were made in both markets. 3/

The regulator's objective of enhancing the integrity of markets is achieved through: (i) promotion of transparent markets with ample public disclosure of information on price and security transactions empowering

1/ This scandal involved fraud and unauthorized borrowing and lending through the repo market by some banks (domestic and foreign), financial institutions and stock exchange members. Among other things, poorly developed systems for clearing and settlement made fraud possible by pledging collateral or promising to deliver securities that did not exist. Following an event leading to sizeable declines in the value of equities, a number of banks found themselves with counterparties unable to repay, and holding non-existent government and public sector undertaking bonds or promises to deliver.

2/ The firm Drysdale Government Securities--a newly created subsidiary of Drysdale Securities--took advantage of the lack of accounting for coupon payments in repurchase agreements using bond collateral. They "reversed in" bonds with high coupon rates and gave cash up to the value of the bond, then sold the bonds for the price plus accrued interest (high coupons carrying lots of interest), using the net proceeds for speculative investments. When the coupon date of these bonds arrived, Drysdale Government Securities was supposed to then pay the owners of the bonds the coupon amounts, but they did not have the money. The firm, which lasted only three months, lost an estimated \$250 million against \$20 million in capital.

3/ For example, in U.S. market the passing of the Government Securities Act of 1986 and its extension in 1994 provides the Treasury with rule making authority and closes gaps in regulation of market participants; improvements were made in market surveillance; changes were made in primary auction rules; and promulgation of sales practices rules are being considered. In India, an electronic book-entry system was introduced; regulations were tightened and market surveillance enhanced; and measures were introduced to improve transparency.

traders to self-police transactions; (ii) the surveillance of market transactions; and (iii) prudential regulation and supervision of market intermediaries.

Inherently, different market structures provide various degrees of transparency and difficulty in monitoring market activity. In general, centralized market structures offer a high degree of transparency, while electronic markets easily allow market surveillance, offering the capability of establishing real-time monitoring and electronic audit trails of all transactions. In contrast, the simple OTC market (without interdealer brokers) offers relatively poor transparency, while making it extremely difficult to establish audit trails. ^{1/}

Thus, regulators prefer centralized and electronic market structures. Especially so in countries where institutions lack a track record or tradition of credibility and integrity, and where the regulator has limited ability to undertake prudential supervision. Many economies in transition and developing countries fall into this category and in response have encouraged the development of electronic market structures (for example, Russia and China).

2. Selection of market structure

In any national market, the various criteria discussed above may give contradictory indications of the suitable market structure(s) (see Table 5). Thus, the art of designing market architecture is to weigh the importance of each consideration. Those weights may vary depending on the tastes and preferences of the responsible agents for market structure--i.e., banks, exchange members, securities commission, central bank, or ministry of finance. Chart 1 provides a decision tree against which those criteria and their weighting give a basis for judging along which branch to travel until the appropriate market structure is selected.

For example, in many European countries, the above considerations have led to the development of wholesale continuous dealer markets for "cash" government securities. Increasing stocks of debt, liberalized financial markets, and growing participation of foreign investors (dealing across time zones) made for fertile ground for more continuous trading. Therefore, in some countries, market structure shifted from periodic to continuous markets. Also, with holdings of government debt concentrating in institutions with a high propensity to trade, the demand for immediacy for block-size trading was satisfied by dealers. Thus, market structure tended

^{1/} Following the Salomon scandal, the SEC pressed for establishing audit trails for government securities transactions. In addition to difficulties in establishing the time-of-trade when dealing in a decentralized market, the cost of imposing such reporting on intermediaries was considered prohibitive and would therefore reduce liquidity and increase debt service costs. The request was turned down by Congress.

Table 5. Considerations in Market Selection

Institutional Characteristics	Market Structure Indication
Stage of market development	
• nascent	periodic
• developed	continuous: competing dealer or auction-agency
Type of security	
• treasury bills	continuous: dealer
• bonds	periodic or continuous: dealer or auction-agency
The type of traders	
• patient	periodic or auction-agency
• impatient	continuous
• block	dealer or call market
• small	periodic or auction-agency
• informed	electronic
• uninformed	OTC or floor-based
Capitalization and competition	
•	auction-agency when insufficient
Trading expertise	
•	floor-based or OTC when insufficient
Objective function of the authorities	
• debt manager: --impatient	dealer
--patient	auction-agency or call auction
• monetary authority	continuous: dealer
• regulator	electronic: auction-agency or call

to migrate from auction-agency to dealer markets. In a number of countries, those trends were accelerated by the authorities whose preferences and needs led them to establish special "primary dealer" arrangements supporting debt management and monetary operations.

Furthermore, a variety of market architecture and different approaches to market architecture have emerged with the diversity of government securities (cash and derivatives), different trader types and tastes, and given the advances in technology. In some countries, separate market architecture serves different market segments--for example, the wholesale and retail market. Some exchanges have targeted the retail segment of the "cash" market, providing low cost intermediation for small-sized trade. For example, in Spain, the Madrid stock exchange introduced a CATS (Computer Assisted Trading) system (electronic order matching) to provide faster access and transparent trading for retail investors. 1/ In Italy, the Rome stock exchange introduced an electronic call auction market in 1994, tailored to the more patient trading of the retail segment of the government securities market. 2/ In some countries, different market structures compete for trading in the same securities. For example, in Denmark, reflecting different trader's tastes, the Copenhagen Stock Exchange offers three trading systems to investors (see Skafte 1995): the Match System providing automated and continuous matching of orders (for large-sized trades); the Accept System which is a semi-automated "electronic notice board" for posting bids and offers (for smaller-sized trades); and the Electro Broker System with designated "market makers" providing liquidity (for traders demanding immediacy and for trading on an anonymous basis). In turn, these trading systems offered by the Exchange compete with the OTC telephone market (about 42 percent of bond trading between members of the Exchange takes place via the trading systems, whereas 58 percent is traded by telephone and subsequently reported to the Exchange). In Italy, the electronic dealer market competes with the OTC market for wholesale "cash" securities. In addition, hybrid market structures have been introduced capturing features of different market structures. For example, the Italian futures market combines features of electronic order-matching with competing market makers. In Norway, bonds are traded through a continuous screen-based quotation system (dealer market), but the market opens with a call auction (see Brøker 1993).

Conflicting indications and multiple possibilities for market structure notwithstanding, the following stylized country examples of suitable market structures are highlighted below.

1/ In conjunction with the Stock Exchange Interconexion system: a centralized communications network linking the four stock exchanges in Spain.

2/ This market also provides the basis by which the official prices are "fixed" and retail OTC trades are priced.

- Countries in the nascent stage of development with thin markets are good candidates for periodic markets with low clearing frequency, which leads to market deepening and efficient price discovery.
- In small countries that lack sufficient numbers of well-capitalized financial institutions, call auction or auction-agency market structures are likely to be more efficient than dealer markets.
- Countries where holdings of government securities are held and actively traded by the household sector are good candidates for auction-agency markets or call auction markets that provide low transaction costs and a high level of transparency.
- Countries where holdings of government securities are concentrated in institutions with large-sized portfolios and having a high demand for immediacy are good candidates for dealer markets.
- Countries where debt managers have sizeable (and lumpy) government financing requirements and fixed borrowing calendars may foster dealer markets that support the underwriting of primary issuance and the distribution and trading of government debt.
- Countries where the monetary authorities are instituting indirect (market-based) monetary control may foster dealer market structures because dealers are natural counterparties for the conduct of monetary operations and promote, over time, continuous markets with immediacy of execution to ensure the effective implementation of monetary policy.
- Countries with sophisticated public traders and sufficient trade volume should adopt electronic market structures for auction-agency or call markets deriving the full benefits of technology for operational efficiency and market liquidity.
- Countries with limited supervisory capabilities and institutions that lack a track record of integrity are strong candidates for electronic market structures that promote transparency and self regulation.
- Countries with "quote-driven" OTC markets whose authorities prefer centralized trading structures for transparency reasons and surveillance capabilities might encourage the development of electronic dealer markets.

V. Implications for the Development Strategy of Government Securities Markets

This section develops the main thesis of the paper that the authorities should seek to encourage the development of efficient market structures. As one market structure may be more efficient than another, the authorities' strategy for the development of government securities markets, consists of two parts: (i) selecting appropriate market structure (discussed in the

previous Section); and (ii) fostering the development of that market structure (discussed in this Section).

Once selected, the authorities' actions aimed at fostering the efficient market structure(s) would include the following:

- establishing a regulatory framework supporting the market structure;
- organizing and possibly providing key elements of that market structure;
- establishing transitional and supporting arrangements aimed at promoting market development and the efficient functioning of markets; and
- adopting debt management strategies that promote the efficient functioning of the market structure.

In carrying out major reforms or development efforts, discussed below, the authorities--the central bank, debt managers, ministry of finance and regulators--might either take the general responsibility for matters of market structure (for example the Bank of England) or contribute an important voice on joint committees (for example Italy, where a decision making body--the Market Committee--is made up of market participants, the Bank of Italy, and the Ministry). ^{1/} This provides the authorities with a vehicle to carry out a strategy for the development of efficient market structures.

1. Establishing a regulatory framework supporting market structure

The regulatory framework should support the development of efficient market structures by providing an appropriate balance between considerations of competition and market structure goals; promoting fair and efficient markets by enhancing transparency; building the framework within which the market functions; and enabling the authorities to pursue policies and use instruments to help ensure the efficient functioning of markets.

Regulatory reform efforts are sometimes needed to create efficient market structures by removing obstacles to competition. For example, in France, in order to establish a primary dealer system for government securities, the law providing the Paris Bourse with a monopoly on the trading of government securities was abrogated in 1987.

Conversely, regulation may seek to establish a type of market structure to achieve certain regulatory or market efficiency goals by limiting competition between market structures. For example, in Poland, the

^{1/} The underpinning of such a general responsibility may come from one or more of the following sources: public debt act, regulatory and prudential authority, or as the issuer.

securities act states that capital market instruments (which includes government bonds) must be traded on a centralized exchange approved and registered with the securities commission to achieve the goal of "concentration of supply and demand for securities." ^{1/} Over-the-counter trading is not permitted, thereby preventing a fragmentation of order flow from reducing overall market liquidity.

Information is an integral part of a trading system; it is also a product of the trading system. The availability of that information--transparency--is an important aspect of the efficient and fair functioning of markets. Increasingly, the authorities are exerting efforts to improve transparency. For example, in the U.S., the regulators and law makers (through the threat of regulation) encouraged the introduction of a screen-based information system called GOVPX (owned by the primary dealers). This system displays quotation, transaction and volume information passing through the major interdealer brokers on a real-time basis. It has greatly improved the transparency of the over-the-counter market for government securities, leading to savings for public traders (and reduced margins for intermediaries) and a fuller integration of the interdealer and dealer-client markets.

New market architecture and trading structures may require a new legal framework (separate from that supporting equity markets or over-the-counter markets for government securities). For example, in Italy, the legal framework for the electronic screen-based dealer market and its functioning was established by several ministerial decrees. Other examples include India, where ministry of finance directives established a national market system and the National Stock Exchange.

Finally, regulatory changes may be needed to support active debt management policies including, for example, the authority to engage in secondary market intervention. In France, for instance, Section 56 of the 1991 Finance Act was adjusted authorizing the Trésor to repurchase and swap loans in the secondary market.

2. Organizing and possibly providing key elements of market structure

An active role of the authorities in encouraging efficient market organization can be a powerful catalyst in the development of government securities markets in lesser developed and developed countries. The rationale and actions are discussed below.

In economies in transition and developing economies, market participants may lack the resources to foster the emergence of efficient market structures--either its organization or the supporting infrastructure. In this case, the authorities might play an active role in organizing the market structure, and providing the resources to develop elements of the market structure.

^{1/} Act on Public Trading in Securities and Trust Funds (1991).

Even in industrialized economies with adequate private sector resources, efficient market structures might not emerge. This may arise if a group of market participants (for example members of an exchange) support an existing, but less-than-efficient market structure. Network externalities may pose a significant barrier to the emergence of a more efficient market structure as it would need to attract a critical mass of traders before benefits could be realized in switching trading to the new market structure. As these externalities are larger in more developed markets, radical changes in market structures in many industrialized countries have typically involved an active role of the authorities. Ireland is a case in point, where trading of government debt is being shifted from an auction to a dealer market structure by the authorities.

Finally, new electronic and highly integrated market structures, such as the electronic dealer market in Italy, tend to require a great deal of coordination between the authorities and market participants in achieving consensus on market organization, as well as an active role by the authorities in providing some of the supporting infrastructure.

Measures to organize the market may include all or some of the following elements: (a) defining the market structure; (b) defining the type of intermediaries and the role and obligations of intermediaries vis-à-vis the market and public; (c) selecting intermediaries; (d) designing, managing, and providing the trading system; and (e) providing the physical location of the market (if required).

In many countries, the authorities in fostering the development of government securities markets have organized the market around the architecture of competing dealers--typically called primary dealer systems--for the following reasons:

- By forming a specialized and recognized group of intermediaries, public confidence in the government securities markets is enhanced. In turn, order flow for securities transactions tends to increase and "market making" as a business becomes more profitable and markets more continuous with greater liquidity. The resulting increase in competition with an expanding number of dealers, primary dealers, and other intermediaries tends to narrow secondary market spreads.

- "Special facilities" (such as lines of credit discussed in the next section) sometimes provided to primary dealers help to support continuous market making and therefore improve secondary market liquidity and the development of the secondary market. In turn, government securities enjoy greater liquidity and lower yields as compared to nongovernment securities.

- In their capacity as market makers, primary dealers facilitate the execution of open market operations and thereby improve the ability of the central bank to conduct monetary policy using indirect monetary instruments.

- Primary dealers, as agent of the central bank and treasury, provide valuable information about market conditions and investor preferences. This helps to improve the overall design of market-based debt management and monetary operations, thereby contributing to the smooth functioning of the market, and increasing the depth and breadth of the government securities market.

- The formation of a primary dealer group facilitates the transition to market-based debt management operations by providing underwriting support (which is sometimes explicit in the agreement with the primary dealer) for primary auctions.

The Bank of England, for example, played a leading role in establishing a competitive group of market makers called gilt-edged market makers. ^{1/} These market makers have a positive obligation to support continuous market trading in gilts; they are selected by the Bank and are under the direct supervision and regulation of the Bank of England. Appendix II provides an overview of the organization of primary dealer systems in France, Italy, Spain, U.K., and the U.S.

With the goal of improving the transparency and efficiency of the government securities market that was functioning as an unregulated OTC wholesale market, the Ministry of Finance and the Bank of Italy, in conjunction with market participants, introduced an electronic dealer market (see Santini 1995). This centralized, automated screen-based trading system for government securities--known as the *Mercato Telematico Secondario*--offers a highly integrated system by automating the trading system (typically called the front end) and integrating it with trade comparison or matching (typically called back office functions), which is then electronically linked with the book-entry clearing and settlement system (see Appendix II). The Bank of Italy carries out secondary market intervention (electronically) on the system.

In order to initiate the development of a nascent market for treasury bills, the National Bank of Kazakhstan organized a call (periodic) market on its premises, establishing trading rules and procedures for clearing and settlement.

Similarly, the National Bank of Romania, in a joint effort with other authorities, is organizing an auction-agency market for government securities and equities. It will be located on the premises of the Central Bank.

3. Establishing transitional and supporting arrangements aimed at promoting market development and efficient functioning of markets

In the context of encouraging a transition from nascent to well-developed markets, the authorities may want to establish transitional and

^{1/} See Bank of England (1985).

market supporting arrangements aimed at promoting market development and the efficient functioning of markets, as well as a smooth transition to the efficient market structure. 1/ As markets develop and market structures evolve, some or all of these arrangements would be phased out. Arrangements listed and discussed below include a role in the market--direct (a. to d.) and indirect (e.)--for the authorities as:

- a. dealer--discount house
 - b. market maker--secondary market window
 - c. interdealer broker--brokerage system
 - d. price stabilizer--active auctioneer and market maker of last resort
 - e. liquidity support--credit lines
- a. Discount house 2/

When trading volumes are insufficient to attract or support competing dealers, or possibly when conditions of adequate capitalization and competition are not met, the authorities may want to assist in developing a dealer market structure beginning with a single (monopoly) dealer or a limited number of dealers. It is important to stress that the "monopoly" does not involve an exclusive legal right preventing other dealers from competing. Only that in the context of a nascent market, with insufficient order flow and scarce capital resources, one or a few discount houses, whose role it is to provide liquidity to the secondary market through buying and selling of outstanding securities are formed; sometimes by the pooling of capital of financial institutions--possibly including some capital ownership by the authorities--and generally supported by a line of credit from the central bank permitting them to function effectively as a market maker and inventory securities. Once established, the discount house, operating in the government securities market, attracts order flow in sufficient volumes that warrant the capital investment. Later as the market develops, the discount house would form part of a broader arrangement--such as the formation of a primary dealer group--encouraging the emergence of competing dealers.

Country examples include Ghana, India, and Malaysia. In 1987, the Ghanaian authorities decided that a specialist "market making" institution would be a useful way to help develop a money market, help break down the segmentation of the financial system, and facilitate the Central Bank's use of indirect methods of monetary control. The Consolidated Discount House

1/ Recall earlier discussion in the text (Section IV) which suggested that markets may go through a transition in market structure as they develop.

2/ It is important to note that the "model" discount house discussed here differs from that of the U.K. money market in that the former is designed to operate largely in the government securities market (as compared to the interbank deposit market) and do not enjoy privileges that tend to increase their role in intermediating interbank liquidity.

was established, owned by several commercial banks and insurance companies. A second discount house was licensed in 1991 to encourage competition while operating privileges of discount houses with the Central Bank were reduced.

In India, the Discount Finance House of India (DFHI) was formed to develop the money market by a pooling of capital from several financial institutions, including capital contributed by the Reserve Bank of India. In 1994, the Government Securities Trading Corporation (GSTC) was similarly established to develop the bond market. As trading volumes increased, the Reserve Bank of India established criteria (1995) for the development of a group of competing primary dealers. In this arrangement, the GSTC and the DFHI will be two in a larger group of dealers that are under the same obligations and sharing equal access to the same facilities as other members of a primary dealer group.

In Malaysia, the authorities licensed a limited number of discount houses without central bank capital, but with special privileges in order for them to operate efficiently in the money and government securities market. Later, as the market developed, special privileges were removed and discount houses became part of a larger group of government securities dealers.

There are risks to the above strategy that need to be considered. Particularly important factors are the extent and nature of competition and the potential conflicts with policy goals of the central bank.

Licensing one or a limited number of discount houses provides a franchise (monopoly powers) to discount house(s) while providing privileges aimed at supporting market functions of discount houses may stifle competition. Therefore, the establishment of discount houses should form part of an articulated strategy to develop efficient market structures. Even if there is only one discount house, other financial institutions should be permitted to trade in securities and be allowed to emerge as dealers over time adding to competition (as in India). As the market develops and the demand for trading services increases, licensing should be expanded while privileges reduced encouraging the development of a market of competing dealers (as in Malaysia).

Moral hazards for the central bank may arise when the central bank contributes capital to the discount house and provides arrangements supporting the discount house's operations. Accordingly, the profitable operations of the discount house becomes a direct responsibility of the central bank which may distract the central bank from conducting monetary operations to achieve its primary goal of price stability. Therefore, the participation of the central bank in the formation and operation of the discount house should be carefully considered.

b. Secondary market window

In nascent markets, the liquidity risk to dealers of accommodating customer trades to and from securities inventories is high as two-way

markets are not yet fully developed. This lengthens the average time that a dealer holds a sub-optimal portfolio of securities, lowering returns and increasing the exposure to changes in market conditions (see Stoll 1978 (b)).

In these circumstances and to foster the development of nascent competing dealer markets (OTC), market making support is sometimes provided by the central bank through a so-called secondary market window, whereby the central bank buys or sells securities from those dealers that are supporting secondary market trading, under certain conditions. This window tends to reduce liquidity risk which encourages dealers to supply quotations to the public and maintain continuous market conditions. As markets become more developed and liquidity risk falls, the central bank would withdraw from market making activity, either by closing the secondary market window altogether, or transforming the window for the sole purpose of conducting open market operations or for active debt management policies (discussed later).

This arrangement must be carefully designed so as not to unduly conflict with monetary policy objectives on the one hand--i.e., by carrying out operations that lead to unintended and large changes in base money--nor discourage private sector market participants from emerging on the other hand--i.e., by becoming the counterparty to all trades in the market. The design and organization of secondary market windows is discussed in detail in Appendix III.

Examples of countries that have instituted a secondary market window as a transitional arrangement to promote the development of a secondary market include Jamaica, Iceland, Thailand, Malaysia, and Nepal. A developed market example is provided by the Bank of England which operates a secondary market window for gilt-edged index-linked instruments to encourage the market to develop for that instrument.

c. Brokerage system

In the absence of real-time price information and a poorly developed counterparty relationships between potential dealers, as well as a lack of available brokerage expertise and clearing arrangements, the authorities might institute a brokerage/trading system, patterned after the market structure of monopoly interdealer brokers (Appendix I). ^{1/} Lending the authority's name and infrastructure to such facilities can promote confidence among major market participants and develop trading expertise. Moreover, these systems enhance the price discovery process and provide transparency to developing markets. As the market develops, scope for private sector entrants increases and the need for such a facility may well

^{1/} Again, "monopoly" does not involve an exclusive legal right preventing other intermediaries from competing.

diminish. Appendix III discusses the detailed organization of this possible role of the authorities. Country examples include Turkey, Thailand, and Poland; the latter is highlighted below.

In Poland, the National Bank of Poland (NBP) provided a screen-based interdealer brokerage system--called Telegazette--for central bank bills and treasury bills with supporting facilities to clear and settle government securities transactions. Dealers appointed by the NBP could telephone to the Bank their buying and selling interest. Bank personnel would display bids and offers to the other dealers in possession of the screen display system. After establishing a functioning market, the NBP has all but closed its facility; currently there is one private sector interdealer broker functioning in the market.

d. Active auctioneer and market maker of last resort

As discussed in the main text, auction-agency markets and to a lesser extent call auction markets can be subject to execution risk and therefore spurious price volatility. This is particularly so in lesser developed markets. In this case, the authorities could play a role as price stabilizer participating directly in the auction-agency market as an active auctioneer or as a "market marker of last resort." This encourages a broader range of participants in the secondary market and diminishes the liquidity premium on government debt. This role should not be so great as to discourage the emergence of "speculative stabilization" (discussed in Appendix I) by private sector intermediaries. Nor should it influence price trends. Arrangements therefore have to be carefully designed so as not to conflict with market development, monetary or debt management objectives. As the market develops and deepens, the price stabilization role of the authorities should likewise diminish and ideally be eliminated. The role of the authority as an active auctioneer and price stabilizer is discussed in detail in Appendix I.

In Germany, the Bundesbank, on behalf of the government, participates in the market on eight regional exchanges, buying and selling from time-to-time, as appropriate, to reduce price volatility and provide continuity and stability in secondary market trading. It also participates in the fixing session (call auction). In Ireland, the NTMA acts as a "market maker of last resort" quoting prices on benchmark bonds listed on the exchange in order to help market confidence and stability (see Horgan 1995). Malta is another example where the Central Bank performs this function.

e. Credit lines

To foster a competing dealer market structure in the absence of well-developed funding markets (repo or call money markets), central banks often establish lines of credit with primary dealers. In lesser developed markets, this encourages dealers to provide secondary market liquidity and cost effective execution services. Such lines reduce financing risk which may arise if after undertaking an inventory position during the course of trading, funding is unavailable (or only at exorbitant costs) to the dealer.

For these reasons, many countries establish lines of credit to support primary dealers--for example, India, Italy, Canada, and U.K. ^{1/} Later as efficient funding markets develop, the central bank might provide only indirect support through the conduct of open market operations (as in U.S., France) or the size of such lines diminish in importance (as in Canada) relative to the size of the market.

4. Adopting debt management strategies for the efficient functioning of the market structure

Achieving the cost minimization goal of public debt management generally includes the following broad policies: using market-based methods for the primary issuance of government debt; improving market liquidity and efficiency for government securities; developing markets in related (derivative) instruments that contribute to market liquidity, including the repo, strip and futures market; developing new instruments that are cost-effective and deepen the market for fixed income securities; and promoting a broad distribution of government debt. To implement these policies, among other things, instrument design, selling techniques and secondary market intervention arrangements, all should be adapted to promote the efficient functioning of the market structure.

Instruments are successfully traded in the secondary market when their design is simple and easily understood, standardized, and have features that enhance their tradeability in the market. For this reason the current trend in debt management is to provide few choices in the types of instruments, thereby enhancing standardization; importantly, they generally do not have redemption or call features so as to derive their liquidity from the existence of a secondary market and facilitate pricing. Illustrating this approach, the French Trésor describes its debt management strategy as one of "simplicity, transparency and liquidity" (French Trésor Annual Report (1993)).

In order to promote secondary market liquidity, a practice of establishing a limited number of benchmark bonds and reopening outstanding issues at consecutive auctions is becoming common practice in many countries. Especially when instruments are traded in auction-agency markets, the number of outstanding issues traded in the market should be small, minimizing the degree of security fragmentation. For example, in the case of treasury bills, this argues for making available as few original issue maturities (ideally only one of a long maturity) and reopening that issue for as long as possible. This technique would mimic the practice of futures markets of establishing a few standardized "contracts" which can be easily traded in an auction-agency market structure.

^{1/} In this context, it is notable that the Bank of England are introducing initiatives, beginning in 1996, to develop a repo market to improve secondary market functioning.

The type of selling techniques (primary market issuance) should also support the efficient functioning of the market structure. For example, in countries which rely on dealer markets, the authorities generally adopt periodic primary auctions of relatively low frequency. This encourages the dealer's role (and business) of maintaining continuous secondary market conditions and underwriting securities in the primary market by reducing competition from the primary market. 1/

In contrast, countries with auction-agency market structures (for example, Ireland and Denmark) often adopt continuous primary auctions, directly selling into the secondary market by joining, in a seamless manner, the double-sided auction (of buyers and sellers) at market prices. 2/ In essence, this technique integrates the primary with the secondary market. The continuous sales technique reduces the execution risk and possible market disruption of selling a large block of securities at periodic intervals into an auction-agency market. It also permits the authorities to modulate the supply of securities on a continuous basis to take advantage of good market conditions and reduce the risk of selling large amounts into weak market environments.

Secondary market intervention is an important tool of active debt management policy in fostering efficient secondary market trading by improving the technical position of the market. For example, the Bank of England and the French Trésor entertain switches from dealers looking to trade into more liquid, currently traded outstanding issues, reducing problems related to the fragmentation of issues. 3/ In addition, the authorities might intervene to purchase maturing stocks of bonds (before the maturity date) and sell new issue bonds, reducing the risk of market disruption of refunding operations.

VI. Conclusions

This paper argues that the authorities--debt manager, central bank, and the regulatory authority--should play an active role in fostering the development of efficient market structures for government securities markets. In the case of developing countries and economies in transition where financial markets are less-developed, an active role of the authorities in encouraging efficient market organization can be a powerful catalyst in the development of government securities markets. In turn, these markets help support debt management, monetary policy, and financial market reforms.

1/ New primary issuance provides the offered side of the market, while maturing securities provides the bid side (at par) of the market.

2/ This technique is sometimes called tap issuance (see Bröker 1993), but should not be confused with "fixed-price" tap sales that are often used for over-the-counter sales of retail debt instruments.

3/ See the French Trésor 1993 annual report for examples of active debt management policies.

Efficient price discovery and liquid and deep government securities markets is a common goal shared by the authorities. Achieving this goal depends on the existence of efficient market structures, according to the microstructure literature and supported by empirical evidence. Various market structures exist and a taxonomy is given and their features discussed, while Appendix I and II gives a detailed description of trading mechanisms and the role of intermediaries in price discovery and liquidity, and market organization. Advances in technology have led to continuous improvements in market functioning, and to new electronic market structures with automated trading. A trend away from floor-based and towards electronic auction-agency and electronic call auctions is in evidence. Electronic dealer markets have been developed that compete effectively with over-the-counter dealer markets.

Examining the features of those market structures does not lead to definitive conclusions about the general superiority of one market structure over another, while the existence of various market structures across countries suggests that suitability depends on the institutional characteristics of the national market. The institutional characteristics identified as being important for market suitability are: (a) the stage of market development; (b) the type of security; (c) the type of trader; (d) the degree of capitalization and competition; (e) the level and location of trading expertise; and (f) the objectives and needs of the authorities. Implications of these suitability criteria for market structure, discussed in the text, are summarized in the Attachment.

Applied to any one country or market, these criteria will likely lead to contradictory indications of suitable market structure. Weighing the importance of each consideration is the art of designing market architecture. Those weights will vary according to the tastes and preferences of the responsible agents for market structure--market participants, the central bank, the ministry of finance or regulatory authorities.

For example, in many European countries, the above considerations have led to the development of wholesale continuous dealer markets for "cash" government securities. Increasing stocks of debt, liberalized financial markets, and growing participation of foreign investors (dealing across time zones) made for fertile ground for more continuous trading. Thus, in some countries, market structure shifted from periodic to continuous markets. Also, with holdings of government debt concentrating in institutions with a high propensity to trade, the demand for immediacy for block-size trading was satisfied by dealers. Therefore, market structure tended to migrate from auction-agency to dealer markets. In a number of countries those trends were accelerated by the authorities whose preferences and needs led them to establish special "primary dealer" arrangements to support debt management and monetary operations. Furthermore, a variety of market architecture and different approaches to market architecture have emerged with the diversity of government securities (cash and derivatives), different trader types and tastes, and given the advances in technology. In some countries separate market architecture serves different market

segments--for example, the wholesale and retail market. In some countries, different market structures compete for trading in the same securities. Finally, hybrid market structures have been introduced that attempt to capture features of different market structures.

Notwithstanding the possibilities of conflicting indications and multiple market structures, the authorities' strategy for market development consists of two parts: selecting the efficient market structure(s) (stylized country examples of suitable market structure are highlighted in Table 6), then fostering its development. Measures aimed at fostering the efficient market structure(s) may include: (a) establishing a regulatory framework supporting the market structure; (b) organizing and possibly providing key elements of that market structure; (c) establishing transitional and supporting arrangements aimed at promoting market development and the efficient functioning of markets; and (d) adopting debt management strategies that promote the efficient functioning of the market structure.

The regulatory framework should support the development of efficient market structure by: providing an appropriate balance between considerations of competition and market structure goals; promoting fair and efficient markets by enhancing transparency; building the framework within which the market functions; and enabling the authorities to pursue policies and use instruments to help ensure the efficient functioning of markets.

Regulatory reform measures are sometimes needed to create efficient market structures by removing regulatory obstacles to competition; conversely, regulation may seek to establish a type of market structure to achieve certain regulatory or efficiency goals by limiting competition between market structures. The regulatory authorities may need to exert pressure on intermediaries or introduce regulatory measures to assure an adequate degree of transparency for fair and efficient market functioning. New legal framework may be required to support new market architecture and trading structures. Finally, regulatory changes may be needed to support active debt management policies including secondary market intervention.

In economies in transition and developing economies, market participants may lack the resources to foster the emergence of efficient market structures--either its organization or the supporting infrastructure. Moreover, new electronic and highly integrated market structures tend to involve a great deal of coordination between the authorities and market participants, as well as an active role by the authorities in providing some of the supporting infrastructure. Measures to organize the market may include: (a) defining the market structure; (b) defining the type of intermediaries and the role and obligations of intermediaries vis-à-vis the market and public; (c) selecting intermediaries; (d) designing, managing, and providing the trading system; and (e) providing the physical location of the market (if required). Examples of countries where the authorities have played a role for different types of market organization are highlighted in Table 7.

Table 6. Stylized Country Examples of Suitable Market Structure

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- Countries in the nascent stage of development with thin markets are good candidates for periodic markets with low clearing frequency, which leads to market deepening and efficient price discovery.
 - In small countries that lack sufficient numbers of well-capitalized financial institutions, call auction or auction-agency market structures are likely to be more efficient than dealer markets.
 - Countries where holdings of government securities are held and actively traded by the household sector are good candidates for auction-agency markets or call auction markets that provide low transaction costs and a high level of transparency.
 - Countries where holdings of government securities are concentrated in institutions with large-sized portfolios and having a high demand for immediacy are good candidates for dealer markets.
 - Countries where debt managers have sizeable (and lumpy) government financing requirements and fixed borrowing calendars may foster dealer markets that support the underwriting of primary issuance and the distribution and trading of debt.
 - Countries where the monetary authorities are instituting indirect (market-based) monetary control may foster dealer market structures because dealers are natural counterparties for the conduct of monetary operations and promote, over time, continuous markets with immediacy of execution to ensure the effective implementation of monetary policy.
 - Countries with sophisticated public traders and sufficient trade volume should adopt electronic market structures for auction-agency or call markets deriving the full benefits of technology for operational efficiency and market liquidity.
 - Countries with limited supervisory capabilities and institutions that lack a track record of integrity are strong candidates for electronic market structures that promote transparency and self regulation.
 - Countries with "quote-driven" OTC markets whose authorities prefer centralized trading structures for transparency reasons and surveillance capabilities might encourage the development of electronic dealer markets.
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Table 7. Active Role of Authorities in Market Organization

Market Structure	Country and Goal of Reforms	Actions of Authorities
Competing (primary) dealer market	U.K. (1986)--enhance competition between intermediaries and reduce transactions costs	<ul style="list-style-type: none">• Bank of England established performance standards and prudential framework for gilt-edged market makers
Electronic dealer market	Italy (1988)--improve the transparency and efficiency over the existing OTC market (principally a telephone market)	<ul style="list-style-type: none">• Ministry of Finance and Central Bank in conjunction with market participants introduced a screen-based dealer market with a full integration of the trading system, the trade confirmation and matching systems and clearing and settlement systems.
Auction-agency market	Romania (in process)--establish secondary market for government securities	<ul style="list-style-type: none">• In cooperation with other authorities, the National Bank of Romania is establishing a stock exchange on its premises
Call auction market	Kazakhstan (1994)--initiate secondary market for government securities	<ul style="list-style-type: none">• The Central Bank sponsored a periodic call auction on its premises establishing trading rules, and clearing and settlement arrangements.

In the context of fostering efficient market structures, the authorities of countries in the early stages of development might develop dealer markets when: (a) the monetary authorities are instituting market-based monetary control, using dealers as natural counterparties for the conduct of monetary operations, thereby promoting, over time, continuous markets with immediacy of execution to ensure effective implementation of monetary policy; and (b) the debt managers are instituting market-based issuing techniques, such as auctions, using dealers for underwriting and distribution support, thereby enhancing the depth of the primary market. In addition, by forming a specialized and recognized group of intermediaries, public confidence in the government securities markets is enhanced. In turn, order flow for securities transactions tends to increase and "market making" as a business becomes more profitable and markets more continuous with greater liquidity. Special facilities (such as lines of credit) can help to support continuous market making and therefore improve secondary market liquidity and the development of the secondary market. The market organization of primary dealer systems in a selected number of countries is provided in Appendix II.

In the context of encouraging a transition from nascent to well-developed markets, the authorities can establish transitional and supporting arrangements aimed at promoting market development and the efficient functioning of markets, as well as a smooth transition in market structure as markets develop. Arrangements would evolve as markets develop with a diminishing role for the authorities. They involve a direct role of the authorities in the market as: (a) dealer--establishing one or more discount houses, possibly as part owner; (b) market maker--establishing a secondary market window for supporting secondary market liquidity; (c) interdealer broker--establishing a simple infrastructure for the brokering of transactions of market participants and the displaying and reporting of prices; (d) price stabilizer--participating in an auction-agency market as an active auctioneer or as a "market maker of last resort;" and (e) indirect supporting arrangements for market making--establishing lines of credit with market makers to support efficient market making by dealers and supporting inventory financing. Table 8 lists these types of arrangements and their use by countries. So as not to conflict with monetary policy objectives or discourage the participation of the private sector in market arrangements and market development, the above arrangements need to be carefully designed; this is discussed in Appendix III.

Table 8. Transitional and Market Supporting Arrangements

Market supporting arrangements	Country example
1. Discount house	Ghana, India, Malaysia
2. Secondary market window	U.K. (for index-linked gilts), Nepal, Jamaica, Malaysia, Iceland, Botswana
3. Brokerage operations	Turkey, Poland, Thailand
4. Price stabilization	Germany, Ireland (as market maker of last resort), Malta
5. Lines of credit to dealers	Canada, U.K., Italy, Pakistan

Debt management strategies should support the efficient functioning of the market structure. This calls for the appropriate design of instruments, the choice and use of selling techniques, and appropriate secondary market intervention. Making instruments easily understood and easily traded in secondary markets is an objective in designing instruments. Improving liquidity by issuing only a few benchmark instruments and reopening of outstanding issues to improve fungibility reduces the effect of security fragmentation on liquidity. Selecting selling techniques--periodic versus continuous auctions--should consider market structure: the former is appropriate for efficient functioning dealer markets while the latter for auction-agency markets. Finally, secondary market intervention can be designed to improve the technical position of the market and ease refunding risk, improving the functioning of the secondary market.

Suitability Criteria and Market Structure

- Stage of development

Nascent markets are unlikely to exhibit sufficient trading volumes to either sustain continuous auction-agency markets or attract sufficient competing dealers, resulting in a high degree of spurious price volatility and execution risk. Such markets are good candidates for commencing as periodic markets that lead to market deepening and efficient price discovery. As the number of participants grows and financial markets are liberalized, scope increases for more continuous trading and market structures such as auction-agency or competing dealer markets.

- Type of security

Different government securities might be traded in different market structures, reflecting type-of-security characteristics. For instance, treasury bills as compared to bonds: (i) have greater yield volatility arguing for a market structure with a higher clearing frequency and more continuous trading than bonds; (ii) have a higher degree of security fragmentation arguing for dealer markets over auction-agency markets; and (iii) are generally held by a narrower group of institutions, facilitating direct trading on an OTC basis.

- Type of trader

Trader types and their tastes may influence market structure. When securities holdings are widely held (dispersed) by the household sector--characterized as small patient traders--auction-agency and call markets which provide for price improvement and low transaction costs are well suited. When holdings are concentrated with institutional traders--characterized as impatient, block-size traders--dealer markets which provide a high degree of immediacy and accommodation of block-size trading may develop.

- Capitalization and competition

Competing dealer market structures require adequate numbers of well-capitalized dealers to create competitive conditions and support "quote-driven" trading. When preconditions of capitalization and competition are not met, such as in small countries, auction-agency or call markets, which rely on competition among orders rather than dealers, are appropriate.

- Trading expertise

Floor-based or over-the-telephone trading may be more effective in developing trading expertise and encouraging dynamic trading, as compared to electronic trading systems which tend to be impersonal. As expertise

develops, electronic trading systems may be more readily adopted deriving the full benefit of those features. The location of trading expertise is also an important determinant of efficient market structure.

- The objectives of the authorities

Debt managers with sizeable financing requirements and rigid issuance calendars, characterized as impatient traders with a high demand for immediacy, prefer dealer markets which facilitate the underwriting of primary issuance, reducing execution risk.

Central banks generally prefer continuous dealer markets as dealers are natural counterparties for open market operations, providing "immediacy" of execution and supporting continuous market trading for effective monetary policy implementation.

Regulators generally prefer centralized and electronic markets that are highly transparent and lend themselves easily to market surveillance and establishing audit trails. This is particularly the case in some developing countries and economies in transition where institutions may lack a track record or tradition of credibility and integrity, and where the regulatory body has limited ability to undertake thorough prudential supervision.

Glossary of Terms

Active auctioneer: a special trader (for example, the ministry of finance, the central bank, or specialist) in either call or auction-agency markets who participates in trading to influence the outcome in order to achieve certain objectives for the benefit of traders--for example, price stabilization or price discovery.

Dual-capacity broker: a broker that can trade as principal (on his or her own account), as well as on behalf of public traders.

Equilibrium (underlying) value: the price of a security that would emerge from a market free of trading frictions, revealing fully the underlying demand and supply conditions.

Execution risk: The risk in executing a trade of a spurious price movement.

Fair market: a market with safeguards against fraud, manipulation of prices, and abuse by intermediaries of their position.

Homogenous expectations: where all traders agree on the relevant parameters determining a security's valuation. For example, in the context of the CAPM model, investors agree on the mean, variance, and covariance characteristics of individual securities.

Immediacy: the capability of traders to execute trades immediately.

Interdealer broker: a specialized intermediary providing trade execution services to dealers in OTC markets.

Informed traders: traders that have superior information about a security's underlying valuation and trade on that basis (information-motivated trades).

Intrinsic or fundamental value: the price of a security determined in reference to a "pricing model" or to another market (for example, as in the case of derivative securities).

Limit order: a buy or sell order contingent on price: minimum price in the case of a sale, and maximum price in the case of a buy.

Liquidity: the ease with which traders can buy and sell securities in desired quantities at prices (including all trading costs) that are close to underlying values.

Market order: a noncontingent buy or sell order that only indicates the quantity to be traded in the market.

Market structure: the organization of the secondary market including market access, order handling, the trading mechanism, transparency, the role of intermediaries, clearing and settlement services, and so forth.

Network externalities: positive externalities that are associated with market structures.

Single-capacity broker: a broker that can only act on behalf of a client and not on his or her own account as principal.

Price discovery: refers to the function of securities markets of finding the prices at which trades are made. In markets with *efficient price discovery*, prices should track closely their equilibrium value.

Price stabilization: mechanism for the reduction of large short-term (spurious) movements in transaction prices.

Thin markets: are characterized by few participants and infrequent trading.

Trading frictions: costs or impediments to trading, such as commissions, intermediation (bid-offer) spreads, restrictions to market access, and information deficiencies (for example, on prices and transactions).

Transparency: amount and timeliness of information relevant to the trading process that is made available to the public including, for example, bids and offers, the depth of the order book (auction market), and transaction information such as prices, number of trades, and size of trades.

Uniformed or liquidity traders: non-informationally motivated traders, trading to raise or deploy cash (liquidity).

Taxonomy and Organization of Market Structure and
the Role of Intermediaries

This appendix provides a taxonomy of market structure (see Chart 1 in the text) and describes how each market organization functions, summarizing the role intermediaries in contributing to price discovery, market depth, and liquidity. There exists a diverse make-up of market structures which may be adopted for government securities markets. However, the various market structures can be classified as:

- (1) periodic markets or (2) continuous markets

In turn, continuous markets can be classified as:

- (2a) auction-agency markets or (2b) dealer markets

Various types of market design fall within the above classes and are discussed in detail below.

1. Periodic markets

In periodic markets, trading occurs at periodic (discrete) intervals. At the specified time of the call auction, accumulated orders are executed in a multilateral transaction (batch) at a uniform (single) price that balances demand with supply.

All periodic markets share a number of properties:

- Traders benefit from an intertemporal consolidation of trading interest--the depth of the market is enhanced by increasing the number of traders present at a single trading session which tends to stabilize the price and an enhance liquidity.
- Low transaction costs as a result of no "intermediation" costs (i.e., no bid-ask spread) and economies of scale in order handling of a centralized market structure.
- The single (uniform) price outcome simplifies clearing and settling of transactions, reducing costs and the possibility of errors.
- A high degree of transparency: all market participants receive the same treatment; all orders are executed at the same price enhancing market integrity.

The various types of periodic markets shown in Chart 1 are discussed below. They differ in three respects--the price discovery mechanism, how price stabilization is achieved, and the role of intermediaries.

a. Sealed-order call auction

(1) With passive auctioneer

The price discovery mechanism of the sealed-order call auction market mimics that of the Walrasian auctioneer. The auctioneer in this market combines the orders of public traders to find the market clearing price (see Table 1; the trading mechanism is detailed in Table 2). However, as traders have no knowledge (until after the auction) of the prices and intentions of the other participants, the price discovery process is a "black box." When an imbalance in orders occurs, price volatility (from one call session to the next) may result without any change in fundamental aspects of the security's valuation, reducing efficiency. To address this problem, exchanges using this system typically institute a maximum and minimum permissible price change at a single session as a mechanism to stabilize prices. An advantage of the sealed-order call auction is that it is simple to organize. Also, the sealed-order format reduces the risk of collusive arrangements forming among market participants by making it more difficult for ring members to enforce arrangements.

(2) With active auctioneer

In this call market structure, price stabilization and price discovery is facilitated by an active auctioneer. The active auctioneer is not indifferent as to the price outcome of the auction, participating directly in the auction to influence its outcome (see Table 3). In the context of government securities markets, the active auctioneer could be the central bank, ministry of finance, or a designated specialized intermediary. 1/ 2/ The objective function of the central bank may primarily reflect monetary policy considerations (which may or may not be compatible with price stabilization). In the case that the ministry of finance or the debt agency is the active auctioneer, the objective function is more likely to be that of price stabilization.

1/ In the case where the auctioneer is a designated intermediary, the auctioneer has full information of the order book. His role therefore can not always be that of a "profit maximizer" but rather as a "market stabilizer" (for example, the specialist on the New York Stock Exchange (NYSE) plays such a role at the market opening).

2/ In Romania, in the call auction market for foreign exchange (used until July 1994), the central bank placed the final bid or offer for the purpose of establishing the official exchange rate after all market orders were submitted.

Table 1. Illustration of a Double-Sided Auction

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Buy Quantity	Cumulative Buy	Price	Sell Quantity	Cumulative Sell	Excess Demand (-) or Supply (+)	Total Possible Trade
--	0	101.00	10,000	93,000	+ 93,000	0
--	0	100.90	3,000	83,000	+ 83,000	0
--	0	100.80	15,000	80,000	+ 80,000	0
--	0	100.70	1,000	65,000	+ 65,000	0
13,000	13,000	100.60	5,000	64,000	+ 51,000	13,000
15,000	28,000	100.50	15,000	59,000	+ 31,000	28,000
11,000	39,000	100.40	20,000	44,000	+ 5,000	39,000
10,000	49,000	100.30	9,000	24,000	- 25,000	24,000
1,000	50,000	100.20	5,000	15,000	- 35,000	15,000
500	50,500	100.10	10,000	10,000	- 40,500	10,000
10,000	60,500	100.00	--	0	- 60,500	0
20,000	80,500	99.90	--	0	- 80,500	0

Table 2. Trading Mechanism: Sealed-Order Call Auction

The trading mechanism works as follows:

- (i) a date/time is set for the receipt of orders (for example, the frequency of periodic auctions could be weekly, bi-weekly, daily, or bi-daily or sporadic);
- (ii) traders submit buy and sell orders (price and quantity pairs);
- (iii) the auctioneer tabulates the buys and the sells arranged in two separate columns (see Table 1, columns (1) and (4)) in a double-sided auction--descending price in terms of buys and ascending price in terms of sales;
- (iv) the equilibrium price (100.40, Table 1 column 3, price in bold) is set which maximizes the total value of possible trades (39,000 see Table 1, column 7), or (equivalently) minimizes excess supply or demand (+5000 see Table 1, column 6);
- (v) the share of unsatisfied orders at the market clearing price among participants would be distributed according to some rule, such as a prorata distribution;
- (vi) traders are informed of the market clearing price and any unsatisfied orders;
- (vii) the auction is cleared in a multilateral transaction at the uniform market clearing price for buy (sell) orders that are equal to or above (below) the clearing price--all other orders are left unexecuted.

Table 3. Trading Mechanism: Call Auction With Active Auctioneer

The trading mechanism involves an additional step:

After viewing the initial (undisclosed) price outcome of the call auction (Table 2, step iv), the auctioneer submits an additional order in order to stabilize prices or to achieve a particular price objective.

This form of market structure has the advantage of reduced risks of unwarranted price volatility, through the discretionary price stabilization of the active auctioneer and 1/ provides a convenient framework for the central bank to conduct open market operations.

b. Open-outcry call auction

(1) Floor-based

Price discovery is interactive in this call market structure. Traders (floor-based) are able to react to the submission of orders and the formation of "trial prices" by submitting new orders, before the market price is set: no bids or offers are binding until auction participants agree on the final price configuration (see Table 4). The technical term for this trading mechanism is a "recontracting auction." With respect to the theoretical literature, this outcome approximates a Nash equilibrium where each trader has bid optimally given the reaction of other traders (see Blume and Seigel 1992). This transforms the call markets discussed above from a "black box" to an "interactive" market of price discovery.

In this market structure, the price stabilization role of the active auctioneer (monopolist) is replaced by floor-based intermediaries (competing). If members of the "crowd"--those traders that are members of the exchange and physically present on the floor--find the price diverging from their expectations, they may submit additional orders in order to profit from spurious price movements, thereby stabilizing prices and adding to market depth.

With interactive price discovery and "speculative stabilization" this market structure is likely to result in prices which are closer to their equilibrium values. In addition, the central bank or the ministry of finance may also participate in the call auction as part of the crowd, to achieve monetary or debt management objectives (as an active auctioneer). 2/ Even though the price discovery process can lead to efficiency and market depth, these call auctions are administratively more

1/ In the case that the active auctioneer is a private sector agent, his or her trading must be monitored given that agent's privileged access to information and position as active auctioneer. For this reason specialists on the New York Stock Exchange have a positive obligation for market smoothing and are required to buy on downticks and sell on upticks in prices.

2/ As compared to the previous call market structure, the actions of the active auctioneer are visible to the crowd, which may react in response.

Table 4. Trading Mechanism: Open-Outcry Call Auction

The trading mechanism works as follows:

- (i) the auctioneer begins the auction process with an opening price (for example, the price of the previous auction); 1/
 - (ii) the floor brokers submit customer and own-orders and the resulting net excess demand or supply is revealed to the crowd;
 - (iii) the auctioneer adjusts the price in response to a net excess demand (by raising the price) or supply (by lowering the price);
 - (iv) floor traders are permitted to submit new orders (and in some cases revisions of old orders) in response to the contemporaneous developments in price and order demand; and
 - (v) the auction stops at the point where demand and supply are equilibrated-- when there are no further orders to buy or sell.
-

complex to organize. 2/ For this reason, they would generally be used for securities where there is sufficient trading interest and market expertise to support the interactive process. Due to the close time frame within which the auction occurs and the physical limitations of voice/visual trading, direct participants in the auction are limited to the crowd. From one perspective, traders in the crowd act as intermediaries for public traders, providing a service of enhanced price discovery and price stabilization. From another perspective, traders in the crowd have certain advantages over public traders in terms of information on the formation of prices and in their ability to submit orders in response to that information.

(2) Electronic call auction 3/

In the preceding call auction, participation in the interactive price discovery process is limited to the crowd. By using

1/ Rules for beginning trading and arriving at the market clearing price vary from system to system. For a study on the effects and efficiency of such trading rules see McCabe, Rassenti, and Smith (1993).

2/ It is for this reason that primary auctions of government securities are almost always sealed-bid. Of note, the U.S. authorities did examine the desirability of introducing "open outcry" or "recontracting" primary auctions following the Salomon scandal, but due to its complexity, the idea was dismissed.

3/ The so called "electronic call auction" underscores the use of technology in the organization of the secondary market.

instantaneous communication and trade execution systems, the electronic call auction market removes the physical barriers of the exchange floor. This permits public traders to participate on an equal footing with the crowd in terms of: (i) the access to information on the formation of prices and order flow; and (ii) the capability to submit new orders on the basis of that information. The "crowd" may therefore be enlarged significantly, potentially creating a deeper and more liquid market and leading to more efficient price discovery. To render full advantage of the possibilities of electronic call auctions, however, a sophisticated investor base that is interested in participating directly in the trading process is needed.

In 1994, the Tel Aviv stock exchange began operation of an electronic call auction market (called the Computerized Call Market) for government bonds. Also in 1994, the Rome stock exchange introduced an electronic call auction for the trading of retail bonds.

2. Continuous markets

As the name suggests, continuous market structures permit continuous trading. They share the following properties:

- Continuous price discovery with real-time information on prices, transactions, and market conditions;
- Immediate trade execution possibilities; and
- Flexible management of trading strategies.

There are two basic types of continuous markets: (2a) auction-agency markets; and (2b) dealer markets. The various types of these market structures are discussed below.

a. Auction-agency markets

Auction-agency markets are centralized to facilitate the interaction of orders (buying and selling interest of public traders). Reflecting this characteristic, they are often referred to as "order-matching" markets. The various types of auction-agency markets discussed in detail below, differ in respect to the order-matching process and the role of intermediaries in the market. As classified in Chart 1, auction-agency markets are sub-divided between floor-based and electronic markets. Floor-based markets are further sub-divided between double-sided auction, board trading, and crowd trading systems.

(1) Floor-based

(a) Double-sided auction market (with single-capacity broker). At the center of this market structure is the "consolidated order book" where orders are stored and executed. There are two general types of orders--limit orders and market orders. Limit orders are contingent on a certain minimum price (in the case of a sell limit order) or maximum price

(in the case of a buy limit order). Market orders do not specify a price, only the quantity to be executed at the best price(s) available. The former may be thought of as a means for public traders to advertize their buying or selling interest to other public traders, thereby supplying liquidity to the market, while the latter permits public traders to buy and sell immediately, demanding liquidity of the market. The order book provides traders with a hierarchy of trade priorities: this includes "price priority"--the best price (highest buy or lowest sell) is executed before other prices; and "time priority"--in the case of two orders with the same price, the order submitted the earliest--i.e., that has been on the consolidated order book the longest--will receive priority of execution. The trading mechanism is described in Table 5 below.

Table 5. Trading Mechanism: Double-Sided Continuous Auction

The trading mechanism works as follows:

- (i) the consolidated order book, maintained by an exchange, records buying and selling interest expressed as limit orders;
 - (ii) a trade occurs when either limit orders cross (buy price exceeds or equals the sell price), or when an incoming market order (an order to sell or buy a particular quantity at the "best" price) is crossed against a limit order(s) in the order book; and
 - (iii) the transaction is reported to the market.
-

Single-capacity brokers are so termed as they provide access to the exchange and manage public orders but are prohibited from submitting their own orders (orders where the broker acts as principal). The management of orders in the best interest of public traders is a service provided by them: as public orders may arrive sporadically or unevenly, delegating the management to a broker of the timing of submission of orders into the auction can potentially reduce transaction costs.

Greece, Malta and Ireland provide examples of a pure auction market for government securities, although the Irish market structure is in the process of changing into a dealer system (see Introduction).

(b) Board trading. In markets characterized by "board trading," a central board replaces the consolidated order book, displaying only the most attractive prices. However, time priority is generally maintained for only the first and second prices listed. The

advantage of board trading is its simplicity. 1/ The board might be a regular chalk board or an electronic board. Board trading is typical of stock exchanges in many developing countries. The trading mechanism is highlighted in Table 6 below.

Table 6. Board Trading Mechanism

The trading mechanism works as follows:

- (i) floor members place bids and offers on the board, generally for the best and second best buy and sell prices for a standard "board lot" size: 2/
 - (ii) floor members are permitted to improve the bid or offer, thereby removing the previous (and inferior) bid or offer from the board; and
 - (iii) any member can "lift" (buy) the offer or "hit" (sell) the bid on the board.
-

(c) Crowd trading (with dual-capacity brokers). In this market structure, floor-based intermediaries (called locals) are dual-capacity brokers--they act on behalf of their clients and on their own behalf as principal. As with all auction-agency markets trading is centralized, occurring on the floor of the exchange in a particular location (sometimes called a trading pit or post) for each security. Crowd trading is characterized by bilateral trading between floor traders (there is no consolidated order book) using verbal/sign communication (see Table 7 below). The role of locals is discussed below.

Table 7. Crowd Trading Mechanism

The trading mechanism works as follows:

- (i) public orders are routed to floor traders "locals" gathered at a trading post;
 - (ii) locals actively bid and offer into the crowd for both own-account and public trader interest; and
 - (iii) a trade occurs when any two locals agree on a bilateral transaction.
-

1/ Board trading systems are compatible with hybrid dealer/agency market systems where, for example, floor traders may be required to maintain a certain spread.

2/ Board trading is done in a predetermined standard size termed a "board lot" in order to simplify trading and concentrate liquidity.

Locals expose public orders to the market (other locals) for execution. Locals may also trade on their own account as principals (hence the term dual-capacity). This permits them to actively provide liquidity in the market as compared to single-capacity brokers. For example, in the case of an arrival of a large order to the market, several locals may participate on the other side, thereby effectively breaking up the size of the order into smaller pieces, adding to the market depth.

Locals also play an active role in price stabilization. They react continuously to order flow arriving onto the exchange, following closely such factors as market momentum, size of orders, and the origination of orders. They tend to trade actively on an intra-day basis, while closing positions by the end of the day. Highlighting their importance in providing liquidity, the locals on the Chicago Board of Options Trade contribute to about 60 percent of total trading volume (see Massimb and Phelps 1994).

In the context of government securities markets, crowd trading is often used for government securities futures and options markets--for example, London's LIFFE and Chicago Mercantile Exchange.

(2) Electronic order-matching systems

As in the case of electronic call auctions, electronic order-matching systems potentially expand the "crowd" by removing the limitations posed by physical trading floor arrangements, opening access to the market through electronic communications and trading facilities.

In electronic auction markets, public traders have access to order flow information and can trade on anonymous basis in response. It is argued by some (for example Massimb and Phelps 1994) that this may discourage the active participation of locals and therefore reduce the overall liquidity in the market. Despite these concerns, there is a distinct trend towards electronic order-matching systems and away from floor-based auction-agency markets. Depending on market size and required level of computer sophistication, electronic markets may be very cost effective as they avoid the necessity of having to maintain a physical trading floor.

Electronic order-matching systems are being used in Italy and Ireland for the futures (government securities) market, in India for some government securities on the Wholesale Debt Market, and the Madrid stock exchange offers a CATS (Computer Assisted Trading System) for retail bonds.

b. Dealer markets

In this market structure, the spurious arrival of orders to the market is bridged by intermediaries--dealers--that maintain continuous market conditions. Dealers supply two-way (bid and offer) quotations to public

traders, which, in turn, may either buy or sell against those quotations. 1/ For this reason, dealer markets are often described as "quote-driven" markets, underscoring the dealer's function of maintaining continuous markets.

Two basic types of dealer markets are discussed below--competing and monopoly. Competing dealer markets are subdivided into decentralized and centralized (electronic) markets (see Chart 1).

(1) Competing dealer markets

Dealers provide continuous quotations in competition with other dealers thereby earning the spread between bid-offer quotations.

(a) Decentralized over-the-counter market. The simplest form of dealer market--the over-the-counter market--is characterized by direct dealing (bilateral trading) between dealers (see Table 8 below), and between dealers and public traders (clients).

Table 8. OTC Trading Mechanism

The trading mechanism usually involves the telephone communication system and works as follows:

- (i) dealer A telephones dealer B and requests a "run of quotes" on the most liquid benchmark issues of government securities;
 - (ii) dealer B gives firm two-sided quotations (bid and offer) for the requested securities and states the size for which the quotations are good for;
 - (iii) dealer A will then either (1) "hit a bid" or "lift an offer" for any size up to the stated maximum, (2) ask whether a particular bid or offer is good for more size and after having the size confirmed return to (1) above, or (3) "pass" on the quotations (i.e., decline to any trading business); and
 - (iv) in the event that a trade is done, both traders enter the trade onto their trading blotter and the trade is later confirmed by the back-office and prepared for clearing and settlement.
-

Nascent markets often begin as OTC markets. This is typical of treasury bill markets, for example. As treasury bills tend initially to be held by a narrow group of institutions, namely banks, the holders of treasury bills are known to each other, creating natural counterparts for

1/ In a pure dealer system, one public order does not have an opportunity to be exposed to another public order, which is the essence of auction/agency markets.

trading and reducing search costs. Clients undertake a search among dealers to find the most competitive dealer quote (highest bid for a sale and lowest offer for a purchase). ^{1/}

In the basic OTC market, trading and information is entirely decentralized, therefore, real-time information on prices tends to be limited. Inefficiencies may result as trades occur at different prices at the same time. Moreover, without price and transaction information, public traders may find it difficult to judge the quality of execution offered by intermediaries.

(i) Over-the-counter markets with competing interdealer brokers. For efficient price discovery, the OTC market discussed above will need to develop further. This is facilitated by interdealer brokers. The importance of the interdealer market and the role of interdealer brokers is discussed below.

An efficient interdealer market is essential to price discovery in decentralized OTC markets. In the first instance of trading, internal order flow (dealer-client trades) is accommodated into and from dealer inventories. As the cost of holding a suboptimal portfolio rises the longer it is held (see Stoll 1978(b)), a dealer will attempt to adjust inventory position quickly against other dealers supplying quotations. If competing dealers are experiencing net demand (supply) conditions, prices will quickly adjust upward (downward) in the interdealer market, contributing to price discovery. Table 9 below highlights the importance of dealer-to-dealer trade, in this regard, in a few government securities markets.

Table 9. Composition of Bond Market Trading

(In percent of total value)

	U.S.	Canada	Spain	U.K.
Dealer-to-dealer	60	45	44	44
Dealer-to-client	40	55	56	56
Total	100	100	100	100

Source: Based on estimates of respective central banks.

^{1/} Single-capacity brokers may emerge in markets where the distribution of securities has broadened to nonbanks to facilitate this search.

Interdealer brokers are specialized intermediaries offering trade execution services 1/ to dealers that improve the efficiency of the interdealer market in the following ways.

First, Garbade (1978) identifies the economic role of interdealer brokers (in the U.S. Treasury market) in improving market efficiency by providing information on quotations and transactions that: (i) reduces search costs; 2/ and (ii) improves competition among dealers leading to a narrowing in the dispersion of market quotations.

Second, Harris (1993) highlights the interdealer broker's role in negotiating trades between dealers (illustrated by the trading mechanism in Table 10 below). Importantly, an interdealer broker system provides anonymity to dealers ("blind broker" system). This service is particularly crucial in a market with informed traders, or dominated by large dealers.

Table 10. Interdealer Broker Trading Mechanism

The trading mechanism works as follows:

- (i) a dealer telephones an interdealer broker to place a two-part trade with the broker--the first part consists of a firm quote (either buy, sell, or both) and the second consists of potential further size that could be made available, if interest is expressed;
 - (ii) the interdealer broker publicizes the quotation (first part) either by telephone or screen to other dealers;
 - (iii) an interested dealer telephones the broker and either (1) trades against the firm quotation or (2) negotiates with the broker for a larger size or possibly price improvement;
 - (iv) the trade is reported to the rest of the market (either by telephone or screen);
 - (v) the interdealer broker earns a commission from one or both counterparties; and
 - (vi) the trade is cleared and settled through the interdealer broker such that the parties to the transaction remain anonymous (blind brokers).
-

1/ An interdealer broker generally provides the essential communication network--"hotline" telephonic connections and screen systems--among dealers to accomplish this.

2/ As markets develop, search costs rise with: (i) increasing numbers of market makers; (ii) increasing numbers of securities traded; and (iii) market volatility, increasing the risk of holding a suboptimal portfolio.

Finally, unlike dealers, interdealer brokers are paid strictly on commission (as opposed to the bid-offer spread). Interdealer brokers therefore help to increase trading volumes by educating dealers as to possible trade and arbitrage opportunities. In a sense, trading is "commission-driven." This can be an important factor in promoting underdeveloped markets.

The importance and role of interdealer brokers in facilitating interdealer trade in well-developed government securities markets is highlighted in Table 11 for a selected number of countries.

Table 11. Government Bond Market: Composition of Interdealer Trade in Selected Countries

(In percent)

Trade	U.S.	Canada	Spain	U.K.
Interdealer brokers	99	65	37	96
Dealer-direct	1	35	63	4
Total interdealer trade	100	100	100	100

Source: Based on estimates of respective central banks.

Interdealer brokers compete with each other for trading business from dealers. In general, the market can only support a limited number of interdealer brokers as the benefit of consolidating market information (competing dealer quotations) declines with the number of interdealer brokers, and as total commission income is spread over an increasing number of brokers. 1/ The number of dealers versus interdealer brokers in a selected number of countries is highlighted in Table 12 below.

1/ In practice, there must be fewer interdealer brokers than dealers.

Table 12. Government Bond Market: Number of Dealers
and Interdealer Brokers

(In percent)

	U.S.	U.K.	Spain	France
Primary dealers	39	22	33	18
Interdealer brokers	7	3	4	1

Source: Respective central banks.

(ii) Over-the-counter market with a monopoly interdealer brokers. In some countries, for example France, there exists a single interdealer broker. ^{1/} A monopoly interdealer broker offers a full consolidation of quotation information onto a single system. However, it may not provide the same degree of competition as competing interdealer brokers. Nonetheless, in markets where there is insufficient trade to support competing interdealer brokers, such an architecture may suggest itself as a transitional arrangement (see Section V.3.c of the text). For example, the authorities in Poland instituted a interdealer system (owned by the central bank) in order to develop their market and improve transparency (see Appendix III).

(b) Centralized dealer market

(i) Electronic dealer market. In an electronic dealer market, dealer quotations are centralized (consolidated) onto a screen-based network. Public trading interest is routed electronically onto the system and executed automatically against the best dealer quotations displayed on the screen-based system (see Table 13 below).

^{1/} In France, the interdealer broker PROMINOFI is owned by the primary dealers.

Table 13. Electronic Dealer Market Trading Mechanism

The trading mechanism works as follows:

- (i) designated market makers enter onto the system firm price quotations (bid and offer), along with the size that the quotation is good for;
 - (ii) the electronic system displays the best bid and offer for each security that is listed on the system;
 - (iii) agency brokers access the system and route client buy and sell orders (market orders only) electronically through the system;
 - (iv) client orders are executed against the best quotation available on the system; and
 - (v) the transaction is flashed across the system and the price quote is restored by the dealer or a competing dealer.
-

Centralized electronic (automated) trading offers certain advantages over OTC markets: (i) better transparency of price and transaction information; (ii) price and time priorities are provided as customer orders are executed on a first-in basis, against the best market price; (iii) interdealer intermediaries are not required--the centralized quotation system provides for the "information" and "intermediary" functions of the interdealer broker; and (iv) real-time auditing of transactions for the purpose of conducting market surveillance is facilitated.

However, centralized automated trading changes the nature of OTC dealer markets in a number of subtle ways. Centralized trading with transparent trade reporting reduces opportunities for dealers to compete for internalized (dealer-client) order flow, and profit from that information (by transacting with other less well-informed dealers) reducing dealer services supplied. In addition, the market maker is unable to differentiate between liquidity traders (uninformed) and information (informed) traders as trading is impersonal (there is no relationship between the market maker and the client). As a result, quotations provided by dealers may be for smaller size and bid-ask spreads may be wider, in order to guard against adverse selection by informed traders.

Italy provides an example of an electronic dealer market, introduced in 1988 as a reform of the OTC market. It was reformed further in 1994, as trading began to migrate back to the OTC market and abroad. The recent reforms addressed the above design issues by: adding a small number of well-capitalized market makers with greater obligations to quote in larger size (discussed in the text); providing more flexibility in managing trades (introducing interdealer brokers); and by locating electronic access points abroad, providing greater access to the system to attract foreign dealers.

(2) Monopoly dealer ^{1/}

A competing dealer market may not always emerge for reasons of economies of scale, presence of informed traders, and insufficient trading volumes. These factors are discussed below.

Economies of scale in market making may lead to a monopoly supply of dealer services. Evidence suggests that while economies of scale in market making are apparent, they are not normally so large as to result in a monopoly dealer structure.

Glosten and Milgrom (1985) suggested that when dealers are adversely selected by "informed traders," only a monopoly dealer can maintain markets by recouping losses from liquidity traders. As compared to equity markets, trading in government securities is generally characterized by a high portion of liquidity versus information traders. Nonetheless, as discussed above, this has been a factor in the Italian electronic dealer market. However, evidence suggests it is not so significant a factor as to lead to a monopoly dealer market, even in fully electronic and anonymous systems.

In nascent markets, there may be insufficient trading volumes to attract and support competing dealers. For example, in India, as a transitional arrangement, the money market was supported by a "single dealer" (discount house) (see Section V.3.a of the text and Appendix III).

^{1/} It is important to stress that monopoly does not necessarily involve an exclusive legal right that prevents other dealers from competing.

Comparison of Selected Primary Dealer Systems in Industrialized Countries

This Appendix provides a comparison of the major characteristics of primary dealer systems in France, Italy, Spain, the U.K., and the U.S.

France: Primary Dealer System	
MARKET STRUCTURE Description	<ul style="list-style-type: none"> • Primary dealer system established in November 1986 as part of government securities market reforms (primary dealers were chosen in February 1987) • Quote-driven, over-the-counter wholesale market for government securities
Dealers	<ul style="list-style-type: none"> • 18 primary dealers (<u>Spécialistes en Valeurs du Trésor (SVTs)</u>) • Reporting dealers (<u>Correspondants en Valeurs du Trésor (CVTs)</u>): none at this time • Dealers: stock exchange brokers, banks, securities houses, etc. • One interdealer broker (IDB) (<u>Prominofi</u>--owned by the SVTs)
Trading System	<ul style="list-style-type: none"> • The IDB provides: trading system (screen/telephone) on anonymous basis & compete for quotations from SVTs; securities lending and borrowing brokerage; and repo brokerage
Clearing and Settlement	<ul style="list-style-type: none"> • Intra-SVT clearing system; Banque de France (BOF) SATURNE system (book-entry) for short- and medium-term government paper; long bonds are held in SICOVAM, the French central securities depository.
PRIMARY MARKET	<ul style="list-style-type: none"> • Auctions: eligible to all participants including individuals, banks, stock brokers, financial companies--by electronic access or written tender • Securities: BTFs--short-term discount treasury bills, BTANs--(annual) interest-bearing treasury bonds typically two and five year maturities, and OATs--long-term bonds (in FF and ECU) typically 10 and 30 years are reopened (fungible) regularly
PRIMARY DEALERS Eligibility	<ul style="list-style-type: none"> • Eligible institutions: credit institutions, <u>caisse des dépôts</u>, banks, securities houses (institutions governed by Article 99 of the Banking Act); primary dealers will reflect the diversity of institutions active in market, including foreign
Minimum Requirements	<ul style="list-style-type: none"> • <u>Minimum capital requirement</u>: minimum capital of FF 300 million • Probationary period as a CVT • Willingness to meet obligations of a primary dealer and performance standards • SVTs and CVTs are selected annually
Obligations	<ul style="list-style-type: none"> • <u>Primary auction underwriting</u>: regular and significant participation; at minimum must win an average of 3 percent over the three types of securities in FF; and 2 percent in each issue over a one-year period • <u>Secondary market making</u>: must trade a minimum of 3 percent of total secondary market volume in each FF security, and 2 percent for securities in ECU • Quote two-way markets on principal issues common to all primary dealers (list is established jointly by the Trésor and the primary dealers) • Must promote sales domestically and abroad to clients (i.e., nonprimary and reporting dealers) and provide information (weekly) on distribution
Incentives	<ul style="list-style-type: none"> • <u>Line of Credit</u>: none • <u>Rights</u>: exclusive access to the IDB • <u>Other</u>: only SVTs may submit noncompetitive bids; up to 10% of the proposed amount (mid point of fourchette) at the auction, and up to 15% after the auction (up to midday the day after the auction), allocated on the basis of the average tender performance of each SVT of previous three auctions; and only SVTs can strip and reconstitute OATS
IMPLEMENTATION	<p>"Cahier des charges des SVTs" (primary dealer agreement)--from time to time, the Trésor issues broad guidelines and specific performance criteria for SVTs</p> <ul style="list-style-type: none"> • Before becoming an SVT, an institution first demonstrates its ability to fulfil all the conditions listed above, during a probationary period, in which it serves as a CVT • SVT status is subject to performance standards reviewed annually (see above)
Open Market Operations (OMO)	<ul style="list-style-type: none"> • Trésor conducts active debt management operations with SVTs • Bank of France (BOF) executes open market operations (in BTFs and BTANs only) through a group of 26 interbank market agents--selected separately by the BOF
Regulation	<ul style="list-style-type: none"> • <u>Comité de la Réglementation Bancaire</u>--rule making authority for lending institutions • <u>Commission Bancaire</u>--responsibility for ensuring compliance by lending institutions • <u>Commission des Opérations de Bourse</u>--supervises the operation of securities markets of listed financial instruments
OTHER CHARACTERISTICS	<ul style="list-style-type: none"> • Well-developed repo market and future markets • Established benchmark securities • OATs bid/offer spread is about 5-15 centimes; blocks of FF 50 to 200 million trade

Italy: Centralized Screen-Based Automated System "Mercato Titoli di Stato" (MTS)	
MARKET STRUCTURE Description	<ul style="list-style-type: none"> • MTS was established in May 1988 (and revised Feb. 1994) by the Bank of Italy (BOI) and the Treasury to enhance transparency and efficiency of the government securities market • MTS is a wholesale debt market characterized as: (1) a centralized quote-driven dealer market; (2) automated screen-based trading; and (3) computerized electronic communication links with market centers and the clearing & settlement system of the BOI
Dealers-- Participants	<ul style="list-style-type: none"> • Dealers--three tier: 10 <u>specialists</u>, 31 <u>primary dealers</u>, and 173 <u>dealers</u> • Eligible participants as dealer include BOI, banks (including foreign banks operating abroad), stock brokers, insurance companies, investment fund Co., securities firms (SIMs), and securities firms registered in EC, all with net capital of at least 10 billion lire
Trading System	<ul style="list-style-type: none"> • MTS--two-tier, screen-based trading system automated with book-entry & settlement system • <u>First tier</u>--specialists and primary dealers display firm two-way quotes on screen; • <u>Second tier</u>--dealers access the MTS to execute (electronically) own and customer orders against those quotes • A special agreement "Convention" signed by all dealers establishes the organization and operational framework of MTS
Clearing and Settlement	<ul style="list-style-type: none"> • Involves Clearing House (CH), Cash Account (CA), and Centralized Deposit (CD) systems • CH: run by the BOI--located in 7 main cities electronically connected--cleared on a <u>multilateral netting basis</u> • CA: centralized accounts of banks and nonbanks held at BOI for settlement • CD: BOI runs the system and sets conditions for membership--automated link with CH
PRIMARY MARKET	<ul style="list-style-type: none"> • Auctions: bond auctions are uniform price; limited to banks and SIMs (which include primary dealers and specialists) • Commission is paid on auctioned bonds (ranges from 35 to 65 cents on long bonds)
PRIMARY DEALERS Eligibility	<ul style="list-style-type: none"> • Only SIMs and banks (including foreign--with a branch established in Italy) are eligible to be primary dealers and specialists
Minimum Requirements	<ul style="list-style-type: none"> • <u>Primary dealers</u>: minimum capital requirement of 50 billion lire; and selling contracts in the previous year of at least 10 trillion lire in government bonds; • <u>Specialists</u>: status as primary dealer with at least 75 billion lire in capital
Obligations	<ul style="list-style-type: none"> • <u>Primary dealers</u>: secondary market making--(1) yearly trading volumes on MTS of at least 1% for each category of security; (2) quote two-way market on minimum of 10 issues for minimum size of 5 billion lire; and (3) must replace quote on screen within five minutes of trade (must be at least 2 dealers for each issue) • <u>Specialists</u>: primary auction underwriting--(1) average annual share of at least 3% across all security categories issued by auction, and (2) 1% for each security category; secondary market making--(1) commitment to trade a volume of 3% of total market turnover on MTS; (2) 1% for each security category; and (3) must quote for size of 25 billion lire on benchmark stocks
Incentives	<ul style="list-style-type: none"> • <u>Line of credit</u>: specialists and primary dealers access at their initiative a special repo and reverse repo facility for up to a limit 100 bln. and 50 bln lire, respectively for a period of up to seven days, on a "carry-neutral" basis (repo rate set at the 2 week interbank rate, and the reverse repo rate is set at the yield of the securities); and specialists and primary dealers are sole "market makers" on first tier of MTS (screen) • <u>Rights</u>: specialists have exclusive access to supplementary re-openings offered at the discretion of the Treasury (up to 10% of quantity issued at auction, awarded at the marginal price on a prorata basis as a percentage of their successful bids at the last 3 auctions) • <u>Other</u>: specialists can propose security transactions to the BOI
IMPLEMENTATION	<ul style="list-style-type: none"> • Membership in screen-based system is controlled by the Management Committee composed of the BOI (gives final approval), and market participants • Dealers must sign "special convention" for trading obligations and rules • Specialists and primary dealers that no longer meet minimum requirements over a one-year period have their status removed
Open Market Operations	<ul style="list-style-type: none"> • BOI conducts OMO in repo off screen with banks and some SIMs for monetary management • BOI conducts reverse auctions in T-bills only with primary dealers and specialists • BOI buys bonds (sometimes sells) on screen with primary dealers and specialists
Regulation	<ul style="list-style-type: none"> • Rules of MTS contained in ministerial decree dated February 24, 1994 • Management Committee of MTS is an SRO; Treasury and Commission for Stock Exchanges and Joint Stock Companies (CONSOB), and BOI participate in meetings of Committee • Dealers are signatories of the Convention
OTHER CHARACTERISTICS	<ul style="list-style-type: none"> • Daily turnover of about 15 trillion lire (\$9.6 billion)--(to September 1994) • Average spread (bid-offer) of about 2-3 basis points on liquid benchmark issues • Total of 114 different issues quoted

Spain: Government Debt Market and Book-Entry System	
MARKET STRUCTURE Description	<ul style="list-style-type: none"> • Book-entry system established in 1987 as a decentralized dealer market by the Bank of Spain (BOS) as part of reforms to improve secondary market efficiency • Quote-driven over-the-counter market
Dealers Market Participants	<ul style="list-style-type: none"> • Three tier dealer system--99 full-capacity registered dealers of which: 11 <u>Creados de Mercado</u> (market makers--all banks); and 22 aspiring market makers <u>Negociantes de Deuda</u> • <u>Wholesale market</u> includes registered dealers and account holder entities (see clearing and settlement) • <u>Client market</u>: consists mainly of repo operations between registered dealers & investors
Trading System	<ul style="list-style-type: none"> • Wholesale trading takes place over the telephone--either direct or through brokers • Interdealer brokers (screen-based/telephone) provide anonymous quotations (blind broker system) for primary dealers--accounts for about 37% of interdealer trade • Stock exchange recently introduced an electronic small-order execution system for client market
Clearing and Settlement	<ul style="list-style-type: none"> • BOS owns and operates Central Book-Entry Office (CBO) which clears and settles all transactions among market members • Market members include: (1) account holder entities--can trade in their own name only and hold accounts (in their name only) at the CBO; and (2) registered dealers--can hold third party accounts (<i>clients</i>) in government securities • Third-party non-account holders access CBO through registered dealers
PRIMARY MARKET	<ul style="list-style-type: none"> • <u>Auction committee</u>: made up of 2 BOS and 2 Ministry of Finance (MOF) members • Two types of auctions: (1) placement amount is not preannounced and stop-out rate is chosen by auction committee; and (2) placement amount is preannounced (infrequently used) • Auctions are eligible to all participants resident and nonresident--bid prices higher than the weighted average pay the weighted average price while bids below the average price pay the bid price (limited noncompetitive bids are also accepted) • If the placement target is not reached (auction type 2), MOF may call a second round auction, for market makers only, at freed prices, provided the amount accepted in the first round is equal to or greater than 70% of amount offered. Each market maker is obliged to submit bids for an amount no less than their prorata share of the remaining portion • Following any auction type 1, or any thoroughly covered type 2, an automatic second round occurs, for market makers only. Market makers can bid at their option, but at interest rates no higher than the average yield resulting in the first auction. The MOF must award a minimum of 10 percent of the accepted bids when bids accepted in the first round are greater than or equal to 50 percent of total bids received, or a minimum of 20 percent of accepted bids when bids accepted in the first round are less than 50% of total bids received
MARKET MAKERS Eligibility	<ul style="list-style-type: none"> • Market makers can include commercial banks, savings banks, or securities firms
Minimum Requirements	<ul style="list-style-type: none"> • (1) Must have a <u>minimum capital</u> of Pta 750 million, to be increased to Pta 1,000 million within two years time; and (2) be under BOS's supervision and control
Obligations	<ul style="list-style-type: none"> • <u>Primary auction underwriting</u>: must participate in auctions and are obligated to bid for coverage of second round auction (see primary market above) • <u>Secondary market making</u>: must maintain an active and continuous two-way secondary market with specified minimum and maximum spreads; and provide BOS with market information
Incentives	<ul style="list-style-type: none"> • <u>Line of credit</u>: none • <u>Rights</u>: market makers and aspiring market makers have exclusive access to interdealer broker system; market makers have exclusive access to second round auctions; and market makers have exclusive access to some categories of open market operations
IMPLEMENTATION	<ul style="list-style-type: none"> • Requirements for aspiring and market makers are revised from time to time by the BOS • Selection of aspiring and market makers made by the BOS based upon activity in primary and secondary markets, customer base, and quality of human and technical resources • Aspiring market makers are ranked annually according to a weighted index of quantitative indicators of activity in primary and secondary markets: only the 12 best placed qualify for becoming market makers for the coming year.
Open Market Operations	<ul style="list-style-type: none"> • Though the bulk of OMO are conducted through repo auctions in which all banks participate, overnight repos and direct interventions are conducted only with market makers
Regulation	<ul style="list-style-type: none"> • BOS is entrusted, in coordination with the Ministry of Economy and Finance, the responsibility for the organization and management of both the primary and secondary markets for government securities--supervision is shared between the BOS & the capital market authorities
OTHER CHARACTERISTICS	<ul style="list-style-type: none"> • Average trade size for bonds is Pta 500 - 1,000 million • Average daily turnover of Pta 156 trillion of government securities and Pta 1,441 billion in repo for 1991 • Average bid-offer spread on liquid bond issues is about 5 to 10 basis points

United Kingdom: Gilt Edged Market Makers (GEMM)	
MARKET STRUCTURE Description	<ul style="list-style-type: none"> • New structure of gilts was inaugurated October 27, 1986 (Big Bang)--trading moved off-floor • Continuous improvements in book-entry system
Dealers	<ul style="list-style-type: none"> • 22 GEMMs (14 of which owned by foreign parents from U.S., Japan, and Europe) • 3 interdealer brokers (IDBs) • 8 stock exchange money brokers (SEMBs)
Trading System	<ul style="list-style-type: none"> • Over-the-counter, screen-based quotes • IDBs act as "blind broker" (anonymous quotes) for GEMMs • GEMMs, IDBs, and SEMBs are all members of the London Stock Exchange (LSE)
Clearing and Settlement	<ul style="list-style-type: none"> • Bank of England's (BOE) Central Gilts Office (CGO) provides book-entry holdings of stock and a computerized stock transfer and payment system for its members • Members (total of 175 direct) include GEMMs, banks, specialized financial institutions, insurance co., and pension funds; and nominee co. (indirect members)
PRIMARY MARKET	<ul style="list-style-type: none"> • Auctions: broad outline of financing (the REMIT) is announced each March, followed by more detailed information prior to auction • All types of investors are permitted to submit bids for auctions • Tap issues: following auction or tenders, or from direct placement with the BOE, the BOE sells stock, generally in rising market conditions to GEMMs, generally by way of a "mini tender"
PRIMARY DEALERS Eligibility	<ul style="list-style-type: none"> • Must be a member of London Stock Exchange (LSE) • Must be separately capitalized entities with dedicated capital held in the European Economic Area
Minimum Requirements	<ul style="list-style-type: none"> • <u>No minimum capital requirement</u> • Must comply with BOE's capital adequacy standards based on ratio of risk exposure to capital
Obligations	<ul style="list-style-type: none"> • <u>Primary market underwriting</u>: no fixed arrangements between BOE and GEMMs for primary issuance underwriting • <u>Secondary market marking</u>: must make, on demand and in all trading conditions, continuous and effective two-way prices in appropriate size in the full list of gilt maturities • Must meet capital adequacy standards at all times
Incentives	<ul style="list-style-type: none"> • <u>Line of credit</u>: access to a secured lending facility at the BOE (in relation to capital) • <u>Rights</u>: only GEMM may borrow stock from SEMBs (and Discount Houses in stocks up to 7 year maturity; and only GEMM are permitted access to IDBs) • <u>Other</u>: certain tax arrangements facilitating market making; a direct dealing relationship with the BOE; and GEMMs may submit bids for auctions by telephone up to the auction deadline; other participants (that bid directly) must bid by "written tenders" the day before the auction
IMPLEMENTATION	<ul style="list-style-type: none"> • <u>Memorandum of understanding</u>--relationship between BOE and GEMM is outlined in 1985 document "The Future of the Gilt-Edged Market--the BOE's Dealing and Supervisory Relationship with Certain Participants"; and in 1986 "Operational Market Notice" • Prospective firm applies for GEMM status; the application is discussed with the BOE; guidelines as to expected market participation and size of quotations are discussed and drawn up in a letter to the prospective GEMM; firms have 2 weeks to confirm acceptance; BOE publishes a list of GEMMs • Market is conducted according to the rules and regulations of the Exchange
Open Market Operations	<ul style="list-style-type: none"> • The BOE occasionally purchases gilts with a maturity of less than one year • Receives bids for stock from GEMMs just before the market open--BOE deals at its discretion • Money market operations conducted with discount houses
Regulation	<ul style="list-style-type: none"> • GEMM are subject to regulation and prudential supervision of the BOE • BOE oversees protection of investors on behalf of the Securities and Futures Association • The LSE monitors trade from the point of conduct of business
OTHER CHARACTERISTICS	<ul style="list-style-type: none"> • Typical spreads are 1/32 for short-dated and up to 1/8 for longer dated off-the-run issues • Turnover averaged about 6.3 billion pounds per day in 1993 • Total capitalization of GEMMs (1993) is 733 million pounds

United States: Primary Dealer System	
MARKET STRUCTURE Description	<ul style="list-style-type: none"> • Quote driven, over-the-counter market (OTC) • Treasury notes and bonds are listed on the New York Stock Exchange but trading volume is minuscule compared to the OTC market
Dealers and Market Participants	<ul style="list-style-type: none"> • 39 primary dealers; 1,700 broker/dealers; and 7 interdealer brokers • Largely a wholesale market in which institutional investors such as banks, thrifts, dealers, pension funds, insurance companies, mutual funds, and state and local governments operate
Trading System	<ul style="list-style-type: none"> • Interdealer brokers (IDBs), screen-based/telephone, provide anonymous quotations (blind broker system) • Three IDBs allow access to primary dealers only; another three allow access to Government Securities Clearing Corporation (GSCC) members; and one IDB permits its own list of credit worthy customers to trade • GOVEX owned and operated by the primary dealers provides real time price information and trading volume information on government securities
Clearing and Settlement	<ul style="list-style-type: none"> • Federal Reserve system owns and operates a book-entry system for title registry whose members are clearing banks which in turn act as sub-depositories for other market participants • Private sector GSCC provides automated trade comparison, clearing and a netting services for members (more than 60 of the most active banks, dealers, and interdealer brokers) • Final settlement for securities transactions occurs on the FED wire • Treasury Direct book-entry system is offered primarily for retail investors that intend to hold securities to maturity--no custodial or transaction fees are charged
PRIMARY MARKET	<ul style="list-style-type: none"> • Auctions: all types of investors are permitted to submit bids • Only depository institutions, government securities brokers, and dealers registered with the Securities Exchange Commission (SEC) are permitted to bid on behalf of customers • In 1991, primary dealers bidding accounted for about 72 percent of auction winnings, of which the top 10 primary dealers accounted for 50 percent
PRIMARY DEALERS Eligibility	<ul style="list-style-type: none"> • Commercial banking organizations subject to supervision by U.S. federal bank supervisors or broker/dealers registered with the SEC
Minimum Requirements	<ul style="list-style-type: none"> • Commercial banks must meet minimum capital standards under the Basle Capital Accord, and have at least \$100 million of tier I capital; registered broker/dealers must have at least \$50 million in regulatory capital and net free capital above regulatory warning levels
Obligations	<ul style="list-style-type: none"> • <u>Primary auction underwriting</u>: must participate in a meaningful way in treasury auctions • <u>Secondary market</u>: must make reasonably good markets in their trading relationship with the Fed's trading desk; and provide the desk with useful market information and analysis
Incentives	<ul style="list-style-type: none"> • <u>Line of credit</u>: none • <u>Rights</u>: exclusive access to open market operations • <u>Other</u>: permitted to submit bids on behalf of customers
IMPLEMENTATION	<ul style="list-style-type: none"> • <u>Guidelines</u> for primary dealers developed by the Federal Reserve Bank of New York (FRBNY) • Following the Salomon scandal, the primary dealer system is being adjusted to provide for a more equitable access to primary and secondary markets, for example: <ul style="list-style-type: none"> - administration of primary auctions was partially automated to provide easier access by investors - progress has been made in creating wider access to the interdealer broker systems - FRBNY is automating its OMO, thereby removing a technical constraint on the size of the primary dealer group - FRBNY has broadened its mandate, away from "dealer surveillance" which had conveyed the impression that it had the supervisory oversight of primary dealers, to "market surveillance"
Open Market Operations	<ul style="list-style-type: none"> • Open market operations are conducted by FRBNY through primary dealers
Regulation	<ul style="list-style-type: none"> • Treasury has rule making authority (Government Securities Act, revised 1993) • Enforcement by the SEC, bank supervisors, and federal financial institution regulatory authority • FRBNY heads an interagency working group on market surveillance consisting of the Treasury, Federal Reserve, SEC, and the CFTC. • NASD (National Association of Securities Dealers), an SRO, have (drafted) sales practice rules for government securities
OTHER CHARACTERISTICS	<ul style="list-style-type: none"> • Average daily trading volume (to Sept. 1994) was about \$150-250 billion • Average size of repo outstanding with dealers to Sept. 1994 was \$800 billion • Bid-offer spreads are razor thin on benchmark issues: about 1/32 on long term treasury bonds (more narrow on shorter-term benchmark issues)

The Organization of Transitional and Market Supporting Structures:
Secondary Market Window, Discount House, and Brokerage System

1. Secondary market window

In the initial stages of market development, when two-way markets are yet to develop with sufficient numbers of market makers to provide secondary market liquidity, central banks have often established a *secondary market window*; standing ready to buy and sell government securities as a market maker. As discussed in the text, the goal of this arrangement is to promote a more liquid secondary market through promoting more continuous market-making on the part of dealers by reducing the liquidity risk they face in holding inventories of government securities. This facility needs to be carefully designed so as not to conflict with monetary or market development objectives, as discussed below.

Two general approaches to establishing the functioning of the window are: (a) where buy and sell prices are fixed--either on an ad hoc basis or automatically against a reference price--and then announced to the market; or (b) where prices and transactions are flexibly managed, responding on a dynamic basis to market developments.

In the fixed case, with ad hoc adjustment, prices are generally set for a particular time period, say for a couple of days or a week and adjusted as necessary with market determined benchmark rates. Alternatively, prices can automatically adjust using a reference benchmark price plus or minus a percentage margin for buys and sells, respectively. Typically, in this case, the benchmark used is the interest rate established at the last treasury bill auction, especially in the absence of established secondary market benchmarks. In both cases, buy and sell margins should be set sufficiently wide to encourage direct trading.

In contrast, using the dynamic approach, secondary market window pricing by the central bank mimics a dealer by continuously adjusting price in response to market movements. Dynamic pricing usefully encourages the emergence of continuous market; however, care should be taken that the secondary market window operation *facilitates* market adjustment as opposed to the central bank *becoming the market*. Therefore, rather than provide quotes to the market, and possibly stifling price discovery, the central bank would respond to quotes from market participants. In practice, this is generally implemented by the central bank by responding to market quotes from the participants (dealers) by either "doing the proposed deal," or simply "passing" on the proposed transaction. Participants are thereby *encouraged to trade with one and another rather than with the central bank*.

In order to conduct dynamic secondary market window operations, the central bank trader needs to be in regular contact with market participants to determine how the market is being quoted and to find out volumes of trade occurring in the secondary market. Armed with this information, the central bank can better assess the appropriateness, given market circumstances, of

conducting a secondary window trade. 1/ As a rule, any participant approaching the central bank for a secondary window trade should normally have attempted to do the trade in the market before approaching the window.

Secondary market window transactions must strike a balance between the central bank's monetary policy and secondary market development objectives. For example, it would be inappropriate for open market operations to drain liquidity from the system to tighten money market conditions, while, through the secondary window, purchase large amounts of securities from the market, thereby injecting liquidity.

In order to prevent this from happening, operating rules should be established. For example, the secondary market window could be operated on a basis that net purchases or sales are kept within a set daily margin. The operation of the window would seek to accommodate the market, where appropriate, while maintaining its book within set operating limits. In addition, in contrast to open market operations which are for same-day settlement, *secondary window transactions could be for next-day settlement.* This would provide an opportunity to neutralize the liquidity effect of window operations the following day through open market operations.

Table 1 below highlights examples of countries using the general approaches highlighted above. Central banks may go through a transition from fixed to dynamic pricing as the market develops and becomes more continuous, while the role of the central bank in setting pricing and providing liquidity is reduced.

2. Discount house

In some countries, the authorities have encouraged the development of the market by establishing *one or more discount houses*--sometimes jointly owned by financial institutions, including possibly the central bank. Generally, a line of credit from the central bank would be extended to the discount house to help provide financing for inventory arising from its market making activity.

The discount house would at all times provide two-way quotes on selected benchmark securities under all market conditions. The discount house would constantly adjust its buy and sell quotations (level and spread) according to market conditions in order to keep inventories of securities at manageable positions and so that earnings from bid-offer spreads are sufficient to make operations profitable. Care should be taken that the

1/ Only if the central bank is informed of market conditions can it assess whether the participant has "done his homework." Importantly, the market intelligence information will prevent the central bank from being arbitrated by the market: for example, a participant buying from the market and selling the security simultaneously to the central bank at a higher price (lower yield).

Table 1. Structure of Secondary Market Window Operations

Structure	Country	Description
1. Fixed		
a. Ad hoc	India (up to 1992)	• Central bank sets buy and sell price list and announces to market
b. Automatic	Botswana	• Sets a price as a margin from the last primary auction of treasury bills
2. Dynamic		
	England	• Central bank responds to dealers' quotes according to market conditions

discount house does not discourage the emergence of market makers in the private sector or unduly discourage direct interbank trading in securities. In this context the profit motive is key such that operating margins for market making attract other dealers as the market develops. Arrangements with the central bank would need to be carefully considered so as not to interfere with monetary operations (discussed in the text).

3. Brokerage systems

Some central banks (Poland, Turkey, Thailand) have also encouraged the development of secondary markets by providing a brokerage or trading system, including of facilities to clear and settle government securities transactions. Such a system can be very effective in nascent markets by providing transparency of price information and, as well, making the clearing and settlement of securities simple and effective. Importantly, they can reduce resistance to establishing trading counterparties in the over-the-counter market when a lack of standardized trading practices and confidence in counterparties creates risks in securities dealing. In addition, they can be very simple to install, using existing technology, and require only a small number of people to operate.

The National Bank of Poland, for example, operated a brokerage system with considerable success in initiating a secondary market in treasury bills. The simple screen-based broker system--called the Telegazette--operated in the following manner: (a) participants (selected dealers) telephoned into the central bank with their buying and selling interests and accompanying quotations; (b) the central bank would enter onto the screen the quotations, which could be then be seen by all other participants on the system; (c) a participant would telephone the central bank and the buying or selling interest would be transacted against the quotation on the screen; (d) the central bank would confirm the trade by fax; and (e) the central bank would clear the trade through the banking department.

In situations where there are few, or some large, market players it would be particularly important that quotations are on a "blind basis"--that is, the names behind the quotations would not be revealed, and each side of the trade would be done through the central bank so that the identities of the trader would remain anonymous. An example of "blind broking" is provided by the Bank of Turkey which acts as the counter party to each trade (fully backed by collateral in the event of a fail).

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