Discussion: Aggregate Bank Capital and Credit Dynamics

Lars Peter Hansen

University of Chicago

January 28, 2016

Aim of this Research

Central banks need a new type of quantitative model for guiding their financial stability decision. The aim of this paper is to propose such a model.

Similar aim to Brunnermeier and Sannikov and He and Krishnamurthy

Implications

The paper does a nice job of deriving and explaining a differential equation for the (common) book to market value as a function of aggregate bank capital and a resulting stochastic evolution for aggregate bank capital.

- ○ Stationary density
- ○ Transition dynamics

Stationary densities and transitions

Bank capital evolution:

$$dE_t = \mu(E_t)dt + \sigma(E_t)dZ_t$$

- volatility induced stationarity - move away from high volatility states
- spectral expansions of the transitions - follows Wong(1964)

Handbook chapter: methods summarized in Ait Sahalia, Hansen and Scheinkman

Impulse Response Functions

Bank capital evolution:

$$dE_t = \mu(E_t)dt + \sigma(E_t)dZ_t$$

Paper criticizes the following "small noise" expansion:

- Find the steady state $\bar{E}$
- Use

$$dF_t = \mu'(\bar{E})F_t dt + \sigma(\bar{E})dZ_t$$

- Compute impulse response for the approximate linear system.

In macroecomics this approach and higher order refinements applied to large dimensional economic models.

Impulse Response Functions II

$$dE_t = \mu(E_t)dt + \sigma(E_t)dZ_t$$

Malliavin derivative - use small increment instead of small noise

- Solve
  $$dF_t = \mu'(E_t)F_t dt + \sigma'(E_t)F_t dZ_t$$
  with initial condition $F_0 = \sigma(E_0)$
- Nonlinear (random) impulse response is
  $$\mathcal{D}_0 E_t = F_t$$

- Compute interesting conditional expectations.

See for instance "Shock Elasticities and Impulse Response Functions" by Borovicka, Hansen and Scheinkman in *Mathematics and Financial Economics*.

Quantitative Policy Support

How do we use the model or refinements of it as a guide for policy?

- Low capital requirements are "destabilizing" in contrast to high ones. What does this mean operationally?
- Potential welfare gains for making capital constraints state dependent. How do we implement this?
- What is the real world counterpart to a bank in this model?