Discussion: Lagos - Zhang

Macro Finance Society

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May 12, 2016

Overview

- Stock Market Returns affected by FED decisions
  - More so than overall price level
- Lucca and Moench (JF, 2013): equity premium concentrated during FOMC announcement windows
- Why do stocks react to FED funds rate?
- First-order question: reveals transmission mechanism

What Theories do we have

1. Responses linked to idionsync price stickiness
   Gorodnichenko & Webber
   - ...but counter-cyclical markups
   - why would stocks react positively to drops in i?
2. Theories silent about volumes
3. Lagos-Zhang evidence on price and volume impact
   - Lower rates, higher price, more so for securities with higher turnover

Lagos Zhang Model

To talk about volume, need role for trade.

- Add in difference of opinion (Harrison Kreps)
- ...or alternatively differences in holding costs (DGP)

Money only a medium of exchange

Postulate Fisher equation:

- relationship with rates

Lagos Zhang Mechanism

- Inflation: cost of money medium of exchange
- Inflation: reduces store of value
- Inflation: stocks become better store of value
  - even if low valuation
- Inflation: link to rates (Fisher equation)

Structure of Discussion

Attempt to flesh out mechanism

- simplified version

Challenges:

- Theoretical and empirical

Argue: look at bank-lending channel

Modified Lagos Zhang Model

Environment

- t=1,2,3,...
  - two subperiods, s=m,n.
- Unit mass of divisible tree a.
- Outstanding stock of money m_t

Modified Lagos Zhang Model

Timing

- Morning market:
  - all identical
  - + helicopter drop
  - Market 1: asset-4-money trade
- Night Market
  - valuation shock $\varepsilon \tilde{} F$.
  - Tecnical assumption: mass point at $F(\varepsilon_h) = f_h$.
  - Market 2: asset-4-money trade
- Only shock: H-drops

Two Bellmans

Morning

$$\begin{aligned} V(m,a) &= \max_{\{m,'a'\}\in R^{+}} \mathbb{E}_{\varepsilon}\left[W\left(m',a',\varepsilon\right)\right] \text{ st} \\ pm'+a' &= pm+pT+a. \end{aligned}$$

Night

$$\begin{aligned} W(m,a,\varepsilon) &= \max_{\{m,'a'\}\in R^{+}} \varepsilon a'+\beta\mathbb{E}_{\pi}\left[V\left(m,'a'\right)\right] \text{ st} \\ qm'+a' &= qm+a. \end{aligned}$$

Solution

Conjecture 1: Q-theory equation:

$$\begin{aligned} pM\varphi^m &= 1 \\ qM\varphi^n &= 1. \end{aligned}$$

Conjecture 2: linear values

$$V\left(m', a'\right) = \bar{v}_1\left(pm' + a'\right) + \bar{v}_2\tau.$$

Back on Value Functions

Value at night:

$$\begin{aligned} W(w,\varepsilon) &= \max_{\{m,'a'\}\in R^{+}} \varepsilon a' + \beta\bar{v}\mathbb{E}_{\pi}\left[\varphi^{m}m'/(1+\pi)+\tau+a'\right] \text{ st} \\ \varphi^{n}m'+a' &= w. \end{aligned}$$

then implies that:

$$\begin{aligned} \left(a',m'\right) &= (w,0) \text{ if } \varepsilon > \varepsilon^{*} \\ \left(a',m'\right) &= (0,w) \text{ if } \varepsilon < \varepsilon^{*} \end{aligned}$$

where ε^{*} solves the following equation:

$$\varepsilon^{*} = \beta\bar{v}\left(\frac{\varphi^{m}}{\varphi^{n}}\mathbb{E}_{\pi}\left(\frac{1}{1+\pi}\right)-1\right).$$

Market clearing

Night market:

$$\varphi^n \underbrace{\left(1 - F\left(\varepsilon^*\right)\right)}_{\substack{\text{trees} \\ \text{bought}}} = \underbrace{F\left(\varepsilon^*\right)}_{\substack{\text{trees} \\ \text{sold}}} \rightarrow \text{Turnover Liquidity}$$

Portfolio from morning to night

$$w' = \left(\frac{\varphi^m}{\varphi^n}\omega^m + \left(1 - \omega^m\right)\right) w.$$

Indifference condition:

$$\varphi^m = \varphi^n = \varphi$$

Different in paper because of intermediary markup. Inessential for story.

Solution

Value Solves:

$$\bar{v_1} = \frac{\mathbb{E}_\varepsilon \left[\varepsilon | \varepsilon > \varepsilon^*\right] \left(1 - F\left(\varepsilon^*\right)\right) + \varepsilon^* F\left(\varepsilon^*\right)}{1 - \beta}.$$

Important condition. Higher cutoff, higher the value.

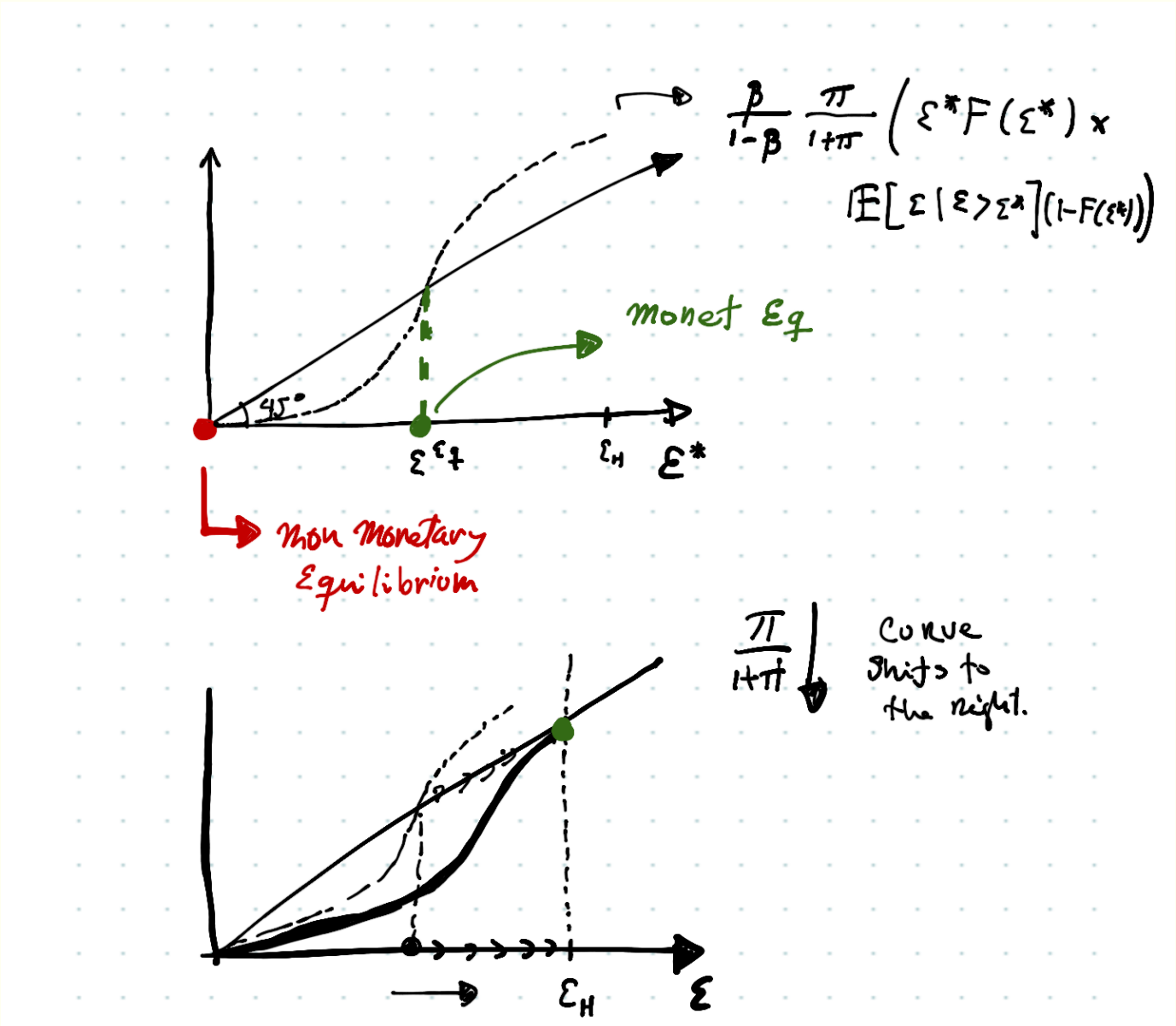
Cutoff solves:

$$\overbrace{\varepsilon^*}^{\text{Threshold}} = \beta \overbrace{\frac{\mathbb{E}_\varepsilon \left[\varepsilon | \varepsilon > \varepsilon^*\right] \left(1 - F\left(\varepsilon^*\right)\right) + \varepsilon^* F\left(\varepsilon^*\right)}{1 - \beta}}^{\text{Option Value}} \underbrace{\left[\frac{1}{1 + \bar{\pi}} - 1\right]}_{\substack{\text{Opportunity} \\ \text{Cost}}}$$

Friedman Rule: $\frac{1}{1+\bar{\pi}} = \beta$, solution is:

$$F\left(\varepsilon^*\right) = 1 \rightarrow \text{highest possible rate}$$

Graphically



Accounting

Turnover:

$$F\left(\varepsilon^{*}\right).$$

Goods valus of Stocks:

$$\bar{v}=\frac{\mathbb{E}_{\varepsilon}\left[\varepsilon|\varepsilon>\varepsilon^{*}\right]\left(1-F\left(\varepsilon^{*}\right)\right)+\varepsilon^{*}F\left(\varepsilon^{*}\right)}{1-\beta}$$

Monetary Value of Stocks:

$$\frac{1}{\varphi^{n}} \quad = \quad \frac{\left(1-F\left(\varepsilon^{*}\right)\right)}{F\left(\varepsilon^{*}\right)}$$

Need production like in Lagos-Wright

Challenges for Ricardo and Shengxing

[1] Real value of stocks to GDP vs. value of Money to stocks

- Money and the stock market, JPE 88

[2] Fisher equation: doesn't hold in short periods

- predicts: one-for-one movement with inflation
- data: real rate is what adjusts

[3] Without Helicopter Drop...

- OMO - different trade off
- DW and IOR - there's no opportunity cost of holding money

[4] Monetary Policy

- Through banks, not via H-drops
- Shouldn't it affect stocks via lending?

Alternative - Bank Lending

[1] Lower DW and IOR imply lower cost of funding for banks

[2] OMO expand bank liquidity

[3] Policies imply lower intermediation costs

- Expansion in FED lending to borrow

[4] Bank lending channel affects stocks too!

Conclusion

The direct relation between real stock prices and real balances can be rationalized in three different ways: (1) A rise in stock prices means an increase in nominal wealth (2) A rise in stock prices reflects increase in expected return from risky relative to safe assets. (3) A rise in stock prices may be taken to imply a rise in the dollar volume of financial transactions increasing the quantity of money demanded to facilitate transactions

MILTON FRIEDMAN - MONEY AND THE STOCK MARKET, JPE 88