borrowers are risk-neutral and have limited liability, borrower j with effort cost e_j undertakes the project if

$$E\left(\max\left\{0,\ \theta_1 V_1-(1+r)\right\}\right)-e_j \geq 0 \tag{2}$$

Denote by $e^*(r)$ the threshold effort cost level where (2) holds with equality when the loan rate is r. Loan demand is the mass of entrepreneurs with effort cost below $e^*(r)$. Denoting by $C_d(r)$ the loan demand at interest rate r, we have

$$C_d(r)=H\left(e^*(r)\right) \tag{3}$$

Since $H(\cdot)$ has full support on $[0,\infty)$, $C_d(r)>0$ for all $r>0$ and is strictly decreasing in r.

2.2.2 Credit risk

The bank lends to many borrowers and can diversify away idiosyncratic risk. Credit risk follows the Vasicek (2002) model, a many borrower generalisation of Merton (1974). The standard normal W_j in (1) is given by the linear combination:

$$W_j=\sqrt{\rho}Y+\sqrt{1-\rho}X_j \tag{4}$$

where Y and $\{X_j\}$ are mutually independent standard normals. Y is the common risk factor while X_j is the idiosyncratic risk facing borrower j. The parameter $\rho\in(0,1)$ is the weight given to the common factor Y.

The borrower defaults when $\theta_1 V_1<1+r$, which can be written as

$$\sqrt{\rho}Y+\sqrt{1-\rho}X_j<-d_j \tag{5}$$

where d_j is *distance to default:*

$$d_j=\frac{-\ln(1+r)+\mu\left(\bar{\theta}_1\right)-\frac{s^2}{2}}{s} \tag{6}$$

Thus, borrower j repays the loan when $Z_j\geq 0$, where Z_j is the random variable:

$$\begin{aligned} Z_j &= d_j+\sqrt{\rho}Y+\sqrt{1-\rho}X_j \\ &= -\Phi^{-1}(\varepsilon)+\sqrt{\rho}Y+\sqrt{1-\rho}X_j \end{aligned} \tag{7}$$