Bond Markets in Serbia:

regulatory challenges for an efficient market

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TABLE OF CONTENTS

Executive Summary

This report covers in considerable detail the legal as well as institutional structures of the Serbian bond market, and compares these to the evolution of the recently developed bond markets in the Czech Republic, Hungary, Poland, and Slovakia. The core of the study is a technical section on the estimation of the bond yield curve in Serbia using the Nelson-Siegel Model, followed by an illustration of how parameter estimates can be utilized to forecast the term structure. This analysis was constrained by limited data availability on the over-the-counter market. About 80% of overall trading volume takes place over-the-counter but prices are only reported from trades taking place on the stock exchange. The results of the estimation, together with the legal and institutional analysis form the basis for the study's conclusions and recommendations.

Firstly, Serbia should change the term structure of government bonds by shifting state debt from short to long-term maturities. This step will aid stability in debt management as well as attract foreign investors. The Serbian bond market with government bonds is still underdeveloped; however, there is a promising transition pattern towards being a more mature market. This is important since; in general, emerging market debt managers face greater and more complex risks in managing their sovereign debt portfolio and executing their funding strategies than is the case in more advanced markets.

To maximize these market opportunities, regulators should focus on the microstructure of the secondary market with the objective of increasing its transparency and liquidity. Regulators should concentrate on potential misuse of private or inside information by large institutional investors, investment companies and large broker firms, rather than on small players. Specifically:

i) Better enforcement of the existing laws on reporting requirements will enhance transparency of the secondary market. If the existing legal enforcement is not sufficient, sanctions should be established that can be imposed by the Securities' Exchange Commission on the Central Registry. Reporting requirements should include the market price, which has become a standard on most recently developed bond markets.

ii) The spread of Serbian bonds relative to common European benchmarks is in the unsuitable range from the medium-term perspective. A significant part of the spread (on the order of more than 20 basis points) of euro-area government securities relative to German government securities of comparable maturity is accounted for by differences in liquidity rather than credit risk. Elevated liquidity should improve this.

iii) A related task is to create and maintain bond indexes with benchmark status, and methods for calculating and publishing reference prices of these bonds. Indexing will increase new issues of individual groups of bonds and overall trading activities. The Serbian bond market will also benefit from the introduction of switching operations.

iv) Enhancements to market infrastructure such as clearance and settlement, repo and derivatives markets, techniques for issuing securities, and trading systems in secondary markets, are all highly desirable to propel market performance. The BSE should match settlements of OTC trades at T+0.

v) The V4 countries have implemented primary dealer systems, used auctions for issuing debt, and established pre-announced issue calendars with "benchmark" issues. Serbian authorities should take a similar path. This can significantly lower the cost of public debt and foster the development of securities markets in general.

vi) Market makers and members of the stock exchange in general should not be allowed to participate in over-the-counter trading. The OTC system should be required to provide maximum information regarding prices and volumes of settled deals.

vii) In most countries, government bonds are low-risk and highly liquid instruments with a well-developed market infrastructure (including supporting repo and derivatives markets). These markets are still not a prevalent feature in Serbia. Action toward a developed market infrastructure is highly desirable since changes will open space for issues of corporate bonds that will have a positive effect on the liquidity and further expansion of the bond market.

1. Bonds and the Development of the Financial Market in Serbia

Government bonds are considered securities that compel the issuer to pay the nominal value of the bond together with agreed interest to the bond holder when the bond maturity expires. This definition is in full accord with the Law on Securities published in the Official Gazette of FRY, No. 26/95, No. 59/98.

It is common practice for governments to issue securities in its national bond market that are subsequently traded within that market. This method of financing is most often used by governments of emerging market countries, as it allows the inflow of much needed capital to the emerging economy, and, at the same time, substantial profits for investors at the lowest possible risk which could be associated with the country.

However, indirect effects on the emerging economy could be even more significant. In the case of Serbia, government bonds were a great chance to introduce rules of financial markets to the wider public, and an opportunity for common citizens to realize the possibility of gaining profits through securities trading. Throughout our work, we shall explain the conditions under which government bonds were introduced to the Serbian financial market, as well as the missed opportunities and problems of bond trading, both on the stock exchange and over-the-counter-market (OTC).

Throughout the1970s and 1980s, one of the major resources of foreign capital for the Socialist Federal Republic of Yugoslavia were the savings of its residents, but especially that of its citizens working abroad. Realizing the importance of these financial resources, monetary authorities of SFRY kept interest rates at attractive levels – considerably higher than those of most Western countries. Over the years, this country, which lived by Eastern principles and Western standards, managed to maintain an impression of financial and economic stability. Moreover, Yugoslav (state owned) banks were considered just as secure and reliable as most West European banks, at least by its residents or former residents. Living on the idea of returning to the motherland, Yugoslavs working abroad deposited most of their savings in Yugoslav banks. For SFRY, this was a substantial source of hard currency capital.

Under the socialist regime, all banks were under government supervision, and therefore major investment decisions could not be reached without political consent. Therefore, profit was not the leading criteria behind most investment decisions. This became obvious with changes in the political climate in the early 1980s, and by 1990it was too late for most depositors to claim their savings. By that time, due to the shortage of hard currency, banks first severely limited withdrawal amounts and later

curtailed withdrawals altogether. In 1991, FRY proclaimed a moratorium on government debt towards all private depositors, referred to as "old foreign currency savings". At the time of the moratorium, the total outstanding balance was close to 6 billion DEM. The events that followed had a major influence on the average bond holder's psyche and risk preferences. The build-up of political tensions that led to the collapse of SFRY left Serbia and Montenegro united in an effort to continue the legacy of the previous country. However, with civil war on its borders, FRY was not setting economic development as its top priority. By 1992, FRY was politically and economically isolated. A high level of inflation was followed by rapid depreciation of the dinar. Converting the dinar into hard currency was the only means of protection from high inflation.

The first attempt to resolve the government debt based on "old foreign currency savings" was made with the adoption of the law on regulating the public debt of the Federal Republic of Yugoslavia arising from appropriation of citizens' foreign exchange savings (Official Gazette No. 59/98, 44/99 and 53/01).

The government recognized most of its financial liabilities towards private depositors and committed itself to paying all the frozen deposits by 2011. Nevertheless, this law was, from the very beginning, full of technical and practical difficulties. It assumed the debt conversion into bonds on a voluntary basis. The bonds were issued in paper format and thus were liable to forgery and theft. The non-electronic format of bonds proved to be complicated for trading and clearing procedures as well. Finally, the law was financially based on GDP growth levels that were unattainable at that time. This ambitious but unrealistic attempt to pay frozen private deposits turned out to be a great burden for the state budget and was economically unsustainable. With no major positive results, the consequence of this policy was further deterioration of the already severely damaged public confidence.
On July 4, 2002 a new law was adopted (Official Gazette of FRY, No. 36/2002) which presented a modified and more realistic solution to the "old savings" problem. It retained the spirit of the previous law by avoiding the withdrawal of old bonds, but the new solution was to convert government debt to private depositors into bonds of the Republic of Serbia and Republic of Montenegro. The payment schedule was also changed, providing for bond maturity between 2002 and 2016.

All bonds issued by the previous law could be converted on a 'one to one' basis into new 'series A' bonds of the Republic of Serbia. Bonds were issued in electronic format in order to avoid all major difficulties experienced under the previous law. All data regarding the bond holders, maturities and payment schedules were stored in the Central Registry, an institution set up for such a purpose. This solution required that all bond holders have a specialized trading account in a bank of their choice. The procedure assumes that all trading goes through the Central Registry and that money is transferred into bank accounts. This improves and simplifies the securities trading and reduces the possibility of mistake or fraud.

The priority of the new law was to coordinate the bond maturity structure with budget income. According to the payoff model, an estimated GDP growth of 3% to 5% was needed in order to avoid economic slowdowns. This was a realistic projection and proved to be a sustainable burden for the budget in the first two years of

bond payments. On August 19, 2002, the Republic of Serbia issued bonds of series A in the total amount of 4.2 billion EUR, which presented the total debt of Republic of Serbia towards "old foreign currency savings" depositors. The volume of the last four bond series accounted for 37.2% of the total debt, which meant that the government relied on acquiring bonds before they reach maturity through the process of privatization, or by allowing the possibility of purchasing government property with 'frozen savings' bonds.

1.1. Debt Repayment Program

As mentioned earlier, a bond is a debt security that promises to make periodic payments for a specified period of time. Government bonds are a typical and very important part of financial markets, because they enable governments to borrow in order to finance their activities.

Table 1-1: The Repayment Schedule

	EUR mil.	% of total debt
2002	172	4.12%
2003	192	4.60%
2004	225	5.39%
2005	198	4.74%
2006	211	5.05%
2007	225	5.39%
2008	241	5.77%
2009	258	6.18%
2010	277	6.63%
2011	298	7.14%
2012	320	7.66%
2013	345	8.26%
2014	373	8.93%
2015	404	9.67%
2016	437	10.46%
	4176	**100.00%**

However, international experience also recognizes bonds as an instrument of debt settlement. This solution is very common in transition economies emerging from communist regimes. Unable to repay debts to their own citizens, these states prolong the payment period by issuing bonds. And, as they start to develop financial markets to support economic development, new bonds present a perfect opportunity for a healthy fresh start. For a weak and vulnerable economy, debt repayment to citizens is just as important politically as it is economically. Therefore, repayment

program creators had to reconcile different interests and produce a solution that would be both politically and economically sustainable.

In the case of Serbia, the first limit was that annual payments on frozen savings should not exceed 1% of the state budget. Therefore, the program had to assume GDP growth within the limits set by the IMF, meaning 3% - 5% per annum. This was a realistic and acceptable projection having in mind the current level of economic development. However, it would also be the predominant factor in determining the level of default risk on these bonds.

The social and political aspects of debt required that the majority of citizen debt holders be paid off in the first two or three years. Because almost 90% of frozen savings were under EUR 2,500 per individual, the program had to be structured so as to repay all these debts by 2006. It was essential for the government to regain public confidence and produce a solid base for the development of the financial market. Consequently, series A2002, A2003 and A2004 were issued in fixed amounts of EUR 276.1, EUR 380 and EUR 530. This means that by paying 14.10% of its debt, the government managed to reduce the number of debt holders by 90% (see Table 1-1). The total amount of EUR 589 million was paid from the state budget within three years of the launch of the debt repayment program without any major difficulties. This was a positive sign of the government's ability and economic soundness.

The debt repayment program was based on a bank restructuring system that introduced solvency measures into the banking market. As a result, a total of ten state-owned banks lost their business licenses and were subsequently closed. Those are: Slavija banka, Privredna banka Novi Sad, Valjevska banka, JIK banka, Pozarevacka banka, Sabacka banka, Beogradska banka, Beobanka, Jugobanka, and Investbanka. Later, two more banks were added to this list - Dafiment banka and Banka privatne privrede Crne Gore.

Payments to depositors from all these banks were transferred to the newly formed National Savings Bank (more details in Section 3). Two other banks (Jubanka a.d. and Kosovska banka a.d.) that survived the changes of banking regulations also participated in bond distribution. However, from the very beginning of bond trading, some signs of legal inefficiency could be observed. These are further discussed in the regulatory framework section.

The registration of debt holders was concentrated on these surviving banks, which acted as 'collectors' of available bonds for sale. It should be noted that these banks had an important role in the initial stage of bond market development. Public reaction to the prospect of liquid securities was positive at that time. Nevertheless, specified procedures for bond trading initially turned out to be quite complicated for most bond holders due to their inexperience with bond trading, but even more so due to the lack of trust in the financial system.

The majority of 'small frozen savings' holders were elderly citizens for whom this was just another government promise lacking credibility, and it is understandable that they were eager to collect their long ago deposited savings. This would be the main reason for the economically irrational behavior in the first years of bond trading, and also the basis for the arbitrage that was to come. It was up to these banks to provide a financial, but also educational, service to all debt holders. Soon, a great

number of broker firms emerged offering their services to the newly created market. With privatization in progress, the prospect of bond trading gained a whole new dimension.

Upon the introduction of the new law on regulating public debt of the FRY arising from citizens' foreign exchange savings, the Republic of Serbia issued EUR 4176 bonds of series A on August 19, 2002. The trading volume in the first six months was around EUR 100 million. During that period the annual yields varied from 13% to 14% for short-term bonds, and from 8% to 15% for long–term bonds. As we will show later, the yield curve was inverted from the very beginning of trading, which could be explained by the additional use of bonds as a means of payment in the privatization process. This was also one of the main reasons for the bond market segmentation in Serbia.

Moreover, bond prices were strongly influenced by the presence of information asymmetries in the market. Most bondholders were poorly informed of the possibilities that bonds represent, how they can be traded, and what kinds of risk they carry. At the beginning of trading, a great majority of bondholders believed bonds to be liable to default risk, which, from their perspective, significantly reduced bond price.

Serbia's old saving bonds are discount types of bonds. They bear a 2% annual interest rate (rolled in interest rate) that is paid at the time of maturity. Each bond matures on the 31st of May in the year of its maturity. From the beginning of trading, bond prices on the stock exchange were very volatile. The highest volatility was recorded during auctioned trading on the stock exchange, but was reduced with the beginning of continuous trading.

1.2. The Roots of the Segmented Bond Market in Serbia

Despite all the skepticism, the 'old savings' bonds turned out to be the perfect opportunity for the development of financial market in Serbia. This was a new and liquid security that carried virtually no risk for its holders.

However, for a number of reasons, the bond market became distorted, dividing into primary and secondary markets, with the secondary market further segmented into over-the-counter and stock exchange markets. Transformation of the banking system in Serbia was required for the national payment system to be transferred from the Clearing and Settlement Bureau to commercial banks. The development of the financial market required a less expensive and more efficient payment system with the active participation of commercial banks.

At the same time, the 'frozen savings' debt settlement program demanded an organized distribution channel that would be able to sustain high levels of initial demand, and, at the same time, provide an important educational service to new bond holders. In the initial stage, it was essential to avoid any major difficulties during the bond distribution process and to create a setting for smooth debt collection.

Bearing in mind the understandably suspicious nature of the average debt holder, any potential repayment problems could create a tense political climate. This was a major financial, but also political, test for the recently formed government, and the one it could not afford to fail.[1]

As part of the new financial infrastructure in Serbia, a special purpose bank and two key institutions were established: the National Savings Bank, the Belgrade Stock Exchange, and the Central Registry. Each of these institutions fits a complex mosaic and plays a role in the financial environment. These institutions as well as their functions are introduced in Section 3.

[1] The abolition of the Clearing and Settlement System had a social impact as well, leaving a number of people unemployed. Most of them were highly specialized personnel, well-experienced in domestic payment operations but at the same time relatively inflexible to systemic changes that were to come. This created an additional pressure on the government to find a solution that would make the transfer to the new payment system less distressing. The obvious solution was to sell or rent government-owned Clearing and Settlement Bureau premises to the existing banks under the condition that these workers remain employed. This created additional income to the budget and partly resolved the previously mentioned social problem. Finally, 13 banks were allowed to use Bureau premises under the condition that they employ around 2000 Bureau workers.

2. NBS Bills and RS T-bills

Two types of bills currently exist on the Serbian financial market: T-bills issued by the Ministry of Finance of the Republic of Serbia, and NBS bills, issued by the National Bank of Serbia. The main idea behind these financial instruments is to facilitate the development of the financial market in Serbia. This is in accordance with the monetary policy of the National Bank of Serbia, but also an important aspect of the economic restructuring program. Nevertheless, both types of bills are currently traded only on the primary market. Both securities are used as instruments for regulating money supply.

In order to accumulate additional funds, the Ministry of Finance started issuing T-bills in April 2003, when the first auction was held. RS T-bills are short-term securities, with maturity varying between three and six months. They are the dinar denominated securities, and, accordingly, the interest rates are calculated on a dinar basis, typically around 20%. Although they were presented as an additional instrument for the development of the financial market, T-bills never reached the stock exchange. Instead, they were only traded on the online auctions through the system of the Ministry of Finance.

In order to eliminate the surplus of liquidity accumulated in commercial banks, NBS started issuing bills in 2000 (see Figures 2-1 and 2-2 for some time series data). Since then, NBS bills are utilized as the main tool in open market operations. They are typically short-term securities, issued with 7, 14, 30 and 60 day maturities at the following interest rates:[2]

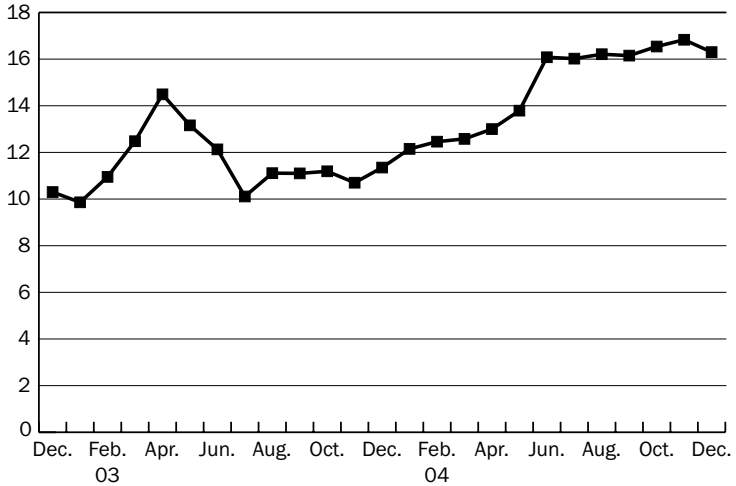
- 7-day maturity - 15.9% p.a.
- 14-day maturity - 17.5% p.a.
- 30-day maturity - 18.3% p.a.
- 60-day maturity - 18.9% p.a.

Initially, NBS bills were traded on the stock exchange, but in October 2003, online trading was introduced. Online auctions carry lower transaction costs and have no intermediaries or provisions. They represent the first step in the implementation of new regulations of operation in the open market, regulations intended to provide gradual movement towards indirect instruments of monetary policy. From the very beginning, online auctions were very successful, with trading volumes significantly above pre-online trading periods. Nevertheless, moving from the stock exchange to online trading had no significant impact on the interest rates, and apparently did not disturb the market. Moreover, since the trading was moved from the stock exchange, the volatility of interest rates was smaller, even compared to RS T-bills. The downside of the new auction system is that the number of market participants has significantly decreased, and there are clear indications of higher ownership concentration in the market. With the existing levels in interbank markets, this trend could affect the market efficiency in future.

[2] As of February 2005.

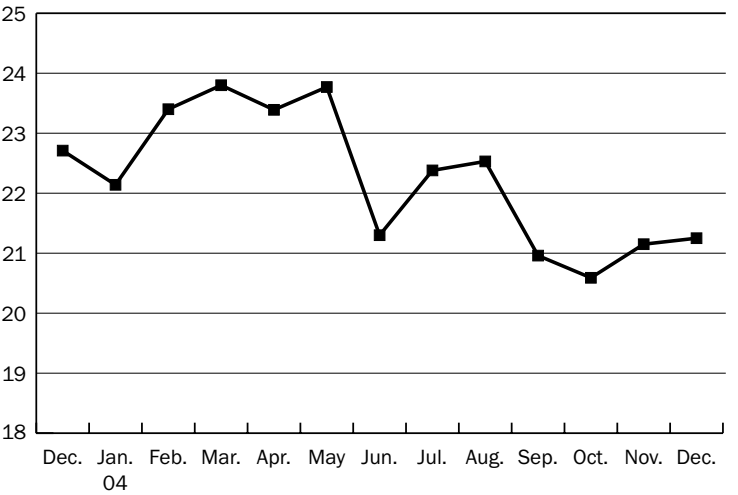
Following the introduction of RS T-bills, the average weighted interest rate on this type of security was significantly above the interest rate on NBS bills. Since RS T-bills and NBS bills are risk-free securities, commercial banks and other investors would rather buy those securities that have higher interest rates. Consequently, there is a tendency for the interest rate on NBS bills to increase in order to follow interest rates on RS T-bills.

Figure 2-1: Annual Interest Rates on NBS bills



Source: http://www.nbs.yu/serbian/monetarno/index.htm

Figure 2-2: Annual Interest Rates on RS T-bills



Source: http://www.nbs.yu/serbian/monetarno/index.htm

3. Regulatory Environment for Bond Trading and Related Institutions

3.1. Belgrade Stock Exchange

Certain attempts to undertake reforms in the socialist economy led to reactivation of the Belgrade Stock Exchange (BSE) in 1989, and it has functioned without interruption since then. The stock exchange conducts activities related to organization of trade with securities and financial derivatives. The position and activities of the stock exchange are stipulated by the Law on Securities and Other Financial Instruments' Market, as the most important act in this area, which will be discussed in some detail below. Certain regulations of importance for the stock exchange are also contained in the Law on Corporate Societies, especially regarding issues related to the organization of the stock exchange, i.e., a joint-stock corporation. This Law is applied as the substitute authority for adjudication if the Law on Securities and Other Financial Instruments' Market does not anticipate or resolve a specific issue.

In accordance with the above acts, the stock exchange has enacted new bylaws regulating its activities, a new statute, rules of practice, stock exchange price list and rulebook on listings and quotations. The following can be the subject of public tender: shares, bonds, warrants for purchase of shares or bonds, deposit certificates and financial derivatives determined by the stock exchange decision and approved by the Securities' Exchange Commission (e.g. future exchange contracts and options), as well as other financial instruments which can be traded on the organized financial market in accordance with the law.

The stock exchange's managing authorities are defined by the stock exchange Statute, which came into force on February 9, 2004. The Assembly includes representatives of stock exchange shareholders. Currently there are fifty-seven shareholders, out of whom the highest number is represented by the Banks (forty-one representatives), legal entities (ten representatives), and one representative each from the brokerage/dealers' society, Postal Savings Bank, Energoprojekt Garant a.d. for insurance and reinsurance (Belgrade), the company Dunav Insurance from Belgrade, as well as the State Union of Serbia and Montenegro and the Republic of Serbia. The Assembly elects the Steering Committee, comprised of fifteen members. The Securities' Exchange Commission approves the election of the Steering Committee members, in line with the law. The Supervisory Committee includes five members, also elected by the Assembly. In addition to the above bodies, as in other stocks there is an authority responsible for the amicable settlement of disputes, and arbitrage. Decisions made by arbitrage are final and binding for the disputing parties.

The stock exchange Statute stipulates the scope of activities of the stock exchange: first, the organization of public tender of securities, which implies connecting supply and demand for securities, and providing information relating to supply, demand and market price of securities, as well as other data of relevance for securities' trading. Another task of the stock exchange is to determine the securities' price quotation lists and to make them public. The stock exchange itself cannot trade securities, provide advice related to trades, advise on choosing the brokerage/dealers' society or the authorized bank, nor conduct activities specified as the activities of the brokerage/dealers' society. Due to their importance, the Securities' Exchange Commission conducts control and supervision. Among other things, it approves the election of members of the stock exchange authorities. In accordance with the Rules of Practice, the BSE submits in writing data related to securities trading to the Securities' Exchange Commission at the end of each working day. Monthly reports on business operations are submitted every 15th day of the month for the previous month, while the annual report for the preceding year, as well as the annual accrual with the authorized auditor's report, are submitted July 15th. Data regarding membership, such as changes therein, are submitted to the Commission within three days from the date of the change. Data related to admission to the stock exchange list or inclusion into the free stock market of the stock exchange, refusal of admission or removal of securities from the stock exchange list or the free stock market, are to be submitted within three days of their occurrence.

The stock exchange and central securities' depository (described below) have concluded an agreement for the purpose of providing the prerequisites for successful functioning of the market. This agreement regulating these mutual relations was concluded in July 2004, and refers primarily to data exchange and mutual notification.[3]

The Belgrade Stock Exchange is the only organized securities market in Serbia and, as such, has an active role in the development of the financial market. Nevertheless, market participants are not obligated to perform trading on the official stock exchange. Some view this as the main obstacle to more efficient trading. From this perspective, concentrating both supply and demand in one place would reduce the existing information asymmetries created by current practices. This might increase market stability, transparency and liquidity, which would be of benefit to all market participants. Moreover, existing bond price discrepancies generated from unequal market positions could be significantly reduced, if not eliminated. As it is, the level of inside trading is presumably high and plays an important role in 'frozen savings' bond trading. The Belgrade Stock Exchange has never been able to increase the volume of trading up to a level that would be attractive to larger foreign investors or to local banks that are willing to hedge their positions by investing in bonds. Initially, bonds were traded in auctions. Six months after classical trading began, continuous trading was introduced. Continuous trading offered the possibility of selling and purchasing bonds at any desirable moment during the workweek, while auctioned trading was possible only at dates set for auctions.

[3] A new agreement was signed recently.

We estimate that about one fifth of total bond trading is currently executed through the organized market.[4] It seems that most of the initial bond holders considered trading procedures to be too complex and often chose simpler counter trading, regardless of the higher price that they could achieve on the exchange. This irrational behavior of market participants was the main characteristic of the first years of bond trading and as previously mentioned, created conditions for arbitrage that could not exist on a single market.

Mainly due to the lack of information, investing in securities is still not generally popular. The public is not well informed about the possibilities of the financial market and consequently views trading in securities as too complex and risky. Although long term interest rates on foreign currency deposits have increased in the past few years, it is still more profitable to invest in bonds with maturities longer than one year than to deposit money in one of the commercial banks. Nevertheless, effects could be immediately observed through the steady decline in yields, since bonds were traded at a lower discount than before the recent country rating. Although it is obvious that movements of bond prices are mostly determined by factors other than those characteristic of a mature financial market, the impact of the country credit rating is undisputed. The effects on the banking system are also expected to follow.

However, this perception of risk is understandable if we take into account that Serbia is classified as a country of large indebtedness. Since the introduction of bond trading, the ratio of debt to GDP was one of the highest in the region (for 2002, the ratio of debt/GDP was 76%, while for 2003, the ratio was 52%), with predicted decline in the following period if GDP growth rates reached 5to 5.5% per year. In future years the debt to service ratio will rise significantly, due to the expected installments for repaying debts to international organizations. Serbia is due to repay 95% of its obligations in 2016. In this respect, it is not unreasonable to expect that in the next decade, there is a possibility of a debt crisis in Serbia. Unexpected occurrences in the risk environment, such as failures in the privatization process or in credit lines not approved and not granted from international financial institutions, can significantly hamper Serbia's already fragile economy. Risk-averse investors are willing to invest only in an environment where they can expect a positive and stable return. Political instability is an obstacle for economic growth, and substantial GDP growth is a guarantee for timely fulfillment of bond obligations. Despite that, according to the majority of prognoses based on GDP growth and other macroeconomic factors, there is a very small chance of debt crisis in Serbia.

[4] See table 4-2 below.

3.2. Central Securities Depository

The Law on Securities and Other Financial Instruments' Market defines the Central Securities' Depository as follows:

"...Central Registry, Depository, and Clearing of Securities (hereinafter Central Registry of Securities) shall be a joint-stock company that keeps the central records of legal possessors of securities and other financial instruments and of the rights arising from these securities and/or instruments, as well as of the third party rights to these securities and other financial instruments and of these entities, and shall conduct the clearing and balancing of accounts of securities and balancing of accounts of financial assets and liabilities arising on the ground of business transactions involving securities, including the performance of other operations in conformity with the present Law..."

The Central Securities' Depository (hereafter Central Registry) plays a crucial role in over-the-counter market bond trading. It was founded by a separation from the National Bank and through connection (in January 2004) with the shareholders' database from the Privatization Agency's temporary depository. Besides the old foreign currency savings and treasury bonds of the National Bank of Serbia, the Central Registry has conducted registration and primary selling of short-term securities issued by the Republic of Serbia since April 2003. It also keeps a unified record of owners of all issued securities on the territory of Serbia. The Central Registry is the institution operating as a shareholders' society. Although it is currently completely owned by the state, the state is legally required to maintain a 51% stake. In addition, the Central Registry contains precisely designated members who do not necessarily have to be shareholders. These members are the Federal State (since the Law was enacted by the Federal Assembly), the Republics forming the Union, the National Bank, brokerage/dealers' societies, banks, the stock exchange, fund management associations, and foreign legal entities conducting activities related to the clearing and settlement of the securities. Bodies included in the Central Registry are: the Managing Board containing seven members, most of which are appointed by the Government; the Supervisory Board which includes three members, two of whom are nominated by the Government; and the Director, appointed by the Managing Board. Supervisory functions are performed by the Securities' Committee, which approves the Central Registry's general deeds.

The Central Registry, in line with its Rules of Practice,[5] maintains the list of all types of securities and designates the so-called ISIN numbers and CFI codes. In addition, the Central Registry keeps computerized records of the money accounts of its members, and archives all records in paper form.

One of the most significant roles of the Central Registry is the clearing and settlement of liabilities and receivables expressed in securities and money and incurred on the basis of concluded operations performed with securities. Since the Central

[5] RS Official Gazette No. 128/2003, 14/2004, 26/2004, 104/2004, 126/2004

Registry keeps a record also on securities' owners, it conducts transfers of the securities' ownership rights. Rules of Practice prescribe that the Central Registry is to perform corporate activities for its members, as well.

There are two types of members of the Central Registry. Those members conducting activities related to the clearing of liabilities and receivables expressed in securities or money based on concluded operations are so-called clearing members. Those members who are not allowed to conduct clearing of liabilities and receivables, the so-called non-clearing members, represent the second group.

Each member is obliged to pay an admission membership fee in the amount of EUR 40,000, which shall serve as a security deposit for liabilities that could possibly be incurred in case the member does not settle his liabilities towards the Central Registry or some other member in a timely manner. The Managing Board enacts the Central Registry Price list, which prescribes for each activity, separately and in detail, the fees for services provided by the Registry.

The Central Registry was formed in order to organize securities trading, with the purpose of developing and improving trading and of facilitating the growth of financial markets in Serbia. The system was based on the principle of registration and transfer of ownership, while settlements of transactions were done exclusively through commercial banks. Unification of securities and money flow settlement enable the implementation of the basic principle of modern securities' depository and clearinghouse; this principle is the synchronized payment for, and transfer of the ownership of, securities. Therefore, in the spring of 2002, a new system was introduced under the name "Beokliring."

The National Bank of Serbia has authorized direct on-line access to the computer system of the Central Registry for direct participants (brokers, banks, custody banks, the government of the Republic of Serbia), while indirect market participants receive confirmation on the following day (T+1 settlement). The settlement period for securities traded on the BSE is as follows: Bonds of the Republic of Serbia and shares are three days (T+3), corporate bonds are T+1, while trades with the OTC, NBS bills and treasury bills are exercised immediately (T+0). This is a key reason for many major market participants choosing over-the-counter trading in their transactions.

3.3. The National Bank of Serbia

The institutional setup of the central bank is defined in the Law on the National Bank of Serbia.[6] In addition to standard functions, the National Bank enforces rules regulating payment transactions on money accounts and, together with the Securities Commission, oversees the work of the Central Registry.

From the bond market perspective, the Bank played an important role in the conversion of state debt from old foreign currency savings into bonds. After enforcement of the Law on debt conversion, the National Bank enacted a number of by-laws

[6] RS Official Gazette" No. 72/2003, 55/2004

that describe more precisely the conditions and manner of conversion of citizens' savings deposits into the bonds of the Republic of Serbia.

3.3.1. The Dinar Exchange Rate

The major success of NBS monetary policy has been the relatively stable dinar exchange rate for the past few years. We say "relatively stable," because the Serbian national currency, both in real and nominal terms, is slowly depreciating against all major world currencies. In 2004, inflation reached 13.7% per annum and continued to grow in January 2005, reaching a projected annual rate of 14.4%, (2.7% per month). The average monthly trade deficit in 2004 was close to USD 620 million, including December 2004 when it reached USD 1242 million.[7]

The NBS exchange rate policy is a managed float. Officially, levels of supply and demand on the money market determine the dinar, and the exchange rate is calculated on a daily basis. Like most central banks, the NBS is interested in keeping the exchange rate stable, thus avoiding the potential imbalances in the real sector. Within the association of banks, the positions of banks towards the supply of or demand for the dinar are established based on their needs for currencies during each day. If these positions were to show a greater imbalance between supply and demand for currencies that would have a significant impact on the level of the exchange rate, the NBS would intervene in order to reduce the gap, thus stabilizing the market. With an appropriate level of foreign currency reserves, the NBS is able to keep the exchange rate under control. Nevertheless, supply/demand ratio levels continue to be the fundamental factor of the dinar exchange rate formation, and the central bank acts mostly as a buffer against severe fluctuations, which could damage the stability of the economy.

Under these conditions, it would be very difficult to introduce currency trading on the Belgrade Stock Exchange. From a legal perspective, trading the dinar on the stock exchange is completely acceptable. There are no legal barriers that would prevent potential investors from trading the dinar for other currencies. However, under the conditions of a controlled or even partly controlled money market, there is a lack of interest for this kind of trading. Any major diversions from the official exchange rate are not tolerated by the central bank as they could damage the stability of the economy. Therefore, although legally possible, trading the dinar on the stock exchange is not probable in practice. It is the policy of the NBS to "direct the exchange rate so as to make it consistent with keeping the country's balance of payments position sustainable in the medium term, minding at all times its primary objective: the reduction of the inflation rate."[8] Therefore, the market will have to wait for liberalization to take place. Until then, the lack of transparency in determining the dinar exchange rate will continue to exist.

[7] Data from Republic of Serbia Statistical Bureau.
[8] See Monetary Policy Program of the National Bank of Serbia for year 2005.

It is generally accepted that high interest rates are a sign of weak currencies, while at the same time an increase in interest rates should strengthen a currency relative to foreign currencies. According to this theory, weak currencies have to pay high interest rates in order to compensate the investors for an anticipated depreciation. Depreciation of the dinar has become a certainty in the past few years, mainly due to a constant threat from inflation supported by high levels of the foreign trade deficit and low levels of production. The reduction of the discount rate can be viewed as a sign of a stronger economy, but it does not show any major effect on the dinar's position towards major world currencies. With an inflation rate close to double digits, the existing dinar-denominated securities are hardly tempting for foreign investors. Banks commonly trade existing short-term debt securities that can be acquired on the Serbian financial market, so as to offset inflation. High interest rates tend to perpetuate high inflationary expectations, a cycle that the NBS has been trying to break (with some success) by reducing inflation.[9]

Unexpected inflation, with an unchanged nominal interest rate, has effectively reduced the real interest rate on short-term securities traded on the financial market, but has also made euro-denominated securities more attractive for investors. Liberated from the foreign exchange risk, 'frozen savings' bonds have been perceived as a profitable investment opportunity carrying sufficient yield to offset the risks involved.

3.4. Securities' Exchange Commission

While bank regulation is mostly the domain of the NBS, the Securities' Exchange Commission, whose responsibilities are described by the Law on the Securities' Market, regulates the functioning of financial markets. The National Assembly of the Republic of Serbia elects the members and chairman of the Commission, which allows the latter to be more independent from the government and the overall executive apparatus. Prior to enactment of the Law on the Securities Market, the Federal Securities' Exchange Commission was an agency of the Federal State, subordinated to the federal parliament. Based on article 13 of the Law on Enforcement of the Constitutional Chapter of the State Union of Serbia and Montenegro, the Federal Exchange Commission for the Securities and Financial Market became an authority of the Republic of Serbia and continued to conduct its activities in accordance with the Law.

Supervision of the following institutions is of special importance: brokerage/dealers' societies, the stock exchange, management associations, investment funds and the Central Registry, authorized banks and custody banks, securities' issuers, and investors in relation to their activities on the securities' market.

A brokerage/dealers' society is not allowed to conduct its activity without the consent of the Commission, which publishes its authorizations. The Commission

[9] See Monetary Policy Program of the National Bank of Serbia for year 2005, Article 3.

determines which information shall be submitted and which shall be published; stipulates the standards regarding registration of the trading activities on the stock exchange; organizes, undertakes and controls implementation of the measures which ensure efficient functioning of the securities' market and protection of the investors; determines the criteria to be fulfilled by the information systems of the authorized participants operating with securities, as well as the Central Registry and stock exchange, in order to be allowed to perform securities' trading.

Records on all issued certificates in accordance with the Law are kept with the Commission, as well as records regarding the foundation and business operations of investment funds (these authorizations still await enforcement of the appropriate law). In case of a breach or serious violation of the Law, the Commission is obliged to bring charges under the competent state authority against the participants' operation with securities, including the Central Registry and the stock exchange. Under these conditions, the Commission cooperates with supervisory authorities for the securities' market with the aim of providing legal assistance, information exchange, and institution of court proceedings in order to ensure protection of investors' and other entities' interests, when their legal rights or interests have been deemed to be broken.

In addition to supervisory activities, the Commission monitors changes on the securities' market and undertakes necessary measures to cure any distortions that might occur. The Commission also keeps records of authorized brokers and investment advisers, and issues certificates on the basis of the records kept.

3.5. Ministry of Finance and its Debt

In addition to bonds issued with the objective of settling debts based on old foreign currency savings, the Republic of Serbia also issues treasury bills. These bills are short-term securities, issued by the Ministry of Finance, that mature in 91 days. Public bidding information is available to all stakeholders, containing all relevant information for the issuance (date of the auction, due date).

The primary sale is conducted via the Central Registry in the form of an auction on the non-stock market. Only members of the Central Registry, banks and brokers are allowed to take part in the auction, although those entities interested in buying state bills are allowed to take part through the above-mentioned members.

Bids are considered and accepted in accordance with the order based on the discounted price, starting from the highest to the lowest. Treasury bills are issued for the purpose of refinancing the state budget. Since debtors' securities are treasury bills, this arrangement allows the state to become the debtor via the market.[10]

Treasury bills can be used as collateral in order to ensure specific obligations; this will be discussed in more detail in a later section.

[10] The common practice (in the socialist economy) that the National Bank lends to the state was abolished.

3.6. National Savings Bank

Banks have also played an important role in the formation and functioning of the young financial market in Serbia. Their functioning is governed by: the Law on Banks and Other Financial Organizations; the Law on Bank Rehabilitation, Bankruptcy and Liquidation; and the Law on the Agency for Deposit Insurance and Bank Rehabilitation, Bankruptcy and Liquidation.[11] A big portion of early instances of over-the-counter trading with foreign currency denominated bonds took place through the National Savings Bank A.D., which was established in 2001. The National Savings Bank A.D. provides services related to conversion of the foreign currency savings deposits into the bonds of the Republic of Serbia, as well as disbursement of the due payments for the savers of banks that are in bankruptcy or liquidation procedure.[12]

The National Savings Bank was formed with the primary purpose of providing a service in bond distribution and payment programs. At the time this seemed like the most practical solution, but eventually it turned out to be the first step towards the creation of a segmented bond market. The National Bank of Yugoslavia empowered the National Savings Bank to deliver certificates for the conversion to government bonds of hard currency savings held by ten banks that lost their business licenses. After years of waiting, depositors from these ten banks were finally directed to the National Savings Bank, where they were instructed on the procedures through which they could collect their savings. However, given the age, risk preferences, and economic status of the average 'frozen savings' depositor, it was hardly a surprise that most of them considered this procedure too complicated and preferred to sell bonds before maturity. As a result, the National Savings Bank was able to collect bonds from different series and to create the initial supply for the secondary bond market. It is often argued that the National Savings Bank was, and still is, in a position to decide whether to direct this supply to the organized or over-the-counter market; this can be an important role since it is authorized for repayment of almost 90% of the government's 'frozen savings' debt. This is the main reason this bank was and probably still is viewed as the monopolist of 'frozen savings' bond trading. Proponents of this theory point out that the National Savings Bank exploited its position through counter trading by purchasing bonds at a high discount compared to stock exchange price levels. Later on, as was the case with most other banks, the National Savings Bank paid for bonds in dinars instead of in euros, thus making an additional profit through unnecessary conversion for a major market segment.

[11] "SFRY Official Gazette" No. 84/89, 63/90, 20/91 and "FRY Official Gazette" No. 53/2001.

[12] There is a Decree on more detailed conditions and manner of disbursement of the citizens' foreign currency savings deposited formerly with Jugobanka A.D. from Kosovska Mitrovica (Official Gazette of the Republic of Serbia, No. 37/04). Based on the above mentioned decree, the conversion of the foreign currency deposits (held with this bank and denominated in euros) into the bonds of the Republic of Serbia is specified. The decree also contains the provision stating that the National Savings Bank provides the service regarding conversion and disbursement of this debt.

However, this shows that the lack of information of a number of bond holders as an important factor in the first years of trading. Banks relied heavily on uninformed market participants and hence were able to gather large bond packages at low prices. This proved to be the crucial advantage they had over the organized market, which in fact was never able to create a volume of supply that would be of interest to major buyers.

On the other hand, the demand side did not suffer from this lack of information, as it had clear requirements in terms of bond series, volume and prices. An additional value of 'frozen savings' bonds is that they can be used in the privatization process where the government would recognize their nominal value instead of achieved market prices. Therefore, during periods of privatization, there was a high demand for larger packages of later bond series, namely bonds with maturity in 2015 and 2016. Moreover, since these bonds are nominated in euros and therefore exempted from risk of dinar depreciation, the demand side also consisted of a number of banks that considered bonds to be a rare investment opportunity in a Serbian financial market characterized by low trading volume and few investment alternatives. The National Savings Bank was in a position to form bond packages of different sizes and maturities that would be of interest to these buyers. It was often the choice of buyers whether these transactions would be performed through the stock exchange or over-the-counter. The unusually high yields attracted both institutional investors (mainly commercial banks and investment funds who participated in the process of privatization) and private individuals to invest in these kinds of securities. There are indications from the OTC market that the demand for bonds is still significantly higher than the supply. This is particularly the case for larger bond portfolios (for amounts over 1 million euros). Under the circumstances of a shallow financial market, it is quite difficult to collect sufficient bond packages. However, without available data from the OTC market, verifying these indications would be difficult.

4. Regulation and Bond Trading in Practice

4.1. Bond Trading: BSE and OTC

An important step in developing a sound financial market is a well-organized stock exchange. The first stock exchange in Serbia was established in 1894. In 1992, it changed its name to the Belgrade Stock Exchange (BSE). Being a member of the Federation of Euro-Asian Stock Exchanges (FEASE) and recently attaining membership in the Federation of European Stock Exchanges (FESE), the Belgrade Stock Exchange proved that its trading procedures are comparable with those of stock exchanges in developed countries. An example of convergence to high standards of trading was the introduction of on-line distance trading, which started in March 2003, when the trading floor was removed from the Exchange.

On the Belgrade Stock Exchange, the following securities can be traded:
1) Shares;
2) Debt securities;
3) Warrants for buying shares and bonds and other securities granting the right to buy shares or bonds;
4) Derivatives;
5) Deposit certificates;
6) Other financial instruments that may be traded on the Exchange in compliance with the Law.[13]

Currently, just four types of securities are traded on the BSE:
- Shares;
- 'Frozen savings' bonds;
- Short-term corporate bonds;
- Commercial bills.

In primary trading the following methods can be used:
1. the proportional selling method;
2. the continuous selling method;
3. the multiple price method.[14]

[13] See "Rules of business operation of the Belgrade stock exchange", http://www.belex.co.yu/licnakarta/normativa/index-e.html
[14] ibid.

The methods used in the secondary trading of securities are:
1. the single price auction with one or more auctions per day;
2. the continuous trading method;
3. the minimum price method – only in secondary trading in securities on the Free Exchange market, in compliance with these Rules.[15]

Bonds were present on the BSE from the inception of trading. For the first six months, they were traded in auctions. However, after improving the Exchange's information system, in March 2003 the new platform of continuous bond trading was accepted. Bond trading is performed both on the stock exchange and on the OTC market, but only through authorized brokers who are members of the BSE and are therefore allowed to trade through the BSE on-line system.

Depending on the market participants involved, bond trading through the Exchange can be described as the following:

When buying bonds:

A buyer of bonds first signs a contract of custody with the authorized broker who is a member of the Exchange. The broker opens the securities account in the Beokliring and bank sub-account, where the buyer needs to deposit money. The buyer then issues the buy order on a security to his broker. The security is then converted into electronic format and entered into the BSE information system.

When selling bonds:

A seller of bonds can sign a contract either with an authorized broker or a custody bank that is a member of the Central Registry and Beokliring. To be eligible for the contract, the seller has to submit all necessary documentation that proves ownership of bonds. The next step is opening a money sub-account in the custody bank, and a bank securities sub-account with Beokliring. The securities are then transferred to the sub-account of the custody bank. When securities are placed in the securities sub-account at the Central Registry, the seller can submit the sell order to a broker or a custody bank. The custody bank receives the order and decides whether it will proceed with settlement. When settlement is accepted, the broker puts the order in electronic form and enters it into the BSE information system.

Table 4-1: Major Participants of Bond Trading on the BSE

Brokerage house	Turnover value	No. of transactions
Senzal a.d. Beograd	20,11%	14,24%
M&V Investments a.d. Novi Sad	9.46%	8.11%
Delta broker a.d. Beograd	8.29%	8.05%
Vojvođanska banka a.d. Novi Sad	7.02%	10.72%
First Global Brokers a.d. Beograd	6.41%	6.16%

[15] ibid.

A transaction on the BSE can be concluded only when a member of the Exchange delivers the trade order. In some cases, a trading transaction can be concluded if an authorized person of the Central Registry delivers the order in his name and on the account of a BSE member. The Republic of Serbia and the National Bank of Serbia can trade securities through their own authorized broker. Currently, neither the Republic of Serbia nor the National Bank of Serbia trade on the BSE.

Table 4-1 presents those brokerage houses that accounted for the majority of trading in 2004. However, the table refers only to turnover through the stock exchange. The lack of information from the OTC market permits only an assumption that the structure of major traders is similar.

The transaction is concluded at the moment the total quantity of bond value requested is met, or when a pre-specified quantity of a trading order placed on the BSE is executed. When the transaction is executed, the confirmation has to be converted to electronic format and then submitted in the same format to the Central Registry and to the member who concluded the transaction. All transactions are settled through the Beokliring system by a delivery-versus-payment system. The settlement period for bonds is T+3. Following the execution of the transaction, brokers and custodian banks inform their clients about the concluded settlement.

Trading of debt securities can also be conducted on the OTC market. According to the rules of trading of the BSE (which conforms with the existing legal framework), authorized traders on the OTC are obliged to submit information about completed trades by electronic mail. Furthermore, all prices concluded on the trading session should be published on the BSE web page. This rule is not obeyed in practice. However, the Central Registry provided us with partial information on the OTC trading, which included a number of bonds traded over-the-counter in 2004. We merge this information with the data from the BSE and report the results in Table 4-2. The OTC trades are mostly close to 80% of the overall trading volume. While this is not unusual (a similar number would be 100% in the Czech Republic or Hungary), the fact that prices for this segment of the bond market are not publicly available is a sign of potential problems such as insider trading, lack of liquidity, etc.

The record of each trade on the OTC market submitted to the BSE contains:

- Name and the registered office, and name and address of the seller;
- Name and the registered office, and name and address of the buyer;
- Data on type, class, series, and number (quantity) of securities and the date of their trading;
- Date on which the data is released on the website of the Exchange.

Table 4-2: OTC Trading as a Percentage of the Total Trading (i.e. OTC+BSE)

	ARS2004	ARS2005	ARS2006	ARS2007	ARS2008	ARS2009	ARS2010	ARS2011	ARS2012	ARS2013	ARS2014	ARS2015	ARS2016
Jan 2004	84,1	76,7	69,5	64,0	62,0	76,6	73,1	76,1	79,8	82,2	81,7	60,7	72,5
Feb 2004	82,3	42,1	52,3	51,3	51,0	55,4	62,8	56,6	63,8	61,2	66,1	80,3	69,4
Mar 2004	73,8	65,4	85,6	87,2	89,2	88,9	85,5	74,5	76,3	68,0	74,9	76,1	74,5
Apr 2004	72,9	76,2	82,8	86,0	87,8	85,6	83,8	73,1	74,4	78,0	74,4	84,4	76,9
May 2004	85,4	85,4	71,7	83,6	63,2	57,5	54,9	78,6	77,9	79,5	81,8	69,7	54,8
Jun 2004	100,0	81,4	67,8	69,9	79,1	78,0	71,5	73,9	59,6	61,4	61,0	46,7	62,3
Jul 2004		87,7	85,2	87,4	85,6	82,2	78,3	82,4	83,9	82,1	75,9	64,6	72,3
Aug 2004		83,3	81,4	84,0	83,4	88,8	87,6	84,1	84,7	81,0	74,2	79,1	40,2
Sep 2004		89,6	81,7	73,8	75,5	62,9	63,5	62,4	72,3	83,4	67,3	87,6	75,9
Oct 2004		76,6	78,9	72,5	74,1	46,3	64,9	82,8	76,2	75,6	79,8	77,1	74,0
Nov 2004		73,2	68,9	83,6	87,2	79,5	79,1	84,1	82,2	77,8	80,7	80,7	75,5
Dec 2004		87,6	89,1	85,3	79,3	73,8	66,8	88,1	90,1	85,0	82,9	90,2	71,8
Overall	**78,7**	**79,0**	**77,7**	**80,4**	**80,4**	**78,2**	**75,7**	**79,2**	**80,1**	**78,4**	**76,7**	**79,2**	**70,3**

Note that a record of the settlement price concluded on trading is not included. Any order that is not in accordance with Exchange rules can be rejected or cancelled by the Exchange supervisor.

Transaction cancellation in the primary and secondary markets on the Belgrade Stock Exchange is possible on the basis of a written request to cancel the transaction along with the written approval of the other member with whom the transaction was concluded. The transaction may be cancelled due to a technical error that can be examined and identified in the order ledger book or in other relevant documents. A member must submit a cancellation request, along with written explanation, within a period no longer than 30 minutes after the transaction was concluded. In a case where some piece of information is incorrect, the supervisor of the BSE can cancel any transactions included in primary or secondary trading.

4.2. Law on Securities and Other Financial Instruments' Market

The Law on Securities and Other Financial Instruments' Market is the main act governing the function of financial markets. It was adopted by the Assembly of the Federal Republic of Yugoslavia on the basis of a proposal of the National Bank of Serbia, and drafted on the basis of similar laws in the European Union.

Since the State Union of Serbia and Montenegro does not have expertise in monetary system and finances, these areas were assigned to the member Republics. Thus, this regulation became the Republic regulation, similar to all authorities and institutions whose functions are based on it. The main idea behind this law is to improve the financial system, which will affect the overall economic environment. The law has replaced the previous two laws regulating the Stock Exchange, stock operations and intermediaries. It thus provides a unified legal framework, regulating four main issues:

1. Definition of the types of securities and their main characteristics;
2. Announcement of offers in distribution and trade of securities on the organized market;
3. Authorizations of participants on the security market, as a procedure related to the monitoring of the operations of brokerage/dealers' societies;
4. Function of the Central Registry and function and competence of the Securities' Committee.

The Law regulates issues related to securities, warrants for purchase of shares or bonds, standardized financial derivatives and deposit confirmations, as well as other types of financial instruments determined by the Securities' Exchange Commission to be securities or standardized financial instruments. Types of securities include the shares assigned as part of the main assets of the shareholders' association, debtors' securities, and warrants for purchase of shares or bonds, which grant the right of the owner to purchase future shares or bonds.

Securities can be distributed only by means of a public tender upon publication of the securities' distribution prospectus. According to this law, securities should exclusively be traded on the organized market, or through a brokerage/dealers' association. Every broker/dealer is required to adhere to a prescribed minimum of assets in the range from EUR 50,000 to 300,000, depending on the activities conducted by such an association. However, the Draft Law on Changes and Amendments to the Law on Securities and Other Financial Instruments' Market is being considered by the Serbian republic legislature. The existing law mandates that selling of securities must be conducted on the organized market and only in exceptional cases outside the organized market. Provisions in articles 67-83 of the Law regulate the procedure related to taking over of the shares in cases when one entity gains a 25% or higher share in the shareholders' assets of the shareholders' association.

The Securities' Exchange Commission conducts monitoring and stipulates the manner of calculation of the assets' liquidity coefficient, as well as the smallest scope of liquidity to be provided by the brokerage/dealers' society. Audits of the brokerage/dealers' society's activities are conducted at least twice a year. The Commission is given wide latitude regarding the oversight procedure. Also, the law regulates the status of the authorized bank, as well as preconditions for obtaining custody bank status. Conditions are regulated in more detail by sub-laws related to the law, like for instance the Rulebook on preconditions for conducting custody bank activities.

The Securities' Commission is a legal entity with premises in Belgrade. It is an organization of the Republic of Serbia, and reports to the Republic Assembly on its activities.

5. Bond markets in Central Europe: Lessons and Experiences

The Visegrad Four countries (V4 includes the Czech Republic, Hungary, Poland, and Slovakia) have completed their transition from plan to market. During their transition, each of the V4 countries launched various privatization programs and adopted an extensive range of measures to implement monetary and fiscal policies that would suit the needs of that country's overall transformation. At the same time, the V4 countries also shared some common features of economic transformation, ranging from institutional changes promoting a market economy to practical issues such as exchange rate regimes, inflow of foreign direct investment to industries with comparative advantage, and creation and regulation of financial markets.

These countries have striven to establish a workable framework for international trade and cooperation to facilitate the transition process. As early as December 1991, the former Czechoslovakia, Poland and Hungary signed so-called "European Agreements" with the European Union. An international trade arrangement among the V4 countries was then institutionalized in March 1993 in the form of the Central European Free Trade Agreement (CEFTA) that also included Slovenia.[16] From 1994 to 1996, the V4 countries officially applied for membership to the European Union (EU). Given their prospects for accession, the V4 countries have been confronted since the mid-1990s with a list of criteria upon which EU conditioned the acceptance of new member countries. Admission talks with the V4 countries began in 1998-1999 and concluded in 2002 (see Table 5-1 for details). In May 2004, the V4 group, along with six other countries, joined the European Union as full members.

Economic development in the V4 countries exhibits considerable convergence. Considerable real and monetary convergence has been found among the Central European countries during the 1990s.[17] However, numerous risks lie ahead of them on their paths to admission into the Euro zone. Empirical evidence has shown that stronger growth rates after the beginning of accession talks are indicative of the benefits of prospective membership, thus strengthening convergence with Union macroeconomics. Documented, significant convergence in monetary and other policy is consistent with recent studies as well. On the other hand, serious deficiencies in meeting the criteria for deficit-to-GDP and debt-to-GDP ratios were also

[16] Later, the CEFTA was enlarged with the inclusion of Romania (1996) and Bulgaria (1998).

[17] See Kočenda (2001) and Kutan and Yigit (2004). The results are sensitive to the choice of econometric methodology, though.

observed.[18] Fiscal consolidation through expenditure-reduction policies, along with a supply-side oriented policy, reducing unit labor costs and increasing competitiveness, are some policy choices in this regard. Our observation of discouraging progress in fiscal convergence in the V4 is quite important with regard to the bond market, since the majority of government debt in the V4 countries is covered by the issuance of government bonds.

This section presents an overview of bond market development in the V4 countries. A comprehensive account on proportions of the Central Government (Marketable) Debt to GDP in each country is given in Table 5-2, along with proportions of the debt in the form of government bonds. The extent of the debt and its part in bonds supplement information provided in the following narrative.

Table 5.1: Timing of the EU Admission Process

	Application Submitted	Admission Negotiations	
		Beginning	End
Czech Republic	January 17, 1996	March 31, 1998	December 13, 2002
Cyprus	July 3, 1990	March 31, 1998	December 13, 2002
Estonia	November 24, 1995	March 31, 1998	December 13, 2002
Hungary	March 31, 1994	March 31, 1998	December 13, 2002
Latvia	October 13, 1995	October 13, 1999	December 13, 2002
Lithuania	December 8, 1995	October 13, 1999	December 13, 2002
Malta	July 16, 1990	October 13, 1999	December 13, 2002
Poland	April 5, 1994	March 31, 1998	December 13, 2002
Slovakia	June 27, 1995	October 13, 1999	December 13, 2002
Slovenia	June 10, 1996	March 31, 1998	December 13, 2002

Source: European Commission

[18] See Kočenda, Kutan and Yigit (2005) for details.

Table 5.2: Extent of Debt and its Part in Government Bonds

Central Government Marketable Debt (as a percentage of GDP)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Czech Republic	3,6	4,4	6,1	6,8	7,7	9,2	10,9	13,6	15,5	17,0
Hungary	26,3	28,1	27,3	33,6	28,2	29,2	35,3	35,1	37,3	41,3
Poland	13,0	21,9	19,0	18,8	17,1	16,4	19,2	19,6	24,2	29,2
Slovak Republic	11,4	12,6	13,2	13,5	16,7	19,2	19,8	21,4	34,7	31,8

Government Bonds (as a percentage of total marketable debt)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Czech Republic	53,4	54,3	49,8	41,2	45,0	41,2	37,2	38,7	44,5	57,6
Hungary	81,0	80,9	77,8	75,8	72,5	76,6	79,4	81,9	81,3	79,2
Poland	6,8	47,0	52,7	61,3	61,7	69,5	78,0	83,3	80,7	81,3
Slovak Republic	83,2	100,0	80,5	65,8	66,9	86,7	90,4	90,8	88,8	88,7

Central Government Debt (as a percentage of GDP)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Czech Republic	15,6	13,3	11,2	9,9	10,0	10,6	12,0	14,6	15,9	17,4
Hungary	87,9	85,2	84,3	71,5	62,9	61,1	60,4	54,9	52,0	55,1
Poland	85,2	64,9	52,1	46,0	45,1	41,2	41,3	37,4	37,8	42,5
Slovak Republic	24,0	21,4	19,1	18,5	21,0	22,7	22,8	24,0	36,4	35,4

Government Bonds (as a percentage of central government debt)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Czech Republic	12,3	18,0	27,1	28,3	34,7	35,8	33,8	36,0	43,4	56,3
Hungary	24,2	26,7	25,2	35,6	32,5	36,6	46,4	52,4	58,3	59,4
Poland	1,0	15,9	19,2	25,1	23,4	27,7	36,3	43,7	51,7	55,9
Slovak Republic	39,5	58,9	55,6	48,0	53,2	73,3	78,5	81,0	84,7	79,7

Source: OECD

5.1. Czech Republic

The Securities Exchange Commission, established in 1998, regulates the capital market in the Czech Republic.[19] The Securities Center of the Czech Republic acts as the central registry of securities in book-entry form.[20] The system of short-term debt securities (SKD) is the central registry and clearing center for short-term debt securities. The government issues its debt obligations in the form of treasury bonds and bills through the Ministry of Finance[21], and the Czech National Bank (CNB)[22] is an agent of the Ministry for issuing treasury bonds and bills. Finally, the Prague Stock Exchange is the main regulated securities market.

While the focus of this study is bond trading, we will start our discussion of the securities markets in the Czech Republic with the market for stocks where there existed an OTC market via the Securities Center. The Securities Center resembles its Serbian equivalent, the Central Registry, and many lessons from the stock market in the Czech Republic can be extended to the Serbian bond market. At one point during the 1990s, the OTC market trading reached 95% of the overall volume of stock trading (see Hanousek and Němeček, 2001, for details). The Prague Stock Exchange reacted by prohibiting its members from participating in the OTC market.[23] At the same time, it enabled them to settle off-market trades via UNIVYC, its subsidiary. This step significantly increased transparency of the stock market and made trading more efficient.

The development of the bond market has been less dramatic. From its creation in 1993, the bond market has been an over-the-counter dealer market dominated by five Banks. In 1997, it became affiliated with the Prague Stock Exchange through an agreement with the Association of Bond Traders, who undertook to supply bond quotes on a daily basis to the Exchange. Little trade is actually conducted on the PSE and most trade is conducted as block trades. A block trade is technically an OTC trade, but because a PSE member represents at least one party to the trade, the trade is registered in the PSE trading system.[24] Thus, the relative share of OTC transactions (all transactions in short-term securities, transfers on the RM-System and at the Securities Center, and block trades registered by the PSE) in the secondary market is

[19] Details on the Securities Exchange Commission, including legal issues and latest developments, can be found at http://www.sec.cz/ .

[20] See http://www.scp.cz for more details and for the organizational structure of the Securities Center of the Czech Republic.

[21] Ministry of Finance web page http://www.mfcr.cz/ also includes details about the market of government bonds. Note that before the Securities Exchange Commission came into existence, the Ministry of Finance acted as the main regulator of the bond and securities markets.

[22] The Czech National Bank web site http://www.cnb.cz/ also contains details on the short-term bond system and legal framework associated with government debt securities.

[23] Legal requirements, trading statistics, and composition of the market makers at the Prague Stock Exchange can be found at its official web page http://www.pse.cz/.

[24] In addition to the PSE, long-term debt securities are also traded on the RM-System (an organizer of off-exchange trading) and can also be transferred directly (by bilateral agreements) via the Securities Center accounts.

near 100%. The yields to maturity are based on daily reference prices quoted by the market makers (average of bid and ask prices). No coupon adjustment is performed in the calculation and the yield figures do not adjust for tax.

The Ministry of Finance issues government obligations to cover borrowing needs in a given fiscal year, and to refund the state debt. Treasury bonds are issued as fixed interest-bearing securities in book-entry form with a face value of CZK 10,000 (approximately EUR 332). Treasury debt securities are denominated in Czech korunas (CZK). The domestic market is easily able to absorb all the securities issued so far by the Czech government. Treasury bills and Treasury bonds are sold on the primary market through American (multiple price) auctions, in which bids are submitted in the form of yields to a group of direct participants, typically banks and approved securities dealers.[25]

The amount of outstanding debt securities represents about 60% of GDP. With regard to maturity structure, 14% of debt securities in the national currency issued by the general government had an original maturity of between one and five years. Debt securities with a maturity of five years or more, but fewer than ten years, constituted 23% of the total, while another 21% was represented by debt securities with an original maturity of ten years and more. The aim of the government is to finance two-thirds of the debt by mid- and long-maturity bonds.

Official interest rates used:

- Repo rate (two weeks) – this is the limit interest rate that the CNB is willing to accept in a repo tender. The CNB announces repo tenders to inject or withdraw liquidity from the domestic banking system.
- Discount rate – this is the interest rate at which banks are allowed to place excess funds at the end of the day with the CNB. It generally provides a floor for short-term interest rates on the money market.
- Lombard rate – this is the interest rate at which the CNB provides liquidity to banks in the event they experience short-term difficulties with liquidity. It provides a ceiling for short-term interest rates on the money market.
- PRIBOR (Prague interbank offered rate) and PRIBID (Prague interbank bid rate) – these are arithmetical averages of the interest rate quotes of reference banks at 11 a.m. local time on the interbank money market.

Overall, the bond market forms a large segment of the capital market in the Czech Republic. Its rapid development commenced after 1993 when inflation dropped below 10 percent, and the economic and political situation was more or less stabilized. The Czech bond market now ranks among the most developed bond markets in Central and Eastern Europe in terms of foreign investors' access, liquidity, offer of instruments, and other characteristics.

[25] Note that originally the CNB used Dutch auctions as a sale mechanism. See ECB (2003) for more details.

Rapid growth of the public debt, a majority of which consists of government bonds, represents a serious risk factor for the future. Its trend is reflected in lower ratings by Standard & Poor. An increase of the risk premiums on bonds could lead to increases in the interest rate and currency volatility. Reform of public finances is an imperative. Reform without increasing bond exposure is a challenge.

5.2. Hungary

The two driving forces behind the foundation of the government securities market in Hungary were the need to reduce rollover risk and the need to mitigate exchange rate risk for the government treasury. The former concern required the lengthening of the maturity spectrum of government bonds, while the latter was addressed by the issuance of local currency denominated bonds.[26] As for the logistics of bond issuance, government obligations in Hungary are issued by the Government Debt Management Agency, Ltd.[27], which also manages the domestic and foreign debt of the government. The Hungarian Financial Supervisory Authority facilitates the smooth operation of the financial markets and acts as a regulatory body.[28]

Since the very beginning there has existed a system of primary dealers.[29] One of the basic responsibilities and exclusive rights of primary dealers is to support the issuance of Hungarian government bonds and discount Treasury bills publicly offered since 3 January 1996 by regular bidding at auctions. Every six months, all dealers are required to buy, either on their own or on their clients' account, at least 3% of both Hungarian government bonds and discount Treasury bills in the primary market.

Currently, Hungarian government bonds are issued for five benchmark maturities, namely two years, three years, five years, ten years and fifteen years, by the Government Debt Management Agency. The first auction of the two-year and three-year fixed rate bonds occurred in 1996.[30] The new 15-year fixed rate bond was issued

[26] Monetary policy considerations pushed for fixed income issues.

[27] Details on the Government Debt Management Agency Ltd., including rules, calendars of auctions and statistics may be found at http://www.allampapir.hu/.

[28] Detailed information on the Hungarian Financial Supervisory Authority can be found at its official web site http://www.pszaf.hu/english/start.html.

[29] A primary dealer may be any security dealer or credit institution registered in Hungary that complies with the Securities Act and with the primary dealer contract. It is required that the company or its controlling shareholder has operated for at least two years on the money and capital markets of one of the OECD countries.

[30] The average maturity of auctioned securities was between three and six months in 1994 while it is 2.3 years currently (four months for T-bills and almost three years for marketable government bonds). See Sándor (2002) for an overview.

in November 2001. All marketable bonds issued since 1 April 1999 have been dematerialized and as mentioned above, the issuance of government securities is organized through a primary dealer system.

The total amount of outstanding debt securities represents more than 55% of GDP. More than 80% of the total outstanding amount was issued by the general government, and the remainder – less than 20% of the total – was issued by state financial institutions, primarily by the National Bank of Hungary (NBH). The debt securities issued by the general government and denominated in the national currency amount to 88% of the total, while nearly 10% were denominated in euros. Twenty-seven percent of all debt securities have an original maturity of between one and five years, 26% have one of between five and ten years and 24.5% have one of ten years or more.

Official interest rates used:

- Central bank deposits, one-day: credit institutions can place (overnight) deposits with the central bank without any restrictions.
- Central bank reference rate, two-week: the two-week central bank deposit facility has been one of the main benchmark instruments for the bank.
- Central bank repo, one-day: under the overnight repo facility, credit institutions can have credit with the central bank without any restrictions.
- Money market rates: typically, the average interbank interest rates include both secured and unsecured lending among banks and specialized credit institutions in the money market. The monthly average interest rate is the weighted arithmetic average of interest rates on new or rolled-over secured and unsecured interbank lending transactions in a given month.

One potential driving force for the development of debt markets is the expected growth of derivatives markets. Despite full liberalization, these markets are still not very liquid, though there are signs that interest rate swaps are gaining popularity. The most important segment currently is the foreign exchange swap market. Overall, the Hungarian government securities market is now a developed and mature market, one of the most liquid and sophisticated in the region.

The same can be said of the Hungarian stock market, where the Budapest Stock Exchange has managed to avoid problems encountered in the Czech Republic. The foundations of the market follow rules of operation in London and in Frankfurt. At the same time, there was no equivalent of voucher privatization, which resulted in ownership fragmentation in the Czech Republic. The stock market has been more transparent and liquid, and the OTC market has never fully developed.

Coming back to the Hungarian bond market, it is important to note that in Hungary, government debt recently exceeded, if slightly, 60% of the Maastricht reference value, due to the high level of general government borrowing. This is a problem because such a situation creates even greater risks for bond markets than in the case of the Czech Republic.

5.3. Poland

The National Bank of Poland (NBP), under an agreement with the Ministry of Finance, acts as the issue agent for Treasury securities sold to institutional investors; it organizes sales of these securities at auctions. The Ministry of Finance is the issuer of Treasury securities and is also responsible for State Treasury debt management. The OTC market is the dominant market for Treasury securities, although since April 2002, part of the OTC market has been shifted to the Electronic Treasury Securities Market. Debt securities can be quoted on the Warsaw Stock Exchange (WSE), with the permission of the Polish Securities and Exchange Commission. However, as in the Czech Republic, debt securities constitute a marginal proportion of quoted securities.[31]

Treasury bonds – long-term bonds with maturity of up to 10 years – are issued through monthly (American-like) auctions in de-materialized form. Only those institutions having the status of a "direct participant" can bid in the auctions for Treasury bonds. Other market participants wishing to bid must do so through these intermediaries. The majority of outstanding Treasury securities were fixed rate marketable bonds. The liquidity of the T-bond market improved markedly in recent years, with gross turnover almost doubling since the mid-1990s. Treasury bonds are registered with the National Depository System (NDS) and are traded on the Warsaw Stock Exchange, over the counter, and on a non-regulated interbank market. Transaction costs are much higher on the regulated market; as a result, 98% of the volume of transactions is carried out on the non-regulated interbank market.[32]

The total outstanding amount of debt securities issued represents almost 40% of GDP. The general government sector was the dominant issuer with a share of almost 82%. Such issues were predominantly (close to 90%) denominated in national currency; the rest were denominated in euros and other currencies (US dollars and UK pounds sterling). According to the maturity structure, 38% of outstanding debt securities issued by the general government in the national currency had an original maturity of five or more but fewer than ten years. The share of general government debt securities with an original maturity of ten years is the smallest, amounting to roughly 14%.

[31] Warsaw Stock Exchange at http://www.wse.com.pl
National Bank of Poland at http://www.nbp.pl/
Minister of Finance at http://www.mofnet.gov.pl
Polish Securities and Exchange Commission at http://www.kpwig.gov.pl

[32] See Stopyra, Trzecinska and Grat (2002) for an overview.

Official interest rates used:

- The discount rate refers to the interest rate offered by the NBP on purchases from commercial banks of bills that the latter have already discounted. The use of discount loans is marginal at present.
- The repo rate refers to the minimum yield on 28-day NBP bills, used by the central bank to absorb liquidity in the banking sector through open market operations. It is the official reference rate that signals the current monetary policy direction.
- The Lombard rate refers to the interest rate offered on loans made by the central bank to commercial banks for very short maturities (several days) against collateral in the form of securities (Treasury bills, Treasury bonds and bills of exchange). The use of Lombard loans by commercial banks is, at present, very marginal and unimportant.
- Interbank money market rates refer to the mostly used offered rates (WIBOR). Several authorities and observers note that overnight deposits rates are predominant and therefore can be considered the most representative.

The bond market in Poland is developed and liquid. The Ministry of Finance aims to improve the liquidity of the T-bill market by encouraging banks to carry out transactions on an electronic platform through a primary dealer system. The primary dealer system should also help boost market transparency by providing more information on quoted prices and making it easier for pension funds to value T-bonds.

The treasury bond market in Poland is affected by large government indebtedness as in other CEE countries, but the situation is less dramatic than in Poland. Further, continuing expectations of reductions of the central bank key interest rates limit the decrease in treasury bond prices. Recent Polish experience with its bond market development is quite satisfactory.

5.4. Slovakia

In Slovakia's bond market, the Ministry of Finance is the principal debt agency and is responsible for government cash and debt management. The National Bank of Slovakia (NBS) acts as an agent for the Ministry of Finance as the issuer of debt. In this connection, the National Bank of Slovakia is responsible for the technical aspects of the primary sale both of government bonds issued in national currency and of Treasury bills, for the settlement of transactions in financial and material terms, and for the keeping of a central register of Treasury bills.

The primary market for securities is also organized by the NBS and is typically open to a wide group of participants satisfying Securities Act conditions. The issuing conditions and the method of sale are set according to a recommendation of the NBS. At present, all government securities are sold by auction. The private market for Treasury bills is also organized by the NBS and the underlying securities are registered at the Central Register of Short-Term Securities, which is also kept by the NBS.

The secondary market with governmental bonds is conducted via the Bratislava Stock Exchange (BSE). In order to increase price-making transactions, participants of the so-called "module for market makers of government bonds" are obliged to provide daily two-way prices for certain issues of government bonds. These bonds are the benchmark bonds in the domestic market of Slovakia. Since the benchmark bonds are bonds traded in the module of market makers on the BSE, this arrangement ensures the existence of benchmark prices every day.

The total amount of outstanding government debt represents about 34% of GDP. Of this amount, the largest share consists of debt securities issued by the general government (98% or EUR 8.369 million). Of the debt securities issued by the general government, the largest share (78%) is made up of debt securities denominated in the national currency, whereas debt securities denominated in euros represents 18%. The share of debt securities issued by the general government in the national currency (25 %) had an original maturity of up to and including one year. Debt securities with a maturity of more than one year and fewer than five years constituted 21% of the total. The largest part of the general government's debt in national currency (36%) was made up of debt securities with an original maturity of more than five and fewer than ten years. Debt securities with a maturity equal to or higher than ten years constituted 18% of the total. [33]

Official interest rates used:

- The discount rate refers to the interest rate offered by the NBS on purchases from commercial banks of bills that the latter have already discounted.
- The NBS repo rate: this is the intervention rate of the NBS that relates to the standard two-week repo tenders either for sterilization or for refinancing of commercial banks. This rate is used either as the lower or the upper limit rate-for relevant two-week repo operations.
- The overnight refinancing and sterilization rates of the NBS: these are standing facilities for refinancing and sterilization, which commercial banks may use without any volume restrictions. This is a policy variable rate.
- The interbank deposit market interest rates (BRIBOR): these are calculated as the average quotes of eight commercial banks (overnight, one-week, two-week, one-month, two-month, three-month, six-month, nine-month and twelve-month). Observers tend to consider the most relevant maturity band being that of one month.

Over time, we have observed significant changes on the primary market of the general government sector, mainly in the original maturity split. Before 1995, the share of common one-year maturity bonds fell to below one quarter. As of 1995, five-year bonds were issued for the first time. To these were added first issues of seven and ten-year government bonds, which, taken together, created an important benchmark at the long end of the yield curve. In 1998, when government bonds with a

[33] See the ECB (2003) for more details.

maturity of one and two years were issued solely on the domestic market, long-term debt securities accounted for 22% of the total. This proportion subsequently rose to 32% in 1999 with the addition of three-year government bond issues, and by 2000, longterm debt securities accounted for 70%. The year 2000 was also important for the primary market in government bonds, since it was in this year that all long-term debt securities in the national currency issued by the general government were issued at auction. The structure of the Slovak bond market leans toward longer maturities, which is in line with government reform strategies for public finances. Non-marginal government debt may be reduced after tax reform takes hold. Long-term bonds are expected to be repaid when the economy increases productivity and tax collections increase. Any assurances of such a development are premature, though.

5.5. Comparison and Summary

Recently, the bond markets in CEECs Central Eastern Europe have represented an attractive investment opportunity for many investors. Average yields on Czech, Slovak and Hungarian government securities were considerably higher than in the euro area. The individual countries in the region offered similar yields to investors in the long run, despite recent differences and changes in their economic conditions, the sophistication of their bond markets, and their credit ratings. On the other hand, the higher average yields were associated with higher average dispersion, and higher risk as well. Such a situation is associated with the development of the CEE economies, and changing structures of the public finances that await major reforms.

To a certain extent, all V4 countries during the last decade changed the term structure of their governmental bonds by shifting their debt from short to long-term maturities, and by attracting foreign investors. All countries promoted liquidity and transparency in the secondary bond market. To achieve this, during their transformation the V4 had to concentrate on an array of tasks. Foremost among these was the elimination of any barriers in the settlement and clearing system and in the system of transaction fees. These countries also introduced new techniques of settlement, as well as a supporting system of market makers for (governmental) bonds and money market makers. Promotion of trading in securities took place via an electronic platform. Of important note is the introduction of switching operations, in which a bond is bought back before reaching maturity, and the settlement made by issuance of another bond (with a benchmark status) to the holder. The bond that has been bought back is written off; switching is thus a non-cash combination of buyback and issuance of two different bonds.

Other tasks included the preparation of an index with benchmark status, and methods for calculating and publishing reference prices of these bonds. Elimination of mandatory reserves on repos in the TS market was undertaken, as were increases in the issuance of individual groups of bonds, and limitations on the number of auctions for each category of bonds.

6. Serbian Yield Curve

In this section, we provide an overview of term structure models and use one of them – the Nelson and Siegel (1987) model (N-S model) – to estimate the yield curve using data from Serbia. We comment on the development of the Serbian bond market in light of our estimation results. Potential applications of the estimated term structure are discussed in subsequent sections.

6.1. Term Structure Models

Analysis of the yield curve is based on the simplest fixed-income instrument, a zero-coupon bond. The zero-coupon bond promises to pay a unit of currency on a given date in the future. The time between a current period and the pre-specified future date determines the maturity of the bond. If held to maturity, the bond earns a fictional, constant, annual interest rate, which is the bond's yield. Plotting yields of zero-coupon bonds, as a function of their respective maturities, results in the yield curve.[34]

Approaches to modeling the term structure of interest rates can generally be distinguished between those that model forces driving the yield curve, and those that employ data obtained from asset prices to model the yield curve. The former group of models makes explicit assumptions about the development of state variables and asset pricing methods, and uses either arbitrage or equilibrium arguments. The latter dynamic statistical models smooth data from asset prices without incorporating explicit factors presumed to drive the yield curve. Both approaches have their advantages, though the latter class of models does not suffer from potential misspecification due to employing inadequate variables.

Whatever approach is adopted in an empirical work, a good model of term structure should be able to reproduce stylized facts documented in the literature and also be sufficiently flexible to accommodate idiosyncrasies of a given bond market. Our analysis seeks to incorporate the idiosyncrasies of the Serbian bond market. Following Diebold and Li (2003), the stylized facts could be summarized as follows:

1) The mean yield curve is increasing and concave.
2) The shape of the yield curve can change over time. Potential shapes include upward sloping, downward sloping, humped, and inverted-humped.
3) Dynamic properties of yields are persistent, more so than those of yield spreads.
4) The long end of the yield curve is less volatile than the short end.
5) Short rates are less persistent than long rates.

[34] Term structure models capture the state of an economy and are used to value interest rate derivatives such as swap options, callable bonds, and structured notes.

We will compare these data features with the dynamics of yields in the Serbian bond market, comment on potential deviations, and develop an appropriate methodology based on a performance-driven choice from the following three basic approaches.

Major examples of no-arbitrage models are those of Hull and White (1990) and Heath, Jarrow, and Morton (1992). Such models typically concentrate on fitting the term structure at each point in time by imposing no-arbitrage conditions. While they might be very useful in pricing derivatives, they do not reveal much in terms of dynamics or forecasting of interest rates.

In the affine equilibrium term structure literature, the shape of the yield curve depends on a bond yield with the shortest maturity, the so called short-rate. To characterize the evolution of the yield curve through time, we can express bond prices (and hence yields) at any given time as a function of the short rate and other state variables. This function defines a term structure model. The fundamental contributions in the equilibrium tradition include Vasicek (1977), Cox, Ingersoll, and Ross (1985), Duffie and Kan (1996), and more recently, de Jong (2000) and Dai and Singleton (2000). Since the equilibrium models focus on the process driving the instantaneous rate, they can potentially be used for forecasting. However, Duffee (2002) demonstrates that they forecast rather poorly and are inconsistent with many of the above-mentioned stylized facts.

An advanced example of the dynamic statistical models of term structure is the Nelson and Siegel (1987) model. The N-S model, together with its more flexible version described in Svensson (1994), implies that forward rates readily tend towards a flattened end of the forward rate curve. This is in contrast to the McCulloch (1971, 1975) model that allows forward rates to fluctuate and even to rise as the term to maturity increases. This feature makes the McCulloch model unsuitable when forward rates reflect expected future short-rates, which is often a reasonable assumption. The Svensson and N-S models are, in effect, extensions of the McCulloch model that prevent such objectionable shapes of the forward curve. The N-S model can replicate stylized facts with ease and is well suited for forecasting. Moreover, variations of this model are often used by central banks to form inflationary expectations – e.g., the Bank of England (see Deacon and Derry 1994). The N-S model is a three-factor model where the factors are actually time-varying parameters, and can be interpreted as level, slope, and curvature of the yield curve. Knez, Litterman, and Sheinkman (1994) introduced a similar model in the spirit of the N-S model. Since the N-S model is relatively easy to estimate, has intuitive interpretation, conforms to stylized facts, and can be used for forecasting, we use it as a starting point to formulate a model specification suitable for analyzing the term structure of the Serbian bond market.

6.2. Data

As mentioned in earlier sections of this report, there are three types of government bonds currently available in Serbia. These are the bills issued by the National Bank of Serbia (NABS-B), Republic of Serbia T-Bills (RS-B) issued by the Ministry of Finance, and the Foreign Currency Savings Bonds (FCSB) as a form of repayment of foreign currency deposits in former Yugoslavia. The first auctions of NABS-B bills occurred in April 2000, while RS-B bills were first issued three years later. Auctions for NABS-B bills take place approximately once every two weeks. RS-B bills are auctioned irregularly, approximately in one to two month periods. The typical maturities of NABS-B bills are 7, 14-15, 30, and 60 days while those of RS-B bills are longer, e.g. 91,154, and 182 days. There is no secondary market for either type of bill and they are denominated in dinars. The first NABS-B bills matured in January 8, 2001. The data on FCSB issues has been available since November 2001 (four series: A2002, A2003, A2004, B[35]) for single price auctions that were replaced by continuous trading in March 2003. Moreover, additional bond series were introduced on September 9, 2002. FCSB bonds are traded actively on a secondary market and we possess the daily data series. Data on the NABS-B and RS-B bills were kindly provided by the National Bank of Serbia. Data on the FCSB bonds come from the Belgrade Stock Exchange.

The yield curve is typically extracted from the prices of discount bonds, which are often not observed since bonds with long-term maturities are coupon bonds. Hence, one proceeds by estimating a smooth discount curve and then converting it to yields with different maturities. In the case of Serbia however, our analysis is in this aspect simplified because all the bonds are discount bonds and the available dataset thus contains observations of the discount prices.

Other aspects of the Serbian data are less suitable with respect to term structure analysis. One issue is the fact that bond prices for bonds with maturities less than a year are only observed bi-weekly. Yet another problem is the market segmentation. The market for the short-term bills is not only just a primary market but the bills are denominated in dinars and are mostly used by banks to smooth their liquidity needs. The bonds with maturity over one year are denominated in euros; they are traded daily on the stock exchange (a secondary market), and potential investors are not limited to banks. However, FCSB bonds are perceived as safer than saving instruments in dinars such as simple bank deposits, not only because of a higher level of government guarantee (even though deposit insurance exists in Serbia) but mainly because their denomination is in euros. Distrust of the dinar due to its loss of value in the nineties hovers over the landscape of expectations still. Therefore, the foreign exchange risk premium is assumed to be relatively small; we address this particular

[35] We took the B series out of our dataset since it was clearly an outlier with unrealistically high yields. The series A2002 was taken out for real yields because inflationary expectations based on the previous year average of infltaion made the real yields too negative.

problem by converting nominal interest rates into real ones, accounting for depreciation of the dinar vs. the euro between the years 2002 and 2005.[36] Unfortunately, this creates other issues, namely the necessity to take a stand on what is the form of inflationary expectations. A proper modeling used in well functioning and stable market economies such as various ARMA processes is not appropriate due presence of structural breaks and instability. Hence we form the expectations based on the average monthly inflation over the last year. The last available year is also used for the forecasts of inflation rates to the future.

For NABS-B and RS-B bills we used annual, discretely compounded yields from NABS bonds calculated from the auction prices. First, we converted them into daily real yields and then to real annual yields. We construct the real yield $r_t(\tau)$ as

$$r_t(\tau) = [(1 + i_t(\tau))^t PI_t/PI_{t+\tau}]^{1/\tau} - 1,$$

where τ is the maturity of a given bill and t is the current date, $i_t(\tau)$ is the corresponding nominal yield, and PI_t is the retail price index.

Nominal bond interest rates for FCSB bonds are simple discounted prices. When constructing real yields for FCSB bonds, we need to take into account the exchange rate between dinar and euro, further denoted as S_t. To express the real yield more compactly, let us also define the real value of a bond as V_t. Note that $V_{t+\tau} = S_{t+\tau}/PI_{t+\tau}$ and $V_t = (S_t P_t)/PI_t$ where P_t is the current bond price. The real yield is then defined as:

$$r_t(\tau) = (V_{t+\tau}/V_t)^{t/\tau} - 1.$$

Finally, we merge the data on yields with a defined maturity with the data on bills. We comment on the historical yields later on, when comparing them to our estimates.

6.3. Methodology

We consider the Nelson and Siegel (1987) yield curve but use its factorization given in Diebold and Li (2003) as

$$y_t(\tau) = \beta_{1t} + \beta_{2t}\left(\frac{1 - e^{-\lambda_t \tau}}{\lambda_t \tau}\right) + \beta_{3t}\left(\frac{1 - e^{-\lambda_t \tau}}{\lambda_t \tau} - e^{-\lambda_t \tau}\right),$$

[36] A possible means of modeling the market segmentation more formally would be to use the Kalman filter approach to estimation (see for example Cortazar, Schwartz, and Naranjo 2004), where different groups of bond yields are allowed to differ, say by their variances. Such an approach is quite demanding on extensive datasets, though.

where $y_t(\tau)$ can be either real or nominal interest rate, τ is the maturity of a given bill and t is the current date. This factorization differs somewhat from Nelson and Siegel (1987) and allows for an intuitive interpretation of the three latent dynamic factors β_{1t}, β_{2t} and β_{3t}. It also avoids estimation difficulties due to multicolinearity. Since the loading on the first factor is a constant, it can be interpreted as a long-term factor, which does not converge to zero with increasing maturity. The loading on the second factor begins at 1 but quickly decreases to zero and can thus be viewed as a short-term factor. Finally, the loading on β_{3t} starts at 0, increases, and then slowly declines; hence it can be viewed as a medium-term factor.

From a different perspective, the three factors can be interpreted as level, slope, and curvature of the yield curve, respectively. To see that β_{1t} determines the level of the term structure, it is enough to realize that its size affects yields of all maturities equally and that $y_t(\infty) = \beta_{1t}$. If we define the yield curve slope as $y_t(\infty) - y_t(0)$, it exactly equals β_{2t} . Moreover, β_{2t} changes the slope of the yield curve since its loading is greater for shorter yields than for longer yields. The medium term factor β_{3t} has the greatest loading on yields with medium maturities and therefore increases the yield curve curvature, typically defined as

$2y_t(24) - [\, y_t\,(3) + y_t\,(120)] = .00053\beta_{2t} + .37\beta_{3t}$, with maturity given in months.

The Nelson-Siegel yield curve formula is parsimonious yet flexible and surely capable of replicating the stylized facts regarding yield curves. In particular, the average term structure is calculated using factor averages and can be in general increasing and concave. It can also reproduce a variety of shapes on a given date, which can change depending on variability of the factors. Strong persistence in the level factor translates into persistent yield dynamics and weak persistence in the slope factor into weak persistence of the spreads. The variance of short yields depends on the variance in the first two factors and the long yield variance only on the level. Therefore, short-term yields are more volatile. The same reasoning implies that longer rates are more persistent than shorter ones.

To characterize the yield curve, we need to estimate the parameters

$\theta = (\, \beta_{1t}, \beta_{2t}\,, \beta_{3t}, \lambda_t)'$.

Parameter λ_t is typically not estimated but set to the value maximizing the loading factor next to the β_{2t} (medium-term part) at 30 months i.e., setting λ=0.0609. Diebold and Li (2003) estimate the factors using ordinary least squares at each date. Due to the lack of bonds of different maturities on any given date, we cannot use this strategy and fit the yield curve daily. Instead, we assume that the coefficients are stable in a short time period (two weeks) and use a cross-section of data of selected daily observations on bond interest rates. Using ordinary least squares (OLS), we then estimate $\beta_{1t}, \beta_{2t}\,, \beta_{3t}$ on a bi-weekly basis.

Figures 6-1 and 6-2, respectively, characterize the evolution of beta estimates over time. One can clearly see the development of the bond market in Serbia. Before September 2002, only a few series of the FCSB bonds were traded. The estimates settle down somewhat after the introduction of additional bond series and continuous time trading, with the exception of β_3 . A similar pattern can be identified in Figures

6-3, 6-4, and 6-5, which show estimates of individual betas together with their confidence intervals from cross-sectional regressions (betas for nominal yields are always on the left and betas for real yields on the right) – the confidence intervals again narrow down in September 2002. To view the Serbian market from yet another perspective, we plot the number of observations for yields over time as well, which again clearly marks the beginning of the continuous time trading (see Figure 6-6). The number of observations drops regularly around the end of each year, marking the beginning of the Serbian Christmas season.[37]

Now we are in a position to compare the actual with the estimated yields and observe the yield curve changes over time. Figure 6-7 depicts the term structure in March 2001. The number of observations is small (see the number of dots in the graph). The nominal yield curves has an inverted shape and the real yield curve is linear. Interest rates can be converted into forward rates (see Section 7 below for details), which are essentially expectations of the short-term (in our case one-month) interest rates. Figure 6-7 then indicates that the market expected the nominal short rates to decrease in the time horizon of about half a year. Then predictions differ somewhat for the nominal and real yields. The nominal rates were expected to stay at the level of about 14% and then start rising, while the real rates were expected to start rising immediately.

Next we analyze observed versus estimated yields in August 2003 in Figure 6-8. Interestingly, the nominal yield curve is inverted here, while the real yield curve has the typical concave "hump" shape. Both curves seem to fit the data rather well. The difference in the shape of the two curves is likely to be due to unexpected depreciation (i.e. above a given trend) of YUD against EURO at the time. The yield curves again have a similar shape in February 2005, the end of our dataset.

We further concentrate on how well the N-S model fits the historical yields by maturities. Figure 6-10 compares observed and estimated three-month yields. The series only start in June 2003, when the first auctioned RS-B bonds matured. The method seems to systematically underestimate the nominal yields – this may be caused by lower frequency of auctions of government bonds, giving more weight to bonds with longer maturities because of the larger number of observations. This could potentially be remedied by apriori giving more weight to observations at the short end of the yield curve, which is only a minor alternation of the N-S method.

An interesting picture emerges in Figure 6-11 with historical yields being higher than estimated ones in May of each year. Bonds closer to maturity are traded with a much lower frequency than other bonds – with the lack of observations the observed yield curve is "smoothed out" while the estimated term structure has peaks at these dates. Finally, Figures 6-12 and 6-13 indicate a rather good fit for bonds with long-term maturities.

[37] Serbia celebrates Christmas according to the Eastern Orthodox Church, which uses the Julian calendar, making January 6 Christmas Eve.

Figure 6-1: Time evolution of the three parameters β_i in nominal yield curve

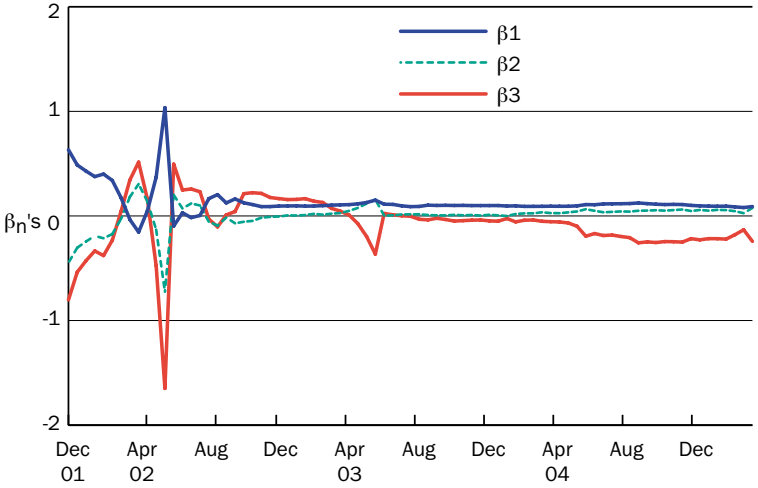


Figure 6-2: Time evolution of the three parameters β_i in real yield curve

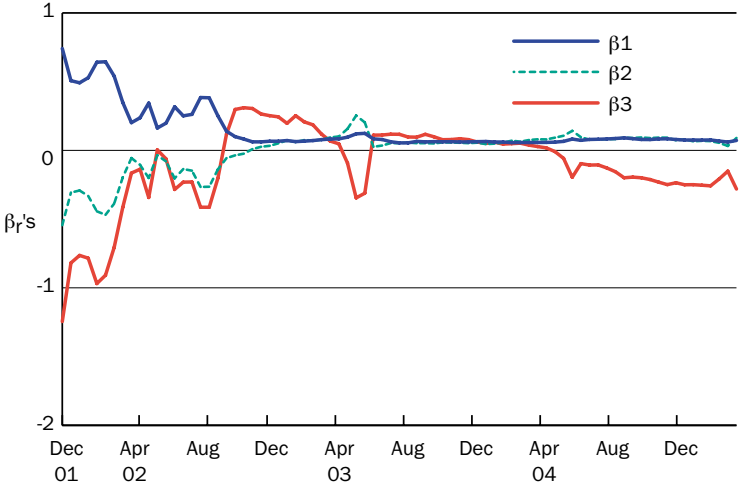
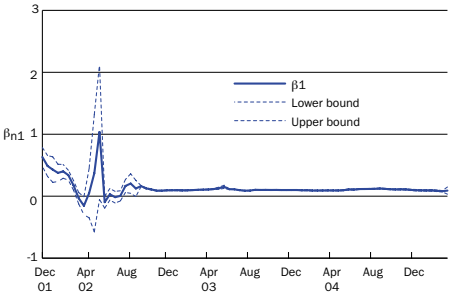


Figure 6-3: Time evolution of the parameters β_1 in nominal and real yield curve (with its 95% confidence interval)



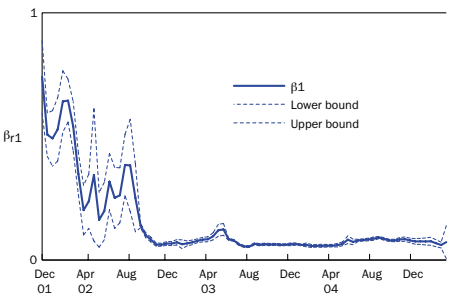
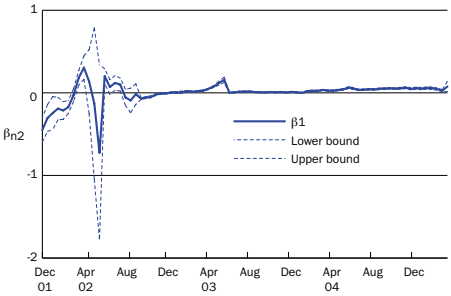


Figure 6-4: Time evolution of the parameters β_2 in nominal and real yield curve (with its 95% confidence interval)



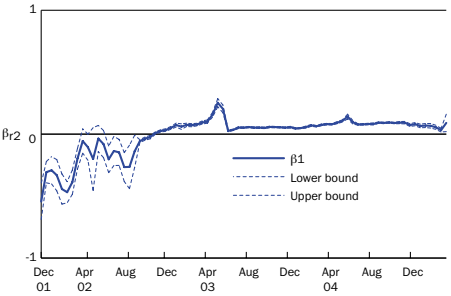
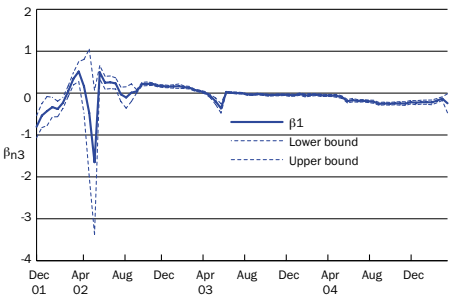


Figure 6-5: Time evolution of the parameters β_3 in nominal and real yield curve (with its 95% confidence interval)



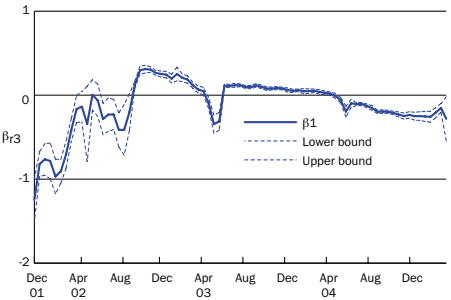


Figure 6-6: Number of observations over time

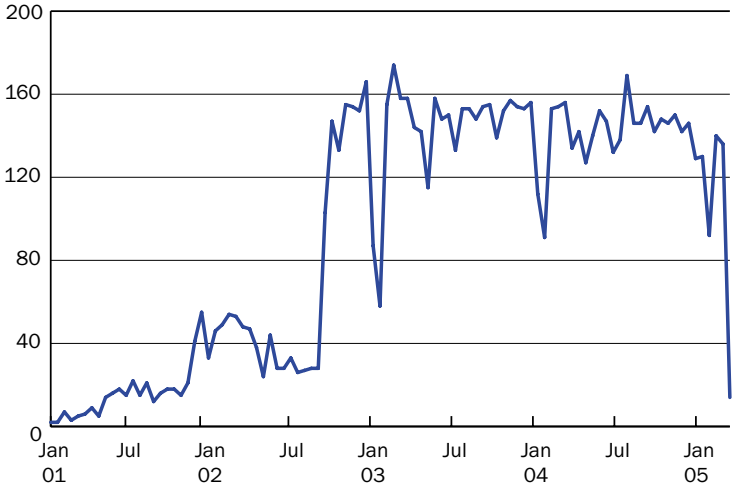


Figure 6-7: Observed versus estimated yields in March 2001

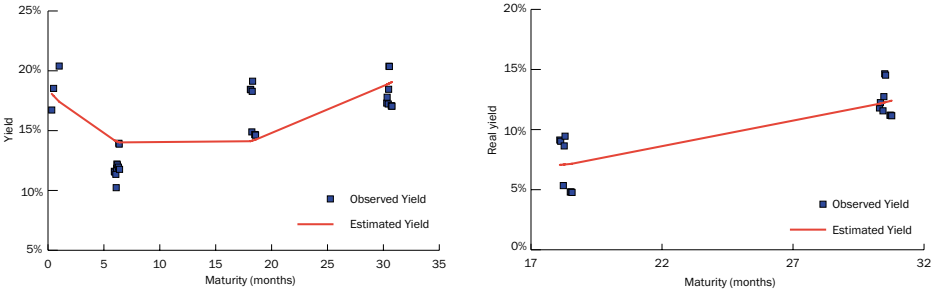


Figure 6-8: Observed versus estimated yields in August 2003

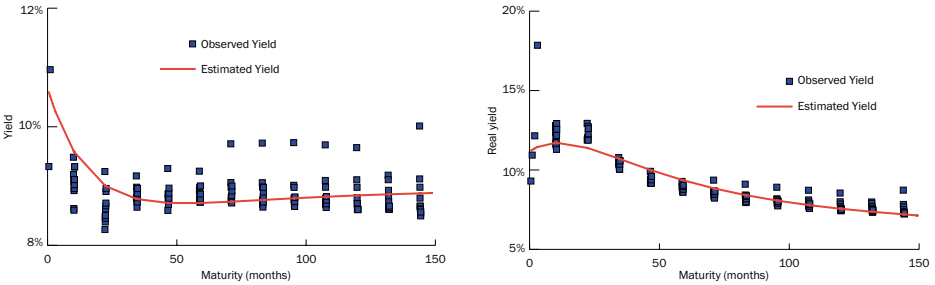


Figure 6-9: Observed versus estimated yields in February 2005

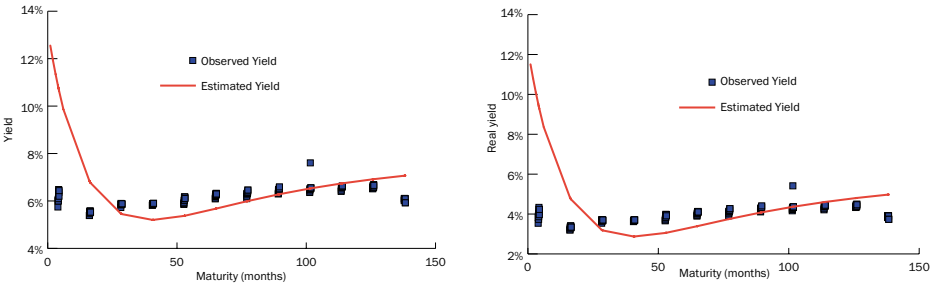


Figure 6-10: Evolution of observed and estimated 3-month yields in time

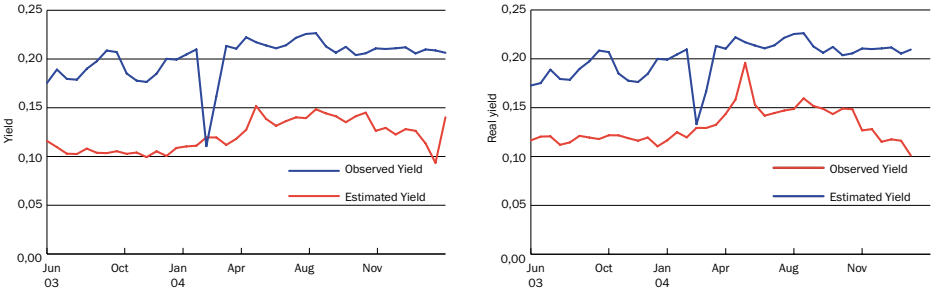


Figure 6-11: Evolution of observed and estimated 1 year yields in time

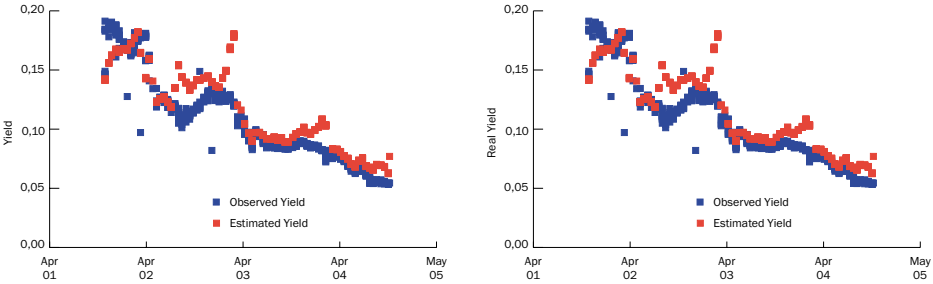


Figure 6-12: Evolution of observed and estimated 5 years yields in time

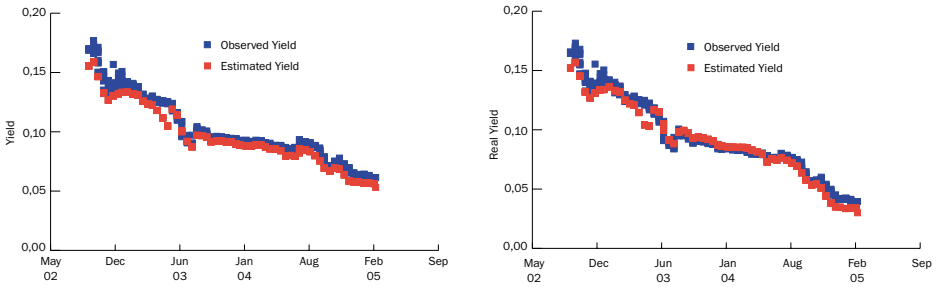
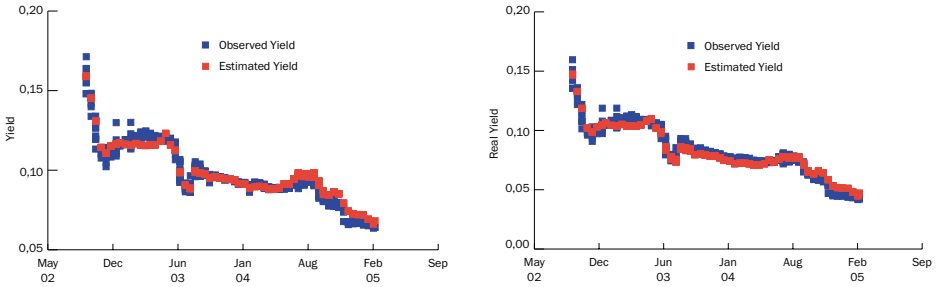


Figure 6-13: Evolution of observed and estimated 10 years yields in time



6.4. Forecasting the Term Structure

Estimates of level, slope, and curvature give us three time series, which we use to estimate the parameters of univariate autoregressive models for the factors. These estimates can then be used to forecast the term structure. The time series for the three factors are relatively short and hence we use the simplest autoregressive model, AR(1) with the following specification:

$$\hat{\beta}_{i,t+1} = const_i + \phi_i \hat{\beta}_{i,t} + \omega_{t+1} \quad , \quad \text{i=1,2,3} \; .$$

This equation is estimated using OLS. The OLS estimates of $const_i$ and ϕ_i can be used to formulate forecasts of the term structure parameters conditional on information available at time t, e.g. $\hat{\beta}_{i,t+1|t}$. To clarify our notation, $\hat{\beta}$'s denote the cross-sectional OLS estimates (our "observations" in this case) and $\tilde{\beta}$'s denote factor forecasts from the AR(1) process. We first consider nominal yields. Table 6-1 shows esti-

mates of the AR(1) process for the whole sample period and for the period with the larger number of observations available during our two-week windows. Table 6-2 compares forecasts of the factors of the yield curve with the observed values. It indicates that predictions for the level factor relatively closer when we use data starting in November 2002 – for instance, the first factor's prediction is 0.085 while the actual observation is 0.09. The differences for the other two factors are somewhat greater but at least the predicted values match the actual signs. The fit is similar for real yields (- see Tables 6-3 and 6-4).

Finally, we conduct the estimation in a dynamic setup, i.e. we estimate the coefficients of the AR(1) based on 60 prior two-week periods. In this way, we allow the coefficients to change over time. The dynamics of the AR(1) process are illustrated in Tables 6-5 and 6-6. This type of exercise can provide information about the stability of the coefficients and hence the yield curve over time. The dynamics for nominal yields indicate that the market has settled since September 2004, with relatively stable coefficients of the AR processes for all the factors (see Table 6-5). Table 6-6 paints a similar picture for the real yields. We also formulate predictions based on AR(1) estimates from the previous period – see Tables 6-7 and 6-8.

The factor predictions can be implemented to predict the whole yield curve that is specified as:

$$\hat{y}_{t+1|t}(\tau) = \tilde{\beta}_{1,t+1|t} + \tilde{\beta}_{2,t+1|t}\left(\frac{1-e^{-\lambda_t \tau}}{\lambda_t \tau}\right) + \tilde{\beta}_{3,t+1|t}\left(\frac{1-e^{-\lambda_t \tau}}{\lambda_t \tau} - e^{-\lambda_t \tau}\right).$$

This would provide an estimate for the term structure for the upcoming period, which can be used for various purposes discussed later, such as forming expectations and judging macroeconomic conditions.

Table 6-1: Estimates of autoregressive coefficients in the N-S specification for the nominal yield curve

Date of Start	Date of End	Estimates of AR(1) process for β coefficients in N-S					
		β_{1n}		β_{2n}		β_{3n}	
		Φ	const	*Φ*	const	*Φ*	const
20-Nov-01	3-Feb-05	**0.356**	**0.084**	**0.363**	**0.005**	**0.370**	**-0.048**
		(0.106)	(0.021)	(0.106)	(0.013)	(0.106)	(0.030)
5-Nov-02	3-Feb-05	**0.791**	**0.021**	**0.644**	**0.013**	**0.866**	**-0.017**
		(0.086)	(0.009)	(0.109)	(0.005)	(0.066)	(0.010)

Note: We consider two periods: First one starting as early as we have enough observations to estimate the yield curve (since November 20, 2001), and the second period starts roughly a year later (after settling down and when we have more observations). Motivation for these dates can be also visible from the Figures 6.1 and 6.2.

Table 6-2: Predictions of β coefficients in the N-S specification for the nominal yield curvecurve

Date of Start	Date of Prediction	AR(1) Predictions of β's for last observed period					
		β_{1n}		β_{2n}		β_{3n}	
		Predicted	Observed	Predicted	Observed	Predicted	Observed
20-Nov-01	21-Feb-05	0.112	0.090	0.014	0.077	-0.097	-0.243
05-Nov-02	21-Feb-05	0.085	0.090	0.030	0.077	-0.132	-0.243

Note: We used estimated coefficients from Table 6.1 and we make prediction one period ahead for the last observed period. Table above shows comparison with original value of beta.

Table 6-3: Estimates of autoregressive coefficients in the N-S specification for the real yield curve

Date of Start	Date of End	Estimates of AR(1) process for β coefficients in N-S					
		β_{1r}		β_{2r}		β_{3r}	
		Φ	const	Φ	const	Φ	const
20-Nov-01	3-Feb-05	**0.910**	**0.008**	**0.904**	**0.004**	**0.898**	**-0.004**
		(0.031)	(0.008)	(0.035)	(0.007)	(0.035)	(0.014)
5-Nov-02	3-Feb-05	**0.826**	**0.013**	**0.672**	**0.025**	**0.898**	**-0.008**
		(0.077)	(0.006)	(0.101)	(0.009)	(0.059)	(0.010)

Note: We consider two periods: First one starting as early as we have enough observations to estimate the yield curve (since November 20, 2001), and the second period starts roughly a year later (after settling down and when we have more observations). Motivation for these dates can be also visible from the Figures 6.1 and 6.2.

Table 6-4: Predictions of β coefficients in the N-S specification for the real yield curve

Date of Start	Date of Prediction	AR(1) Predictions of β's for last observed period					
		β_{1r}		β_{2r}		β_{3r}	
		Predicted	Observed	Predicted	Observed	Predicted	Observed
20-Nov-01	21-Feb-05	0.063	0.072	0.047	0.090	-0.144	-0.281
05-Nov-02	21-Feb-05	0.063	0.072	0.033	0.090	-0.140	-0.281

Note: We used estimated coefficients from Table 6.3 and we make prediction one period ahead for the last observed period. Table above shows comparison with original value of beta.

Table 6-5: Dynamics of estimates of autoregressive coefficients in the N-S specification for nominal yield curve

Date of Start	Date of End	Estimates of moving AR(1) process coefficients					
		β_{1n}		β_{2n}		β_{3n}	
		Φ	const	Φ	const	Φ	const
22-Oct-01	20-Apr-04	**0.283**	**0.094**	**0.273**	**0.000**	**0.275**	**-0.021**
		(0.124)	(0.025)	(0.125)	(0.016)	(0.125)	(0.036)
5-Nov-01	5-May-04	**0.231**	**0.097**	**0.225**	**0.004**	**0.254**	**-0.019**
		(0.126)	(0.025)	(0.127)	(0.016)	(0.126)	(0.035)
20-Nov-01	21-May-04	**0.186**	**0.099**	**0.189**	**0.008**	**0.244**	**-0.018**
		(0.128)	(0.024)	(0.128)	(0.016)	(0.127)	(0.035)
5-Dec-01	7-Jun-04	**0.132**	**0.102**	**0.142**	**0.012**	**0.233**	**-0.016**
		(0.129)	(0.023)	(0.129)	(0.015)	(0.127)	(0.035)
21-Dec-01	21-Jun-04	**0.115**	**0.100**	**0.128**	**0.016**	**0.243**	**-0.015**
		(0.129)	(0.023)	(0.129)	(0.015)	(0.127)	(0.035)
8-Jan-02	5-Jul-04	**0.127**	**0.097**	**0.148**	**0.017**	**0.260**	**-0.018**
		(0.129)	(0.023)	(0.129)	(0.015)	(0.126)	(0.035)
21-Jan-02	21-Jul-04	**0.102**	**0.102**	**0.108**	**0.016**	**0.247**	**-0.025**
		(0.129)	(0.023)	(0.129)	(0.015)	(0.126)	(0.035)
4-Feb-02	5-Aug-04	**0.077**	**0.109**	**0.049**	**0.013**	**0.217**	**-0.036**
		(0.130)	(0.023)	(0.130)	(0.014)	(0.128)	(0.034)
20-Feb-02	20-Aug-04	**0.107**	**0.107**	**0.081**	**0.011**	**0.264**	**-0.041**
		(0.129)	(0.023)	(0.130)	(0.014)	(0.126)	(0.034)
7-Mar-02	6-Sep-04	**-0.744**	**0.187**	**-0.668**	**0.034**	**0.567**	**-0.024**
		(0.059)	(0.014)	(0.074)	(0.013)	(0.092)	(0.033)
22-Mar-02	20-Sep-04	**0.752**	**0.025**	**0.732**	**0.007**	**0.877**	**-0.011**
		(0.068)	(0.007)	(0.078)	(0.005)	(0.051)	(0.010)
8-Apr-02	5-Oct-04	**0.633**	**0.038**	**0.688**	**0.008**	**0.882**	**-0.009**
		(0.096)	(0.010)	(0.094)	(0.005)	(0.059)	(0.009)
22-Apr-02	20-Oct-04	**0.660**	**0.035**	**0.709**	**0.007**	**0.877**	**-0.011**
		(0.086)	(0.009)	(0.088)	(0.005)	(0.059)	(0.009)
7-May-02	4-Nov-04	**0.498**	**0.053**	**0.682**	**0.008**	**0.872**	**-0.012**
		(0.106)	(0.011)	(0.093)	(0.005)	(0.061)	(0.009)
22-May-02	19-Nov-04	**0.741**	**0.027**	**0.784**	**0.006**	**0.889**	**-0.009**
		(0.081)	(0.009)	(0.077)	(0.004)	(0.061)	(0.009)
6-Jun-02	6-Dec-04	**0.775**	**0.023**	**0.782**	**0.006**	**0.888**	**-0.007**
		(0.065)	(0.007)	(0.071)	(0.003)	(0.060)	(0.009)
21-Jun-02	20-Dec-04	**0.740**	**0.027**	**0.765**	**0.007**	**0.900**	**-0.010**
		(0.087)	(0.009)	(0.086)	(0.004)	(0.060)	(0.009)
8-Jul-02	6-Jan-05	**0.777**	**0.020**	**0.777**	**0.020**	**0.777**	**0.020**
		(0.059)	(0.025)	(0.059)	(0.025)	(0.059)	(0.025)

Note: This table contains estimates of AR(1) process for each parameter of the N-S model. Estimation has been done in a dynamic setup, i.e., we consider for each period a fixed data "window" (60 periods of two weeks observations).

Table 6-6: Dynamics of estimates of autoregressive coefficients in the N-S specification for real yield curve

Date of Start	Date of End	Estimates of moving AR(1) process coefficients					
		β_{1r}		β_{2r}		β_{3r}	
		Φ	const	Φ	const	Φ	const
22-Oct-01	20-Apr-04	**0.910**	**0.008**	**0.903**	**0.004**	**0.897**	**0.002**
		(0.036)	(0.011)	(0.042)	(0.009)	(0.039)	(0.018)
5-Nov-01	5-May-04	**0.924**	**0.007**	**0.917**	**0.003**	**0.903**	**0.000**
		(0.040)	(0.010)	(0.046)	(0.008)	(0.045)	(0.016)
20-Nov-01	21-May-04	**0.919**	**0.008**	**0.913**	**0.003**	**0.896**	**0.000**
		(0.042)	(0.010)	(0.047)	(0.008)	(0.048)	(0.016)
5-Dec-01	7-Jun-04	**0.911**	**0.008**	**0.907**	**0.004**	**0.887**	**0.000**
		(0.042)	(0.010)	(0.047)	(0.008)	(0.049)	(0.016)
21-Dec-01	21-Jun-04	**0.898**	**0.009**	**0.898**	**0.006**	**0.875**	**0.001**
		(0.038)	(0.009)	(0.042)	(0.007)	(0.046)	(0.015)
8-Jan-02	5-Jul-04	**0.880**	**0.010**	**0.884**	**0.007**	**0.857**	**0.000**
		(0.040)	(0.009)	(0.043)	(0.007)	(0.050)	(0.015)
21-Jan-02	21-Jul-04	**0.861**	**0.013**	**0.868**	**0.007**	**0.835**	**-0.001**
		(0.047)	(0.009)	(0.049)	(0.007)	(0.059)	(0.015)
4-Feb-02	5-Aug-04	**0.856**	**0.014**	**0.869**	**0.006**	**0.822**	**-0.002**
		(0.058)	(0.009)	(0.058)	(0.007)	(0.069)	(0.014)
20-Feb-02	20-Aug-04	**0.864**	**0.014**	**0.877**	**0.005**	**0.824**	**-0.003**
		(0.064)	(0.009)	(0.062)	(0.006)	(0.075)	(0.014)
7-Mar-02	6-Sep-04	**0.862**	**0.013**	**0.877**	**0.006**	**0.828**	**-0.003**
		(0.062)	(0.009)	(0.060)	(0.006)	(0.075)	(0.014)
22-Mar-02	20-Sep-04	**0.866**	**0.012**	**0.878**	**0.007**	**0.842**	**-0.002**
		(0.053)	(0.008)	(0.054)	(0.006)	(0.068)	(0.013)
8-Apr-02	5-Oct-04	**0.897**	**0.009**	**0.893**	**0.006**	**0.867**	**-0.004**
		(0.056)	(0.007)	(0.058)	(0.006)	(0.068)	(0.012)
22-Apr-02	20-Oct-04	**0.896**	**0.009**	**0.893**	**0.006**	**0.872**	**-0.004**
		(0.055)	(0.007)	(0.056)	(0.006)	(0.067)	(0.012)
7-May-02	4-Nov-04	**0.900**	**0.007**	**0.894**	**0.007**	**0.883**	**-0.003**
		(0.042)	(0.006)	(0.046)	(0.005)	(0.060)	(0.012)
22-May-02	19-Nov-04	**0.900**	**0.007**	**0.891**	**0.007**	**0.884**	**-0.003**
		(0.047)	(0.006)	(0.051)	(0.005)	(0.062)	(0.012)
6-Jun-02	6-Dec-04	**0.891**	**0.008**	**0.883**	**0.008**	**0.885**	**-0.003**
		(0.048)	(0.006)	(0.052)	(0.005)	(0.061)	(0.012)
21-Jun-02	20-Dec-04	**0.887**	**0.007**	**0.877**	**0.010**	**0.883**	**-0.001**
		(0.031)	(0.004)	(0.041)	(0.005)	(0.055)	(0.011)
8-Jul-02	6-Jan-05	**0.858**	**0.009**	**0.852**	**0.011**	**0.873**	**0.000**
		(0.034)	(0.004)	(0.044)	(0.005)	(0.056)	(0.011)

Note: This table contains estimates of AR(1) process for each parameter of the N-S model. Estimation has been done in a dynamic setup, i.e., we consider for each period a fixed data "window" (60 periods of two weeks observations).

Table 6-7: Dynamics of predictions of autoregressive coefficients in the N-S specification for nominal yield curve

Date of Prediction	Moving AR(1) Predictions of β's for next period					
	β_{1n}		β_{2n}		β_{3n}	
	Predicted	Observed	Predicted	Observed	Predicted	Observed
21-May-04	0.127	0.116	0.010	0.039	-0.073	-0.183
07-Jun-04	0.124	0.117	0.013	0.043	-0.065	-0.196
21-Jun-04	0.121	0.118	0.016	0.041	-0.065	-0.207
05-Jul-04	0.117	0.124	0.018	0.050	-0.064	-0.257
21-Jul-04	0.114	0.118	0.022	0.051	-0.078	-0.248
05-Aug-04	0.112	0.112	0.024	0.055	-0.082	-0.254
20-Aug-04	0.114	0.109	0.022	0.051	-0.088	-0.245
06-Sep-04	0.118	0.110	0.015	0.056	-0.090	-0.246
20-Sep-04	0.119	0.109	0.015	0.062	-0.106	-0.250
05-Oct-04	0.106	0.101	-0.007	0.047	-0.166	-0.217
20-Oct-04	0.101	0.096	0.042	0.057	-0.201	-0.228
04-Nov-04	0.098	0.094	0.047	0.051	-0.211	-0.217
19-Nov-04	0.097	0.093	0.043	0.058	-0.201	-0.218
06-Dec-04	0.099	0.093	0.048	0.056	-0.201	-0.222
20-Dec-04	0.096	0.087	0.049	0.046	-0.206	-0.180
06-Jan-05	0.090	0.080	0.042	0.026	-0.167	-0.132
19-Jan-05	0.086	0.090	0.027	0.077	-0.129	-0.243

Note: This table contains predictions of β parameters based on AR(1) process for each parameter of the N-S model. Estimation has been done in a dynamic setup, i.e., we consider for each period a fixed data "window" (60 periods of two weeks observations), see Table 6-5 for estimates of β coefficients.

Table 6-8: Dynamics of predictions of autoregressive coefficients in the N-S specification for real yield curve

Date of Prediction	Moving AR(1) Predictions of β's for next period					
	β_{1r}		β_{2r}		β_{3r}	
	Predicted	Observed	Predicted	Observed	Predicted	Observed
21-May-04	0.080	0.081	0.074	0.079	-0.094	-0.106
07-Jun-04	0.082	0.083	0.075	0.082	-0.096	-0.128
21-Jun-04	0.084	0.086	0.078	0.082	-0.115	-0.155
05-Jul-04	0.087	0.091	0.078	0.093	-0.138	-0.199
21-Jul-04	0.090	0.085	0.089	0.090	-0.173	-0.195
05-Aug-04	0.085	0.079	0.086	0.094	-0.166	-0.199
20-Aug-04	0.081	0.079	0.088	0.090	-0.167	-0.212
06-Sep-04	0.082	0.083	0.084	0.093	-0.176	-0.231
20-Sep-04	0.085	0.084	0.087	0.093	-0.193	-0.249
05-Oct-04	0.086	0.079	0.087	0.073	-0.210	-0.236
20-Oct-04	0.080	0.075	0.071	0.080	-0.201	-0.250
04-Nov-04	0.077	0.075	0.077	0.066	-0.221	-0.250
19-Nov-04	0.077	0.075	0.065	0.069	-0.222	-0.253
06-Dec-04	0.075	0.076	0.069	0.067	-0.226	-0.258
20-Dec-04	0.076	0.068	0.067	0.055	-0.231	-0.208
06-Jan-05	0.069	0.061	0.057	0.032	-0.187	-0.151
19-Jan-05	0.060	0.072	0.038	0.090	-0.134	-0.281

Note: This table contains predictions of β parameters based on AR(1) process for each parameter of the N-S model. Estimation has been done in a dynamic setup, i.e., we consider for each period a fixed data "window" (60 periods of two weeks observations), see Table 6-6 for estimates of β coefficients.

6.5. Summary of the Yield Curve Estimation

There are several potential pitfalls in attempting to fit a yield curve for the Serbian bond market: primary vs. secondary market, dinar denominated vs. euro denominated bonds, bi-weekly (or irregular) auctions vs. daily trading, bonds maturing in May, etc. Yet in spite of these problems, the altered N-S model seems to do rather well in the environment of a developing market. Not surprisingly, the model fits best the yields for FCSB bonds, which are traded daily. We illustrated how predictions of the factors can be formed and how they can be used to forecast the term structure.

One also needs to realize that we are missing a big segment of the market given by OTC transactions. Inclusion of this data (existing but not released by the Central Registry) would make our analysis more complete and could potentially alter some of our findings. The data could also shed some light on inefficiencies and arbitrage opportunities, which are likely to be present in a non-transparent market.

7. Macroeconomy and the Yield Curve

In this section, we first derive the forward rates using our estimated term structure and illustrate how they can be employed to derive implications for inflationary expectations. Then we relate the estimated yield curve to other macroeconomic factors besides inflation, namely capacity utilization and the federal funds rate.

The yield curve can be used to calculate a guaranteed future short-term interest rate on a fixed-income instrument. This interest is called a forward rate. The forward rate conveys information about inflationary expectations via the Fisher equation, which states that the nominal interest rate is simply given by the real interest rate plus inflation ($i_t = r_t + \pi_t$).

To see how the forward can be computed, let us consider an investment that will pay (for simplicity) \$1 at time $t + 1 + \tau$. To achieve this future payment, an investor buys a bond maturing at $\tau + 1$ for $P_t(\tau + 1)$. To transfer the cost of this investment from time t to $t + \tau$, the $P_t(\tau + 1)/P_t(\tau)$ bonds with maturity τ are sold. Selling these bonds generates a positive cash flow at time t in the amount of $(P_t(\tau + 1)/P_t(\tau))P_t(\tau) = P_t(\tau + 1)$, which is used to finance the initial investment. The sale of bonds implies that the investor will have to pay back a dollar amount of $P_t(\tau + 1)/P_t(\tau)$ at time $t + \tau$. This can be viewed as the price of a one-period investment. The return on this one-period investment is by definition the forward rate:

$$(1 + f_t(\tau)) = \frac{1}{P_t(\tau+1)/P_t(\tau)} = \frac{(1+y_t(\tau+1))^{\tau+1}}{(1+y_t(\tau))^{\tau}} \quad .$$

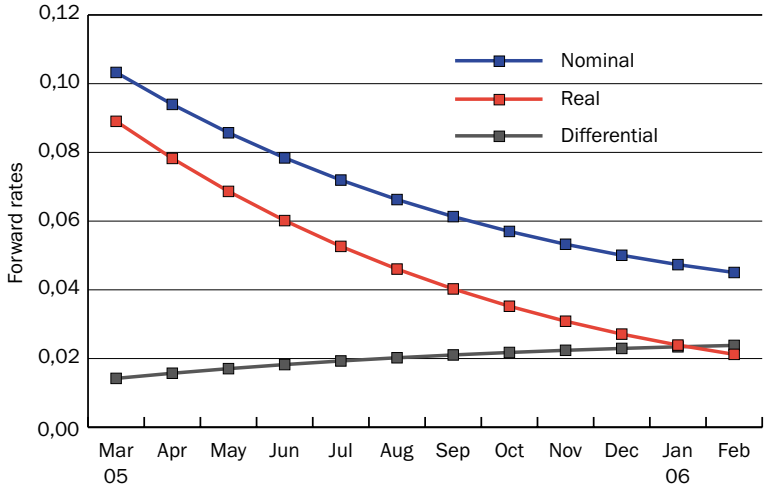
We performed calculations described above and present the forward rate for factors estimated for the last month of the data in Figure 7-1. The equation for the forward rate can be used to draw implications for inflationary expectations. Under the expectations hypothesis, the forward rate is equal to the expectation of the one-period interest rate, i.e. $f_t(\tau) = E_t[y_{t+\tau}(1)]$. Using the Fisher equation we can write the relationship in the terms of expectations in the following form:

$$E_t \, \pi_{t+\tau} = E_t i_{t+\tau}(1) - E_t r_{t+\tau}(1) \, ,$$

where π denotes inflation in the usual fashion. The expectations of nominal and real interest rates can be calculated by fitting the yield curves using nominal and real interest rates respectively, and then by computing the implied forward rates. Typically, to deduce inflationary expectations, one fits the nominal and real yield curves, where the real yield curve is fitted using data on indexed bonds (details are given in Deacon and Derry 1994).

While we calculated yield curves for both types of interest rates and it seems we might be able to formulate expectations of inflation, one needs to realize that the real interest rates were calculated under many implicit assumptions. One needed to make assumptions about future inflation to calculate real yields, which would imply a somewhat circular definition of inflationary expectations. Therefore, the differential between the expected nominal and real rates in Figure 7-1 is only illustrative and is likely to reflect an expectation of depreciation together with inflation

Figure 7-1: Forward Rates



As argued in Diebold, Rudebush, and Auroba (2003, hereafter abbreviated as DRA), the N-S model is widely used by central banks all over the world to study the interaction of yields and macroeconomic variables. DRA study this type of relationship formally. They estimate the N-S model using the Kalman filter approach and combine the model with macroeconomic variables. The macro variables they use consist of what is considered to be the minimum set of fundamentals needed to characterize the dynamics of the macroeconomy. The measures of the economy are manufacturing capacity utilization, the federal funds rate, and annual price inflation. These are chosen to capture the level of real economic activity relative to potential, the instrument of monetary policy, and the inflation rate, respectively.

DRA use the N-S model alone as well as in combination with macro variables. A by-product of their study is the fact that both of these models explain the term structure dynamics rather well. This is reassuring from the perspective of our study, in which we use a yields-only type of the N-S model. Further analysis by DRA shows that macro variables can be related to the three factors of the N-S model: level, slope, and curvature. The first observation made by DRA using US data is that the level factor is correlated with actual inflation, which suggests a relationship between the level of

the yield curve and inflationary expectations, consistent with the Fisher equation. The second interesting observation is that the slope of the yield curve may be connected to the business cycle because the second factor of the N-S model is correlated with capacity utilization. In our case, both inflation and $\hat{\beta}_{1t}$ (see Figure 6-3) are relatively stable. One has to keep in mind again that interpretation of $\hat{\beta}_{1t}$ (for either real or nominal yields) can be problematic due to the presence of euro denominated bonds. However, it does seem to contain some information about inflationary expectations. $\hat{\beta}_{2t}$ has two peaks in Figure 6-4 since September 2002, which correspond to similar peaks in the industrial production index, so $\hat{\beta}_{2t}$ might mimic the business cycle to some extent. Of course, such claims would have to be supported by additional, more formal evidence.

DRA further investigate interactions between the economy and the yield curve using impulse response functions and variance decomposition. While the macro variables react very little in response to changes in slope or curvature, they respond strongly to the level factor. An increase in level causes increases in capacity utilization, the funds rate, and inflation. In other words, an increase in future perceived inflation implies a lower real interest rate giving a boost to real economic activity followed by a reaction of the Federal Reserve. Of interest are also responses of the yield curve factors to changes in macro variables. For example, an increase in the funds rate is followed by an increase in slope, and then a decline, perhaps due to monetary policy raising the short end of the yield curve. Also, the level factor responds positively to inflation surprises.

As indicated by the anecdotal evidence presented above, some of the conclusions appearing in DRA are relevant for the Serbian case and can be used as a basis for further investigation. Some of the suggested relationships can be used as a source of information about the macroeconomy, especially if the data is incomplete or not available. For example, an increase in the slope factor can be viewed as a sign of increased utilization of capacity.

8. Bond as Collateral

8.1. Legislative Framework

An interesting feature of the new bond market in Serbia is the possibility of using bonds as collateral. Besides transferring bond ownership, there is also an opportunity to pledge the right deriving from bonds as well as from other securities, in order to secure obligations. Similar to pledging movable and immovable property, ownership rights are not being discontinued, but only restricted to a certain extent. The purpose of pledging is to ensure certain obligations, most often under a loan or similar contract (letter of credit, letter of guarantee, short-term overdrafts, etc.).

The current situation with respect to legal regulations seems quite varied and confusing. Unlike other countries, various provisions in Serbia regulate the pledging of securities with different importance and strength. Namely, certain provisions regarding the pledging of securities are regulated by the Law on Torts and Contracts ("Official Gazette of the SFRY" No. 29/78, 39/85, 45/89, 57/78, "Official Gazette of the FRY" No. 31/93, 22/99, 23/99, 35/99, 44/99), while other and significant provisions are overseen by the Security Market and Other Financial Instruments Law ("Official Gazette of the FRY" No. 65/2002, "Official Gazette of the RS" No. 57/2003), and in certain Circumstances, one can also apply the provisions stipulated under the old Law on Enforcement Procedure ("Official Gazette of the FRY" No. 28/2000, 73/2000, 71/2001), which is still valid.

Pledging of securities in its current form entered the legal system by enforcement of the Law on Security Market and Other Financial Instruments. However, its principle was embedded beforehand in Article 1069 of the Law on Torts and Contracts, which depicts the loan contract on the basis of pledged securities. Banks and other creditors also apply provisions of the earlier Law on Enforcement Procedure in order to enable a more efficient means of collecting due receivables.

The most important novelty in the Serbian legal system is enforcement of the Security Market and Other Financial Instruments Law and the foundation of the Central Registry and clearinghouse as a public register for securities. Securities are in electronic form and de-materialized in accordance with the legislative practice in developed countries, primarily in the EU. De-materialization implies electronic record-keeping of securities in the accounts of their owners. This allows for an element of publicity and provides a new and confident way of pledging securities. Collection of debt for creditors is easy and fast.

Efficient and quick inscription and collection of the debt, as provided by the legal regulations and especially by the Central Registry institution, should be an incentive for fast development of this type for securing through bonds collateral. In order to enable wider implementation of this kind of securing, faster development of the securities' market is needed, which would provide the creditor with comfort of mind, i.e., he would not have problems related to the selling of pledged securities on the

stock market. Bonds are usually sold outside the stock market, but the lack of legal regulations leads to lack of confidence. For these reasons, besides the establishment of an institutional-legal framework, growth of overall economic activity is needed so as to ensure substantial growth of this area.

The legal framework for using government and corporate bonds as collateral in Serbia is already in place, though perhaps not functioning as smoothly as desired. Collateralized securities, combined with models of credit risk, could potentially increase the efficiency of the Serbian financial markets by providing a building block for securitization. This raises the question of proper bank supervision in this environment. The Basle Committee on Banking Supervision, whose policy recommendations are summarized in the report of the Bank for International Settlements (BIS, 1997), addresses such issues.

The BIS report (1997) focuses on the transferer or issuer of asset-backed securities. The securitization process starts with a pool of homogeneous assets such as mortgages, credit card receivables, or car loans.[38] These assets are pooled and sold to a special purpose trust fund. Shares of the trust fund are then sold on the market. The existence of the special purpose trust fund enables the banks to transfer risks of lending to other parties and to free capital resources for future lending. The credit risk is further pooled by credit enhancement, which could be issued by a third-party bank, insurance company, or the originator of the asset-backed securities. Credit enhancement often takes the form of a cash collateral account and, in principle, bonds could be used in this context as well. It also includes letter of credit, letter of guarantee, etc., and would provide insurance against a portion of the default risk associated with the original asset (e.g. mortgage). Proper design of securitization rules and supervision, however, is needed to ensure that the securitization process does not leave the originator (typically a bank) with a higher level of risk but without additional capital. Also, while the efficiency of a financial system is improved by introducing securitization, it can diminish the importance of banks. Securitization may in some cases increase the volatility of asset values, which again can be mitigated by credit enhancement.

[38] Securitization is very popular especially in United States with its large mortgage and credit card markets.

8.2. Models of Credit Risk

Any analysis of the bonds as collateral involves modeling credit risk. In this section, we look at credit risk measurement from the perspective of a single bank, rather than from the point of view of the central bank. Credit risk measurement includes both publicly traded corporate bonds, as well as private loans provided by commercial banks. Credit risk is defined as the probability of default on a loan, and bad credit risk management is a source of problems in developing markets. We survey traditional approaches to credit risk measurement, value-at-risk (VAR) models, and structural models, all of which employ the estimated yield curve as their input. Our discussion is related to the Basle II Capital Adequacy Requirements. We then address changes in risk when loans can be collateralized.

Traditional approaches to measuring credit risk implicitly consider interest rates. Methods include approvals by a credit officer, rating systems for loans and portfolios of loans, and credit scoring systems (see Saunders 1999 for a survey). Credit officers approve of loans according to pre-selected criteria such as character, capital, capacity, collateral, and business cycle conditions, which typically include the level of interest rates. At an unusually high level of interest rates, there may be an adverse selection problem: quality borrowers will drop out of the market, leaving the bank with "bad" ones. Rating methods can be external and internal and involve assessment of risk, which is used to calculate the needed level of capital. Risk exposure may be estimated by spreads between yields for bonds of various ratings and zero-coupon government bonds. Finally, credit scoring systems are used to determine probability of default based on pre-identified key factors. Interest rates may be one of the factors.

The risk-based Basle II Capital Adequacy Requirements for uncollateralized loans are at the level of 8%, regardless of risk associated with the borrower. However, subject to approval of a central bank, banks are allowed to replace this one-fits-all rule by an internal system used to calculate a more accurate risk-adjusted level of capital. This gives banks an incentive to develop and test VAR models. Technically, VAR is the maximum loss in the value of an asset (loan, portfolio of stocks, etc.) at some confidence level (e.g. 99%) in a given time period. A widely used system is CreditMetrics, originally developed by J.P. Morgan. It can be applied when the market value of a loan is not available. One of the inputs for the model is the yield curve. The forward zero rates are used together with spreads to discount future cash flows.

If there is a developed bond market, spreads for VAR analysis can also be generated using state-of-the-art structural models of corporate bond pricing. These models are sophisticated measures of credit risk whose input is also the estimated yield curve. Eom, Helwege, and Zhi (2004) provide a good survey of these models, discussing their properties with respect to predicting spreads of bonds with various levels of risk. They review five major structural models: Merton (1974), Geske (1977), Longstaff and Swartz (1995), Leland and Toft (1996), and Collin-Dufresne and Golstein (2001). The models can also generate an expected default frequency measure for a borrower. They use stock market information together with market values for corporate bonds, and can be employed in the future under the assumption that the corporate bond market will take off in Serbia.

A natural question now arises as to how the presence of collateral affects the riskiness of a loan. The notion of collateral is relatively broad. In principle, it can be a physical asset, such as a house, or a security, such as a government bond. Secured loans should reduce the level of risk for a lender, since the lender has an additional claim without limitation of the original one. The Basle rules only recognize this feature for loans collateralized by the governments of the OECD countries and banks/dealers, for whom the capital requirement is 0% and 1.6%, respectively. For all other secured loans it is still the generic 8%. The credit risk decreases with the higher market value of the collateral and with greater priority of the lender's claim. Hence, using collateral is an effective credit risk mitigation technique, especially in an environment where the financial market is not as developed and there is a lack of information on companies, including their credit rating.

While the use of collateral is supposed to reduce credit risk exposure, the question remains as to what extent and for what costs sensible modeling can be performed. Estimation of exposure requires several layers of modeling. One starts with a model for the yield curve, such as the N-S model, which characterizes the dynamics of interest rates on government securities and reflects macroeconomic conditions. The next step is to quantify how much riskier a loan is compared to the government bond. If there were no market for corporate loans, this would be best done by a model, such as CreditMetrics (noted earlier). If a corporate bond market does exist and is efficient, one can use a structural model. Finally, an appropriate model should be employed that would distinguish secured and unsecured loans for firms with the same probability of default. This model should also take into account fluctuations of the value of the collateral, which can affect the riskiness of the loan (for a recent literature review, see John, Lynch, and Puri 2003). Formulation and estimation of such a model is a complicated task and is hindered by the lack of data availability on private loans. As of now, it is also beyond the scope of this report.

While modeling and quantitative implications of using collateral to secure loans may be complex, government bonds have several features, which make them useful in this context. First, their credit risk is typically minimal. Since the objective of collateralized loans is to mitigate such risk, government bonds provide an ideal financial instrument for such purposes. Assuming well-functioning and active markets, government bonds have other advantages in their use as collateral compared to corporate bonds, namely minimal operational risk and liquidity. However, these advantages can erode over time; e.g. the use of Treasuries to secure loans in the United States has become costly over time due to their shrinking supply.

The Serbian bond market seems to have potential for the use of government bonds as a collateral, not least because of the lack of competing instruments such as rated, low-risk corporate bonds. On the other hand, there are some idiosyncrasies, which may cause problems. Liquidity can be improved together with transparency of the market. Moreover, trading on the market with maturities over one year involves only FSCB bonds, which are subject to the foreign exchange risk. This increases the level of market risk. Also, credit risk is still not perceived as small and the supply of bonds is limited.

9. Conclusions/ Recommendations

This report on the Serbian bond market covers in considerable detail its legal as well institutional structures. It also includes a technical section on the estimation of the bond yield curve. The results of our estimation show that the estimates of the term structure fit best the data on the FCSB bonds traded on a daily basis, but work less reliably with the less traded bills. This is not a surprise, because the frequency of traded volumes and relative availability of information contained in prices formed on the market make the analysis fruitful as well as dependable. These results, together with the legal and institutional aspects, form the basis for our conclusions and recommendations.

In a similar fashion to other emerging economies, Serbia should work on changing the term structure of government bonds by shifting their debt from short- to long-term maturities. This step will aid stability for the government debt and its management, as well as attract foreign investors. The Serbian bond market with government bonds is still underdeveloped; however, there is a promising transition pattern towards becoming a more mature market. This is important because, in general, emerging market debt managers are generally facing greater and more complex risks in managing their sovereign debt portfolio and executing their funding strategies, than is the case in more advanced markets.

In our opinion, the major issues for successful transition of the Serbian bond market, and especially those related to the government bonds, are the following:

i) Transparency and liquidity of the secondary bond market should increase. We propose concentrating on market microstructure issues. In particular, we see it necessary to eliminate any barriers in the settlement and clearing system, and in the system of transaction fees. The introduction of standard and transparent supporting techniques of settlement, as well as a supporting system of market makers for (government) bonds and money market makers will be very useful. We do not see trading over-the-counter as flawed a priori, but the fact that there is very limited information about trades conducted over-the-counter increases market inefficiency, and hurts price formation mechanisms.

To be more specific, transparency of the Serbian over-the counter market can be increased by better enforcement of existing laws. Provided that our understanding of the Law on Securities and Other Financial Instruments' Market is accurate, the legal rule, which makes reporting of each OTC trade mandatory, is in place. The Securities' Exchange Commission should enforce the reporting requirements to the extent allowed by the law. If the existing legal enforcement is not sufficient, an attempt should be made to include some sort of sanctions, which can be imposed by

the Commission on the Central Registry. Moreover, the reporting requirements should include the market price, which has become a standard in most recently emerging bond markets.[39] Publicly available market bond prices have other beneficial side effects, such as providing a way to monitor capital gains on the bond market for tax purposes.

With respect to the above, we recommend building as transparent a trading system as possible to minimize use of private or inside information. When undertaking this task, regulators should concentrate on potential misuse of private or inside information by large institutional investors, investment companies and large broker firms, rather than on small players.

ii) With respect to the liquidity issue, combined with our estimated results, the spread of the Serbian bonds relative to common European benchmarks is in the unsuitable range from the medium-term perspective. A significant part of the spread (on the order of more than 20 basis points) of euro-area government securities relative to German government securities of comparable maturity is accounted for by differences in liquidity rather than credit risk. Higher liquidity should improve the current situation.[40]

iii) A related task is to create and maintain bond indexes with benchmark status, and methods for calculating and publishing reference prices of these bonds. We expect that, as in other markets, these measures will facilitate new issues of individual groups of bonds and overall trading activities. As is common in other markets, the Serbian bond market will benefit from the introduction of switching operations.[41] Government yield curves sometimes serve as benchmarks for quoting and pricing yields on private (credit-risky) securities. From the public issuer's point of view, the key advantage of having debt securities used as benchmarks is that they are heavily traded. This characteristic, in tandem with their low default risk, usually means the yield is the lowest possible for a particular market segment. Benchmark interest rates are most useful when they allow investors to clearly distinguish fluctuations in premiums for credit risk from fluctuations in interest rates. Changes in benchmark rates are usually passed through, one-for-one, to other fixed-income instruments with the same maturity.

[39] For example, in the Czech Republic, the Securities Center publishes average daily bond prices together with other useful information (see http://www.scp.cz).

[40] The high liquidity and range of maturities of government securities also differ markedly across markets. U.S. treasury securities are liquid in all maturities (from 3 months to 30 years), while EU government securities are not liquid in all maturities (and typically have their benchmark – the "benchmark" is defined as the lowest-yielding issue – well below 10 years).

[41] In a switching operation, a bond is bought back before reaching maturity, and the settlement made by issuance of another bond (with a benchmark status) to the holder. The bond that has been bought back, is written off. Switching is thus a non-cash combination of buy-back and issuance of two different bonds.

The benchmark role of government securities could, in principle, be important, not just for quoting yields on private securities but, more fundamentally, for pricing those securities. For instance, a uniform set of discount rates might be valuable for discounting cash flows, in order to price claims to such cash flows. In the major economies, however, government securities are not generally used directly by investment banks to price new issues of securities. Instead, private securities are usually priced by reference to prices of existing private instruments that are close substitutes. In European fixed-income markets, the swap yield curve itself is often used as a pricing reference, owing in part to the lack of a uniform benchmark government yield curve. In less developed markets where a wide range of outstanding private debt securities does not exist, interest rates on benchmark government securities may be essential for pricing private fixed-income instruments and possibly other financial contracts. In short-term, fixed-income markets more generally, private obligations are more likely to be indexed to private interbank rates (such as LIBOR) than to rates on short-term government obligations.

iv) Adjustments on the market and its infrastructure such as clearance and settlement, repo and derivatives markets, techniques for issuing securities, and trading systems in secondary markets, are highly desirable to propel market performance to an advanced stage. The BSE should match settlements of OTC trades at T+0.

v) Further development and cultivation of practices in the primary and secondary government securities market can significantly lower the cost of the public debt, and foster the development of securities markets in general. The same has been observed in other emerging economies. As we mentioned in the case of V4 countries, they have implemented primary dealer systems, used auctions for issuing debt, and established pre-announced issue calendars with "benchmark" issues. It is recommended that Serbian authorities follow a similar path.

vi) The market regulators should strive to cultivate an environment such that major market makers are attracted to it. Market makers ensure liquidity on the market and an increasing extent of trading which will positively influence price formation. Subsequent transfer of trading from over-the-counter methods to the exchange market will benefit its overall performance. It is suggested that market makers, and members of the stock exchange in general, not be allowed to participate in over-the-counter trading. The OTC system should be required to provide maximum information regarding prices and volumes of settled deals.

Serbia can draw on experience from the Czech OTC stock market in the 1990s. The Belgrade Stock Exchange could follow the example of the Prague Stock Exchange and introduce a rule where members of BSE are not allowed to trade bonds off-market.[42] Opponents of such a rule often point out to difficulties related to

[42] It should be pointed out however that success of this rule depends on how many of the current members of the BSE actually do trade off the stock exchange. Unfortunately, very little data on this issue are available.

conducting direct and block trades. To avoid these objections, a subsidiary of the BSE can be set up, which specializes in settlement of the non-standard trades. The aim of the regulators should be to improve the framework and to increase incentives for expanding the amount of trading on the market, and to decrease the amount of trading outside the market. Only in this way will prices reflect all information. General price disclosure should be a priority as well.

vii) In most countries, government bonds are low-risk and highly liquid instruments with a well-developed market infrastructure (including supporting repo and derivatives markets). This is still not a prevalent feature in Serbia. Measures taken towards this goal are highly desirable since changes will open space for issues of corporate bonds that will have a positive effect on the liquidity and further expansion of the bond market.

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