Caballero, Simsek: A risk-centric model of demand recessions and macroprudential policy

Discussion by Jaroslav Borovička (NYU)

January 2018

SUMMARY

Model summary

- time-variation in risk/volatility
- zero lower bound
- contribution of speculation under heterogeneous beliefs

Empirical/quantitative questions and challenges

- Fluctuations in risk-free rate and risk premia
    - role of intertemporal elasticity of substitution
- Extent of speculation
    - magnitude of fluctuations in the wealth distribution

PRODUCTION

Capital accumulation

$$\frac{dk_{t,s}}{k_{t,s}} = g_{t,s}dt + \sigma_s dZ_t$$

- volatility regimes $s \in \{1, 2\}$, $\sigma_1 < \sigma_2$ ($s = 1$ is the 'good' state)
- endogenous investment choice (Q-theory) determines $g_{t,s}$

Output

$$y_{t,s} = A\eta_{t,s}k_{t,s}$$

- capital efficiency $\eta_{t,s} \leq 1$, efficient level $\eta_{t,s} = 1$.

Endogenous price of capital $Q_{t,s}$ (locally predetermined)

$$\frac{dQ_{t,s}}{Q_{t,s}} = \mu^Q_{t,s}dt$$

Aggregate resource constraint $c_{t,s} + i_{t,s} = y_{t,s}$

Logarithmic preferences, belief λ_s about leaving state s (jump intensity)

- Constant wealth-consumption ratio

$$c_{t,s} = \rho Q_{t,s} k_{t,s}$$

- Heterogeneous beliefs as an extension (later)

Optimality condition for the portfolio choice

- Merton-type optimal choice of risky investment ($\omega_{t,s} = 1$ in eqm)

$$\omega_{t,s} = \frac{1}{\sigma_s^2} \left(\underbrace{\overbrace{\frac{A\eta_{t,s} - \iota_{t,s}}{Q_{t,s}}}^{\text{net rental rate}} + \overbrace{g_{t,s} + \mu^Q_{t,s}}^{\text{capital gain}}}_{\substack{\text{return on capital } r^k_{t,s} \\ \text{conditional on } s}} + \lambda_s \underbrace{\frac{M_{t,s'}}{M_{t,s}} \frac{Q_{t,s'} - Q_{t,s}}{Q_{t,s}}}_{\substack{\text{return on capital} \\ \text{cond. on jump}}} - r^f_{t,s} \right)$$

MARKET CLEARING AND EFFICIENT EQUILIBRIUM

Characterization

- previously defined objects are functions of s only
- economy homogeneous degree 1 in capital (conditional on s)

Efficient equilibrium: in each state

- efficient output produced ($\eta_s = 1$)
- easy to verify that $Q_s = Q^*$, consistent with $c_s = c^* k_s$, and $i_s = \iota^* k_s$
- hence $r_s^k = r^k$
- Merton's optimality condition implies

$$r_s^f = r^k - \sigma_s^2$$

- this establishes correct risk premium while supporting capital price Q^*

Logarithmic preferences

- price of capital constant, risk-free rate adjusts to clear asset markets

ZERO LOWER BOUND

Now consider the zero-lower bound restriction

$$r_s^f \geq 0.$$

- when σ_s^2 high, asset markets cannot clear (violation of $r_s^f = r_s^k - \sigma_s^2$)

In order to generate correct risk premium, r_s^k has to rise, hence Q_s must fall

$$r_s^k = \frac{A\eta_s - \iota_s}{Q_s} + g_s + \lambda_s \frac{M_{s'}}{M_s} \frac{Q_{s'} - Q_s}{Q_s}$$

- $Q_s < Q^*$ associated with a lower level of current economic activity
  - due to $c_s = \rho Q_s k_s$, when Q_s falls, consumption c_s must fall too $\implies \eta_s < 1$
- $Q_s < Q^*$ associated with a lower level of future economic activity
  - lower investment rate ι_s reduces capital growth rate g_s
- demand-driven recession
- belief about recovery λ_s an additional factor

Asset market equilibrium condition

$$r_s^f = \left(\underbrace{\frac{A\eta_s - \iota_s}{Q_s} + g_s}_{\substack{\text{return on capital } r_{t,s}^k \\ \text{conditional on s}}} + \lambda_s \underbrace{\frac{M_{s'}}{M_s} \frac{Q_{s'} - Q_s}{Q_s}}_{\substack{\text{return on capital} \\ \text{cond. on jump}}} \right) - \sigma_s^2$$

When is the zero-lower bound problem more severe?

1. volatility σ_s^2 is high
2. growth rate of economy g_s low (e.g., inefficient investment)
3. agents believe transition into good states ($Q_{s'} > Q_s$) is less likely (λ_s low)
4. agents believe transition into bad states ($Q_{s'} < Q_s$) is likely (λ_s high)

ADDING SPECULATION

Agents differ in subjective probabilities of regime transitions λ_s

- pessimists believe recessions more likely, recoveries less likely
- optimists vice versa

What now matters is the wealth-weighted average belief about transiiton.

Agents engage in speculative trades

1. in the good state, optimists sell insurance on jumps into the bad state
    - lose wealth when transition occurs
    - this wealth loss reduces the wealth-weighted belief about recovery
    - exacerbates the recession and further constrains output
2. In the bad state, optimists bet on recovery
    - when recovery does not happen, optimists keep losing wealth
    - further exacerbates the recession

ROLE OF MACROPRUDENTIAL POLICY

Speculative positions determine wealth dynamics

- agents do not take into account the zero lower bound externality
- larger speculative positions imply larger wealth loss of the optimists in the recession state

Simple macroprudential policies

- limiting the extent of speculation can improve welfare
- careful considerations of alternative definitions of welfare

CONTRIBUTION TO THE LITERATURE

Carefully written paper

- very clean modeling choices
- excellent discussion of the underlying mechanisms

Emphasizes externality from the zero lower bound

- similar to the literature with financial constraints
  - Bernanke, Gilchrist and Gertler; Brunnermeier and Sannikov; He and Krishnamurthy, etc.
- financial constraint externality: valuations must support an additional constraint in the intermediary sector
  - requires inefficient balance sheet adjustment

Does the story hold quantitatively?

- requires proper calibration of two important channels

INTERTEMPORAL ELASTICITY OF SUBSTITUTION

Authors deliver sharp results using logarithmic preferences

- constant wealth-consumption ratio
- absent ZLB, fluctuations in the value of capital must be absorbed by fluctuations in risk-free rate

$$\sigma_s^2 = r_s^k - r_s^f$$

Other extreme $IES = \infty$

- constant risk-free rate, all adjustment through the price of capital

Substantial disagreement about the value of *IES*

- micro vs. asset pricing
- here the key is to nail the asset price dynamics
- use estimated values from asset pricing studies: $IES \approx 1.5 - 2$

Fluctuations in risk/volatility then partly absorbed by efficient fluctuations in the price of capital

- asset market clearing condition

$$\sigma_s^2 = r_s^k - r_s^f$$

- fluctuations in r_s^k mitigate fluctuations in r_s^f
- alleviates the zero lower bound problem

DYNAMICS OF WEALTH DISTRIBUTION OVER THE BUSINESS CYCLE

Introducing belief heterogeneity adds degrees of freedom

- direct calibration to shifts in the wealth distribution desirable

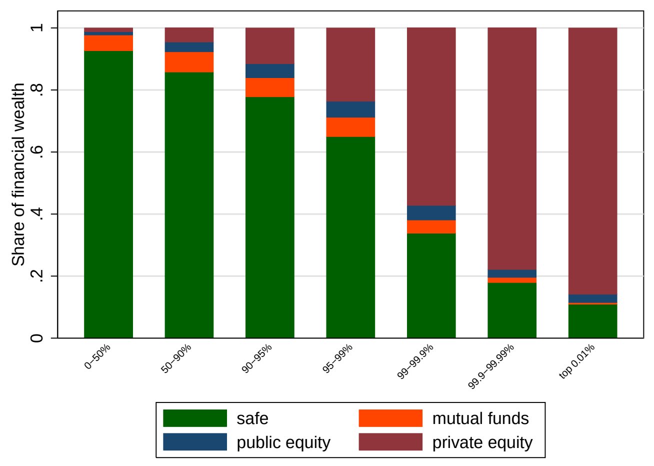
What wealth distribution? Depends on interpretation.

- households
- financial institutions

Fluctuations in the wealth distribution of households

- e.g., Fagereng, Guiso, Malacrino, Pistaferri (2016)
- substantial idiosyncratic risk in returns (underdiversification)
- limited systematic short-horizon churning
    - strong systematic effects over longer horizons

Portfolio allocation across the wealth distribution



FAGERENG, GUISO, MALACRINO, PISTAFERRI (2016)

Heterogeneity in returns over time