A Discussion of **"Macro-Finance Model with Sentiment'**

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2023 AFA Annual Meeting

Motivation

- Large literature on financial crisis:
  - **Financial intermediaries are central**: Reinhart and Rogoff (2009), Brunnermeier and Pedersen (2009), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), Verner, and Xiong (2021).
  - **Frothy asset prices before crises**: Schularick and Taylor (2012), Baron and Xiong (2017), Lpez-Salido, Stein, and Zakrajsek (2017), Krishnamurthy and Muir (2020).
- This paper: study the interaction between **financial frictions** and **diagnostic beliefs**.
- Very deep investigation with interesting results! Well written and easy to read!

Model Structure: Summary

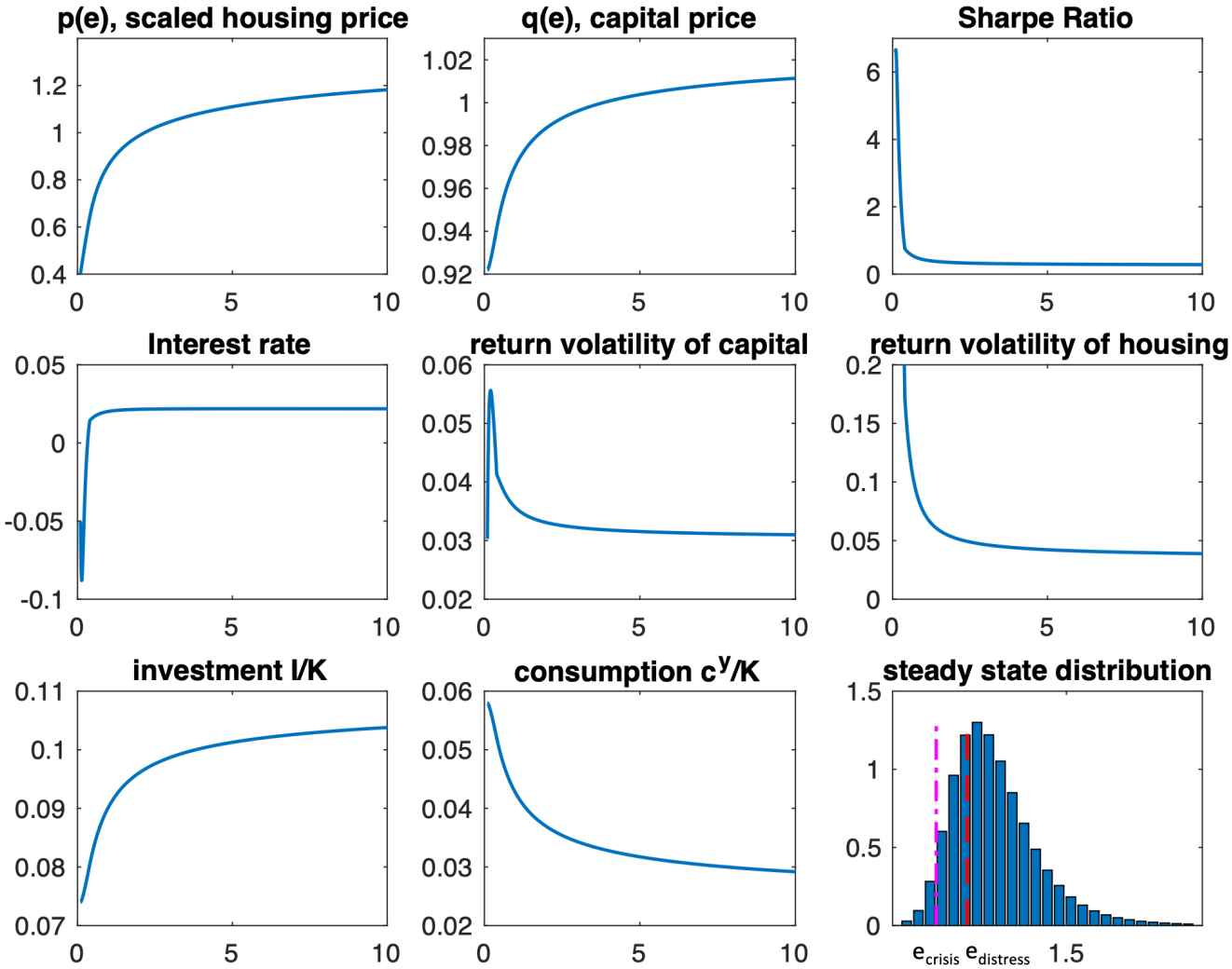
- At a high level: He and Krishnamurthy (2019) + Labor income + Diagnostic expectations.
  - He and Krishnamurthy (2013): Two agents, intermediaries + households. One shock on capital. Occasional binding constraint with financial amplification.
  - He and Krishnamurthy (2019): introduce housing consumption,

    $$C_t = (c_t^y)^{1-\phi}(c_t^h)^{\phi}$$

    to address the tension between low investment vol and high asset price vol.
  - Labor income: to increase consumption/output ratio.
  - Diagnostic expectation: key innovation, a structural deviation from rational expectation.

    $$\mathcal{I}_t = \int_0^t e^{-\kappa(t-s)} dZ_s$$

Baseline Model Behavior (He and Krishnamurthy, 2019)



Source: He and Krishnamurthy (2019), Figure 4.

Diagnostic Belief (Bordalo, Gennaioli, and Shleifer, 2018)

- The general formulation:

$$f_t^{\theta}(X_{t+1}) \propto f_t(X_{t+1}) \cdot \underbrace{\left(\frac{f_t(X_{t+1})}{f_{t-1}(X_{t+1})} \right)^{\theta}}_{\text{"representativeness"}}$$

- If X_t is AR(1), then

$$E_t^{\theta}[X_{t+1}] = \underbrace{E_t[X_{t+1}]}_{\text{forward-looking rational benchmark}} + \underbrace{\theta \left(E_t[X_{t+1}] - E_{t-1}[X_{t+1}] \right)}_{\text{overreation}}$$

Diagnostic Belief (This paper)

- A continuous-time version,

$$\mathcal{I}_t = \int_0^t e^{-\kappa(t-s)} dZ_s$$

- Deriving its law of motion:

$$\mathcal{I}_{t+dt} = \int_0^{t+dt} e^{-\kappa(t+dt-s)} \sigma dZ_s = \underbrace{e^{-\kappa dt}}_{1-\kappa dt} \cdot \underbrace{\int_0^t e^{-\kappa(t-s)} \sigma dZ_s}_{\mathcal{I}_t} + \sigma(Z_{t+dt} - Z_t)$$

$$\Rightarrow d\mathcal{I}_t = -\kappa \mathcal{I}_t dt + \sigma dZ_t$$

- Key feature:
  - An OU process, driven by recent capital growth shocks, σdZ_t.
  - Sentiment reversion: the drift is $-\kappa \mathcal{I}_t$, so the stronger is the sentiment, the stronger is the reversion. Symmetric.

Key Mechanism

- A sequence of good shocks $dZ_t \rightarrow$ high sentiment $\mathcal{I}_t \rightarrow$ high expectation of capital growth and "frothy" capital valuation $\rightarrow$
  - A bad shock dZ_t causes more losses of bank capital
  - Stronger belief correction, $-\kappa \mathcal{I}_t dt$, causing decline of asset valuation and bank capital.

- This sling-shot mechanism works in the opposite direction as well.
  - A sequence of bad shocks trigger faster recovery.
  - Lower probability in the crisis state (capital constraint binding).

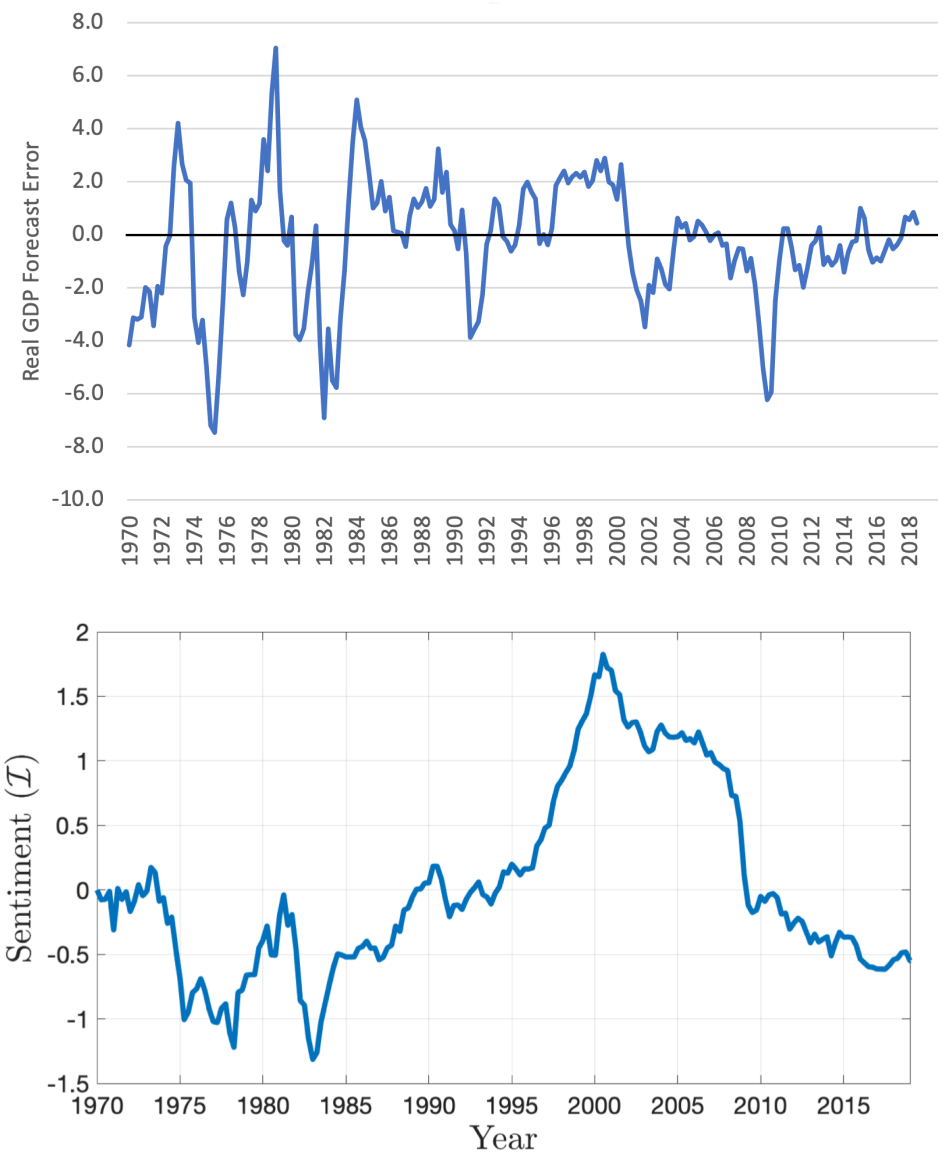
Quantitative Exercise

- The current model elegantly predicts that sentiment can be directly measured from forecast errors,

$$\mathcal{I}_t = \int_0^t e^{(-\kappa+\theta)(t+s)} \cdot \underbrace{\widehat{\sigma dZ_s}}_{\text{forecast errrors on GDP growth}}$$

- Data on professional forecast errors can inform $\mathcal{I}_t$ given a calibration of κ and θ.
- From the dynamics of $\mathcal{I}_t$, the shocks dB_t can be inferred.
- The model does a good job replicating intermediary capital ratio, risk premium, and forecast errors from 2002 to 2018.

From Forecast Errors to Sentiment



Note: In the upper panel, I downloaded SPF real-GDP growth forecast data and calculated the four-quarter ahead forecast error. The sentiment graph is from the paper.

Questions

- Does it make a difference if sentiment is affected by asset prices?

$$d\mathcal{I}_t = (\underbrace{p_t - \bar{p}}_{\text{house price deviation}} - \kappa\mathcal{I}_t)dt$$

  More generally, we can measure sentiment in both macroeconomic quantities and asset prices (see Bordalo et al 2018). They seem to have large differences.

- Does sentiment increase stability or decrease stability? In Krishnamurthy and Li (2020), sentiment causes more frequent rare disasters.

Summary

- Very interesting paper on an important topic! Both theory and quantitative contributions.
- Highlights
  - Sentiments significantly alters financial constraint dynamics.
  - Elegant modeling of sentiment that is *measurable* in the data.
- Future research
  - Which sentiment? Asset prices or macroeconomic quantities?
  - Unconditional impact of sentiment on financial fragility and regulatory responses.