0.2.3 Pricing Prepayment Optionality

Acknowledging that leveraged loans have embedded redemption features, we return to the single tranche corporate issuer from section 0.2.1, to properly adjust the price of its zero-coupon debt to include this embedded option and find the fair market value of a callable loan.

For this stylized model, we introduce a Bermudian call option, where the corporate borrower has the right, but not the obligation to repay, i.e. buy back, its outstanding loan at a prespecified price, at one or more prespecified dates prior to its maturity.

In perfect markets with no transaction costs, the Borrowers' decision to repay its debt, at a call date prior to maturity, will depend on benefit from refinancing its existing loan with a less expensive loan, with identical remaining duration. For zero-coupon debt, this happens when the current equilibrium value of debt, $D(t)$, exceeds the face value discounted at the promised yield, y_0, in addition to any transaction costs. This decision is represented by the following inequality:

$$D(t) > Be^{-y_0(T-t)} + \mathcal{P} \tag{11}$$

where $\mathcal{P}$ is an optional penalty to refinancing, e.g. a fixed or percentage cost of the amount refinanced. For our baseline scenario, we assume: $\mathcal{P}(B) = 0$.

Payoffs to the Lender

Letting τ be the first time $D(t) > Be^{-y_0(T-t)} + \mathcal{P}$, i.e.:

$$\tau = \inf\left\{t \in [0,T] : D(t) > Be^{-y_0(T-t)} + \mathcal{P}\right\} \tag{12}$$

then the cash flows, received by the lender, at the call date τ is: $CF(\tau) = Be^{-y_0(T-\tau)}$, and if the loan is not repaid prematurely, then the lender will receive $CF(T) = \min\left(V(T), B\right)$, at maturity T.

Pricing the Loan

Next, the fair price of a callable loan D^c can be estimated numerically, by averaging the discounted cash flows, under the risk-neutral measure, from N simulations:

$$D_0^c = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=0}^{T} CF_i\left(t\right)\ e^{-r_f\, t} \tag{13}$$

The equilibrium option price is then $\mathcal{C} \equiv D_0^c - D_0$ and by substituting $D\left(t\right)$ by D_0^c in equation 6 and 7, the equilibrium yield, y^c, and spread, s^c, of the callable loan can be estimated and then compared with the non-callable yield and spread, to investigate the relative size of the call option.