A Theory of Safe Asset Creation, Systemic Risk, and Aggregate Demand

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Disclaimer

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Motivation

- Persistent macroeconomic slumps have been attributed to shortages of safe assets (e.g. Caballero Farhi 2018)
  - Central bank purchases of *risky* assets (MBS, corporate bonds, equities)
  - Points to interactions between demand-driven fluctuations and risk in the financial system

- Open questions:
  - How are persistent demand-driven slumps related to financial vulnerabilities?
  - Why can't the economy produce more safe assets to alleviate a shortage?
  - When should the central bank purchase risky assets rather than safe ones?

- This paper develops a theory to understand how the creation of safe assets affects systemic risk and aggregate demand
  - Then studies monetary and macroprudential policies

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Mechanism

- The model is built around two basic premises:
  - 1. When banks issue safe debt, they generate a *risk of a future crisis*, in which banks must liquidate assets to service their debt
  - 2. These crises entail *macroeconomic spillovers* which reduce households' future labor income

- **Key mechanism:** The creation of safe assets generates a risk of a future crisis (*systemic risk*), which lowers aggregate demand ex ante due to precautionary saving
  - The natural rate of interest is determined by the level of systemic risk

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Results

- The creation of safe assets by the financial sector can lead to demand-driven recessions
  - Two-way interaction between high systemic risk and depressed aggregate demand
  - This can give rise to persistent slumps driven by high systemic risk (**a risk-driven stagnation trap**)

- Policy implications:
  - QE: *Risky* asset purchases can stimulate output through a **risk absorption channel**
  - Macropru: Tighter bank regulation can stimulate output during a slump

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Related literature

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- **4) Quantitative NK models with both collateral constraints and an ELB:** Benigno et al. (2023), Boissay et al. (2023), Cao et al. (2023), Collard et al. (2017)

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Model environment

- 3 dates (0, 1, 2)
  - Risk-averse households solve a consumption-saving problem each period
  - Risk-neutral banks have access to a risky technology to produce new capital
  - New Keynesian firms who have fully rigid prices and variable utilization

Date 0

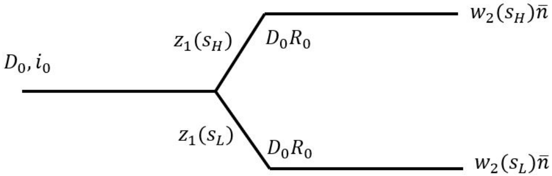
- Safe assets traded, D_0, B_0
- Banks invest in risky capital

Date 1

- TFP shock
- Debt repayment

Date 2

- Labor income



Households

- Supplies labor inelastically each period and chooses portfolio of bonds (public and private) to solve a consumption-saving problem at date 0

$$\max_{c_0, c_1, c_2, D_0, B_0, B_1} \log c_0 + E_0 [\log c_1 + \log c_2]$$

$$s.t. \quad \underbrace{c_t}_{consumption} + \underbrace{D_t + B_t}_{safe\ asset\ holdings} \leq \underbrace{w_t \bar{n}}_{labor\ income} + \underbrace{R^D_{t-1} D_{t-1} + R^B_{t-1} B_{t-1}}_{interest\ income} + \underbrace{e_t + d^F_t - T_t}_{other\ net\ income} \quad \forall t$$

- Private and public bonds are equivalent assets from the perspective of an individual household
  - The rates of the return on the private and public bonds must be equalized in equilibrium, $R^D_0 = R^B_0$

- Date 0 Euler equation: $\frac{1}{c_0} = R_0 E_0 \left[\frac{1}{c_1(s)} \right]$

Government

- The government issues safe debt and levies lump-sum taxes and transfers

$$\underbrace{R^B_{t-1} B_{t-1}}_{\text{debt repayment}} = \underbrace{T_t - T^B_t}_{\text{lump-sum taxes and transfers}} + \underbrace{B_t}_{\text{new borrowing}}$$

- For now:
  - Leave aside government asset purchases (QE)
  - Take the government's behavior as given

New Keynesian block

- Continuum of monopolistically competitive firms who have variable capital utilization, $u_t(\nu) \in [0,1]$

$$y_t(\nu) = z_t \left(u_t(\nu) k_t(\nu)\right)^{\alpha} n_t(\nu)^{1-\alpha}$$

- Prices are pre-set prices and fixed forever, $p_t(\nu) = \frac{P_t(\nu)}{P_t} = 1$
  - Utilization is determined to meet the demand faced by the firm $y_t^d(\nu) = p_t(\nu)^{-\varepsilon} y_t$ by competitive final goods producers

- Monetary policy targets the natural rate of interest subject to the ELB, $R_t^{MP} = \max\{R_t^*, 1\}$

- **Takeaways:**
  - When the natural rate exceeds the ELB, output is at potential $(u_t = 1)$
  - But at the ELB, a demand-driven recession $(u_t < 1)$ is needed to clear the market

$$y_t = (u_t)^{\alpha} \underbrace{z_t k_t^{\alpha} \overline{n}^{1-\alpha}}_{\text{potential output}}$$

Banks

- Banks consume only at date 2, own capital, and rent it out each period at a competitive rate r_t^k

$$\max_{i_0, D_0, k_1, i_1, \ell_1, k_2, c_2^E} E_0 \left[c_2^E \right]$$

- Date 0 budget constraint

$$\underbrace{i_0}_{\text{date 0 investment}} \leq \underbrace{r_0^k k_0}_{\text{rental income}} + \underbrace{D_0}_{\text{bank debt}} + \underbrace{T_0^B}_{\text{transfers}}$$

- Date 1 budget constraint

$$\underbrace{i_1(s)}_{\text{date 1 investment}} + \underbrace{D_0 R_0^D}_{\text{debt service}} \leq \underbrace{r_1^k(s) k_1}_{\text{rental income}} + \underbrace{\ell_1(s) k_1}_{\text{liquidated capital}} + \underbrace{T_1^B}_{\text{transfers}}$$

- Liquidation converts capital into units of the consumption good, but entails a convex cost $\phi(\ell_1)$, where $\phi', \phi'' > 0$

$$\underbrace{k_2(s)}_{\text{date 2 capital stock}} = \underbrace{i_1(s)}_{\text{date 1 investment}} + \underbrace{(1 - \ell_1) k_1(s)}_{\text{non}-\text{liquidated capital stock}} \underbrace{- \phi(\ell_1(s)) k_1(s)}_{\text{liquidation cost}}$$

Bank's optimal choices

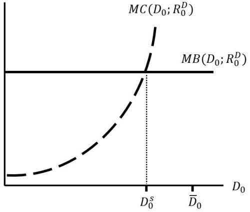
Date 1

- *Good state (Normal times):* Rental income $r_1^k(s_H)$ is high, so $\ell_1(s_H) = 0$
- *Bad state (Crisis):* Rental income $r_1^k(s_L)$ is insufficient to meet debt repayments, so the bank liquidates capital to cover the difference

$$\underbrace{\ell_1(s_L)k_1}_{\textit{liquidated capital}} = \underbrace{D_0 R_0^D - T_1^B}_{\textit{net debt obligation}} - \underbrace{r_1^k(s_L)k_1}_{\textit{rental income}} > 0$$

Date 0

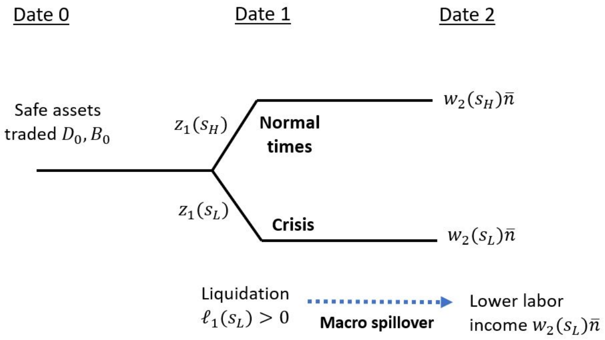
- At date 0, bank behaves as if it were risk-averse at date 0 due to the convex liquidation cost



Crises entail macroeconomic spillover on labor income

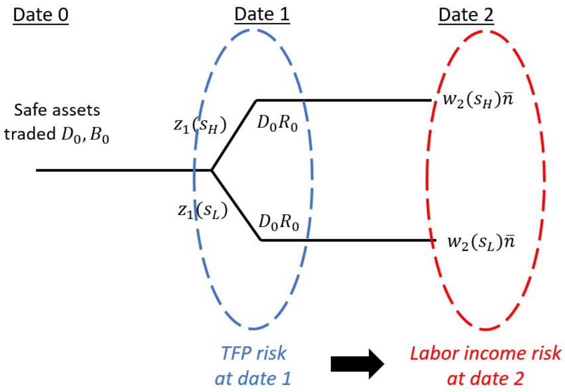
- Liquidation at date 1 $\ell_1(s_L)$ lowers the future capital stock $k_2(s_L)$
  - This lowers labor income due to complementarities between capital and labor:

$$w_2(s_L) = \underbrace{(1-\alpha)\frac{y_2(s_L)}{\bar{n}}}_{marginal\ product\ of\ labor}$$



Safe asset creation entails risk transformation

- Private safe assets insure individual households against the TFP shock at date 1
  - But this increases the household's labor income risk at date 2
  - Individual households don't internalize this since they take $w_2(s_L)$ as given



- Safe asset creation doesn't eliminate fundamental risk – it just reallocates it
  - In doing so, it also **amplifies** aggregate risk endogenously (liquidation costs)

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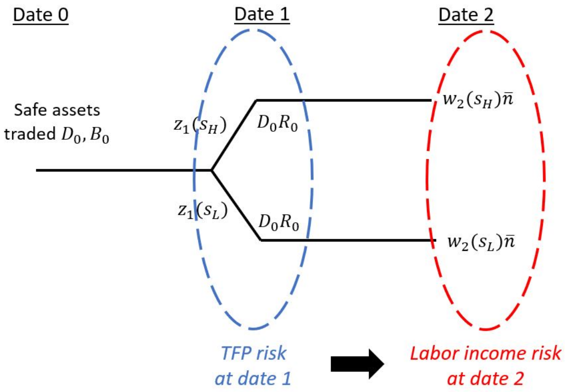

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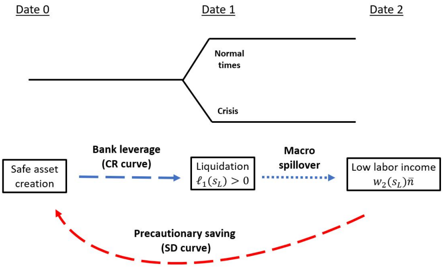
Household's demand for safe assets at date 0

- The anticipation of a future crisis at date 1 $\ell_1(s_L)$ generates a precautionary saving demand for safe assets due to the macroeconomic spillover

- **Paradox of safety:** demand for insurance against systemic risk *further increases* systemic risk through the creation of private safe assets



$$\underbrace{D_0^d(R_0, B_0; u_0)}_{\text{demand for private safe assets}} = \underbrace{w_0\bar{n} + e_0 - T_0 + d_0^F}_{\text{income}} - \underbrace{\frac{1}{R_0}\left(E_0\left[\frac{1}{c_1(s)}\right]\right)^{-1}}_{\textbf{consumption demand}} - \underbrace{B_0}_{\text{supply of public assets}}$$

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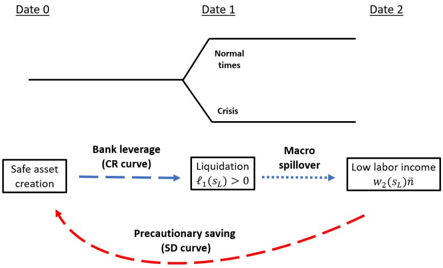

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General equilibrium

- Natural rate of interest at date 0 is decreasing in the risk of crisis $\ell_1(s_L)$

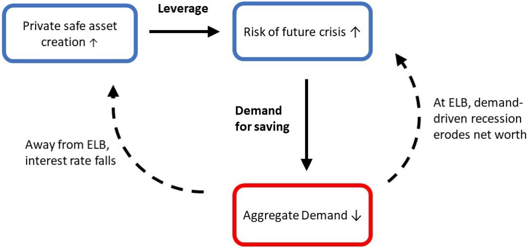
$$R_0^* = \frac{u'(c_0)}{E_0\left[u'\left(\boldsymbol{c_1(s)}\right)\right]}$$

- Two regimes at date 0:
  - If the natural rate $R_0^* \geq 1$, monetary policy ensures that **output is at potential**
  - If the natural rate $R_0^* < 1$, a fall in utilization must clear the market $\rightarrow$ **demand-driven recession**

- At the ELB, aggregate risk is too high relative to the capacity of the economy to absorb this risk
  - Household want to save more due to the labor income risk they face **(consumption demand $\downarrow$)**
  - But banks are unwilling to issue more safe assets because of the high liquidation risk they face **(investment demand $\downarrow$)**

Risk-driven stagnation trap

- The model features a two-way feedback between high systemic risk and depressed aggregate demand



- When this feedback is strong, the economy can enter a *risk-driven stagnation trap*
  - High systemic risk leads to a demand recession
  - Recession reduces total investment, reducing expected output growth
  - This increases systemic risk ex ante
- Unlike Benigno and Fornaro (2018), Caballero Farhi (2018), subsidies to private investment or bank leverage would be **counterproductive**

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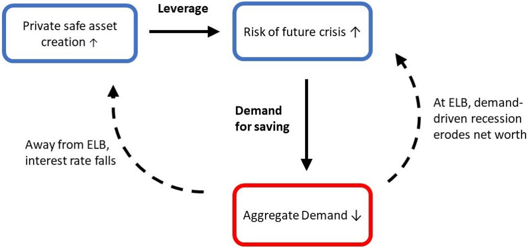

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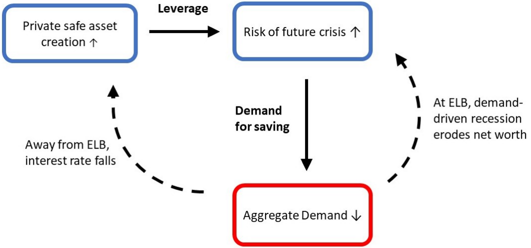

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Policy considerations

Central bank purchases of *risky* assets

- At date 0, the government issues debt to buy capital from banks: $\boldsymbol{q_0 k_0^G} = B_0$
  - At date 1, the government can always repay $B_0 R_0^B$ *without liquidating capital* due to its power to tax

$$\underbrace{R_0^B B_0}_{\textit{debt repayment}} = \underbrace{r_1^k(s) k_0^G}_{\textit{rental income}} + \underbrace{T_1(s) - T_1^B(s)}_{\textit{lump-sum taxes and transfers}}$$

- QE stimulates demand at date 0 through a **risk absorption channel**:
  - In the bad state at date 1, none of k_0^G is liquidated
  - This boosts the household's future labor income $w_2(s_L)\bar{n}$ in the bad state
  - This lowers precautionary saving ex ante, which increases output at date 0

- **Summary:** The government has a comparative advantage at bearing aggregate risk due to its power to tax
  - By transferring risky assets from bank balance sheets to that of the government, QE **reduces** aggregate risk, stimulating output

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Macroprudential policy as a tool for aggregate demand management

- Bank capital requirement: tax on bank borrowing at date 0 which reduces bank leverage
  - Reduces the severity of future crises $\ell_1(s_L)$ and the household's labor income in bad state $w_2(s_L)\overline{n}$
  - Less precautionary saving stimulates aggregate demand at date 0

$$\left(1-\tau_0^D\right) D_0 + r_0^k k_0 + T_0^B \geq i_0$$

- In much of the literature, macroprudential policy reduces the severity of *future* recessions (e.g. Farhi-Werning, Korinek-Simsek)
  - But in this paper, macroprudential policy increases *current* output

- Even when the ELB is not binding, bank capital regulation boosts the natural rate R_0^*, reducing the burden on monetary policy to manage aggregate demand

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Conclusion

- Introduced a theory to shed light on the nature of persistent slumps and safe asset shortages
- Highlights the role that safe asset creation plays in the determination of economic activity, systemic risk, and growth
- Showed that accounting for the interactions between systemic risk and aggregate demand yields qualitatively different implications for macroprudential policy and QE