Essays on European bond markets
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Citation for published version (APA):

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Chapter 6

Summary

This dissertation focused on a number of issues that are of importance in the current European bond market. In the past years, the fiscal policy of the Eurozone members, advances in the technology of trading platforms and the introduction of a single currency have reshaped the fixed income markets in Europe. These developments have resulted in a far going integration of Eurozone capital markets. Moreover, the massive amounts of debt issued by Japan and the United States combined with the deteriorating stock markets in 2000-2002 have also resulted in an increased asset allocation to European bonds. Currently, the Eurozone bond market is the third largest market in the world with the German Schätze, Bobl and Bund futures among the heaviest traded financial contracts. In recent years, the empirical work on the microstructure of financial markets has received considerable attention in the academic literature. Most of the substantial empirical work in this area pertains to stock markets. Given the emphasis on stock markets in the theory and the availability of data, this is understandable. On the other hand, in terms of both capitalization and trading volume, bond markets are bigger than stock markets. Research on bond markets is also interesting because of their special structure. These markets are centered around a large number of professional dealers. Outside customers trade with the dealer of their choice. Volume is high and interdealer
trading is frequently being observed. This work could be divided into two parts. The first part focused on the microstructure of European bond markets. The second part focused on the growing European inflation-linked bond market. Notice that throughout this dissertation, we distinguished between market participants who can set new prices (market makers or dealers) and market participants that can only take prices (traders).

In the first part, we turned our attention to the microstructure of Eurozone bond markets by studying the Belgian, French, German, and Italian bonds. We started with a review of microstructure literature in chapter 2 and studied inventory and information models. For inventory models, the equilibrium price formed by dealers compensates for non-optimal inventory positions while the equilibrium price in information models protects against adverse selection. Because a competitive market structure prevails in the Eurozone bond market, interdealer trading is important. We therefore provided a discussion about interdealer trading and its impact on the formation of prices. We showed that in these interdealer models, inventory and information asymmetry are still important because order flows are sources of private information. This private information, combined with risk-averse speculation among dealers, will result in strategic interdealer behavior. We ended chapter 2 with a discussion about some variables that could be observed by an econometrician and therefore useful for testing market microstructure topics. We turned our attention to the bid-ask spread, price volatility and order flow. The bid-ask spread is an important instrument for dealers because it controls the incoming and outgoing order flow, it compensates dealers for their market making activity and it serves as a protection against adverse selection. Based on quote data, one can calculate the average, effective and realized spread. Based on transaction data, one can calculate implicit trading costs. An important role is also put aside for price volatility. According to theory, the more informed traders we have, the more price volatility will occur as market makers will change their quotes more often to protect themselves against adverse selection. The empirical papers indeed support this idea and show
that the arrival of information is an important contributor to intraday price volatility. Monitoring order flow is also crucial in financial markets. Even if markets are driven by publicly available news, there exist information asymmetry in the form of private order flow as it can observed only by the parties involved in the transaction. In addition, the impact of order flow is time-varying. Not only does it depend on the size and its direction, but also on the arrival of information in the market.

In chapter 3, we turned our attention to the trading activity of the MTS Global Market system, which is the most important European interdealer fixed income trading system. This system is composed of a number of trading platforms on which designated bonds can be traded. The trading system is fully automated and effectively works as an electronic limit order market. The first interesting feature of the MTS trading platform is its organizational setup. Fixed income securities can be traded on a domestic and an European (EuroMTS) platform. The range of securities being traded on the domestic platform is however much larger than on the EuroMTS trading platform. A dealer on the domestic trading platform can therefore trade a much wider range of bonds. However, the existence of both trading platforms suggests differences and we therefore asked ourselves the following question: Why would a market maker with entrance to the local platforms also operate on the EuroMTS trading platform? To answer this question, a detailed study on the costs and the dynamics of price formation is needed. Throughout the paper, we provided a comparison of the trading costs and price dynamics on the domestic MTS markets and the EuroMTS by calculating comparative measures of liquidity, such as the quoted and effective spread. We showed that despite the apparent fragmentation of trading on domestic platforms and EuroMTS, the markets are closely connected in terms of liquidity. The second interesting feature of the MTS Global Market system is its pure interdealer platform. This allowed us to study the price and order flow dynamics under competitive market making. We asked ourselves: What are the dynamics of prices in the Eurozone fixed income market under competitive market making and interdealer trading? What is the role of trading intensity? Interestingly,
the study of trading intensity and its relation to price and order flow dynamics do not explicitly take the role of interdealer trading into consideration. Single dealer models argue that there exist a positive relation between information and trading intensity as more informed traders are active during large market activity. This means that any unexpected trade during active trading has a higher impact on prices. Some authors also documented the same empirical results. We think that interdealer trading may shed a different light on these results. Dealers use interdealer trading to control their inventory position but interdealer trading is more costly compared to outside customer trading because dealers have to pay a fee (to the other dealer) rather than receiving a fee (from an outside customer). In addition, there is less need to adjust the spread as traders enter the market on a frequent basis, which by definition occur during high market activity. Next to these searching costs, interdealer trading can also result in a repeated passing of inventory among dealers as they have the moral obligation to quote prices. The repeated passing of inventory is called "hot-potato" trading and this creates noise in the pricing process when dealers are risk averse and speculative. In other words, a dealer's decision to conduct an interdealer trade depends on his ability to offset his inventory using customer order flow. Not only is this cheaper compared to interdealer trading; it also avoids the "hot-potato" process. This implies that the price impact of a trade is much larger during periods where trading intensity is low because customer flows are scarce. Our data provided an opportunity to test this. We documented the following: order flows are strongly correlated but the correlation gradually decreases over time. We also found the impact of a trade in a low trading intensive environment having a larger impact on price than in a high trading intensive environment. This contrasts the findings for stock markets but confirms the dealer's preference to trade with outside customers rather than the more costly interdealer trading. When we took announcement effects into consideration, we found the overall price sensitivity to order flow being stronger and this reflects the information asymmetry in order flow. However, this price sensitivity is magnified when trading activity is low. The latter
confirmed the important role of order flows to determine the true impact of economic news.

In chapter 4, we analyzed the impact of basis volatility on the pricing of Eurozone sovereign bonds. Hedging and speculative motives of market makers often require strategies involving positions in both the futures and spot market. These are so-called basis strategies and arise from the market makers need to hedge incoming order flow. The payoff of these strategies depends on the basis volatility or basis risk and we argued that basis risk is a relevant factor in determining the price of a fixed income security. We showed that the basis risk (or basis volatility) is relevant as it determines the final payoff of a trader's hedged position. Basis risk is also important due to costs associated with managing inventory and holding a position. These costs are mostly operational costs, waiting costs or a deviation from an optimal (mean-variance efficient) portfolio. The more difficult it is to hedge, i.e. the larger the basis volatility, the more difficult it is to manage these costs and the higher the required compensation for offering liquidity. Using simulations, we found a convex relation between the quoted spread and basis risk. More specific, an increase in the basis risk results in a more than proportional widening of the quoted spread. This non-linearity in spread dynamics suggests that a market maker requires a higher compensation for his services when his exposure to basis risk increases by quoting a larger bid-ask spread. When the basis risk becomes problematic however, he widens his spread even more and this indicates his reluctance to trade. We also estimated the basis risk for some Eurozone government bonds using transaction data from the MTS trading system and bund future data from EUREX. Although the bund future requires the delivery of German bonds, there exist a relation between the futures and the cash market even if the cash instruments cannot be delivered because the futures and spot market are driven by the same interest rates. We showed that bonds with larger basis volatility are traded at a premium. This provides an alternative explanation for the yield differences in the Eurozone besides credit risk or liquidity premium. The fact that yield differences are also related to hedging quality has important implications
for policy making. A strong fiscal convergence and operations leading to an increase in liquidity are important for convergence of bond yields but any measures that can limit the basis risk should be taken into consideration as well. This can be achieved by e.g. cash settlement or allowing non-German bonds for delivery. Although these measures do not solve additional problems, it would help in lowering the 'natural' advantage incorporated in German bonds due to their physical delivery. We think that these measures can greatly improve the efficiency of using futures to hedge Eurozone fixed income securities.

The recent commitment by the French Treasury to issue inflation-linked bonds almost every month in 2004 and the announcement by the Italian and Greek Treasury agent to issue more inflation-linked bonds in the coming years reflect the growing importance of these instruments for the Eurozone debt market. We studied the French inflation-linked bond market in chapter 5. Most research on inflation-linked bonds is conducted for the UK and US market while little has been said about the inflation-linked bond market in the Eurozone. Given the attention of issuers and investors on the Eurozone inflation-linked market, this is not justified. Nowadays, a reasonable European real yield curve has emerged, containing maturities varying from 2006 to 2032. Along with this real government curve a relatively liquid and economically significant Eurozone real swap market has evolved. In chapter 5, we analyzed the inflation premium contained in French inflation-linked government bonds. The real interest rate and expected inflation are the key unobservable variables in our analysis. If real interest rates are reflected through index-linked bonds, it is common practice to use a break-even approach to calculate the expected inflation in real bonds. The expected inflation is then the yield difference between a nominal and an index-linked bond with the same maturity. Albeit simple, this method suffers from a number of problems. First, only the maturities of nominal and real bonds are taken into consideration so it does not generate a complete term structure of interest rates. More importantly, the method assumes that the Fisher equation holds and this implies that the inflation premium is set to zero. In order
to calculate the inflation premium within a break-even framework, expected inflation extracted from survey data is incorporated. The inflation premium is then the difference between the nominal yield, real yields and the expected inflation. Still, the proposed method assumes that the index-linked curve estimated from inflation-linked price data is equal to the real term structure of interest rates. There is however a difference due to liquidity and imperfect indexation. Most papers focusing on the liquidity premium do understand the importance of liquidity but do not explicitly model liquidity as a driving factor of bond prices. It is well known however that liquid securities are traded at a premium. Taking liquidity into account allowed us to use data on both nominal and inflation-linked debt in markets where the outstanding amount of inflation linked debt is small. In France for example, the fraction of inflation-linked bonds stands at 7% of total debt while the Italian treasury estimates that some 1.3% of its current debt is inflation-linked. The US treasury market is the worlds largest inflation-linked bond market and the outstanding amount of treasury inflation protected securities (or TIPS) equals 150 billion. This is approximately 6% of the total outstanding tradable US treasury debt. To some extent, the problem of liquidity can be avoided by analyzing the UK bond market because almost 25% of their tradable debt is inflation linked. The objective chapter 5 is to estimate the inflation premium by taking liquidity into account. This allowed us to study the empirical properties of the term structure of real rates in the Eurozone bond market. We used data from French index-linked and nominal bonds and estimate the inflation and liquidity premium in a state space framework using the extended Kalman filter and quasi-maximum likelihood. In particular, we simultaneously derived the nominal and real term structure of interest rates and this enabled us to calculate the price of any discount bond. In order to fit coupon bearing bonds into an affine structure, we used the extended Kalman filter to linearize the state equations. A state space approach is also useful for taking advantage of cross-sectional and timeseries behavior of nominal and real rates and this should reduce the instability of timeseries. Our findings are as follows: in the absence of
liquidity, the inflation premium runs from 113 basis points to some 250 basis points across the curve. These numbers implies that the inflation premium in long-term bonds is more than 2 times larger compared with the short-end of the curve and comparable with US TIPS. The liquidity premium in real bonds equals some 6 basis points for bonds maturing in 2009 and is slightly humped shaped with a peak at the 10-year bond. If liquidity is taken into consideration, the expected nominal yield spread between nominal and real bonds equals some 15 basis points in the short end of the curve but increases to 135 basis points in the long end of the curve. For short-term (long-term) bonds, the liquidity premium accounts for some 5% (10%) of the total real risk premium. On the other hand, the inflation premium is a prominent factor in nominal bonds as it account for more than 50% of the total risk premium across the term structure for nominal interest rates. As a final remark, although the contribution of the liquidity premium to total premium is small, it has a large impact on the expected nominal yield spread through the expected liquidity level. We find that this yield spread is upward sloping as it runs from 76 basis points to some 198 basis points for the 2032 bond.