China's Model of Managing the Financial System

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China's Distinct Economic Structure

- Central planning is still largely mixed with free markets
  - Dual tracks (market & planning tracks) are present in many sectors
  - The state sector, while much improved, is still less efficient than the private sector, and is large and will likely remain large

- The government still plays a central role in many aspects
  - Sets agenda for policy reforms
  - Has strong influence on allocation of key resources—fiscal spending, credit, land, ...
  - Provides soft budget constraints to state firms and implicit guarantees to various sectors
- The fluctuations in the financial system all revolve around government policy, intended or unintended
  - ongoing housing market boom
  - expansion of shadow banking system
  - stock market turmoil in 2015
    breakdown of circuit breakers in 2016

Policy Risks in Financial Development

- Unavoidable policy risks
  - complex financial instruments and entangled financial structures
  - largely new to policy makers
- Intense speculation by market participants of government policy may reinforce, and even trigger, policy errors

Two related but separate issues

1. Front-running by market may cause the gradualistic approach of "crossing river by touching the stone" to fail in financial development
   - separately discussed in our other paper "China's Gradualistic Economic Approach and Financial Markets"
2. Intensive government intervention
   - makes noise in policy making a pricing factor
   - government noise attracts market speculation and may get amplified

Government's Paternalistic Philosophy

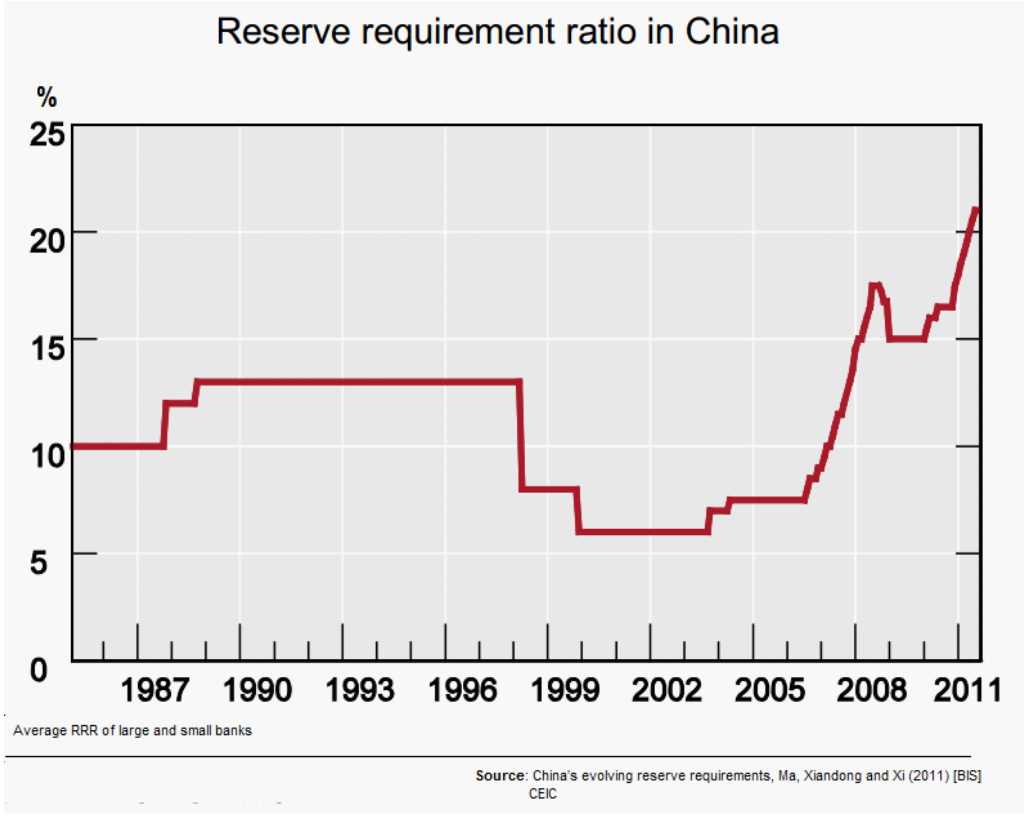
- Large population of **inexperienced retail investors**
  - retail investors hold 50% of tradable shares and contribute to 90% of trading volume
- Large price **volatility** in China's stock markets and heavy turnover
  - highest turnover rate among major stock markets
- Asset prices often **deviate from fundamentals**
  - large price differentials between A-B and A-H stock pairs, e.g., Mei, Scheinkman and Xiong (2009)
  - dramatic warrant bubble in 2005-2008, e.g., Xiong and Yu (2011)
- **CSRC's mission**: protect retail investors and stabilize markets

Government Interventions in China's Financial System

- Countercyclical **policies and regulations**
  - interest rate and bank reserve ratio policy
  - suspension and quota control of IPO issuance
  - stamp tax on stock trading
  - mortgage rate and first payment requirement
- **Direct trading** in stock markets
  - "national team" directed to bail out stock market in summer 2015
- Tremendous **uncertainty** surrounding timing and scale of intervention

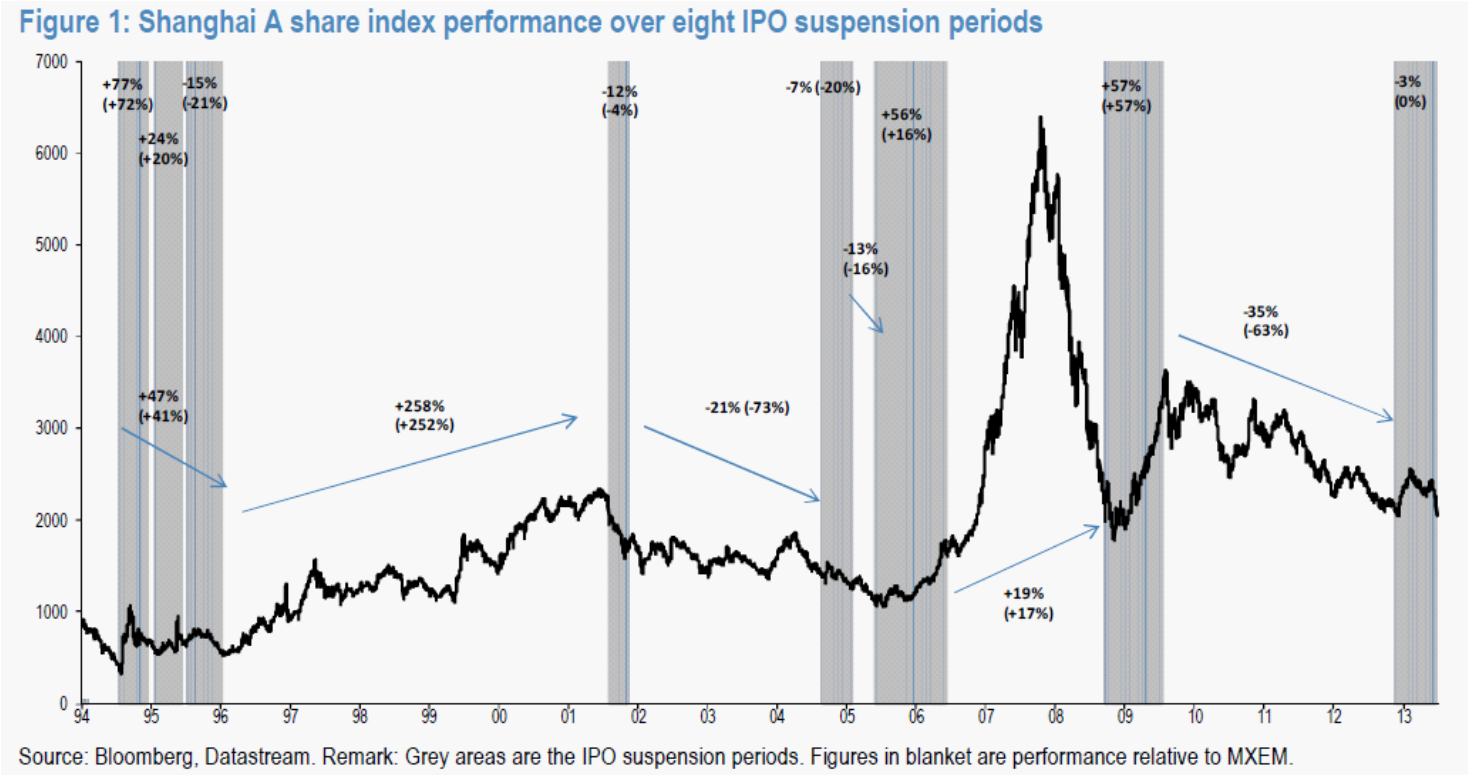
Required Reserve Ratio in China

- Active monetary policy: up 32 times, down 4 times from 2003-2011
- Powerful and direct impact on credit supply, money multiplier



IPO Issuance in A-Share Markets

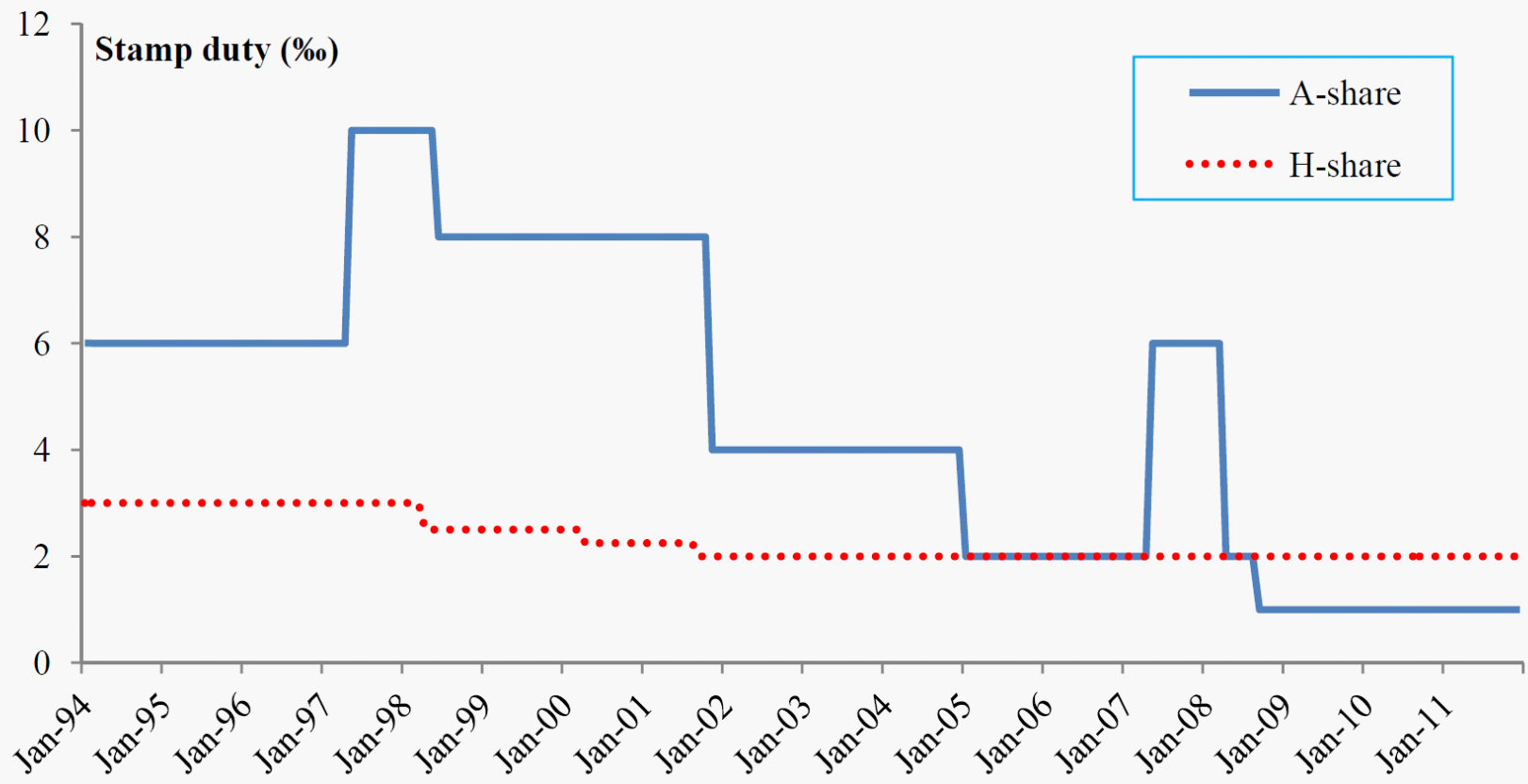
- The government (CSRC) directly **controls IPO issuance**
  - had suspended IPO issuance 8 times
  - quantity and allocation of quota



Stamp Tax in Stock Trading

Figure 1 Evolution of Stamp Duties in China and Hong Kong

The figure shows the evolution of trading stamp duty (sum over buyers and sellers) in A-share and H-share markets. Y-axis shows the absolute level of stamp duty in ‰.



Conceptual Questions

- How does government intervention impact market dynamics?
- How do market participants react to this intervention?
  - do they trade along with or against the government?
- What is the right objective of government intervention?
  - reduce price volatility or improve informational efficiency?

Outline

We develop a dynamic framework

1. to justify the need for government intervention
2. to show that intense intervention may alter market dynamics
   - Intensive government intervention makes **uncertainty about policy errors** a factor in asset prices
     - this factor gets **magnified by market speculation**
     - it attracts information acquisition by market participants and distracts them from analyzing economic fundamentals
   - Potential tension between **reducing price volatility** and **improving information efficiency**

A Model with Perfect Information

Discrete-time with infinitely many periods: $t = 0, 1, 2...$

- A risky asset, which pays a stream of **dividends** over time:

$$D_t = \theta_t + \sigma_D \varepsilon_t^D, \ \varepsilon_t^D \sim \mathcal{N}(0, 1)$$

- θ_t is an exogenous **asset fundamental**:

$$\theta_{t+1} = \rho_\theta \theta_t + \sigma_\theta \varepsilon_{t+1}^\theta, \ \varepsilon_{t+1}^\theta \sim \mathcal{N}(0, 1)$$

- For now, θ_{t+1} is **publicly observable**
  - will be made unobservable later when we introduce information frictions and policy errors

A Model with Perfect Information

Noise traders submit random market orders:

$$N_t = \rho_N N_{t-1} + \sigma_N \varepsilon_t^N, \ \varepsilon_t^N \sim \mathcal{N}(0,1)$$

- Price insensitive orders, capturing unstable market forces
- Meant to capture trading by inexperienced retail investors

Rational short-term investors each maximize myopic trading profit:

$$U_t^i = \max_{X_t^i} E\left[-\exp\left(-\gamma W_{t+1}^i\right) \mid \theta_{t+1}, N_t\right]$$

with $W_{t+1}^i = R^f \bar{W} + X_t^i R_{t+1}$ and $R_{t+1} = D_{t+1} + P_{t+1} - R^f P_t$.

- Equilibrium without any government intervention:

$$\int_0^1 X_t^i dt = N_t$$

Market Breakdown

Conjecture a linear equilibrium: $P_t = \frac{1}{R^f - \rho_\theta}\theta_{t+1} + p_N N_t$

- Optimal position of each myopic rational investor:

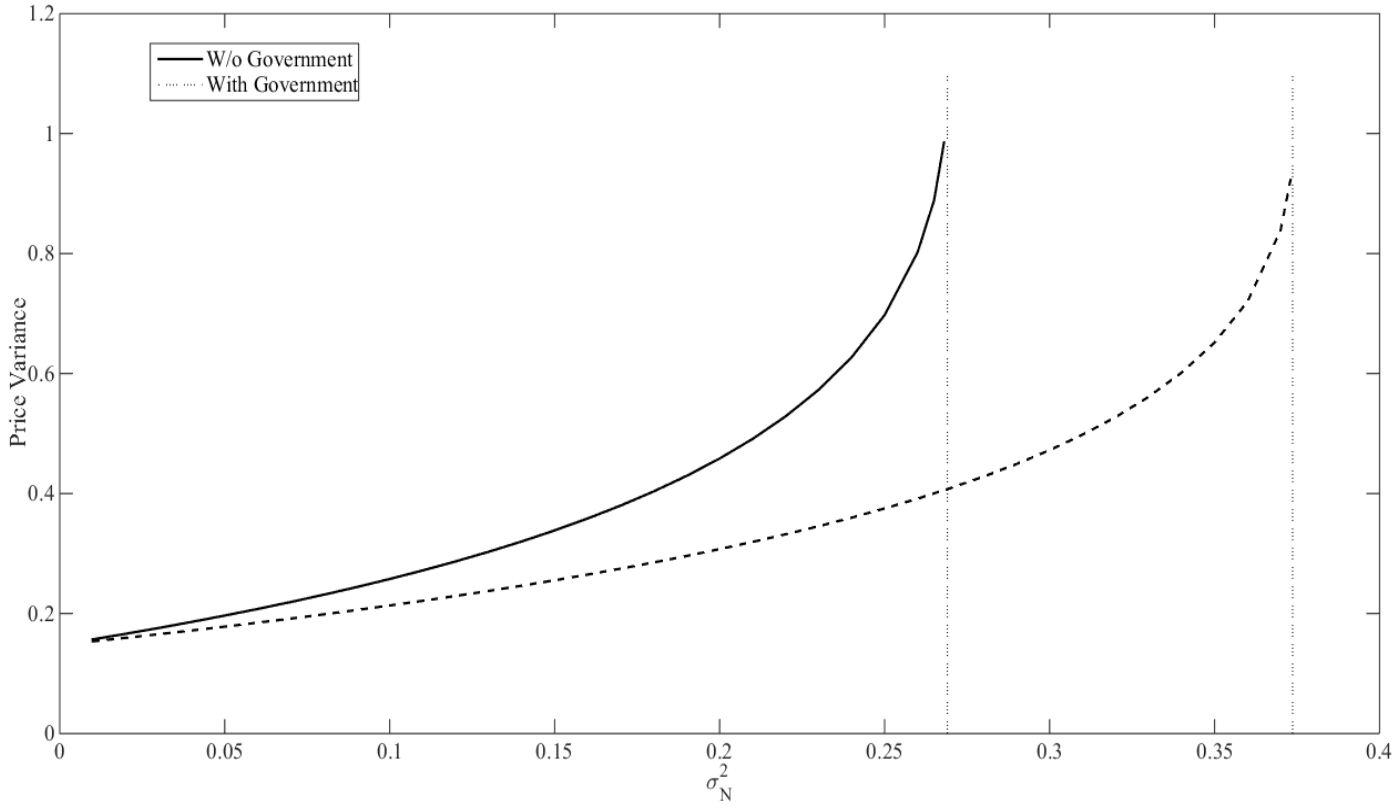
$$X_t^i = \frac{1}{\gamma}\frac{E_t\left[D_{t+1} + P_{t+1} - R^f P_t\right]}{Var_t\left[D_{t+1} + P_{t+1}\right]} = \frac{1}{\gamma}\frac{p_N\left(\rho_N - R^f\right)}{\sigma_D^2 + \left(\frac{R^f}{R^f - \rho_\theta}\right)^2 \sigma_\theta^2 + p_N^2\sigma_N^2} N_t$$

- The **market breaks down** when

$$\sigma_N > \sigma_N^* = \frac{R^f - \rho_N}{2\gamma\sqrt{\sigma_D^2 + \left(\frac{R^f}{R^f - \rho_\theta}\right)^2 \sigma_\theta^2}}.$$

  - Short-term investors ineffective in trading against noise trader risk, similar to DSSW (1990)

Volatility Explosion



Government Intervention

- Introduce a government that trades the asset and takes a position

$$X_t^G = \underbrace{\vartheta_{N,t} N_t}_{\text{intended intervention}} + \underbrace{\sqrt{Var\left[\vartheta_{N,t} N_t \mid \mathcal{F}_{t-1}\right]}\, G_t}_{\text{unintended noise}},$$

  - the government chooses intervention intensity $\vartheta_{N,t}$
  - the amount of unintended noise increases with $\vartheta_{N,t}$
- Government intervention affects discount rates not cash flows D_t
  - distinct from Pastor & Veronesi (2012) and Bond & Goldstein (2015), which focus on interventions that affect cash flow

Government Objective

- Define the government objective: choose ϑ_N to maximize

$$U_t^G = \min_{\vartheta_{N,t}} \gamma_\sigma Var\left[\Delta P_t\left(\vartheta_{N,t}\right)|\mathcal{F}_t\right] + \gamma_\theta Var\left[P_t\left(\vartheta_{N,t}\right) - \frac{1}{R^f - \rho_\theta}\theta_{t+1}\ |\mathcal{F}_t\right]$$

  - Penalty γ_σ for price volatility, penalty γ_θ for price deviation from fundamental

- Two possible objectives: reducing conditional volatility and improving informational efficiency
  - often treated as equivalent in policy discussions
  - reducing price volatility is more convenient and widely adopted in practice, e.g., in US monetary policy - Stein and Sundarem (2016)
- The government internalizes the market failure by taking a sufficiently large $\vartheta_{N,t}$ to prevent market breakdown

Intervention Equilibrium

- Again, we conjecture a linear equilibrium:

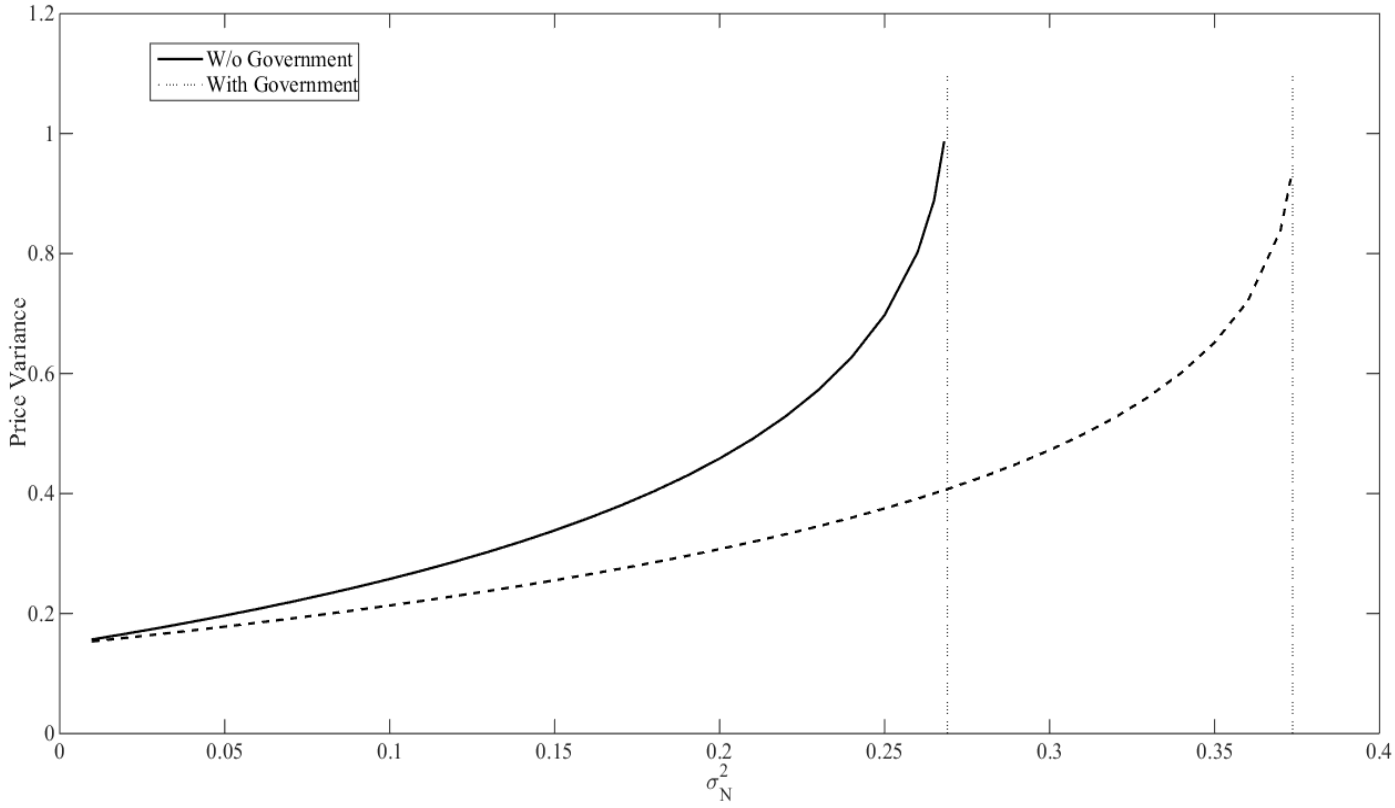
$$P_t = \frac{1}{R^f - \rho_\theta}\theta_t + p_N N_t + P_g G_t$$

- The market clearing $\int_0^1 X_t^i dt + X_t^G = N_t$ implies the market breaks down only when

$$\sigma_N > \frac{1}{(1-\vartheta_N)\sqrt{\left(1 + \left(\frac{\rho_N - R^f}{R^f}\right)^2 \left(\frac{\vartheta_N}{1-\vartheta_N}\right)^2 \sigma_G^2\right)}} \sigma_N^*$$

  - $\vartheta^N > 0$ **mitigates** the region of market failure and may prevent failure if sufficiently large

Volatility Explosion



An Extended Model with Information Frictions

- Suppose now θ_{t+1} is **unobservable**
- The public information set: $\mathcal{F}_t^M = \sigma\left(\{D_s, P_s\}_{s \leq t}\right)$
  - $\hat{\theta}_{t+1}^M = E\left[\theta_{t+1} \mid \mathcal{F}_t^M\right]$ serves as the anchor of asset valuation
  - $\hat{N}_t^M = E\left[N_t \mid \mathcal{F}_t^M\right]$ is the market perceived noise trading
- The government has no private information and intervenes

$$X_t^G = \vartheta_{\hat{N}} \hat{N}_t^M + \sqrt{Var\left[\vartheta_{\hat{N}} \hat{N}_t^M \mid \mathcal{F}_{t-1}^M\right]} G_t$$

with an objective

$$\min_{\vartheta_N} \quad \gamma_\sigma Var\left[\Delta P_t\left(\vartheta_{\hat{N}}\right) \mid \mathcal{F}_{t-1}^M\right] + \gamma_\theta Var\left[P_t\left(\vartheta_{\hat{N}}\right) - \frac{1}{R^f - \rho_\theta}\theta_{t+1} \mid \mathcal{F}_{t-1}^M\right]$$

An Extended Model with Information Frictions

- **Rational short-term investors** again trade in the risky aseet
- Each investor i also chooses $a_t^i \in \{0,1\}$ to acquire private information about either θ_{t+1} or future government noise G_{t+1}:

$$s_t^i = \theta_{t+1} + \left[a_t^i \tau\right]^{-1/2} \varepsilon_t^{s,i} \quad \text{or} \quad g_t^i = G_{t+1} + \left[\left(1 - a_t^i\right) \tau\right]^{-1/2} \varepsilon_t^{g,i}$$

- Once again, investors have a myopic objective:

$$U_t^i = \max_{a_t^i \in \{0,1\}} E\left[\max_{X_t^i} E\left[-\exp\left(-\gamma W_{t+1}^i\right) \mid \mathcal{F}_t^i\right] \mid \mathcal{F}_{t-1}^M\right],$$

where $\mathcal{F}_t^i = \mathcal{F}_t^M \vee \left\{a_t^i s_t^i + \left(1 - a_t^i\right) g_t^i\right\}$

Equilibria with Government Intervention

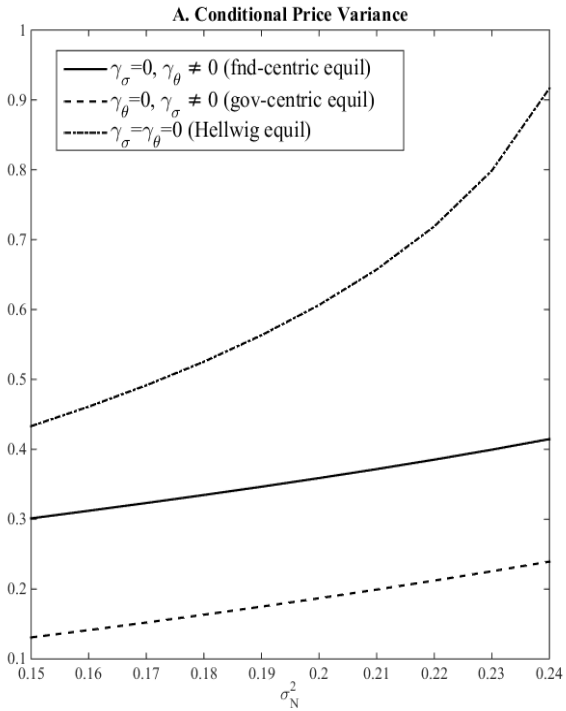
- A **fundamental-centric** equilibrium
  all investors acquire signals about θ_{t+1}
  - investor trading makes price more informative about θ_{t+1}
  - investors may trade against government, depending on signals

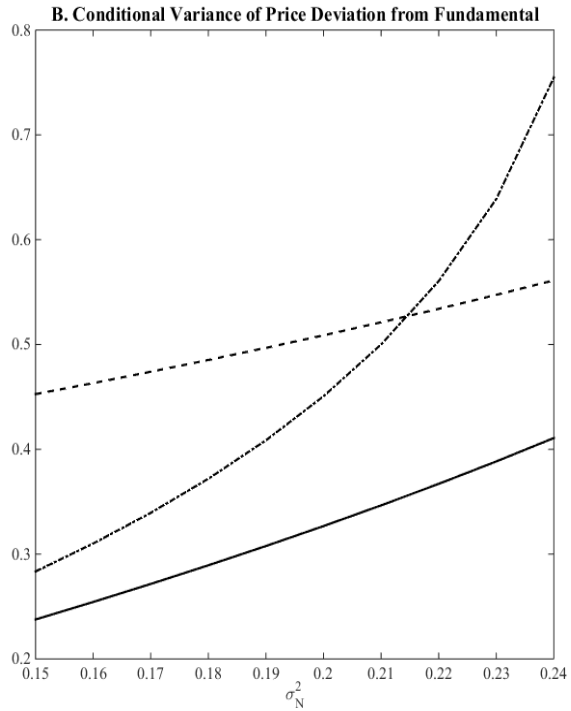
- A **government-centric** equilibrium
  all investors acquire signals about G_{t+1}
  - occurs when the government intervention is sufficiently intensive
  - price may be less informative about θ_{t+1}
  - investors all trade along the government, making price volatility lower and allowing government to trade less

- A mixed equilibrium
  some investors acquire signals about θ_{t+1} some about G_{t+1}

Market Equilibrium with a Single Government Objective

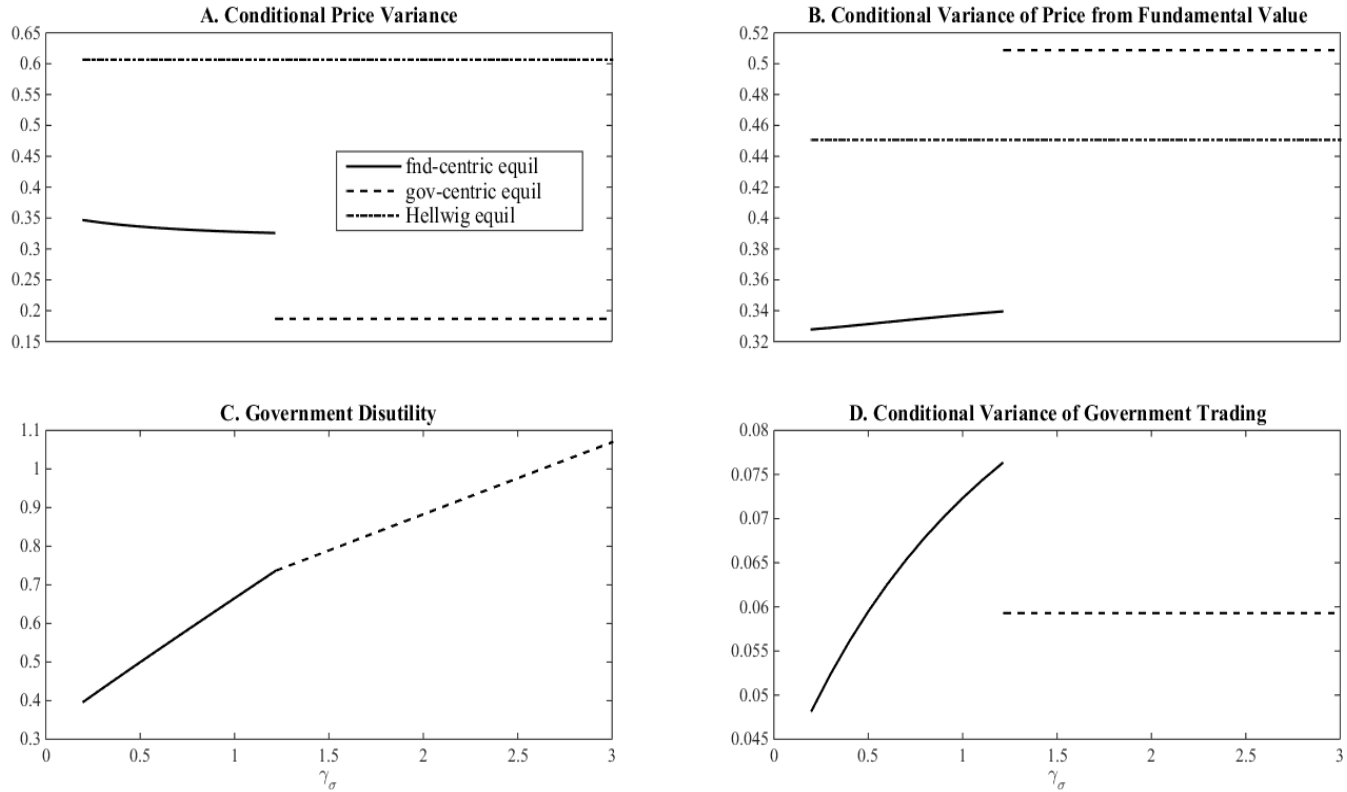
Three cases: 1) $\gamma_\sigma = 0, \gamma_\theta \neq 0$; 2)$\gamma_\theta = 0, \gamma_\sigma \neq 0$; 3)$\gamma_\theta = 0, \gamma_\sigma = 0$



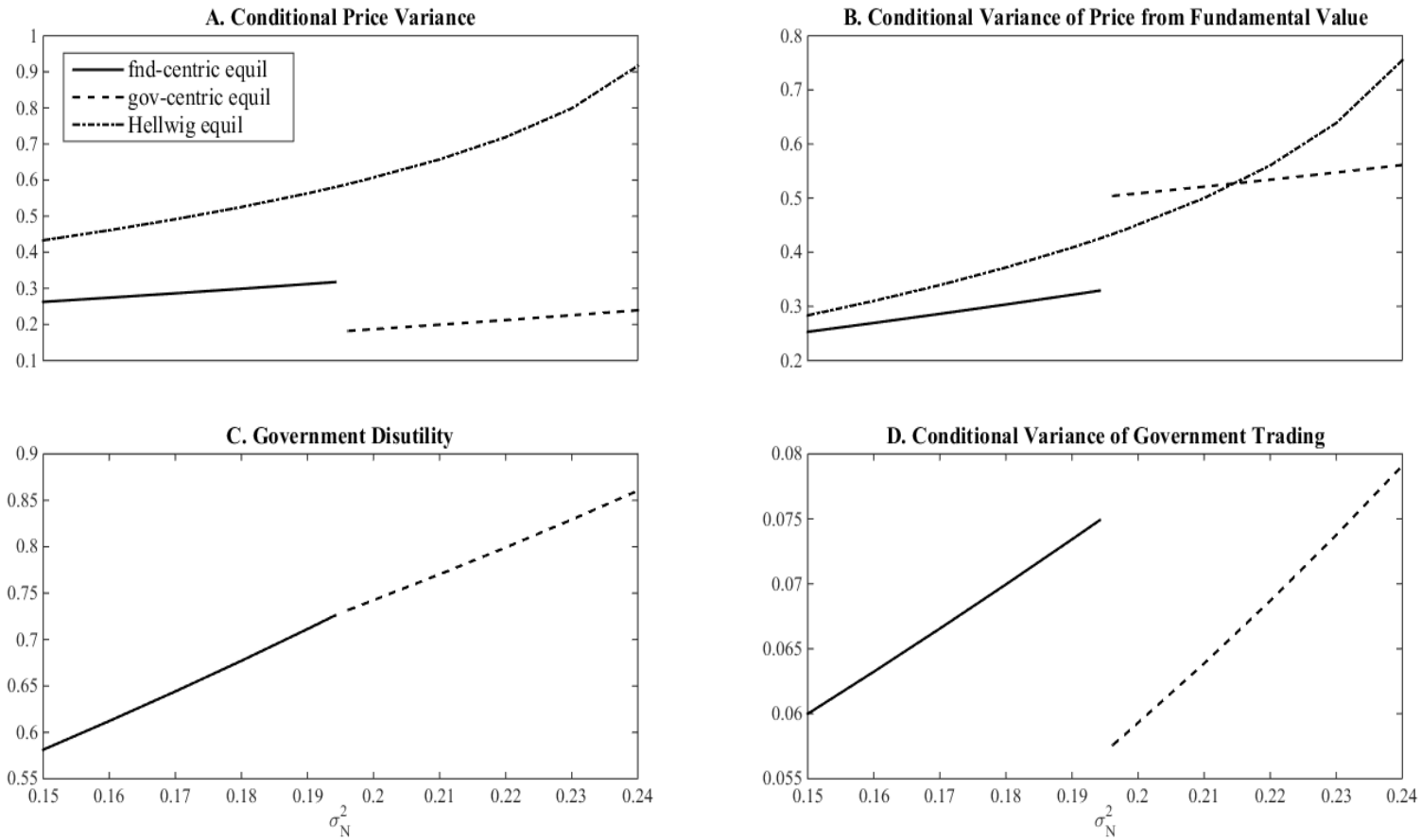


Market Equilibrium with a Mixed Government Objective

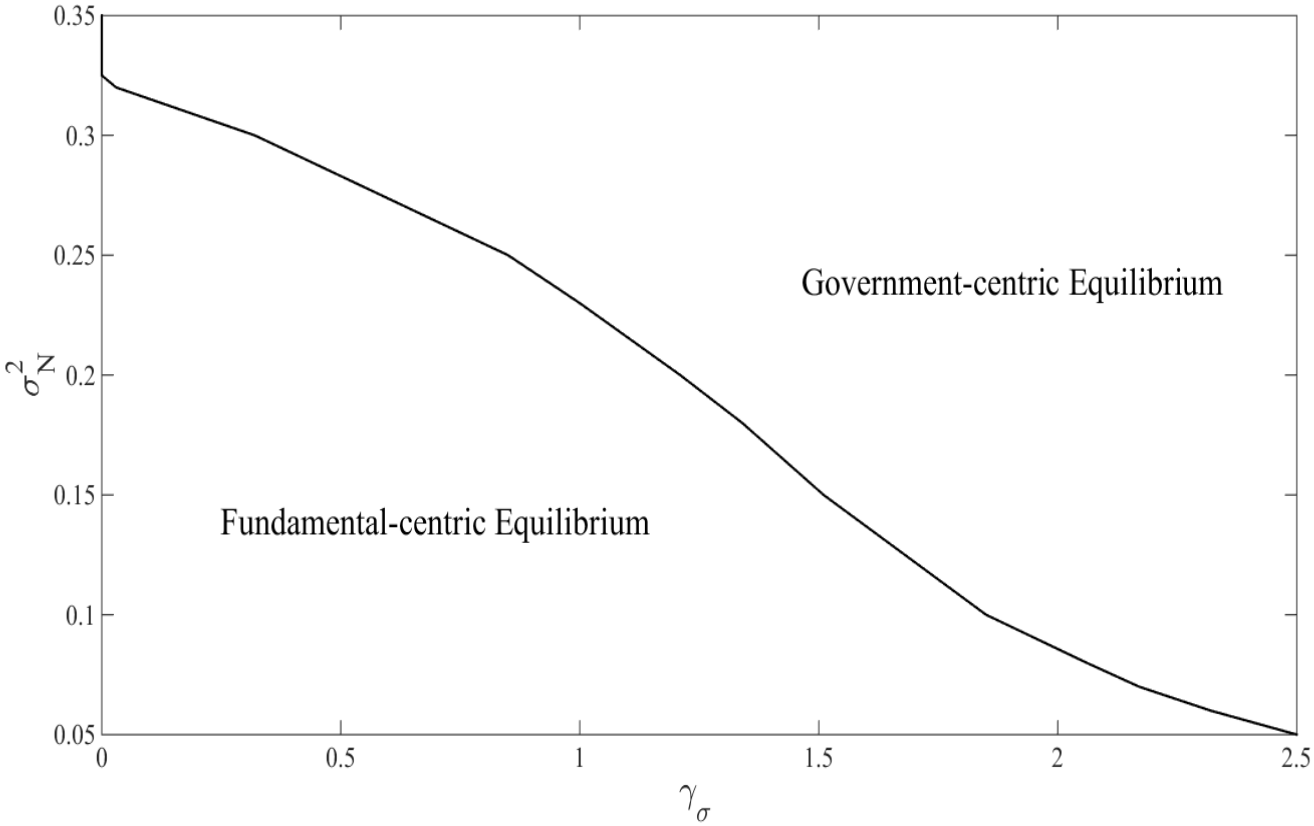
$\gamma_\theta = 1$ and varying γ_σ



$\gamma_\theta = 1$ and $\gamma_\sigma = 1.25$



Boundary between Government- and Fundamental-Centric Equilibria



Key Insights

- Government intervention helps to stabilize financial markets
  - unregulated markets can be highly volatile and might break down when noise trader risk is sufficiently large
- Adverse effects:
  - active government intervention renders noise in government policy **a pricing factor**
  - intervention can cause investors to **speculate on government noise** rather than fundamentals, which amplifies effects of policy errors
- Tension between objectives of reducing **price volatility** and improving **informational efficiency**
  - while price volatility is lower with intervention, informational efficiency can be worse

Risks in China's Financial System

- Commonly concerned risks
  - Noise trader risk created by inexperienced retail investors
  - Rising leverage across the nation
  - Overheating housing markets
- Another risk: policy errors **magnified** by financial market speculation
  - the stock market turmoil in summer 2015
  - the breakdown of the circuit breaker in January 2016
  - the exchange rate crash in August 2015