



Credit default swap spreads and variance risk premia



Hao Wang^{a,*}, Hao Zhou^{b,1}, Yi Zhou^{c,2}

^a Tsinghua University, School of Economics and Management, 318 Weilun Building, Beijing 100084, China

^b Tsinghua University, PBC School of Finance, 43 Chengfu Road, Haidian District, Beijing 100083, China

^c Florida State University, Department of Finance, College of Business, Rovetta Business Bldg, 353, 821 Academic Way, P.O. Box 3061110, Tallahassee, FL 32306-1110, USA

ARTICLE INFO

Article history:

Received 20 April 2012

Accepted 9 February 2013

Available online 14 March 2013

JEL classification:

G12

G13

G14

Keywords:

Variance risk premia

Credit default swap spreads

Option-implied variance

Expected variance

Realized variance

ABSTRACT

We find that the firm-level variance risk premium has a prominent explanatory power for credit spreads in the presence of market- and firm-level control variables established in the existing literature. Such predictability complements that of the leading state variable—the leverage ratio—and strengthens significantly with a lower firm credit rating, longer credit contract maturity, and model-free implied variance. We provide further evidence that (1) the variance risk premium has a cleaner systematic component than implied variance or expected variance, (2) the cross-section of firms' variance risk premia capture systematic variance risk in a stronger way than firms' equity returns in capturing market return risk, and (3) a structural model with stochastic volatility can reproduce the predictability pattern of variance risk premia for credit spreads.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

It has long been recognized in the literature that a critical component of systematic economic risk may be missing in credit risk modeling (Jones et al., 1984; Elton et al., 2001; Collin-Dufresne et al., 2001; Huang et al., 2003), which is the main cause of the so-called credit spread puzzle. The relatively larger spikes of high

investment-grade credit spreads than speculative-grade during the recent financial crisis highlight a possible systematic shock that tends to explain the low-frequency cyclical movements of credit spreads. In this paper, we try to explain individual firms' credit spreads by the variance risk premium (hereafter, VRP) and relate the VRP component of the credit spread to the exposure to systematic variance or economic uncertainty risk (Bollerslev et al., 2009; Drechsler and Yaron, 2011).

VRP is defined as the difference between expected variance under the risk-neutral measure and expected variance under the objective measure (see among others Britten-Jones and Neuberger, 2000; Jiang and Tian, 2005; Carr and Wu, 2008). Theoretically, the variance risk premium isolates only firms' exposure to systematic variance risk that must be priced in all risky assets since, by construction, the risk-neutral and objective expectations of firms' idiosyncratic variance risk cancel out with each other. Empirically, we estimate VRP as the difference between the model-free option-implied variance and the expected variance based on the realized measures estimated from high-frequency equity return data.

We present robust evidence that firm-level VRP is the most prominent predictor for credit default swap (CDS) spread variations relative to the other macroeconomic and firm-specific credit risk determinants identified in the existing literature: VRP by itself predicts 29% of credit default spread variation. This finding echoes the recent studies that recognize the linkage among

* We would like to thank Turan Bali, Antje Berndt, Michael Brennan, Darrell Duffie, Robert Geske, Bing Han, Jean Helwege, Robert Jarrow, George Jiang, George Tauchen, Marliese Uhrig-Homburg, Jan Werner, Yelena Larkin, Liuren Wu, Yuhang Xing, and Hong Yan; seminar participants at Tsinghua University, the University of Texas at Dallas, the University of South Carolina, Baruch College, and Shanghai University of Finance and Economics; and conference participants at FDIC Derivatives and Risk Management, the Financial Intermediation Research Society, the China International Conference in Finance, the European Finance Association, the Financial Management Association, and the American Finance Association annual meetings for helpful discussions. We also thank Ellen Levy for editing assistance. The authors acknowledge funding support from the Global Association of Risk Professionals, the Centre for Hedge Fund Research at Imperial College London, the Specialized Research Fund for the Doctoral Program of Higher Education of China (Grant No. 20090002120025), and the National Natural Science Foundation of China (Grant No. 71272023).

* Corresponding author. Tel.: +86 10 62797482.

E-mail addresses: wanghao@sem.tsinghua.edu.cn (H. Wang), zhouh@pbcfs.tsinghua.edu.cn (H. Zhou), yizhou@cob.fsu.edu (Y. Zhou).

¹ Tel.: +86 10 62790655.

² Tel.: +1 850 644 7865.

macroeconomic conditions, the equity risk premium, and credit risk pricing (see, e.g., David, 2008; Bhamra et al., 2009; Chen et al., 2009; Chen, 2010), but our paper focuses on providing cross-sectional evidence of individual firms. We also find that VRP complements the leverage ratio, which has been shown as a leading explanatory variable for credit spreads (Collin-Dufresne and Goldstein, 2001). Importantly, this firm-level VRP measure crowds out the popular market VRP (or VIX) measure that has been shown as a strong predictor for aggregate credit spread indices (Zhou, 2009; Buraschi et al., 2009). Such predictive power turns out to be greater for speculative-grade credit spreads, longer CDS contract maturities, and VRPs constructed from model-free option-implied variances.

The 2007–2008 sub-prime credit crisis changed substantially the landscape of the CDS markets. We examine the consistency of the predictability of VRP on CDS spreads before and after the crisis. During both periods, VRP positively and significantly predicts subsequent CDS spreads. Interestingly, the S&P 500 return, the aggregate credit price index, and the fixed income market illiquidity measure switch to be significant in predicting firm CDS spreads after the crisis, suggesting contagion in financial markets and that the increase in the perceived systemic risk was mainly driven by the heightened risk aversion and liquidity squeeze (Longstaff, 2010; Huang et al., 2012).

Previous research suggests that implied variance is informatively more efficient than realized variance in predicting credit spreads (Cao et al., 2010; Berndt et al., 2006; Carr and Wu, 2010). However, by decomposing the implied variance into VRP and expected variance, we find that VRP can substitute for most of the explaining power of implied variance, especially for lower frequencies of monthly and quarterly horizons relative to weekly. We also present evidence that the first principle component of VRP across all firms explains 79% of the total variation, while that of implied variance only explains 58% and expected variance only 65%. Finally, we show that, at the aggregate level, VRP Granger causes implied and expected variances, but not vice versa. These additional findings imply that VRP may be an ideal measure of firms' exposures to a systematic variance risk factor, and the economic interpretation of implied variance in explaining credit spreads could largely rely on VRPs that are exposed to such a macroeconomic uncertainty risk.

To further corroborate the interpretation that firm VRPs are exposed to systematic uncertainty risk, we provide two additional justifications. In the first exercise, we run a two-pass regression of individual firms' VRPs on the market VRP. The second-stage cross-sectional regression obtains an R^2 of 9%. In contrast, a similar exercise with firm equity returns obtains an R^2 of 4%. These results suggest that the cross-section of firms' variance risk premia is able to capture systematic risk factor(s) in a stronger way than firm equity returns in the CAPM framework. In another exercise, we simulate from a structural model with stochastic volatility and find that VRP can indeed provide additional explanatory power for a representative firm's credit spreads, even with the control of a true leverage ratio. On the contrary, the Merton model without stochastic volatility cannot reproduce such a stylized pattern found in our empirical exercise.

Our work is related to recent efforts to explain individual firms' credit spreads from several innovative angles. Campbell and Taksler (2003) find that increases in bond spreads can be explained by the upward trend in idiosyncratic equity volatility. Cremers et al. (2008) rely on an option-implied jump risk measure to interpret the cross-sectional variations in default risk premiums. Ericsson et al. (2004) and Ericsson et al. (2006) exploit credit derivatives in explaining credit spreads and evaluating structural models. In particular, Cao et al. (2010) document that volatility risk premia (volatility-based VRPs) strongly covary with the CDS spreads. Our

study shares the same spirit as theirs in terms of risk-based explanations and finds consistent results. We, however, emphasize using VRP as a novel tool to isolate the firm's exposure to systematic variance risk from its idiosyncratic counterpart. We further demonstrate the consistency of VRP's predictive power before and after the sub-prime credit crisis. Importantly, we document that the cross section of firms' variance risk premia capture systematic variance risk in a stronger way than firms' equity returns in capturing market return risk in the CAPM framework. Thus, our finding provides an economic interpretation for the superior predictive power of implied variance on credit spread and points to a clear direction for improving the structural credit risk modeling—by incorporating a systematic variance risk factor.

The rest of the paper will be organized as follows: Section 2 introduces the variance risk premium measure and our empirical methodology, and it is followed by a description of data sources and summary statistics in Section 3, Section 4 then presents empirical findings of variance risk premiums with respect to predicting credit spreads and discusses some economic interpretations, and Section 5 concludes.

2. Variance risk premia and empirical methodology

In this section, we introduce the concept of VRP for individual firms, following the recent literature in defining the market VRP as a difference between the model-free implied variance and the forecasted realized variance. Then we outline our empirical strategy for explaining the CDS spreads of individual firms, using such a firm-specific VRP variable, together with other established market and firm control variables—noticeably the firm leverage ratio and the risk-free rate.

2.1. Constructing the VRP measure for individual firms

To construct the benchmark measure of firm VRP, we compute the model-free implied variances from the OptionMetrics data of the individual firms' equity option prices and the forecasted realized variances from high-frequency stock returns of individual companies.

Following Britten-Jones and Neuberger (2000), we apply the Cox et al. (1979), or CRR, binomial lattice model to translate the OptionMetrics prices of American call options of different maturities and moneyness into implied volatilities. By fitting a smooth cubic splines function to the implied volatilities, we compute the term structure of implied volatilities at various strikes for call options of T -maturity. Then, the term structure of implied volatilities are translated back into the term structure of call prices at various strikes using the CRR model. Note that such a procedure is not model-dependent, as the CRR model serves merely as a mapping device between option prices and implied volatilities (Jiang and Tian, 2005).

With the term structure of call option prices, we compute risk-neutral or model-free implied variance by summing the following functional form over a spectrum of densely populated strike prices:

$$\begin{aligned} IV_{i,t} &\equiv E_t^Q[\text{Variance}_i(t, t+T)] \\ &\equiv 2 \int_0^\infty \frac{C_i(t+T, K)/B(t, t+T) - \max[0, S_{i,t}/B(t, t+T) - K]}{K^2} dK, \end{aligned} \quad (1)$$

where $S_{i,t}$ denotes the stock price of firm i at time t . $C_i(t+T, K)$ denotes the option price of a call option maturing at time T at a strike price K . $B(t, t+T)$ denotes the present value of a zero-coupon bond that pays off one dollar at time $t+T$. This way of calculating

Download English Version:

<https://daneshyari.com/en/article/5089206>

Download Persian Version:

<https://daneshyari.com/article/5089206>

[Daneshyari.com](https://daneshyari.com)