2 "Non-fundamental" movements in asset prices and investment

- Late 90's "bubble"

- High investment, high asset prices

- What shocks driving it? Expectations, rational/exuberance

- What channels?

- What welfare/policy implications?

2.1 A model of non-fundamental prices

- Harrison and Kreps, Sheinkman and Xiong

- Trading dates 0 and 1

- Payoff realized at date 2 $R^H = 1, R^L = 0$

- Signal $s \in \{h, l\}$ observed date 1

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- Agents with different "view of the world"

- Agent O does not think signal is informative, he assigns probability π^o to high realization

- Agent T thinks signal is informative, assign conditional probabilities

$$\pi^h > \pi^o > \pi^l$$

- Both think signal h has ex ante probability α

- No short selling

- Price of the asset is π^o or π^h at date 1

- Price of asset at date 0 is

$$P_0 = (1 - \alpha)\,\pi^o + \alpha\pi^h > \pi^o$$

- Cost of investment at date 0

$$-\frac{1}{2}k^2$$

- Optimal choice of k

$$k = P_0 = \pi^o + \alpha\left(\pi^h - \pi^o\right)$$

- both "fundamental" and "non fundamental"

2.1.1 Welfare

- Agent T zero surplus

- Agent O surplus

$$\left[\pi^o + \alpha\left(\pi^h - \pi^o\right)\right] k - \frac{1}{2} k^2$$

- First welfare theorem holds: k efficient

- Panageas: under mispricing driven by difference of opinions and short-sale constraints

1. q theory holds

2. investment is efficient

2.2 Monopolistic supply of bubbly investment

- Gilchrist, Himmelberg, Huberman

- Suppose large mass of Agents T, risk averse CARA

- they enter the economy at date 1 only consume at date 2

- Now at date 1

$$\max \mathbb{E}^T \left[U \left((R - P) x + W \right) \right]$$

$$\mathbb{E}^T \left[(R - P) U' \left((R - P) x + W \right) \right] = 0$$

- Rewrite focs using CARA

$$\pi (1 - P) e^{-\rho x} + (1 - \pi) (0 - P) e^{-\rho 0} = 0$$

- Demand for stocks at date 1

$$x = \frac{1}{\rho} \left[\log \frac{\pi}{1 - \pi} - \log \frac{P}{1 - P} \right]$$

- Inverse demand function

$$P = \mathcal{P} (x, \pi)$$

Problem of Agent O at date 1:

$$
\begin{aligned}
V(k,\pi) = \mathsf{max} \quad & x\mathcal{P}(x,\pi) + \pi^O[k-x] \\
s.t. \quad & 0 \le x \le k
\end{aligned}
$$

- still no short selling
- now prices depend on amount sold, monopolist

- If $\pi = \pi^l$ optimal $x = 0$

$$\mathcal{P}\left(x, \pi^l\right) - \pi^o + \frac{\partial \mathcal{P}}{\partial x} x < 0 \text{ at } x = 0$$

proof:

- $\mathcal{P}\left(0, \pi^l\right) = \pi^l < \pi^o$

- If $\pi = \pi^h$ two possibilities

$$\mathcal{P}\left(x, \pi^h\right) - \pi^o + \frac{\partial \mathcal{P}}{\partial x} x = 0 \text{ with } x \in (0, k]$$

$$\mathcal{P}\left(x, \pi^h\right) - \pi^o + \frac{\partial \mathcal{P}}{\partial x} x > 0 \text{ with } x = k$$

- In the first case

$$\frac{\partial V\left(k, \pi^h\right)}{\partial k} = \pi^o$$

- In the second case

$$\frac{\partial V\left(k, \pi^h\right)}{\partial k} = \mathcal{P}\left(k, \pi^h\right) + \frac{\partial \mathcal{P}\left(k, \pi^h\right)}{\partial x} > \pi^o$$

- Investment at date 0

- Case 1:

$$k = (1 - \alpha)\,\pi^o + \alpha\pi^o = \pi^o$$

Asset prices

$$P_0 = \pi^o$$

- Case 2:

$$k = (1 - \alpha)\, \pi^o + \alpha \left[\mathcal{P}\left(k, \pi^h\right) + \frac{\partial \mathcal{P}\left(k, \pi^h\right)}{\partial x} \right]$$

Asset prices

$$P_0 = (1 - \alpha)\, \pi^o + \alpha \mathcal{P}\left(k, \pi^h\right)$$

- Dispersion of opinion

$$\pi^h = \pi^o + \sigma$$
$$\pi^l = \pi^o - (\alpha/(1-\alpha))\,\sigma$$

- when σ is high then Case 2 applies

- when σ is low then Case 1 applies

- q theory does not hold

- investment responds less than 1:1 to the non-fundamental shock

Model predictions

1. Increase in $\sigma \Rightarrow$ increase in asset price P_0 over and above predicted increase in MPK $(\pi^o R^H + (1 - \pi^o) R^L = \pi^o)$

2. Increase in $\sigma \Rightarrow$ increase in investment

3. The investment respons is relatively weaker after a "non-fundamental" shock

$$\frac{\Delta k / \Delta \sigma}{\Delta P_0 / \Delta \sigma} < \frac{\Delta k / \Delta R^H}{\Delta P_0 / \Delta R^H}.$$

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2.2.1 Welfare

- Two elements of efficiency:

1. Efficient allocation of the bubbly asset ex post

2. Efficient investment ex ante

Ex post efficiency (constrained efficiency)

$$\max_{x,\tau} \phi \mathbb{E}^T \left[U \left(Rx + W - \tau \right) \right] + \mathbb{E}^O \left[R \left(k - x \right) + \tau \right]$$
$$\text{s.t. } 0 \leq x \leq k$$

1. • Efficiency achieved by competitive trading of the bubble: find a P s.t.

$$\begin{aligned} \mathbb{E}^T \left[(R - P) U' ((R - P) x) \right] &= 0 \\ \mathbb{E}^O [R - P] &= 0 \end{aligned}$$

if $x \in (0, k)$ and inequalities if $x = 0$ or $x = k$.

Claim: In case 2 we have ex post efficiency, since

$$\mathcal{P}\left(x, \pi^h\right) - \pi^o + \frac{\partial \mathcal{P}}{\partial x} x > 0$$

implies

$$\mathcal{P}\left(x, \pi^h\right) - \pi^o > 0$$

so corner solution is efficient.

In case 1 we have $x < x^*$, too little bubble is sold to the public (usual monopoly result).

Ex ante efficiency

- Two notions: conditional efficiency and second best efficiency

- depending on whether you can fix or not monopoly distortion at date 1

- In case 1 we may have second best efficiency but we always have conditional inefficiency

- if the bubble was efficiently allocated ex post and $x^* < k$, then π^o would be the social value of the bubbly asset

$$k = \pi^o$$

- conditional on monopoly ex post, $P^h > \pi^o$,

$$k < \alpha P^h + (1 - \alpha) \pi^o$$

- In case 2 ex post allocation is efficient

- we have inefficient investment ex ante

$$k = \alpha \left(\mathcal{P}\left(k, \pi^h\right) + \frac{\partial \mathcal{P}}{\partial x} \right) + (1 - \alpha)\, \pi^o < \alpha \mathcal{P}\left(k, \pi^h\right) + (1 - \alpha)\, \pi^o$$

- The bubbly asset is collateral for betting and agents enjoy betting

- A monopolist produces too little betting collateral

2.3 Bubble in Japan

- Chirinko and Shaller (2001) more structural approach to finding a bubble and its effects

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- Remember foc from Hayashi model

$$G_1\left(k', k\right) = \beta \mathsf{E}\left[V_1\left(k', s'\right)\right]$$

- envelope

$$V_1(k, s) = \left(A(s) F_1(k, l) - G_2\left(k', k\right)\right)$$

Functional form

$$G\left(k', k\right) = p_I \left(k' - (1-\delta)\, k\right) + C\left(\left(k' - (1-\delta)\, k\right), k\right)$$

where C is adjustment cost (sensu stricto).

- Euler equation

$$p_{I,t} + C_{I,t} = \beta \mathsf{E}_t \left[A_{t+1} F_{K,t+1} - C_{K,t+1} + (1-\delta)\left(p_{I,t+1} + C_{I,t+1}\right)\right]$$

(interpretation)

- Scenario 1: no bubble/inactive financing mechanism

$$
\begin{aligned}
Q_t &= p_{I,t} + C_{I,t} \\
p_{I,t} + C_{I,t} &= \beta \mathsf{E}_t \left[A_{t+1} F_{K,t+1} - C_{K,t+1} + (1-\delta) \left(p_{I,t+1} + C_{I,t+1} \right) \right]
\end{aligned}
$$

- Scenario 2: bubble/inactive financing mechanism

$$
\begin{aligned}
Q_t &= p_{I,t} + C_{I,t} + B_t \\
p_{I,t} + C_{I,t} &= \beta \mathsf{E}_t \left[A_{t+1} F_{K,t+1} - C_{K,t+1} + (1-\delta) \left(p_{I,t+1} + C_{I,t+1} \right) \right]
\end{aligned}
$$

- Scenario 3: bubble/active financing mechanism

$$
\begin{aligned}
Q_t &= p_{I,t} + C_{I,t} + B_t \\
p_{I,t} + C_{I,t} &> \beta \mathsf{E}_t \left[A_{t+1} F_{K,t+1} - C_{K,t+1} + (1-\delta) \left(p_{I,t+1} + C_{I,t+1} \right) \right]
\end{aligned}
$$

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- Can we distinguish this from good signal not in the econometrician observable set?

- A: No.

- Simple two periods example

$$k = \pi$$

- Suppose the econometrician does not observe good signal, replaces π with $\bar{\pi}$, then asset price

$$q = \pi$$

- both equations violated:

$$\begin{aligned} \pi &> \bar{\pi} \\ k &> \bar{\pi} \end{aligned}$$