Discussion of “Slowly Unfolding Disasters”
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Motivation

- **Stylized fact**: Economic disasters are typically persistent and unfold gradually over several years (Barro-Ursua).
  - macro disasters last for $\approx 4$ yrs (peak-to-trough), 2 obs
  - stock market disasters last for $\approx 3$ yrs (peak-to-trough), 8 obs
  - stock market disasters lead macro disasters

- In a neoclassical model of **full information** rational expectations, a macro contraction leads to an **immediate** reaction in valuations.

- What frictions are needed to generate gradual asset price responses?

- **This paper**: imperfect information and **Bayesian learning** about disaster risks to generate a gradual stock price response
Motivation

- Only 1 monthly return that exceeded -20% during the Great Depression
- Losses are spread out over an extended period of time rather than concentrated at the beginning
- Investors uncertain of the severity and duration of the depression at the onset?
Lucas Tree Economy

- Rep agent with **EZ preferences** - cares about the temporal resolution of risk.
  - IES > 1/RA: persistence in disaster risk is penalized more severely
  - IES > 1: persistent macro contractions ⇒ drop in valuations
- Consumption growth is exposed to **disasters** following Wachter (2013):
  \[
  \Delta c_{t+1} = \mu_c + \sigma_c \epsilon_{c,t+1} + J_{t+1}
  \]
- \( J_{t+1} = \sum_{j=1}^{N_{t+1}} Z_j \) is a compound Poisson jump process with jump intensity:
  \[
  \lambda_{t+1} = (1 - \rho) \bar{\lambda}_{t+1} + \rho \lambda_t + \sigma \sqrt{\lambda_t} \epsilon_{t+1}
  \]
  where \( \bar{\lambda}_{t+1} = (1 - s_{t+1}) \lambda_L + s_{t+1} \lambda_H \) follows a two-state Markov chain and \( \epsilon_{t+1} \sim iidN(0,1) \).
- Dividends are a levered claim on consumption.
Information Frictions

\[ \lambda_{t+1} = (1 - \rho)\bar{\lambda}_{t+1} + \rho\lambda_t + \sigma\sqrt{\lambda_t} \epsilon_{t+1} \]

▶ Agent observes the jump intensity \( \lambda_t \) but not the processes, \( \bar{\lambda}_t \) and \( \epsilon_t \).

▶ Updates beliefs about \( s_t \) conditional on observing \( \lambda_t \) (and the past history) according Bayes rule.

\[
\pi_{t+1} = \left[ 1 + \exp \left( -\frac{(1 - \rho)(\lambda_H - \lambda_L) \left( \lambda_{t+1} - \rho\lambda_t - \frac{(1-\rho)(\lambda_H+\lambda_L)}{2} \right)}{\sigma^2 \lambda_t} \right) \frac{1 - \pi_{t+1|t}}{\pi_{t+1|t}} \right]^{-1}
\]

▶ **Speed of learning** is faster if: \( \lambda_H - \lambda_L \) is larger, \( \sigma \) is smaller, and \( \rho \) is smaller.

★ sufficiently slow speed of learning is required to generate gradual stock market declines when economy enters a depression.
Key Result

- Model is calibrated so that beliefs update very slowly when the economy enters into a depression, reflected in the gradual reaction in prices.

- In the full information counterpart, valuations plummet immediately when the economy enters in a depression.
  - produces negative return jumps with a magnitude far larger than observed in the data
Sluggish Responses

- The sluggish response of the real economy and asset prices to macro shocks are pervasive.
- Consumption, investment, output, labor hours, stock prices, inflation typically exhibit hump-shaped responses to structural shocks in the data.
- Identify relevant frictions for explaining the dynamic responses to a wide array of disturbances (e.g., TFP, MP, MEI, G, disasters, etc).
  - DSGE literature proposes demand- and supply-side frictions for generating hump-shaped responses in fundamentals.
- This paper proposes a powerful propagation mechanism for generating sluggish asset price responses to changes in fundamentals.
  - **informational frictions** are a potentially important channel for jointly explaining slow responses of quantities and prices.
Monetary Policy Shock

Hump-shaped responses to a MP shock - peak responses occur around 1.5 yrs and return to pre-shock levels after 3 years.

Also some evidence of hump-shaped reaction in stock prices.

Source: Christiano, Eichenbaum, and Evans (2005)
Investment Specific Shock

- Peak responses occur around 1 year after the shock.

Source: Ramey (2016)
Responses to three different measures of unanticipated disturbances to TFP.

Hump-shaped responses for the Fernald measure (adjusts for capital utilization).
Take away: The macroeconomy and asset prices adjust gradually to shocks (including disasters!)

DSGE models introduce two key frictions for generating delayed hump-shaped response in macro variables:

- habit formation in consumption
- investment adjustment costs

Can these frictions also account for the slow response of asset prices as well?
Real Frictions

▷ A neoclassical model with habit formation and adjustment costs:

☆ preferences

\[ V_t = U(C_t - \nu H_t, L_t) + \beta E_t[V_{t+1}] \]

where \( H_t = H(C_{t-1}, C_{t-2}, ...) \) is the stock of habit.

☆ technology

\[ Y_t = (Z_t L_t)^{1-\alpha} K_t^\alpha \]

☆ capital accumulation

\[ K_{t+1} = (1 - \delta) K_t + I_t \left[ 1 - \frac{\Phi}{2} \left( \frac{I_t}{I_{t-1}} - 1 \right)^2 \right] \]

▷ First, consider the effects of each friction individually on the macro variables at the first order...
Habit Formation

- Comparing the responses to a negative TFP shock with and without habits, without adjustment costs.
- Desire to smooth consumption *relative to past consumption* generates a more gradual consumption response.
- Investment (and other macro variables excluding consumption) still respond immediately with habits.
Comparing the responses to a negative TFP shock with and without investment adjustment costs, with habits.

Investment adjustment costs as in Christiano, Eichenbaum, and Evans (2005) are specified to smooth investment growth.
With habit formation, risk aversion depends inversely on surplus consumption.

Price-dividend ratio is driven by cash flow news and discount rate news:

\[ p_t - d_t = \frac{K}{1 - \rho} + E_t \left[ \sum_{j=0}^{\infty} \rho^j (\Delta d_{t+1+j} - r_{t+1+j}) \right] \]

Need to use a higher-order approximation to capture the effects of time-varying risk aversion.

Can habit formation explain the slow response of asset prices?
Gradual consumption response (first-order effect) leads to a slow decline in surplus consumption, implying a gradual increase in RA.

Gradual increase in RA generates a sluggish increase in discount rates (higher-order effect), reflected in gradual decline p/d.
Stock-Market-Only Disasters

- Standard demand- and supply-side frictions can jointly explain the gradual response of fundamentals and asset prices to shocks, but...

- These real frictions cannot rationalize the 6 stock market disasters that did not coincide with the macroeconomic depressions.
  - similar magnitude and duration of stock price declines with the stock market crashes coinciding with economic contractions

- Can the information frictions quantitatively account for the stock-market-only disasters with the stock-market-and-macro disasters?
  - discipline the learning mechanism
  - distinguish the information frictions from standard frictions
This paper shows how imperfect information about disasters can explain the gradual response of stock prices during a macro contraction.

- resolves a key shortcoming of disaster risk models
- highlights an important propagation mechanism

See if the model jointly account for the persistent stock market disasters with and without an actual macroeconomic disaster.

Overall, very nice paper!