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Corporate bond market interdependence: Credit spread correlation between and within U.S. and Canadian corporate bond markets

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ABSTRACT

This study investigates the correlation and interdependence between and within the U.S. and Canadian corporate bond markets. The empirical framework adopted allows credit spreads to depend on common systematic risk factors derived from structural models and incorporates dynamic conditional correlations (DCC) between spreads. Results show that there is a surprisingly weak correlation between the two markets in normal times. However, during crises, there is a sudden and strong increase in the correlation between U.S. and Canadian credit spreads. The analysis of credit spread correlation within each market also shows an unusual increase in credit spread correlations between sectors and between risk classes in the U.S. during the 2007–2009 global financial crisis. This increase persists over the post-crisis period. By contrast, in Canada, credit spread correlations between sectors remain remarkably stable over time, suggesting an interdependence of credit spreads within the Canadian market.

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1. Introduction

This study investigates credit spread[1] correlation and interdependence between and within U.S. and Canadian corporate bond markets, where interdependence is defined as a strong and stable correlation over time between the two markets in all states of the world (i.e. in normal times and during periods of shocks and post-shocks) (Forbes & Rigobon, 2002). The issue of correlation is of central importance in credit risk assessment. Correlations between asset classes or between markets are crucial inputs for portfolio and risk management and are an essential tool in portfolio and asset allocation decisions. Moreover, any unusual changes in credit spread correlation has a significant influence on the pricing and hedging of credit derivatives. These changes can lead to substantial and sudden losses and can even jeopardize the stability of the financial system.

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[1] Credit spreads are generally regarded as proxies for both changes in the probability of future default and in recovery rates (e.g. Collin-Dufresne, Goldstein, & Martin, 2001).

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The behavior of credit spread correlations in the U.S. and Canada is particularly interesting because the Canadian corporate bond market is closely linked to its U.S. counterpart (Mittoo & Zhang, 2010). Canadian investors and firms rely heavily on the U.S. bond market and, since 1993, about 48% of public Canadian debt has been issued in the U.S. Moreover, since the elimination of the Foreign Property Rule early in 2005, Maple Bonds, defined as Canadian-dollar-denominated bonds issued by foreign borrowers (mainly from the U.S.) in the domestic Canadian market, has shown particularly rapid growth. This development, combined with the geographical proximity and economic ties between the two countries, may have heightened the interdependence between financial markets and, more specifically, between corporate bond markets. Lastly, by contrast to the U.S., very few studies examine the Canadian corporate bond market because of its small size,[2] its lower liquidity[3] and the fact that it consists primarily of high-quality bonds.[4] However, the Canadian corporate bond market has become more active in recent years.[5] This increased level of activity has been accompanied by the development of new products and can lead to higher credit risk, especially during financial crises, because of the assumed close link between the Canadian and U.S. corporate bond markets.

The literature on transmission processes between financial markets has investigated two correlation mechanisms: cyclical correlation and direct or event correlation. Cyclical correlation stands for a state of ‘continuous’, ‘normal-period’ relation between markets. Kallberg, Liu, and Pasquariello (2008) and Baele and Inghelbrecht (2010) assume that cyclical correlations are due to fundamentals. On the corporate bond market, cyclical correlation refers to credit spread correlation across obligors due to systematic common factors (see, for e.g., Giesecke, 2004). A number of studies have investigated the relationship between credit spreads and the business cycle and find that credit spreads are strongly related to general macro-economic factors such as the level of default-free interest rates (see, for e.g., Duffee, 1998 or Longstaff & Schwartz, 1995). Due to their joint dependence on varying common variables, credit spreads across firms are smoothly correlated through time. In contrast, direct or event correlation is characterized by strong and sudden changes in measured market linkages. On the corporate bond market, direct or event correlation refers to how a firm’s credit spread is affected by the credit quality of other firms. As emphasized by Giesecke (2004)**,** the sudden large changes in spreads across several issuers are not independent from one another. For example, a sudden spread change in one issue, possibly due to a rating downgrade, a news announcement, or a default, can lead to a simultaneous market-wide response in spreads. Direct correlation is therefore a potential source of contagion. A recent example would be the default of Lehman Brothers and the associated immediate spread widening on debt in the U.S. and around the world. One explanation for this type of correlation is the existence of close direct ties between firms which are, generally, of legal (e.g. parent–subsidiary), financial (e.g. trade credit), or business nature (e.g. buyer–supplier). In this paper, we provide a credit spread correlation model that takes into account the two correlation mechanisms and in which we emphasize the direct ties between firms’ credit spreads.

In the credit risk literature, there are two main approaches to describe credit spread correlations: the intensity-based approach[6] and the structural approach.[7] Unlike intensity-based models, structural models provide an intuitive framework for identifying the state variables, which are the theoretical determinants of credit spread changes, and offer a prediction for whether changes in these state variables are positively or negatively correlated with changes in credit spreads. For example, Collin-Dufresne et al. (2001) identify at least four theoretical determinants of credit spreads changes, namely the risk-free rate, the slope of the yield curve rate, the market value of the firm’s assets, and the volatility of market value of the firm’s assets.

Our study focuses on the structural approach and contributes to the literature in several ways. First, our research examines credit spread correlation, which complements studies by Zhou (2001), Giesecke (2004) and Giesecke and Goldberg (2004) that focus on *default* correlations under the multi-firm structural credit model. In addition, unlike Zhou (2001), who focuses on cyclical correlation, we take, as Giesecke (2004) and Giesecke and Goldberg (2004), a comprehensive approach that examines both cyclical and direct correlations. Our investigation is motivated by prior research (see, for e.g., Collin-Dufresne et al., 2001; Giesecke, 2004 and Giesecke & Goldberg, 2004) that suggest that cyclical default correlation does not account for all credit risk dependence between firms, including credit spread correlation across firms which is a significant component of overall risk. Second, unlike Giesecke (2004) and Giesecke and Goldberg (2004), who introduce

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[2] Anderson, Parker, and Spence (2003) argue that the small issue size is a product of the small number of Canadian institutional managers and the smaller average size of assets under management. Further, the smaller asset size, combined with the regulatory constraints on a single-name exposure, limit the size of corporate bond issues that can be placed on the Canadian market at any one time.

[3] Mittoo and Zhang (2010) show that the Canadian bond market is less liquid than the U.S. market because most Canadian investors follow a buy-and-hold investment strategy. The secondary market trading of corporate bonds is thin for all corporate bonds.

[4] The Canadian high-yield bond market is still in its infancy and only accounts for about 3% of the annual corporate debt issuance in Canada.

[5] The Canadian bond market grew rapidly in the 1990 s. At the end of 2012, the outstanding amount of Canadian domestic corporate debt securities was US $200 billion, up from US$48 billion in 1990 [Bank for International Settlements, Securities statistics and syndicated loans, Table 16B (http://www.bis.org/statistics/secstats.htm)].

[6] In the intensity-based approach, correlation between credit spreads is introduced by the correlation between intensity processes (see, for e.g., Jarrow et al., 2000). This is done by allowing intensities of different firms to be driven by common variables, which reflect the observed credit spread correlation across firms as a result of the dependence on general macro-economic factors. The drawback of this approach is that event correlations cannot be captured while intensities vary smoothly. In recent papers (see, for e.g., Driessen, 2005) based on Jarrow & Yu, 2001), a stronger degree of credit spread correlation can be imposed by letting intensities experience correlated jumps. The main problem then lies in the calibration of the jump components.

[7] Structural default models are built on the original insights of Black and Scholes (1973), who demonstrate that equity and debt can be valued using contingent-claims analysis. Introduced by Merton (1974) and further investigated by, among others, Longstaff and Schwartz (1995) and Collin-Dufresne et al. (2001) structural models posit some firm value process and assume that default is triggered when firm value falls below some threshold. This default threshold is a function of the amount of debt outstanding.

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