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Credit rating impact on CDO evaluation

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ABSTRACT

One of the most significant developments in international credit markets in recent years has been the trade in Collateralized Debt Obligations (CDO), which has enabled financial institutions to repackage the credit risk of an asset portfolio into tranches to be transferred to investors. The present paper evaluates the credit risk of such a portfolio and the related tranches by applying two prominent prototypes for credit ratings, namely the point-in-time and through-the-cycle approach. The central parameters default probability and correlation are forecast for multiple years and related forecasting errors are included. The article's main findings are that banks which transfer debt tranches but retain an equity part and apply a through-the-cycle rating approach may be exposed to higher insolvency risk. Firstly, the credit risk retained may be underestimated resulting in an inadequate capital allocation. Secondly, the credit risk transferred may be overestimated resulting in additional risk-based transfer costs.

1. Introduction[2]

One of the most significant developments in international credit markets in recent years has been the trade in Collateralized Debt Obligations (CDOs). CDOs repackage the credit risk of a portfolio into tranches and transfer it to investors. Due to the trade of portfolio characteristics, not only a single entity's risk

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characteristics (e.g. the probability of default), but also correlation modeling of the underlying portfolio is of crucial importance for the accurate pricing of CDOs.

In the CDO related literature we see two major streams. One stream is concerned with modelling and estimation of the risk characteristics of a bank portfolio. Here, the focus is on individual risk parameters, such as default probabilities, loss rates given default and exposures at default, and on dependence parameters such as correlations or more general copulas. See e.g. Shumway (2001) or Crouhy, Galai, and Mark (2001) for methods of bankruptcy prediction and Gordy (2000) and Gordy (2003) for an alternative concept of portfolio credit risk modelling.

The second stream of the literature focuses on the pricing of CDOs where the central issue is to identify assumptions which provide accurate explanations for observed CDO spreads. These approaches use a risk-neutral pricing framework, develop pricing techniques and fit alternative models to market spreads. Recent papers of this direction include Laurent and Gregory (2005) and Hull and White (2004).

In the financial community, a lively discussion exists on how to assess the credit risk of portfolios. Two prominent prototypes for credit ratings are point-in-time (PIT) and through-the-cycle (TTC). The former approach assesses a borrower's credit risk by using all current information about the credit cycle (and is mainly employed by banks) while the latter evaluates credit risk by abstracting from the macroeconomic environment (and is mainly employed by credit rating agencies), for a discussion see Crouhy et al. (2001) among others. Recently, primarily in the context of the new capital standards for banks (Basel II, Basel Committee for Banking Supervision, 2004) some authors analysed effects of both rating types with respect to cyclicality of resulting risk assessments and bank capital, see e.g. Nickell, Perraudin and Varotto (2000), Rösch (2005), Rösch and Scheule (2005), or Heitfield (2005) who suggests formal definitions of both schemes. Here, we want to continue the discussion and analyse the effect of using alternative rating systems for assessment of portfolio risks and tranches thereof. We ask from the viewpoint of a bank which uses one of two rating systems, how the implied credit spreads of the CDO tranches differ by following either rating philosophy and what the implications are. We refer to 'implied spreads' as spreads which reflect the risk characteristics of the underlying portfolio and are derived by using a simple evaluation framework. A special focus in contrasting the rating philosophies will be on the problem of forecasting future portfolio risk characteristics. Often, the underlying portfolios have maturities of multiple years and portfolio risk has to be forecast for long time horizons. We will analyse how both rating approaches perform in a forward-looking application and additionally include forecasting errors.

The rest of the paper proceeds as follows. Section 2 contains a brief summary on CDO mechanics. Section 3 presents different credit rating models. Section 4 contains the results without forecasting risk. Section 5 considers forecasting risk and Section 6 provides the discussion of the results and economic implications.

2. CDO mechanics at a glance

CDOs are a type of multi-name credit derivatives. A portfolio of defaultable instruments is tranched into loss bearing pieces. Via these tranches the credit risk is sold to investors, who in turn obtain an agreed periodic payment. Each tranche is defined by a lower and an upper attachment point K_l and K_u, measured in percent of portfolio loss (compare Elizalde, 2005). Buyers of a tranche with lower attachment point K_l and upper attachment point K_u are exposed to losses which exceed K_l up to K_u. The losses suffered by the holders of a tranche are therefore limited to K_l-K_u. The tranches might exemplarily be structured as in Table 1, which uses the lower and upper attachment points in reference to the Dow Jones CDX NA IG tranches.

Consider a portfolio with value V on which a CDO is originated at the beginning of time (year) t with maturity T (years). Let L_τ denote the percentage portfolio loss at time (year) τ and $l_\tau=\sum_{s=t}^{\tau} L_S$ the total percentage loss up to year τ. The loss suffered by the holders of tranche j of the CDO up to year τ is then

$$l_{j,\tau}=\min\{l_\tau, K_{j,U}\}-\min\{l_\tau, K_{j,L}\} \tag{1}$$

where $K_{j,U}$ and $K_{j,L}$ are the upper and lower attachment points of tranche j. The losses are paid by the tranche holders with a predetermined frequency η in years. Then the payment of the holders of tranche j at time $\tau+\eta$ is the fraction $l_{j,\tau+\eta}-l_{j,\tau}$ of total portfolio value.