1.6 Business cycle applications

- Outside finance premium: is it countercyclical?

- Investment volatility: is there amplification/propagation?

- General answer: it depends on the shocks (persistence)

- We focus on amplification
• almost temporary shock $\rho = .05$
• more persistent shock $\rho = .1$

Figure 11:
• persistent shock $\rho = .5$

![Figure 12:](image)
• Related empirical micro issue: do firms with tighter constraints respond more/less to cash flow shocks?

• Fazzari, Hubbard, Petersen (1998): Yes
  (see table before)

• Kaplan and Zingales:
  – in theory: maybe

  – in empirics: no
• Crucial macro issue: are contracts state-contingent?

• Balance sheet

\[ R_t k_t - b_t \]

• Investment

\[ k_{t+1} = \frac{R_t k_t - b_t}{q_t^m - \theta \beta C \mathbb{E}[R_{t+1}]} \]

• question is \( b_t \) sufficiently responsive to shocks?
1.6.1 Amplification

- In Kiyotaki-Moore no state contingent contracts

- Feed-back investment-asset prices in KM

- Recall that

\[ R_t = A_t F_1 (K_t, 1) + q_t^o \]

- Suppose we are in region where \( R_t k_t - b_t \) close to zero/bankruptcy

- with non-state contingent contracts that may happen
• then small positive productivity shock increases $k_{t+1}$ more than proportionally

• this increases $q_t^O \rightarrow$ larger increase in $K_{t+1}$ and so on

• Krishnamurthy (2003): it all depends on ability to condition on aggregate shocks
• Detour on models of Costly State Verification

• Caveat: CSV helps explain why non-state contingent debt is used at the micro level, but it does not really help at the macro level

• In general aggregate shocks seem relatively easy to condition upon: why sometimes balance sheets very exposed?
1.6.2 A failure of diversification

- Three period version

- No adjustment costs

- Risk averse consumers $\mathbb{E}[u(c_1 + c_2)]$
• In period 0 no investment, no consumption, only financial contracting ex ante

• Shock in period 1: $s = H, L$

• In period 1 entrepreneurs have initial endowment $\omega_s^E \in \{\omega_H, \omega_L\}$

• Consumers have endowment $\omega_s^C$ in period 1 and work in period 2

• No aggregate shock

$$\omega_s^C + \omega_s^E = 1$$
• Entrepreneurs

• In period 1: Invest $k_{2,s}$

• In period 2: produce $F(k_{2,s}, l_{2,s}) - w_s l_{2,s}$

• Balance sheet of the entrepreneur at date 1

\[ n_{1,s} = \omega_s^E + z_s^E \]

• state contingent contracts $z_s$ are available at date 0

• question: will they hedge?
Consumer problem

\[
\begin{align*}
\text{max} & \quad \sum \pi_s u \left( c_{1,s} + c_{2,s} \right) \\
\text{s.t.} & \quad \sum q_s z_s^C \leq 0 \\
& \quad c_{1,s} = \omega_s^C + z_s^C \\
& \quad c_{2,s} = w_s
\end{align*}
\]
• Entrepreneur problem

\[
\begin{align*}
\text{max} & \quad \sum \pi_s \left( c_{1,s}^E + c_{2,s}^E \right) \\
\text{s.t.} & \quad \sum q_s z_s^E \leq 0 \\
& \quad c_{1,s}^E + k_{2,s} = \omega_s^E + z_s^E \\
& \quad c_{2,s}^E = R_{2,s} k_{2,s}
\end{align*}
\]

• \( \theta = 0 \) only internal funds can be used

• Value function of entrepreneur now is simply

\[
V \left( \omega_s^E + z_s^E, s \right) = R_{2,s} \left( \omega_s^E + z_s^E \right)
\]

as long as \( R_{2,s} \geq 1 \).

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• Reduced form consumer’s problem

\[
\max \sum \pi_s u \left( \omega_s^C + z_s^C + w_s \right) \\
\text{s.t.} \quad \sum q_s z_s^C \leq 0
\]

• Reduced form entrepreneur’s problem

\[
\max \sum \pi_s R_{2,s} \left( \omega_s^E + z_s^E \right) \\
\text{s.t.} \quad \sum q_s z_s^E \leq 0
\]

• market clearing: financial market

\[
z_s^C + z_s^E = 0
\]

labor market

\[
R_{2,s} = F_1(K_s, 1), \quad K_s = \omega_s^E + z_s^E
\]
Equilibrium

\[
\frac{\pi_L u' \left( \omega_L^C + z_L^C + w_L \right)}{\pi_H u' \left( \omega_H^C + z_H^C + w_H \right)} = \frac{q_L}{q_H} = \frac{\pi_L R_{2,L}}{\pi_H R_{2,H}}
\]

- multiple equilibria possible

- symmetric equilibrium always exists: full diversification

\[K_H = K_L = \sum \pi_s \omega_s^E\]

- asymmetric equilibrium \(K_H > K_L\) (also the opposite possible!)

- pecuniary externality
Example

\[ \pi_L = \pi_H = 1/2 \]

\[ u(c) = c^{1-\gamma} \]

\[ F(k, 1) = Ak^\alpha \]

\[ \omega^E_L = 0, \omega^E_H = 1 \]

\[ \omega^C_L = 1, \omega^C_H = 0 \]

\[ z = z^E_L \]

\[ q = \frac{q_L}{q_H} \]
Two relations

\[
\frac{u'(1 - z + Az^\alpha)}{u'(qz + A(1 - qz)\alpha)} = q
\]

\[
\frac{z^{\alpha - 1}}{(1 - qz)^{\alpha - 1}} = q
\]
Examples:

- US vs Japan asset price bubble
- real estate concentrated in banks -> feedback
• stock market diffused -→ no feedback

• Dollarized economies: consumers want deposits in US$ to be safe, then banks lend in US$, then companies exposed to XR risk, wages more volatile, consumers want deposits in US$...

• very different balance sheet effects

• “financial fragility” difficult to assess, credit chains...