1 Financial frictions

- *accelerator*, old idea: feedback investment increases output (multiplier) output increases investment (accelerator)

- GE discipline: think of both effects as driven by underlying shocks

- e.g. persistent productivity shock: output goes up because of current shock, investment because of expected higher productivity

- need of large and persistent productivity shocks

- can financial factors help: amplification, persistence

- more generally: financial factors can help explain *balance sheets effects*

- example: dollar denominated debt in currency crises

issues

- understanding investment and asset prices (from the producers point of view)

- welfare implications/optimal policy

- how deep in corporate finance need a macro person go?

- intermediation: banks and monetary policy

One motivating picture

Image removed due to copyright restrictions.

Image removed due to copyright restrictions.

- split the material in two parts

- one emphasizes borrowing

- the other (liquid) asset accumulation

- in both a (non-representative) selection of tools and applications

1.1 Financial frictions and investment

Two basic sources of friction:

- it is hard to promise future returns
- separation of control and ownership (it is hard to delegate decisions)

The first easier to incorporate in macro models

1.2 Basic model of limited pledgeability

- Holmstrom and Tirole (1997) (see Tirole's book 3.4)
- Entrepreneur lives two periods, 0 and 1
- Has initial wealth N
- Chooses to invest K in project
- In period 1 chooses action $e \in \left\{e^h, e^l\right\}$

- Action determines probability of success $p^h > p^l$
- Success: payoff $R^H K$
- Insuccess: payoff $R^L K$

- Utility

$$\mathsf{E}\left[c_0^E + c_1^E - eK\right]$$

$$c_0^E \geq, c_1^E \geq 0$$

- Utility of outside investors (consumer)

$$\mathsf{E}\left[c_0 + c_1\right]$$

large endowment e

- Financial contract: payment from consumers to entrepreneur at date 0

$$l_0,$$

state contingent payment from entrepreneur to consumers at date 1

$$d_1^H, d_1^L.$$

1.2.1 Incentives at date 1

- Choose action e^h if

$$p^h \left(R^H K - d_1^H\right) + \left(1 - p^h\right) \left(R^L K - d_1^L\right) - e^h K \geq$$
$$p^l \left(R^H K - d_1^H\right) + \left(1 - p^l\right) \left(R^L K - d_1^L\right) - e^l K$$

- Simplify: assumption

$$R^L = 0$$

conjectures

$$d_1^L = 0 \qquad c_0^E = 0$$

definition

$$\begin{aligned} \Delta p &= p^h - p^l \\ \Delta e &= e^h - e^l \end{aligned}$$

- Obtain upper bound for d_1^H

$$\Delta p\left(R^H K - d_1^H\right) - \Delta e K \geq 0$$

$$\begin{aligned} d_1^H &\leq \left[R^H - \frac{\Delta e}{\Delta p}\right] K \\ &= \frac{1}{R^H}\left[R^H - \frac{\Delta e}{\Delta p}\right] R^H K \end{aligned}$$

- $\frac{1}{R^H}\left[R^H - \frac{\Delta e}{\Delta p}\right]$ pledgeable portion of future returns

- Assumption

$$\theta = \frac{1}{R^H}\left[R^H - \frac{\Delta e}{\Delta p}\right] > 0 \tag{A1}$$

- fact

$$\theta < 1$$

- Optimization

$$\max p^h \left(R^H K - d_1^H\right) - e^h K$$

$$\begin{aligned} d_1^H &\leq \theta R^H K \\ K &= l_0 + N \end{aligned}$$

$$l_0 \leq p^h d_1^H$$

- in short

$$\max p^h R^H K - e^h K - K$$

$$K \leq p^h \theta R^H K + N$$

- Assumption: profitability

$$p^h R^H > 1 + e^h \tag{A2}$$

- Assumption: limited pledgable returns

$$\theta p^h R^H < 1 \tag{A3}$$

- picture...

- Equilibrium *leverage*

$$K = \frac{1}{1 - p^h \theta R^H} N$$

- Investment increasing in insider's wealth: basice balance sheet effect

- Rate of return on entrepreneurial capital higher than market return

$$p^h R^H - e^H > 1$$

- (interest rate here is 0, we didn't look at consumers' endowment...)

- check that the low effort is dominated

- assume that

$$p^h R^H < e^l + 1$$

- then the best contract with the low effort has $K = 0$

1.2.2 Closing the model in GE

- Fixed supply of labor equal 1

- Unit mass of entrepreneurs with uncorrelated shocks

- CRS concave production function $AF(K, L)$, where $A \in \left\{A^H, A^L\right\}$, keep $A^L = 0$

$$R^H K = \max_L A^H F(K, L) - wL$$

- equilibrium

$$R^H = A^H F_1\left(K, 1/p^h\right)$$

Find $\tilde{K}$ s.t.

$$\tilde{K} = p^h \left[A^H F_1 \left(\tilde{K}, 1/p^h \right) - \frac{\Delta e}{\Delta p} \right] \tilde{K} + N$$

Also find two cutoffs:

1. the first best level of investment K^* s.t.

$$p^h A^H F_1 \left(K^*, 1/p^h \right) = 1 + e^h$$

2. the level of investment $\hat{K}_1$ optimal at the low action

$$p^l A^H F_1 \left(\hat{K}_1, 1/p^l \right) = 1 + e^l$$

Three cases:

- If $\tilde{K} < \hat{K}_1$ then we reach an equilibrium with unconstrained borrowing but suboptimal effort $e = e^l$

- If $\tilde{K} \in [\hat{K}_1, K^*)$ we reach an equilibrium with constrained borrowing and effort $e = e^h$ as the one described above

- If $\tilde{K} > \hat{K}_1$ then we reach an unconstrained, first best equilibrium with $K = K^*$ and the entrepreneur can consume

$$c_0^H = N - \tilde{K} - p^h \left[A^H F_1 \left(\tilde{K}, 1/p^h \right) - \frac{\Delta e}{\Delta p} \right] > 0.$$