

**Proposal to the Bank of Greece on the
organization of the secondary market
for Greek State bills, notes and bonds**

by

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Executive Summary

The Bank of Greece is advised to open a secondary market in Greek State bills, notes, and bonds. Such a market should be run by the Bank of Greece as an *open electronic call market*. The Bank is also advised to run the primary market for Greek State bills, notes and bonds as an *ascending open-outcry single-price auction*. For that purpose, the Bank of Greece is advised to create a new Division to run the primary and secondary markets. Both markets should be run by the same automated system which should also do the clearing process and run the depository of titles of bonds at the Bank of Greece. There are a number of benefits of the primary and secondary market when organized in the manner described in this proposal. They include the strengthening of public confidence in the obligations of the Greek State, the reduction of short term interest rates, additional ability of government policy to influence the short term interest rates through open market operations, the ability of the Greece State to borrow in longer durations and lower interest rates, and the general strengthening and widening of capital and other financial markets in Greece.

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Proposal to the Bank of Greece on the organization of the secondary market for Greek State bills, notes, and bonds¹

I. Introduction

In managing the public debt, the Bank of Greece is considering the opening of a secondary market in Greek State bills, notes and bonds.² The eventual integration of Greece in the EMS, and the process of convergence of the Greek economy to the EC make the creation of this market not only desirable, but in fact, necessary.

II. Summary of benefits of the *Secondary Market*

The existence of a well-run secondary market will serve a number of goals of the Bank:

- (1) Efficient management of the public debt.**
- (2) Possibilities of intervention through open market operations to adjust liquidity and interest rates in the money market as well as other macroeconomic variables.**
- (3) Reduction of uncertainty and speculation in the money market.**
- (4) Possibility of restructuring of the public debt toward longer durations and lower yields, so that borrowing costs are reduced.**
- (5) Strengthening public confidence in Greek State Obligations.**
- (6) In conjunction with the opening of the market for foreign exchange, the creation of the secondary market for Greek State obligations will help integrate the basic elements of the Greek financial system into the European (and World) financial system.**

¹ I thank Ernest Bloch, Panayiotis Pavlopoulos, Bob Schwartz, Bill Silber, Dick Sylla, Mike Tindall, Paul Wachtel, and Larry White for comments and suggestions on an earlier version of this study.

² Presently, there are occasional liquidations of bonds before their expirations done as special favors of commercial banks to their customers. These transactions are infrequent, and the bonds are heavily discounted. These occasional transactions do not constitute a market.

The present paper analyzes the specifics of the organization and the operation of the secondary market and their effects on the primary market. A number of issues and aspects are examined.

III. Fundamentals of a secondary market

The first fundamental feature of a secondary market is the provision of information. The presence of a market generates accurate information about risks and rewards of particular financial instruments. The lack of markets inherently reveals the existence of uncertainty about the price (here interest rate) of the non-traded asset. In many developing countries the uncertainty revealed by the lack of markets is exaggerated in the beliefs of traders. Thus, uncertainty generates further uncertainty. Because investors are risk-averse, uncertainty is paid dearly in financial markets. Thus, the reduction of uncertainty will significantly reduce the cost of servicing the Greek National Debt.

The information produced by financial markets is crucial for the allocation of resources according to risk. The information produced by the State bonds market (which is generally considered to have the least risk of default) is extremely important for the (intertemporal) allocation of resources. A persistent problem of LDCs is that resources are allocated to unproductive activities. An efficient secondary market will help alleviate this problem.

A second important feature of a secondary market is that the Bank of Greece can influence the level of economic activity in the short term through intervention in the secondary market to adjust short term interest rates. Such *open market operations* are of significant importance for the exercise of macroeconomic and monetary policy.

IV. Organization of the secondary market

(a) Definitions

In a *continuous market*, transactions are made frequently during the period when the market is open.³ In a *call market* transactions are made only at a pre-specified time. Orders to buy or sell are accumulated over time, bunched, and executed at a pre-specified time. Early stock markets were organized as (*sequential*) *call markets*.⁴ The name is derived from the traditional practice in these markets to *call* sequentially the name of the security to be traded at that moment in time.⁵ In contrast, in a modern call market, the markets for all securities are cleared **simultaneously**. The call market that we consider appropriate for the secondary market of Greek State securities has an added important feature: the aggregate supply and demand for each security are displayed in real time in the time period that leads to the call.

I propose, for reasons that are elaborated below, that the secondary market should be run as an *electronic call market* run by the Bank of Greece. This market will have open access and utilize a simultaneous clearing of all securities.⁶

(b) How the electronic call market works

A call market is essentially a **two-sided auction**. The operation of a call market is as follows. Orders to buy or sell a specific quantity at a specific price are placed through a network of terminals. An unconditional order is placed in the "*open book*". An order with specific

³ The NYSE currently operates a continuous market. The NYSE operated as a sequential *call* market from its start in 1792 up to the Civil War in 1870. In 1870 it merged with the **Open Board** which sprang up during the Civil War and was trading in a continuous market. After 1870, the NYSE has operated a continuous market. See Sobel (1965).

⁴ Examples of call markets include the Paris Bourse and the Tel Aviv Stock Exchange.

⁵ In early call markets typically securities were "called" once a day.

⁶ Open access to the market means that there will be no special class of dealers (primary dealers) who have exclusive access to the primary market.

contingencies is kept in the "*reserve book*". When contingencies are fulfilled, it is moved from the reserve book to the open book.⁷ The accumulated aggregate supply and demand schedules and curves of the open book are displayed on the terminals of all traders in real time. Traders can continue placing orders until a pre-specified time, say 12:00. As the time approaches 12:00, traders are able to see the accumulated aggregate supply and demand schedules, and their movements over time on their terminals. Indeed, traders can see the demand and supply curves on their terminal screens as in the textbooks. At 12:00 order entry stops. The market "auctioneer" matches supply and demand. The intersection of supply and demand determines the market clearing price. This is "*price discovery*" in this market. All orders that can be matched are matched at that price. All traders are advised of the fate of their orders.

The Appendix shows an example of the auction process in action. There I describe in detail what the traders input during the call, what the auctioneer discloses to the traders during the auction, the matching of supply and demand in the determination of the equilibrium price, and the allocation of quantities that change hands among the bidders.

The Bank of Greece will act as the exchange for this market. It is eminently qualified to do so. To implement this, the Bank should create a special division to act as the auctioneer and supervisor of both the primary and secondary markets. See "Institutional Changes" below.

As a start, it is best to do one clearing (i.e., one "call") a day. At a later stage, and if the liquidity of the market has grown significantly, there can be two "calls" a day, one in the morning, and one in the afternoon. As mentioned earlier, the markets for all Greek State bonds (of different issue date and different durations) are all cleared simultaneously.

⁷ For example, a condition that a trader might place on a large order is that there is a matching counter-order (in the aggregate). Such an order will be placed in the reserve book until its condition is fulfilled. Once its condition is fulfilled, it is moved to the open book. Only at that point in time it appears as part of the aggregate demand or supply that appears on the terminal screens.

(c) **Benefits of a call market over a continuous market**

(1) **Liquidity**

In a call market, transactions are bunched and executed at once. Thus, the call market provides a liquid, thick market with a large number of potential transactions available.

(2) **Effects of secondary market organization on uncertainty**

The thickness of the call market reduces the market variance of the price. Actualized market uncertainty is minimized.⁸ *This is a crucial advantage of the call market over a continuous market.*

(3) **Effects of secondary market organization on transaction costs**

Continuous markets are relatively thin by nature, in comparison with call markets for the same security. Thus, continuous markets require the services of *specialists* who provide liquidity to the market. In contrast, the high liquidity of the call market eliminates the need for specialists. The elimination of the specialists results in significantly smaller transactions cost in a call market.⁹

(4) **Reduction of the possibility of market manipulation**

Financial markets are subject to a variety of speculative schemes. Market manipulation is much easier in thin markets. The thickness provided by a highly liquid market guards against manipulation.

⁸ See Economides and Siow (1988), Economides and Heisler (1992), and Garbade and Silber (1976a, 1979).

⁹ The transaction fee faced by a trader is higher as the time of the "call" comes closer. Thus, traders are induced by lower transaction fees to put their order in the system early. This non-linear pricing scheme captures the positive externality to others (commonly called *network externality*) of market participation by a trader.

(5) **A call market provides better utilization of limit orders**

In a limit order, a trader defines acceptable price limits for a transaction. Limit orders give the opportunity to market participants to play more sophisticated strategies than just buying at the going market price. For example, a trader may be willing to buy IBM stock only at a price of \$80 or below, so he sends a limit order to buy at 80. In a continuous market, this transaction takes place the first time the price of IBM falls at \$80. The price may fall further later, but the trader cannot take advantage of that. In a call market, transactions happen at a single price, and because of the uncertainty reduction mentioned earlier, this price is lower in expectation than \$80. Thus, in a call market, a trader can expect that a limit order at \$80 will be executed at a lower price.

(6) **Possibility of use of orders that are contingent on certain eventualities or market conditions**

The call market is unique in making available the possibility of *contingent orders* that are dependent on a variable other than price. Example 1: A trader may want to execute an order for 100,000 shares if the transaction is not more than 30% of all transactions in that security. In this way, a trader attempts to reduce the probability that his trading will move the market price. Example 2: A trader may want to limit his aggregate exposure to all securities at the end of the call, i.e., a trader can specify a maximum net outlay in a collection of markets. The central operator of the call market can ensure that this condition is fulfilled. This is clearly hard to fulfill in sequential trading while achieving the trading objectives in fullness.¹⁰

¹⁰ More sophisticated trading based on contingencies can also be implemented in the future. In a perfectly competitive Arrow-Debreu economy, market equilibria are *efficient* provided that all possible markets exist. Arrow (1963) showed that efficiency could be achieved if there were sufficiently diverse securities based on contingencies. In practice, the market structure is *incomplete*, and the fully efficient equilibrium is not achieved. There are two reasons for that. First, there are increasing returns to scale in the issuing of securities. Thus, it may be very costly to issue all the necessary securities to make the market complete. Second, all contingencies

(7) **Direct access to the call market provides anonymity and no price shifts caused by large orders**

An important consequence of the high liquidity of call markets is that the market handles large orders without special procedures. Large orders can be transacted at a single price. Further, the danger of disclosure of the existence of a large order is minimized.

(8) **Elimination of bid-ask spread**

In a call market, the bid-ask spread is eliminated. The Exchange charges a fixed commission. The Exchange can induce liquidity by charging lower fees to the traders who are willing to disclose their participation in the market at an early time.

V. **Possibilities of intervention by the Bank of Greece through open market operations.**

The present interest rate structure in Greece is disjoint from world markets. For example, the present 3-month **real** interest rate in Greece is at least 6%, while the similar interest rate in the US is less than 1%. Clearly, the creation of an open foreign exchange market can be of substantial benefit to Greece in reducing the interest charges on the Public Debt.

The crucial function of the secondary market is the determination of interest rates of variable durations. The orderly operation of the secondary market for Greek State bonds, notes, and bills will allow the Bank of Greece to intervene at will through open market operations to adjust the liquidity of the money market and the short term interest rates. Thus, the Bank will be able to apply the appropriate level of stimulus to the economy.

cannot be anticipated, and traders have difficulty in guessing probabilities for all eventualities. Now, the possibility of including some contingencies in the trading orders in an electronic call market allows the traders to endogenously create new marketable securities, even though such securities have not been issued. Thus, the first reason for the incompleteness of the market structure is eliminated.

VI. The Primary Market

(a) General Remarks

The operation of the secondary market is very closely linked with the operation of the primary market for Greek State bills, notes and bonds. Because of the close substitution between bonds of similar duration, the interest rates of newly issued bonds will be close to the interest rates in the secondary market for bonds of similar duration. In the United States, there are two types of bids accepted in the primary market for US Treasuries, *competitive* and *non-competitive*. *Competitive bids* are placed by active bidders in the auction. Relatively small investors have the option to place *non-competitive bids*, which are awarded at the *average* price of all accepted competitive bids. Thus, the non-competitive bidders just buy at the going price without being able to influence it. The discussion of the primary market that follows in section (b) is for the auction participants that actively participate in the auction, i.e., those who place competitive bids. These bids constitute the main part of the primary market.¹¹ The discussion of non-competitive bids is deferred until section (c) below.

(b) Competitive bidding in the Primary Market

(1) The *when-issued* market for US Treasuries

Besides the primary market and the secondary market there exists another large market for U.S. Treasuries. This is the *when-issued* (WI) market. This market opens **before** a US Treasury auction and after the announcement of a certain issue date and amount to be auctioned.¹² In this market, dealers sell US bonds that are to be auctioned by the Treasury in

¹¹ Non-competitive bids were limited to \$1 million per single bidder. Since November 5, 1991, this limit was raised to \$5 million. Total awards to non-competitive bidders were about 8-9% in the notes and bond market (duration 2-30 years) and about 20% in the bill market (duration 13 to 52 weeks).

¹² Only since 1981 has the when-issued market operated before the auction. Earlier, it used to operate in the time period between the price-setting auction and the actual issue of the bonds.

the near future. Thus, this market acts as a futures or forward market for US bonds, although all transactions take place between dealers and customers (over the counter), and there is no formally listed futures contract. Buyers can lock-in a specific price for the bonds they bid for and will receive; dealers carry the obligation to supply them with bonds at the pre-arranged price. Thus, **all risk associated with the auction is born by the dealers**. This is the same dealer risk as taken by an underwriter in high quality bonds.

(2) **How market manipulation happens, and how to avoid it**

Primary and secondary markets for bills, notes and bonds are vulnerable to manipulation, *squeezes*, and shorts, even in the largest market in the world, the market for U.S. Treasury bills, notes, and bonds. The term "*squeeze*" or "*short-squeeze*" refers to a shortage of supply relative to demand for a particular security. As a result of the squeeze, the price of the security may move significantly out of line¹³ with the prices of comparable securities.¹⁴

A squeeze happens as follows: Dealers participating in the when-issued market have assumed obligations to deliver bonds at specified prices. These dealers may not be able to receive the full amount of their commitment (to their customers) in the when-issued market as the result of the Treasury auction. Dealers with uncovered commitments must cover them by buying **after the auction** from other dealers. If the distribution of quantities of the issue in the auction is widespread, the post-auction market is nearly competitive, and there is no problem.

¹³ Even if the price differences do not seem large, the very large quantities involved in such trades make a squeeze very costly to a squeezed dealer.

¹⁴ Squeezes were reported in April and May 1991 in the two-year Treasury notes. In particular, in the May issue, the squeeze developed at the time of the auction. A yield of 6.83% was reported in the when-issued market, but the auction produced an average yield of 6.81%. *Salomon Brothers* and its customers were awarded 87% of the total amount auctioned. Thus, many auction participants, including dealers with obligations in the when-issued market, did not receive as many securities as they expected. The squeeze appeared soon afterwards and prices rose significantly in the secondary market, as traders tried to cover their short positions. Soon afterwards, the Treasury started a review of the auction procedures.

However, if only very few dealers have received almost all the auctioned securities, the post-auction is very tightly oligopolistic. As a result, the price for the specific issue may soar at the post-auction market to prices significantly higher than the auction price and the when-issued price. This is a *squeeze*.

Note that for a squeeze to happen there are **three necessary conditions**. First, some dealers must have a hard time guaranteeing for themselves a certain quantity of the issue. This is mainly a feature of the **auction procedure**. The second necessary condition for the squeeze is that the bulk of the issue is distributed among very few buyers. This results in a tight oligopoly of sellers in the post-issue market. Currently in the U.S., only a few firms, mainly **primary dealers**,¹⁵ have significant **monopsonistic power** over the market,¹⁶ which allows them to have monopolistic power in and dominate the post-auction market.¹⁷ The third necessary condition for a squeeze to occur is that there are no close substitutes to the particular issue. In principle, there should be close substitutes. For example, a 6-month Treasury bill expiring on date X is a close substitute on date (X - 3 months) to a 3-month Treasury bill. However, the contracts in the when-issued market **do not allow any substitution**, even when from a financial point of view there are close substitutes, as in the example above.¹⁸ And, in

¹⁵ *Primary dealers* have the obligation to participate in Treasury auctions.

¹⁶ The persistence of *monopsonistic power* by a few of the 40 primary dealers in the US Treasury market has not been adequately explained in the literature. Some theorize that only few large primary dealers are sufficiently capitalized *and* have long term informal relationships with sufficient numbers of customers to be able to buy a very significant part of the issue at the auction and resell it.

¹⁷ However, given the present auction procedure, the elimination of the special position of the primary dealers does not eliminate the possibility of squeezes.

¹⁸ In futures markets, typically there are two or three close substitutes names, and the holder of a contract is forced to accept delivery of any of the substitutes. Rules allowing substitutions help avoid corners in futures markets. The problem here is that the when-issued market is not a formal **futures market** run through an exchange, but resembles a **forward market** run by individual dealers. Thus, by tradition no substitutions are allowed.

the event of a squeeze, the holder of the contract will demand delivery of the security in short supply, in the hope that the dealer carrying the obligation will buy back his contract (repo market). Also, even if substitutes were permitted, for bills of longer durations it is hard to match the coupons of bonds that have the same expiration, and therefore it is hard to find close substitutes. In summary, given that close substitutes are not available, **two features of the primary market for US Treasuries have been singled out as the most important facilitators of the squeeze: the auction procedure, and the extent of the distribution of the quantity of the issue.**

We show later in the paper that the possibility of a squeeze could be eliminated through changes in the auction procedure. Without such changes, the orderly operation of the market can only be policed through the implementation of special rules on the size of the bids, to avoid oligopsony in the auction and oligopoly in the post-auction market. The US Treasury has a collection of such rules that limit the amount that any particular dealer can buy.¹⁹ However, repeated violations of these rules have led to the series of squeezes.²⁰ In the presence of a squeeze, the US Treasury also has the option of re-opening issues -- selling more of an issue after the auction. This option has been used only rarely.

(3) The traditional auction procedure of the US Treasury

The traditional auction procedure in the US is a *multiple-price sealed-bid auction*. The Treasury starts awarding securities to the highest bidders and continues down the bid schedule

¹⁹ A key rule limits the percentage of the total auction that can go to a single dealer to 35%.

²⁰ Recent reforms in the US treasuries market (announced October 25, 1991) now make it easier for all government securities brokers and dealers to submit bids in Treasury auctions. Other administrative changes were also instituted to avoid future abuses. They included stronger enforcement of the auction rules, improved surveillance of the market, and reopening old issues. Most importantly, the US Treasury is actively considering to change the nature and procedure of the auction, including the possibility of a single-price auction, as discussed later on.

until the whole issue is covered. Bidders receive the securities at the price they bid. Thus, different bidders receive the same security at different prices.²¹ Since the highest bidders pay the highest prices, this is called "*winners curse*". This leads to inefficiencies. Traders do not want to be singled-out as the ones who paid more than the others for the same issue. To avoid this eventuality, traders will tend to bid less aggressively in the auction. Further, the risk of paying more is significantly higher for those traders who are less informed than others. Relatively uninformed traders face higher risks in auctions. Thus, they tend to avoid participating in the auctions, and they instead buy in the when-issued market. Thus, one expects that the prices in the present auction procedure will be slightly lower than they should be. Realizing this, the US Treasury is currently testing the procedure of a *closed-bid single-price auction* for the primary market of US Treasury bills, notes and bonds, while the general issue of the auction procedure is under re-consideration.

(4) The procedure proposed as an experiment by the US Treasury

Recently, the US Treasury proposed an experimental change in the auction procedure.²² The proposed *closed-bid single-price auction* will assign the same price to all auction participants. That is, each participant who is awarded securities at the auction will pay the price of the lowest bidder who was awarded securities. This procedure has the advantage of not discouraging less-informed bidders from bidding, since they know that, even if they bid too high, they will still receive the same price as others. However, although the Treasury hopes otherwise, **the proposed *closed-bid single-price auction* will not eliminate the possibility of squeezes in the market.** This is because the proposed procedure as well as the traditional one make it

²¹ The width of the range of yields in recent Treasury note auctions is usually 1 basis point (1/100) and at most 2 basis points (2/100).

²² This procedure has been used twice this far for the 2- and 5-year notes. It will be used experimentally for a year for notes of these durations.

difficult for a trader with a commitment to sell in the when-issued market to guarantee that he will buy the required amount of bonds. However, there exists an auction procedure that guarantees this and almost guarantees the elimination of squeezes. This is the *ascending single price auction*.

(5) **Organization of the primary market as an *ascending open-outcry single-price auction***

We propose an *ascending open-outcry single-price auction* for the primary market where all traders can participate. We expect that the single price auction procedure will diminish, if not completely eliminate, squeezes. This is because the procedure of the ascending single-price auction provides a conservative (and not very expensive) strategy to traders to avoid situations that lead to them being squeezed.

The auction process is similar in structure to the auction of a work of art, although it is automated and there is not a single item to sell but rather there are a large number of securities to be sold. Bidders will be able to place orders through a network of computer terminals that are connected to the computer of the Bank of Greece which will play the role of an electronic auctioneer. The auctioneer will start by announcing a low price (i.e., high yield) relative to recent experience. This price will be transmitted electronically to all the computer terminals of the bidders. Each bidder will reply through the terminal stating the number of securities that he is willing to buy at that price. Starting with a relatively low price ensures that at that price the entire issue would be sold. Before the auction, there is a well-known scale of price increments. For the US Treasury market, the price increment would typically be 1/32. At each point during the auction, every bidder has the option to state a higher price (go to the immediately higher price on the scale),²³ together with the quantity he would like to buy at that price. This is

²³ Bidders can only bid the going price or the one immediately above it on the pre-specified scale. Thus, large or unexpected jumps in price are eliminated. This feature ensures that the equilibrium price is not missed as price increases during the auction.

almost equivalent to a bidder calling out a higher price at an auction for a work of art.²⁴ Once an aggressive bidder has stated a higher price, the auctioneer calls out that higher price, and solicits offers to buy at that price or higher bids. At every stage, bidders are able to see on the screen terminals, not only the going price, but also the aggregate amount (demand) already bid at that price, as well as the total amount bid on lower prices. Thus, *during the auction process, traders are able to trace the demand curve for this commodity.* The auction ends when at a certain price, say p_n , there are **not enough** bids to cover the whole amount of the offering. The price at which *all securities* are finally sold is **not** the price p_n (at which the offering is not covered), but the immediately lower bid price p_{n-1} at which the whole offering is covered. Securities are then sold in priority to all bidders who offered to buy at the highest price p_n , and in the full quantity each bidder asked for. Remaining securities are divided proportionately according to their bids among the bidders of the immediately lower price p_{n-1} , which is also the final price of the auction.²⁵ Thus, a trader can guarantee to receive the full amount of securities

²⁴ The only reason this procedure is slightly more complicated is that here there are many items (securities) to be auctioned.

²⁵ For example, suppose there are 1,000 units to be auctioned, and there are four bidders, A, B, C, and D. Suppose that bids are as in the table below.

Price	A	B	C	D	Total Demand	Supply	Excess Demand
\$5	400	300	300	100	1,100	1000	100
\$5.10	300	200	200	45	945	1000	-55

Since at price $p_n = \$5.10$ demand is insufficient, the final price of the auction at which securities are sold is $p_{n-1} = \$5.00$. Traders A, B, C, and D receive 300, 200, 200, and 45 units respectively at price \$5.00, allocated to them from their bid at \$5.10. The remaining 55 units of the offering are sold proportionately to the traders according to the amounts they bid to buy at price \$5. Thus, trader A receives $55 \cdot 400 / 1100 = 20$ units extra, traders B and C receive $55 \cdot 300 / 1100 = 15$ units each, and trader D receives $55 \cdot 100 / 1100 = 5$ units. The final sale is

Price	A	B	C	D	Total Amount Sold	Excess Demand
\$5	320	215	215	50	1,000	0

he desires by bidding the high price p_n . However, he does not pay p_n unless there are enough bids at p_n to cover the whole issue. Thus, **traders are not punished for bidding aggressively**. The *ascending single-price auction encourages aggressive bidding* by the buyers and is therefore favorable to the issuing institution, since it results in the most favorable prices (and the lowest yields).²⁶

It is useful to do this auction quickly. For example, the total allowed time to bid at each price can be 3 minutes. The clock restarts (for a new 3 minutes) as soon as a higher bid is placed. Thus, the total duration of the auction can be about 15 minutes.

(6) Elimination of squeezes

A participant at this open-outcry auction can observe what quantities he would receive as the price increases during the auction. Thus, by playing an aggressive strategy, *a trader can guarantee for himself to receive a certain quantity at the ascending single-price auction*. Therefore *the possibility of a squeeze can be eliminated without the use or requirement of administrative measures such as limits to traders participation in particular issues*.

(7) Frequency and duration of issues of bills, notes and bonds

It is crucial to take steps to enhance and preserve liquidity in the both the primary and secondary markets. The possibility of more frequent primary offerings of bonds (for example daily offerings) and the availability of variable durations should be evaluated in the context of

²⁶ If total quantities bid at price p_{n-1} exceed supply, but no trader bids a higher price, the auction ends at that point, and the equilibrium price is p_{n-1} . Traders are allocated quantities according to the timing of their bid, earlier bidders first. Thus, traders are also given a strategic incentive to bid early. To induce them to bid early, traders who place orders early may also be given a discount in transaction costs.

their effects on liquidity. The Bank should avoid too frequent offerings so that each issue has sufficient liquidity.

(c) **Non-competitive bidding in the Primary Market**

Non-competitive bids are placed by relatively small investors. They are awarded securities at the *average* price of all accepted competitive bids. Thus, the non-competitive bidders just buy at the going price without being able to influence it. The Bank of Greece should open the auction to small investors for non-competitive bids. These bids can be placed directly at a branch of the Bank of Greece. There is an appropriate upper limit to the size of a non-competitive bid. For example, that could be 10 or 20 million drachmas per bidder.

The creation of this market for small investors in Greek State obligations is an important step in popularizing the market. The bonds of the non-competitive bids are also handled by the **electronic depository** to be established by the Bank (discussed in section X).

VII. **Effects of the creation of a secondary market: expansion of demand for Greek State bonds and bills in the primary market**

(a) **Demand for short term instruments**

The creation of the secondary market makes the Greek State bills, notes and bonds immediately liquid, since they can be resold on demand at a relatively small cost. The added liquidity of these financial instruments will attract new customers, mostly risk-averse ones who want to have the option to receive the cash value of their bonds immediately. Even existing customers will buy larger quantities of an issue once it becomes less risky.

(b) **Reduction of interest on short term public debt**

The demand expansion for Greek State obligations resulting from the creation of the secondary market will imply **significantly lower interest rates** for the short run State debt. **This**

will imply substantial savings in the servicing of the public debt through the issue of short term instruments. The following two subsections discuss the implications for longer term debt issues.

(c) **Demand for medium and long term instruments**

The creation of the secondary market will have an even more substantial impact on the demand for bonds of longer maturity, say of 5, 10, or 20 years. Once a secondary market is established, the risk of lack of liquidity is eliminated. Although interest risk remains, *ceteris paribus* the willingness to pay for longer maturity bonds should increase significantly.

(d) **Reduction of interest on long term public debt**

Currently, the Bank of Greece does not offer bonds of long durations because it will have to pay an equally high interest rate as in short term instruments. The existence of a secondary market will radically change this. I expect that within a year of the establishment of a secondary market, the Bank of Greece should be able to sell a 2-year note at a substantially lower yield difference from the prevailing yield for short term bills than at present. Progressively, the Bank of Greece can issue bonds of longer durations. If everything goes well, in five years the Bank of Greece should be able to shift most of the debt to intermediate and long durations.

VIII. Organization and management of the primary market by the Bank of Greece to facilitate transacting in the secondary market

(a) **Immediate transfer of legal rights**

To facilitate transacting in the secondary market, the Bank of Greece has to ensure that legal rights of possession should be immediately transferred to the bond-holder so that the bond can be traded almost immediately after it is issued.

(b) Re-opening of old issues

To enhance the liquidity in the market, the Bank of Greece may want to re-open old issues rather than issue new securities. For example, suppose that a one-year bill has been issued in January 1993 with expiration in December 1993. In June 1993, the Bank of Greece may be considering selling a 6-month note expiring December 1993. Instead, it is better for the Bank of Greece to re-open in June 1993 the sale of the one-year Dec. 93 bill, i.e., to sell in June 1993 more of the one-year Dec. 93 bill. Liquidity is enhanced because of the re-opening, resulting in all the positive effects discussed above. Also note that the existence of the secondary market for the one-year Dec. 93 bill reveals the going 6-month interest rate, and makes it easy to set the initial bid prices of the auction.

IX. Creation of depository of bonds and of an electronic accounting system at the Bank of Greece

(a) Function

Bonds, bills and notes held at the Bank of Greece on accounts of individuals and corporations, and can be traded according to the account-holders' orders. The depository of bonds at the Bank of Greece can take the form of an electronic accounting system. The issuance of paper bonds may not be necessary. There may be considerable savings in transaction and other costs if electronic accounting is used as a substitute for issuance of paper bonds. Blocks of bonds can be broken in smaller pieces and then traded.

(b) Charges and profitability of depository

The avoidance of issuance of *paper* bills, notes and bonds as they are substituted by electronic accounting will reduce the production costs of these financial instruments and will speed their production and processing. The creation of a depository will also have positive effects on the revenue of the Bank of Greece. When used as an electronic or physical depository of bonds, the Bank of Greece should be able to charge for the holding service. Further, the Bank should be able to charge a fee per transaction authorized by the account-holder. The depository service can be a moderately profitable operation for the Bank of Greece.

X. Clearing procedure

The Bank of Greece should establish **an electronic clearing procedure** for the participants of the primary and secondary market as part of the finalization of the transaction. It is best to have an integrated electronic system that runs the primary and secondary markets, and also runs the clearing procedure and interfaces with the depository of titles of ownership of bonds at the Bank of Greece.

Guarantees have to be given by the participants in the primary auctions and the secondary call market that they have the necessary financial resources to fulfill the obligations that they undertake in the auction process, and that they will not renege after the auction. To this end, the Bank of Greece should have guarantees or collaterals in the accounts of the potential bidders.

XI. Institutional changes

We propose that the Bank of Greece have three separate departments involved in the primary and secondary markets for State bills, notes and bonds. First, the Bank already has a department of issuance and distribution of bonds. It has to be re-organized to be able to issue bonds electronically, and have an **electronic depository** of bonds. Second, the Bank needs a new department to run the primary and secondary markets. This department will be in charge of the occasional primary auctions, as well as of the daily "calls". These two departments should share

an electronic system of information exchange. Third, the Bank needs to expand its department of market intervention to include open market operations in the secondary market.

XII. The Effects of integration in the European and world financial markets

It is expected that Greece will soon have a fully liberalized exchange market for the drachma. This market, together with an efficient market for Greek State obligations, will fully integrate Greece in the world financial markets. This opens a number of possibilities for positive developments, and poses a couple of dilemmas. On the positive side, one expects short run expected returns equalization which will imply significantly lower short run interest rates in Greece. The integration of the Greek financial market in the world financial markets can be highly beneficial if Greece taps on the large resources of the world economy. Here the proper and efficient functioning of the primary and secondary markets is crucial.

The full liberalization of the exchange market will also allow capital flows from Greece to profitable projects abroad. This may diminish the internal demand for Greek State bills, notes and bonds. And, with the advent of liberalization, the possibility exists to do most of the Greek State borrowing in foreign currency. Some may even argue that because of expected return equalization, it does not matter in what currency Greece borrows.

I strongly disagree with this point of view. **It is important to keep and develop this large market of Greek State obligations in drachmas.** There are two reasons for this. First, strategically, it is preferable for Greece to have most of its debt denominated in its own currency. Second, it is important to develop a big capital market in drachmas. We would like to see foreign investors convert money to drachmas, and keep them in drachmas for some time. This can have significant positive effects in the liquidity of capital markets (denominated in drachmas) in Greece, and in particular on corporate bond markets and on the equity market of the Athens Stock Exchange.

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XIV. Appendix**(a) Outline of the operation of a two-sided call market**

Suppose that the market opens for bids at 11:45, with a market clearing ("call") at 12:00. Traders place bids to buy or sell through their terminals. Every 1 minute the auctioneer reveals to traders the aggregate demand and supply schedule of bids.

Time 11:46

During the last minute, 1 bid to buy and 2 bids to sell have been placed as follows.

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>
Trader A	50	10,000

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>
Trader Z	50	5,000
Trader Y	51	6,000

This information has been received by the auctioneer. He reveals the aggregate supply and demand information to the terminals of the traders (indicated in italics). This information is also be shown in diagrammatic form as a standard supply/demand diagram.

Information made public by the auctioneer at 11:46

<i>Price</i>	<i>Demand</i>	<i>Supply</i>	<i>Excess Demand</i>
51	0	11,000	-11,000
50	10,000	5,000	5,000

Time 11:47

During the last minute, 3 new bids to buy and 3 new bids to sell have been placed as follows.

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>
Trader B	51	9,000
Trader C	52	10,000
Trader D	49	5,000

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>
Trader X	52	7,000
Trader W	49	10,000
Trader V	53	5,000

This information has been received by the auctioneer. He reveals the aggregate supply and demand information this far to the terminals of the traders (indicated in italics).

Information made public by the auctioneer at 11:47

<i>Price</i>	<i>Demand</i>	<i>Supply</i>	<i>Excess Demand</i>
53	0	33,000	-33,000
52	10,000	28,000	-18,000
51	19,000	21,000	-2,000
50	29,000	15,000	14,000
49	34,000	10,000	24,000

Time 11:48

During the last minute, 2 new bids to buy and 2 new bids to sell have been placed as follows.

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>
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Trader E	51	15,000
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Trader F	50	16,000
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<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>
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Trader U	51	13,000
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Trader T	50	10,000
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This information has been received by the auctioneer. He reveals the aggregate supply and demand information this far to the terminals of the traders (indicated in italics).

Information made public by the auctioneer at 11:48

<i>Price</i>	<i>Demand</i>	<i>Supply</i>	<i>Excess Demand</i>
53	0	56,000	-56,000
52	10,000	51,000	-41,000
51	34,000	44,000	-10,000
50	60,000	25,000	35,000
49	65,000	10,000	55,000

Time 11:49

During the last minute, 3 new bids to buy and 2 new bids to sell have been placed as follows.

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>
Trader G	52	5,000
Trader H	51	7,000
Trader I	52	5,000

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>
Trader S	51	7,000
Trader R	52	3,000

This information has been received by the auctioneer. He reveals the aggregate supply and demand information this far to the terminals of the traders (indicated in italics).

Information made public by the auctioneer at 11:49

<i>Price</i>	<i>Demand</i>	<i>Supply</i>	<i>Excess Demand</i>
53	0	66,000	-66,000
52	20,000	61,000	-41,000
51	51,000	51,000	0
50	77,000	25,000	52,000
49	82,000	10,000	72,000

(b) Market equilibrium if the call is at 11:49

The market continues in this fashion until 12:00. At 12:00 the bidding stops and supply is matched with demand. For example, if the call were to happen at 11:49 in the example above, **the market equilibrium price would be 51, at which excess demand is zero, and 51,000 units change hands.** Bids are satisfied as follows.

Satisfied Bids

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>
Trader B	51	9,000 Satisfied at price 51
Trader C	52	10,000 Satisfied at price 51
Trader E	51	15,000 Satisfied at price 51
Trader G	52	5,000 Satisfied at price 51
Trader H	51	7,000 Satisfied at price 51
Trader I	52	5,000 Satisfied at price 51
Total satisfied demand at price 51:		51,000

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>
Trader Z	50	5,000 Satisfied at price 51
Trader Y	51	6,000 Satisfied at price 51
Trader W	49	10,000 Satisfied at price 51
Trader U	51	13,000 Satisfied at price 51
Trader T	50	10,000 Satisfied at price 51
Trader S	51	7,000 Satisfied at price 51
Total satisfied supply at price 51:		51,000

Unsatisfied Bids

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>	
Trader A	50	10,000	Unsatisfied; buy bid too low
Trader D	49	5,000	Unsatisfied; buy bid too low
Trader F	50	16,000	Unsatisfied; buy bid too low

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>	
Trader X	52	7,000	Unsatisfied; sell bid too high
Trader V	53	5,000	Unsatisfied; sell bid too high
Trader R	52	3,000	Unsatisfied; sell bid too high

(c) Market equilibrium if the call is at 11:47

If there is no price at which excess demand is exactly zero, the equilibrium price is the one that corresponds to the smallest absolute value of the excess demand. For example, if the call was at 11:47, the equilibrium price would be 51 because it corresponds to an excess demand of $-2,000$ that has the smallest in absolute value. All bids at price 51, amounting to a total of 19,000 units, are satisfied. Supply bids at a price lower than 51 are satisfied first. In our case, there is a total of 15,000 units supplied at 50, and these are satisfied first. To cover demand, there have to be 4,000 units rationed among the bidders who bid to supply 6,000 units at exactly price 51. These 4,000 units are rationed proportionately among these bidders, so that, for each unit offered to be supplied at exactly price 51, a trader ends up supplying $4000/6000 = 2/3$ of a unit. Bids are satisfied as follows.

Satisfied Bids

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>	
Trader B	51	9,000	Satisfied at price 51
Trader C	52	10,000	Satisfied at price 51

Total demand at price 51 19,000

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>	
Trader W	49	10,000	Satisfied at price 51
Trader Z	50	5,000	Satisfied at price 51
Trader Y	51	6,000*(2/3)	Satisfied at price 51

Total supply at price 51 19,000

Unsatisfied Bids

<u>Buy orders</u>	<u>Bid Price</u>	<u>Demand</u>	
Trader A	50	10,000	Unsatisfied; buy bid too low
Trader D	49	5,000	Unsatisfied; buy bid too low

<u>Sell orders</u>	<u>Bid Price</u>	<u>Supply</u>	
Trader V	53	5,000	Unsatisfied; sell bid too high
Trader X	52	7,000	Unsatisfied; sell bid too high
Trader Y	51	6,000*(1/3)	Unsatisfied; proportional rationing

The same procedure is used for the *primary market*, except that there the supply is fixed, and all bids are on the demand side. See the example of the operation of the primary market in footnote 25, page 14.