Financial Institution Dynamics and Funding Portfolio

Jose-Victor Rios-Rull, Tamon Takamura, Yaz Terajima

University of Minnesota, Bank of Canada

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Bank manager's problem

$$V(n;\Omega) = \max_{c,z,y,n',e,\phi} \left\{ u(c) + \chi V\left(n';\Omega\right) \right\}$$

subject to

$$c + z + y = n + \alpha\phi \tag{1}$$
$$n' = f(y) \tag{2}$$
$$\phi = \beta e \Omega\left(n'\right) \tag{3}$$
$$c \leq \psi z \tag{4}$$
$$e \leq \frac{\phi}{n+\phi} \tag{5}$$

In equilibrium,

$$\Omega(n) = z(n) + \beta\left(1 - e(n)\right)\Omega\left(n'(n)\right).$$

Bank manager's incentive issues

- Without (4), the manager pays no dividend ($z = 0$).
- Without (5), existing equities are completely washed away ($e = 1$).
- *Time inconsistency*: the amount of funds raised today through new equities depends on the amount of dividends paid out tomorrow. But once new equities are issued, the manager reoptimizes dividend payouts neglecting existing shareholders' interests.
- Even though (4) and (5) are designed to mitigate this problem, they do not perfectly align the manger's incentive to that of shareholders. Assuming no commitment technology, we require time consistency on the manager's decisions.

Simplifying the problem

- (3) and (5) imply that

$$n + \phi = \beta\Omega\left(n'\right). \tag{6}$$

- Since $1 - e = n/\left(n + \phi\right)$ of (6) belongs to existing shareholders, the following holds in equilibrium.

$$\Omega\left(n\right) = z\left(n\right) + n. \tag{7}$$

- Using (1), (2) and (6), the budget constraint (1) becomes

$$\left(1 + \psi\right) z + y = \left(1 - \alpha\right) n + \alpha\beta\Omega\left(f\left(y\right)\right). \tag{8}$$

- (8) gives an implicit function of y given z and n.

$$y = Q\left(z, n; \Omega\right).$$

Simplified problem

$$V(n;\Omega) = \max_z \{u(\psi z) + \chi V(f(Q(z,n;\Omega));\Omega)\}$$

- First-order condition is

$$\psi u_c + \chi V_n' f_y Q_z = 0$$

- Envelope condition is

$$V_n = \chi V_n' f_y Q_n + \frac{\partial z}{\partial n} \underbrace{\left[\psi u_c + \chi V_n' f_y Q_z\right]}_{=0}$$

$$= -u_c(\psi z(n)) \frac{Q_n(z(n), n)}{Q_z(z(n), n)}.$$

- The optimality condition is

$$u_c = \chi u_c' f_y \frac{Q_z}{Q_z'} Q_n'$$

Visualizing the optimality condition

- From (8),

$$Q_z = \frac{1+\psi}{1-\alpha\beta\Omega_n f_y}, \quad Q_n = \frac{1-\alpha}{1-\alpha\beta\Omega_n f_y}.$$

- Since (7) from $\Omega(n) = \partial z/\partial n + 1$,

$$u_c = \chi u_c' f_y \frac{1-\alpha}{1-\alpha\beta\left(\frac{\partial z'}{\partial n'}+1\right) f_y}. \tag{9}$$

- Note that $1 > \alpha\beta\left(\partial z'/\partial n' + 1\right) f_y$ in equilibrium. This implies that either or both of the following must hold.
    - $\partial z/\partial n$ is small (dividend smoothing)
    - f_y is small (excess return on bank asset is small).

Steady state analysis

$$1 = f_y \left[\chi + \alpha \left(\beta - \chi \right) + \frac{\partial z}{\partial n} \alpha \beta \right]$$

- If $\partial z / \partial n > 0$, a smart bank manager invests more than a myopic manager who sets $\partial z / \partial n = 0$. By investing more, he lets tomorrow's manager to pay out more dividends, which increases the amount of equity financing today.
- The more impatient a manager is, the smaller he invests for tomorrow.