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# Credit spread changes within switching regimes ☆

Olfa Maalaoui Chun [a,1], Georges Dionne [b,2], Pascal François [b,*]

[a] KAIST, Graduate School of Finance, 87 Hoegiro, Dongdamoongu, Seoul 130-722, South Korea
[b] HEC Montreal, 3000 Chemin de la Côte-Sainte-Catherine, Montréal, Québec H3T 2A7, Canada

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ABSTRACT

Empirical studies on credit spread determinants are predicated on the presence of a single-regime over the entire sample period and thus find limited explanatory power. A single-regime model hides the fact that explanatory variables take on different loadings across changing patterns in credit spreads. In a model with endogenous regimes for credit spreads or with monetary regimes, we find that market, default, and liquidity factors have superior explanatory power because of their interaction with the regime. Lower improvements are found when the regime is defined according to the credit supply regime or the NBER regimes (announced and official).



## 1. Introduction

We study the determinants of credit spread changes within endogenous Markov switching regimes dictating the dynamics of credit spread data. Although a large body of literature has investigated the determinants of credit spread changes, no-one has provided an empirical answer to the puzzling disconnect between the set of explanatory variables implied by the theory and fluctuations in credit spreads. Recently, several theoretical contributions developed an economic interpretation for endogenous credit spread dynamics. First, dynamic structural models such as Hackbarth et al. (2006), David (2008), Chen (2010), Bhamra et al. (2010) examine the impact of macroeconomic cycles on corporate financing decisions and credit spreads. In these models, default arises endogenously through firms' responses to macroeconomic fundamentals.[3] Specifically, Chen (2010) and Bhamra et al. (2010) propose a dynamic capital structure model that endogenizes firm's financing and default decisions over the business cycles. In addition to those models, other approaches relate monetary policy and credit

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* Corresponding author. Tel.: +1 514 340 7743; fax: +1 514 340 5632.
*E-mail addresses:* olfa.maalaoui@gmail.com (O. Maalaoui Chun), georges.dionne@hec.ca (G. Dionne), pascal.francois@hec.ca (P. François).
[1] Tel.: +82 2 958 3424; fax: +82 2 958 3180.
[2] Tel.: +1 514 340 6596; fax: +1 514 340 5019.

[3] A common feature of these models is to adopt a Merton structural form model combined with a Markov regime switching process to capture the impact of macroeconomic conditions and different states of the economic cycle on the credit risk premium. The models explain the level of credit spreads by assuming significant variation in the market price of risk over the economic cycle.

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supply effects to credit spread dynamics (Fender et al., 2012, Bhamra et al., 2011, Bernanke and Gertler, 1989, Kiyotaki and Moore, 1997).

These theoretical contributions call for a re-examination of credit spread determinants within an endogenously defined switching regime framework. We find that the role of explanatory variables in explaining credit spread changes is significantly enhanced when accounting for endogenously determined switching regimes. In contrast to a single regime model, where the coefficients of the explanatory variables are constant across time, a switching regime model allows for distinct effects across different regimes. This turns out to be an important modeling insight as some determinants have their effect strengthened, weakened or even reversed as we switch across regimes. These changing effects cannot be captured by a single regime model, which explains the limited power of the explanatory variables. By allowing for differential effects across different regimes, our model provides an intuitive and economically meaningful answer to the credit spread puzzle.

Collin-Dufresne et al. (2001, hereafter CGMs), consider a large class of default and non-default credit spread determinants, which according to theory, could affect credit spread changes.[4] However, their model captures only 25% of the variation in credit spread changes. A principal component analysis applied to the regression residuals shows that most of the changes in credit spreads can be explained by a common systematic factor, yet this systematic factor is only partially linked to business climate indicators and macroeconomic variables. Our research extends the work of CGM by allowing for a switching regime structure in the dynamics of credit spreads. It models credit spread regimes endogenously, in contrast to existing regime switching models that construct regimes based on macroeconomic fundamentals. Following Hamilton (1990), we model monthly changes in the level of credit spread as deriving from two endogenous regimes corresponding to episodes of high (high regime) and low (low regime) credit spreads. Our research also extends the contribution of Davies (2004) who finds that allowing for different volatility regimes enhances the explanatory power of economic determinants of credit spreads (see also Alexander and Kaeck, 2007, Davies, 2007).

We find that many key determinants have an altered effect on credit spread variations in high regimes relative to low regimes. Specifically, some variables have stronger effects, weaker effects or even opposite effects when switching from one regime to another. On a related note, the empirical works of Morris et al. (1998) and Bevan and Garzarelli (2000) suggest a positive relation between risk-free rates and credit spreads, whereas CGM, among others, find a negative effect consistent with the prediction of structural models. Thus, the regime-based effect of variables on credit spreads may be averaged out within a single regime model, thus limiting the overall explanatory power of these variables. By accounting for differing effects across regimes, a regime-based model reflects hidden effects on the background of the single regime model, thus enhancing the explanatory power of the well-known credit spread determinants.

Theoretical and empirical contributions have suggested that credit spread cycles can be driven by other regimes than macroeconomic regimes. Specifically, Bhamra et al. (2011) and Fender et al. (2012) point towards monetary effects affecting the dynamics of credit spreads, whereas Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) advocate for the role of credit supply shortage as the trigger for persistent shocks on credit spreads. In line with these contributions, we further analyze the effect of credit spread determinants by conditioning on a monetary regime (proxied by the Fed fund rate) and on a credit supply regime (proxied by the Senior Loan Officer survey data). Consequently, we also analyze the effect of credit spread determinants by contrasting the regime specification based on the endogenous credit spreads with other regime specifications obtained by conditioning on the economic cycle (official and announced), the monetary cycle, and the credit supply cycle. We find that the explanatory power of the key credit spread determinants improves when we condition on either the economic cycle or the credit supply cycle: across ratings, the average adjusted R-squared of regressions shifts from 26% (no regime) to 42% (official economic cycle) and to 37% (credit supply cycle). The explanatory power improves even more when we condition on the endogenous credit spread regimes or on the monetary regimes (with average adjusted R-squared of 45% and 44%, respectively). Similar results are obtained with aggregate credit spreads with adjusted R-squared of 52% and 53% for the endogenous credit regime and the monetary regime, respectively.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 documents the regime patterns of credit spreads. Section 4 describes the credit spread determinants considered in this study. Section 5 is devoted to the Markov switching regime model and to the different cycle specifications used to characterize regime effects. Section 6 presents the empirical results. Section 7 discusses robustness tests. Section 8 concludes the paper. The Appendix provides a description of explanatory variables, and results of an analysis on an aggregate sample.

## 2. Data

### 2.1. Transaction prices

The National Association of Insurance Commissioners database (NAIC) provides transaction (rather than quoted) price data for U.S. corporate bonds. The database reports trades made since 1994 by American insurance companies, which are major investors in corporate bond markets. Three types of insurers report their trades in the NAIC database: Life insurance companies, Property and Casualty insurance companies, and Health Maintenance Organizations. The database accurately reflects trading activity in the bond market from 1994 onwards. Our sample period spans January 1994 to January 2011.[5]

### 2.2. Bond characteristics

Characteristics of corporate bonds are obtained from the Fixed Investment Securities Database (FISD). The FISD database, provided by LJS Global Information Systems Inc., includes descriptive information about U.S. issues and issuers (bond characteristics, industry type, characteristics of embedded options, historical credit ratings, default events, auction details, etc.). Our sample is restricted to fixed-rate U.S. dollar bonds in the industrial sector. We exclude bonds with embedded options such as callable, putable or convertible bonds. We also exclude bonds with remaining time-to-maturity below 1 year. With very short maturities, small price measurement errors lead to large yield deviations, making credit spread estimates noisy. Finally, we exclude bonds with over-allotment options, asset-backed and credit enhancement features and bonds associated with a pledge security. Issuers' credit ratings are reported by four rating agencies: Fitch, Duff and Phelps,

[4] Examples of similar studies investigating the ability of non-default risk factors (such as market, liquidity and firm-specific factors) to explain credit spread changes include Elton et al. (2001), Campbell and Taksler (2003), Huang and Kong (2003), Davydenko and Strebulaev (2004), Driessen (2005), Longstaff et al. (2005), Han and Zhou (2008), Dick-Nielsen et al. (2012).

[5] We clean the data from duplicates and double entries. Specifically, when a transaction involves two insurance companies on the buy and sell side, it is reported twice in the database. In this case, we include in our sample one transaction side only.