

# An Integrated Structural Model for Market, Credit and Liquidity Risk

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## Abstract

We propose a unified structural credit risk model incorporating insolvency, recovery and rollover risks. Default occurs when the firm's asset value process falls below a certain threshold. The financial institution finances its risky assets by a mixture of short- and long-term debt as well as equity. Short-term creditors have the possibility not to renew their funding at certain rollover dates. Thereby, the firm is exposed to liquidity risk through possible bank runs. We show that a unique threshold strategy exists for short-term creditors to decide when to withdraw their funding, and this strategy is closely related to the solution of a non-standard optimal stopping time problem with control constraints. We decompose the total credit risk into an insolvency component and an illiquidity component based on such an endogenous bank run barrier together with an exogenous insolvency barrier.

We further integrate market risk in this setting by assuming interest rates to be stochastic and correlated with the firm's asset value. In this setting we endogenously derive the firm's coupon payments to its creditors depending the firm's credit and liquidity risk. Equity holders have to bear the gains and losses from rolling over short-term debt. They choose the default threshold such that the expected equity value is maximized subject to their limited liability. This endogenous default barrier enables to compute fair credit spreads and to determine the firm's optimal capital structure.