Safe Assets

with Valentin Haddad

The I Theory of Money

- Money & Banking with Asset Pricing Tools -

with Yuliy Sannikov

Princeton University

World Finance Conference

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Definitions of Safe Asset

1. Safe = risk-free for a particular horizon
   - But inflation risk
   - E.g. holders are infinitely risk aversion - Caballero & Farhi
2. Safe = informationally insensitive
   - No decline in value due to asymmetric info

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Definitions of Safe Asset

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   - … but inflation risk

   Caballero & Farhi

2. Safe = informationally insensitive
   - No decline in value due to asymmetric info

   Holmstrom & Gordon

3. Safe = "Good friend analogy"
   - Safe for random horizon
   - Appreciates in times of crisis

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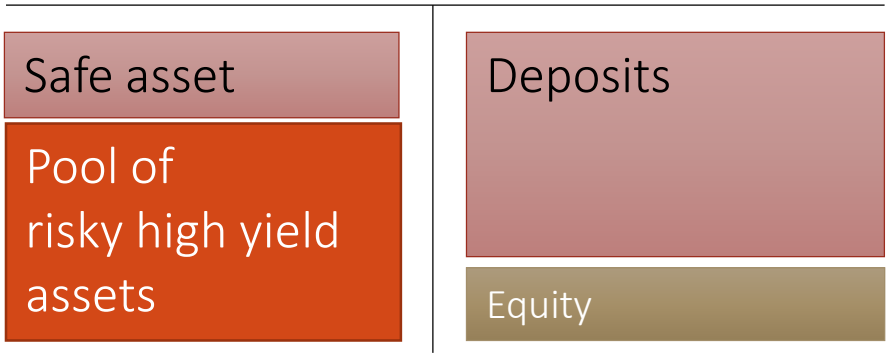
   Safe = "Safe Asset Tautology"
   - Safe because perceived to be safe (multiple equilibria)
   - Bubble

Safe asset & money - close cousins

- Store of value — store of value

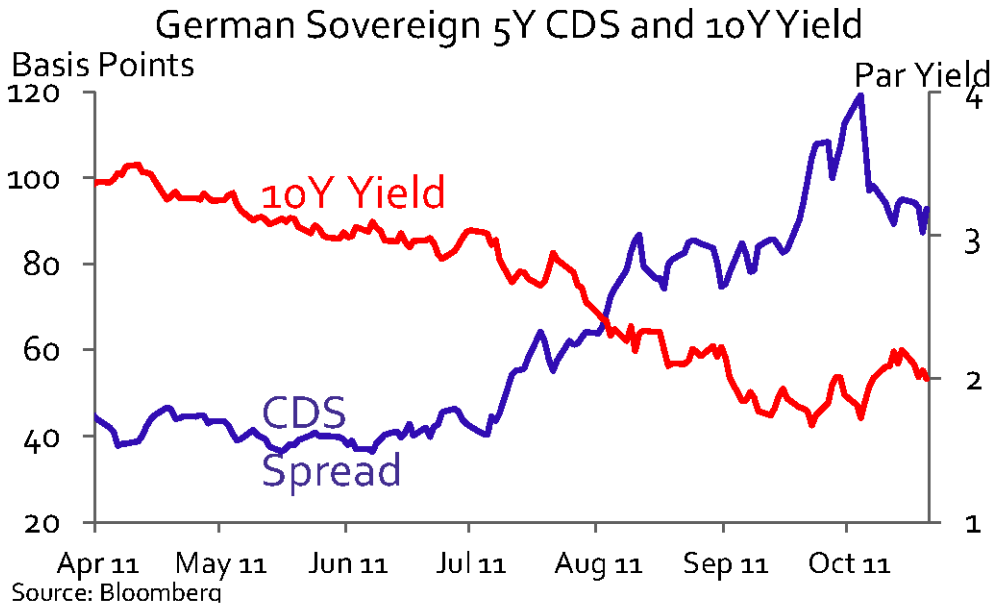


  - Held in addition to risky assets
  - Held in order to produce (private) safe assets (by banks!)

- Reference/benchmark asset — unit of account
- Good collateral: stable margins — transaction role
  - Facilitates financial trade

Safety versus Risk

- US Treasury downgraded by S&P (due to default risk)
  - … but yield declines
- German CDS spread versus yield during Euro crisis



"Money and Banking" (in macro-finance)

- Money → store of value/safe asset
- Banking → "diversifier"
  holds risky assets, issues inside money
- Amplification/endogenous risk dynamics
  - Value of capital declines due to fire-sales **Liquidity spiral**
    - Flight to safety
  - Value of money rises **Disinflation spiral** a la Fisher
    - Demand for money rises – less idiosyncratic risk is diversified
    - Supply for inside money declines – less creation by intermediaries
      - Endogenous money multiplier = f(capitalization of critical sector)
  - Paradox of Thrift (in risk terms)

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  - ~~Paradox of Thrift~~ Paradox of Prudence (in risk terms)
- Monetary Policy (redistributive)

Risk, Monetary & Macropru Policy

- Risk
  - Exogenous risk
    - Sector-specific → systematic cash flow risk
    - Idiosyncratic
  - Endogenous risk
    - Shifts in wealth share → systemic risk
    - Variation in risk premia

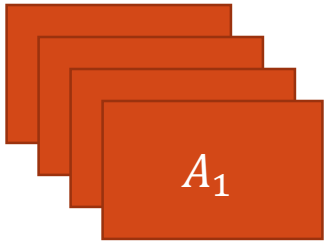
- Risk management
  - Monetary policy as "risk transfer"
    - Affects (relative) asset prices → reduces systemic risk
  - Macroprudential policy
    - Affects/limits quantities/risk taking

Roadmap

- Safe assets and money: close cousins
- Model absent monetary policy
  - Toy model: one sector with outside money
  - Two sector model with outside money
  - Adding intermediary sector and inside money
- Model with monetary policy
- The Curse of Safe Assets
- ESBies: securitization and safe assets

One sector basic model

- Technologies a



- Each household can only operate one firm
  - Physical capital

$$\frac{dk_t}{k_t} = (\Phi(\iota_t) - \delta)dt + \sigma^a dZ_t^a + \tilde{\sigma} d\tilde{Z}_t^a$$

sector; idiosyncratic risk

  - Output

$$y_t = Ak_t$$

- Demand for money

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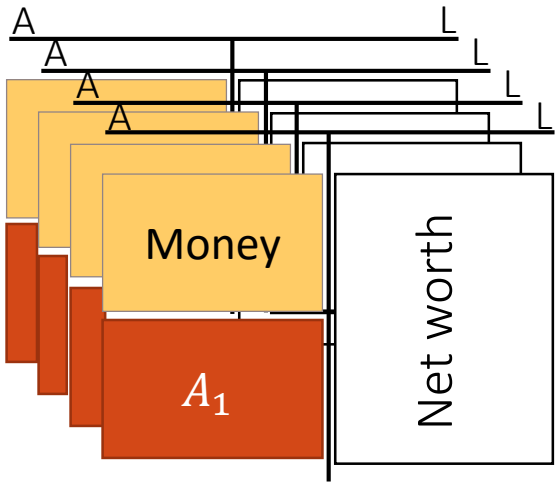
Adding outside money

Outside Money

- Technologies a

- $q_t K_t$ value of physical capital
  - Postulate constant q_t
- $p_t K_t$ value of outside money
  - Postulate value of money changes proportional to K_t



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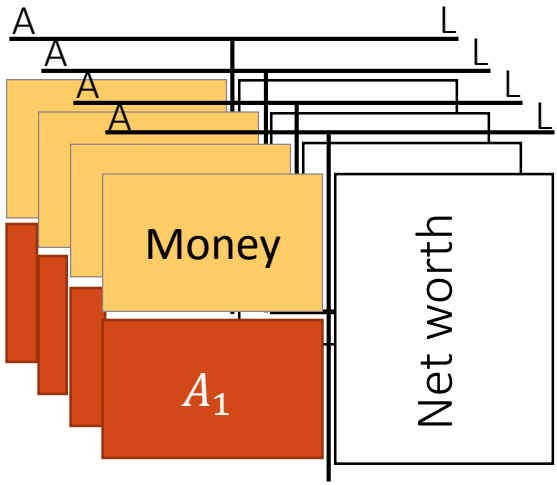
Adding outside money

Outside Money

- qK_t value of physical capital
  - $dr^a = \frac{A-\iota}{q}dt + (\Phi(\iota) - \delta)\,dt + \sigma^a dZ_t^a + \tilde{\sigma} d\tilde{Z}_t^a$
- pK_t value of outside money
  - $dr^M = \underbrace{(\Phi(\iota) - \delta)}_{g}\,dt + \sigma^a dZ_t^a$

- Technologies a



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    sector; idiosyncratic risk
  - Output
    $y_t = Ak_t$
- Demand for money

Demand with $E\left[\int_0^\infty e^{-\rho t} \log c_t \, dt\right]$

Outside Money

- Technologies a

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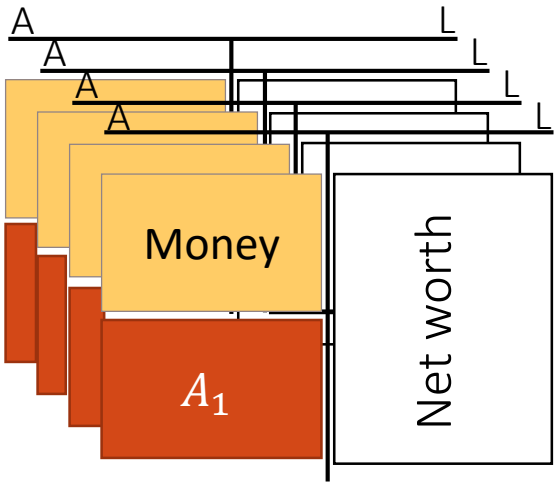
- Consumption demand:

$$\rho(p+q)K_t$$



Demand with log-utility

Outside Money

- Technologies a

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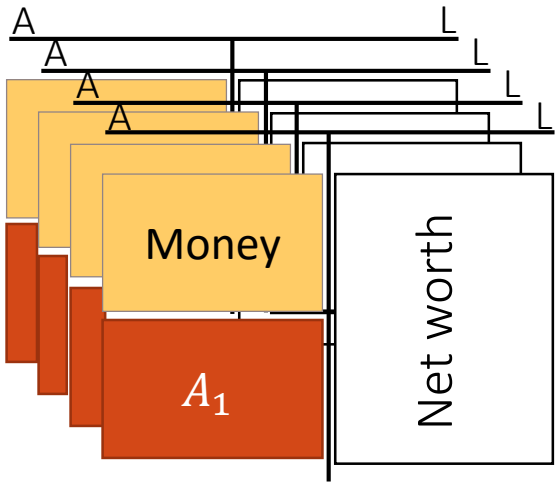

- Consumption demand:

$$\rho(p+q)K_t$$

- Asset (share) demand x^a:

$$E[dr^a - dr^M]/dt = Cov[dr^a - dr^M, \underbrace{\frac{dn_t^a}{n_t^a}}_{dr^M + x^a(dr^a - dr^M)}] = x^a \tilde{\sigma}^2$$

$$x^a = \frac{E[dr^a - dr^M]/dt}{\tilde{\sigma}^2} = \frac{(A-\iota)/q}{\tilde{\sigma}^2}$$

- Investment rate: (Tobin's q)

$$\Phi'(\iota) = 1/q$$

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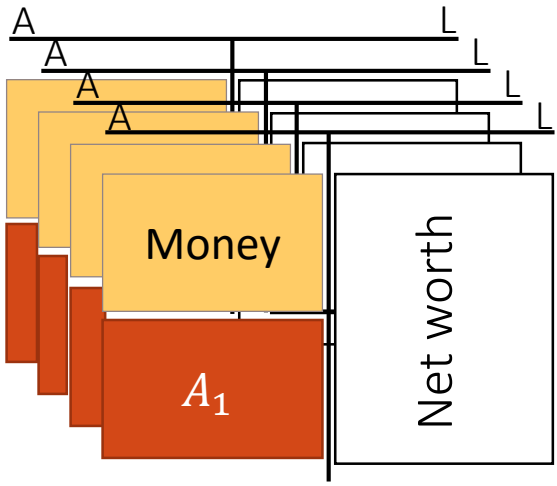

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- Investment rate: (Tobin's q)

$$\Phi'(\iota) = 1/q$$

  - For $\Phi(\iota) = \frac{1}{\kappa}\log(\kappa\iota + 1) \Rightarrow \iota = \frac{q-1}{\kappa}$

Market clearing

Outside Money

- Technologies a

- qK_t value of physical capital
  - $dr^a = \frac{A-\iota}{q}dt + (\Phi(\iota) - \delta)\,dt + \sigma^a dZ_t^a + \tilde{\sigma} d\tilde{Z}_t^a$
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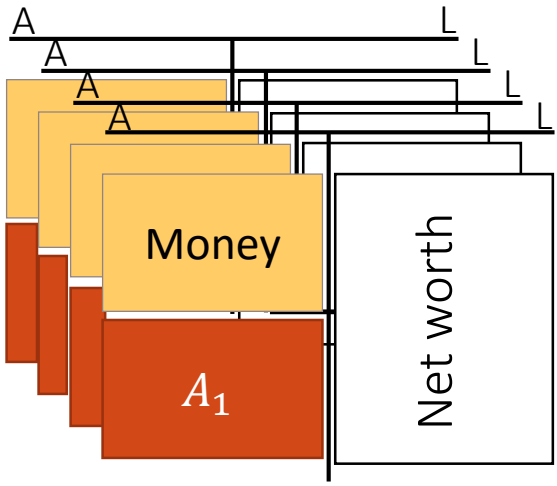

- Consumption demand:

$$\rho(p+q)K_t = (A-\iota)K_t$$

- Asset (share) demand x^a:

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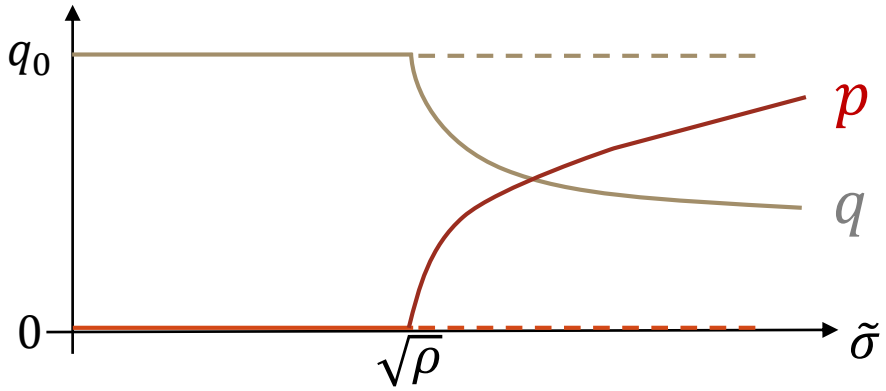
$$x^a = \frac{E[dr^a - dr^M]/dt}{\tilde{\sigma}^2} = \frac{(A-\iota)/q}{\tilde{\sigma}^2} = \frac{q}{q+p}$$

- Investment rate: (Tobin's q) $\Phi'(\iota) = 1/q$
  - For $\Phi(\iota) = \frac{1}{\kappa}\log(\kappa\iota + 1) \Rightarrow \iota = \frac{q-1}{\kappa}$

Equilibrium

Moneyless equilibrium		Money equilibrium
$p_0 = 0$		$p = \frac{\tilde{\sigma} - \sqrt{\rho}}{\sqrt{\rho}} q$
$q_0 = \frac{\kappa A + 1}{\kappa \rho + 1}$	>	$q = \frac{\kappa A + 1}{\kappa \sqrt{\rho} \tilde{\sigma} + 1}$



Welfare analysis

Moneyless equilibrium		Money equilibrium
$p_0 = 0$		$p = \frac{\tilde{\sigma}-\sqrt{\rho}}{\sqrt{\rho}}q$
$q_0 = \frac{\kappa A+1}{\kappa\rho+1}$	>	$q = \frac{\kappa A+1}{\kappa\sqrt{\rho}\tilde{\sigma}+1}$
g_0	>	g
welfare_0	<	welfare

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Outline of two sector model

- Technologies b
- Technologies a

- Households have to
  - Specialize in one subsector → sector specific + idiosyncratic risk
    for one period

$$\frac{dk_t}{k_t} = \cdots dt + \sigma^b dZ_t^b + \tilde{\sigma} d\tilde{Z}_t^b$$

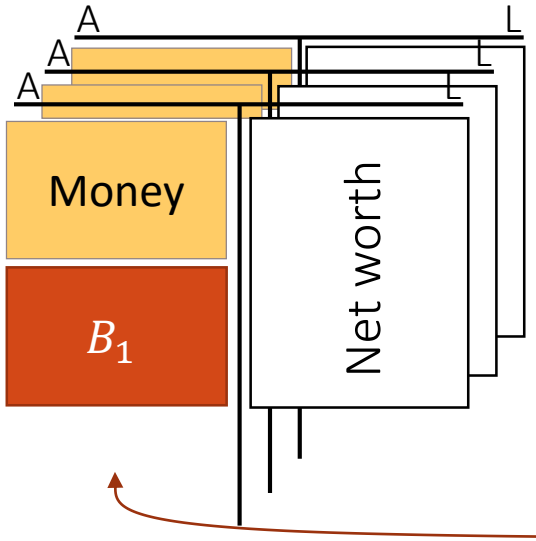
$$\frac{dk_t}{k_t} = \cdots dt + \sigma^a dZ_t^a + \tilde{\sigma} d\tilde{Z}_t^a$$

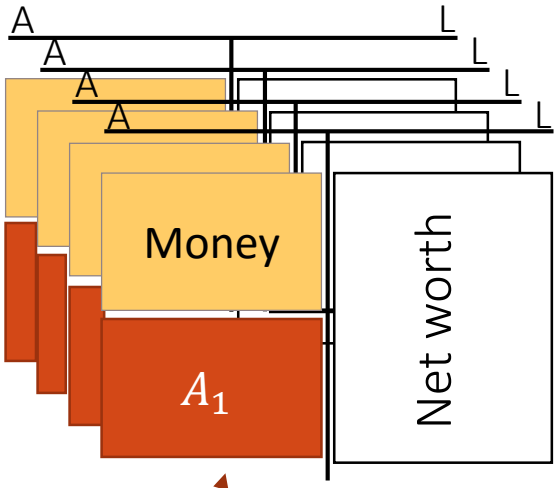
  - Demand for money

Add outside money

Outside Money

- Technologies b
- Technologies a





Switch technology

- Households have to
  - Specialize in one subsector
    for one period
  - Demand for money

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Roadmap

- Model absent monetary policy
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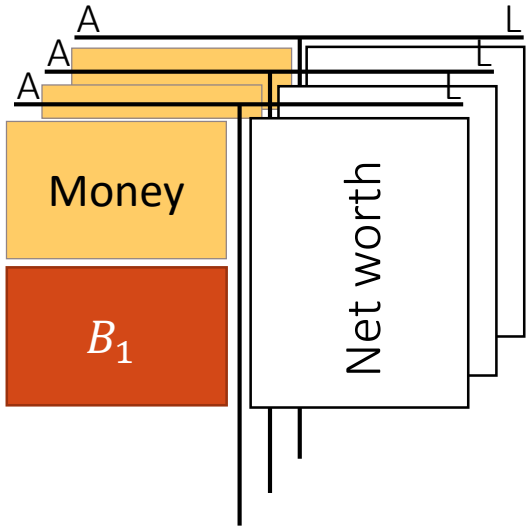
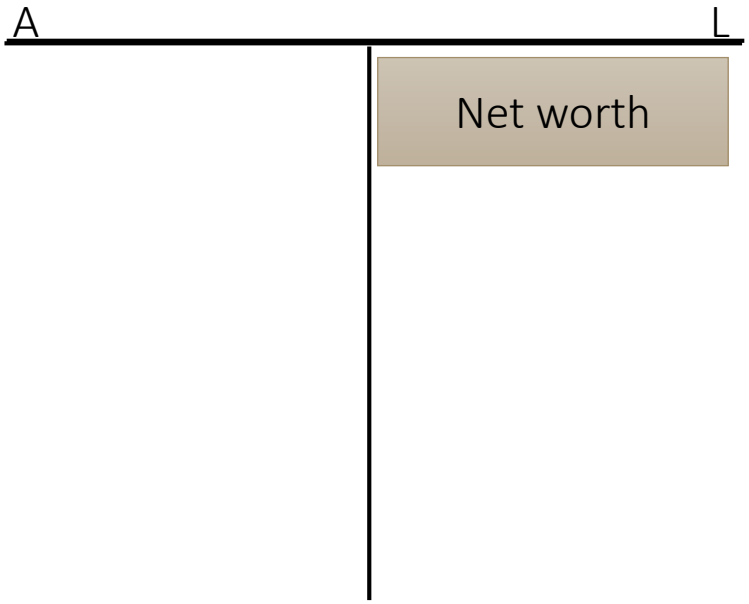
- Model with monetary policy
- Model with macro-prudential policy

Add intermediaries

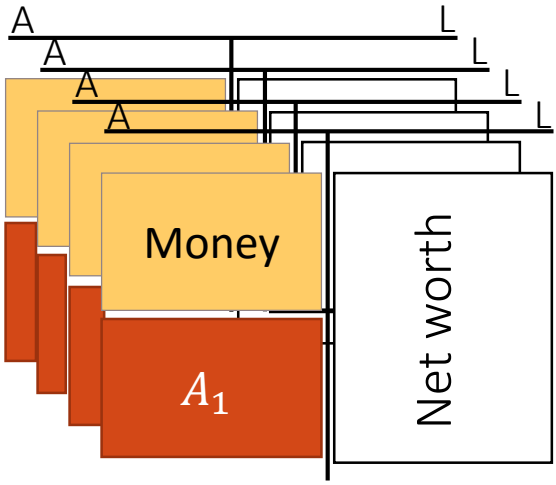
Outside Money

- Technologies b





- Technologies a



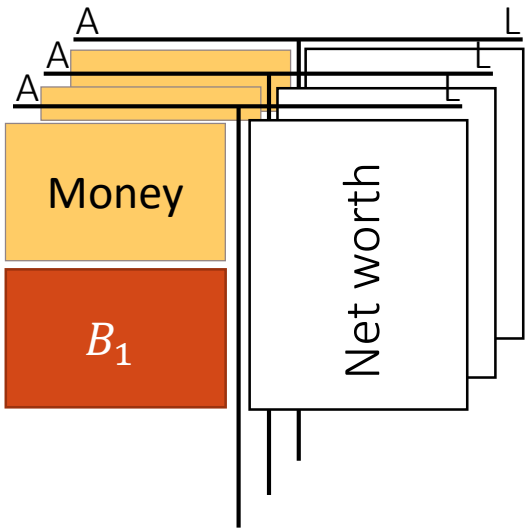
- Risk can be <u>partially sold off</u> to intermediaries

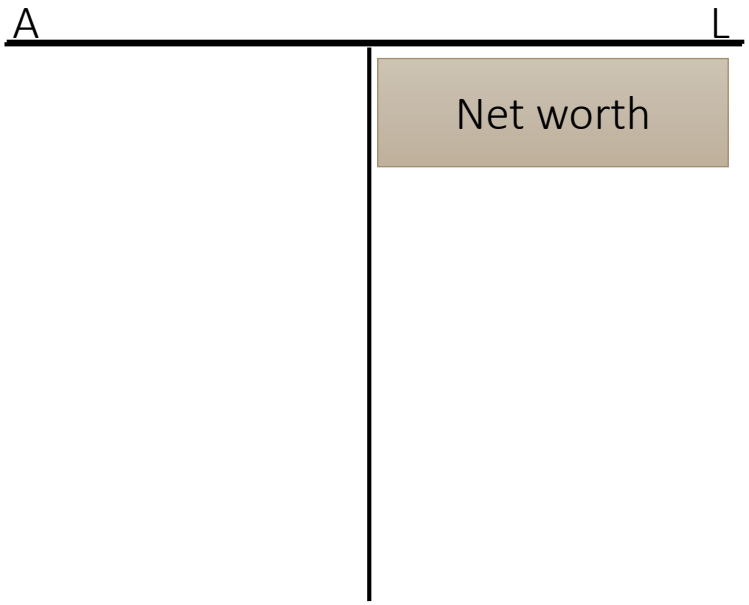
- Risk is <u>not contractable</u> (Plagued with moral hazard problems)

Add intermediaries

Outside Money

- Technologies b





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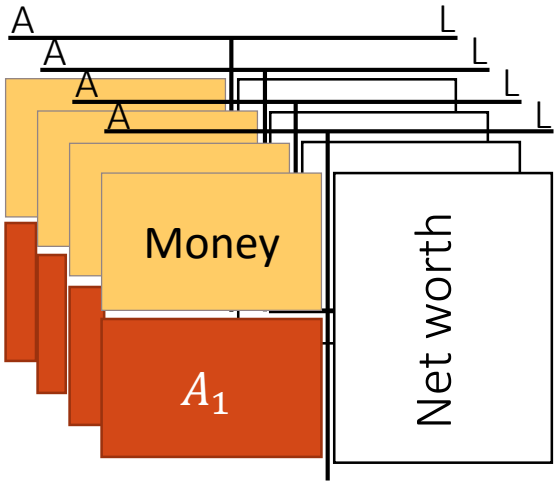
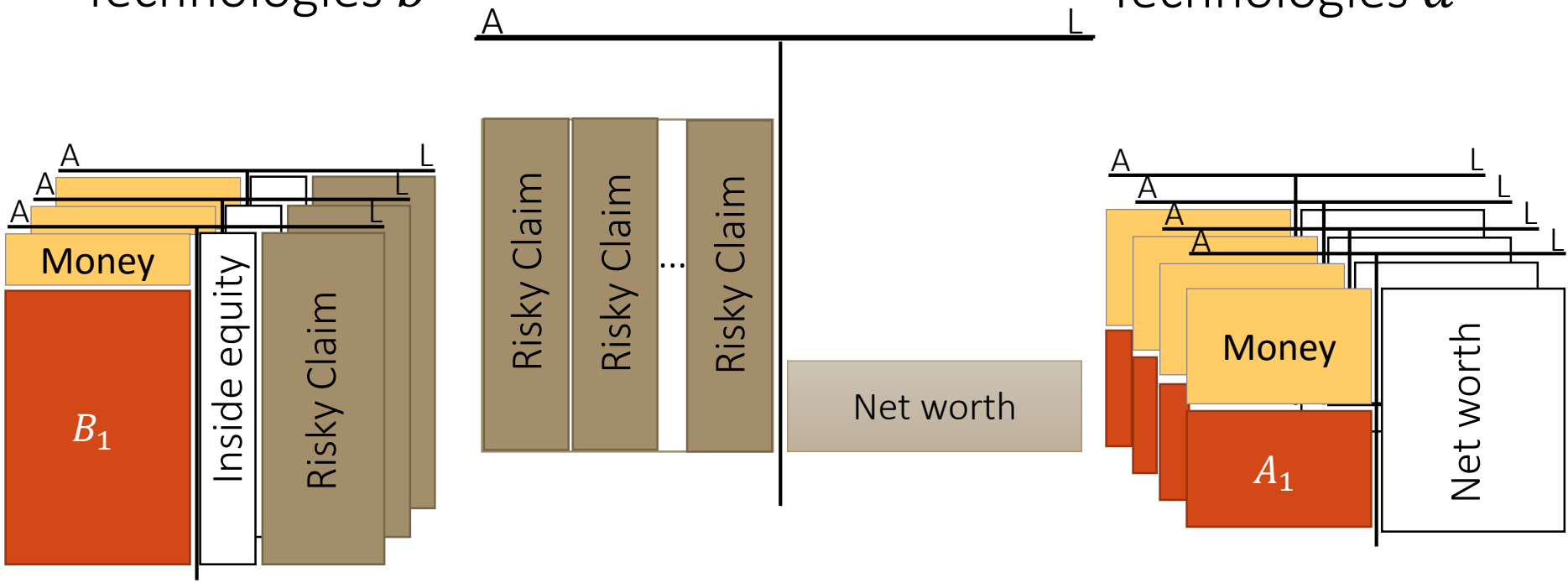


- Intermediaries
  - Can hold outside equity & diversify within sector b
  - Monitoring

Add intermediaries

Outside Money

- Technologies b
- Technologies a



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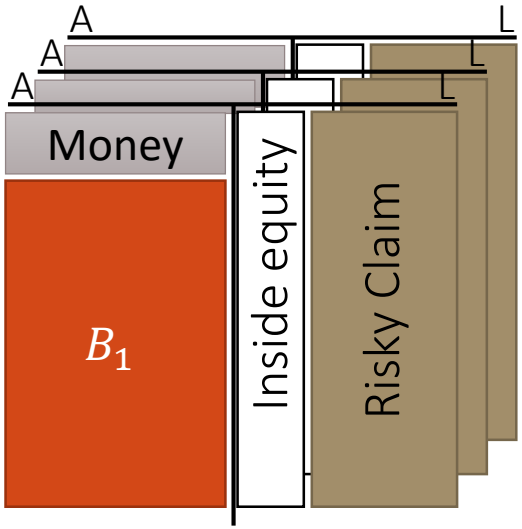

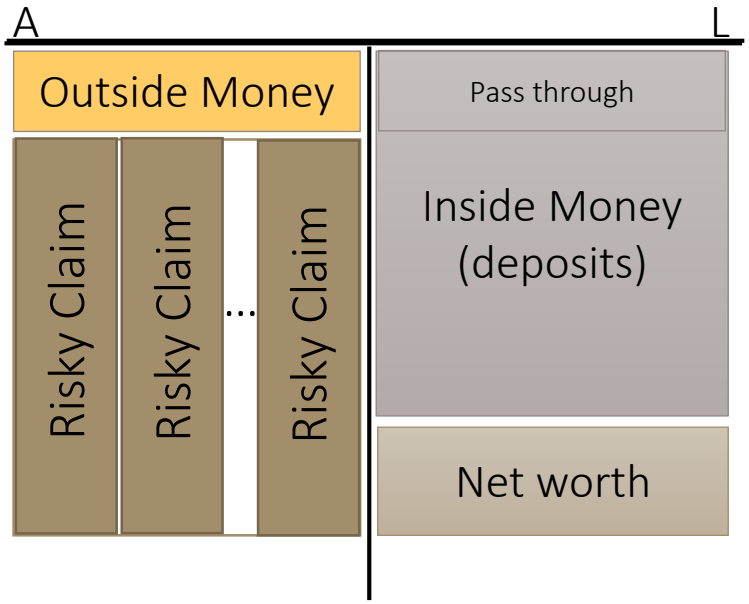

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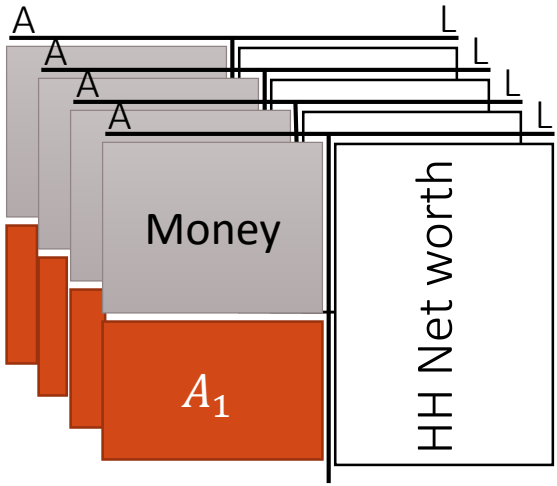
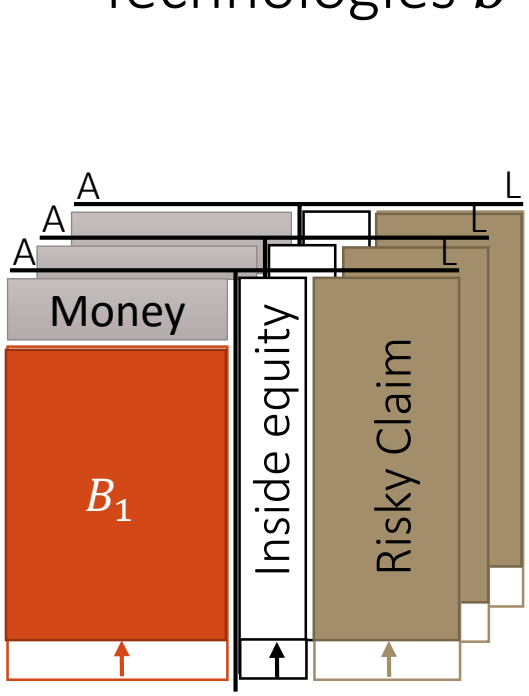
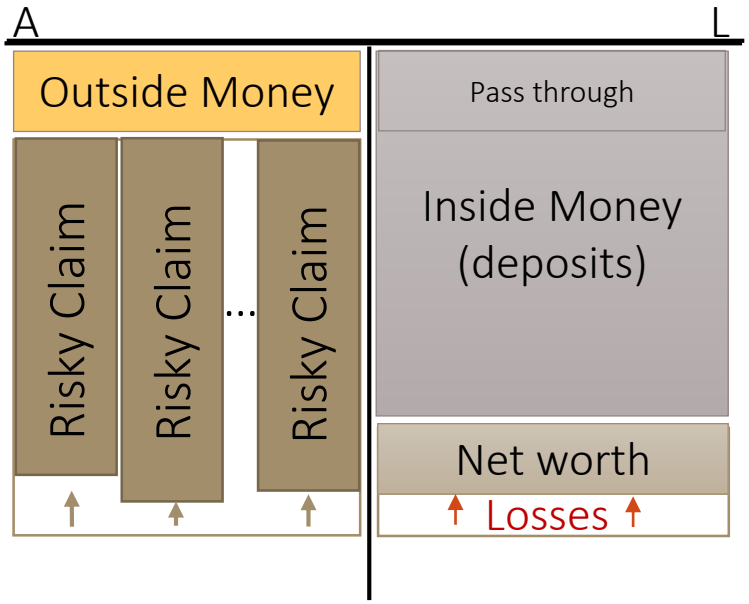


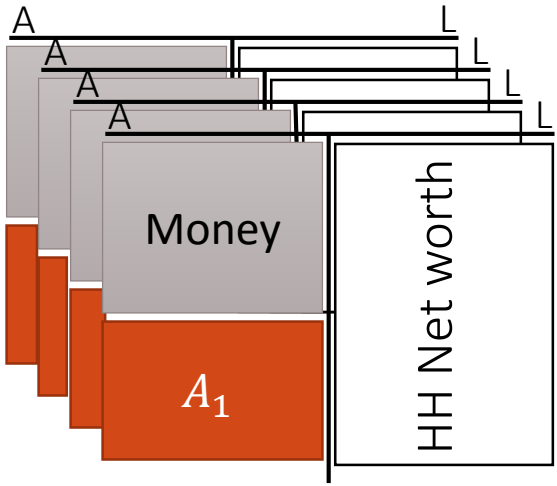
- Intermediaries
  - Can hold outside equity & diversify within sector b
  - Monitoring
  - Create inside money
  - Maturity/liquidity transformation

Shock impairs assets: 1st of 4 steps

- Technologies b
- Technologies a

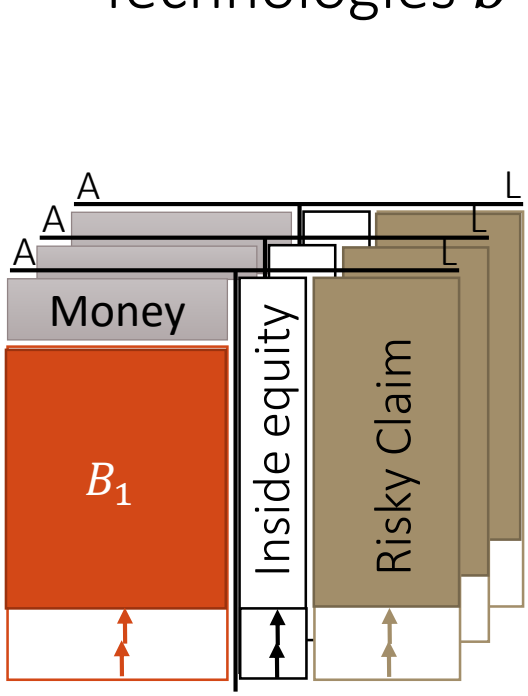


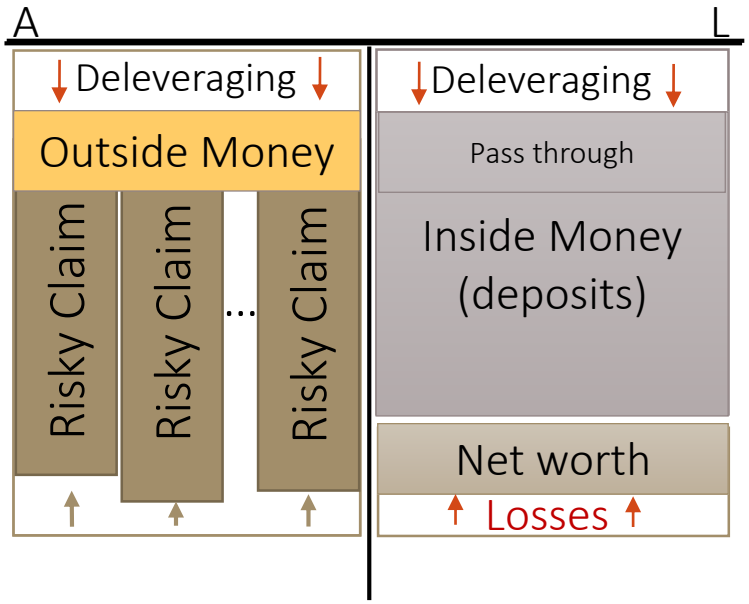


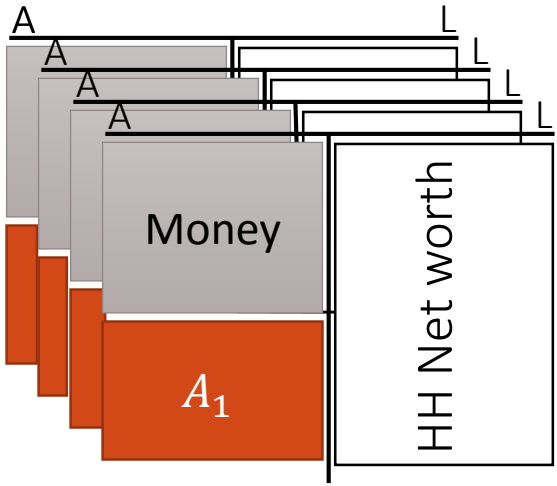


Shrink balance sheet: 2nd of 4 steps

- Technologies b
- Technologies a







Switch

"Paradox of Prudence"

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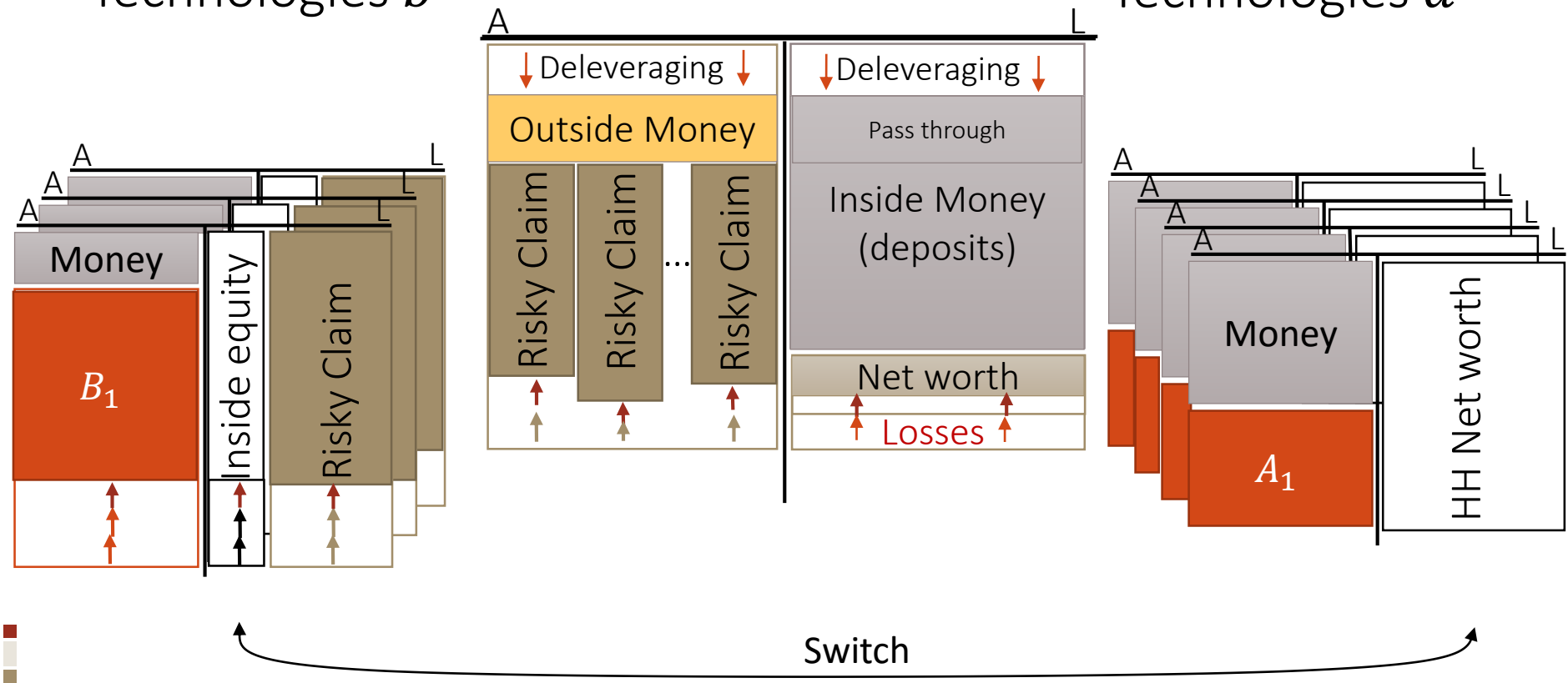
Liquidity spiral: asset price drop: 3rd of 4

- Technologies b
- Technologies a



Disinflationary spiral: 4th of 4 steps

- Technologies b
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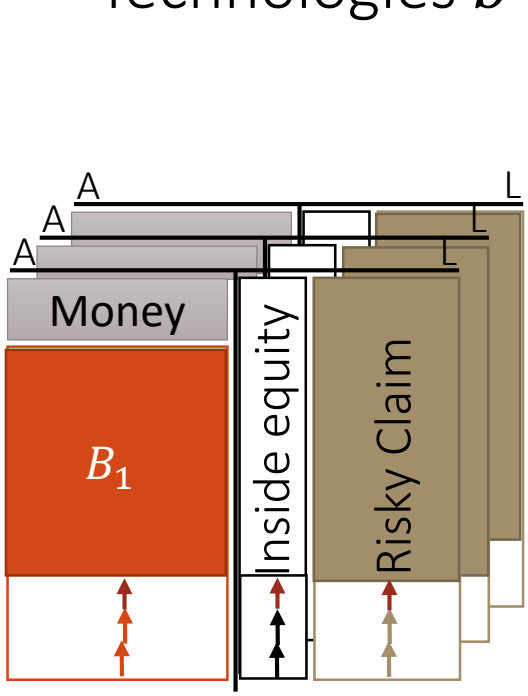
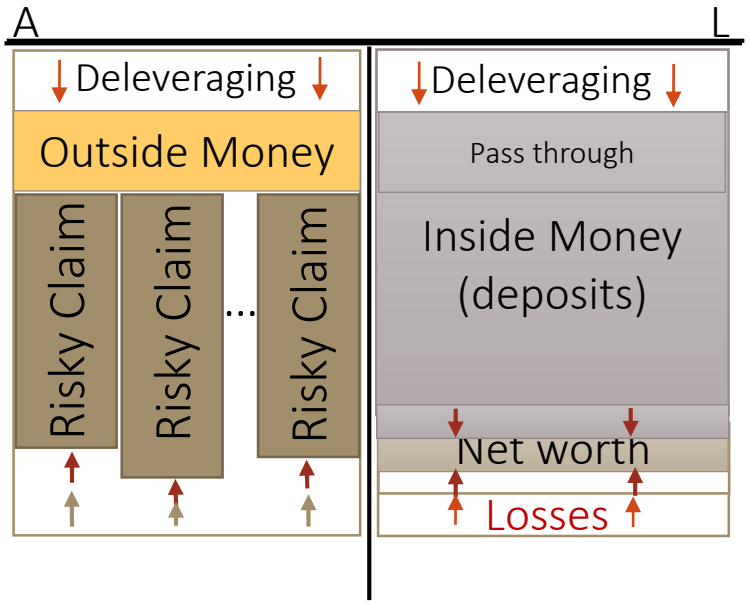
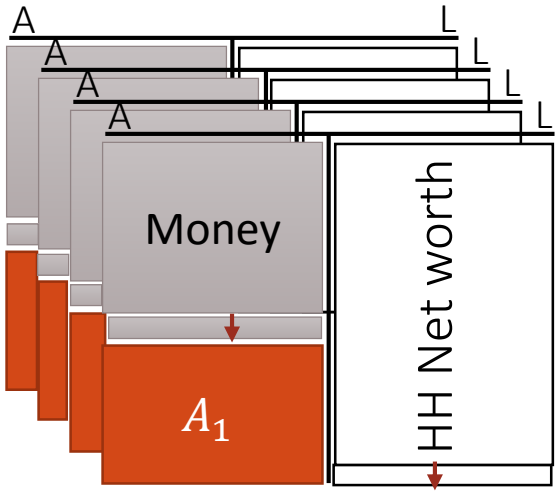






… after an adverse shock

- Intermediaries are hit and shrink their balance sheets inducing
  - Asset side — liquidity spiral — financial stability
  - Liability side — disinflation spiral — price stability

- Response of intermediaries to adverse shock leads to endogenous risk
  - Amplification
  - Persistence

- Other sectors can also be undercapitalized
  - Japan 1980: corporate sector
  - US 2000s: household sector

Allocation

- Equilibrium is a map

Histories of shocks $\{\boldsymbol{Z}_\tau, 0 \leq \tau \leq t\}$ ⟶ prices q_t, p_t, λ_t, allocation α_t, χ_t & portfolio weights (x_t, x_t^a, x_t^b)

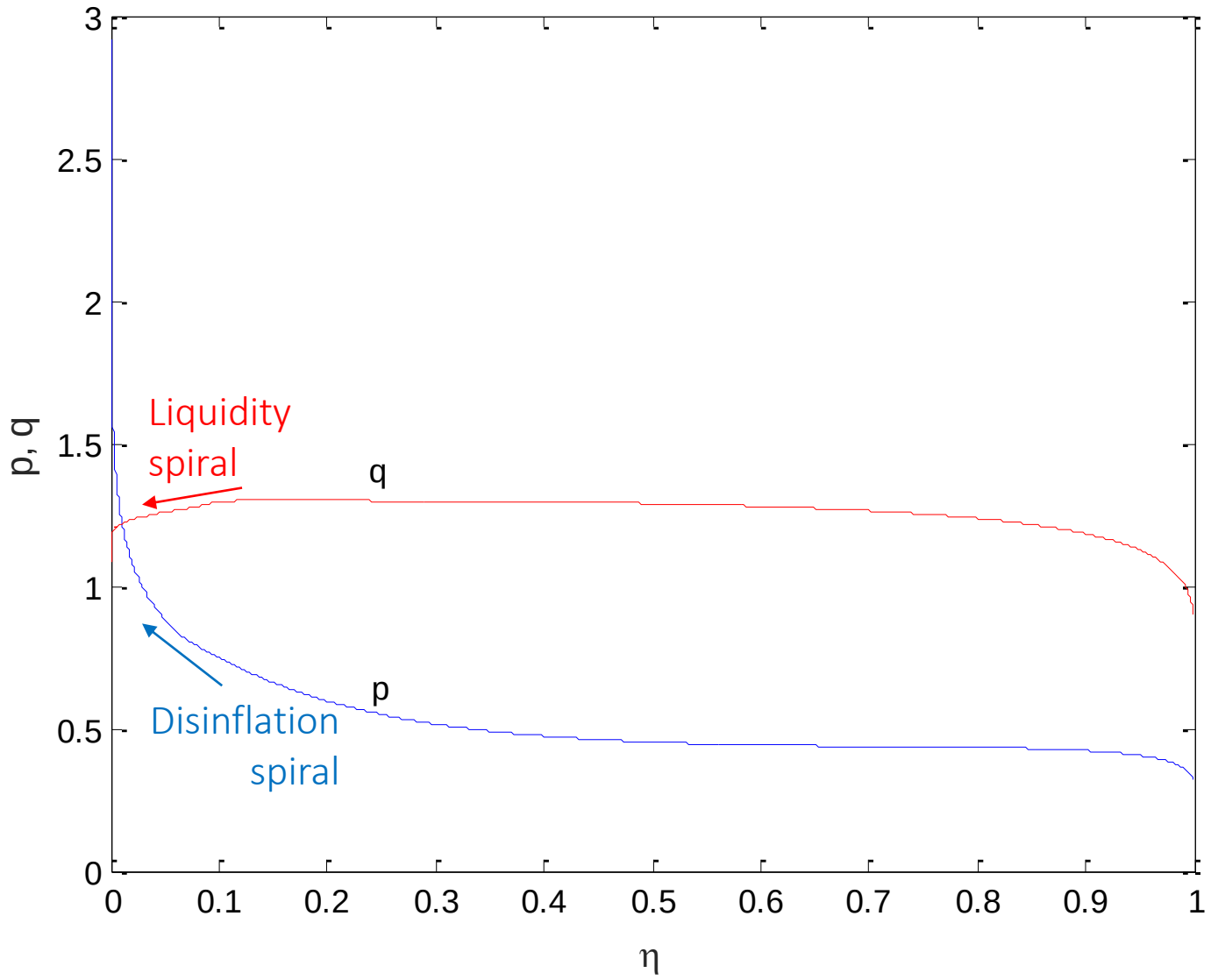
wealth distribution

$$\eta_t = \frac{N_t}{(p_t+q_t)K_t} \in (0,1)$$

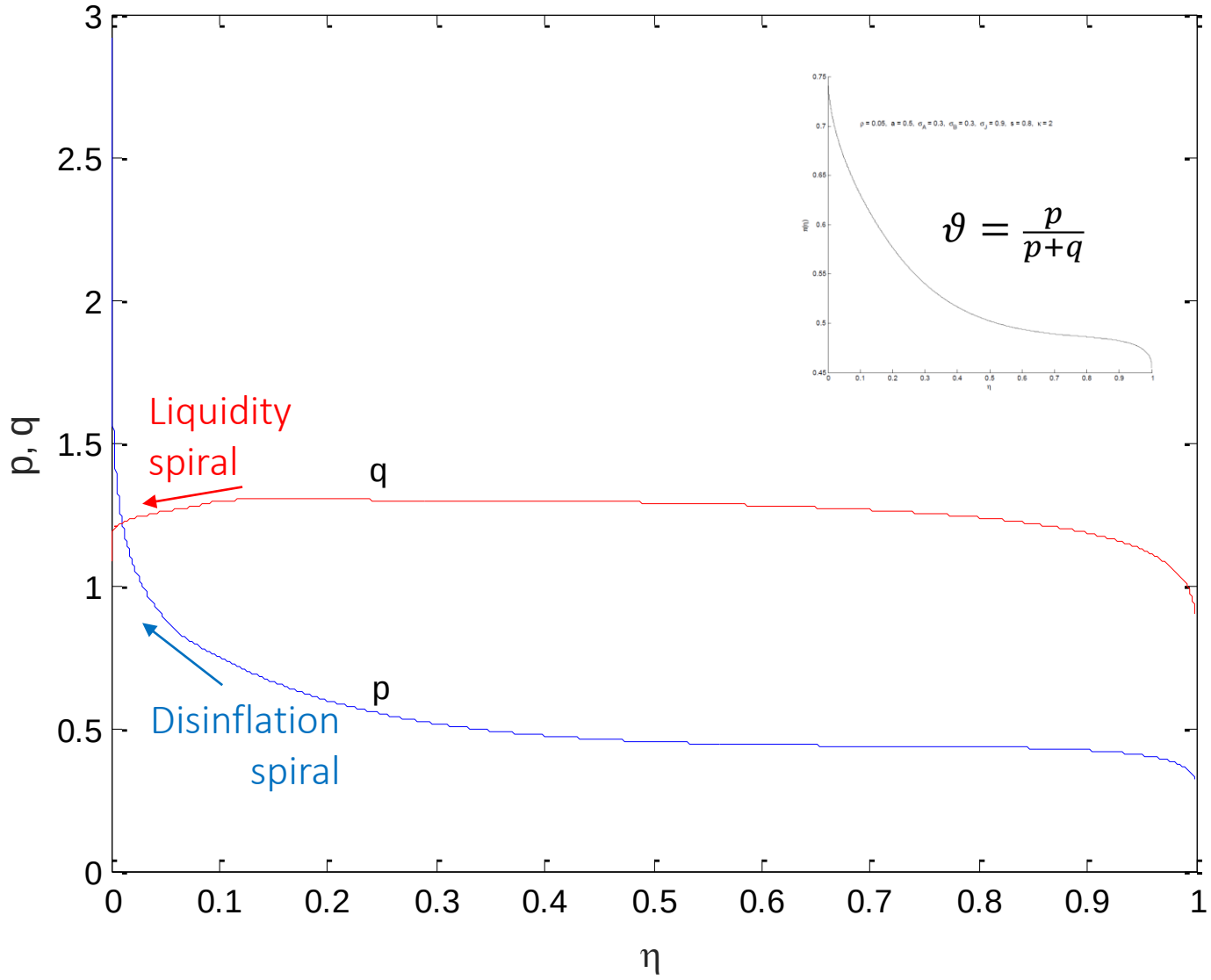
intermediaries' wealth share

- All agents maximize utility
  - Choose: portfolio, consumption, technology
- All markets clear
  - Consumption, capital, money, outside equity of b

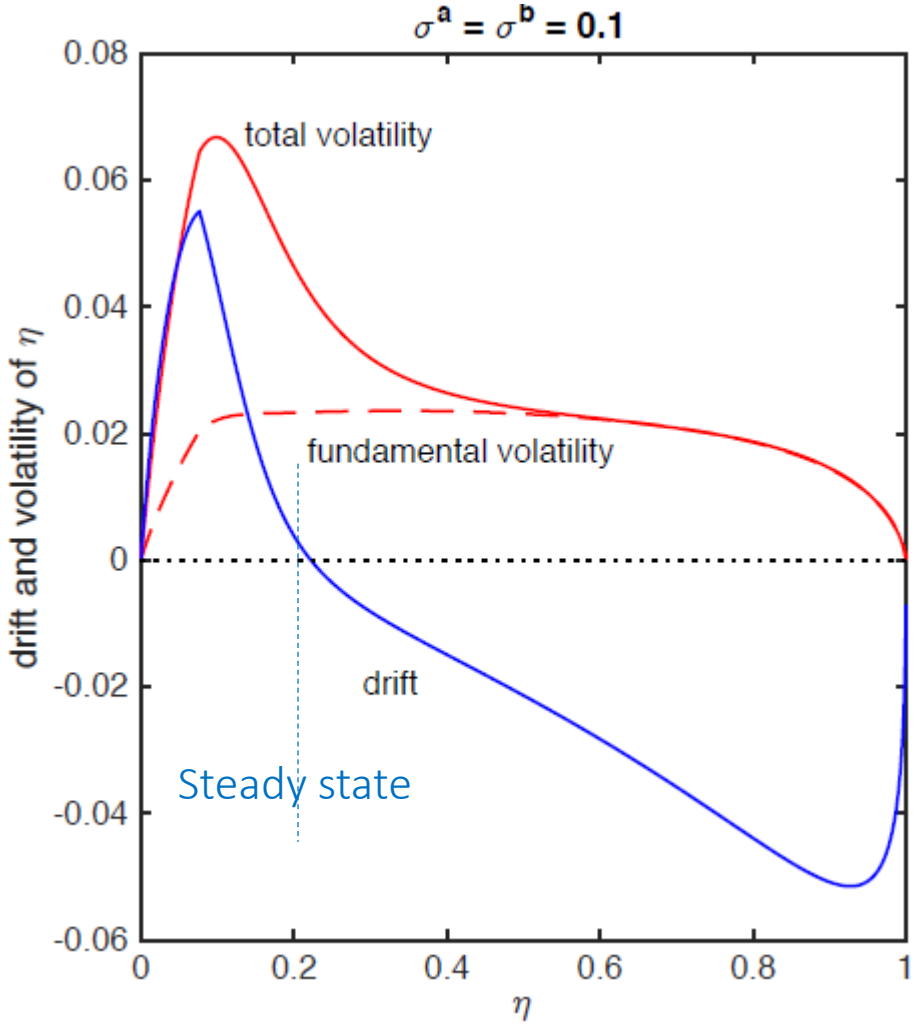
Numerical example: prices



Numerical example: prices



Numerical example: dynamics of η



$$\sigma_t^\eta = \frac{\overbrace{x_t\,(\sigma^b 1^b - \sigma_t^K)}^{\text{fundamental volatility}}}{\underbrace{1 - \underbrace{\left(\frac{x_t}{1-\vartheta_t} - 1\right)}_{\text{leverage}} \underbrace{\frac{-\vartheta'(\eta_t)}{\vartheta/\eta_t}}_{\text{elasticity}}}_{\text{amplification}}}$$

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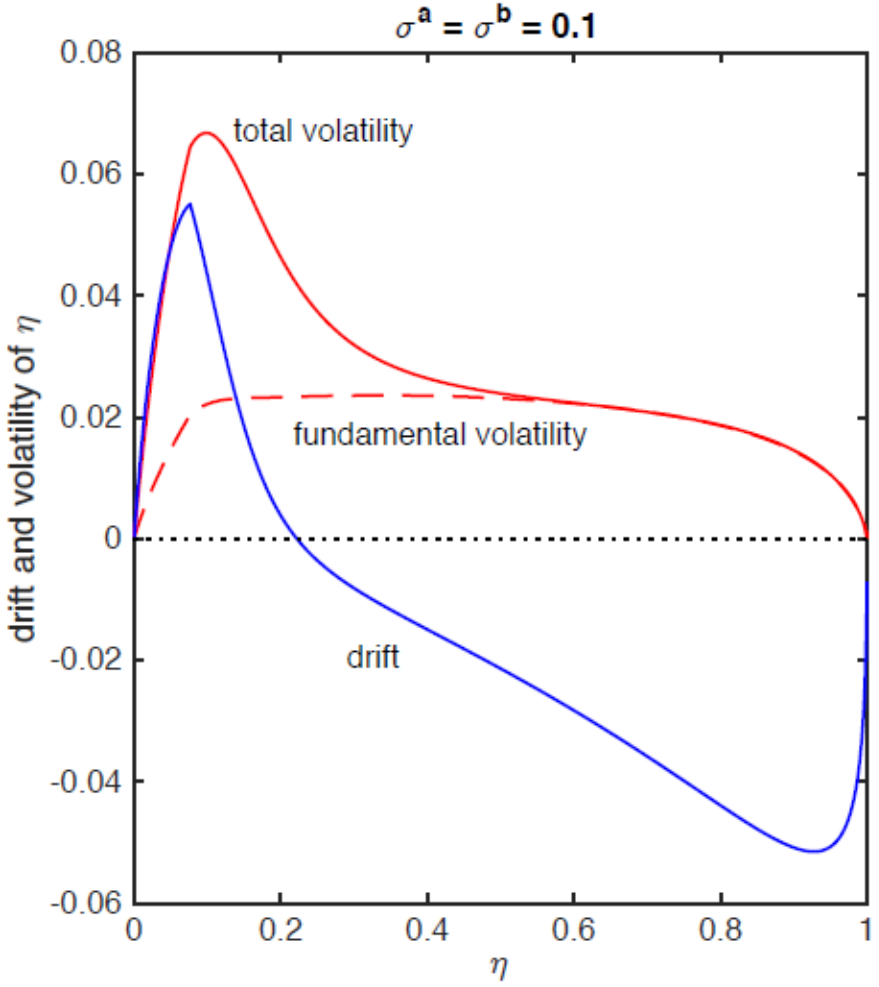
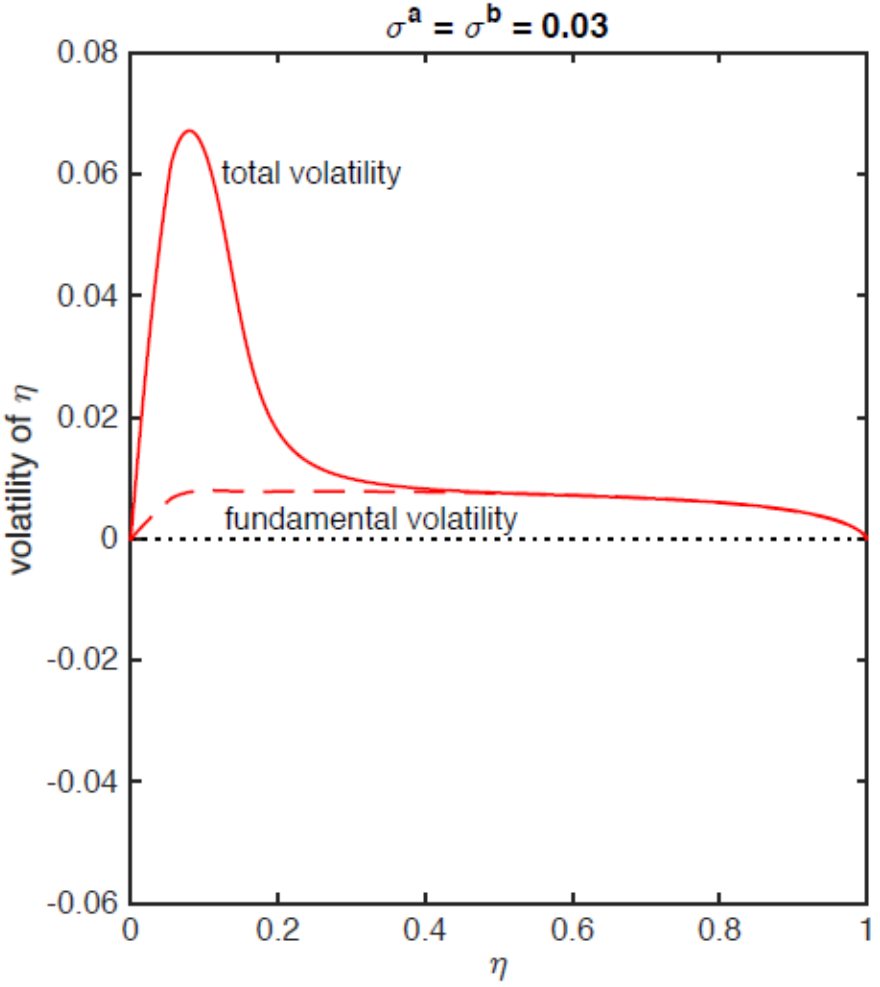
Volatility Paradox

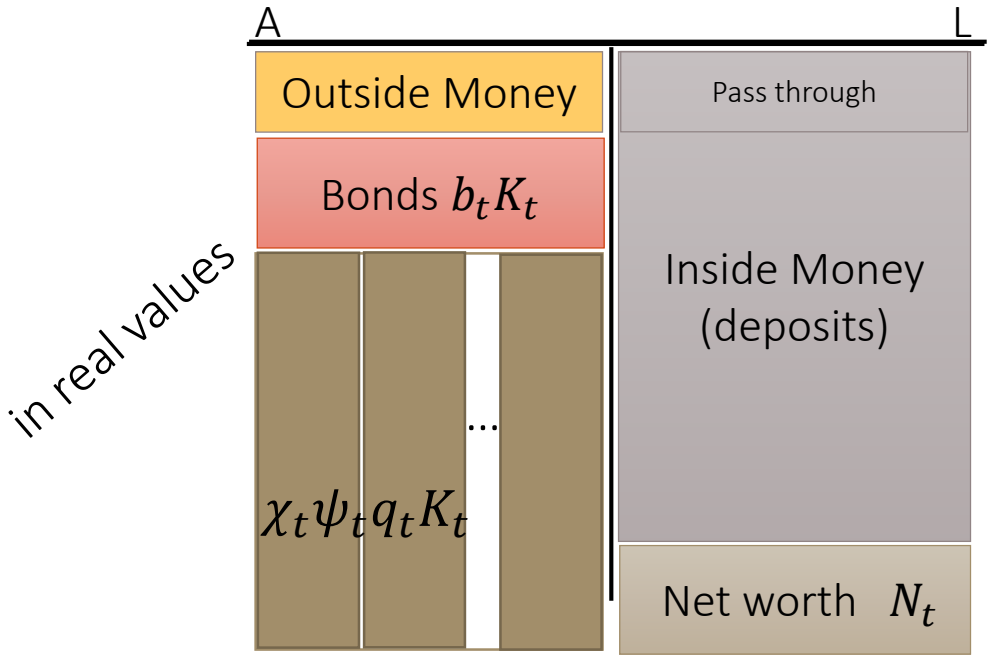




Overview

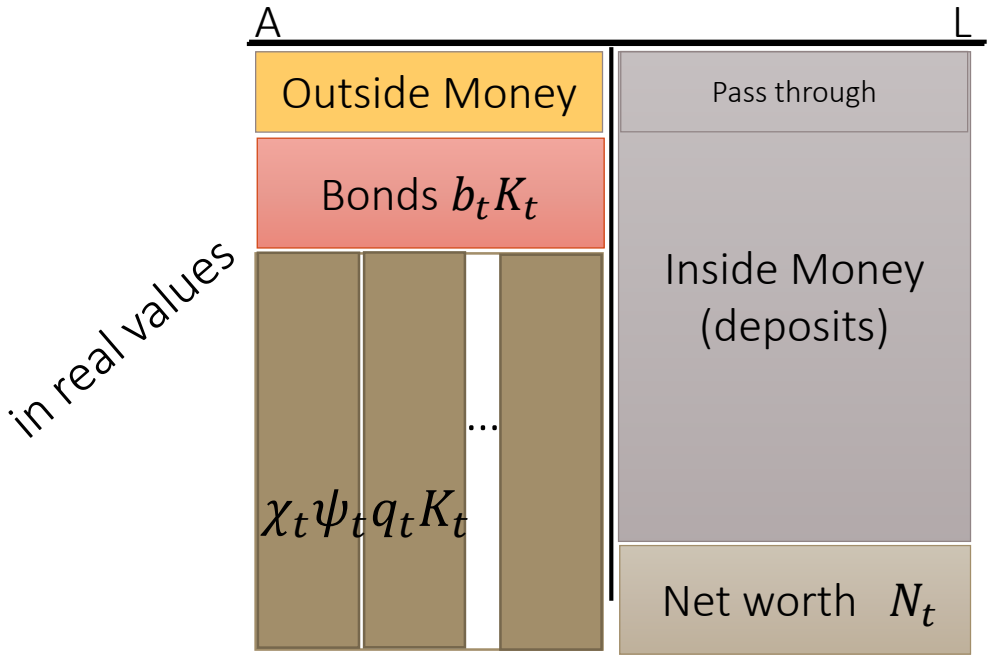
- Safe assets
- No monetary economics
  - Fixed outside money supply
  - Amplification/endogenous risk through
    - Liquidity spiral — asset side of intermediaries' balance sheet
    - Disinflationary spiral — liability side
- Monetary policy
- The Curse of Safe Assets
- ESBies: Creating Safety via Securitization

Redistributive MoPo: Ex-post perspective



- Adverse shock → value of risky claims drops
- Monetary policy
  - Interest rate cut ⇒ long-term bond price ↑
  - Asset purchase ⇒ asset price ↑
  - ⇒ "stealth recapitalization" - redistributive
  - ⇒ risk premia ↓
- Liquidity & Deflationary Spirals are mitigated

Redistributive MoPo: Ex-post perspective



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"stealth recapitalization"
LTRO, QE

Monetary policy and endogenous risk

- Intermediaries' risk (borrow to scale up)

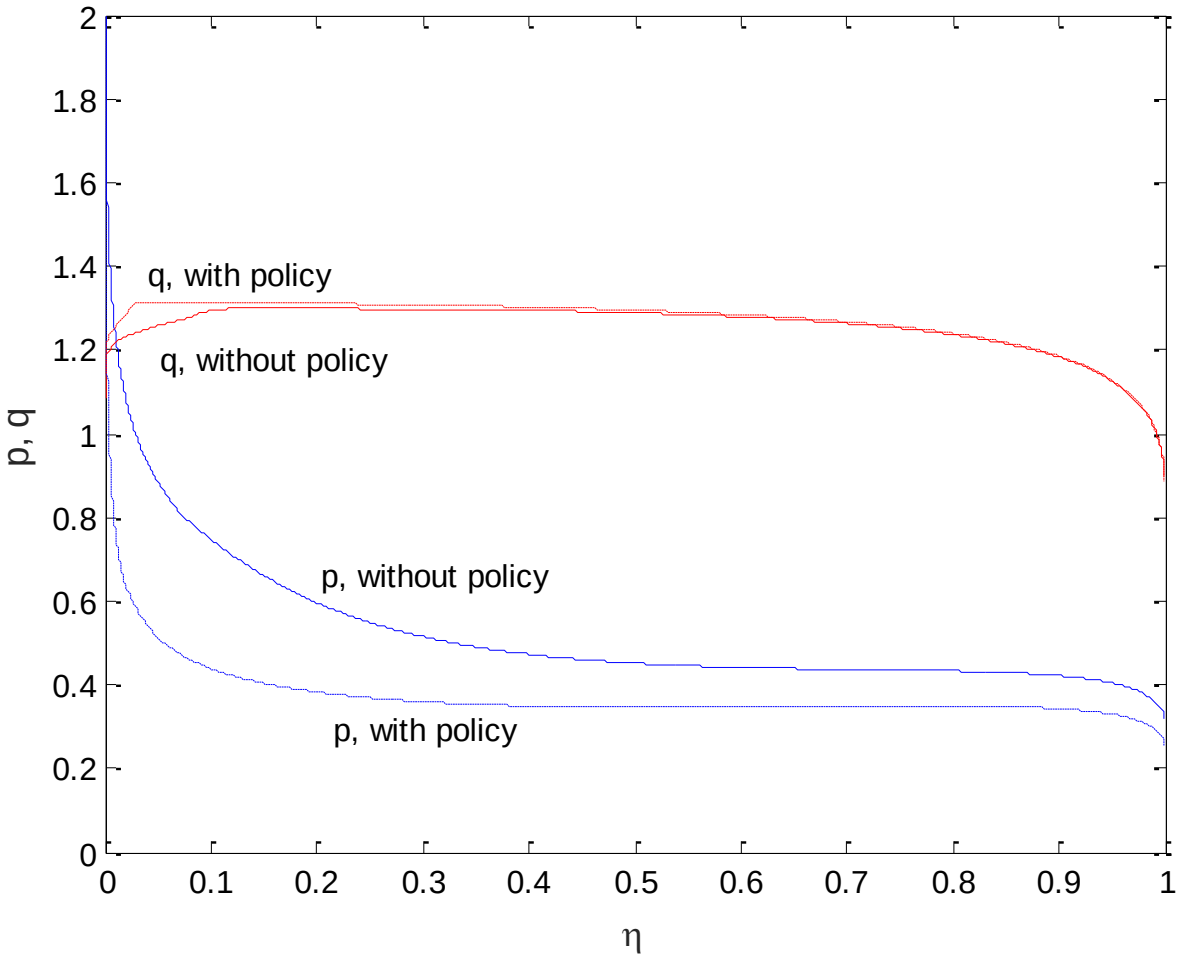
$$\sigma_t^{\eta} = \frac{x_t\,(1^b\sigma^b - \sigma_t^K)}{1 + \underbrace{\left(\frac{\chi_t\,\psi_t - \eta}{\eta_t}\right)\frac{\vartheta'(\eta_t)}{\vartheta/\eta_t}}_{\text{amplification}} - \underbrace{\left(x_t + \vartheta_t\frac{1-\eta_t}{\eta_t}\right)\frac{b_t}{p_t}\frac{B'(\eta_t)}{B(\eta_t)/\eta_t}}_{\text{mitigation}}}$$

fundamental risk

- MoPo works through $\frac{B'(\eta_t)}{B(\eta_t)/\eta_t}$
  - with right monetary policy bond price $B(\eta)$ rises as η drops "stealth recapitalization"
  - Switch off liquidity and disinflationary spiral
- Example:
  Remove amplification s.t. $\sigma_t^{\eta} = x_t(1^b\sigma^b - \sigma_t^K)$

Numerical example with monetary policy

- Prices



q is more stable

p less disinflation

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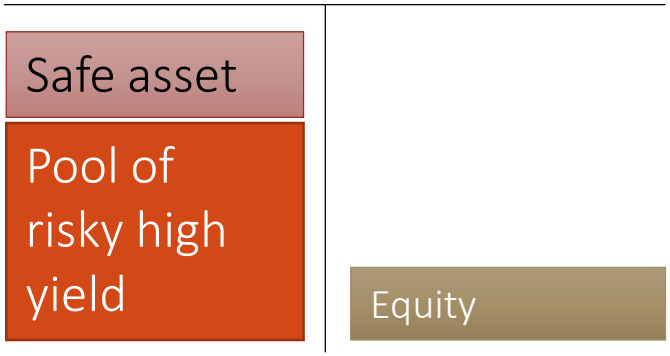
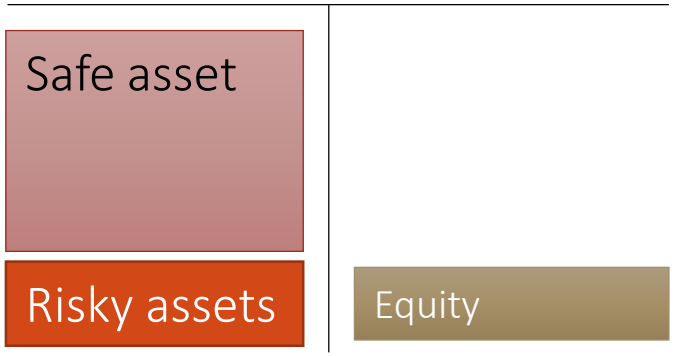
The "Curse of Safety" with Haddad

- Investment equilibrium



- High real investment
- High market liquidity of risky assets
  - Less safe asset holdings necessary

- Safety equilibrium



- Low real investment
- Low market liquidity of risky assets
  - High safe asset holdings necessary

Overview

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- Monetary policy
- The Curse of Safe Assets
- Asymmetrically supplied safe asset: ESBies solution

The two “safe asset challenges”

- Challenge 1:
  Safe asset + sovereign debt restructuring w/o diabolic loop

  French IMF/Anglo-American/German

- Challenge 2:
  No asymmetrically supplied safe asset
  - German Bund

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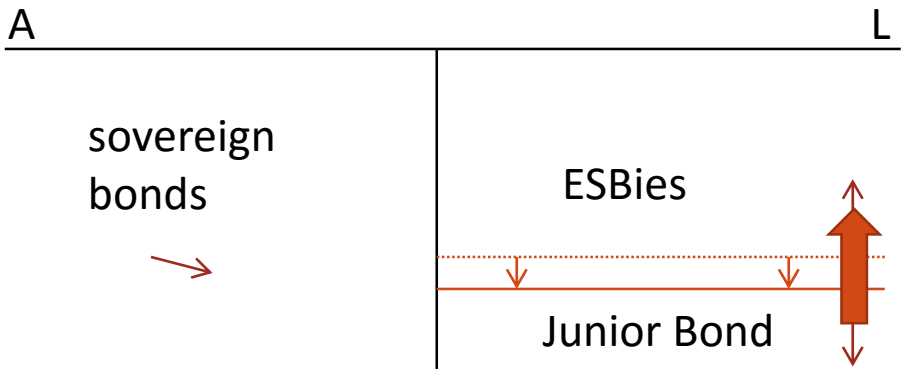
Cross-border flight to safety

- Today: asymmetric shifts across borders
  - Value of German debt increases
    - German CDS spread rises, but yield on bund drops (flight to quality)
  - Value of Italian/Spanish/Greek… sovereign debt declines

Solution: ESBies



- Today: asymmetric shifts across borders
  - Value of German debt increases
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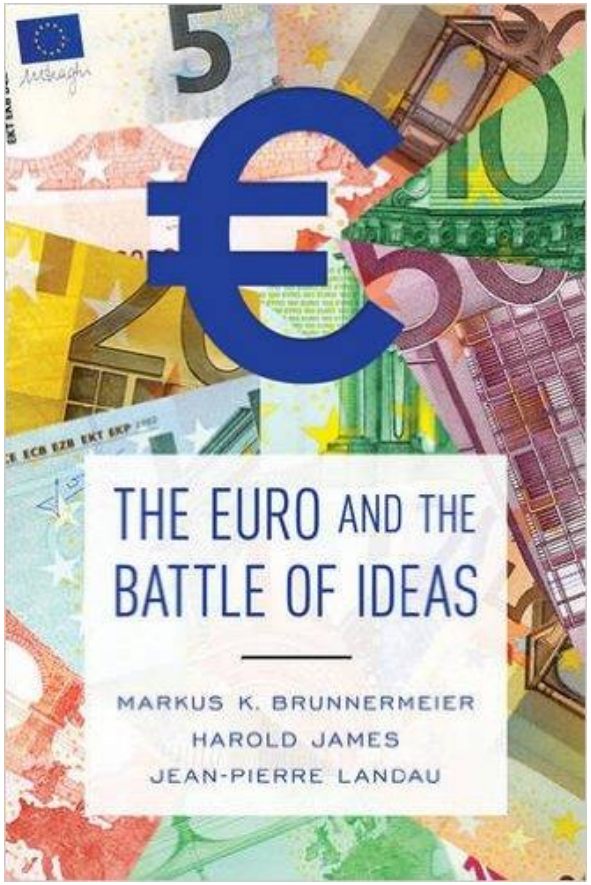
  - Value of Italian/Spanish/Greek… sovereign debt declines
- With ESBies: Negative co-movement across tranches
  - Value of ESBies expands – due to flight to quality
  - Value of Junior bond shrinks – due to increased risk
  - Asset side is more stable

Conclusion

- Safe assets
  - “Good friend analogy”
  - Safe asset tautology (multiple equilibria, bubble)
  - Flight to safety
- Safe asset and Money are close cousins
- Amplification & endogenous risk–
  due to “Paradox of Prudence”
  - Liquidity spiral (fire sales etc.)
  - Disinflationay spiral
- Redistributive monetary policy
- Ex-ante insurance -> MH requires MacroPru regulation
- Curse of safe assets
- ESBies – symmetrically supplied for Europe

ESBies and more …

The Euro & The Battle of Ideas



Markus K. Brunnermeier,
Harold James &
Jean-Pierre Landau

"interests are interpret through the lens of ideas"≈models