as a deterministic function of Y. If the bank chooses the bad portfolio, the realized value of assets at date T is the random variable $w_B(Y)$ defined as:

$$\begin{aligned} w_B(Y) &= (1+r)\,C \cdot \Pr\left(\sqrt{\rho}Y + \sqrt{1-\rho}X_j \geq \Phi^{-1}(\varepsilon+k)\,|Y\right) \\ &= (1+r)\,C \cdot \Phi\left(\tfrac{Y\sqrt{\rho}-\Phi^{-1}(\varepsilon+k)}{\sqrt{1-\rho}}\right) \end{aligned} \tag{37}$$

It is convenient to normalize w_B by the face value of assets. We define $\hat{w}_B(Y) \equiv w_B(Y)/(1+r)\,C$. The c.d.f. of $\hat{w}_B$ is then given by

$$\begin{aligned} F_B(z) &= \Pr(\hat{w}_B \leq z) \\ &= \Pr\left(Y \leq \hat{w}_B^{-1}(z)\right) \\ &= \Phi\left(\hat{w}_B^{-1}(z)\right) \\ &= \Phi\left(\tfrac{\Phi^{-1}(\varepsilon+k)+\sqrt{1-\rho}\Phi^{-1}(z)}{\sqrt{\rho}}\right) \end{aligned} \tag{38}$$

If the bank chooses the good portfolio, the default probability is ε and correlation in defaults is zero. The outcome distribution for the good portfolio is obtained from (38) by setting $k = 0$ and letting $\rho \to 0$. In this limit, the numerator of the expression inside the brackets is positive when $z > 1-\varepsilon$ and negative when $z < 1-\varepsilon$. Thus, the outcome distribution of the good portfolio is

$$F_G(z) = \begin{cases} 0 & \text{if } z < 1-\varepsilon \\ 1 & \text{if } z \geq 1-\varepsilon \end{cases} \tag{39}$$

so that the good portfolio consists of i.i.d. loans all of which have a probability of default of ε, and the bank can fully diversify across the i.i.d. loans. Define:

$$\varphi \equiv (1+f)\,L/(1+r)\,C \tag{40}$$

φ is the notional debt of the bank - the amount to be repaid - normalized by total notional assets. At the same time, φ is the strike price of the embedded option for the bank from limited liability. The maximizes net worth, which can be written as

$$E(\hat{w}) - [\varphi - \pi(\varphi)] \tag{41}$$