LINKAGE BETWEEN TURKISH TREASURY SPOT MARKET AND TREASURY FUTURES MARKET

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TÜRKİYE HAZİNE SPOT PİYASASI VE VADELİ PİYASASI
ARASINDAKİ BAĞLANTI

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Anahtar Kelimeler (Türkçe)   Anahtar Kelimeler (İngilizce)
1) Spot Piyasa   1) Spot Market
2) Vadeli Piyasa   2) Futures Market
3) Hazine Bonosu ve Tahvili   3) Treasury Bill and Bond
4) Forward Eğri   4) Forward Curve
5) Etkinlik   5) Efficiency

Abstract

The purpose of this study is to explain and analyze why futures contracts in Turkey based on interest are not considerably traded. On this regard, efficiency of Istanbul Stock Exchange (ISE) Treasury Bonds and Bills Market was examined by discussing efficient bond and bill market elements in the first part of the study. In the second part, efficiency of ISE Treasury Bonds and Bills Market was analyzed by forming an implicit forward curve. In the third and final part, a number of suggestions were put forward to ensure a more efficient ISE Treasury Bonds and Bills Market and an increase in trading volume of futures contracts.

Key Words: Spot Market, Futures Market, Treasury Bill and Bond, Forward Curve, Efficiency.

Özet

Bu çalışmanın amacı Türkiye'de faize dayalı vadeli işlem kontratlarının neden önemli derecede işlem görmediğini açıklamak ve analiz etmektir. Bu sebeple çalışmanın birinci bölümünde etkin tahvil ve bono piyasa unsurlarını ortaya koyarak, İMKB Tahvil ve Bono Piyasası'nın etkinliği incelenmiştir. İkinci bölümde ise İMKB Tahvil ve Bono Piyasası'nın etkinliği bir zımni forward eğri oluşturularak analiz edilmiştir. Üçüncü ve son bölümde de daha etkin bir İMKB Tahvil ve Bono Piyasa olabilmesi ve vadeli faiz kontratlarının daha çok işlem görebilmesi için bir takım öneriler sunulmuştur.

Anahtar Kelimeler: Spot Piyasa, Vadeli Piyasa, Hazine Bonosu ve Tahvili, Forward Eğri, Etkinlik.

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List of Abbreviations

BW	Bretton Woods
CAPM	Capital Asset Pricing Model
CBRT	Central Bank of Turkish Republic
CMB	Capital Markets Board
CML	Capital Markets Law
DvP	Delivery versus Payment
EM	Emerging Market
GNMA	Government National Mortgage-Backed Association
FR	Forward Rate
JSCC	Japan Securities Clearing Corporation
JASDEC	Japan Securities Depository Center
IR	Interest Rate
IRS	Interest Rate Swaps
ISE	Istanbul Stock Exchange
LOP	Law of one Price
OECD	Organization for Economic Cooperation and Development
OMO	Open Market Operations
OTC	Over-The-Counter
PDS	Primary Dealers System
PDs	Primary Dealers
SROs	Exchanges and Securities Dealers Associations
SEC	Securities Exchange Commission
SFA	Securities Futures Authority
TSPAKB	The Association of Capital Market Intermediary Institutions of Turkey
TAKASBANK	Settlement and Custody Bank
TurkDex	Turkish Derivatives Exchange Inc.
T-bills	Treasury Bills
US	United States

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1   INTRODUCTION

Economy has a variable structure. It is really difficult to forecast its course. The world had this experience in 1971, Bretton Woods (BW). Bretton Woods System of monetary management established the rules for commercial and financial relations among the world's major industrial states. The BW System was the first example of a fully negotiated monetary order intended to govern monetary relations among independent states.

The chief features of the BW System were an obligation for each country to adopt a monetary policy that maintained the exchange rate of its currency within a fixed value in terms of gold and the ability of the International Monetary Fund (IMF) to bridge temporary imbalances of payments. In the face of increasing strain, the system collapsed in 1971, following the US suspension of convertibility from dollars to gold. At this time involvement of individuals and firms in the debt markets expanded, the risks of incorrect decisions increased. So, people need to hedge their portfolio against increased risk. Futures and other derivatives were created to hedge the risks of investors against interest rates. Futures market can provide price discovery, risk management, market efficiency, and operational advantages for spot markets. Thus, futures increased the amount of investors in bond markets.

In this dissertation, we investigate the association between ISE Treasury Spot Market and treasury futures contracts in Turkish Derivatives Exchange (TurkDex) based on linkages (storage, arbitrage, delivery and settlement and yield curve) between them. Spot market and futures market affect each other significantly while these linkages are working well.

According to the theory of efficient market, futures prices must reflect all available information in the market. If a futures market is not perfectly efficient, speculative activity will be higher. Finally, this speculative activity affects spot market volatility through an increase. Additionally, there is a

bidirectional effect between futures market and spot market. At this stage, the efficiency of spot market is important for the efficiency of futures market. In this context, we examine whether ISE Treasury Spot Market is efficient or not.

We also investigate the relationship between the implied forward rates and realized spot rates for Turkish government bond and bills market. Forward rates should reflect the existing information set in the market based on the theory of efficient markets. So, while creating an implied forward curve of Turkey, we can analyse the efficiency of ISE Treasury spot market.

2.   LITERATURE REVIEW

Spot market and futures market are strongly related. According to Telser (1986), this is because lower cost investors prefer to trade in futures markets. Instead of storage money or commodity, investors want to trade in futures markets. So futures markets give a chance to investors to take a position (long, against increases, short, against decreases) in futures market instead of buy or sell spot money, stocks, commodity or interest rates. Also investors can take a chance to hedge themselves according to any extraordinary reflex of markets.

Protopapadakis and Stoll (1983) examined Law of One Price (LOP) between futures market and spot market. Arbitrage is the mechanism which keeps LOP. Arbitrage is a type of transaction in which an investor seeks to profit when the same good sells for two different prices. The individual engaging in the arbitrage, called the arbitrager, buys the good at the lower price and immediately sells at the higher price.

Arbitrage helps markets to be efficient, which is an important role of two markets against each other. Efficiency refers to the state that information in the market is known by every investor. Sholes (1998) is the most popular academician in the world of financial derivatives. He says that market efficiency, CAPM, arbitrage models give him a point of view to build option-pricing technology. He thinks electronic development may reduce spot and futures market inefficiency and help to reduce cost of financial contracts by futures contracts in the computer age.

Delivery and settlement are one of the important linkages between spot market and futures market. At expiration, a futures contract calls for either immediate delivery of the item or a cash payment of the same value. An expiration futures contract is equivalent to a spot transaction.

Another important linkage between spot and futures market is yield curve, curve of futures prices of spot prices. Meanwhile, an efficient government

market needs a benchmark yield curve to forecast interest rate and selection of mis-priced securities in active bond portfolio management. Yield curve is a graph of term structure. Term structure is the relationship between interest rates (or yields) and maturities. Term structure of the interest rate is important for policy makers and academicians. Future expectation of interest rates affects yield curve by upward-sloping, downward-sloping and flatting. If liquidity premium increases fast enough with maturity, it will produce an upward-sloping yield curve.

Especially forward rates and the shape of term structure are important for monetary policy makers. The government borrowing program should follow a regular and well publicized timetable, and the government debt instruments should comprise differing maturities, which will ensure a complete range of benchmark yield curve that facilitates pricing of other financial instruments.

Term structure of interest rates is calculated on basis of bond prices. A problem at issue is that there is no bond auction at a specific maturity. On the other side, some bonds have small liquidity. Mansi and Jordan (2003) tell about two problems which may appear when term structure is calculated. One of them is the gaps between maturities. It is likely that we can not get any bonds at specific maturity. These gaps must be, interpolated. The second problem is homogeneity. The problem of homogeneity is that bonds have a different cash flow structure, tax preferences, and liquidity center at the same maturity.

By the time it is better to talk about the theories of term structure, in other words, theories on yield curve: expectations theory, liquidity preference theory, inflation premium theory and market segmentation theory.

According to the expectation theory, people make some expectations about the level of interest rates. If they think interest rates will decrease, the slope of yield curve will be negative. Investors think that economy will be slower in the future. On the contrary, if investors think that economy will grow

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higher in the future, in other words, that interest rates will raise, the slope of yield curve will be positive.

Liquidity preference theory says that because of accessing their fund early and remaining liquid, investors prefer to invest for short periods rather than for long periods. Investors will be enticed into committing their funds for long periods of time if the interest rate increases over a large amount of time. This theory explains why the yield curve slope is sloping upwards for most of the time. And it shows that long term T-bond rates are higher than short term T-bond rates.

Another theory on yield curve is inflation premium theory. This explains that if investors think futures rate of inflation will be uncertain in the future, they are likely to expect higher interest rate in the long term investments. By such movements used according to this theory, the value of long term assets is affected more than the value of short term assets.

The last theory is market segmentation theory. According to this theory, investors choose certain segments of yield curve or bond market. Some of them choose to invest on basis of short maturity, and the others of long term maturity. According to the theory, there is no contact between these investors. Banks and companies enable that there are regulations such as legal lists, limiting the types of investments. Banks and firms invest on basis of short term. For investors, being knowledgeable about any areas may be more costly; thus, investors focus on one segment.

Yield curve builds expectation about the futures. For right expectations there must be right information efficiency. Efficiency, according to Fama, in the market spot prices reflects all the information, and all investors know all. Anomalies, unexpected movements, according to Fama, have no effect in the long-term. But in the short-run he cannot explain some changes clearly. Market efficiency hypothesis is not clearly well defined up to now. Generally, Efficient Market Hypothesis (EMH) has three forms;

Weak Form means that all past market prices and data are fully reflected in securities prices.

Semi strong Form means that all publicly available information is fully reflected in securities prices.

Strong Form means that all information is fully reflected in securities prices.

Asymmetric information interrupts market efficiency. According to the Mishkin (1990), asymmetric information focuses on the differences in information available to different sides in financial contracts. That causes a decline market efficiency level and credit-rationing problem. Especially at financial shocks it interrupts flow of information in financial markets and asymmetric information becomes higher. Aras and Müslümov say that asymmetric information is very important for capital markets. Crisis in the economy is caused by lack of informativeness in the markets.

If there is asymmetric information in the market, demand of credits will be rising quickly and suddenly. That makes interest rates higher. Credit-rationing, according to Stiglizt and Weiss (1981) is the situation where supply and demand of funds is not equalized by interest rate of loanable funds. If interest rates are higher, investors will choose higher-risk projects and investors who have chosen less- risk projects will not take any credits. If investors choose higher-risk projects, they will be unsuccessful. Bank must pay the loss of the rest of investor's collateral and the lender must pay collateral.

Credit rationing is applied at crisis time. According to World Securities Law Report (1996), most of crises were caused by lack of knowledge of investment managers and investors about investment vehicles, lack of supervision of intermediaries, corporates, banks and investors. Also according to Kuprainov (1995), in the example of Baring Bank corporate, investors who take position in derivatives market in most countries, misuse the system.

Krugman (1979) criticizes the politics of developed economies at crisis time and says that economies must act towards each other considering Ricardo's comparative advantages. And at crisis time, panic will be caused by changing price expectations. Also, Krugman suggests that, because of the mass mentality of the trendy, short-term shareholder, investors pull in and out of the latest and hottest stocks at crisis time. These results show that stock prices become distorted and the market becomes inefficient. So prices can not reflect all available information in the market. Prices are manipulated by profit seekers.

At the yield curve, we can see crisis or any shock effects. In case of any default risks, bond spreads are wider. Increasing uncertainty increases yields on bonds at any maturity. So yield curve shape can be changed. This event affects consumers, credits, swap spreads, default risks and so on.

According to Piazzesi (2005) swap data have been beneficially applied in previous studies of the evolution of the yield curve. Swap is one of the factors which affects yield curve dynamics. Investors usually trade at swap markets because they are cheaper and protecting two sides of constractions. Being more liquid makes swaps and benchmark swap markets more important for all the financial institutions and investors. At the same time, swap transactions are more flexible than others because we can make infinite number of swap transactions.

Crisis also increases default risk on instruments. Spreads of Credit Default Swaps (CDS), the contract protecting against credit risk, will increase at crisis time. For example spread of CDS of Turkey increased 13 basis points in a day and become 512 basis points. This tells us Turkey is more risky than any other countries. This also affects the yield curve of Turkey.

While default risk of any corporates or firms increases, investors avoid investing them. Especially in Emerging Markets (EM), government also takes a huge position in bond markets. First of all, interest rates will not be determined in the market. Secondly, that will make the market incomplete.

Finally, corporations or firms can not find credit easily. All these reduce the efficiency of the bond market. In incomplete markets, there will be a lack of information. Erdoğan and Kayacan (1998) specified that futures market efficiency depends on reducing the dominant role of government on determining IR.

Eurobonds are another factor which affects the yield curve dynamics. Their yield is much more than the yield of treasury bonds. And their liquidity is very high. Investors prefer to invest on Eurobonds than treasury bonds.

Fabozzi (2007) says that volatility of interest rate is changed by many effects like Eurobonds issue, nonconfidence towards the economy, in other words, macroeconomic cycle. Role of the volatility of interest rates is important for valuing derivatives and certain asset-backed securities.

Yield curve is important for valuing derivatives for example treasury future contracts about the expectation of future rates. If it is short, macroeconomic cycle would be ambiguous, futures contracts would be priced wrongly and manipulation would increase. Lack of information will convert the market into an inefficient futures market. Also speculators love the indefinite, so they increase volatility and make a large amount of money.

Newberry (1987) says future markets need speculators to assume price risks and make profits. He also says if all investors are equally well informed and no investors have market power, then speculators can not choose manipulation. Yes, if all investors equally well informed? Also he says increased short term speculative trading volume increases the risk of long term and cost of these risks.

Ireland and Simpson (1985) say that trading appeared to temporarily reduce the level of Treasury bill rate volatility but this effect is reduced more when futures trading substantially increases much more than that of Treasury bills rate. This also depends on speculators because they can easily cover their position in the secondary market according to the primary market.

Figlewski (1981) examined Government National Mortgage-Backed Association (GNMA) market and he found some results. In the futures market, larger numbers of GNMA traders were less informed traders, so they increased trading volume and volatility in the market. Then futures prices were transmitted to the spot market and increased volatility.

Unlike all that mentioned above, Forewiss GNMA spot market has become more efficient since futures trading for these securities began. But he also says it is impossible to say certainly that this improvement is depending on futures trading. He assumes that speculators are more experienced and professional. Therefore speculation helps improving stability in spot market but what if many of speculators not very professional and less informed?

In this study, we discussed Turkish government bond market and found less information efficiency. It must be noted that less efficiency can make futures market less useful according to Figlewski. In addition, "marking to market rule" makes the investor get away from futures market and impend to forward market.

According to Subrahmanyam (1991), risk traders who are precisely informed compete more aggressively than those who are imprecisely informed improve terms of trade. This result suggests an interesting comparison between having private information to enter the price through the trade of insiders and trades of security analysts. Subrahmanyam's analysis suggests that allowing insiders to trade may result in a more liquid market than analysts.

In the working paper of Balaban and Kunter (1996), there are some results about the financial market's efficiency. They found that Turkish financial market is not informationally efficient with respect to daily changes in market liquidity. Meanly, liquidity does not always show efficiency. Investors can at least have a chance to develop profitable trading strategies by using developments in market liquidity as long as the reported

inefficiencies remain in the market. So, speculation effects also raise liquidity, not information.

According to OECD report that we point out above, the following factors can make secondary bond market efficient:

♦ liquid markets by a large stock of outstanding benchmark issues a and repo market financing,

♦ safe and sound clearing and settlement systems,

♦ transparent and impartial regulatory and supervisory framework,

♦ a market-making structure based on primary dealers,

♦ liquid futures markets,

And let's analyze how these factors make secondary treasury market efficient.

3. EFFICIENT SECONDARY BOND MARKET

3.1. Outstanding of Benchmark Issues and Repo Market Financing

3.1.1. Outstanding of Benchmark Issues

Benchmark issues are very important for liquidity of the secondary market. In the secondary market, benchmark issue is the most recently auctioned Treasury issues for each maturity. A benchmark issue has several critical characteristics; this issue must be liquid (transactions should not affect the price of security), quality of the issuer must be very strong and overall structure of the market for the contract or security must be in integrity.

Benchmark issues are also important in valuing other securities in the same class. More "scientific" pricing of such issues, at a spread over the benchmark rate as is done in the United States (U.S.) dollar sector of the market, should make for more transparency in the setting of terms and in aiding investors to estimate the value of the paper on offer.

Benchmark securities for uninformed and informed investors allow them to create trading strategies that are perfectly aligned with their signals. And we can also say that introduction of liquid benchmark securities increases liquidity and price informativeness of all existing individual securities. Because the individual prefers to trade the security knowledge, benchmark issues make informativeness the best and eliminate the exposure to the systematic risk. Benchmarks also enhance the development of a corporate debt market by providing bankers an efficient tool to hedge underwriting risks. The pricing of swaps and options also becomes more efficient.

According to Subrahmanyam (1991) and Gorton and Pennacchi (1993), information sensitivity of benchmark issues is minimized. Benchmark securities make lower adverse selection and that make these securities liquid and popular. They maximize information sensitivity and encourage information production and liquidity. Benchmark securities have liquidity

service to all individual securities, this impact differs sharply in the prediction of Subrahmanyam and Gorton and Pennacchi. Subrahmanyam found that introduction of benchmark security may lower the number of security-specific informed investors for securities that have lower weights in the benchmark. Gorton and Pennacchi found that the introduction of a benchmark security makes traders have homogenous preferences and endowment distributions and eliminates all trading in the individual securities.

Shiller (1993) argues that benchmark securities provide information to individual investors and help them hedge major income risks and complete market. They need to hedge themselves because when they are heterogeneously informed or less informed, they are faced with adverse selection while trading. So, according to Shiller, benchmark issues are much useful for the market liquidity.

In reality, supply of benchmark is limited. Theoretically, the limited supply of benchmark securities can be explained by adverse selection concerns in security design. DeMarzo and Duffie (1999) find that the security issuer's private information regarding the payoff of the security may cause illiquidity for the security.

In Turkey, Treasury auctions government bonds and bills. Turkish Treasury for improving liquidity in the ISE Treasury Spot Market and forecast of debt structure begin to benchmark auctions. In this content, Treasury tries to regularly issue benchmark government bonds but in limited amount. Monthly issued floating rate and fixed coupon bonds, long term government bonds based on TL, long term benchmark bond issued once in every three months and this bonds issued every following three months and Treasury does not issue FX denominated bonds.

Economy of Turkey is really very sensitive. In May-June 2006, economy was in turbulence and Treasury ceased to issue long term bond. Also benchmark issues are affected by such kind of events. Benchmark issues

are traded in ISE. ISE has made some indices for investors to understand easily how much their bonds/bills are changed against any events. But these indices are not much very helpful to the traders and investors.

Treasury is not well-functioned and it does not make any benchmark for every maturity and maturity of securities is short. Turkish secondary government market had 44.777 million $ trading volume in February 2008. This volume was led by benchmark government bonds/bills which were introduced by Treasury. Portfolio managers added these securities, and benchmark interest rate could not be formed for other maturities.

Graph-1: Trading Volume of Benchmark Bonds in Turkey
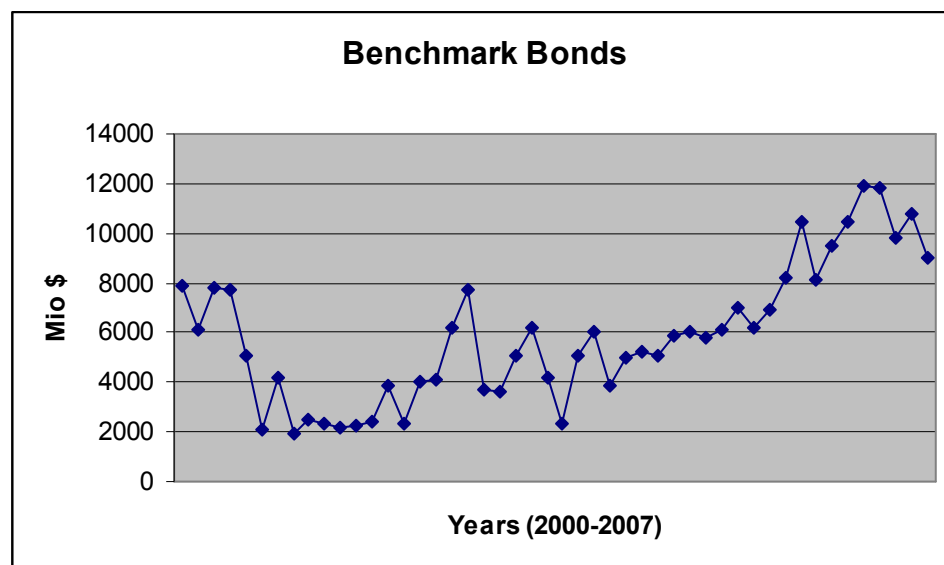
At the Graph-1, we will see the benchmark securities trading volume in 2000-2007 years.

Benchmark issues rates have affected and are floating in many events. Investors are confused about that situation. At this point, yield curve helps investors to be informed about fixed maturity rates. So, yield curve is a function of debt instruments rates having different maturities. Akıncı, Gürcihan, Gürkaynak, Özel (2006) showed that yield curve of Turkey, compared to other countries, is very short. If Treasury issues fixed rate and

long term bonds, they can achieve these kinds of challenges. At the same time, Treasury issues fixed rate coupon bonds/bills to fill the gap between the short term and long term securities.

The right yield curves allow the investors to obtain information about the return of any securities which have different maturities. On the other hand, yield curves help CBRT to make policy about how the changes in short term interest rates can affect long term interest rates, there is a correlation between short term rates changes and long term interest rates direction.

Short yield curve, limited benchmark issues and benchmark issues not created for every maturity lead to the lack of informativeness.

3.1.2. Repo Market Financing

Repo, repurchase, markets are often called "financing" markets since they are effective instruments for collateralized borrowing that are often used to finance the purchase of the underlying collateral. A repo has a single transaction of combining a spot market sale with a simultaneous forward agreement to repurchase the underlying instrument at a later date, often the next day.

In the repo markets, securities function as collateral for rising funds and the funds function as collateral for borrowing securities. As a result, market participants recognize repo transactions as a risk-free means of raising or investing funds against securities as collateral. Of these repo transactions, those for borrowing securities are called special repos while those for raising funds are called general repos. Special repo transactions generate the linkage between the repo market and securities markets, typically the government bond market. Duffie's theoretical insight that bond prices should reflect expected profits from future matched book trading, is defined as the differences between general and special repo rates and it takes advantage of repo spreads. Repo spreads are closely related to the balance of supply and demand of the underlying issues in the repo market.

According to Duffie (1996), repo rates can be priced differently depending on the underlying bonds because expected returns from future matched book trading, are reflected in the cash prices of special bonds.

As explained above, we can see the price linkage between repo markets and government bond markets. Meanwhile, the purpose of foundation of repo markets is to help investors using stocks/money with short maturities. Because of this fact, repo market must be clear before cash market. Repo markets help short maturity funds pour into money market at the same time, helping long maturity bond securities to be liquid. Also repo markets help portfolio managers using bond securities stocks to finance their needing and non-financial firms use their excess money.

So repo market is like hedging for bond securities market. Investors can trade in bond market easily and, if they want, before the maturity that sells this security in the repo market. And they turn into market to buy other security. That increases confidence of the investor towards the security market. The common knowledge is that confidence increases liquidity.

U.S. repo market had a 4300 billion $ trading volume in 2006. Turkish repo trading volume was 3848 billion $ in the same year. For the following years, the volume was 4300 billion $ in 2007 and 4151 billion $ in the nine months of 2008. Turkish repo market has a great liquidity as well as U.S. repo market. If we think that U.S. has the most liquid treasury market in the world, Turkey has a very good liquid repo market in the world.

Table-1: Performance of the ISE Repo/Reverse Repo Market

	2006 (Repo-Reverse Repo Billion USD$)	2007 (Repo-Reverse Repo Billion USD$)	2008/9 (Repo-Reverse Repo Billion USD$)
Brokerage firms	634	762	746
Banks	2.668	3.239	3.253
CBRT+Takasbank	546	300	152
Total	3.848	4.300	4.151

The broadening investor base of Turkish repo market individuals has 6% share, mutual funds have 5% share of total trading volume. Share of these investors must be increased for the most liquid repo market. And also, additional firms such as insurance companies must be added into repo market. For liquid repo market, foreign investors will be attending. Meanwhile, a lack of withholding tax increases attractiveness of repo market.

In Turkish repo market, 15% tax discrimination is applied to the repo transactions. Besides, investors put lines among their repo transactions in ISE. So this increases OTC market trading volume according to ISE.

Without a repo market yield curve will lose its importance. Corporates need to be price relative to a government curve. Underwriters can only hedge rate risk against Interest Rate Swap Curve (IRS). An illiquid repo market generates wide swap spreads. Now that the time seems ripe to swaps:

The name given to the swap is equivalent to a yield curve. The swap curve identifies the relationship between swap rates at varying maturities. The meaning of the word of "Swap" is commutation. Two counterparties determined the date of cash flows commuted mutually based on one or several forward agreements. In the world, it has a really huge transaction

volume (In 1997, 25000 Billion $) because of having a cheaper, more special and more flexible structure than other derivatives instruments.

Swaps are different instruments according to forward and futures instruments. Here we can write some different features of them:

1. Futures and forward are used for hedge transactions but speculation transactions have the most shares of all transactions, but at the swap transactions speculation effects are lower.

2. Swap transactions have short maturities but future and forward transactions are longer.

3. At the swap transactions, counterparties have benefits at the same time, but at the futures and forward transactions, one part's loss is the other part's revenue.

4. At the swap transactions, banks are intermediary and there is no contract, but forward and futures transactions are made by contracts.

3.2. Clearing and Settlement System

A modern, efficient clearing and settlement system is a principal component of the infrastructure necessary for development of securities markets in general and the government securities in particular. Clearing and settlement system affects the degree of confidence in the market infrastructure and determines whether trading in the primary market and secondary market flows smoothly, and influences the capacity which a market has to expand. Efficient clearing and settlement system contributes to timely and reliable settlement government bond trades, causes minimal risk to participants in case of institutional failure, and minimal risk to system operators.

According to the terms of the original trades, that outcome of post-trade clearing and settlement is a transfer of ownership of securities against a cash

payment. Achieving this require several steps, a number of institutions are involved, and there are a variety of associated costs.

Securities trade can be identified in to six steps. They are drawn up below:

- Order: The investor (typically an asset manager) instructs the broker to execute the trade.

- Execution via some trading system: This could be through an exchange but nowadays a large number of trades are executed via alternative trading systems such as electronic networks.

- Matching: The brokers on each side of the trade confirm the various details of the trade (security, quantity, price, arrangements for settlement etc.); and obtain positive confirmation from the investor (referred to as affirmation) that the trade complies with the original order.

- Netting: A considerable reduction in the value and volume of securities trades for settlement can be achieved, by netting off-setting cash and security flows. The maximum potential for netting is when there is a single central counter-party so that all flows can be reduced to a single daily payment and single net amount due for each security.

- Clearing: The positioning of securities and the arrangement of payment prior to settlement.

- Settlement: The final transfer of ownership of securities and corresponding cash payments.

Clearing and settlement systems have met many risks. These are: credit risk, failure of a counterparty to settle an obligation; replacement risk, market loss on an undelivered security; principal risk, loss of security; liquidity risk, delay in settlement date due to funding; systemic risk, "domino effect" whereby settlement failure cause other participants to fail; legal risk, a state

in which claims in law are unclear or may not be uphold and last risk is operational risk, a systems break-down.

A major determinant of systematic risk is the condition of securities settlement. The structure of settlement system will vary by country circumstance. In developing markets for government securities, authorities should place a high priority on establishing a securities settlement infrastructure which suits to country and market circumstance.

Adequate clearing and settlement procedures for cash and procedures for cash and securities are basic policy initiatives supporting government securities market development. A well-functioning clearing and settlement infrastructure will include automated accounts for securities, reliable custody arrangements for the recording of securities ownership and a settlement system with delivery versus payment (DvP) allowing for same-day settlement.

Without an adequate securities settlement infrastructure, there can be considerable systemic risks. Failure of one party to a large securities transaction can lead to a series of subsequent failures.

In most countries, central bank centralized the clearing and settlement system in government bonds. Most economies introduced DvP system and follow book entry system. Some economies have considerably reduced settlement risks by adopting electronic settlement system. A settlement system based on gross principles requires market participants to be able to access intraday or overnight credit facilities from the central bank. This raises the issue whether central banks should be responsible for providing a credit facility to the participants for clearing and settlement in government securities and what consequences this might have for their liquidity management operations.

Transaction costs are another important concern for clearing and settlement system. When transaction costs are high, bond trading could be adversely

effected. In Poland, banks are encouraged to avoid the national depository for securities settlement when transaction cost is high for settlement.

Clearing center is a place where, after the transaction, securities are clearing the delivery and payment of these securities. Clearing and custody center is Takasbank in Turkey. Takasbank is a non-deposit bank and its partners are ISE and its 104 members. Share of ISE is 24%, share of brokerage firms is 36% and share of banks is 40%. It functions like CBRT but it has one important difference, bank of issue. In the point of being a transfer bank, credit mechanism, functions in the money market, and executes clearing of all securities transactions in the ISE, Takasbank is the central bank of capital markets.

Banks and brokerage firms make transformation in money market by Takasbank. Daily trading volume of this market is nearly 1,3 quadrillion TL. Money market helps banks and brokerage firms to find short maturity funds while they do not need to sell long term bonds. Takasbank gives cash and security credits to their members. This service is special for Takasbank members.

Turkey has retained top position in the Emerging Markets Settlement Index for the seventh year in succession in 2001.

3.3.   Regulatory and Supervisor Framework

A fundamental prerequisite of an effective government bond market development is an introduction of a sound legal, regulatory and supervision framework. Before this, government securities market should develop a regulatory and supervision framework. The regulation and supervision of bond markets, intermediaries, institutional investors and other market participants must include systems and procedures to protect investors, to promote sound business practices, and to address systemic risk issues. Also it should be ensuring equitable, smoothly functioning, and transparent markets, as well as protecting investors and consumers of financial services,

particularly in the payment and settlement area. It must be clearly defined and publicized which government agency or agencies are assigned the regulatory and supervisor responsibilities and accompanying powers.

In assessing the allocation of regulatory and supervisory powers, it is important to put the emphasis on functional performance of rules rather than on formal (organizational) issues.

3.3.1. Regulatory Framework

Effective secondary market regulation is necessary to support a viable secondary market. Effective regulation of the secondary market should include (a) regulation of market intermediaries, (b) market conduct regulation (including trading rules) and market surveillance and (c) transparency requirements, which will vary according to the choice of market structure.

3.3.1.1.   Market Structure

Regulatory issues are related to transparency requirements and trading and trading systems will depend on the type of market structure.

The market is organized in four ways; (a) as an exchange with an order book and post-trade reporting, (b) as a dealer-driven market with some transparency provided by market intermediary reporting, (c) as an OTC market with some electronic reporting or information sharing with or without the use of interdealer brokers, or (d) through a combination of these trading systems.

Regardless of the market structure the regulatory authority should have the ability to monitor trading and enforce trading rules. Most bond markets are OTC or dealer markets, and in this case the regulator may impose post trade reporting, record-keeping, and audit trail requirements on market intermediaries. If the bond market is an exchange, the securities regulatory authority should have the ability to license exchanges and impose

requirements for reporting, record-keeping, fair access, and risk management on exchanges.

3.3.1.2. Market Conduct

Fundamental rule pertaining to the market conduct should be included in securities regulation. Fraud and misrepresentation, duty to clients, market manipulation, and self-dealing should be addressed by these rules. The securities regulatory authority may rely on the exchange to carry out market conduct regulation and market surveillance, but should maintain appropriate oversight of the exchange's regulatory functions. In order to ensure consistency across trading system, the securities regulator considers setting out minimum market conduct standards.

In an OTC market, the regulatory authority should develop market conduct rules and should have access to necessary trading records to investigate compliance with rules.

3.3.1.3. Financial Intermediaries

If the market structure relies on the financial intermediaries, regulations of financial intermediaries are important.

Market intermediaries should be subject to entry or licensing standards, including proficiency and capital requirements, ongoing capital adequacy requirements and to internal control requirements to ensure sound risk management and business conduct rules and required to have standards for professional conduct. The regulator should have full authority to conduct examinations of market intermediaries, impose condition on them and enforce compliance with regulations.

3.3.1.4. Exchanges and Securities Dealers Associations, SROs

An industry body of market intermediaries active in the bond market may assist the securities regulatory authority to develop a proper regulatory

framework and standards. An industry association might establish appropriate dealing or transaction conventions and standards of business conduct, and provide expert commentary and advice during policy formulation and rule making.

A formally recognized SRO can assume regulatory responsibility for its members, while an industry association can contribute to standard setting and policymaking. The securities regulatory authority should have the ability to recognize and delegate authority to SROs. The regulatory authority should have an effective oversight role over the SRO, including the right to conduct examinations, impose conditions, and review and approve rules. The SRO should have the authority to enforce compliance with its established rules, to be effective in its role.

3.3.2. Supervisor Framework

Government regulates and supervises the government securities market to support its development. An important responsibility is ensuring compliance with market rules of conduct through its participants, including rules on transparency and adequate disclosure. In the government securities market, there is more than one authority exercising supervision over participating institutions, the actions of these authorities must be coordinated in order to maintain a fair and competitive environment. There is a cross-border transaction activity in the government securities market; there will be a presence of foreign financial institutions in the domestic market and/or the presence of domestic institutions in foreign markets. This international aspect will require cooperation between domestic supervisors and their foreign counterparts.

Supervisory practices differ significantly across jurisdictions. This also seems to be some discussion on how supervision of the government securities market can be best organized under the light of new technological developments (in particular ICT and electronic markets), globalization, and the supervisory objectives of investor protection and market integrity.

The role of Government as regulators and supervisors, the authorities should prevent improper market conduct such as market manipulation and insider trading. A requirement for information potentially affecting prices to be released expeditiously and to all market participants at the same time will result in fair and transparent markets. Requiring intermediaries to comply with minimum capital requirements and internal control procedures will contribute to reducing systemic risk. Also important for minimizing systemic risk are reliable systems for settlement of cash and securities transactions. Lack of standards in these areas have led to substantial problems and often set back the development of government securities markets.

3.4. Market-Making Structure Based on Primary Dealers

Primary Dealers System (PDS) is used for improving the government bonds market. For this it should develop the market needs. Domestic markets needs are changing by country, so is PDS. But all countries must have some important factors for efficient PDS and secondary treasury markets.

1. For efficient PDS there have been adequate Primary Dealers (PDs). That is for a competitive market. Competitiveness is a minimized bid-ask spread, reducing commissions, and improving liquidity of secondary government markets. Optimal numbers of PDs are depending on conditions of countries. For example, there were 18 PDs in the USA in 1960, this number increased to 46 in 1988 and reduced to 23 between 1999 and 2000. This decrease was depending on consolidation of companies. Turkey has more than 51 banks and numbers of PDs are only 10. This is not a sufficient figure.

2. There must be adequate investors in the secondary government bond market for improving PDS. Insurance companies, mutual funds, big and commercial companies and individual investors are the last investors. Last investors make secondary markets deeper so are made more competitive than primary markets and PDs profits,

increasing on the secondary market to increase investor base, decrease depending on one or two groups and allocate risks to individuals, whereby improving trading volume of government bonds.

3. Interest rates of government bonds/bills must be liberalized. Interest rate must show the real supply and demand of the government bonds/bills and PDs calculate efficient price of the bonds and bills.

4. Establishing PDS is based on the behavior of the issuer of the bonds and bills. Debt issuers define strategy of auctions according to risk management possibilities to investors; strategy of auctions must consist of different types and maturities of government bonds/bills and benchmark issues. Types and maturity of government bonds/bills must be responding to the market demands, so auctions will be successful.

5. The debt issuer must support improvement of the primary and secondary markets. For this, in the many countries debt issuers do not sell the government bonds directly to the individual investors to support the PDs. And PDs do not compete with the debt issuers to exchange the bonds/bills. To support the secondary market, debt issuers must market the government bonds/bills and define marketing strategy of the bonds/bills. The technical of auctions of the issuing government bonds/bills is tender method.

6. For efficient PDS there must be a liquid secondary government bonds/bills market. If there is no liquid bonds/bills market, it is increasing the cost of the PDs because of the transactions which are not quick. Also for quick transactions there must be electronic sell/buy orders systems. So fund transactions will be easy and lower cost.

7. In the world there have been many crises. PDs must perform risk management very carefully because of systematic and non-

systematic risks. Futures markets are important at this point because investors can protect themselves according to systematic risks. Efficient PDS is needed for liquid futures markets.

8. For efficiency PDS needs transparency. Depending on transparency, PDS is improving safety of investors. Safety is important in financial markets because if investors do not believe the systems they do not sell and buy in the markets. So losing liquidity kills the importance of the market.

PDs are institutions which have the exclusive right to submit bids in auctions [1] for government bonds. Moreover, a primary dealer has the obligation to participate in a "substantial" way in these auctions, to quote two-way prices for government bonds on secondary markets with paying attention to maximum spread and/or minimum turnover requirements. Furthermore, primary dealers may have access to some other privileges such as special financing facilities which can be transformed into monetary equivalents. PDs have some benefits to secondary markets; (a) improving of efficiency of the government securities market, (b) reducing operating costs, (c) increasing level of competition, (d) relief of occasional shortfall of liquidity, (e) supplying distribution channels, (f) collecting and report of market information, (g) easier implementation of monetary policy.

In market making, parties agree to make prices to each other for the purchase and sale of financial assets. Prices are made during pre-agreed times, in agreed volumes, with agreed buy/sell spreads, qualification of pricing should be monitored on an ongoing basis.

Market making is a difficult and risky business. However, the degree of its difficulty and risks depends on its definition. The most strict form of market

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[1] An auction is a process of buying and selling goods or services by offering them up for bid, taking bids, and then selling the item to the winning bidder. In economic theory, an auction may refer to any mechanism or set of trading rules for exchange.

making requires "continuous quoting (i.e., under any market circumstances)" of "firm" "two-way prices" with "a high trading volume" or "a narrow spread" or a combination of the two. Committing themselves to buying or selling at prices they quote in an illiquid and volatile market environment exposes the PDs to a significant risk. On the other hand, the market making by PDs would contribute to enhancing market liquidity. Thus, there is a chicken-and-egg problem in considering adoption of a PDS.

Also there are some impediments to developed in market making;

- ✓ Tap Issues[2]: If securities are freely available on tap or if auctions are frequent, there is little incentive to trade on the secondary market.

- ✓ High liquid asset ratio: Result in institutions holding more assets than they desire.

- ✓ Investor Base: Small institutional investor base not motivated to manage their risks or a reasonable sized investor's base but concentrated.

- ✓ Small number of dominant market player: Possible collusion and lack of competition.

- ✓ Weak market participants.

- ✓ Poor payment and settlement systems: High settlement risks deter trading.

- ✓ Interbank credit lines too small for trading: Irregular and uncertain issuance pattern and difficult for investors to form expectations about future supply.

- ✓ Poor price discovery mechanisms: Developed markets have published prices, much in the same way as for shares.

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[2] A procedure that allows borrowers to sell bonds or other short-term debt instruments from past issues. The bonds are issued at their original face value, maturity and coupon rate, but sold at the current market price.

- ✓ No hedging mechanisms: there is any access to rental securities, undeveloped repo markets.

- ✓ Poorly defined trading conventions: There are no codes of conducts.

- ✓ Taxes: Taxes based on original discount value, transaction taxes, withholding taxes.

Since 1990, debt stock of Turkey has been rising and cost of debt has been increasing. This situation has made nominal interest rates and risk premium higher, liquidity of government bonds/bills markets lower and the maturity shorter. Debt managers look for well conditions for improving government debt policy in such bad situations. Within this content, Treasury begins PDS for government bonds and bills again in 2002. PDS was started in 2000 and working well but in the period between November 2000 and February 2001, operation of the system was ceased due to the crisis. PDS was stopped in 2001 but authorities made many reviews about the basic subject of the system and defined new principals of the systems. PDS was started again in 2002. Working principal of the system before 2002 was declared to the community so 10 banks which wanted to be PDs and Treasury made an agreement on defined responsibilities for both of them. The first foreign bank of PDS is HSBC and the second one is Deutche Bank.

Responsibilities of banks of PDs are to purchase optimum 3% of government bonds/bills monthly and optimum 5% of government bonds/bills in every three months, declare bid/ask price of the bonds/bills which are traded in the outright purchase and sales market in the ISE are chosen from Treasury. PDs must declare to the Treasury what transactions they do, what kinds of instruments their portfolio are made of and must prepare research sheets on what Treasury needs to learn about the economy of Turkey.

There are some rights to the banks of PDs; they use the title of PDs of government bonds/bills, do not use collateral for the auction of government bonds/bills, benefit from the non auction method of government bonds/bills,

make noncompetitive offer in auctions, act as an intermediary in auction of Treasury to public, using additional liquidity from CBRT, etc..

PDS has made financial markets improved and more liquid, and made monetary policy efficient. CBRT supports the PDs for the liquidity by Open Market Operation (OMO).

Turkey has not had enough PDs, nearly 12 according to 51 banks. This situation makes the auctions and secondary markets less competitive. In the secondary government, bonds/bills market have domestic institutional investors, domestic corporation investors and domestic individuals investors. Domestic institutional investors, including mutual funds, investment trusts and pension funds, have 53% and domestic corporations have 35% volume share. Contrary to the equity market, domestic individuals are not active in this market.

Foreign investors' volume share was around 2% until 1 June 2008, when it jumped to 5.6%. One foreign brokerage firm, which started to operate in the fixed income market in 2008, generated the entire foreign investors' trading volume. Although there is no available data to verify, it is assumed that foreign investors generally prefer to trade T-bills through banks.

Figure-1:
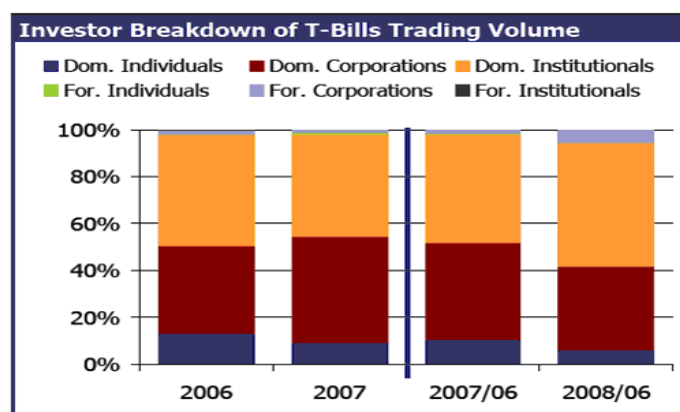
Source: The Associaition of Capital Market Intermediary Institutions of Turkey (TSPAKB)

As we see in figure 1, individual investors and foreign investors really have a little share. Especially decreasing share of domestic individuals is important; we must try working to increase this point. Investor's base must be widened.

In Turkey, interest rate is defined by supply and demand on secondary bonds/bills market. CBRT intervenes in the market with OMO and auctions. On the auctions sometimes multiprice method and sometimes on price method is applied.

3.5. Liquid Futures Market

The efficient government bond market needs liquid futures market or vice versa. Why do the government bond markets need it? Actually, there is a strong linkage between futures market and spot market, government bond market.

Futures contracts are agreements to buy or sell an asset at a future date at a price set today. This type of contract allows buyers and sellers to lock-in a price today or at least partially offset spot price changes with futures price changes. Futures market is an exchange market where futures contracts are traded. The prices of futures are related to bonds through several important mechanisms.

These linkages are introduced before, as arbitrage, storage, delivery and settlement and yield curve.

In addition to these linkages, futures markets have several roles;

One of them is risk management, futures can reduce or increase the risk of owning spot items. For example, buying the spot item and selling a futures contract reduces the investor's risk. If the goods price falls, the price of the futures contract will also fall. This type of transaction is called hedge.

The other one is price discovery; many people believe that the price of futures is the expected future spot price. Forecasting future prices is a

multimillion-dollar industry. Futures markets, however, offer forecasts of future prices at virtually no cost to the general public.

And operational advantages, futures market transaction costs are lower. And they have higher liquidity than spot markets.

And as regards to the last one, market efficiency, bond markets probably would be efficient even if there were no futures markets. However, a few profitable arbitrage opportunities exist even in markets that are usually efficient. The presence of these opportunities means that the prices of some assets are temporarily out of line with what they should be.

Creating of futures idea or needing of futures trading is come from investors' protecting themselves against risk in the future they meet. In the literature, some theorists say futures markets stabilize cash markets prices, reduce volatility, but some of them say futures trading destabilize the cash market prices.

If speculators in market and they have heterogeneous information they use it for making a lot of money. Friedman's argument (1953) is that speculators make profits by moving price towards the correct, i.e. equilibrium level and in so doing, tends to reduce the fluctuations of the futures price around the best estimate of the future spot price.

It has been suggested that futures trading may adversely affect cash prices in three ways:

1. Destabilizing speculation in futures markets might be transmitted to the cash markets and result in increased price volatility.

2. Deliverable supplies of securities could become so low that price distortions in the cash markets could be precipitated by the attempts of holders of futures contracts to cover positions in the cash market.

3. Fraudulent activities in the futures markets could result in price distortions in the cash markets, for example, if the futures markets were used to corner or squeeze cash markets.

Most of available evidence has been developed from markets for agricultural commodities and suffers from the limitation that extraneous influences were not adequately controlled. Nevertheless, this body of evidence does not support the idea that futures markets increase the volatility of cash prices, and there is a slight indication that futures trading reduces the variability of cash prices.

Adversely to extensive evidence from agricultural markets, there appear to be few published investigations of the effect of financial futures on volatility of spot prices. Froewiss concluded that futures trading does not change the variability of spot prices for GNMA pass-through certificates, but Figlewski, using a different methodology, concluded that futures trading has increased the cash price volatility of GNMA securities. According to him, futures trading will increase the price volatility if investors in futures do not have as good information as participants in the cash market. Also technical factors and manipulation increase volatility. And he says insufficient information affects increased price volatility in the cash market. He also gives an attention to speculation to hedge ratio for effective market speculation and hedge activity will be nearly the same. Marking to market idea discouraged hedgers and their using of forward contracts. Dale and Workman (1981) find that there is no evidence of speculative destabilization in the futures or cash markets for Treasury bills.

Bessembinder and Segun (1992) find out that unexpected futures trading volume is positively related to spot price volatility, but expected futures trading is negatively associated with the spot price volatility. They also say that their findings are not definite because we can not evaluate to extend to which trading in the spot market would differ in the absence of futures trading and we do not claim to have controlled for all environmental changes that affect volatility.

Turnovsky and Cample (1985) argue in contrast than in their rational expectations model, futures markets always improve the stability of spot

market. And they also say if the price elasticity demand is low, we can not see stable effect of futures trading on cash market, but by contrasting. It affects the spot prices and increase stability.

The empirical evidence surveyed by Cox (1976) whilst not completely unambiguous, supports the view that futures markets do not increase spot price instability, often reduce instability. Cox argues that the theoretical reason for the improved stability is that the futures market increases the information available to traders.

Also in the working paper of IMF in August 1998, the conclusion reached was that introduction of futures does not support to stabilize spot market prices.

But one of the academicians of Turkey, Kurun (2005), proved in his book that futures trading on treasury bonds or bills reduce the risk of them. On the other hand, he also says data of Turkey's bond market, statistical knowledge, is very little. That is the point. Market efficiency needs more information and its effect is for all investors.

T-bills had bonds futures which have been prepared to trade for investors. Interest risk management tool is very important for every investor. They want to use T-bill and bonds futures to hedge their positions and make profits. And auctions will be very attractive to attend, government would also be very satisfied to find easy debt. Turkey must step up this point.

Erdoğan and Kayacan (1998) say that ISE carry a systematic risk based on interest rate (IR). So futures or other derivatives are important for hedging versus systematic risk. They point out that IR is determined by government bond market. They also point out that government controls the ISE Treasury Bond Market. In the ISE Treasury Spot Market it is easy to see crowding out effect. Crowding out effect reduces efficiency of the markets for both spot market and futures market.

Futures market and secondary market have affected each other. If secondary market can not have efficiency, futures market is not very liquid. And according to Figlewski (1981), speculators can easily transfer risk to the

spot market and fluctuate spot market. So we can see that ISE Treasury Spot Market has much liquidity but not efficiency because of shorter maturity of Treasury bonds/bills and that makes yield curve in efficient and the future not predictable. Also, the number of market-making banks is not adequate for the number of activated banks in the market. Liquidity is provided on only benchmark issue, the other maturities bonds/bills have not much liquidity. Meanwhile, future instruments value depends on the underlying assets, stock, treasury, etc. So having a value problem of the treasury bonds/bills leads to wrong pricing of futures instruments.

4.   A FORWARD RATE CURVE ANALYSIS FOR TURKISH BOND MARKET

At this part, we develop an implied forward curve of Turkey one year from 2006/06/20.

4.1.   Forward Rates and Forward Curve

Forward transaction is an agreement about an asset buying and selling in the specific future date signed today. Forward rates are calculated from spot rates. Forward rates show market consensus about the futures interest rates.

Here are the examples which can compute forward rates from spot rates:

6 month forward rate 1 year from now

3 month forward rate 1 year from now

9 month forward rate 2 years from now.

You can learn below how to compute 6 month forward rates.

Thinking an investor has two options;

Buy a 1 year Treasury bill, or

Buy a 6 month Treasury bill when it is payable in six months and then buy another 6 month treasury bill.

The two options are equal for the investor if they have the same return for 1 year. Investor knows 6 month spot rate and 1 year spot rate but does not know 6 month Treasury bill rates 6 months from now. In the other words, investor does not know 6 month forward rate 6 months from now. Given the spot rates, 1 year Treasury bill and 6 month teary bill, 6 month forward rate is the rate that makes the same return on Turkish Liras (TL) between two options.

Below is how that forward rate is computed assuming that an investor buys a 6 month Treasury bill for TL X. At the end of 6 months, the value of this investment will be,

$$X(1+s_1)$$

s_1 is the one half the bond equivalent yield of the 6 month spot rate. And we use f to represent one quarter of forward rate on a 6 month Treasury bill available 6 months from now. If the investor wants to rollover his/her investment by purchasing that bill at that time, at the end of 1 year from the X investment it would be;

$$X(1+s_1)(1+f)$$

Now thinking that in a 1 year treasury bill, if we let s_2 represent one half the bond equivalent yields of 1 year spot rate, then future TL available at the end of 1 year from the X investment would be;

$$X(1+s_2)^2$$

The amount invested is being compounded for two periods, that is why the squared term appears. (Each period is six month). If the equation is;

$$X(1+s_1)(1+f)=X(1+s_2)^2$$

Is right, then investor will be indifferent when he chooses one of the options.

Determining f is;

$$f = \frac{(1ts_2)^2}{(1ts_1)} - 1$$

We can determine the,

3 month forward rate 1 year from now.

6 month forward rate 2 years from now.

The notation we can use to show 6 month forward rates $_1f_m$ where the subscript m is refers to the period m maturity from now and subscript 1

refs to 1 period rate (6 month). The general formula to determine forward rate is,

$$_1f_m = (\frac{(1ts_{mt1})^{mt1}}{(1ts_m)^m} - 1) * 100$$

At the end, we multiply the solution by 100 to reach the absolute solution

For instance, suppose 3 month forward rate of 1 year. In terms of our notation, m is 4 and seeks $_1f_4$. The formula is then,

$$_1f_4 = (\frac{(1ts_5)^5}{(1ts_4)^4} - 1) * 100$$

At this point, I should explain one important clue of the formula. Sometimes we can not find 3, 6, 9 months maturity of bonds. We can get 10, 22, 43 months rates. At this time, we can approach the formula by months. The formula will be as below;

$$_mf_r = (\frac{(1ts_{mtr})^{\frac{mtr}{m}}}{(1ts_m)} - 1) * 100$$

At this notation, m refers to time from now, r refers to maturity from m. For example, when we try to find 10 months forward rate from 1 year from now, we will use the following formula;

$$_{12}f_{10} = (\frac{(1ts_{22})^{\frac{22}{12}}}{(1ts_{12})} - 1) * 100$$

After this information, we compute an implied Turkish forward rate curve in the following part. Forward curve is as important as yield curve.

Several recent worksheets have been made about the forward curve, which is simply using the shape of the yield curve to indicate what the market has priced in for future short-term rates. Forward curve is the curve representing the prices at which the market is willing to transact future business, today. If you want to make a 6-month investment, you can either buy a 6-month bond or two consecutive 3-month bonds. You know what the 6-month rate is, so you have to consider where you think the 3-month rate will be 3-months

from now. You'll only buy the 3-month if you think the compounded rate of today's 3-month plus the forward 3-month will yield more than today's 6-month.

Since bond buyers are making these kinds of decisions all the time, we assume that the market is efficient, and therefore the 6-month rate is equal to today's 3-month compounded with the forward 3-month. This is why academics say the forward curve is an "unbiased predictor of future rates."[3]

4.2.   An Implied Forward Curve of Turkey

We develop an implied forward curve of Turkey one year from 2006/06/20. On the day there were some T-bills and bonds simple spot interest rates;

TRT270607T14	18,96%
TRT050907T17	20,46%
TRT171007T10	18,07%
TRT090408T17	21,48%
TRT100210T12	18,86%
TRT190111T13	18,92%

So we can compute the 3, 4, 10, 32, 43 months forward rates 1 year from 2006/06/20. At the end, we develop an implied forward rate curve which depends on the forward rates we compute.

Note that the formula for calculated forward rates is approached by months:

$$_{m}f_{r} = (\frac{(1ts_{mtr})^{\frac{mtr}{m}}}{(1ts_{m})} - 1) * 100$$

3 month forward rate (FR) 1 year from 2006/06/20;

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[3] http://accruedint.blogspot.com/2006/08/thoughts-on-forward-curve.html

$$_{12}f_3 = \left(\frac{(1t0,2046)^{(15/12)}}{(1t0,1894)} - 1\right) * 100$$

$$_{12}f_3 = 6,102505487\%$$

4 month forward rate 1 year from 2006/06/20;

$$_{12}f_4 = \left(\frac{(1t0,1807)^{(16/12)}}{(1t0,1894)} - 1\right) * 100$$

$$_{12}f_4 = 4,919968168\%$$

10 month forward rate from 2006/06/20;

$$_{12}f_{10} = \left(\frac{(1t0,2148)^{(22/12)}}{(1t0,1894)} - 1\right) * 100$$

$$_{12}f_{10} = 20,11507085\%$$

32 month forward rate from 1 year from 2006/06/20;

$$_{12}f_{32} = \left(\frac{(1t0,1886)^{(44/12)}}{(1t0,1894)} - 1\right) * 100$$

$$_{12}f_{32} = 58,41746553\%$$
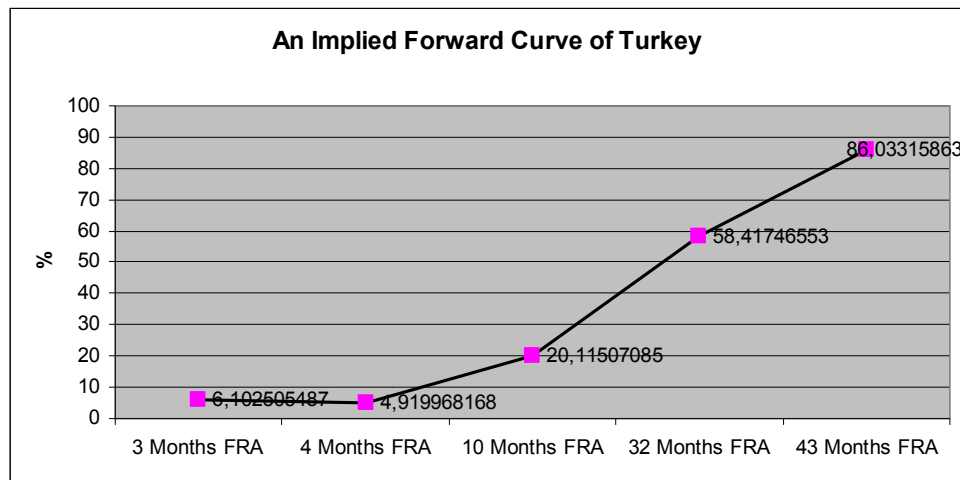
43 month forward rate from 2006/06/20;

$$_{12}f_{43} = \left(\frac{(1t0,1892)^{(55/12)}}{(1t0,1894)} - 1\right) * 100$$

$$_{12}f_{43} = 86,03315863\%$$

Thus we can draw forward curve 1 year from 2006/06/20.

Graph -2:   An Implied Forward Curve of Turkey

An Implied Forward Curve of Turkey

The implied forward rate curve is created by spot rates in Turkish government bond and bills market. If we analyse an implied forward rate curve day by day we can see the changes in its shape.

We can see at the graph that there are big gaps between maturities. Also, investors expect very high interest rates in the future. So, the slope of curve becomes steeper.

In 2001, there were no Treasury bonds. Most of maturities of treasuries are less than one year. Because of the crisis, no one could forecast one year beyond.

Turkish economy is very sensitive. According to Kupranov (1995) and World Securities Law Report (1995), lack of knowledge of investment managers and investors about investment vehicles, lack of supervision of supreme power made the economy sensitive. At any crisis inside or outside of the country, Turkish economy gets in heavy turbulence. These situations have made interest rates high and Eurobonds also have made very high yields. Therefore, investors have been chose to invest Eurobonds than any other securities because of higher yield.

At last, we refer to the spot rates in 2007 to analyse whether FRs is a good predictor or not in Turkey.

In the 2007 the spot rates by which were computed FRs are;

TRT050907T17	16,55%
TRT171007T10	16,00%
TRT090408T17	18,26%
TRT100210T12	17,51%
TRT190111T13	16,95%,

As we see above, FRs could not predict futures rate of Turkey. If we analyse an implied forward rate curve daily, we can see that it can not predict futures rates of Turkish government bonds and bills.

As a matter of fact, FRs is a good predictor of futures spot rates and FRs reflect all relevant information in an efficient market. This empirical evidence shows that there are no effective future markets for Treasury bonds and bills yet in Turkey.

At the second part, we examine efficiency of the ISE Treasury Spot Market in much different point of views. After that we compute FRs. At many times Turkish FRs could not predict futures spot prices. If we could not learn true futures spot prices, how will we price futures Treasury bonds/bills?

5.   CONCLUSION

In this paper, we investigate the relationship between the implied forward rates and realized spot rates. Implied forward rates are obtained from the spot rates in Turkish government bond and bills market. We conclude that the implied rates would not predict future spot rates.

According to the theory of efficient markets, one may expect that the forward rates should reflect the existing information set in the market. However, the realized rates at the end of each maturity time are not significantly the same as with the expected rates. This simply may demonstrate that the existing information set in bond markets does not include all relevant information in the market.

If a market is not perfectly efficient, then the market participants cannot correctly obtain sufficient information and evaluate the asset values in the market. It is true not only for the spot prices but also for the forward prices. Another approach is related with the liquidity preference hypothesis. However, the liquidity preferences are seriously affected by the general economic conditions and conjectural variations through the maturity of bonds. In case that there has been a significant differentiation from the expected rates, and then the participants in the markets can hardly manage their liquidity positions.

As there are no effective futures markets for treasury papers yet in Turkey, this study has investigated Turkish bond markets for the empirical evidence.

As Turkey has experienced certain economic crises that were thought to be because of the monetary policies of the CRBT, the investors have been more sensitive and even suspicious to any developments and announcements in the economy. The lack of confidence is finally affecting the Turkish economy and even benchmark issues in bond markets. Besides, Turkish benchmark issues are not very regular and also limited with the short term.

So the uncertainty increases in the economy. One result in the bond markets is observed with the time span of the yield curve and forward.

Turkey has not well-informated Treasury cash market because of several reasons explained above. So, if trading volume of treasury futures in Turkey increases, market volatility is likely to rise. It is known that spot market will be stabilized when futures trading increases in a well-structured and informed market.

Turkey should make some important changes for developing Treasury cash and futures market. Here are our conclusions:

1. Turkish yield curve and forward curve are short. They must depend on long-term maturity. That gives investors much more information. Futures contracts depending on yield curve or forward curve can be well-standardized and presented to investors.

2. Calendar of treasury issuance is not regular and definite. That also must be in a plan.

3. Benchmark issues' limits must be extended.

4. In outright buy/sale market benchmark issues are the most liquid assets which the brokers traded. The other assets should also be liquid. Because this situation elicits investors to make their portfolio, it depends on only liquid assets. So benchmark interest rate could not develop at every maturity.

5. Futures contracts have doubtful maturity and settlement prices. If treasury issuance is taken in a regular figure, that problem can be solved.

6. Primary Dealers System must be improved. For example, foreign banks should be provided with easier access. The number of primary dealers should be more important. The number of active

banks and primary dealers should be in balance like other countries, as in Korea.

7. Supervision system should be an active objective for all intermediaries, investors, etc.

8. In the fixed-income market, the crowding out effect must be reduced. If the private sector goes easier, interest rates will be determined freely.

9. Education in every subject is a must. Futures contracts and markets are complex. Firms which perform trade between spot market and futures market should employ trained persons. They must have the right information and make good analysis about contracts and the markets.

10. Deficiency and lack of quality of data is another problem. There should be an institution set up for investors who would like to make a less risky investment to get the right information.

Eventually, improving liquidity of futures market depends on effective spot market. ISE Treasury Spot Market is not effective and well-functioned. If trading volume of Treasury futures becomes higher in Turkey, then spot market can be more volatile and undefinitive.

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