# Uncertainty Shocks and Balance Sheet Recessions

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# Balance Sheet Recessions

- Balance sheet recessions: KM, BGG

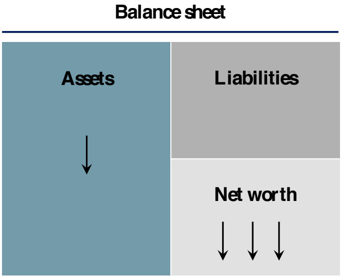
aggregate shock $\Longrightarrow$ balance sheets $\Longrightarrow$ amplification, persistence

- Financial frictions: balance sheets matter
- But why are they taking so much aggregate risk?
- Today: uncertainty shocks can help explain balance sheet recessions

# A simple model

- Standard AK growth model driven by Brownian TFP shocks
- Moral hazard: can't issue equity
- Ad-hoc constraints on contracts: risk-free debt

$$\text{Leverage} \implies \text{Exposure to aggregate risk}$$

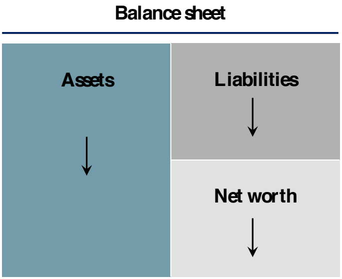


# Result 1: TFP-neutrality

- Contracts on aggregate state of the economy

  $\Longrightarrow$balance sheet channel disappears

- Separate *leverage* from *aggregate risk sharing*
- Implement with simple financial securities



# Result 2: Uncertainty shocks can drive balance sheet recessions

- *Aggregate* uncertainty shock that increases *idiosyncratic* risk
- *Balance sheet channel*, with depressed growth and asset prices
- Endogenously high *aggregate* volatility and flight to quality

# Model

- Experts $[0,1]$ and consumers $[0,1]$. Same CRRA preferences
- Experts trade and use capital $k$ to produce consumption goods.
- Aggregate and idiosyncratic risk:

$$\frac{dk_{i,t}}{k_{i,t}} = g_{i,t}dt + \sigma dZ_t + \nu_t dW_{i,t}$$

- Idiosyncratic volatility $\nu_t$ is stochastic

$$d\nu_t = \lambda\left(\bar{\nu} - \nu_t\right)dt + \underbrace{\sigma_\nu}_{<0}\sqrt{\nu_t}dZ_t$$

# “skin in the game” constraint

- Return from a dollar invested in capital

$$dR^k_{i,t} = \mathbb{E}_t\left[dR^k_{i,t}\right] dt + (\sigma + \sigma_{p,t})\, dZ_t + \nu_t dW_{i,t}$$

- Moral Hazard $\Longrightarrow$“skin in the game” constraint: keep a fraction $\phi \in (0, 1)$ of equity in the project.

$$\tilde{\sigma}_{n,t} = \phi \frac{p_t k_t}{n_t} \nu_t$$

- But they can share aggregate risk freely

$$\sigma_{n,t} = \phi \frac{p_t k_t}{n_t} (\sigma + \sigma_{p,t}) + \theta_t$$

# First best: $\phi = 0$

- Standard AK growth model
- Balanced growth path
- Full idiosyncratic insurance: $\nu$ plays no role
- No financial friction: balance sheets play no role
- Pareto efficient

# $\phi > 0$: Id. volatility and balance sheets matter

- Markov equilibrium in $\nu$ and $x$

$$x_t = \frac{N_t}{p_t K_t} \in (0,1)$$

- Price of capital

$$\underbrace{\mathbb{E}\left[dR_t^k\right] - r_t}_{\text{Excess Return}} = \underbrace{(\sigma + \sigma_{p,t})\,\pi_t}_{\text{Agg. Risk Premium}} + \underbrace{\gamma \frac{\overbrace{p_t k_t}^{x^{-1}}}{n_t} (\phi \nu_t)^2}_{\text{Id. Risk Premium}}$$

- Fictitious price of idiosyncratic risk $W_{i,t}$

$$\alpha_t = \gamma \frac{\phi \nu_t}{x_t}$$

- Growth depends on the price of capital

$$\iota'(g_t) = p_t$$

# Uncertainty shocks can create a balance sheet channel

- Experts always get more utility out of a dollar because they can use capital
- When $\nu$ is high and $x$ is low the gap is bigger

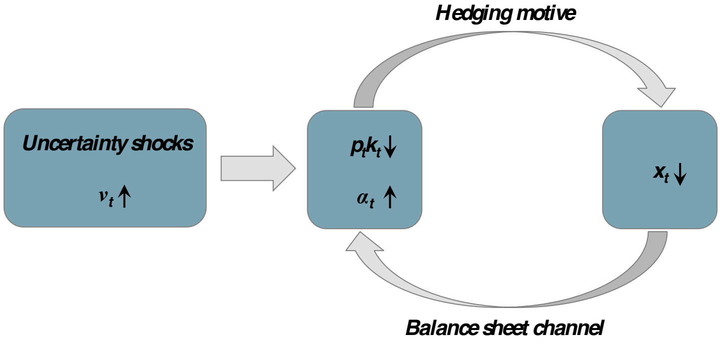
$$\uparrow\uparrow \alpha_t = \gamma \frac{\phi\, \nu_t}{x_t} \begin{matrix}\uparrow \\ \downarrow\end{matrix}$$

$\Longrightarrow$Substitution effect (dry powder) vs wealth effect: $\gamma \gtrless 1$

- Aggregate risk is concentrated on experts

$$\sigma_{x,t} = (1 - x_t)x_t\,(\sigma_{n,t} - \sigma_{w,t}) > 0$$

# Two-way feedback loop



# Price of capital $p(\nu, x)$ and volatility of x, $\sigma_x(\nu, x)$

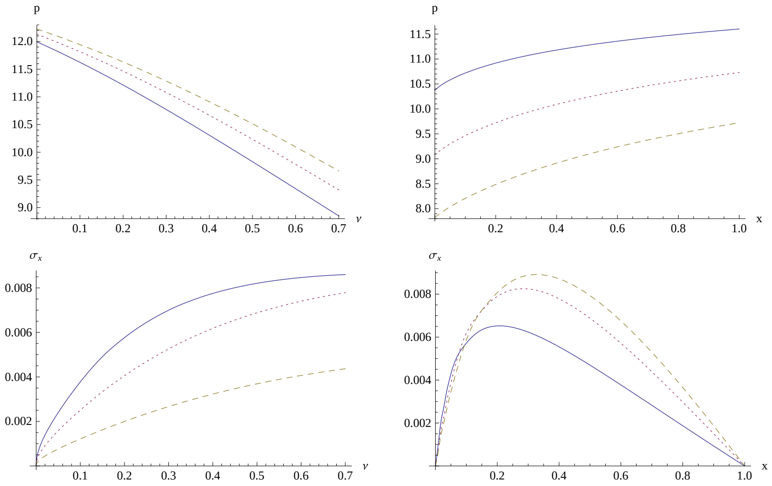



Figure: Price of capital $p(\nu, x)$ and volatility of x, $\sigma_x(\nu, x)$, as functions of $\nu$ (left) and $x$ (right)

# Aggregate volatility $\sigma + \sigma_{p,t}$ goes up endogenously

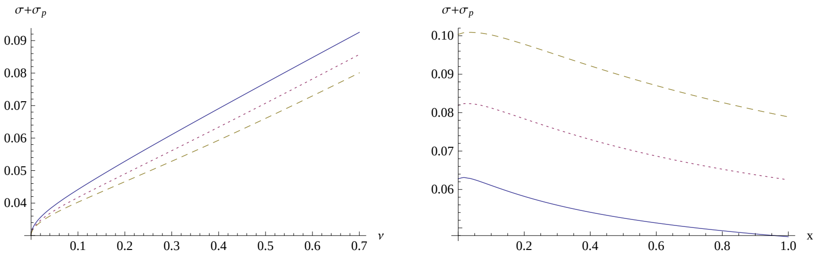



Figure: Aggregate volatility $\sigma + \sigma_{\boldsymbol{p}}(\nu, x)$ as a function of $\nu$ (left) and $x$ (right).

# Flight to quality: $r_t \downarrow$ and $\pi \uparrow$

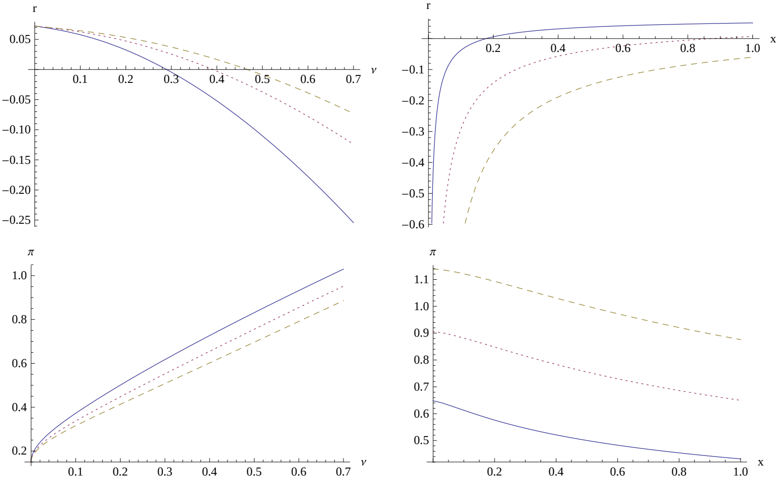



Figure: The risk free interest rate $r(\nu, x)$ and the price of aggregate risk $\pi(\nu, x)$, as functions of $\nu$ (left) and $x$ (right).

# Summary

- Uncertainty shocks and balance sheet recessions tightly connected.
- TFP shock to $K_t$: no balance sheet channel
- Uncertainty shock to $\nu_t$: balance sheet channel
  - depressed growth and asset prices
  - high aggregate volatility
  - flight to quality