Price Formation and Liquidity Provision in the Markets for European and Canadian Government Securities

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The trading and quoting decisions of financial market participants are affected by the organization or structure of a given market. In 1999, a "liquidity pact" was introduced on the dominant European interdealer trading platform for government bonds, also known as Mercato Telematico dei Titoli di Stato, or simply MTS.[1] Dealers that are registered to make markets in specific securities must provide certain minimum levels of liquidity. They must post buy and sell limit orders above a minimum size, within a maximum bid/offer spread, for a minimum number of hours each day. These quoting obligations do not exist in Canada. Another important institutional feature of a financial market is its degree of transparency; i.e., the amount of information on quotes and trades available to interested market participants. The MTS platform provides more information about quotes and trade activity than that provided in Canadian interdealer markets.

D'Souza, Lo, and Sapp (2007) examine whether differences in the structure of government bond markets in Europe and Canada affect how fundamental information is incorporated into prices—henceforth referred to as the price-discovery process. In particular, they examine whether markets are more efficient when quoting obligations are imposed on dealers in a transparent market.

Theory

When securities are thought to be mispriced, participants with this private information will execute trades and post quotes in a manner that maximizes profits. An optimal strategy will take into consideration the speed with which private information is disseminated in the market and, more generally, the structure of the market. Other market participants will update their information sets as they observe trades and/or changes in quotes.[2] Markets are strongly efficient if all public and private information is reflected in prices.[3]

While transparency will improve the informational efficiency of a market, liquidity may fall. In transparent markets, dealers will find it more difficult to manage their inventories and make profits at the same time.[4] The imposition of quoting requirements may also reduce an individual dealer's inventory risks.[5]

There are a number of variables that can be jointly examined to determine the efficiency of a market. If trades provide a signal to the market about the existence of private information, then order flow (defined as the difference between the number of buyer- and seller-initiated trades over a given period) will also be informative. Green (2004), Brandt and Kavajecz (2004), and Pasquariello and Vega (2006) have all shown that in fixed-income markets, order flow

1. The markets function as an electronic limit order book. Limit and market orders are posted and executed via a limit order book. A limit order is an order to buy or sell a certain amount of an asset at a specified price. Market buy and sell orders are executed immediately against the best limit orders in the market.
2. Kyle (1985) and Glosten and Milgrom (1985) illustrate how dealers revise their expectations when they observe trading in the market.
3. Bauer (2004) gives a precise definition of market efficiency.
4. Zorn (2004) discusses the issue of the appropriate level of transparency. There may be a trade-off between informational efficiency and dealer concerns that increased transparency may limit market-making profitability.
5. In a liquid financial market, participants can rapidly execute large transactions with only a small impact on prices. In an efficient market, asset prices reflect all fundamental information. These two dimensions are fundamentally interrelated and determine a market's overall quality.

captures the arrival of information and has a permanent impact on prices.

Depth and spreads are usually associated with measures of liquidity in the market. Relative depth is calculated as the difference between the quantity of a security available for purchase at the best bid quote in the market and the quantity available for sale at the best offer quote in the market. Spreads are the difference between the best offer and bid quotes.

Recent literature on market microstructure demonstrates that market participants may learn about new information by observing the relative supply of liquidity in the market. Bloomfield, O'Hara, and Saar (2005) illustrate how informed traders will strategically use both market orders and limit orders in a market with an electronic limit order book. Goettler, Parlour, and Rajan (2005) demonstrate how limit orders placed by informed traders reveal new information about the underlying value of an asset. Thus, relative depth and spreads, like order flow, may also convey information and have an impact on the price-discovery process.

Institutional Structure

The large and unpredictable inventory shocks that dealers typically face in their trades with customers have led to the creation of interdealer bond markets to facilitate inventory management and risk sharing.

In Europe, the most liquid interdealer trading market for government securities is the pan-European Mercato Telematico dei Titoli di Stato.[6] In Canada, dealers can execute anonymous buy and sell orders through an interdealer broker (IDB). Dealers leave firm quotes with a broker, along with the minimum amount that they are willing to trade. The introduction of IDBs has significantly reduced the role of direct interdealer trading in recent years.

Transparency is an important institutional feature of a financial market. The MTS limit order book market is more transparent than Canadian markets. Dealing quotes are centralized, and market participants observe the top five quotes on either side of the market, in addition to the last transacted price. In Canada, only the best quotes listed by each IDB are observable to the market.

Methodology and Data

To characterize all aspects of the price-discovery process, the joint relationship between price changes, order flow, the relative depth on the bid and offer sides of the market, and spreads, is modelled across several European and Canadian markets for short-term government securities.

Following the approach of Hasbrouck (1991a, 1991b), D'Souza, Lo, and Sapp examine the efficiency of the markets for European and Canadian government bonds by calculating two statistics derived from the estimates of a vector-autoregression model. Impulse-response functions and variance decompositions of price changes provide a measure of how informative the order flow, spreads, and relative depth are in each market.

Impulse-response functions summarize the permanent impact on prices of a shock to each variable and reflect the private information contained in that variable. A variance decomposition of price changes isolates the relative contribution of each variable to variability. If markets are very efficient, order flow, relative depth, and spreads will be uninformative with respect to prices.

The MTS dataset includes all quotes and the associated quote amounts for each security, in addition to transaction prices and traded quantities. The analysis focuses on the largest markets for short-term government bonds over the period from 1 April 2003 to 31 December 2004.

The Canadian dataset was obtained from CanPX—a data service that consolidates and disseminates to subscribers anonymous trade and quote data submitted by Canada's fixed-income interdealer brokers. The best quotes across all the participating brokers are collected by CanPX. The analysis focuses on the 2-year Canadian bond, since the frequency of quotes and transactions is relatively small for Government of Canada 6- and 12-month bills in the IDB sphere. The CanPX dataset spans the period from 1 October 2003 to 31 October 2004.

6. European government bonds can be listed on a domestic MTS platform (such as MTS France) and/or the EuroMTS electronic trading system. Almost all trading in treasury bills and short-term treasury bonds occurs on the domestic MTS platforms.

Findings

Order flow is found to be more informative in the Canadian market. This may reflect the fact that restrictions on quotes in European markets allow dealers to cheaply share their inventory risk through the immediate execution of market orders. Consequently, order flow in the European market will reflect both inventory management and private information.

In contrast to the European market, spreads are surprisingly informative in the Canadian market, and may reflect the absence of quoting restrictions and/or the use of the interdealer market to extract information about the underlying relative supply of liquidity in the market. Generally, spreads widen to reflect a fall in liquidity or a risk that private information may exist in the market. Relative depth explains only a limited amount of the variability in prices in either marketplace.

Conclusion

Adjusting market structures to improve market efficiency can be important to a country's overall economic well-being. Liquid and efficient markets for government securities support optimal savings and investment decisions. They also perform a number of key roles. For example, given their virtually default-free nature, government securities are used as benchmarks for the pricing and hedging of other fixed-income securities.

The results of this study would tend to suggest that market structure is important in the price-discovery process. Findings indicate that in each market examined, private information is incorporated into prices within a couple of hours. According to some measures, however, several markets for short-term European government securities appear to be relatively more efficient than Canadian markets.

There are a number of caveats related to the interpretation of these results. The study has not controlled for either the greater number of market-makers and higher turnover in the MTS fixed-income markets than in Canadian IDB markets. These attributes could potentially explain differences in the efficiency of European and Canadian markets for government bonds. Finally, the metric used here to measure efficiency does not necessarily take into account the possibility that dealers use the Canadian IDB market for information extraction. This work is left for future research.

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