



Research

Summaries

Introduction

Bank of Canada staff undertake research designed to improve overall knowledge and understanding of the Canadian and international financial systems. This work is often pursued from a broad, system-wide perspective that emphasizes linkages across the different parts of the financial system (institutions, markets, and clearing and settlement systems). Other linkages of importance may include those between the Canadian financial system and the rest of the economy, as well as those with the international environment, including the international financial system. This section summarizes some of the Bank's recent work.

Empirical studies tend to find that a well-developed banking sector and a well-developed financial system are important in promoting economic growth. Similarly, a competitive or contestable banking sector is important to the efficiency of the financial system. In light of the worldwide trend towards consolidation in the financial sector, understanding the nature and measurement of banking competition has grown in importance. *Competition in Banking* examines the approaches taken in the theoretical and empirical literature to explore this issue, and provides an overview of some of the major findings.

A liquid market—generally viewed as one that accommodates trading with the least effect on price—is an important factor contributing to the efficiency of fixed-income markets. Indeed, volatility in liquidity is a key factor that affects whether investors enter a market or not. As well, understanding the two-way causality between financial market crisis and market liquidity is critical to the Bank of Canada's objective of promoting financial stability. *Liquidity in the Market for Government of Canada Bonds: An Empirical Analysis* summarizes two papers that aim to enhance the understanding of liquidity in the Canadian bond market. The first paper examines appropriate measures of market liquidity, and

the second looks at the effects of public news on liquidity.

Numerous Canadian firms list their shares on U.S. stock exchanges in addition to listing on a Canadian exchange. Studies on such cross-listing have shown that the share prices of firms that do so are positively affected. These positive effects lead to a reduced cost of equity financing, thus providing a strong motivation for firms to cross-list. In the article *International Cross-Listing and the Bonding Hypothesis*, the authors attempt to identify the mechanism by which cross-listing on U.S. exchanges affects the valuation of Canadian firms. The article supports the bonding hypothesis, in that markets reward firms that succeed in attracting share turnover in the United States.

Competition in Banking

*Carol Ann Northcott**

The worldwide trend towards consolidation of the financial sector has focused the attention of policy-makers on the potential implications for the economy. This article contributes to the debate by reviewing some of the issues raised in the theoretical and empirical literature on competition in the banking sector.

A well-functioning banking sector is important to any economy. Banks facilitate economic growth by, among other things, providing a means to hold and exchange financial assets and by supplying credit to businesses and consumers. The potential benefits of competition in banking are similar to its benefits for other industries. It can improve allocative, productive, and dynamic efficiencies (e.g., by promoting innovation), with the ultimate benefit being stronger economic growth.

The basic question traditionally asked when assessing the competitiveness of a market appears simple: Can firms exert market power? This article examines the approaches taken in the theoretical and empirical literature to explore this issue in the context of the banking sector. Competition in banking may not be as simple as it first appears.

Concentration

The traditional approach to assessing competition has been to associate a larger number of firms with more price competition and fewer firms with less-competitive behaviour. This comes from a classic industrial organization argument, which assumes that there is a causal relationship running from the structure of the market (e.g., firm concentration) to the firm's pricing behaviour, to the firm's profits, and to its degree of market power.¹ That is, a higher

number of firms causes firms to price competitively (marginal-cost pricing), which minimizes the degree of market power that any one firm can exert.

Since pricing behaviour is not easily observable, the emphasis in the literature is on establishing a relationship between the structure of the market and market power. Structural variables include measures of concentration, the number of sellers, and entry conditions. Market power is measured using accounting data on profits and costs.

While traditional studies using this approach are based on cross-industry data, there is a large body of literature that applies the paradigm to one particular industry over time. In the case of the banking sector, the majority of the early literature used U.S. data to examine the relationship between bank profitability (or prices) and concentration. These early studies often found a positive relationship between concentration and loan prices (e.g., Hannan 1991). However, the results of studies using more recent data and taking into account other factors, such as differences in efficiency between banks, have been more ambiguous. In addition, recent work using panel data indicates that potential negative effects of concentration can be largely mitigated by efficient legal systems, open entry and the presence of foreign banks, and by high levels of financial and economic development.

There are several difficulties with the traditional approach. For example, from a measurement perspective, accounting data on profits and costs may not provide an accurate measure of economic profits and market power. As well, the measurement of a structural variable such as concentration requires clear definition of the

1. In the literature, this approach is called the Structure-Conduct-Performance (SCP) paradigm.

* This is an extract of the issues explored by the author in a forthcoming Bank of Canada working paper.

relevant market. All products that are substitutes and all firms that supply substitutable products must be included in the market definition. This can be difficult to assess in practice, especially in a market without homogeneous products, such as banking. A vast range of substitutable products exists—products supplied not just by banks but by other financial and non-financial firms as well.²

Contestability

To address some of these pitfalls, new approaches have been developed that focus on the behaviour of the firm, regardless of the structure of the market.³ The aim of these approaches is to estimate market power based on firm behaviour. That is, they estimate the “effective competition” or “contestability” of the market.

Two widely used techniques are those developed by Bresnahan (1982) and Lau (1982) and by Panzar and Rosse (1987). Based on theoretical models of oligopoly, each approach attempts to measure the competitive conduct of banks without explicitly using information on the structure of the market. They do this by estimating the deviation from marginal-cost (competitive) pricing. Behaviour is characterized as a continuum between perfectly competitive and monopolistic. This relatively new literature consistently finds that banking markets around the world fall between the two extremes and that the number of banks in the market is not necessarily a good indication of competitive behaviour.

Indeed, a recent study using the Panzar and Rosse technique on cross-country panel data finds a *positive* relationship between concentration and contestability (Claessens and Laevan 2003). In this work, as in other studies, the banking market in the Netherlands is found to be the most contestable despite its high level of concentration, and Canada scores higher than countries such as Germany and the United States, which have a much larger number of banks. This and other empirical studies also confirm that contestability is associated with a

greater presence of foreign banks, open entry and exit, few restrictions on permitted activities, and well-developed legal and financial systems.⁴

Non-Price Competition

While the contestability literature avoids some of the problems associated with the traditional concentration approach (in that market power is estimated directly, not with accounting data, and a robust definition of the market is not required), a major problem remains. Both approaches assume a homogeneous product market. But firms may also compete by differentiating their products. While differentiation has traditionally been viewed as a way for firms to maintain some degree of market power, it may also have some social benefits.

Banks differ in many ways, such as reputation, product offerings, and the extensiveness and location of their branch network. Indeed, branch networks are a particularly important feature of bank competition.⁵ Allen and Gale (2000) exploit this particular characteristic of the banking sector to show how two large banks with branch networks can provide a more competitive outcome than a large number of small banks without branches (a unitary banking system).⁶ Other studies show how branch networks can increase the effective size of the market by increasing the geographical scope of competition. In this context, branches can decrease the degree of market power exerted in remote locations relative to a unitary banking model. This can lead to more uniform pricing across urban and remote locations (e.g., Calem and Nakamura 1998). Some theories argue that banks can also compete through innovation: the potential to temporarily gain market power through the introduction of new products provides an incentive to innovate.

2. See Church and Ware (2000) for a more thorough critique of the traditional SCP paradigm.

3. These approaches are loosely called the New Empirical Industrial Organization approach.

4. Activity restrictions refer to the degree to which banks' activities in underwriting securities, insurance, real estate, and in owning shares in non-financial firms are limited. Canada does relatively well by this measure. It is more restrictive than the United Kingdom and Germany but freer than the United States.

5. Branches can be interpreted broadly as any node that allows for the distribution of primary services.

6. Competitiveness in this sense is measured as the sum of the producers' and consumers' surplus.

Discussion

Because the banking sector does not produce homogeneous products, it may not be possible to completely eliminate market power. But as discussed above, some degree of market power may be consistent with other social benefits. For example, an extensive branch network may mitigate market power in remote areas. Furthermore, some theories suggest that where there is market power, banks are encouraged to engage in relationship lending, which benefits small and risky borrowers.⁷ Other theories argue that some degree of market power can decrease a bank's incentives to engage in risky behaviour by increasing the opportunity cost of going bankrupt. Therefore, the overall objective for banking policy may be to facilitate an environment that promotes competitive behaviour while realizing that some residual market power may have certain social benefits.

So, how should competition in banking be assessed? The approaches discussed here indicate that concentration, or the number of banks, may not in itself be a good indicator of competitive behaviour. Market power can be affected by many factors, such as the branching structure of the industry, efficient legal systems, high levels of financial and economic development, low barriers to entry, and openness to foreign banks. At the very least, competition in the banking sector may not be as simple as it first appears to be.

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7. In relationship lending, banks grant credit based on established long-run relationships, rather than solely on the net present value of a particular project (e.g., Petersen and Rajan 1995).

Liquidity in the Market for Government of Canada Bonds: An Empirical Analysis

*Chris D'Souza**

A liquid financial market is one in which participants can rapidly execute large transactions with only a small impact on prices. Market liquidity contributes importantly to the efficiency of fixed-income markets. In particular, it has an impact on security prices because investors will pay a premium to hold more-liquid bonds. Around the world, government debt managers are keen to foster liquidity to minimize the cost of public funds. Liquidity is important in government bond markets because these securities are used as benchmarks for the pricing and hedging of other fixed-income securities.

From a financial system perspective, where the promotion of efficient and resilient financial markets is an objective of the Bank of Canada, one concern is the two-way causality between shocks to financial markets and sharp reductions in market liquidity. This article provides a short description of the structure of the Government of Canada fixed-income market and a summary of the results of two recent research papers that may contribute to a more complete understanding of liquidity.

The Structure of the Canadian Bond Market

The market for Government of Canada securities is the largest fixed-income market in Canada, with some \$256 billion in bonds (par value, not including Real Return Bonds) and \$117 billion in treasury bills outstanding as at the end of December 2003.¹ Average daily trading volumes for Government of Canada bonds and

bills in 2003 were \$17.5 billion and \$4.9 billion, respectively.² Like most sovereign securities markets, the market for Government of Canada securities is primarily a wholesale, institutional market, where a number of professional participants (securities dealers, pension funds, investment managers, insurance companies, and mutual funds) conduct very large trades (often in excess of \$25 or \$50 million) on a relatively infrequent basis. The market is generally described as being divided into the primary market, where Government of Canada securities are sold through auctions, and the secondary market, where transactions are either customer-dealer or interdealer in nature.

Institutional investors typically trade with securities dealers on a bilateral, over-the-counter basis. The results of these bilateral customer-dealer trades are known only to the two counterparties rather than to the entire market, thus limiting the impact of large trades on prices.³ Given the unpredictable inventory shocks that dealers face in their large trades with customers, interdealer debt markets have developed to facilitate inventory management and risk-sharing. While historically these interdealer markets were also direct and bilateral in nature, the introduction of interdealer brokers (IDBs) has significantly reduced the role of direct interdealer trading.

The current Canadian IDBs are screen-based voice brokers, which allow dealers to trade anonymously with each other. Each participant has a screen where bids, offers, and trade outcomes are posted. Participants post quotes and make trades by communicating with the broker

1. Gravelle (1999) provides a detailed discussion of the structure of the Government of Canada securities market.

* This article discusses two recently published Bank of Canada working papers (D'Souza, Gaa, and Yang 2003; D'Souza and Gaa 2004).

2. Source: Investment Dealers Association of Canada <www.ida.ca>. The data exclude repos.

3. More recently, electronic platforms have been introduced in Canada. One offers simultaneous multiple-dealer quote inquiries and trading; another offers order-driven trading.

over the telephone. The level of transparency in the IDB market was enhanced with the 20 August 2001 introduction of CanPX.⁴ CanPX is a data service that consolidates and disseminates to interested subscribers anonymous trade and quotation data submitted by Canada's fixed-income interdealer brokers.

While studies of conditions in the intraday U.S. Treasury market have told us a great deal about the U.S. government securities market (e.g., Fleming 2001), the first such examinations for Canada are addressed in D'Souza, Gaa, and Yang (2003) and D'Souza and Gaa (2004). The first paper empirically measures liquidity in the Canadian bond market, using a number of indicators proposed in the literature, and describes price and trade dynamics in the secondary market for Government of Canada bonds. The second paper analyzes how fixed-income markets in Canada provide liquidity when new information arrives in the market. Findings suggest that the Canadian brokered interdealer fixed-income market is relatively liquid, and that its liquidity dynamics are comparable to those of the U.S. Treasury market. The empirical analysis of both papers focuses on the benchmark (or "on-the-run") 2-, 5-, 10-, and 30-year Government of Canada bonds.

Measuring Liquidity

The challenge of measuring liquidity has been exacerbated by a lack of data. D'Souza, Gaa, and Yang (2003) construct and evaluate a range of indicators for activity and liquidity in the market for Canadian government bonds, using a new dataset. Bid-ask spreads, trading volume, trade frequency, quote size, trade size, and price-impact coefficients are analyzed at intraday frequencies in the interdealer-broker market. The price-impact coefficient measures how much prices adjust to reflect the information content of trades.⁵ Their results suggest that bid-

ask spreads and price-impact coefficients are the most appropriate indicators of liquidity, followed in approximate order by trade size, quote size, trading volume, and trade frequency.

The Effect of Public News Events

One important feature of government debt markets is the extent to which they are driven by public news, particularly the scheduled release of macroeconomic data. D'Souza and Gaa (2004) examine the role of public information and the relationship between activity, price volatility, and liquidity by exploring the impacts of i) Canadian and U.S. announcements of macroeconomic news, and ii) Government of Canada bond auctions. The determination of liquidity in the market for Canadian government securities is examined from an event-study perspective.⁶

It is usually argued that, given the nature of fixed-income government securities, there is little scope for insider information to affect markets. Kim and Verrecchia (1994) argue that *informed* traders possess an informational advantage after an event because of their ability to better interpret the announced information. Liquidity will remain low as long as the informed traders maintain their interpretation advantage. Traditional models of market microstructure predict that liquidity will deteriorate around the release of an anticipated announcement and will return to normal afterwards (Admati and Pfleiderer 1988; and O'Hara 1995). After the news announcement, there may be a period of abnormally high trading activity as information is processed and traders rebalance their portfolios. Volatility may also increase temporarily as investors adjust their beliefs. After an adjustment period, liquidity will revert to normal, and volatility will subside.

When macroeconomic news is announced, a two-stage adjustment process is observed in the Government of Canada securities market. This finding is consistent with the asymmetric information interpretation of market liquidity and with U.S. evidence (Fleming and Remolona 1999). In the first stage, bid-ask spreads widen in the five-minute intervals before and after an

4. Zorn (p. 39 of this *Review*) elaborates on recent discussions between regulators, academics, and market participants associated with the issue of transparency and regulation in Canadian fixed-income markets.
5. Price-impact coefficients are suggested by Kyle (1985). They measure "the rise (fall) in price that typically occurs with a buyer-initiated (seller-initiated) trade" (Fleming 2001). Price-impact coefficients can be used to characterize liquidity in financial markets since liquid markets are those that accommodate trades with the least impact on prices.

6. See MacKinlay (1997) for a survey on event-study methodology.

announcement. In an extended second stage, price volatility, quotation and trading activity, and price-impact coefficients increase to higher-than-normal levels in the time period following the release of news and the first stage, with statistically and economically significant effects persisting up to 15 minutes after the event, in some cases.

Similarly, in the half-hour following the release of the auction results, volatility, trading volumes, trade and quote frequency, and price-impact coefficients are all larger than normal as investors adjust their beliefs to information from the auction results.⁷

Overall, the results of D'Souza, Gaa, and Yang (2003) and D'Souza and Gaa (2004) are consistent with survey results for G-10 countries presented by Inoue (1999),⁸ and suggest that the Canadian fixed-income market is relatively liquid, and that it reacts to news in a manner consistent with theoretical predictions and with U.S. evidence.

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7. In Government of Canada bond auctions, dealers bid for themselves and may also submit bids for their clients. Dealer information about their client demands is private and may reflect information about the fundamental value of the security that is to be auctioned.

8. The BIS Study Group on Market Liquidity (Committee on the Global Financial System) conducted the survey, using a common questionnaire, on the structural features of 11 government securities markets: Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States. The survey was based on the understanding that the degree of market liquidity is at least partly affected by market structure.

International Cross-Listing and the Bonding Hypothesis

*Michael R. King, Bank of Canada and Dan Segal, University of Toronto**

With more than 180 listings in 2003, Canada has the largest number of cross-listed shares on U.S. stock exchanges. Canadian firms cross-list using an ordinary listing, meet all the same filing and disclosure requirements as a U.S. firm, and are subject to supervision and enforcement by the Securities and Exchange Commission. Studies of cross-listing find a positive price effect associated with this act, linked to the greater liquidity and better investor recognition of firms traded on a U.S. stock exchange. These positive effects lead to a lower cost of equity, providing a strong motivation for firms to cross-list.

Recent research suggests an alternative motivation for cross-listing that is based on investor protection. Coffee (1999) suggests that a foreign firm from a jurisdiction featuring potentially weaker investor protection can increase its valuation by bonding itself to the U.S. securities regime through cross-listing (the “bonding hypothesis”). The cross-listed firm signals its desire to respect the rights of shareholders by listing in a jurisdiction with more intense scrutiny, tougher regulation, and better enforcement. This added protection makes investors more willing to buy the shares of a foreign firm that has tied its hands in this way, thus raising its valuation. Siegel (forthcoming) qualifies this hypothesis, and concludes that bonding operates through a reputational mechanism, not through the courts. Reese and Weisbach (2002), Doidge, Karolyi, and Stulz (2004) and Doidge (forthcoming) find support for the bonding hypothesis, using cross-country data that include Canada.

This paper provides an alternative test of the bonding hypothesis using a sample of Canadian

and U.S. firms. Because bonding cannot be observed directly, researchers have designed proxies that attempt to capture this effect indirectly. Here we use a proxy for bonding based on share turnover in the U.S. market.

It is a stylized fact that cross-listing leads to an increase in trading volumes in both the domestic and foreign markets. If this increase in trading volumes is absent, then firms that incur the costs required to cross-list would not experience the benefits of a lower cost of equity and higher returns. Failure to generate significant share turnover in the U.S. market may signal that bonding has not occurred, indicating that U.S. investors do not believe that their minority rights will be respected by this firm. This hypothesis is examined here.

Methodology

The impact of cross-listing on a firm’s valuation is tested through a series of regressions, where the dependent variable is a measure of the valuation of a firm’s equity. The book-to-market ratio is used in one specification and the earnings-to-price ratio in a second specification. Explanatory variables consist of company-specific variables and a set of dummy variables that capture remaining systematic effects. Company-specific variables include firm size, profitability, cost of equity, past sales growth, share turnover, and industry membership. A dummy variable is used to identify the nationality of the firm, while a second dummy identifies whether the Canadian firm is cross-listed or not.

Given that many factors affect investor protection, some of which cannot be quantified, this study uses a dummy-variable approach to capture systematic effects of differences in investor protection indirectly through the choice of sample and the inclusion of control variables in each

* This article summarizes a recently published Bank of Canada working paper (King and Segal 2004).

regression. We examine a large sample of Canadian firms listed exclusively on the Toronto Stock Exchange (TSX), U.S. firms listed on U.S. exchanges, and Canadian firms cross-listed on both the TSX and a U.S. stock exchange over this period.

Outline of Findings

The first set of regressions compares the relative valuation of all three categories of firms. After company-specific and market-specific factors are controlled for, the results indicate that Canadian firms are valued at a discount to U.S. firms. This discount exists despite controlling for the size, profitability, cost of equity, sales growth, and industry membership of these firms. Cross-listing mitigates this discount, and leads to valuations that are closer to or on a par with U.S. firms.

The second set of regressions looks at the relative valuation of cross-listed Canadian firms and Canadian firms listed only on the TSX. The results support the general finding that cross-listed Canadian firms have a higher valuation than other Canadian firms. This result is consistent with the bonding hypothesis, because it suggests that the cross-listed firms, which are exposed to the scrutiny of the U.S. markets, have a higher valuation, despite controlling for firm size, profitability, industry membership, and growth opportunities. These regressions do not prove the bonding hypothesis, however, since the effect could be caused by other factors that are not controlled for directly in these regressions.

A key part of the cross-listing story revolves around share turnover. In line with the studies reviewed in Karolyi (1998), higher valuations are associated with greater share turnover for all firms that cross-list. This finding, however, does not say anything about the location of share turnover, which is important for stock exchanges that compete to attract the secondary trading in a firm's shares. An examination of the share turnover of cross-listed Canadian firms shows a wide divergence in where the trading in these firms actually takes place. Not all Canadian firms that cross-list attract trading on U.S. stock markets. Instead, many of these firms continue to be traded predominantly on the home market.

We argue that the relative amount of trading on the U.S. stock market is a proxy of the degree of reputational bonding to the U.S. regulatory regime, since it indicates the degree of investor confidence that shareholder rights will be respected. We split the sample of cross-listed Canadian firms into two groups based on the ratio of U.S. share turnover to Canadian share turnover, and re-estimate our regressions. The results show a different picture from previous studies of cross-listing. The cross-listed firms that attract a higher share of trading on U.S. exchanges receive an increase in valuation over and above the impact of higher share turnover. Cross-listed Canadian firms that continue to trade predominantly on the TSX do see some benefit if their overall share turnover increases. This result is consistent with previous studies of firms cross-listing on two exchanges within the same country. In some cases, however, Canadian firms cross-list in the United States but do not see an increase in share turnover. These firms are valued similarly to other non-cross-listed firms.

Conclusions

This paper attempts to identify the mechanism by which the bonding hypothesis affects valuation, and is the first to argue that bonding may be proxied by the location of share trading. Cross-listed Canadian firms that succeed in attracting share turnover in the United States realize the benefits from cross-listing in terms of an increase in valuation. When firms cross-list but continue to trade predominantly at home, these benefits are limited. These results are consistent with the bonding hypothesis that suggests that investors in U.S. markets do not value all cross-listed firms similarly, but rather reward some and withhold the benefits from others. Future research will explore why some cross-listed Canadian firms attract U.S. sponsorship while others do not.

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