Modeling Credit Spreads Using Nonlinear Regression

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TriSolutions

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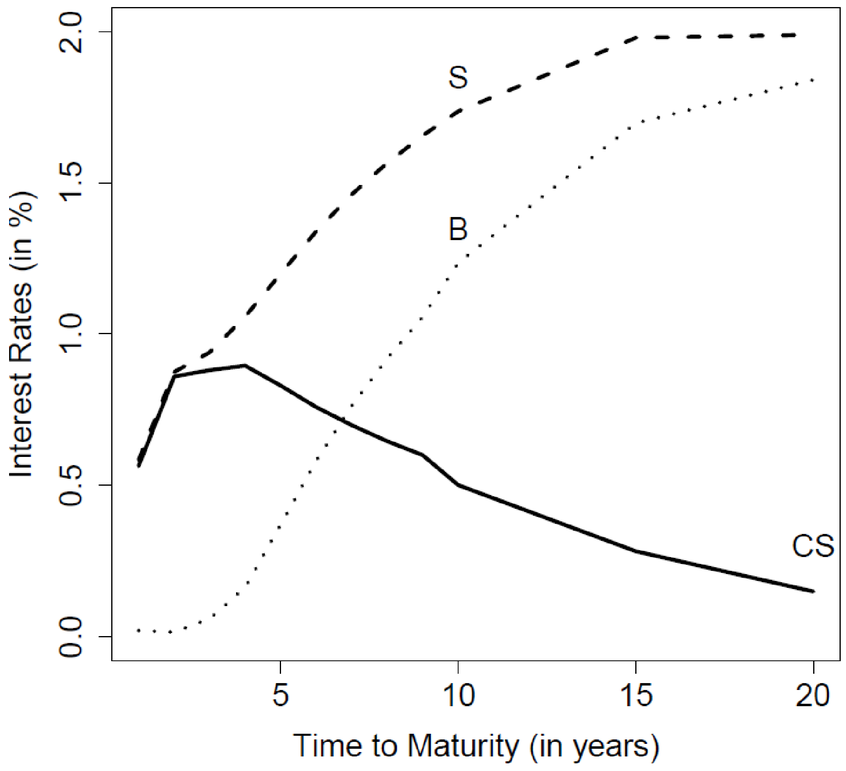


We study the historical development of the credit spread curves, and are interested in forecasting future movements of credit spreads. In economic sciences, credit spreads represent the premium paid for specific risks embedded in a bond. The existing methods used in the banking industry proved unsatisfactory in times of financial crisis, as the relationship between issuer and reference curves has changed.

We model the credit spread curve by a nonlinear parametric function with several parameters, as the complexity of the parametric curve can be reduced to a small number of parameters so that changing patterns of the curve structure can be understood in terms of changes in these parameters. Also, each nonlinear parametric curve may be summarized by its parameter estimates as a single low-dimensional multivariate observation, which then may be subject to a regression or a correlation analysis.

The following model which describes the structure of credit spreads y_i for given times to maturity $x = (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20)$ is studied:

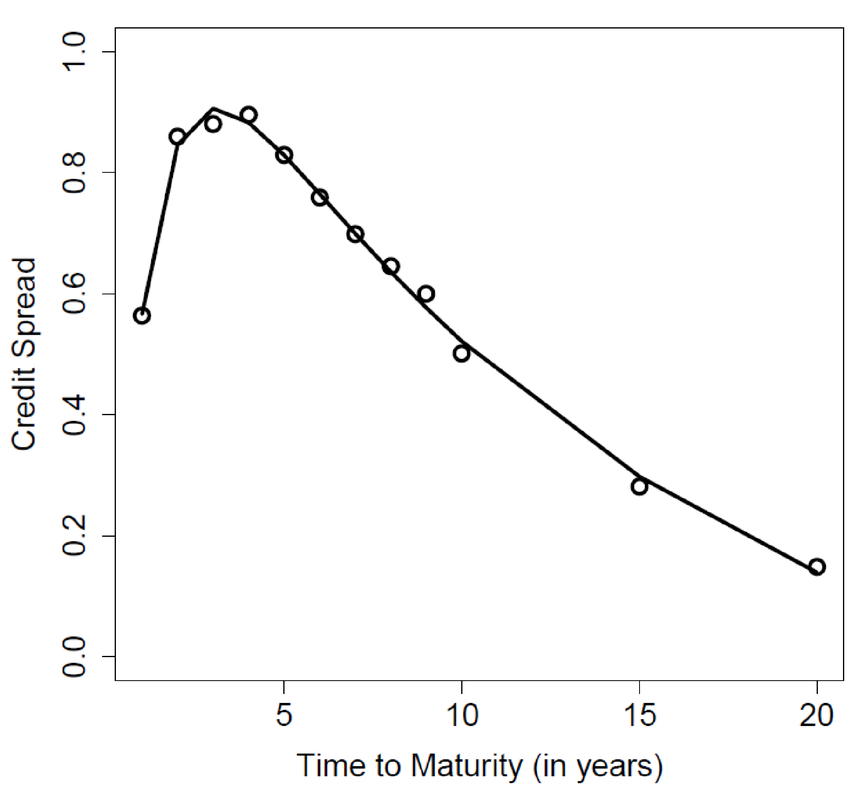
$$y_i = y(x_j) + \varepsilon_i,$$

and $\varepsilon_i \sim \mathcal{F}(0, \sigma^2)$ are error terms with zero mean and constant variance.

The generalization of the log-logistic regression, the so-called Brain-Cousens model is proposed to model the curve:

$$y(x_j) = c + \frac{d + f\,x_j - c}{1 + \exp(b\,[\ln(x_j) - \ln(e)])}$$

The starting values for the iteration necessary to calculate the least squares estimates of parameters are obtained either by using the parameter estimates of the previous day or by generating random starting values.



Conclusions

We study the term structure of credit spreads with an aim to predict their future movements. We suggest a completely new approach to tackle this problem, and utilize the Brain-Cousens nonlinear regression model with five parameters to describe the term structure of credit spreads. Random starting values are introduced in order to obtain convergence of parameter estimates also in cases when the behavior of credit spreads changes dramatically. Eventually, the dependence of the parameter values and given microeconomic factors over time is to be analyzed.

References

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Schlecker, M. (2009) Credit Spreads Einflussfaktoren, Berechnung und langfristige Gleichgewichtsmodellierung. Lohmar/Koeln: Eul Verlag.