



Comment on ‘Swap Pricing with Two-Sided Default Risk in a Rating-Based Model’

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There is a large body of theoretical literature focusing on the valuation of defaultable securities. In particular, the analysis of swaps represents one of the most complex issues for three main reasons. First, the fact that the swap can be an asset as well as a liability for each party entails that default risk is of interest on both sides of the swap. Therefore, models of one-sided default risk such as Cooper and Mello (1991) or Li (1999) cannot be generalized. Second, the most used swap settlement rule in case of default of one counterparty, called the “full two-way payment rule” (ISDA, 1992) introduces an asymmetry in the treatment of default, because the swap is unfolded through a fractional payment of its marked-to-market value only if its value is negative for the defaulting party. Finally, the particular structure of the cash flows of a swap does not make it similar to an mere exchange of loans as only net exchange payments are physically exchanged and are defaultable.

The pathbreaking contribution by Duffie and Huang (1996), who adapt a credit risk framework developed in Duffie and Singleton (1999) to the pricing of swaps, is remarkable in that it proposes an appealing valuation framework under reasonable assumptions but at the same time exhibits dramatic limitations due to the aforementioned difficulties. Their main analytical output, summarized in equations (5) and (6) in this paper, is hardly usable for a complete sensitivity analysis.

The research performed by Huge and Lando extends this stream of research by proposing two major improvements with respect to Duffie and Huang’s (1996) paper. First, the authors adapt a rating-based bond pricing model developed by Lando (1997, 1998), which is essentially a one-sided credit risk framework using a Markov chain, to the swap pricing issue. The second improvement is computational: the paper uses the ADI algorithm in order to speed up the numerical solution of the pricing problem. This method is particularly suited to the stated problem, as it simplifies the implementation of the well-known implicit finite difference method through the alternative use of the Markov chain and the interest rate process as the implicit variable for each step.

When working upstream and downstream from Duffie and Huang (1996), the swap pricing model is considerably enriched and deepened. Its main financial output is the modulation of the evidence shown by Duffie and Huang that the impact of credit risk on interest rate swaps is rather weak. Beyond such a rather expected numerical confirmation of this pure theoretical statement (since they use the same model, this is just a validation exercise), the paper manages to dissect the spread in several ways. In particular, the specification of a credit rating transition process enables the authors to determine that even symmetric credit risk, measured through the same credit rating, produces non-zero swap spreads. More generally, the paper explicitly shows that the specification of the transitions generator yields asymmetric swap spread formation depending on who pays fixed and who pays floating. Such findings look promising, even though the size of the spreads under study is all but large.

Actually, the paper could have been designed along two very different directions. On one hand, the authors could have tried to use valuable numerical tools in order to discuss the valuation of defaultable swaps in a larger scope than the line suggested by Duffie and Huang (1996). On the other hand, the paper could be focused on the application of an algorithm which proves to be particularly powerful and parsimonious for the solution of the complex and sensible problem involved in the valuation of swaps. Obviously, the second alternative has been favored by the authors, which explains why the paper can be considered as a value-adding enrichment of Duffie and Huang.

But it can be highly interesting to adopt a broader approach instead. There are three main reasons why the subject is well suited to such a treatment.

The first reason is related to the body of empirical research surrounding this topic. The authors claim that the study by Sun, Sundaresan and Wang (1993) does not show any significant difference in the midpoint prices charged for identical swap contracts negotiated between counterparties with different credit qualities. Yet, this same study finds that bid-ask spreads are sensitive to credit qualities and, overall, that the risk of default seems to impact swap transactions even though its measurement is hard to perform. More recent research like in Cossin and Pirotte (1997) and Minton (1997) also documents a significant, although not dominant pricing of default risk in swaps. One of the drawbacks of the Duffie and Huang (1996) approach is its relative inconsistency with empirical evidence. The issue of the size of the risk premium is still controversial today, and the approach taken in the paper has the potential to address this issue. It could have been interesting to compare the outputs of the Duffie and Huang model with the ones that could have been obtained using a similar parametrization from the Hübner (2000) approach, which starts from a different set of assumptions and has the potential to obtain a larger range of spread values. Let alone the size of the spreads, but also their sensitivity with different sources of credit risk asymmetries could be matched, which could in turn be related to the quoted studies.

The second way a broader view could be helpful is when one wants to explore other determinants of default. The assumption of homogenous credit quality within each rating is fortunately well adapted to the kind of analysis performed in the paper. However, one has to be aware that the choice of not taking into account more heterogeneity in credit ratings is extremely sensible when it turns to the implementation of an empirical study: since swaps are OTC products, idiosyncratic default risk becomes a major factor in the assessment of the spread to be charged to the swap. In particular, the counterparties might be lead to default strategically, i.e. make the event of default contingent on the current value of the swap if the other counterparty becomes too risky and if market conditions are still favorable. The introduction of an issuer-specific and/or a contract-specific component could eventually show that swaps exhibit a hidden default spread even for parties which exhibit symmetric credit ratings.

Finally, the specialization to interest-rate swaps obviously corresponds to the purpose of the ADI method. When one considers plain-vanilla currency swaps, a third state variable appears in the picture. Nothing prevents the algorithm from being adapted to the presence of more than two variables, even though the method would become computationally more intensive and would presumably involve a numerical innovation. The study of currency swaps is not just another application of the method: it serves the purpose of understanding credit risk too because of the exchange of principals that takes place at the end of the contract. The size of the default spread is necessarily larger, which eases the analysis of its sensitivity with respect to the sources of credit risk asymmetry. Furthermore, the presence of a new source of currency risk opens the way to another important component of the spread, due to the correlation between credit quality and the level of the exchange rate, as documented by Hübner (2000). Another question, even more closely related to the contents of this paper, is the consequence of relying upon the "limited two-way payment rule", yielding a perfect symmetry of exposures, instead of the most common system of "full two-way payment rule" studied by the authors.

These suggestions go far beyond the paper, mainly because they take another view. One big merit of this article is to propose tools for providing useful extensions of the Duffie and Huang (1996). Since Huge and Lando have thoroughly explored the longitudinal applications of the model, they would most usefully keep on contributing to this exciting stream of research by focusing on its transversal dimensions.

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