Financial Intermediary Capital

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Needed: A Theory of Financial Intermediary Capital

- **Question**
  - How does intermediary capital affect financing & macroeconomic activity?
- **Needed**
  - A dynamic theory of financial intermediary capital
- **Motivation**
  - Financial crisis and its aftermath – capitalization of financial intermediaries is arguably critical for economic fluctuations and growth

Our Theory of Financial Intermediary Capital

- **Financial intermediaries have a collateralization advantage relative to households**

- Intermediaries better able to collateralize claims than households
- Firms need to collateralize claims to borrow from intermediaries and households – firms need net worth since collateral constraints limit financing
- Financial intermediaries require net worth as their ability to refinance their collateralized loans from households is in turn limited - intermediaries need to collateralize their promises.

Collateral and Financial Intermediation – Synopsis

- **Economy with limited enforcement and limited participation**
  - Two sub periods
    - Morning: cash flows realized; more (θ_i) capital collateralizable
    - Afternoon: investment/financing; only fraction $\theta < \theta_i$ collateralizable
  - Limited participation with two types of lenders
    - Households present only in afternoons; intermediaries always
  - Optimal contract implemented with two sets of one-period Arrow securities (for morning and afternoon)

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  - Intermediaries need to enforce morning claims
  - Intermediaries need to finance morning claims out of own net worth
  - Intermediated finance is short term

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  - Intermediated finance is short term
- **Role for intermediary capital**
  - Economy with two state variables: firm and intermediary net worth

Our Theory of Financial Intermediary Capital

- **Two state variables**
- The net worth of both firms and intermediaries thus plays an important role in our model
- These two state variables jointly determine the dynamics of economic activity, investment, financing, and loan spreads.

- **Relatively slow accumulation of intermediary net worth relative to firm net worth**

Compelling dynamics

- When corporate sector is very constrained,
  - ... **intermediaries "hold cash" at low interest rates**
- When intermediaries are very constrained,
- firms' investment stays low even as firms pay dividends

Equlibrium Spread on Intermediated Finance

- Unless the intemediary sector is "parking" capital with the intermediary sector, interest rate on intermediated finance is above the household interest rate, thus there is a spread on intermediated finance over household finance.
- Equilibrium spread on intermediated finance increases in the amount of intermediary capital
- Equilibrium spread on intermediated finance can increases or decrease in firm capital – two different effects
- Firms' investment goes up, lowering firms' levered marginal product, hence lowering the demand for intermediated finance and hence the equilibrium spread.
- Firm's investment goes up, increasing the amount of collateralizable assets, hence increasing the demand for intermediated finance and hence the equilibrium spread.

Recent Empirical Evidence on Crisis

- **Reinhart and Rogoff (2014) and related literature**
- Tentative and halting nature of recoveries from crises
- Consistent with key **stylized facts about macro downturns with credit crunch**
  - **Fact 1: Severity**
  - Downturns associated with financial crises are more severe
  - **Fact 2: Protractedness** ("**halting, tentative**... recoveries")
  - Recoveries from financial crises are protracted and often tentative
  - **Fact 3: Severity of credit crunch affects severity/protractedness**
  - The severity of the financial crises itself affects the severity and protractedness of the downturn

Our Model's Implications

- Recoveries from a credit crunch are slow due to the slow accumulation of intermediary capital
- Recoveries from financial crises are protracted and often tentative and halting – the need for intermediaries to catch up results in the tentative and halting nature of the receovery
- The severity of the financial crises itself (here the drop in intermediary wealth) affects the severity and protractedness of the downturn and subsequent recovery
- Bank dependent economies (where more of a given fraction of collateral comes from banks) are more severely affected by a financial crisis, the recovery is also even more protracted and halting.

Literature: Models of Financial Intermediaries

- **Intermediary capital**
  - Holmström/Tirole (1997) – need capital at stake to commit to monitor
  - Diamond/Rajan (2000), Diamond (2007) – ability to enforce claims due to better monitoring

- **Other theories of financial intermediation - no role for capital**
  - Liquidity provision theories – Diamond/Dybvig (1983)
  - Diversified delegated monitoring theories – Diamond (1984), Ramakrishnan/Thakor (1984), Williamson (1986)
  - Coalition based theories – Townsend (1978), Boyd/Prescott (1986)

Literature: Dynamic Models with Net Worth Effects

- **Firm net worth**
  - Bernanke/Gertler (1989), Kiyotaki/Moore (1997a)
- **Intermediary net worth**
  - Gertler/Kiyotaki (2010), Brunnermeier/Sannikov (2014)
- **Firm and intermediary net worth**
  - This paper

Model: Environment

- Discrete time
- Infinite horizon
- 3 types of agents
  - Households
  - Financial intermediaries
  - Firms

Model: Households

- Risk neutral, discount at $R^{-1} > \beta$ where firms' discount rate is β
- Large endowment of funds (and collateral) in all dates and states

Model: Financing Subject to Collateral Constraints

- **Collateral constraints**
  - Complete markets in one period ahead Arrow securities
    - subject to collateral constraints
  - Firms can issue state-contingent promises
    - ... up to fraction θ of resale value of capital to households
    - ... up to fraction θ_i of resale value of capital to intermediaries
  - Related: Kiyotaki/Moore (1997a); but two types of lenders and allow risk management

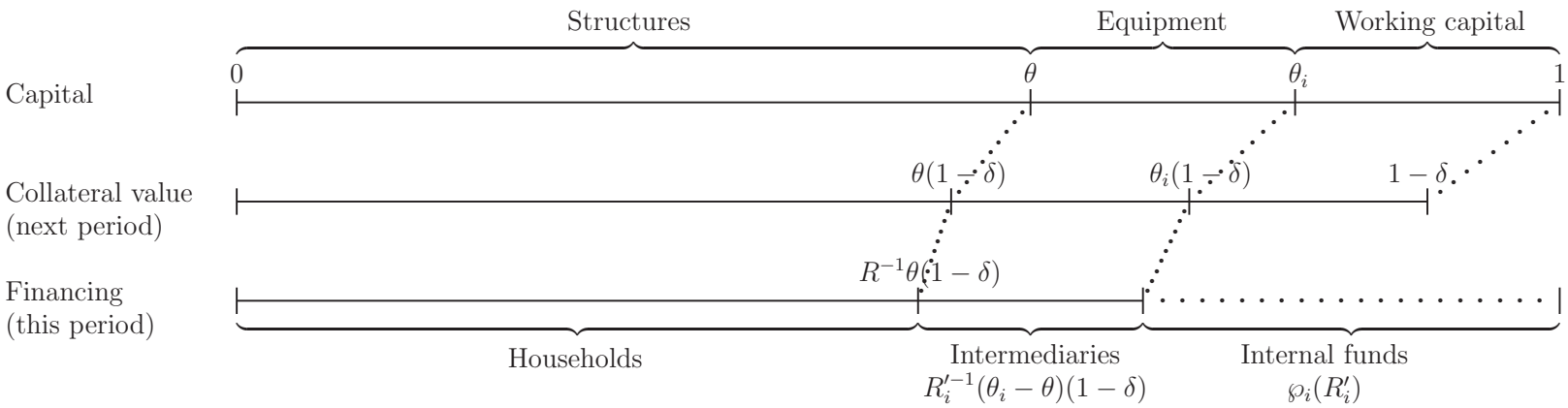
- **Limited enforcement**
  - We derive such collateral constraints from limited enforcement without exclusion - different from Kehoe/Levine (1993)
  - Related: Rampini/Viswanathan (2010, 2013)

Model: Financial Intermediaries

- Risk neutral, discount at $\beta_i \in (\beta, R^{-1})$
- **Collateralization advantage relative to households**
  - Ability to seize up to fraction $\theta_i > \theta$ of (resale value of) collateral
- **Refinancing collateralized loans**
  - Idea: Intermediaries can borrow against their (collateralized) loans
    - ... but only to extent households can collateralize assets backing loans
  - Households can collateralize up to θ of collateral backing loans (**"structures"**)
  - Intermediaries need to finance $\theta_i - \theta$ out of own net worth (**"equipment"**)

Model: Collateral and Financing

- Capital, collateral value, and financing



Model: Representative Firm (or "Corporate Sector")

- Risk neutral, limited liability, discount at $\beta < 1$
- Capital k
  - Depreciation rate δ; no adjustment costs
- Standard neoclassical production function
  - Cash flows $A' f(k)$ where $A' \equiv A(s')$ is (stochastic) Markov productivity with transition probability $\Pi(s, s')$
  - Strictly decreasing returns to scale ($f(\cdot)$ strictly concave)
- Two sources of outside finance
  - Households
  - Financial intermediaries

Firm's Problem

- Firm solves following dynamic program

$$v(w, Z) = \max_{\{d,k,b',b'_i,w'\} \in \mathbb{R}^2_+ \times \mathbb{R}^S \times \mathbb{R}^{2S}_+} d + \beta E\left[v(w', Z')\right] \tag{1}$$

subject to budget constraints

$$w + E\left[b' + b'_i\right] \geq d + k \tag{2}$$

$$A' f\left(k\right) + k(1-\delta) \geq w' + Rb' + R'_i b'_i \tag{3}$$

and **two types of collateral constraints**

$$\theta k(1-\delta) \geq Rb' \tag{4}$$

$$(\theta_i - \theta)k(1-\delta) \geq R'_i b'_i \tag{5}$$

- State-contingent interest rates R'_i determined in equilibrium

Firm's Problem: Comments

- Two sets of state-contingent collateral constraints restricting
  - ... borrowing from households b'
  - ... borrowing from financial intermediaries b'_i

- **State variables:** net worth w and state of economy $Z = \{s, w, w_i\}$
  - **Net worth of representative firm w and intermediary w_i**

Characterization of Firm's Problem

- Multipliers
  - ... on (2) through (5): μ, $\Pi(Z, Z')\beta\mu'$, $\Pi(Z, Z')\beta\lambda'$, and $\Pi(Z, Z')\beta\lambda'_i$
  - ... on $d' \geq 0$ and $b'_i \geq 0$: ν_d and $\Pi(Z, Z')R'_i\beta\nu'_i$
  - (Redundant: $k \geq 0$ and $w' \geq 0$)

- **First order conditions**

$$\begin{aligned}
\mu &= 1 + \nu_d && (6)\\
\mu &= E\left[\beta\mu'\left(\left[A' f_k\left(k\right) + (1-\delta)\right] + \left[\lambda'\theta + \lambda'_i(\theta_i - \theta)\right](1-\delta)\right)\right] && (7)\\
\mu &= R\beta\mu' + R\beta\lambda' && (8)\\
\mu &= R'_i\beta\mu' + R'_i\beta\lambda'_i - R'_i\beta\nu'_i && (9)\\
\mu' &= v'(w', Z') && (10)
\end{aligned}$$

- Envelope condition

$$v'(w, Z) = \mu$$

Intermediary's Problem

- Representative intermediary solves

$$v_i(w_i, Z) = \max_{\{d_i, l', l'_i, w'_i\} \in \mathbb{R}^{1+3S}_+} d_i + \beta_i E\left[v_i(w'_i, Z')\right] \tag{11}$$

subject to budget constraints

$$w_i \geq d_i + E[l'] + E[l'_i] \tag{12}$$

$$Rl' + R'_i l'_i \geq w'_i \tag{13}$$

- State-contingent loans to households l' and to firms l'_i

Characterization of Intermediary's Problem

- Multipliers
  - ... on (12) through (13): μ_i and $\Pi(Z, Z')\beta_i\mu_i'$,
  - ... on $d_i' \geq 0$, $l' \geq 0$, and $l_i' \geq 0$: η_d, $\Pi(Z, Z')R\beta_i\eta'$, and $\Pi(Z, Z')R_i'\beta_i\eta_i'$
  - (Redundant: $w_i' \geq 0$)

- **First order conditions**

$$\begin{aligned} \mu_i &= 1 + \eta_d, && (14)\\ \mu_i &= R\beta_i\mu_i' + R\beta_i\eta', && (15)\\ \mu_i &= R_i'\beta_i\mu_i' + R_i'\beta_i\eta_i', && (16)\\ \mu_i' &= v_i'(w_i', Z'), && (17) \end{aligned}$$

- Envelope condition

$$v_i'(w_i, Z) = \mu_i$$

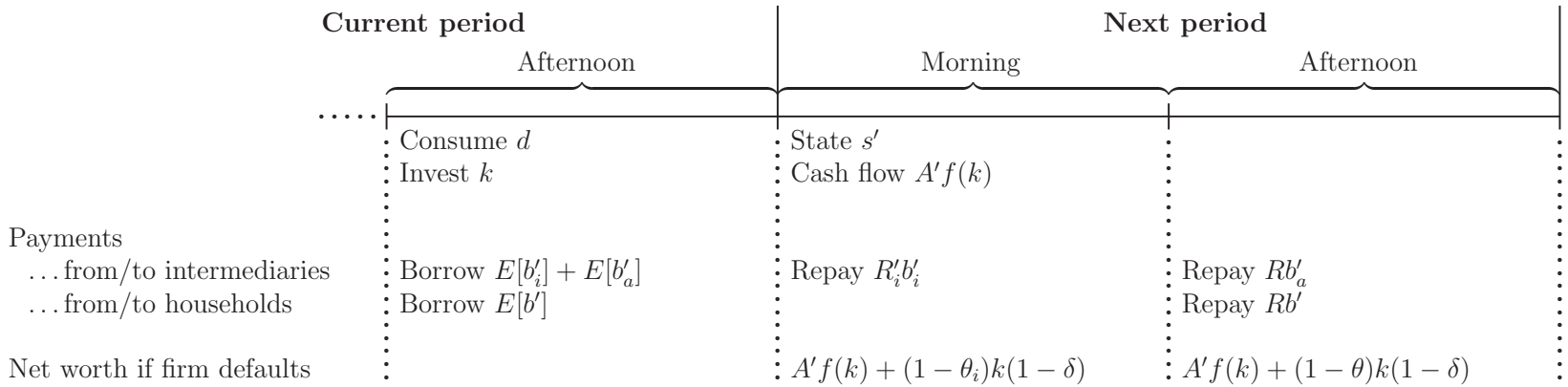
Model with Limited Enforcement and Limited Participation

- **Timing**
  - Afternoon: repayments, investment, consumption
  - Morning: cash flows, repayments

- **Limited participation**
  - Afternoon: Firms, intermediaries, and households present
  - Morning: Firms and intermediaries present, not households

- **Limited enforcement**
  - Afternoon
    - Firms can abscond with cash flows and $1-\theta$ of capital (not structures)
    - Intermediaries can abscond with funds paid in morning
  - Morning
    - Firms can abscond with cash flows and $1-\theta_i$ of capital (not structures and equipment)

Limited Enforcement: Timeline



Equivalence: Limited Enforcement & Collateral Constraints

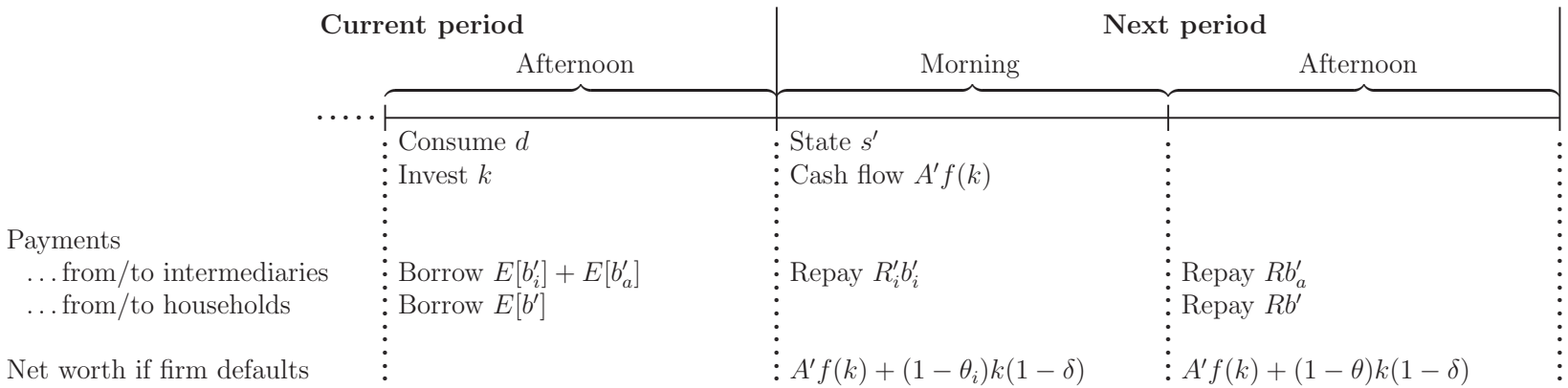
- Loans against $\theta_i - \theta$ ("equipment") only enforceable in morning
  - Intermediaries must extend such loans
  - Loans must be repaid each morning (no rollover) – **new model of short term intermediated finance**

- Loans up to θ ("structures") enforceable in afternoon
  - Households extend such loans w.l.o.g.
  - Rollover possible

- Two equivalent implementations with collateral constraints
  - Direct implementation
    - Households lend to firms directly
  - Indirect implementation
    - Households lend to intermediaries
    - Intermediaries lend to firms and borrow from households against collateralized corporate loans

Limited Enforcement and Limited Participation – Timeline

- Limited participation by households affords intermediaries advantage



Endogenous Minimum Down Payment Requirement

- **Minimum down payment requirement $\wp$ (or margin)**
  - Borrowing from households only

$$\wp = 1 - R^{-1}\theta(1-\delta)$$

  - Borrowing from households and financial intermediaries

$$\wp_i(R_i') = \wp - E[(R_i')^{-1}](\theta_i - \theta)(1-\delta)$$

- **Firm's investment Euler equation**

$$1 \geq E\left[\beta \frac{\mu'}{\mu} \frac{A' f_k(k) + (1-\theta_i)(1-\delta)}{\wp_i(R_i')}\right] \tag{18}$$

User Cost of Capital with Intermediated Finance

- **Extension of Jorgenson's (1963) user cost of capital definition**

$$u \equiv r + \delta$$

  - User cost would be rental cost in frictionless economy

- Premium on internal funds ρ: $1/(R+\rho) \equiv E[\beta\mu'/\mu]$

- Premium on intermediated finance ρ_i: $1/(R+\rho_i) \equiv E[(R_i')^{-1}]$

- **Firm's user cost of capital** u is

$$u \equiv r + \delta + \frac{\rho}{R+\rho}(1-\theta_i)(1-\delta) + \frac{\rho_i}{R+\rho_i}(\theta_i - \theta)(1-\delta),$$

where $1 + r \equiv R$

Premia on Internal and Intermediated Finance

- **Internal and intermediated funds are scarce**
- Proposition 1 (Premia on internal and intermediated finance)
  - *Premium on internal finance ρ (weakly) exceeds premium on intermediated finance ρ_i*

$$\rho \geq \rho_i \geq 0,$$

  - *Premia equal, $\rho = \rho_i$, iff $E[\lambda_i'] = 0$.*
  - *Premium on internal finance strictly positive, $\rho > 0$, iff $E[\lambda'] > 0$.*

Equilibrium

- Definition 1 (Equilibrium) *An* **equilibrium** *is*
  - *allocation* $x \equiv [d, k, b', b'_i, w']$ *(for firm) and* $x_i \equiv [d_i, l', l'_i, w'_i]$ *(for intermediary)*
  - *interest rate process* R'_i *for intermediated finance*

  such that

  - *(i)* x *solves firm's problem in (1)-(5) and* x_i *solves intermediary's problem (11)-(13)*
  - *(ii) market for intermediated finance clears in all dates and states*

$$l'_i = b'_i. \tag{19}$$

Essentiality of Financial Intermediation

- Definition 2 (Essentiality of intermediation) *Intermediation is* **essential** *if an allocation can be supported with a financial intermediary but not without.*
  - Analogous: Hahn's (1973) definition of essentiality of money

- **Intermediaries are essential**

- Proposition 3 (Positive intermediary net worth) *Financial intermediaries always have positive net worth in a deterministic or eventually deterministic economy.*

- Proposition 4 (Essentiality of intermediaries) *In any deterministic economy, financial intermediaries are always essential.*
  - Intuition: Without intermediaries, shadow spreads would be "high."

Deterministic Steady State

- **Steady state spread and intermediary capitalization**

- Definition 3 (Steady state) *A deterministic steady state equilibrium is an equilibrium with constant allocations, that is,* $x^* \equiv [d^*, k^*, b'^*, b_i'^*, w'^*]$ *and* $x_i^* \equiv [d_i^*, l'^*, l_i'^*, w_i'^*]$.

- Proposition 5 (Steady state) *In steady state*
  - *Intermediaries essential; positive net worth; pay positive dividends*
  - *Spread on intermediated finance* $R_i'^* - R = \beta_i^{-1} - R > 0$
  - *(Ex dividend) intermediary net worth (relative to firm's net worth)*

$$\frac{w_i^*}{w^*} = \frac{\beta_i(\theta_i - \theta)(1-\delta)}{\wp_i(\beta_i^{-1})}$$

(ratio of intermediary's financing to firm's down payment requirement)

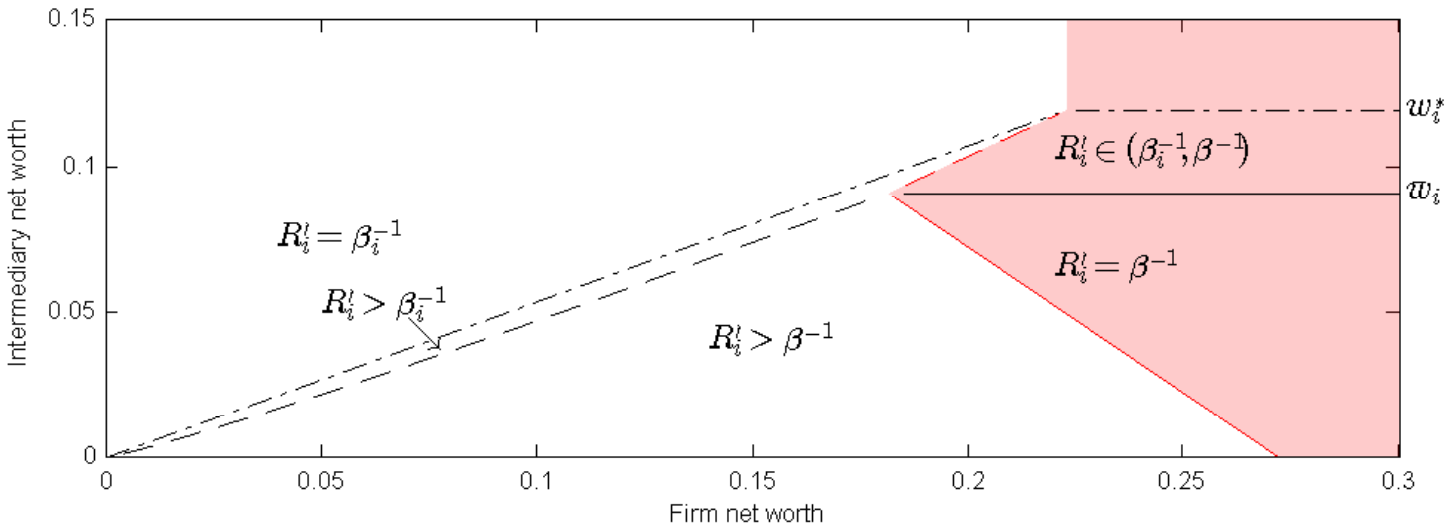
Deterministic Equilibrium Dynamics

- Two main phases: **no dividend phase and dividend phase**
- Definition 6 (Deterministic dynamics) *Given w and w_i, there exists a unique deterministic dynamic equilibrium which converges to the steady state characterized by a no dividend region (ND) and a dividend region (D) (which is absorbing) as follows: [Region ND] $w_i \leq w_i^*$ (w.l.o.g.) and $w < \bar{w}(w_i)$, and (i) $d = 0$ ($\mu > 1$), (ii) the cost of intermediated finance is*

$$R_i' = \max\left\{R, \min\left\{\frac{(\theta_i - \theta)(1-\delta)\left(\frac{w}{w_i}+1\right)}{\wp}, \frac{A' f_k\left(\frac{w+w_i}{\wp}\right) + (1-\theta)(1-\delta)}{\wp}\right\}\right\},$$

(iii) investment $k = (w + w_i)/\wp$ if $R_i' > R$ and $k = w/\wp_i(R)$ if $R_i' = R$, and (iv) $w'/w_i' > w/w_i$, that is, firm net worth increases faster than intermediary net worth. [Region D] $w \geq \bar{w}(w_i)$ and (i) $d > 0$ ($\mu = 1$). For $w_i \in (0, \bar{w}_i)$, (ii) $R_i' = \beta^{-1}$, (iii) $k = \bar{k}$ which solves $1 = \beta[A' f_k(\bar{k}) + (1-\theta)(1-\delta)]/\wp$, (iv) $w_{ex}'/w_i' < w_{ex}/w_i$, that is, firm net worth (ex dividend) increases more slowly than intermediary net worth, and (v) $\bar{w}(w_i) = \wp\bar{k} - w_i$. For $w_i \in [\bar{w}_i, w_i^*)$, (ii) $R_i' = (\theta_i - \theta)(1-\delta)k/w_i$, (iii) k solves $1 = \beta[A' f_k(k) + (1-\theta)(1-\delta)]/(\wp - w_i/k)$, (iv) $w_{ex}'/w_i' < w_{ex}/w_i$, that is, firm net worth (ex dividend) increases more slowly than intermediary net worth, and (v) $\bar{w}(w_i) = \wp_i(R_i')k$. For $w_i \geq w_i^*$, $\bar{w}(w_i) = w^*$ and the steady state of Proposition 5 is reached with $d = w - w^*$ and $d_i = w_i - w_i^*$.

Joint Dynamics of Intermediary and Corporate Net Worth



Some Intuition for Proposition 5

- If both firms and intermediaries are constrained and neither pays a dividend
- Corporate loan demand exceeds intermediary net worth – collateral constraint is slack, the interest rate must equal the marginal levered return on capital

$$R_i' = \frac{A' f_k \left(\frac{w+w_i}{\wp} \right) + (1-\theta)(1-\delta)}{\wp} \tag{20}$$

- Collateral constraint binds, the collateral constraint determines the interest rate which is strictly less than the levered marginal product of capital

$$R_i' = \frac{(\theta_i - \theta)(1-\delta)\left(\frac{w}{w_i} + 1 \right)}{\wp} \tag{21}$$

- Corporate loan demand is much less than intermediary net worth – collateral constraint binds but intermediaries also save capital with households and the intermediary interest rate is R.

Relatively slow accumulation of intermediary net worth in Region ND (no dividend)

- Intermediaries earn R_i' which is at most marginal return on capital (and can be strictly less)
- Firms earn average return (**decreasing returns to scale**)
- Hence in this region firms grow faster than intermediaries

Deterministic Dynamics: Initial Dividend

- Lemma 2 (Initial intermediary dividend) *The representative intermediary pays at most an initial dividend and no further dividends until the steady state is reached. If $w_i > w_i^*$, the initial dividend is strictly positive.*

- Intuition: **Low firm net worth limits loan demand**
  - Intermediaries save only part of net worth to meet future loan demand

Region D: Firms pay dividends and intermediaries catch up

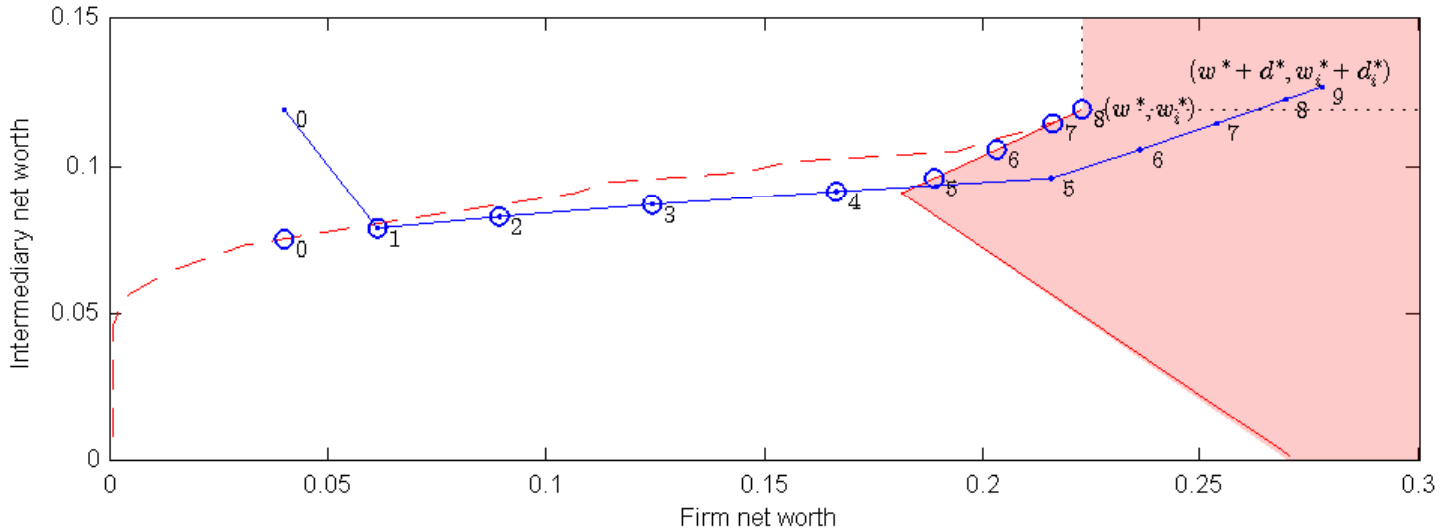
- Suppose firms pays dividends and the collateral constraint is slack.
- Intermediated interest rate must again equal marginal return on capital

$$R_i' = \left(\beta \frac{\mu'}{\mu}\right)^{-1} = \beta^{-1} = \frac{A' f_k(\bar{k}) + (1-\theta)(1-\delta)}{\wp}, \tag{22}$$

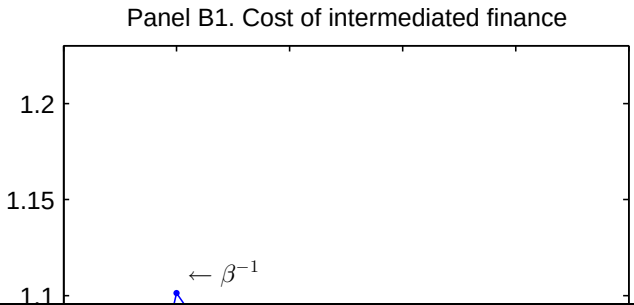
  and we have used $\mu = \mu' = 1$.
- Investment is constant at $\bar{k}$ and intermediaries accumulate net worth while firms gradually relever by paying dividends
- When the collateral constraint binds again, the intermediary interest rate falls below β^{-1} and both firms and intermediaries grow but intermediaries grow faster in this catch up phase until steady state is reached

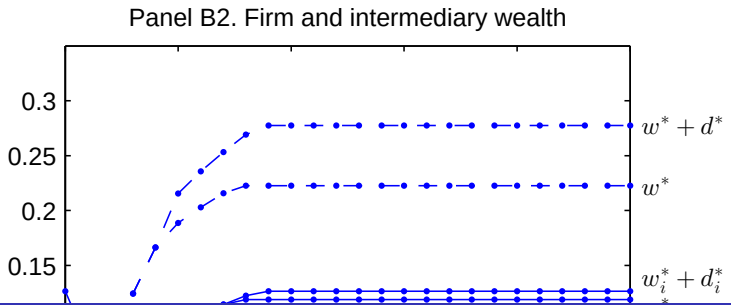
Dynamics of a Downturn Without a Credit Crunch - shock to firm net worth

Unanticipated drop in firm (but not intermediary) net worth from steady state (say due to surprise drop in productivity A') **Panel A:** Joint evolution of firm and intermediary net worth

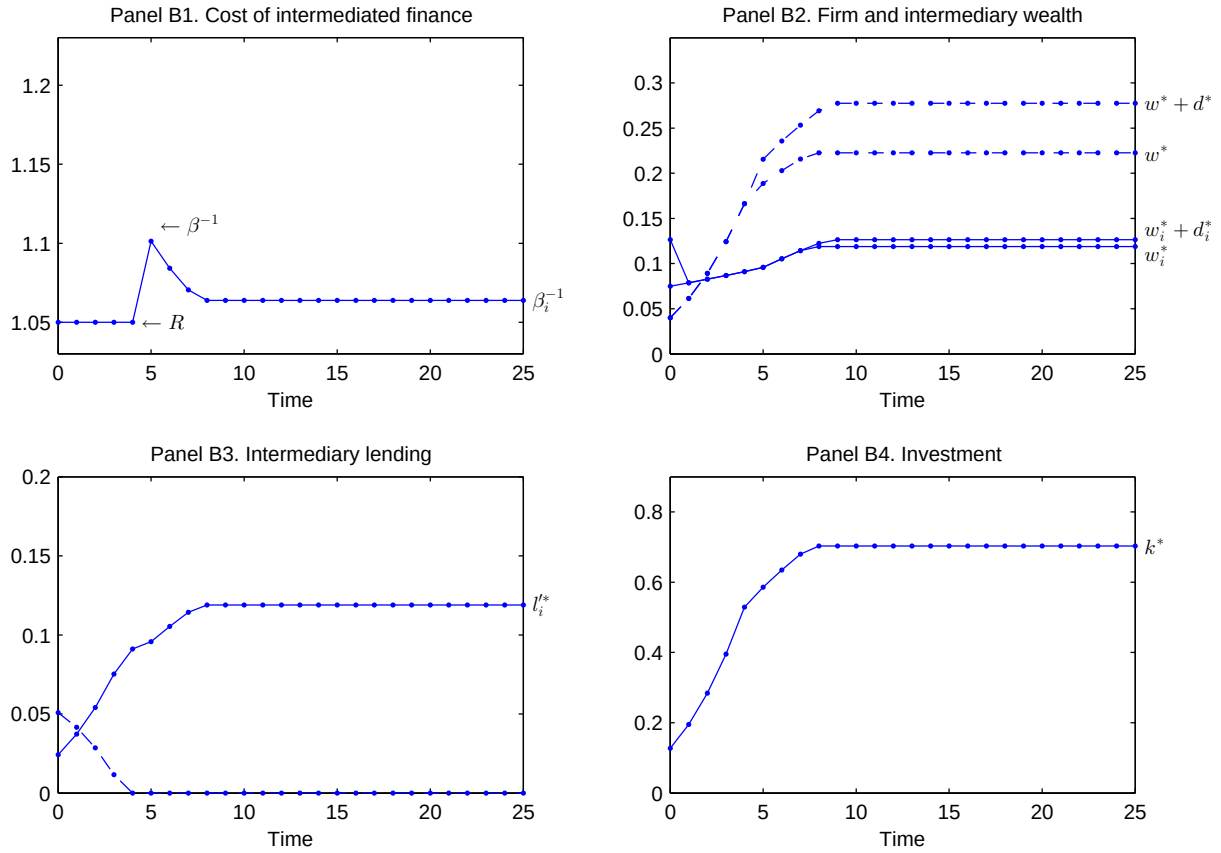


Panel B: Interest rates, net worth, lending, and investment over time





Dynamics of Downturn without Credit Crunch (Cont'd)



- Low firm net worth $\Rightarrow$ drop in real investment $k = w/\wp_i(R)$
- Lack of collateral/low loan demand $\Rightarrow$ spread on intermediated finance may fall
  - **Intermediaries save at low interest rate** $R_i' = R$ (lend to households) to meet future loan demand

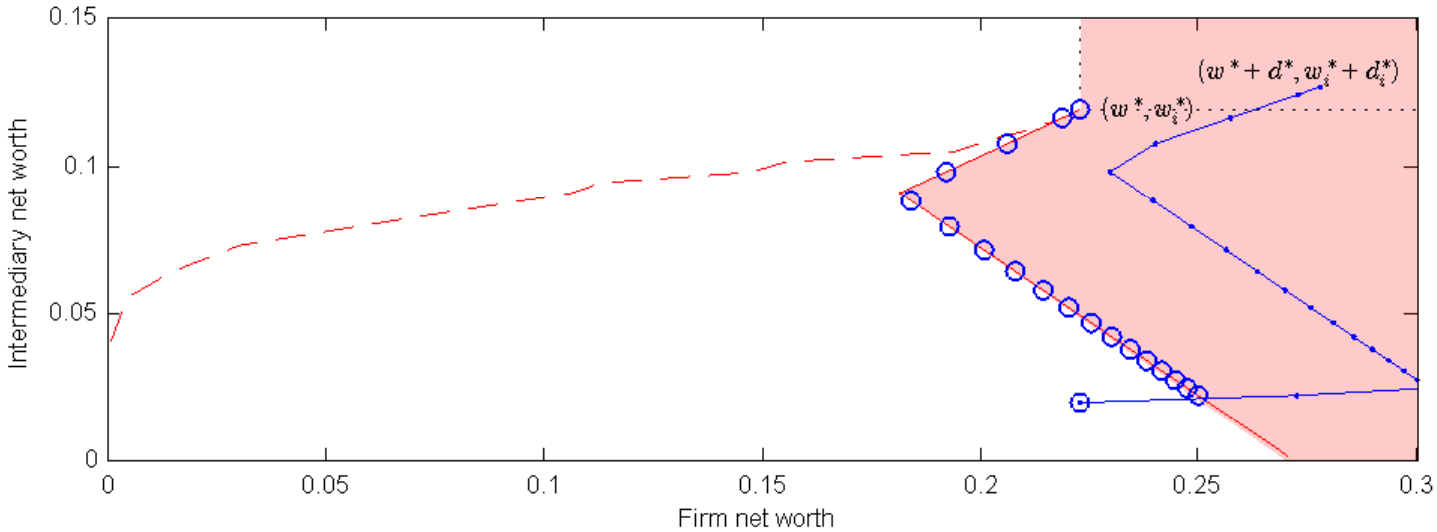
Dynamics of a Credit Crunch

- Unanticipated drop in intermediary net worth from steady state leads to a large increase in intermediary spreads on impact
- Investment drops
- Corporate sector grows faster, starts paying dividends
- Recovery stalls until intermediaries also catch up and accumulate net worth; firms relever by reducing net worth
- Eventually (long time), the collateral constraint binds again and the interest falls below β^{-1} and both firm and intermediary net worth grow until steady state is reached

Dynamics of a Credit Crunch

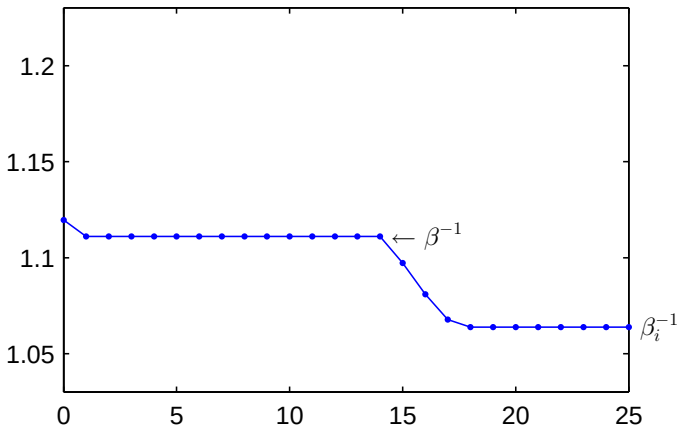
Unanticipated drop in intermediary net worth w_i from steady state

Panel A: Joint evolution of firm and intermediary net worth

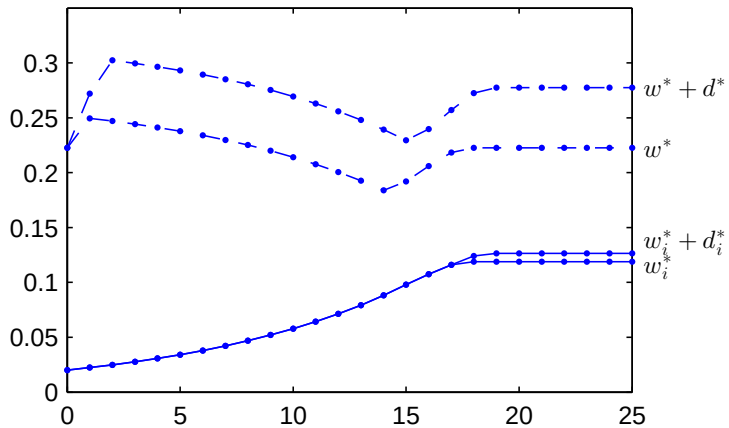


Panel B: Interest rates, net worth, lending, and investment over time

Panel B1. Cost of intermediated finance

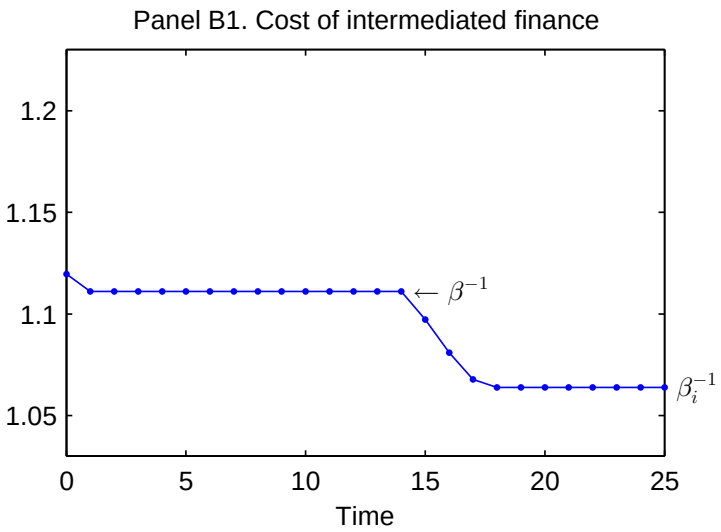


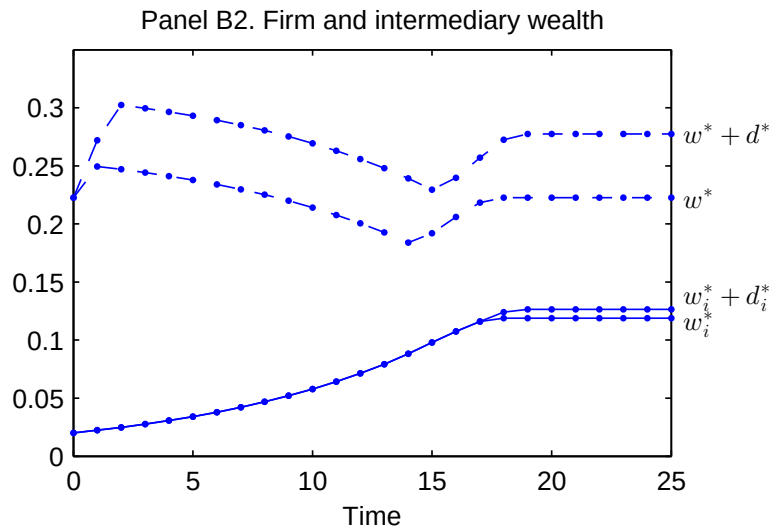
Panel B2. Firm and intermediary wealth

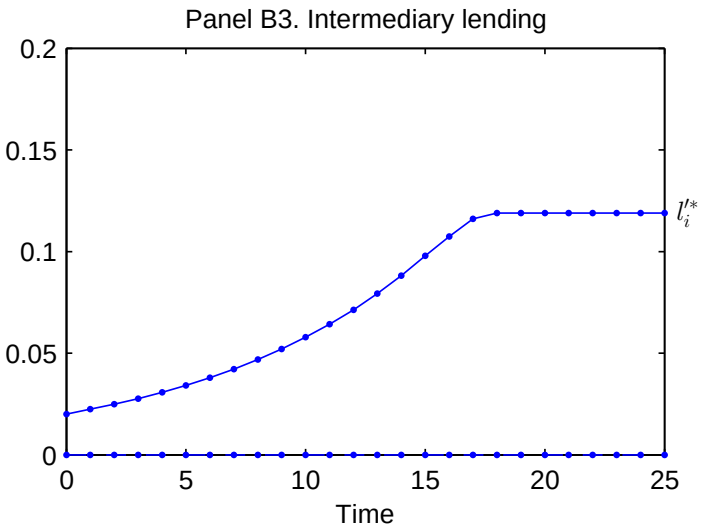


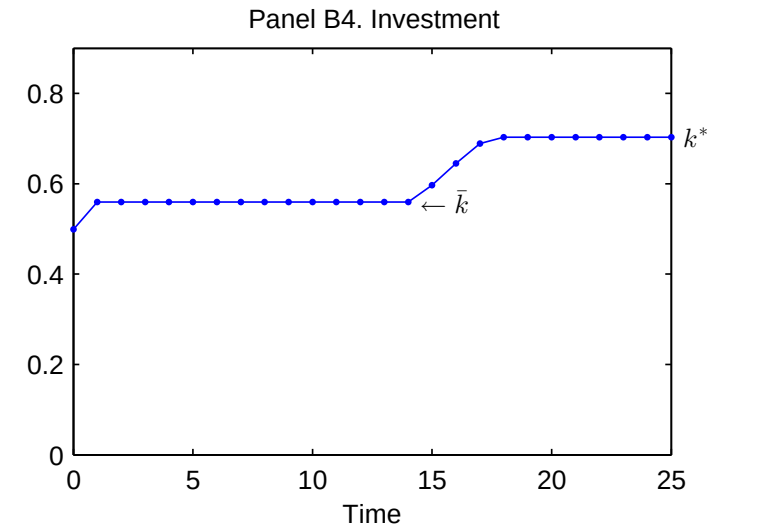
Dynamics of Credit Crunch (Cont'd)

- Dynamics of net worth, spread, and investment









Dynamics of a Credit Crunch (Cont'd)

- **Fact 2: Protractedness** – slow/delayed recovery

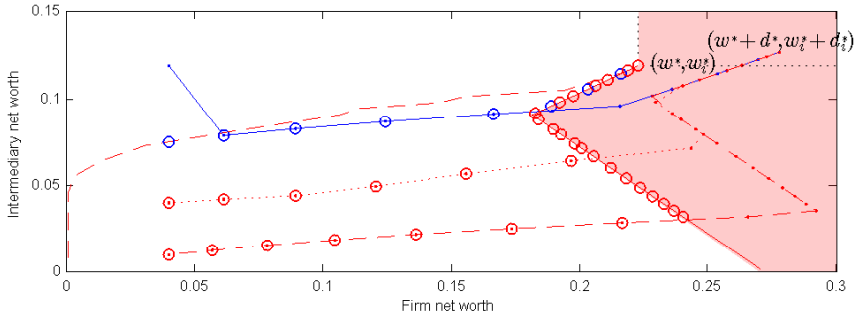
- **"Delayed or stalled recovery"** (until intermediaries accumulate sufficient capital)
  - Reinhart/Rogoff (2014): "halting, tentative nature of the post-crisis recoveries (even in cases where there is a sharp – but not sustained – growth rebound)"
  - Partial recovery until $R_i' = \beta^{-1}$ when firms reinitiate dividends
  - Corporate investment remains depressed at $\bar{k}$ as firms pay dividends and stop growing, **waiting for intermediary capital to catch up**

$$R_i' = \left(\beta \frac{\mu'}{\mu}\right)^{-1} = \beta^{-1} = \frac{A' f_k(\bar{k}) + (1-\theta)(1-\delta)}{\wp}$$

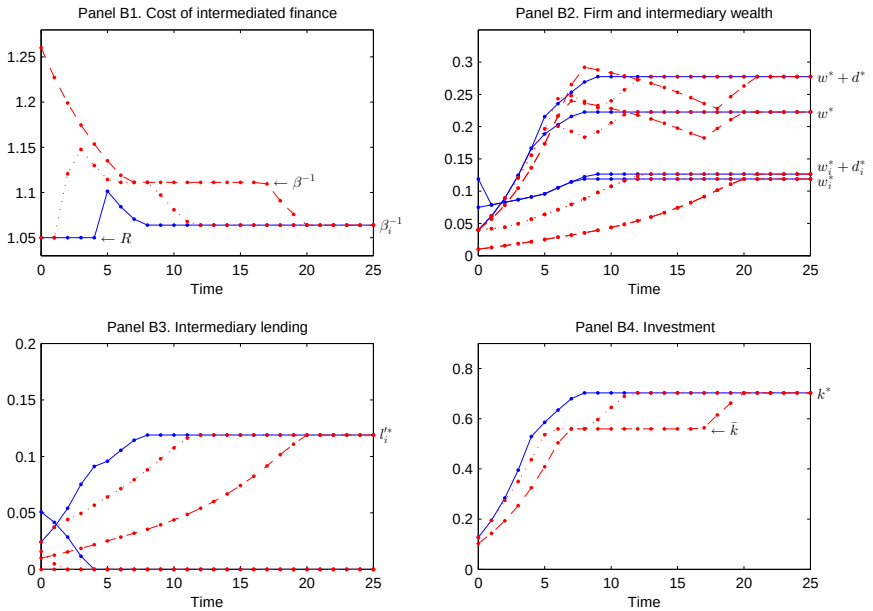
- Corporate deleveraging (and eventual releveraging when intermediaries catch up)

Effect of Severity of Credit Crunch

- Joint dynamics of firm and intermediary net worth



- Fact 3: Impact of severity of financial crises; halting recovery – stalls

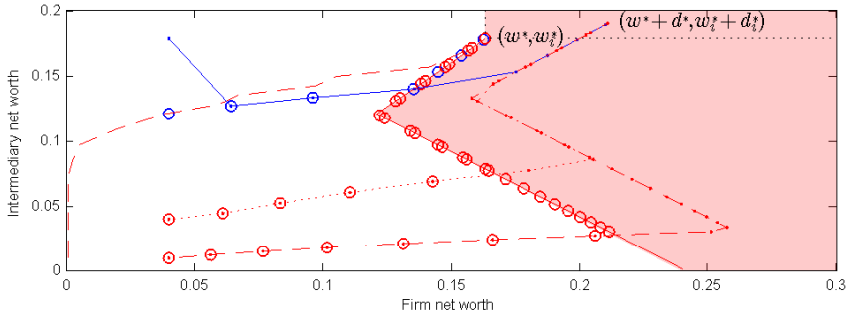


Severity of the Credit Crunch

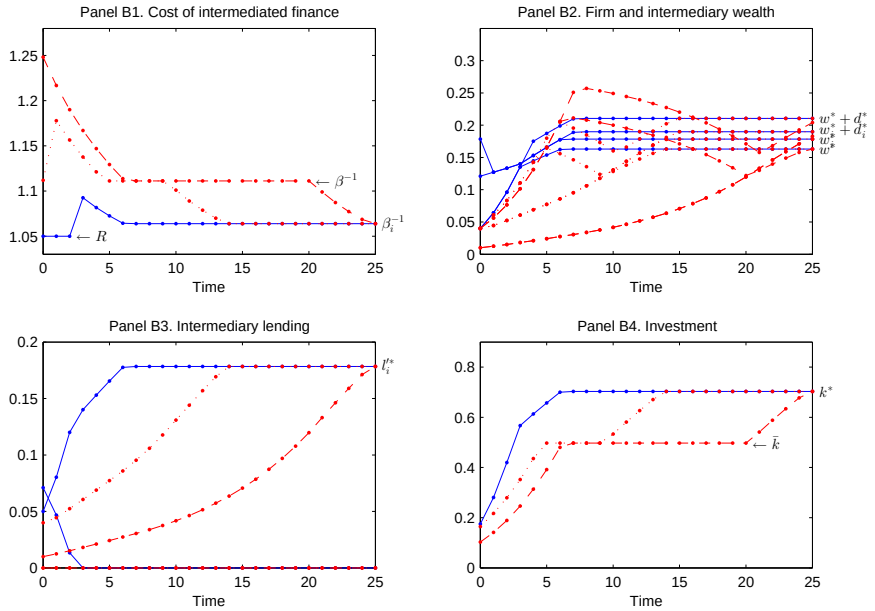
- Moderate credit crunch slows the recovery and raises the spread on intermediated finance
- Corporate accumulation is slowed and corporations pays dividends later
- Recovery stalls
- Severe credit crunch amplifies these effects
- Spreads jump up over even β^{-1} and the recovery is much slower and the stall is longer
- Intermediary lending remains low for a much longer period of time

Downturn with Credit Crunch – Bank-Dependent Economy

- Bank dependence: higher θ_i



- More severe, more protracted, longer stalls; Europe/Japan?



Downturn with a Credit Crunch in Bank-Dependent Economy

- Severity of credit crunch has much higher impact initially itself
- Downturn is also more protracted with investment reduced, intermediated finance depressed and spreads elevated for longer.
- Intermediary net worth takes much longer to recover
- Corporate net worth temporarily accumulates substantially more net worth than it has in the steady state, again in an effort to substitute internal funding for the lack of intermediated finance
- Hence bank dependent economies downturns associated with a credit crunch will be more severe and protracted

Empirical Evidence

- Fact 1: Severity of downturns associated with financial crises – see Reinhart and Rogoff (2014), Krishnamurthy and Muir (2016), Cera and Saxena (2008), and others
- Fact 2: Slow recoveries after financial crises
- Reinhart and Rogoff (2014) state that "*significant part of the costs of [systemic banking] crises lies in the protracted and halting nature of the recovery*" (page 50).
- Moreover, they argue that "*(t]he halting, tentative nature of the post-crisis recoveries (even in cases where there is a a sharp - but not sustained - is evidenced in the relatively high incidence of double dips (or secondary downturns before the previous peak is reached)*", (page 52).
- Fact 3: Impact of severity of financial crises itself
- Krishnamurthy and Muir (2016) measure the severity of a crisis using the spread between high-yield and low-yield bonds, and conclude that "*recessions in the aftermath of financial crises are severe and protracted*" and that furthermore "*the severity of the subsequent crisis can be forecast by the size of [changes in the spread]*"

Conclusions

- **Theory of intermediaries with collateralization advantage**
  - Better ability to enforce claims
    - ... implies **role for financial intermediary capital**
  - Tractable dynamic model with (two types of) collateralized finance

- **Dynamics of intermediary capital**
  - Economic activity and spreads **determined by firm and intermediary net worth jointly**
  - **Slow accumulation** of intermediary net worth
  - Downturns associated with credit crunch are
    - (1) **severe** and (2) **protracted** (and **"tentative" / "halting"**)
    - and (3) **severity of credit crunch affects severity & protractedness**,

  particularly so in bank-dependent economies