Lemma 1. By definition,

$$\varphi = (1+f) L_i / (1+r) C_{is} \tag{15}$$

From the balance sheet identity $C_i = E_{R,i} + L_i$, loan supply of bank i is given by

$$C_{is} = \frac{E_{R,i}}{1 - \frac{1+r}{1+f}\varphi} \tag{16}$$

Aggregating across all regional banks, the aggregate loan supply by the regional banks is

$$C_s = \frac{E_R}{1 - \frac{1+r}{1+f}\varphi} \tag{17}$$

where E_R is the aggregate own funds of all regional banks. Equation (17) is not yet a complete solution, as f is endogenous and determined by market clearing of the wholesale lending market.

Under the incentive compatibility constraint, the asset realisations follow the distribution $F_G(.)$, so that the probability of default by the bank is given by $F_G(\varphi)$, where φ is the solution given by Lemma 1. Denoting by α the bank's probability of default, we have $\alpha = F_G(\varphi)$ so that

$$\alpha = \Phi\left(\frac{\Phi^{-1}(\varepsilon) + \sqrt{1-\rho}\,\Phi^{-1}(\varphi)}{\sqrt{\rho}}\right) \tag{18}$$

Since φ is uniquely solved by Lemma 1, and ρ is a parameter of the contracting problem, α is also uniquely defined once we solve for the probability of default ε of the corporate borrowers, which depends on the exchange rate.

2.2.5 Global banking system

We now introduce global banks in a "double-decker" version of the Vasicek model. There are many regions and each global bank has a diversified portfolio of loans across many regions. However, the global banks bear global risk that cannot be diversified away.

The unit square in Figure 8 represents the population of borrowers across all regions. Regional bank k holds a portfolio that is diversified against idiosyncratic shocks, but not to regional shocks. Global banks hold a portfolio of loans to regional banks, and is diversified against regional shocks, but it faces undiversifiable global risk.