TÜRKİYE CUMHURİYET MERKEZ BANKASI

CBT RESEARCH NOTES IN ECONOMICS

Corporate Bond Yield Curve

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Özet: Bu notta Türk lirası cinsi özel sektör tahvil piyasası tanıtılmakta ve bu piyasa için Nelson Siegel yöntemi kullanılarak getiri eğrisi tahmin edilmektedir. Sonuçlar Nelson Siegel yönteminin özel sektör tahvilleri için iyi bir tahmin verdiğini göstermektedir. Ayrıca, not kapsamında son dönemdeki para politikası kararlarının özel sektör getiri eğrisi üzerindeki etkisi devlet tahvili getirilerindeki değişim ile kıyaslanarak tartışılmaktadır. Vaka çalışmaları özel sektör tahvil getirilerinin devlet tahvillerinden gerek yön gerekse büyüklük olarak farklılaşabileceğini göstermektedir.

Abstract: This paper introduces the Turkish lira (TL) corporate bond market and presents the estimations of corporate bond yield curve using the Nelson Siegel methodology. Results suggest that Nelson Siegel method performs a good fit for corporate bonds. Additionally, we focus on the impact of recent monetary policy induced shocks on the corporate yield curve in comparison with the sovereign yield curve. Event studies present evidence that the response of corporate bond yields to the monetary policy shocks might diverge from that of government bond yields in terms of magnitude or sometimes even direction.

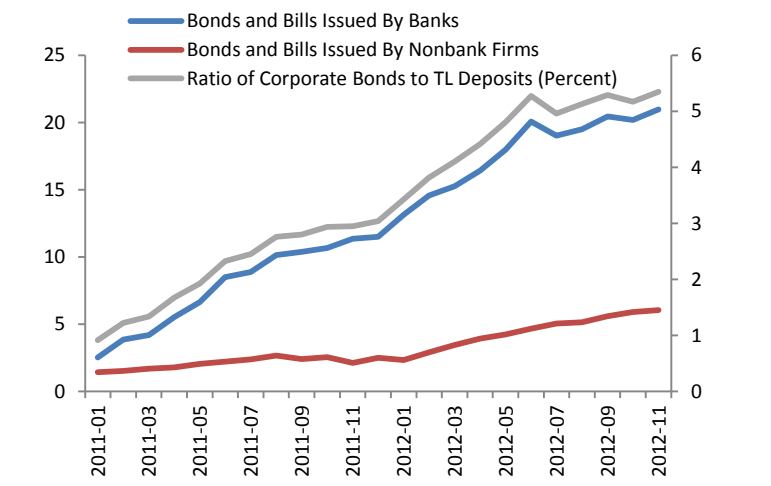
1. Introduction

In Turkey, main source of funding for banks is deposits whereas real sector firms generally rely on bank credits. In this respect, a well-functioning corporate bond market (CBM) could enable banks and corporates to tap capital markets and diversify their funding base. This, in turn would widen available sources and lower the cost of financing for corporates, enrich available set of financial instruments to be invested in and hence augment financial savings. Bond markets

contribute to financial stability by spreading credit risks across the economy and thereby shielding the banking sector in times of stress.

While history of well-developed CBMs dates way back in developed economies, it is quite a new issue for emerging economies and could be deemed at its infancy. However, recent years have witnessed the rapid development of domestic currency CBMs in these economies, particularly in Turkey. While one could hardly mention the existence of a TL CBM in Turkey before the 2008 crisis, total outstanding issuances have boosted to 27 billion Turkish lira as of the end of November 2012 (Figure 1). Financial corporations such as banks, factoring companies and financial intermediary firms have been the pioneers and main players in CBM.

Figure 1. Outstanding Amount of TL Corporate Bonds (Billion TL)



Source: Capital Markets Board of Turkey, Banking Regulation and Supervision Agency, Authors' calculations.

New bond issuance plans of corporates signal further boost to this market which would attract attention from policy makers, market agents and the academia. In this respect, this note is aimed to serve two purposes. First, it provides information about Turkish CBM and presents the yield curve estimation results for the corporate bonds. Second, we also conduct event studies to explore the response of the corporate yield curve to monetary policy shocks.

2. Data and Methodology

In this note, the yield curve for corporate bonds is estimated using daily average price data for zero coupon and fixed coupon corporate bonds traded in the Istanbul Stock Exchange (ISE) Debt Securities Market via "Nelson Siegel (NS)" method, which gives a good overview regarding the shape of the yield curve without relying on individual bond returns heavily.

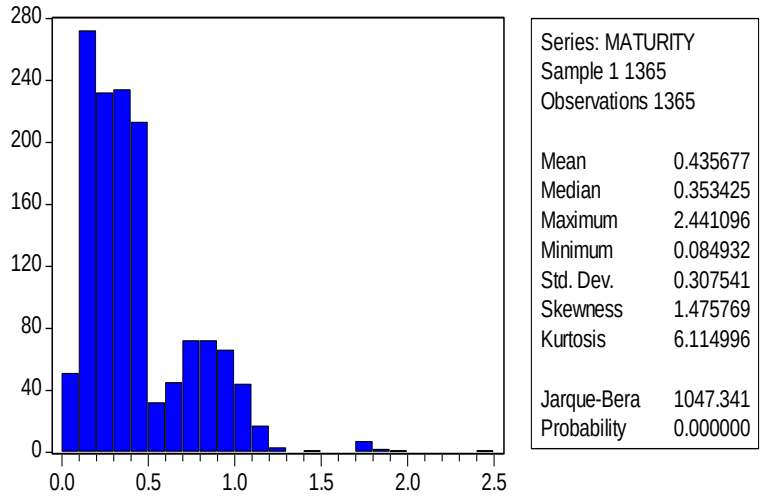
The estimation period starts from 01 August 2012 because in the previous period we failed to spot sufficient number of zero coupon and fixed coupon securities traded to conduct the

estimation procedure for the majority of previous period. The NS estimation procedure entails estimation of four parameters, so that in order to be able to pinpoint those parameters we should have at least four different trading data points.

The NS parameter estimation procedure is based on the minimization of the sum of the squared difference between the realized and the estimated bond prices. The estimated price of each security is the present value of all cash flows associated with the security, so that both the zero coupon and the fixed coupon debt instruments can be used in the same data set. After the estimation of the NS parameters, yields corresponding to different maturities can be calculated easily thanks to the explicit functional form of the NS curve, which correspond to the continuously compounded zero coupon yields in the maturity universe.

The parameter estimation procedure might result in high estimation errors for bonds with short maturity because of the nonlinear relation between bond prices and bond yields. In order to surpass this problem, the estimation error in bond prices is weighted by the inverse of the modified duration of the bond. However, this approach has the side effect of bonds with very short term maturity having extremely high weights. In order this to prevent us from having a good fit to the yields; we removed bonds with maturity less than a month from the data set. After adjustments to the data, the distribution is right skewed and the longest maturity is about 2.5 years (Figure 2).

Figure 2. Maturity of The Corporate Bonds After Adjustment of the Data



Source: ISE, Authors' Calculations.

The average maturity of the bonds traded is about 0.44 years and the median of those is about 0.35 years. Although there are bonds with longer maturities, they are not frequently traded.

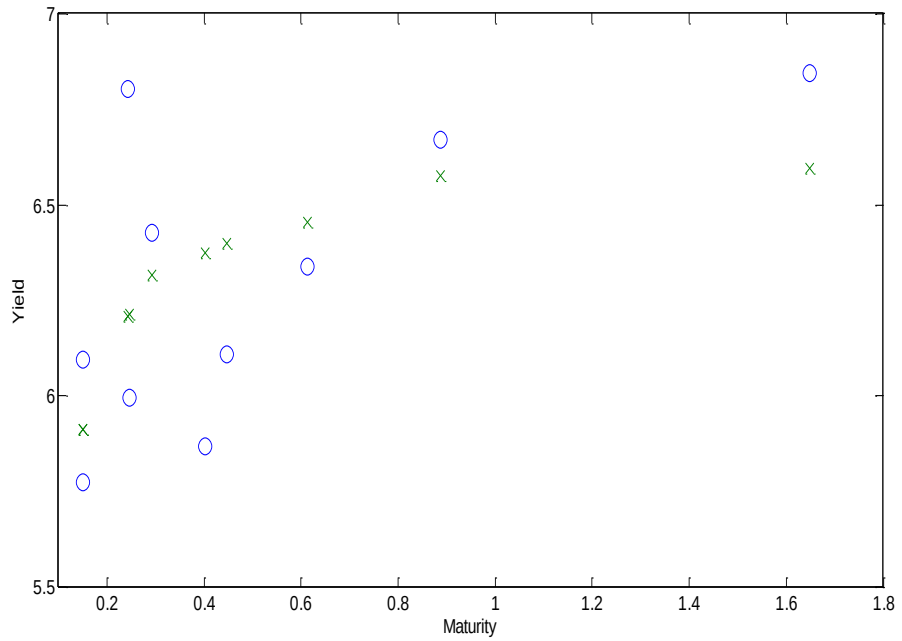
Therefore corporate yield curve will present more reliable information about shorter end of the yield curve. However as time passes it is expected that the longest maturity of the yield curve will extend as the number of longer term securities traded increases.

When constructing yield curve it is optimal to use the securities which are similar to each other in terms of risk premium and liquidity. However it is known that there are some differences between firms in terms of their risk and liquidity premium. Therefore we exclude the nonfinancial firms because their risk premium structure is different from that of financial institutions. However there might still be differences among financial institutions in terms of risk premium and liquidity not reflected by credit rating differentials. Therefore it might be optimal to separate the data into subgroups of similar risk profiles and fit a separate yield curve for each subgroup. Unfortunately, since the number of these bonds traded is still low, this approach is not possible to implement.

3. The Results of the Corporate Yield Curve Estimation

In this section, we present the results of the yield curve estimation. In order to show whether the Nelson Siegel method performs a good fit, the most recent monetary policy date, namely 20 February 2013, is examplified. In Figure 3, the circles represent the realized yield to maturities whereas the crosses represent the fitted zero-coupon yields by the Nelson Siegel method. One important observation is that NS doesn't strive to overfit the data in case two yields with a similar maturity have somewhat different realized yields.

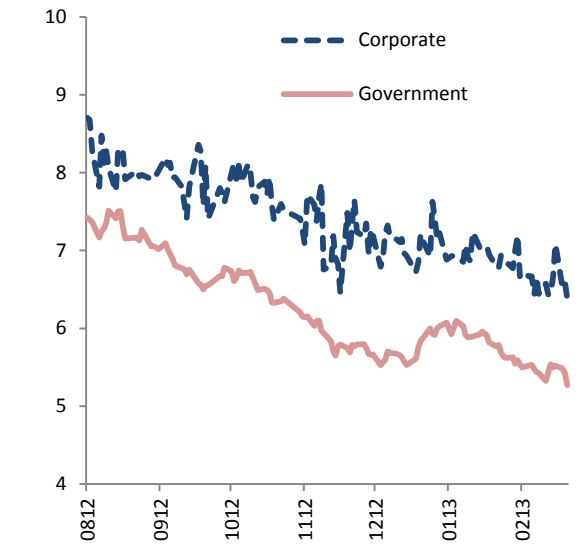
Figure 3. Goodness of Fit



Source: ISE,CBRT.

In addition to the daily estimation performance of the yield curve, we also present the time series of the corporate and government bond yields for 6 and 9 month maturities in Figure 4 and 5.[1] It is observed that the corporate yields are much more volatile than government yields in both maturities. This situation could stem from the inherent riskiness in corporate yields on top of possible estimation errors due to a less populated data set. Since the maturity of the traded corporate bonds is very short compared to that of government bonds and government bonds are more liquid than corporate bonds, estimation results are much more stable in government yields. However it is expected that as the maturity of the corporate bonds traded increases, the stability of corporate yield estimations will enhance. Although the volatility in the corporate yields is higher than government yields, we observe that both yields follow a decreasing trend during the data period.

Figure 4. Government and Corporate Yields For 6 Month (%)



Source: ISE, Authors' calculations.

Figure 5. Government and Corporate Yields For 9 Month (%)

Source: ISE, Authors' calculations.

[1] We have employed the Extended Nelson Siegel (ENS) method to estimate the yields in the government bond market. Since the maturity spectrum of the government bond yields is wider compared to that of the corporate bonds and in general the government bonds outnumber corporate bonds, we think that ENS is a superior choice to fit a curve for the government bond yields Memis (2006) supports the view that for the Turkish government bond market ENS delivers superior results compared to both the NS and cubic spline approaches. We could have used the ENS method for corporate bond yield curve estimation. However since the method requires the estimation of six parameters it is not possible to estimate corporate yield curve for a large number of days due to data limitations.

From the figures, we get the impression of existence of a constant difference between corporate and government bond yields reflecting the risk premium inherent in corporate yields. However at this stage it is hard to figure out the exact nature of the risk premium due to the high variance.

4. Comparison of the Response of Corporate Yield Curve to the Latest Monetary Policy Shocks:

In this section, we focus on the impact of monetary policy induced shocks on the corporate yield curve in comparison with the sovereign yield curve[2]. To this end, we take the two most recent monetary policy committee (MPC) meetings with outcomes that could be deemed as unexpected by market participants to various extent.

In the light of the aforementioned riskiness of firms, yields of financial firms are expected to be affected by monetary policy shocks via two channels. The direct and straightforward channel works through the economy-wide level of interest rates. In addition, corporate yields could respond to monetary policy shocks via the corporate risk premium, which could be considered as "the secondary channel" of the transmission of monetary policy decisions. In other words, shocks could alter the riskiness of firms and this in turn might be reflected on bond yields. This channel is thought to be more pronounced for financial firms since their assets and liabilities are more sensitive to changes in interest rate and macro prudential decisions of the Central Bank. Any change in interest rate directly alters the value of assets and liabilities of financial firms due to their balance sheet structure. For example, a decline/rise in the central bank's policy rate would push prices of debt instruments up/down which would in turn alters the value of assets and liabilities in the balance sheet of the financial firms. This example clearly shows that the risk premium channel has the potential to amplify the response of corporate yields to interest rate shocks.

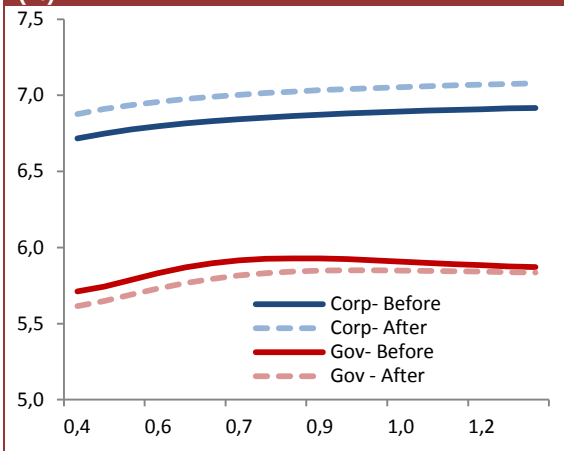
Other than interest rate decisions macro prudential measures taken by the Central Bank also have the potential to influence the balance sheet of financial firms considerably. Specifically, alterations in reserve options coefficient (ROC) which is a genuine tool introduced and utilized by the Central Bank of Turkey (CBT) and required reserve ratios (RRR), again an active tool at the disposal of the CBT[3] are deemed to pass through corporate yields via the risk premium channel. These macro prudential tools influence the profitability of the financial firms.

[2] We called the announcement day of the monetary policy decision as "before" and the following day as "after" since trading of the bonds with the same value date continues until 2.00 pm, when the monetary policy decision is announced.

[3] See Alper et al. (2012) and Küçüksaraç and Özel (2012) for detailed expositions of the Reserve Options Mechanism and how the RRRs utilized in the implementation of monetary policy in Turkey, respectively.

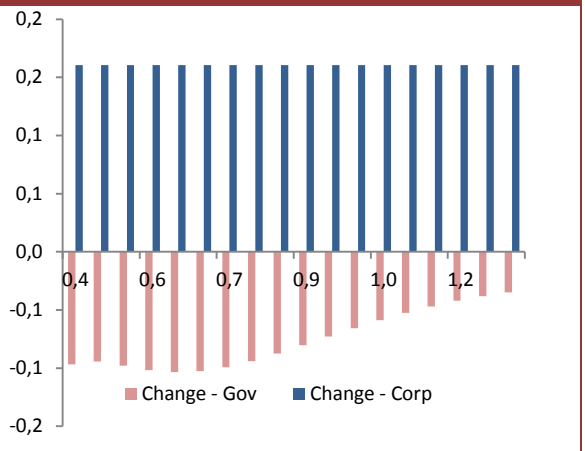
January 2013 MPC meeting constitutes an interesting case for the analysis of corporate yield curves. On the 22nd of January, the MPC reduced the upper and lower bands of the interest rate corridor, which was perceived as a surprise by the vast majority of market participants and "an early move" by some others. Reduction in these rates was accompanied by an increase in RRRs for banks' liabilities in all currencies and ROCs for gold. Sovereign yields came down following the MPC statement, the comedown being more marked at shorter terms. However, this time corporate yields diverged from sovereigns in direction and increased slightly. Such a divergence could be attributed to hikes in RRRs and ROCs which would tighten financing conditions for financial firms.

Figure 6a. Corporate and Sovereign Yield Curves Before and After the January, 2013 MPC Meeting (%)



Source: ISE, Authors' calculations.

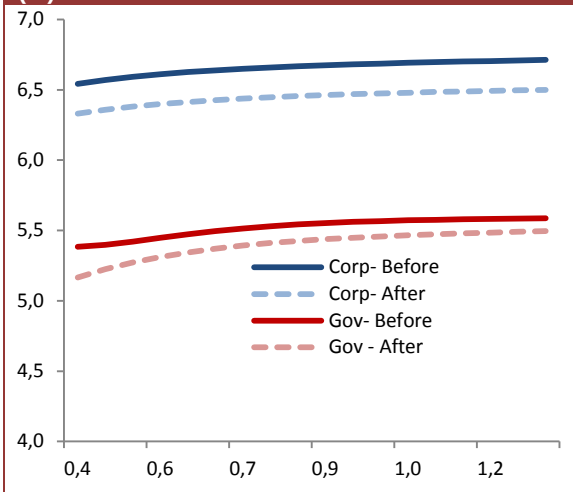
Figure 6b. Changes In Corporate and Sovereign Yields Through Yield Curves (%)



Source: ISE, Authors' calculations.

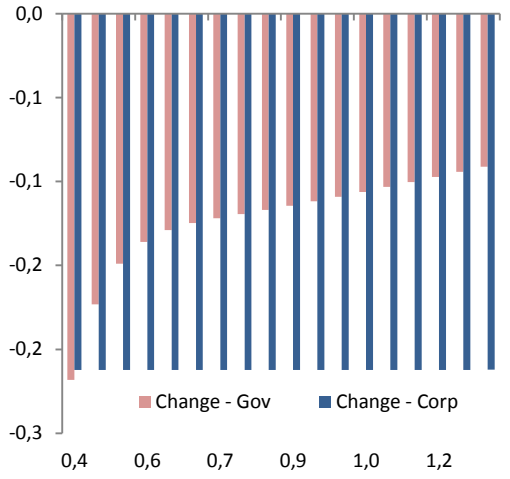
Next, on the 19th of February, 2013 MPC once more reduced both the upper and lower band of the interest rate corridor on one hand, and increased RRRs on the other. Before the meeting, expectations had been observed to be dispersed between "no change", "down-shift in both sides" and "down-shift only in one end of the corridor". In contrast, vast majority of the market had been expecting a hike in RRRs, at an amount of minimum 25 basis points. Hence, both reduction in the overnight borrowing and lending rates and hike in RRRs with an amount of only 25 basis points were perceived as a dovish surprise by the market. As a result, both corporate and sovereign yield curves shifted down following the announcement. Again, reduction in corporate yields was more than the sovereign yields which could have been driven by the risk premium channel described previously.

Figure 7a. Corporate and Sovereign Yield Curves Before and After the February, 2013 MPC Meeting (%)



Source: ISE, Authors' calculations.

Figure 7b. Changes In Corporate and Sovereign Yields Through Yield Curves (%)



Source: ISE, Authors' calculations.

5. Conclusion

Corporate bond market widens available sources and lowers the cost of financing for corporates, enriches available set of financial instruments to be invested in, augments financial savings and leads to efficient pricing of risk. Turkish corporate bond market, which practically had not existed until a couple of years ago, has been developing rapidly, mainly driven by financial firms.

In this note, we estimate the Turkish corporate bond yields using the Nelson Siegel methodology. Results suggest that Nelson Siegel method proves useful in the estimation of corporate bonds. Additionally, we focus on the impact of recent monetary policy induced shocks on the corporate yield curve in comparison with the sovereign yield curve. Event studies present evidence that corporate rates might diverge from sovereign yields in terms of the amount or sometimes even direction of responses to monetary policy shocks which might be a result of the risk premium channel.

Relatively short maturity of Turkish corporate bonds, sparsely distributed data in the maturity spectrum and the necessity to pool the bonds with somewhat differing risk premium in the same data set restrain the efficiency of the estimation results. However, as number and maturity of the bonds traded in the CBM increase further in the future, new research conducted on the issue would enrich the literature on Turkish CBM.

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