CDS 평가로직 설명서

1. Premium Leg

① Premium의 현재가치 (발생이자 제외)

$$\sum_{1}^{N} \mathrm{S} \times \Delta(t_{n-1},\ t_n) Z(0, t_n) Q(0, t_n)$$

S = CDS Spread

N = Number Of Premium Payments

Z = Discount Factor

Q= Survive Probability

② Premium Leg 발생이자의 현재가치

$$\sum_{1}^{N} \int_{t_{n-1}}^{t_n} \mathrm{S} \times \Delta(t_{n-1},\ u) Z(0, u)\big(-dQ(0, u)\big) \approx \sum_{1}^{N} \mathrm{S} \times \frac{1}{2} \Delta(t_{n-1},\ t_n) Z(0, t_n)\big(Q(0, t_{n-1}) - Q(t_n)\big)$$

사다리꼴 넓이 계산하듯 적분식 계산

③ Premium 현재가치(발생이자 포함)

$$\sum_{1}^{N} \mathrm{S} \times \frac{1}{2} \Delta(t_{n-1},\ t_n) Z(0, t_n)\big(Q(0, t_{n-1}) + Q(t_n)\big)$$

2. Protection Leg

① Protection 현재가치

$$\widehat{\boldsymbol{D}}(\mathbf{0}, \boldsymbol{T}) = (\mathbf{1} - \boldsymbol{R}) \int_{\mathbf{0}}^{\boldsymbol{T}} \boldsymbol{Z}(\mathbf{0}, \boldsymbol{u})(-\boldsymbol{dQ}(\mathbf{0}, \boldsymbol{u}))$$

$$\approx (\mathbf{1} - \boldsymbol{R}) \sum_{\boldsymbol{k}=\mathbf{1}}^{\boldsymbol{K}} \frac{\mathbf{1}}{\mathbf{2}} \big(\boldsymbol{Z}(\mathbf{0}, \boldsymbol{t_{k-1}}) + \boldsymbol{Z}(\mathbf{0}, \boldsymbol{t_k})\big)\big(\boldsymbol{Q}(\mathbf{0},\ \boldsymbol{t_{k-1}}) - \boldsymbol{Q}(\mathbf{0}, \boldsymbol{t_k})\big)$$

K = Number of Observation Period of Default

3. CDS Spread

$$\mathrm{V}(0,\mathrm{T}) = (\mathbf{1}-\boldsymbol{R})\sum_{\boldsymbol{k=1}}^{\boldsymbol{K}}\frac{\mathbf{1}}{\mathbf{2}}\left(\boldsymbol{Z}(\mathbf{0},\boldsymbol{t_{k-1}})+\boldsymbol{Z}(\mathbf{0},\boldsymbol{t_k})\right)\left(\boldsymbol{Q}(\mathbf{0},\ \boldsymbol{t_{k-1}})-\boldsymbol{Q}(\mathbf{0},\boldsymbol{t_k})\right) - \sum_{1}^{N}\mathrm{S}\times\frac{1}{2}\Delta(t_{n-1},\ t_n)Z(0,t_n)\left(Q(0,t_{n-1})+Q(0,t_n)\right)=0$$

$$\mathrm{S}(0,\mathrm{T}) = \frac{(\mathbf{1}-\boldsymbol{R})\sum_{\boldsymbol{k=1}}^{\boldsymbol{K}}\frac{\mathbf{1}}{\mathbf{2}}\left(\boldsymbol{Z}(\mathbf{0},\boldsymbol{t_{k-1}})+\boldsymbol{Z}(\mathbf{0},\boldsymbol{t_k})\right)\left(\boldsymbol{Q}(\mathbf{0},\ \boldsymbol{t_{k-1}})-\boldsymbol{Q}(\mathbf{0},\boldsymbol{t_k})\right)}{\sum_{1}^{N}\frac{1}{2}\Delta(t_{n-1},\ t_n)Z(0,t_n)\left(Q(0,t_{n-1})+Q(t_n)\right)}$$

4. MtM Valuation

$$\mathrm{V}(\mathrm{t},\mathrm{T}) = (\mathbf{1}-\boldsymbol{R})\sum_{\boldsymbol{k=1}}^{\boldsymbol{K}}\frac{\mathbf{1}}{\mathbf{2}}\left(\boldsymbol{Z}(\boldsymbol{t},\boldsymbol{t_{k-1}})+\boldsymbol{Z}(\boldsymbol{t},\boldsymbol{t_k})\right)\left(\boldsymbol{Q}(\boldsymbol{t},\ \boldsymbol{t_{k-1}})-\boldsymbol{Q}(\boldsymbol{t},\boldsymbol{t_k})\right) - \sum_{1}^{N}\mathrm{S}_{\mathrm{OLD}}\times\frac{1}{2}\Delta(t_{n-1},\ t_n)Z(t,t_n)\left(Q(t,t_{n-1})+Q(t,t_n)\right)$$