1 Financial frictions

- \textit{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 \textit{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.
• 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 $e \in \{e^h, e^l\}$
• Action determines probability of success \( p^h > p^l \)

• Success: payoff \( R^H K \)

• Insucess: payoff \( R^L K \)
• Utility

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

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

• Utility of outside investors (consumer)

$$E [c_0 + c_1]$$

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

$d_1^H, d_1^L$.  

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1.2.1 Incentives at date 1

- Choose action $e^h$ if
  
  $$p^h (R^H K - d_1^H) + (1 - p^h) (R^L K - d_1^L) - e^h K \geq
  p^l (R^H K - d_1^H) + (1 - p^l) (R^L K - d_1^L) - e^l K$$

- Simplify: assumption
  
  $$R^L = 0$$

  conjectures
  
  $$d_1^L = 0 \quad c_0^E = 0$$

  definition
  
  $$\Delta p = p^h - p^l$$
  $$\Delta e = e^h - e^l$$
• Obtain upper bound for $d_1^H$

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

\[
d_1^H \leq \left[ R^H - \frac{\Delta e}{\Delta p} \right] K
\]

\[
= \frac{1}{R^H} \left[ R^H - \frac{\Delta e}{\Delta p} \right] R^H K
\]

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

\[ \theta = \frac{1}{R^H} \left[ R^H - \frac{\Delta e}{\Delta p} \right] > 0 \]  \hspace{1cm} (A1)

• fact

\[ \theta < 1 \]
• Optimization

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

\[
d_1^H \leq \theta R^H K
\]

\[
K = l_0 + N
\]

\[
l_0 \leq p^h d_1^H
\]

• in short

\[
\max p^h R^H K - e^h K - K
\]

\[
K \leq p^h \theta R^H K + N
\]
• Assumption: profitability

\[ p^h R^H > 1 + e^h \]  \hspace{1cm} (A2)

• Assumption: limited pledgable returns

\[ \theta p^h R^H < 1 \]  \hspace{1cm} (A3)

• picture...
• Equilibrium leverage

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

• Investment increasing in insider’s wealth: basic 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 $A \in \{A^H, A^L\}$, keep $A^L = 0$

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

- equilibrium

\[
R^H = A^H F_1(K, 1/p^h)
\]
Find $\tilde{K}$ s.t.

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

Also find two cutoffs:

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

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

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

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

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