

Research-projects Rüdiger Frey for VGSF

My research projects in the next three years can be grouped under the broad theme of credit risk modeling under partial information, where credit risk is broadly defined and includes also sovereign risk and systemic risk. Within that theme I have the following specific projects.

1. Structural credit risk models with noisy asset information and applications

The project is concerned with structural credit risk models with incomplete information of the asset value. The setup is a generalization of the well-known Duffie-Lando (2001) paper. Recent work of the applicant (see Frey-Schmidt (2009)) has shown that in this context the pricing of typical corporate securities such as equity or corporate leads to a non-standard stochastic filtering problem. This filtering problem has been solved in a recent working paper (Frey-Lu (2012)), opening the door for the analysis of many interesting economic problems. To begin with we plan to test the model empirically, before and during the financial crisis. Moreover, we intend to study the pricing of contingent convertible bonds in the proposed incomplete-information setup. These are bonds that are automatically converted into equity once certain accounting-triggers related to the value of the firm's assets are reached. A major challenge in the pricing of contingent convertible bonds is the fact that the accounting triggers are not directly observable for most market participants. A model where the asset value of a given firm is not directly observable is thus a natural framework to study this issue. Moreover, we will consider the dynamic hedging of these securities by dynamic trading in stock and bonds. Finally, it is interesting to generalize the model to a multi-firm setting and to study value adjustments for counterparty risk for equity and credit derivatives. .

References

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Frey, R., and T. Schmidt (2009), Pricing corporate securities with noisy asset information, *Mathematical Finance* 19, 403-421.

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2. Analysis of Sovereign Credit Spreads (possibly joint with Zehra Eksi)

Sovereign credit spread modeling has attracted a lot of attention after the financial crisis of 2008. We will consider the modeling of sovereign credit spread dynamics in a partial-information setting where the default intensity of sovereigns is driven by an unobservable factor process representing the state of the economy. This setup has a number of advantages: first it allows for the simultaneous modeling of real world and risk-neutral default intensities; second when considered in a multi-country setting, it potentially allows for measuring the contagion in the sovereign debt markets; finally, in a reduced-form framework it might be possible to use techniques from corporate credit risk for the modeling of sovereign risk. Note that, in general it is not possible to use a structural corporate credit risk model directly for sovereign credit risk as the underlying economic and legal principles differ.

The factor process will be modeled as a finite-state Markov chain. In this way it is possible to estimate the parameters of the model and in particular the generator matrix of the factor process using the well-known EM methodology (Elliott(1993), Elliot and Krishnamurty (1997)). The generator matrix of the factor process gives in particular information on the amount of default contagion between different sovereigns. On the methodological side this project involves an extension of the EM methodology to models with diffusive and point-process observations, where the point process information represents the default history of the sovereigns considered; here we will use earlier results of Frey and Schmidt (2012). In the empirical application we will concentrate mostly on the Eurozone countries. It will be interesting to compare our approach to other results in the literature such as Arce-et-al (2013). In the medium term we also plan to study implications of the estimation results for the risk-management of sovereign bond portfolios.

References

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