# Reduced-Form Bond Pricing Formulas

## Formula 1: Flow-Oriented (Survival-Based)

This formula accumulates the expected discounted cash flows step by step, accounting for survival and default probabilities at each time t:

NPV = Σ\_t [Coupon × P\_surv(t) × DF(t)] + Σ\_t [Recovery × P\_default(t) × DF(t)] + Face × P\_surv(T) × DF(T)

Where:  
 - P\_surv(t) = e^(-λt) is the survival probability to time t  
 - P\_default(t) = P\_surv(t-Δt) - P\_surv(t) is the probability of default between t-Δt and t  
 - DF(t) = e^(-rt) is the discount factor to present value

## Formula 2: Academic Notation

This version uses academic notation and treats survival and default as separate processes with precomputed probabilities:

NPV = Σ\_i [Q(t\_i) × Z(t\_i) × (C/f)] + Σ\_i [D(t\_i) × Z(t\_i) × R × F] + Q(T) × Z(T) × F

Where:  
 - Q(t\_i) = e^(-λt\_i) is the survival probability  
 - D(t\_i) = Q(t\_{i-1}) - Q(t\_i) is the default probability in (t\_{i-1}, t\_i]  
 - Z(t\_i) = e^(-rt\_i) is the discount factor  
 - C = annual coupon, f = frequency, R = recovery rate, F = face value