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$$\left\{ \begin{array}{l} \frac{ds_1}{s_1} = \mu_1 dt + \sigma_1 dx_1 \\ \frac{ds_2}{s_2} = \mu_2 dt + \sigma_2 dx_2 \end{array} \right.$$

$$dt \rightarrow \frac{dx_1}{dt} \frac{dx_2}{dt} = \underline{\underline{p}}$$

$$\int ( ) dt + \frac{1}{2} dx =$$

Dis<sup>n</sup> of  $L(t)$

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$$L = Y(1-\theta)$$

$$\begin{aligned} \Pr( L \leq t ) &= \Pr( Y(1-\theta) \leq t ) \\ &= \Pr( Y \leq \frac{t}{1-\theta} ) \\ &= G\left( \frac{t}{1-\theta} \right) \end{aligned}$$

pdf of  $Z(t)$

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$$\frac{G'(y)}{1-\rho}$$

$$G'(y) = \frac{\partial}{\partial y} \phi \left( \frac{\sqrt{1-\rho} \phi'(y) - a}{\sqrt{\rho} a(y)} \right)$$

$$= \frac{\partial}{\partial a} \phi(a) \frac{\partial a}{\partial y}$$

$$= \frac{1}{\sqrt{2\pi}} e^{-\frac{a^2}{2}} \sqrt{\frac{1-\rho}{\rho}} \frac{\partial}{\partial y} \phi'(y)$$

$$x = \phi'(y) \Rightarrow y = \phi(x)$$

$$\frac{dy}{dx} = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$$

$$= \frac{1}{\sqrt{2\pi}} e^{-\frac{a^2}{2}} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} [\phi^T(y)]^2}$$

$$= \sqrt{\frac{1-p}{p}} \sqrt{2\pi} e^{-\frac{1}{2} [\phi^T(y)]^2}$$

$$= \sqrt{\frac{1-p}{p}} e^{-\frac{a^2}{2} + \frac{1}{2} [\phi^T(y)]^2}$$

$$E \{ L(t_j, t_1, t_2) \}$$

$$= E \{ L(t_j, 0, t_2) \} - E \{ L(t_j, 0, t_1) \}$$

Expected Value of Base Tranch Loss

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$$E\{L(t; 0, \ell)\}$$

$$= E\left[\ell \mathbb{I}\{L(t) > \ell\}\right] + \quad (1)$$

$$E\left[L(t) \mathbb{I}\{L(t) < \ell\}\right] \quad (2)$$

$$\textcircled{D} = l E[\mathbb{I}\{L(t) > l\}]$$

$$= l \Pr(L(t) > l)$$

$$= l (1 - \Pr(L(t) < l))$$

$$= l [1 - G(\frac{l}{\tau_0})]$$

$$= l \left[ 1 - \Phi \left( \underbrace{\frac{\sqrt{1-\rho} \phi'(\frac{l}{\tau_0}) - d}{\sqrt{\rho}}}_{arg} \right) \right]$$

$$= l \Phi(-a)$$



$$\begin{aligned}
 (2) &= E \left\{ F(t|z) (1-0) \mathbb{I} \{ F(t|z) (1-0) < t \} \right\} \\
 &= (1-0) E \left[ \Phi \left( \frac{d - \sqrt{p} z}{\sqrt{1-p}} \right) \mathbb{I} \{ \underline{z > -a} \} \right]
 \end{aligned}$$

$$\begin{aligned}
 F(t|z) &< \frac{t}{1-0} \\
 \Phi \left( \frac{d - \sqrt{p} z}{\sqrt{1-p}} \right) &< \frac{t}{1-0}
 \end{aligned}$$

$$\begin{aligned}
 &= (1-0) \int_{-a}^{\infty} \Phi \left( \frac{d - \sqrt{p} z}{\sqrt{1-p}} \right) d\Phi(z) \\
 &= (1-0) \int_{-a}^{\infty} \Pr(A < d | z) d\underline{\Phi(z)}
 \end{aligned}$$



$$= (1-0) \int_{-a}^{\infty} \Pr(A < d, z = z) dz \quad \Pr(A|\beta) = \frac{\Pr(\Delta m)}{\Pr(\alpha)}$$

$$d\Phi(z)$$

$$= (1-0) \Pr(A < d, z > -a) = f(z) dz$$

$$\downarrow \quad A = \sqrt{p} z + \sqrt{1-p} \varepsilon \quad \frac{\Pr(A < d, z = z)}{f(z)}$$

$$\tilde{z} = -z$$

$$A = \sqrt{p} \tilde{z} + \sqrt{1-p} \varepsilon$$

$$= (1-0) \Pr(A < d, \tilde{z} < a)$$

$$= (1-0) \Phi_2(d, a, -\sqrt{p})$$























