Portfolio Optimisation and Calibration with Credit Risk

This thesis covers two important fields in financial mathematics, namely the continuous time portfolio optimisation and credit risk modelling. We analyse optimisation problems of portfolios of Call and Put options on the stock and/or the zero coupon bond issued by a firm with default risk. We use the martingale approach for dynamic optimisation problems. Our findings show that the riskier the option gets, the less proportion of his wealth the investor allocates to the risky asset. Further, we analyse the Credit Default Swap (CDS) market quotes on the Eurobonds issued by Turkish sovereign for building the term structure of the sovereign credit risk. Two methods are introduced and compared for bootstrapping the risk-neutral probabilities of default (PD) in an intensity based (or reduced form) credit risk modelling approach. We compare the market-implied PDs with the actual PDs reported by credit rating agencies based on historical experience. Our results highlight the market price of the sovereign credit risk depending on the assigned rating category in the sampling period. Finally, we find an optimal leverage strategy for delivering the payments promised by a Constant Proportion Debt Obligation (CPDO). The problem is solved via the introduction and explicit solution of a stochastic control problem by transforming the related Hamilton-Jacobi-Bellman Equation into its dual. Contrary to the industry practise, the optimal leverage function we derive is a non-linear function of the CPDO asset value. The simulations show promising behaviour of the optimal leverage function compared with the one popular among practitioners.