AN ACTUARIAL MODEL FOR LOSS GIVEN DEFAULT ESTIMATION
VIA SEMI-MARKOV PROCESS

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According to Basel II (Revised International Capital Framework), banks have to hold adequate capital to cover losses resulting from specific sources of risk, among them credit risk. Credit risk refers to the possibility of a loss occurring due to counterparty failure, against that, the bank has taken credit exposure. The minimum amount of capital that banks should hold against credit risk can be calculated using a standardized approach - based on assessments developed by external Rating Agencies and approved by Authority – or using a Internal Rating Based (IRB) approach - based on the use of an internal rating system. In this framework a strategic variable is the Loss Given Default (LGD), which quantifies the loss which is subject to a credit institute in case of counterparty default, usually referred to any exposure of bank’s client; LGD can also be interpreted as the complement to one of the recovery rate. The aim of this paper is to illustrate an actuarial model for LGD estimation in a IRB approach – i.e. based on a credit institute’s database – by means of a semi-markov approach to describe the recovery process. In fact, creditor’s recovery process can be represented as a multistate model with a finite number of states, where each state corresponds to a possible step of the recovery process. Unlike classical Markov models, the proposed methodology joins the multistate model with a semi-markov probabilistic structure, in which the transition probabilities among states take into account, not only the status previously occupied, as in Markov models, but also the permanence time in the last visited state. The semi-Markov models are an evolution of Markov processes as integrate the information on time spent in the most recent visited state. The semi-Markov model captures a large amount of information, so it seems more adequate for the problem to be treated. In fact, in financial sense, recovery rate is the present value of the cash flows associated with different steps of recovery process, until the settlement, for any unit of exposure. Therefore, to quantify the loss incurred by the creditor, a key variable is the time required to settle each recovery step. Once defined the probabilistic structure, the estimation of LGD needs to define cash flows – usually called rewards - associated with each system state, making a distinction between the rewards associated with permanence in a state and those associated with transitions among different states. When a set of rewards are defined, it is possible to determine LGD on t periods; this measure can be extended to the entire portfolio of outstanding loans, obtaining the Total Loss Given Default (TLGD). Finally it is proposed an application of the model to estimate semi-markov transition probabilities, LGD and TLGD for bankruptcy proceedings, characterized by 12 steps of recovery. Finally, for an entire portfolio of outstanding loans of a financial institution, semi-Markov approach has been compared with Markov approach.

References