Money, Finance and Growth

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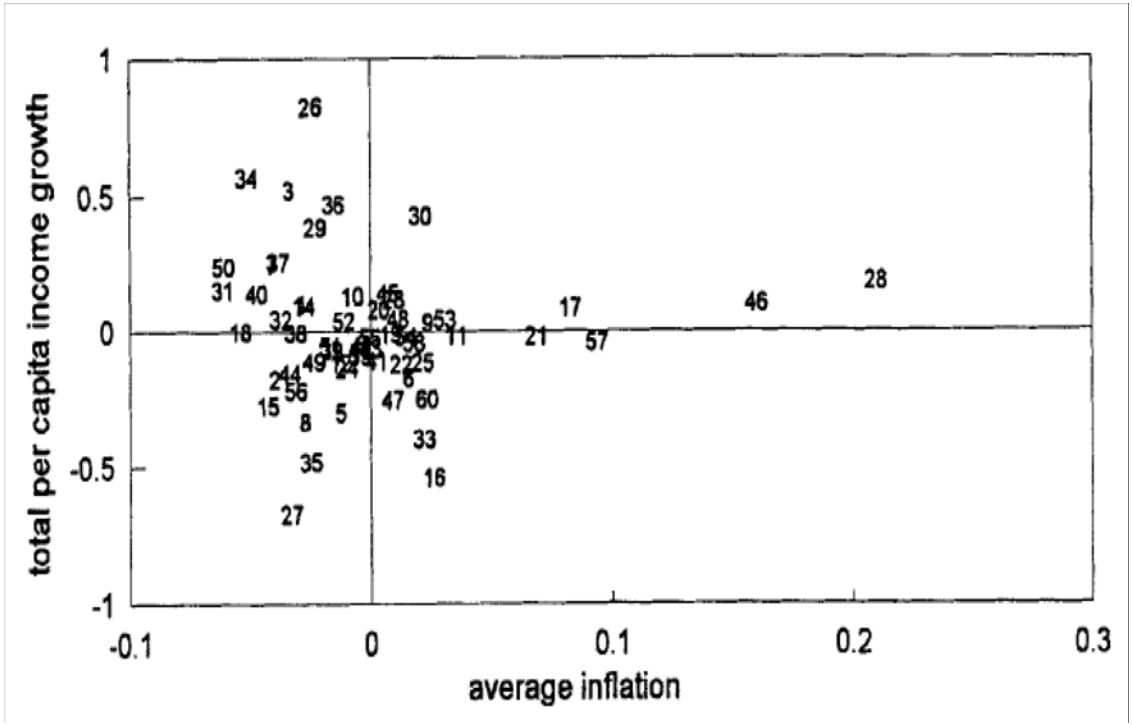
I. Introduction

A. Empirical Regularities

1. Money and growth (Friedman-Schwartz; Walsh, ch. 1):

a. positive correlation in levels
b. largely negative correlation in growth rates
c. presence of a liquidity effect

Summer-Heston data (1960-85, excluding poor quality data, 60 countries):



Note: **(i) High inflation countries: 28 = Indonesia, 46 = Iceland, 57 = Turkey, 17 = Mexico, 21 = Columbia;**

(ii) High growth countries: 26 = Hong Kong, 34 = Singapore, 3 = Morocco, 30 = South Korea, 29 = Japan.

2. Finance and growth (Becsi-Wang 1997; Levine 1997):

- **a. positive correlation in levels (Goldsmith 1969, McKinnon 1973)**
- **b. mixed relation in growth rates:**
  - **i. zero correlation for OECD (Fernandez-Galetovic 1994)**
  - **ii. weakly negative correlation for Latin America (DeGregorio-Guidotti 1995)**
  - **iii. strongly positive correlation for Asia (King-Levine 1993)**

Financial Deepening	Per Capita Income		
	High	Middle	Low
High	US, France, Italy, Switzerland	Chile, Venezuela	Kenya, Jamaica Honduras
Middle	Norway, Germany, Denmark	Malaysia Trinidad & Tobago	Liberia, Uganda
Low		Ireland, Hungary, Yugoslavia	Sri Lanka, Philippines Zimbabwe, Indonesia

Notes: (i) Per capita income is measured by 1985 real GNP per capita in US$ at 1980 constant prices where high income takes values of $7,500 or above, middle income from $3,000 to $6,000, and low income up to $2,000.

(ii) Financial deepening is measured by the financial intermediation ratio (FIR) defined as in Goldsmith (the ratio of M to GNP) where high deepening takes values of 13% or above, middle deepening from 8% to 12%, and low deepening up to 7%.

(iii) Gaps are allowed to ensure more definitive classification.

3. Key Literature

- **Use of money:**
  - **money in the utility function (direct value, wealth or transactions time reduction): Samuelson (1947), Patinkin (1965), Sidrauski (1967), Brock (1974), Wang-Yip (1992a), Wang-Yip (1992b)**
  - **cash in advance: Tsiang (1966), Clower (1967), Lucas (1980), Stockman (1981), Lucas-Stokey (1987), Cooley-Hansen (1989), Wang-Yip (1992a), Gomme (1993), Ireland (1994), Jones-Manuelli (1995)**
  - **transactions cost: Saving (1973), Drazen (1979), Grossman-Weiss (1983), Rottemberg (1984), Wang-Yip (1992a), Jha-Wang-Yip (2002)**
  - **medium of intergenerational transactions: Samuelson (1958), Wallace (1980), McCullum (1983), Wang (1993), Van der Ploeg-Alogoskoufis (1994)**
  - **liquidity service: Feenstra (1986), Chang-Chang-Lai-Wang (2008)**

- **money and search: Wicksell (1898), Jones (1976), Wang (1987), Kiyotaki-Wright (1989, 1993), Trejos-Wrigth (1995), Lagos-Wright (2002), Laing-Li-Wang (2007, 2013)**

- **Major Roles of Financial Intermediation:**
  - **liquidity management: Diamond-Dybvig (1993), Bencinvinga-Smith (1991)**
  - **risk pooling: Townsend (1978), Greenwood-Jovanovic (1990), Bencivenga-Smith (1993)**
  - **effective monitoring: Williamson (1986), Greenwood-Jovanovic (1990)**
  - **funds pooling: Besley (1994), Becsi-Wang-Wynne (1999)**

II. Money in Dynamic General Equilibrium: Wang-Yip (1992)

- **Provide a unified framework to study 3 main dynamic general equilibrium models of money**

- **Main issue: is money superneutral?**
- **Tobin (1965): via asset substitution, higher money growth reduces real balances but encourages capital accumulation and output growth (Tobin effect)**
- **Sidrauski (1967): even if money is valued directly, money growth has no effect on steady-state output**
- **Stockman (1981): higher money growth reduces real balances, limits capital investment, and lowers output growth (reversed Tobin effect)**

a. Money in the Utility Function

$$\max \int_0^{\infty} W(c(t),\ell(t),m(t))e^{-\rho t}dt$$

$$\text{s.t. } c(t) + \dot{k}(t) + \dot{m}(t) = f(k(t), \ell(t)) - nk(t) - (\pi(t) + n)m(t) + \tau(t)$$

- **FOCs and S-S BC:**

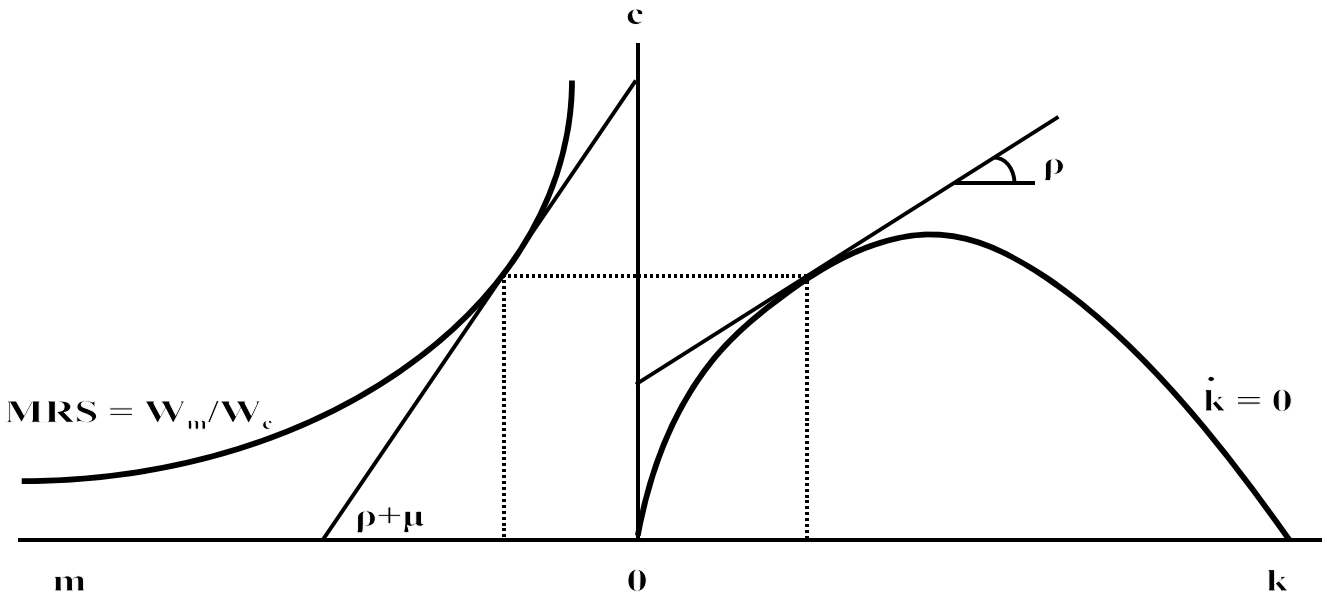
$$f_k(k, \ell) = \rho + n$$

$$W_c(c, \ell, m)f_\ell(k, \ell) = -W_\ell(c, \ell, m)$$

$$W_m(c, \ell, m) = (\rho + \mu)W_c(c, \ell, m) .$$

$$c = f(k, \ell) - nk.$$

- **Equilibrium**



- **Comparative statics**

higher μ => W_m/W_c increases
=> m lowers (if $W_{c\ell} < 0$, i.e., c and x are complem.)
=> (W1) $W_{cm} > 0$, $W_{\ell m} > 0$: c, ℓ, k all fall
(W2) $W_{cm} < 0$, $W_{\ell m} < 0$: c, ℓ, k all rise

b. Cash in Advance

$$\max \int_0^{\infty} U(c(t),\ 1 - \ell(t))e^{-\rho t}dt$$

s.t. $c(t) + \dot{k}(t) + \dot{m}(t) = f(k(t), \ell(t)) - nk(t) - (\pi(t) + n)m(t) + \tau(t)$

$$m(t) \geq c(t) + \Gamma\dot{k}(t)$$

where $\Gamma = 0$, $U_\ell = 0$ => Lucas; $\Gamma = 1$, $U_\ell = 0$ => Stockman

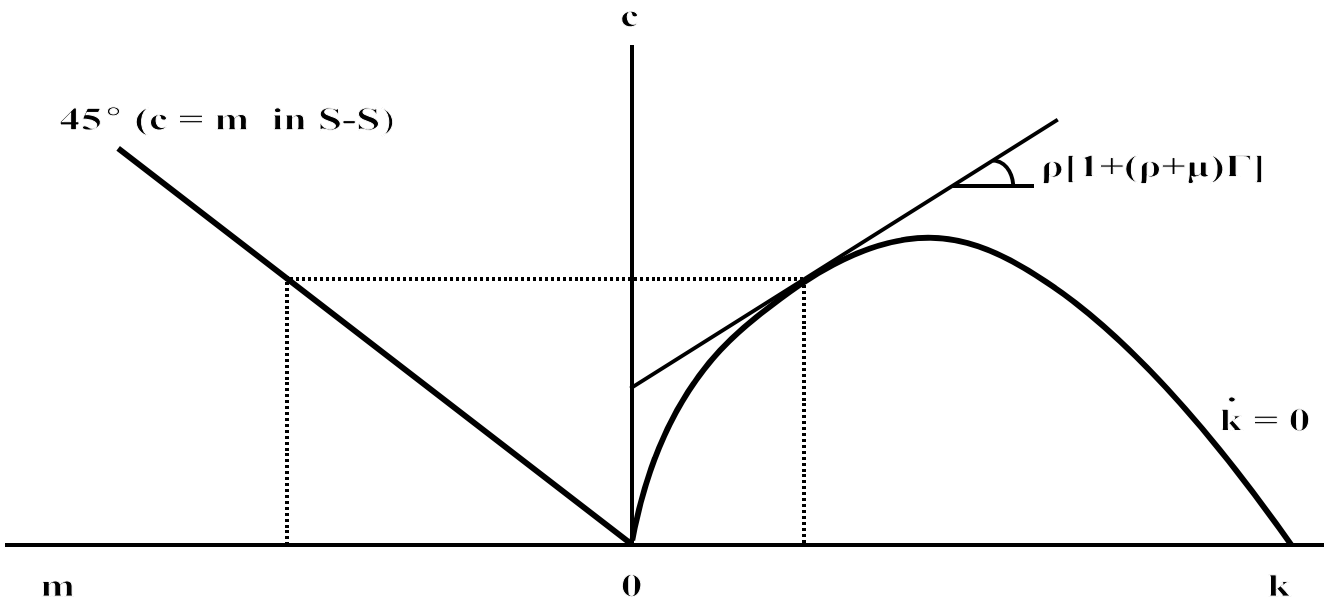
- **FOCs:**

$$f_k = \rho + n + \rho(\rho + \mu)\Gamma$$

$$f_\ell U_c = (1 + \rho + \mu)U_x\ .$$

Thus, money growth affects MPK directly

- **Equilibrium**



- **Comparative statics**

  higher μ => k decreases

  => ℓ lowers ($f_{k\ell} > 0$)

  => y and c fall

  => (1-ℓ) reduces ($U_{cx} > 0$) and so ℓ rises

  => net effect on ℓ ambiguous

c. Transactions Cost Model

$$\max \int_0^{\infty} U(c(t),\ 1 - \ell(t) - T(t))e^{-\rho t}dt$$

s.t. $c(t) + \dot{k}(t) + \dot{m}(t) = f(k(t), \ell(t)) - nk(t) - (\pi(t) + n)m(t) + \tau(t)$

where $T(t) = T(c(t), m(t))$**, satisfying:**

$T_c > 0,\ T_m < 0,\ T_{cc} < 0,\ T_{mm} > 0,\ T_{mc} \leq 0$

- **FOCs:**

$$f_k = \rho + n$$

$$f_\ell U_c = (1 + T_c f_\ell)U_x$$

$$-T_m f_\ell = \rho + \mu\ ,$$

where money growth affects output via MPL

- **Comparative statics**

  higher μ => k/ℓ unchanged, as does f_ℓ
  => $(-T_m)$ increases and hence m decreases
  => T increases and ℓ decreases
  => k decreases, as does c
  => but the decrease in c lowers T
  => net effect on $x = 1 - \ell - T$ ambiguous

d. Qualitative equivalence between the three models if $W_{c\ell} < 0$, $W_{cm} > 0$, $W_{\ell m} > 0$, $\Gamma = 0$, $T(c,m) = 0$ if $c \leq m$ and $= 1$ otherwise

e. Questions: As the three most used "conventional" approaches to money seem to yield qualitatively similar theoretical findings, can "newer" approaches deliver more insights along the lines of money, inflation and growth?

III. Money and Endogenous Growth: Jones and Manuelli (1995)

- **Modified Cooley-Hansen (1989) model to permit endogenous growth**

a. Basic One-Sector Endogenous Growth Model of Money

- **Consumer's optimization:**

$$\max \sum_t \beta^t u(c_{1t}, c_{2t}, 1 - n_t)$$

s.t.

$$m_t + b_{t+1} \leq v_t,$$

$$p_{1t}c_{1t} \leq m_t,$$

$$v_{t+1} \leq (v_t - m_t - b_{t+1}) + (m_t - p_{1t}c_{1t}) - p_{2t}c_{2t} - p_{1t}x_t + p_{1t}w_t n_t + p_{1t}r_t k_t + (1 + R_{t+1})b_{t+1} + T_t,$$

$$k_{t+1} \leq (1 - \delta)k_t + x_t,$$

where v = nominal wealth, T = money transfer (M_{t+1} - M_t),
R = nominal interest rate, w, r = real factor prices
p_i = nominal price of i (1 & 2 are cash & credit good)
p_i = p if both goods are produced

- **Firm's optimization**

  max $\pi_t = p_{1t}c_{1t} + p_{2t}c_{2t} + p_{1t}x_t - p_{2t}r_t k_t - p_{1t}w_t n_t$

  s.t. $c_{1t} + c_{2t} + x_t \leq F(k_t, n_t)$

- **FOCs**

$$\frac{u_1(t)\,F_2(t)}{u_3(t)} = 1 + R_{t+1},$$

$$\frac{u_1(t)}{u_1(t+1)} = \frac{(1 + R_{t+1})}{(1 + R_{t+2})}\,\beta\,[1 - \delta + F_1(t+1)]$$

$$\frac{u_1(t)}{u_2(t)} = 1 + R_{t+1},$$

$$1 + R_{t+2} = \frac{p_{t+1}}{p_t}\,[1 - \delta + F_1(t+1)],$$

and the CIA holds for equality in equilibrium

- **Asymptotic BGP equilibrium**

(A1) $F = Ak + Dk^{\alpha}n^{1-\alpha}$, with $\beta(1 - \delta + A) > 1$

(A2) $u = [(c_1^{-\lambda} + \eta c_2^{-\lambda})^{-1/\lambda}(1 - n)^{\psi}]^{1-\sigma}/(1 - \sigma)$, with $\sigma > 1$, $\lambda \geq -1$

$$\gamma^{\sigma} = \beta[1 - \delta + A]$$

$$\pi\gamma = \mu$$

$$1 + R = \pi[1 - \delta + A]$$

$$c_2/c_1 = [\eta(1 + R)]^{1/(1+\lambda)}$$

where $\mu = M_{t+1}/M_t$, $\pi = p_{t+1}/p_t$

Thus, $r = A - \delta$ and $\gamma = [\beta(1 + r)]^{1/\sigma} = \mu/\pi$ (growth rate of m/p)

- **Comparative statics**
  - money is superneutral in the narrow sense (γ independent of μ)
  - higher μ leads to higher π, higher R, and higher c_2/c_1 (the only source of nonsuperneutrality in the broad sense)

b. Two-Sector Endogenous Growth Model of Money

- **Consumer's optimization:**

$$\max \sum_t \beta^t u(c_{1t}, c_{2t}, 1 - n_t)$$

s.t. $m_t + b_{t+1} \leq v_t,$

$$c_{1t} p_t \leq m_t,$$

$$v_{t+1} \leq (v_t - m_t - b_{t+1}) + (m_t - p_t c_{1t}) - p_t c_{2t}$$
$$- p_t x_{kt} - p_t x_{ht} + p_t w_t n_t h_t + p_t r_t k_t$$
$$+ (1 + R_{t+1}) b_{t+1} + T_t,$$

$$k_{t+1} \leq (1 - \delta_k) k_t + x_{kt},$$

$$h_{t+1} \leq (1 - \delta_h) h_t + x_{ht},$$

where physical/human capital investments are credit goods and the final good production function is given by, $F(k, nh) = Ak^{\alpha}(nh)^{(1-\alpha)}$**, implying k/h = α/(1-α) if** $\delta_k = \delta_h$

- **Firm's optimization stays the same (except modified production)**

- **Asymptotic BGP equilibrium with $\delta_k = \delta_h$**

  2 x 2 system in (γ,n):

  (modified GR) $$\gamma^{\sigma} = \beta\left[1 - \delta + \alpha A n^{1-\alpha}\left[(1-\alpha)/\alpha\right]^{1-\alpha}\right]$$

  (labor tradeoff) $$\gamma = 1 - \delta + Bn^{1-\alpha}\left(1 - \frac{(1-\alpha)(1-n)}{\psi n f(\mu,\gamma)}\right)$$

  where $$f(\mu,\gamma) = 1 + \frac{\mu\beta^{-1}\gamma^{(\sigma-1)} - 1}{1 + \eta^{1/(1+\lambda)}(\mu\beta^{-1}\gamma^{(\sigma-1)})^{1/(1+\lambda)}}$$

- **Comparative statics**
- **money is generally nonsuperneutral even in the narrow sense**
- **for $\lambda > 0$ (c_1, c_2 complements): higher μ reduces c_1 and c_2, lowering n and γ**
- **for $\lambda < 0$ (c_1, c_2 substitutes): higher μ reduces c_1 but raises c_2, lowering n and γ if η is sufficiently small (CIA binds for almost all purchases)**

IV. Finance and Growth - A First Look: Becsi and Wang (1997)

(i) Key: Add a banking sector to the AK-model of endogenous growth

(ii) A Benchmark AK-model without the Financial Sector:

a. optimization:

$$\max \quad U = \int_0^{\infty} \frac{c^{1-\alpha} - 1}{1-\alpha} e^{-\rho t} dt$$

$$s.t. \quad \dot{k} = Ak - \eta k - c, \quad k(0) = k_0 > 0.$$

b. Key relationships without a banking sector:

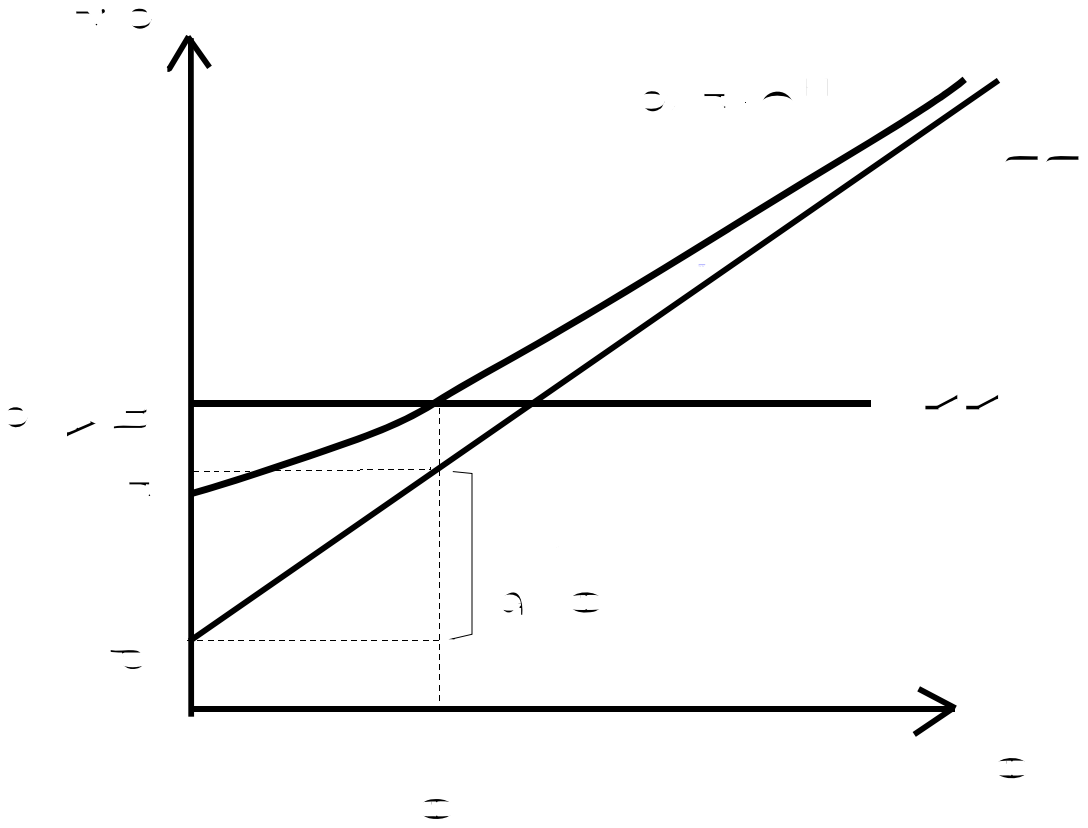
- **Keynes-Ramsey equation:** $\theta = \frac{\dot{c}}{c} = \frac{r - \rho}{\alpha} \Rightarrow r = \rho + \alpha\theta$ **(UU)**
- **Production efficiency:** $\delta = A - \eta$ **(YY)**
- **In the absence of an active banking sector:** $r = \delta$

(iii) Incorporation of the Financial Sector into the AK-Model

- A key ingredient is to recognize the loan-deposit interest differential. With active banking, deposits are transformed into loans, but such operations are not costless.
- In the absence of reserve requirement, loanable funds equilibrium implies that deposits equal to loans, denoted by x (in real values)
- Denote the unit financial intermediation cost as C_{FI}, which is decreasing as an economy develops (i.e., $\partial C_{FI}/\partial \theta < 0$; see Lehr and Wang 1999 for empirical documentation).
- By competitive banking (perfectly competitive or monopolistically competitive), banks must reach zero profit: profit = $\delta x - rx - C_{FI}\, x = 0$, or, $\delta = r + C_{FI}(\theta)$.
- The financial markup can be derived as: $\mu = \delta - r = C_{FI}(\theta)$, which depends negatively on the stage of economic development measured by the rate of growth θ.

(v) BGP Equilibrium

- **Along a BGP, the endogenous growth rate must be pinned down by the loan rate and the production technology, whereas the preferences determines the deposit rate.**
- **The BGP equilibrium (θ, δ) is determined when the YY locus intersects with the markup locus, which can then be used, in conjunction with UU, to pin down equilibrium r.**



- **Comparative statics:**
  - **production innovation: A ↗ => δ ↗, r ↗, μ ↘, θ ↗**
  - **banking innovation: exog. C_{FI} ↘ => δ unchanged, r ↗, μ ↘, θ ↗**
  - **annuity innovation: ρ ↘ => δ, θ ↗, r ↗, μ ↗**
  - **effective monitoring: A ↗ and C_{FI} ↘ => δ ↗, r ↗, μ ↘, θ ↗**
  - **technological and annuity innovation: A ↗ and ρ ↘ => δ ↗, r ? (↘ if direct effect dominates), μ ↗, θ ↗**
  - **limited bank entry: more local market power => μ ↗, θ ? (Smith vs. Schumpeter)**

V. Liquidity Management, Financial Intermediation and Growth: Bencivenga-Smith (1991)

- **The role of financial intermediation: liquidity management.**
- **Liquid investment is not as productive as illiquid investment. To accommodate illiquid investment and possible withdrawals, banks hold liquid reserves. However, should there be unexpected withdrawals, banks may face a illiquidity problem.**

- **The model generalizes Diamond-Dybvig (1983) by incorporating liquidity management into an endogenous growth framework.**

a. The Model

- **3-period overlapping-generations (pop = 1), supplying 1 unit of labor only when young and consuming when middle-aged and old**
- **Production:** $y = \bar{k}^{1-\theta} k^{\theta} L^{1-\theta}$ **(Romer)**
- **Labor demand per entrepreneur: MPL = *w***
- **Utility:** $U = -(c_2 + \varphi c_3)^{-\gamma} / \gamma$ **, $\gamma > -1$ since $\sigma = 1/(1+\gamma)$**

  where $\varphi = 0$ with probability $1-\pi$ (early withdrawers)
  $\varphi = 1$ with probability π (entrepreneurs)
- **Investment returns:**
  - **liquid investment: return = n > 0 (safe return)**
  - **illiquid investment:**
    - **return after 1 period = x ε [0, n) (liquidated scrap value < n)**
    - **return after 2 period = R > n (LT investment return > n)**

- **Labor market equilibrium: $\pi L = 1$ (young's labor supply)**
- **Factor prices:**
  - $w = (1-\theta)k\pi^{\theta}$
  - $r_k = \theta\pi^{\theta-1}$
- **With financial intermediation, all wages are deposited in banks.**
- **Banks:**
  - **have asset management portfolio of {z, q}, choosing a fraction z in liquid investment and q in illiquid investment, where z + q = 1**
  - **have liabilities, paying**
    - r_1 **to 1-period deposits**
    - r_2 **to 2-period deposits without withdrawals (capital)**
    - r_0 **to liquidated 2-period deposits (scraped for consumption).**
- **Banks' resources constraints (payments = revenues):**
  - **1-period:** $(1-\pi)r_1 = \alpha_1 nz + \alpha_2 xq \qquad (\alpha_1 + \alpha_2 = 1)$
  - **2-period:** $\pi r_2 = (1-\alpha_2)Rq$
  - **2-period scraped:** $\pi r_0 = (1-\alpha_1)nz$

- **Gurley-Shaw's bank (in the interest of the depositors, i.e., banks as coalitions formed by the young): choose {q, z, α_1, α_2, , r_1, r_2, r_0} to:**

max $$EV = (1-\pi)\left[-\frac{(r_1 w)^{-\gamma}}{\gamma}\right] + \pi\left[-\frac{\left(\theta\pi^{\theta-1} r_2 w + r_0 w\right)^{-\gamma}}{\gamma}\right]$$

s.t. $\alpha_1 + \alpha_2 = 1$, $z + q = 1$ **and 3 bank resources constraints**

b. Results

- **Equilibrium decisions: with $r_k R = \theta\pi^{\theta-1} R > n$,**
  - $\alpha_1 = 1$ **(2-period reserve always in capital)**
  - $\alpha_2 = 0$ **(no pre-mature liquidation of capital)**
  - $r_0 = 0$ **(paying nothing to liquidated consumption)**
- **Financial intermediation emerges with *rate-of-return dominance***
  - **it requires large γ (or small intertemporal substitution)**
  - **intuitively, small intertemporal substitution is equivalent to more risk aversion intertemporally, thus giving a stronger role for banks to form.**

- **Key finding: the rate of growth with financial intermediation is higher than without it if x is sufficiently small.**

Remark: **Although the current model assumes forced savings (no value of period-1 consumption), main results are robust to such an extension.**

VI. Finance, Investment, and Growth: Aghion-Bolton (1997)

- **The Aghion-Bolton model can be regarded as an extension of Baneree-Newman (1993) by allowing full dynamics of wealth evolution with:**
  (i) endogenous occupational choice
  (ii) credit market imperfections
  (iii) nonstationary distribution (cf. Hopenhyne-Prescott)

a. The Model

- **1-period lived agents of with unit mass with bequest motive, one unit of time endowment, and heterogeneous initial wealth w ~ $G_t(w)$**

Occupational choice:

- **Home production: return $n > 0$ (small)**
- **Entrepreneurial activity:**

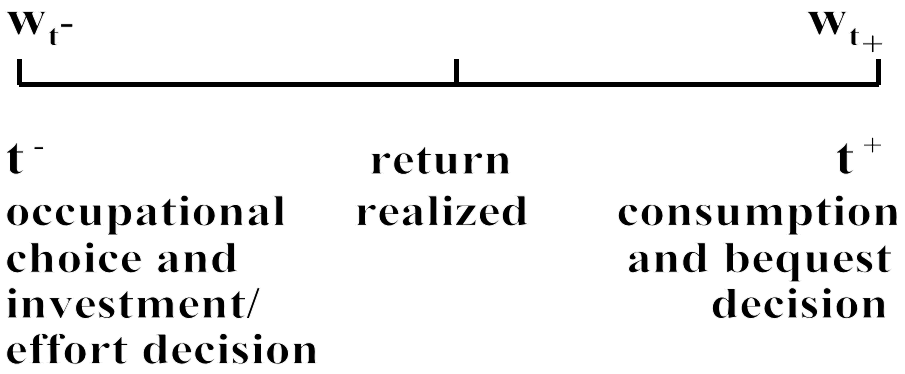
$$F(k,1) = \begin{cases} \text{r} & \text{for k} \geq 1\text{(fixed cost), with prob.} = p \\ 0 & \text{for k} \geq 1, \text{ with prob.} = 1 - p \\ 0 & \text{for k} < 1 \end{cases}$$

where p = effort with effort cost $C(p) = \frac{rp^2}{2a}$, $a \in (0,\ 1]$

- **Mutual fund deposit: safe return $A_t w_t$ (no labor input)**

- **Preferences: Leontief in consumption and bequest**
  $U = [\delta(1-\delta)]^{-1} \min\{(1-\delta)c, \delta b\} - C(p)$
- **Budget Constraint: $c + b = w$**

- **Timing**



b. Optimization

- **Consumption and bequest:**

  $(1-\delta)c = \delta b$ and BC $\Rightarrow b = (1-\delta)w,\ c = \delta w$

  $\Rightarrow\ w_{t+1^-} = b_{t+1} = (1-\delta)w_{t^+}$

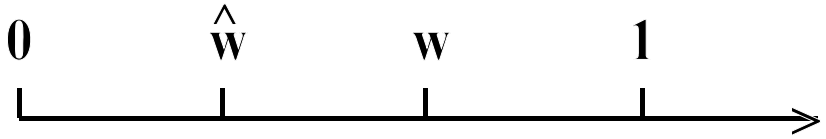
- **Assumptions:**
  - **(A1) (mean wealth)** $\int w dG_0(w) < 1$
  - **(A2) (repayment)** $\forall w < 1$

$$R(w) = \begin{cases} (1-w)\rho(w) & \text{with prob.} = p \\ 0 & \text{with prob.} = 1-p \end{cases}$$

- **Occupational choice and investment decision:**
  - **Potential borrower (w <1):** $\max_p \quad pr - p(1-w)\rho(w) - C(p)$,

    implying $p(w) = a\left[1 - \left(\frac{1-w}{r}\right)\rho(w)\right]$

  - **Rich lender** $(w \geq 1)$**:** $\max_p \quad pr - C(p)$, **implying** $p(w) = a$



poor lender — borrower — rich lender

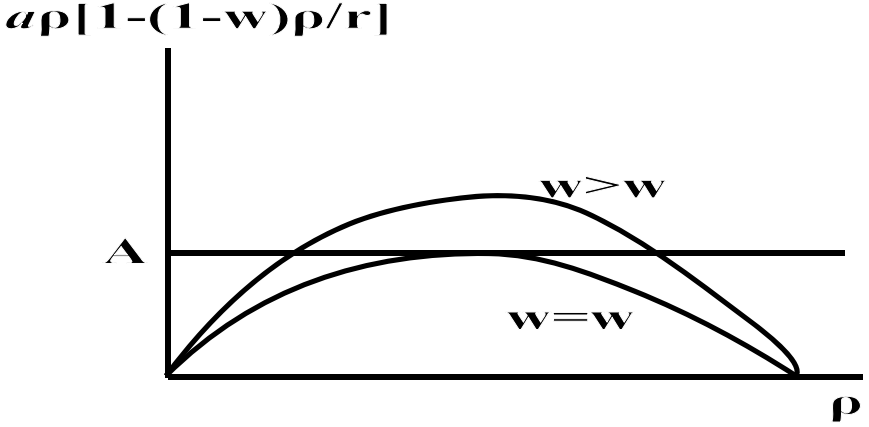
loan = 1-w

c. Atemporal Equilibrium

- **Rate of return equalization to lenders:**

$$p(w)\rho = A \quad \Rightarrow \quad \rho(w) = \frac{r}{2(1-w)}\left[1 - \sqrt{1 - \frac{4(1-w)A}{ar}}\right] \quad \forall\ w \in [\underline{w},\ 1]$$

where $\underline{w} = 1 - ar/(4A)$ with $\rho' > 0$ $(p' > 0)$



$w \in [0,\ \underline{w}) \Rightarrow$ no loan supply $\Rightarrow$ unable to borrow

- **Rate of return equalization to borrowers**

  $p(w_C)r - p(w_C)\rho(w_C)(1-w_C) - C(p(w_C)) - 1 = Aw_C + n$

  => willing to borrow if $w > w_C$ **or** $A < (3/8)ar - n - 1$
- **Condition CR:** $\exists\ \underline{w} > 0$ **and** $w > w_C$ **, or,** $ar/4 < A < (3/8)ar - n - 1$
- **Under condition CR, we have:** $\forall\ w \in (w_C, \underline{w})$**, they are willing to borrow but unable to obtain loan => equilibrium credit rationing**

d. Full Equilibrium

- **Wealth evolution:**

$$w_{t+1} = \begin{cases} (1-\delta)(Aw_t + n) & \text{for } w_t \in [0, \hat{w}_t] \\ g_t(w_t, \theta_t) & \text{for } w_t \in [\hat{w}_t, \infty) \end{cases}$$

where $\hat{w}_t = \max\{\underline{w}, w_C\}$ **,** θ_t **= indicator function for success, and**

$$g(w,1) = \begin{cases} (1-\delta)[r - (1-w)\rho(w)] & w < 1 \\ (1-\delta)[r + (w-1)A] & w \geq 1 \end{cases} \qquad g(w,0) = \begin{cases} 0 & w < 1 \\ (1-\delta)(w-1)A & w \geq 1 \end{cases}$$

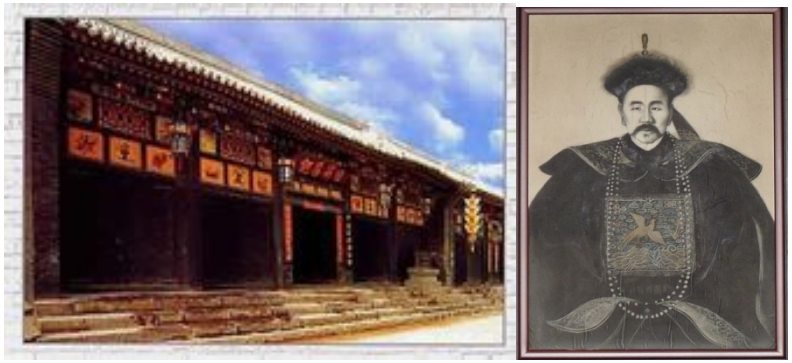
$$prob.(\theta = 1 | w) = h(w) = \begin{cases} p(w) & w < 1 \\ a & w \geq 1 \end{cases}$$

- Distribution converges in weak* topology in Polish space
- Additional assumptions:
  - (A3) (incentive to lend) $\frac{ar}{4}(1-\delta) > 1$
  - (A4) (rapid accumulation) $\frac{3}{8}ar(1-\delta) > 1+n$
- Safe rate of return:
  - $A_t \leq \frac{1}{1-\delta} \quad \forall\, t \geq T$ (ow, unbounded wealth=>excess fund supply)
  - under (A3), CR does not exist for $A_t \in [1,\ 1/(1-\delta)]$
  - under (A3) and (A4), $A_t \to 1$ in finite time
- Trickle-down:
  - CR exists in early stage of development when A_t is high
  - As $w_t \uparrow$ over time, A_t falls in $[1,\ 1/(1-\delta)] \to 1$ => no CR
  - Intuition: the rich trickle down increasing supply of loan and enabling the poor to borrow and invest by lowing capital cost A_t

VII. Big Push or Big Crash: A Retrospect of Financial Crises

- Merchant of Venice (Shakespeare 1596-98):
  - Antonio: merchant of Venice, intermediary/loan guarantor
  - Bassanio: loan demander, suitor to Portia - a beautiful rich heiress of Belmont
  - Shylock: rich Jew, moneylender (loan supplier)
  - Usury/Usance (interest/duration of loan): one pound of Antonio's flesh by a bond date
  - Productivity of loan: gaining Portia's love, which is high risk but potentially high return
  - When Antonio's ships were reported lost at sea, Antonio was at risk of losing a pound of flesh (individual crisis)

a. Historical Financial Crises



- Crises of Chinese Money Stores/Piao-Hau:
  - Hui-gang's (徽幫) Fu-Kang Money Store (阜康錢莊) by Shieh-Yen Hu (胡雪巖) and Gin-gang's (晋幫) Shan-Hsi Piao-Hau (山西票號) by Lui-Tai Lei (雷履泰; after the turn of 20th century, Shiang-Hsi Kung became the leader of this group) were the two largest financial institutions in the turn into the 20th century
  - Bankruptcy of Fu-Kang Money Store suddenly occurred as a result of losing government support
  - Financial contagion caused early withdrawal and illiquidity of Shan-Hsi Piao-Hau
  - **Lesson: financial crisis can come suddenly, being large scale and wide spread with even high performers failing**
  - A view of Gin-gang's Money Store (日昇昌票號, 山西平遙, 1823): http://www.youtube.com/watch?v=fUrD4Gg59Is

b. Major Financial Crises Since 1900

- Argentina (1985, 1989, 1992, 1999-2001), Bolivia (1985), Brazil (1989), Chile (1982), Mexico (1982, 1987, 1994)
- Israel (1985), Russia (1998)
- U.S. (1907, 1929, 1984-85), Spain (1977), Norway (1987), Finland (1991), Sweden
- (1991), Japan (1992),
- A group of Asian countries (1997): Hong Kong, Indonesia, Korea, Malaysia, Philippines, Thailand
- Worldwide Financial Tsunami (2008-09) caused by subprime mortgage crisis in the U.S.

c. A First Look at Financial Crises

- Duration (in years) and depth (in % of cumulative GNP losses) of financial crises over the past century:

Crises	1880-1913	1919-1939	1945-1971	1973-1997
Currency Crises	**2.6 yrs** **8.3%**	**1.9 yrs** **14.2%**	**1.8 yrs** **5.2%**	**2.1 yrs** **5.9%**
Banking Crises	**2.3 yrs** **8.4%**	**2.4 yrs** **10.5%**	**0 yrs** **0%**	**2.6 yrs** **6.2%**
Twin Crises	**2.2 yrs** **14.5%**	**2.7 yrs** **15.8%**	**1.0 yrs** **1.7%**	**3.8 yrs** **18.6%**

d. The 1997 Asian Financial Crises

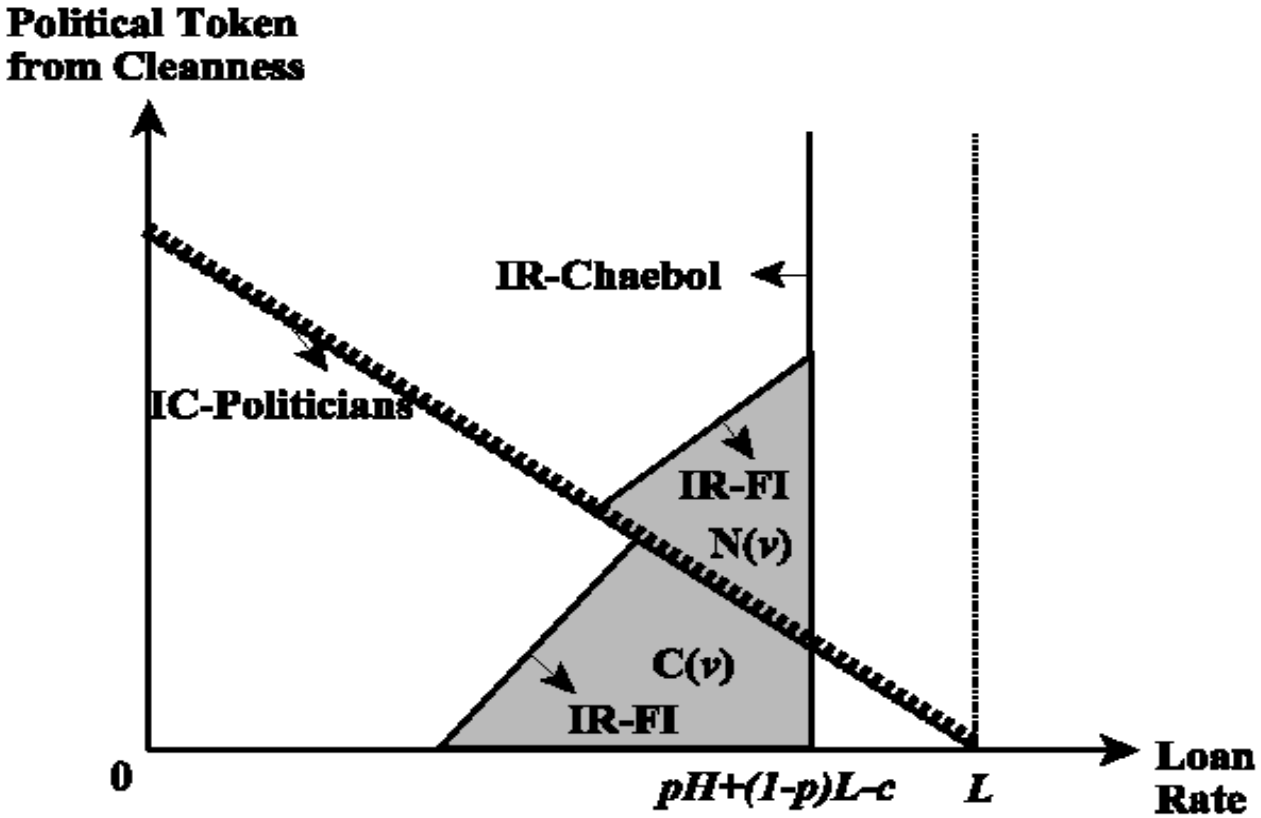
- This episode has puzzled many economists:
  - trade deficit as a poor predictor: Sacks-Tornell-Velasco (1996)
  - no high inflation associated with fiscal or exchange rate collapse crises except Indonesia (Chang-Velasco 1998, Burnstein-Eichenbaum-Rebelo 1998)
  - no excessive foreign debt except Indonesia and Philippines (> 1/2 of GDP)
  - no severe illiquidity problem

	CHI	TWN	SNG	HKG	THD	MAL	KOA	IND	PHN
GDP Growth (%)									
1990	9.19	7.60	7.27	4.97	8.41	8.42	9.13	6.95	-0.51
1995	10.55	6.00	8.75	4.40	8.68	9.46	8.94	8.22	4.76
1996	9.34	5.70	7.32	5.00	6.66	8.20	7.13	7.98	5.67
Inflation									
1990	6.40	3.60	3.40	11.60	5.70	4.40	9.30	9.40	18.70
1995	5.50	3.70	1.79	8.59	5.69	5.28	4.49	9.43	8.11
1996	6.20	3.10	1.32	5.98	5.85	3.56	4.96	8.03	8.41
Savings/GDP									
1990	37.8	29.3	45.3	35.6	32.2	29.1	35.7	31.8	17.9
1995	40.1	28.0	51.1	31.6	37.6	29.8	35.1	27.7	17.2
1996	42.1	28.0	51.3	32.0	33.6	37.0	33.3	28.7	18.3
TradeSurplus/GDP									
1990	3.02	6.70	9.45	8.40	-8.74	-2.27	-1.24	-4.40	-6.30
1995	1.02	1.90	17.93	-2.21	-9.00	-13.5	-1.91	-4.25	-5.06
1996	-0.34	5.20	16.26	0.58	-9.18	-5.99	-4.89	-3.41	-5.86
Gov'tSurplus/GDP									
1990	-0.79	0.80	10.53	--	4.59	-3.10	-0.68	0.43	-3.47
1995	-1.02	0.40	14.27	--	3.01	0.89	0.30	2.29	0.52
1996	-0.82	0.20	12.13	--	4.13	0.77	-0.07	1.19	0.29
Stock Index									
1990	--	4350	1154	3024	612	505	696	417	651
1995	--	6933	2216	13451	831	1237	651	637	3170
1996	--	8187	1529	10722	372	594	376	401	1869
Exchange Rate									
1990	4.78	31.28	1.81	7.79	25.59	2.70	707.8	1843	24.31
1995	8.35	27.78	1.42	7.74	24.92	2.50	771.3	2249	25.71
1996	8.31	27.37	1.41	7.73	25.34	2.52	804.5	2342	26.22
FRs in Mo of Imp.									
1990	--	10.3	6.9	3.1	4.5	3.7	2.3	3.2	0.8
1995	--	11.2	6.2	3.1	5.4	3.1	2.5	2.9	2.3
1996	--	10.5	7.6	3.5	5.4	3.7	2.3	3.6	2.8

	CHI	TWN	SNG	HKG	THD	MAL	KOA	IND	PHN
Bank Lending Boom Measure (%)	9	14	16	14	51	27	17	12	152
Non-performing Loan Percentage (%)	14	4	4	4	19	16	16	17	14
Foreign Debt to GDP Ratio	1/6	<1%	<1%	<1%	1/3	2/5	1/7	>1/2	>3/5
Short-term Debt to Total Debt Ratio (%)	15	<10	<10	<10	30	20	25	15	15
Short-term Debt to Foreign Reserve Ratio (%)	30	<10	<10	<10	>50	25	>50	>120	>80
Liability to Asset Ratio	1.2	0.6	1.6	1.7	10.8	1.5	3.6	4.2	1.7

- Possible Explanation of 1997 Asian Crisis: The possibility of discrete equilibrium shifts may be the only explanation for sudden, large scale and wide spread financial crisis in high performing East Asian countries.
- Hwang-Jiang-Wang (2004): with interplays by financial intermediaries, large businesses (chaebols) and politicians,
  - there are endogenous financial institutions and incentive mechanisms adjusting in response to economic primitives
  - leading to multiple equilibria, one with collusion (no effort devoted to clean institutions) and another with no collusion

- Collusion vs. no-collusion equilibrium



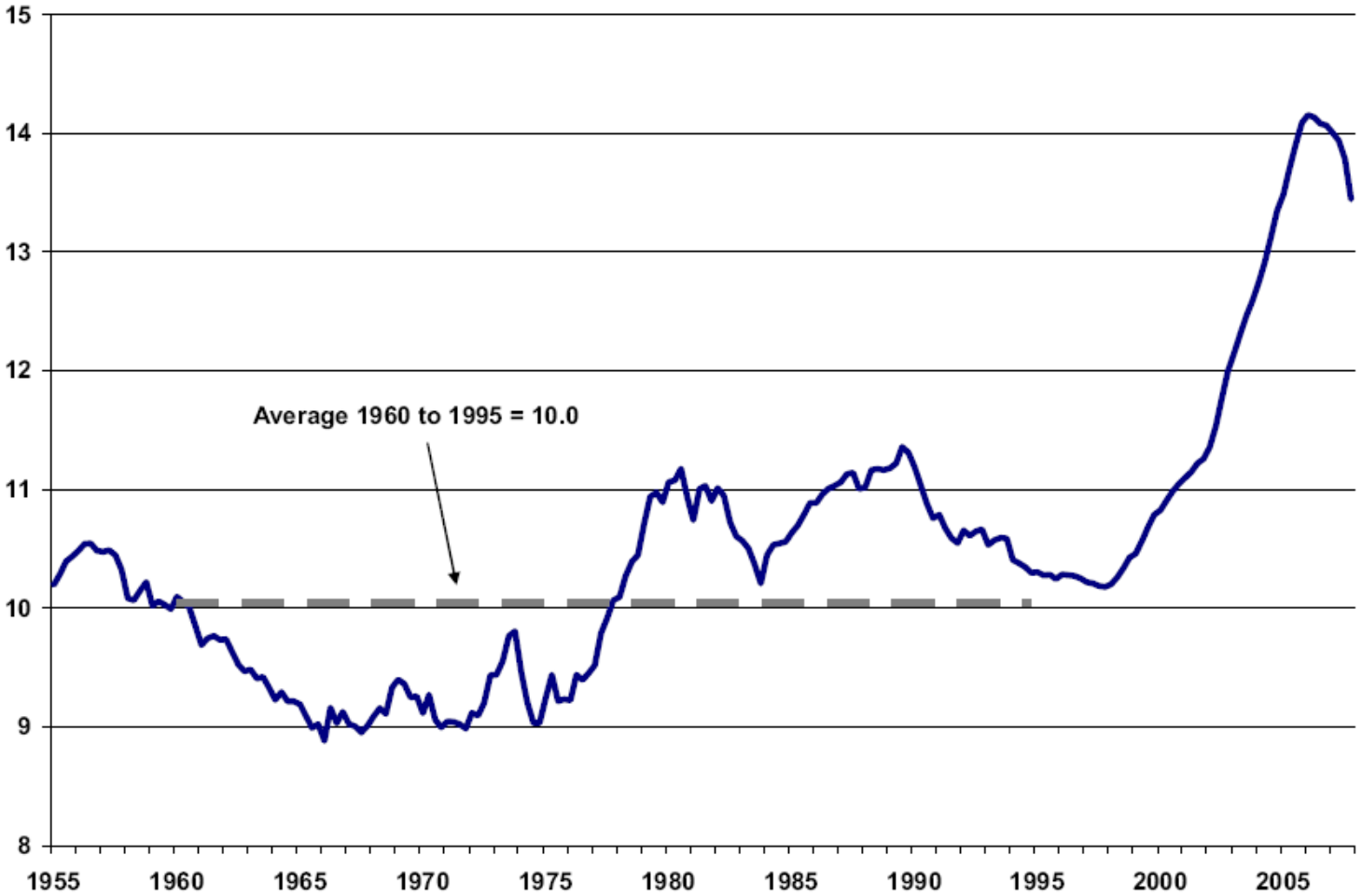
Collusion Set C(v) and No-collusion Set N(v)

- FI's iso-profit curves (upward-sloping) may intersect at N(v) with political token > 0 or at C(v) with token = 0

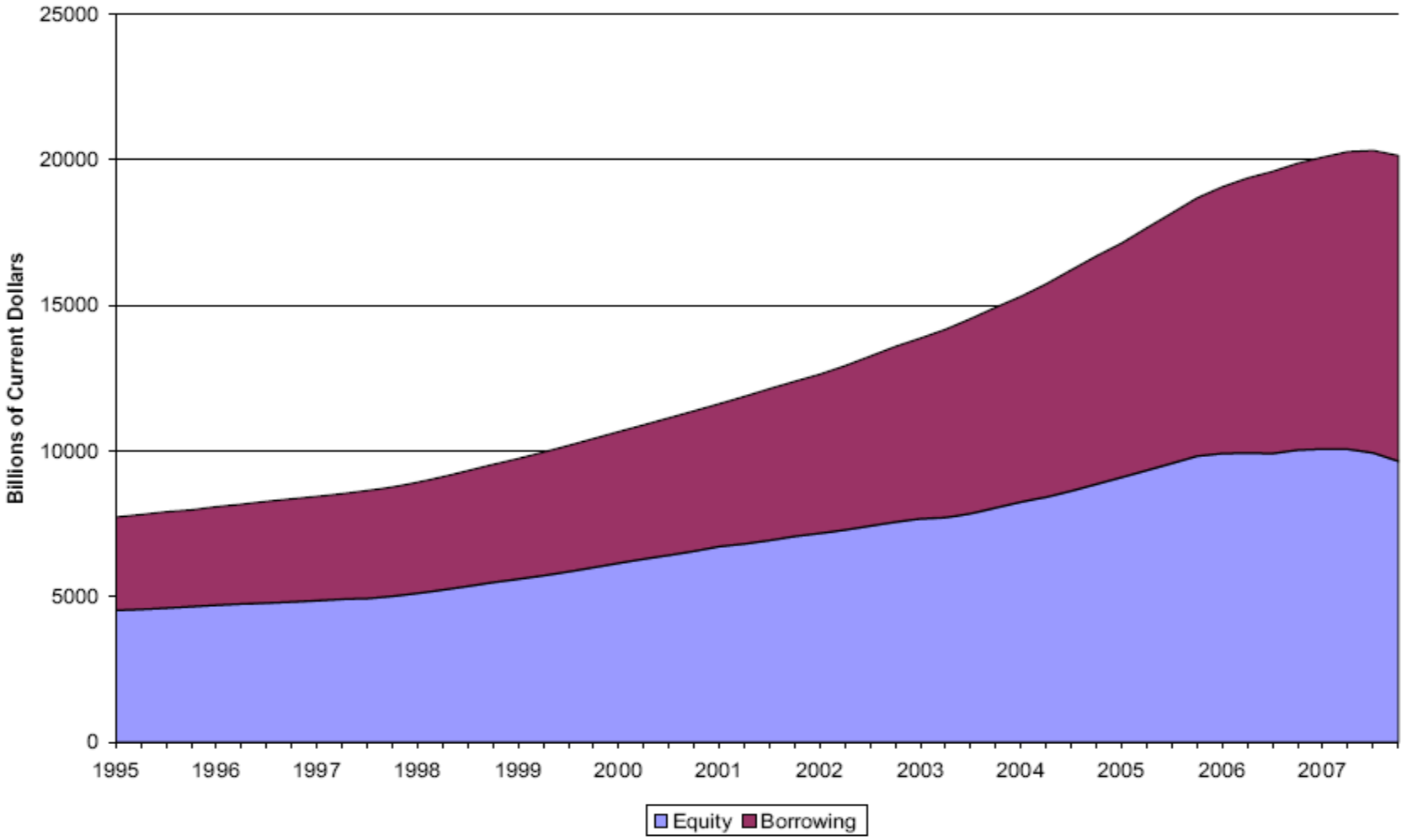
e. The Financial Tsunami

- Two Primary Causes:
  - Financial deregulation since 1992, resulting in severe moral hazard problems
    - subprime lending by government sponsored Fannie Mae/Freddie Mac
    - wide acceptance of risky insuees with low prenium by AIG
  - Widely linked financial derivatives, causing wide spread of crises (putting all bad eggs in one basket, facing many financial firms, such as Bear Stearns & Lehman Brothers)

- Home Price-Rent Ratio

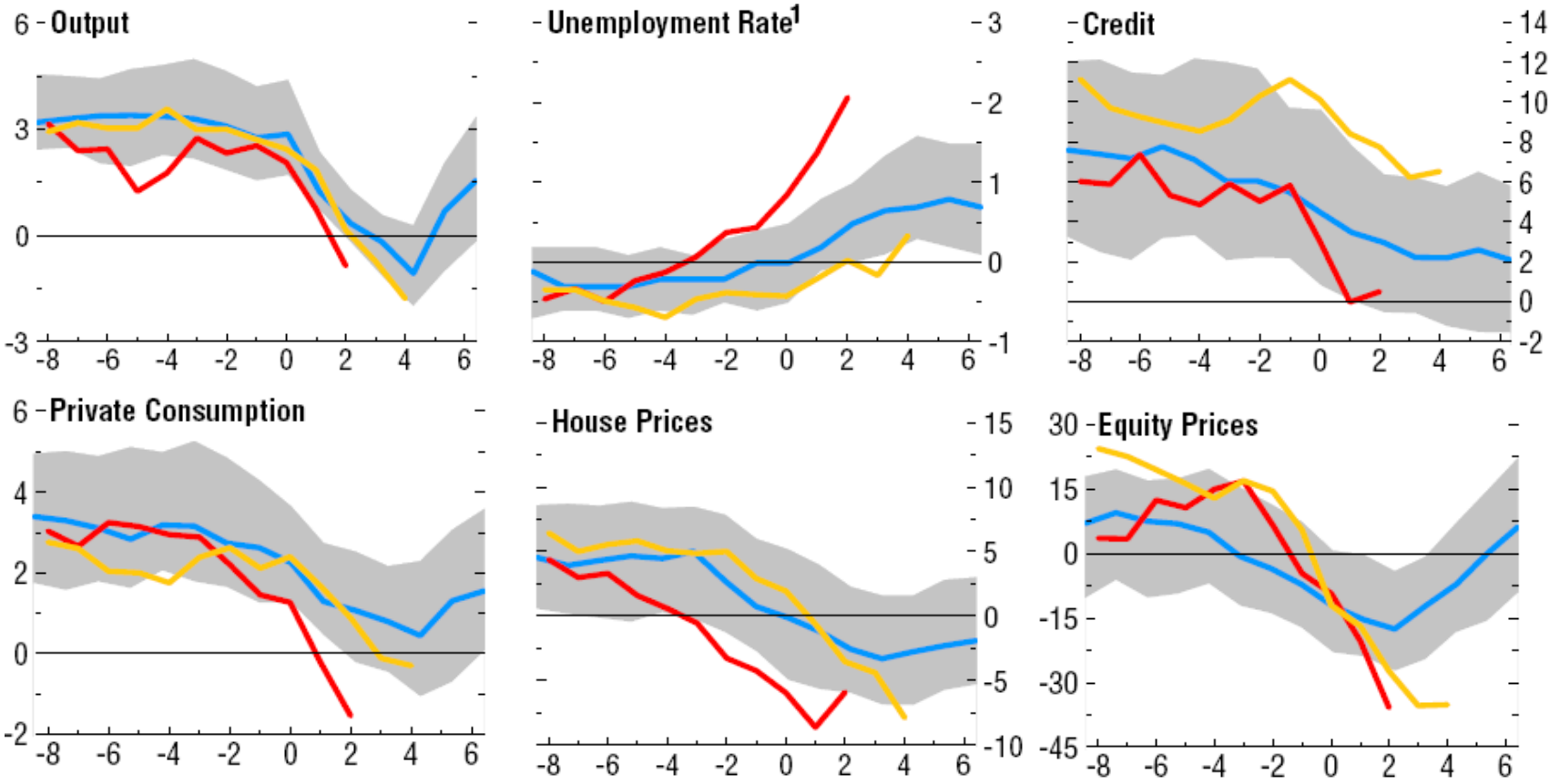


- Housing Equity vs. Borrowing

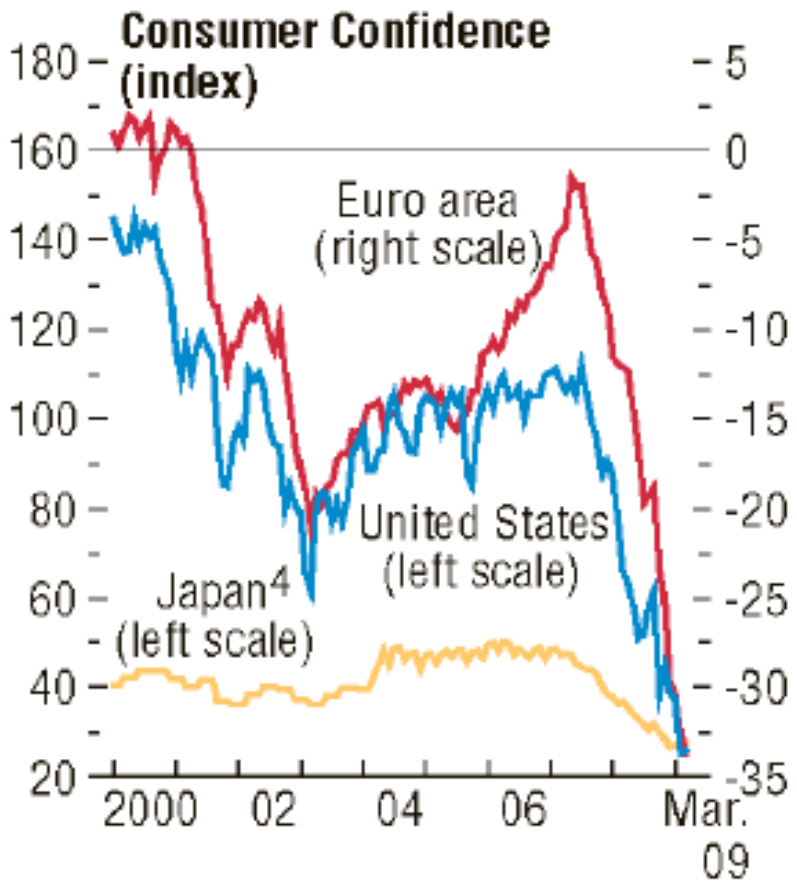


- Severity of Recessions Compared

Current U.S. vs. Current Others & Previous U.S.



- Managers and Consumers Indexes



- Big Push or Big Crash
  - The Financial Tsunami can be explained by interplays between financial institutions and market participations
  - Becsi-Wang-Wynne (1999): There are market participation externalities
    - Production efficiency (PE) describes a positive relationship between market thickness and market returns
    - Bank break-even (BB) can be normal, downward-sloped (thicker markets require lower loan rates to break even), but can also be upward-sloping when there are strong market participation externalities (higher loan rates => higher expected return => thicker markets)
    - With upward-sloping BB, there can be co-existence of a good equilibrium (big push) and a bad equilibrium (big crash)

Bank Breakeven (BB) vs. Production Efficiency (PE)