Confidence and the Propagation of Demand Shocks

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Outline

Popular Narrative

- Household deleveraging or other AD shocks
  - $\Longrightarrow$ Consumers spend less
  - $\Longrightarrow$ Firms produce and hire less
  - $\Longrightarrow$ Consumers lose confidence and spend even less
  - $\Longrightarrow$ Firms produce and hire even less
  - $\Longrightarrow$ ...
  - $\Longrightarrow$ The Great Recession!

Does It Make Sense?

In RBC: **no**

- In GE, interest rates adjust, offsetting AD shock

In NK: **perhaps**

- Only when MP does not replicate flexible price outcomes
- Effects of AD shock = monetary contraction
- Inflation and output co-move

BUT

- ZLB constraint not relevant in earlier recessions
- Philips curve elusive in the data (Mavroeidis et al., 14)
- Non-inflationary demand shocks prevalent
  - Beaudry & Portier (13), Angeletos et al. (20)

This Paper

- A theory of demand driven fluctuations with **flexible prices**

Element 1:

- **Variable utilization $\Rightarrow$ AS responds to AD**

Element 2:

- **Rational confusion** between idiosyncratic & agg. income fluctuations
- $\Rightarrow$ **Confidence multiplier**
  - feedback loop between output, consumer & investor expectations
- A broader bounded rationality interpretation

Roadmap

Representative agent, complete info, version model

- Element 1: variable utilization $\Rightarrow$ **AS responds to AD**

Introduce information frictions

- Element 2: rational confusion $\Rightarrow$ **confidence multiplier**

Extensions

- Comovement of consumption, output, and investment
- Fiscal policy (front-loading vs back-loading)
- TFP Shock

Outline

Preferences and AD Curve

- Preference (representative agent & complete info)

$$U(c_t, n_t) + \beta_t U(c_{t+1}, n_{t+1}) + \beta_t \beta_{t+1} U(c_{t+2}, n_{t+2}) + \cdots,$$

where

$$\log \beta_t = (1 - \rho_\beta) \log \beta + \rho_\beta \log \beta_{t-1} - \underbrace{\log \eta_t}_{\text{AD Shock}}$$

- A positive η_t shock = urge to consume = positive AD shock

- AD curve (log-linearized, complete info)

$$y_t = -\sigma \{R_t + \beta_t\} + \mathbb{E}_t [y_{t+1}]$$

Technology and AS Curve

- Technology

$$y_t = (l_t)^{\alpha} (u_t k_t)^{1-\alpha}$$

$$k_{t+1} = (1 - \delta(u_t) + \Psi(\imath_t)) k_t,$$

- Tentatively: shut down $\imath_t$ and drop $\Psi(\imath_t)$

Technology and AS Curve

- Technology

$$y_t = (l_t)^{\alpha} (u_t k_t)^{1-\alpha}$$

$$k_{t+1} = (1 - \delta(u_t) + \Psi(\iota_t)) k_t,$$

- Tentatively: shut down ι_t and drop $\Psi(\iota_t)$

- AS curve (log-linearized):

$$y_t = (1 - \tilde{\alpha})(u_t + k_t),$$

$$u_t = \frac{\beta}{\tilde{\alpha} + \beta\phi} R_t + \beta \mathbb{E}_t [u_{t+1}],$$

$$k_{t+1} = k_t - \kappa u_t,$$

where $\tilde{\alpha} \equiv 1 - \frac{(1-\alpha)\left(1+\frac{1}{\nu}\right)}{1+\frac{1}{\nu}-\alpha+\frac{\alpha}{\sigma}}$ and $\phi \equiv \frac{\delta''(u^*)u^*}{\delta'(u^*)}$.

Equilibrium

Prop. Demand-driven business cycle without nominal rigidity

$$\frac{\partial y_t}{\partial \eta_t} = \gamma \quad \text{and} \quad \frac{\partial R_t}{\partial \eta_t} = \frac{\sigma}{\sigma + \varsigma},$$

where

$$\gamma \equiv \frac{\varsigma \sigma \beta}{\sigma + \varsigma} \frac{1}{1 - \rho_\beta \beta} \quad \text{and} \quad \varsigma \equiv \frac{1 - \tilde{\alpha}}{\tilde{\alpha} + \beta \phi}.$$

- γ increases with variability of u (decreases with $\phi \equiv \frac{\delta''(u^*)u^*}{\delta'(u^*)}$)

- Baseline NK: natural rate of output fixed ($\gamma = 0$ because $\phi = \infty$)
- Here: natural rate of output responsive to AD

Outline

Full Model with Information Frictions

Supply side

- Complete info, same as above

Demand side

- Islands & idiosyncratic shocks
- Know own discount rate, current local income & interest rates
- **Incomplete info** of, or inattention to, the aggregate
- **Rational confusion** of idiosyncratic & agg. income fluctuations

AD Curve

Prop. The AD Curve

$$y_t = -\sigma\{R_t + \beta_t\} + \mathbb{E}_t[y_{t+1}] + (\mathscr{B}_t + \mathscr{G}_t).$$

- $\mathscr{B}_t$ captures misperception of permanent income

$$\mathscr{B}_t \equiv \frac{1-\beta}{\beta} \sum_{k=0}^{+\infty} \beta^k \int \left(E_t^h[y_{h,t+k}] - \mathbb{E}_t[y_{h,t+k}] \right) dh,$$

where $y_{h,t} = y_t + \xi_{h,t}$ is the local income at t.

- $\mathscr{G}_t$ captures misperception of future interest rates

$$\mathscr{G}_t \equiv -\sigma \sum_{k=1}^{+\infty} \beta^k \int \left(E_t^h[R_{t+k}] - \mathbb{E}_t[R_{t+k}] \right) dh$$

$\mathscr{B}_t$: Misperception of Permanent Income

Hulten's theorem: agg permanent income $\sum_{k=0}^{+\infty} \beta^k \int y_{t+l}$ invariant to AD

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Hulten's theorem: agg permanent income $\sum_{k=0}^{+\infty} \beta^k \int y_{t+l}$ invariant to AD

Prop. Pro-cyclical perceived permanent income

$$\mathscr{B}_t \equiv \frac{1-\beta}{1-\beta\rho_\xi}(1-\lambda)\, y_t,$$

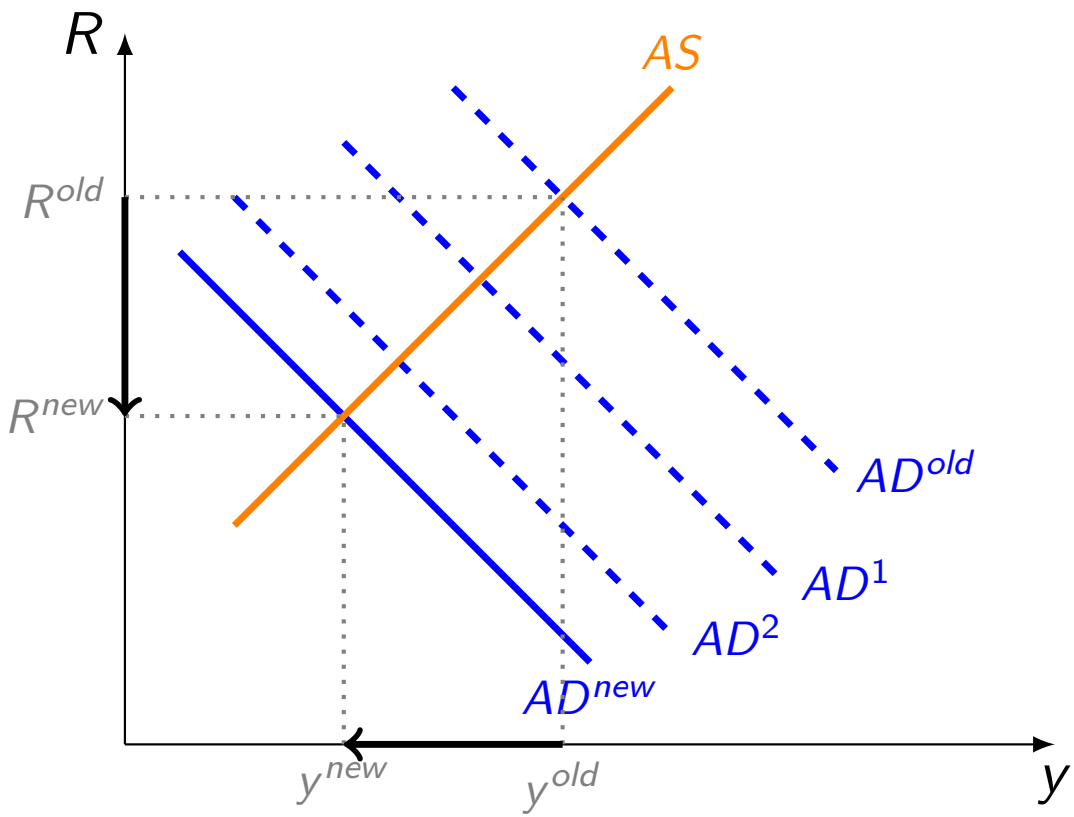
- ρ_ξ is the persistence of the idiosyncratic income shock $\xi_{h,t}$
- $1-\lambda$: degree of confusion between idiosyncratic & agg.

Mechanism: current aggregate income y_t drops

$\Longrightarrow$ rationally confused as drop in idiosyncratic income $\xi_{h,t}$

$\Longrightarrow$ drop in perceived permanent income

Confidence Multiplier



Confidence Multiplier

Focus on the impact of $\mathscr{B}_t$ (as if $\mathscr{G}_t = 0$)

Prop. Equilibrium Impact of Confidence Multiplier

$$\frac{\partial y_t}{\partial \eta_t} = \gamma \cdot m^{\text{conf}}(\lambda, \rho_\xi),$$

where the confidence multiplier

$$m^{\text{conf}}(\lambda, \rho_\xi) \equiv \frac{\varsigma + \sigma}{\varsigma + \sigma - \varsigma \frac{1-\beta}{1-\beta\rho_\xi}(1-\lambda)} > 1$$

- Increases with the persistence of idiosyncratic income ρ_ξ
- Increases with the confusion $1 - \lambda$

$\mathscr{G}_t$: Dampening GE of Interest Rate Adjustments

Prop. Misperception of Future Interest Rate Adjustment

$$\mathscr{G}_t = (1-\lambda)\sigma \sum_{k=1}^{+\infty} \beta^k \frac{\partial \mathbb{E}_t[R_{t+k}]}{\partial \eta_t} \eta_t$$
$$= (1-\lambda) \frac{\sigma^2}{\sigma+\varsigma} \frac{\beta\rho_\beta}{1-\beta\rho_\beta} \eta_t$$

Persistent negative AD shock

- Neoclassical GE: future interest rate R_{t+k} drops
  - goes against the impact of the AD shock
- Here: cannot fully perceive R_{t+k} drop
  - $\mathscr{G}_t$ negative
  - Further amplifies the impact of the AD shock

Full Equilibrium

Prop. Full Equilibrium

The equilibrium response of aggregate output is given by

$$\frac{\partial y_t}{\partial \eta_t} = \gamma \cdot m^{\text{conf}}(\lambda, \rho_\xi) \cdot m^{\text{GE}}(\lambda, \rho_\beta),$$

where

$$m^{\text{GE}}(\lambda, \rho_\beta) \equiv 1 + \beta \rho_\beta \frac{\sigma}{\sigma + \varsigma}(1 - \lambda) \geq 1$$

- Increases with the persistence of AD shock ρ_β
- Increases with the confusion $1 - \lambda$

Bounded Rationality

Broader interpretation of confidence multiplier $\mathscr{B}_t$

- Key: the response of $c_{h,t}$ to $y_{h,t}$ independent from idio. vs agg.
- Rule of thumb (Kahnman, 11)
- Extrapolation (Barberis Greenwood, Jin, Shleifer, 14)
- One-factor representation (Molavi, 19)

Broader interpretation of GE dampening $\mathscr{G}_t$

- Lack of common knowledge (Angeletos & Lian, 18)
- Level-k thinking (Farhi & Werning, 19; Garcia-Schmidt & Woodford, 19)
- Cognitive discounting (Gabaix, 20)

Outline

Investment

$$k_{t+1} = [1 - \delta(u_t) + \Psi(\imath_t)] k_t.$$

Complete info (with small wealth effect on labor supply)

- Positive AS & comovement between c and y
- **Negative comovement between i and c**
  - negative AD shock, $c \downarrow$, $R \downarrow$, $i \uparrow$

Investment

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Complete info (with small wealth effect on labor supply)

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Our resolution:

- **Investment** subject to **confidence multiplier** too
- Feedback between y_t & investor expectations of returns

Prop. Investment comovement

With strong enough info friction, (c, i, y) **all co-move**

Fiscal Multiplier

Q: How does confidence multiplier impact fiscal policy?

Here, for simplicity, shut down wealth effect of G on labor supply

- Same AS as above

AD:

$$y_t = -\sigma R_t + G_t - E_t\left[G_{t+1}\right] + E_t\left[y_{t+1}\right] + \left(\mathscr{B}_t + \mathscr{G}_t\right)$$

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Front-loading $G_t \Longrightarrow$ positive AD shock $\Longrightarrow$ confidence multiplier

Prop. Front-loading government spending

With strong enough info friction, G_t can **crowd in** c_t

Back-loading $G_t \Longrightarrow$ negative AD shock $\Longrightarrow$ negative multiplier

TFP Shock

$$y_t = -\sigma R_t + E_t\left[y_{t+1}\right] + \left(\mathscr{B}_t + \mathscr{G}_t\right),$$

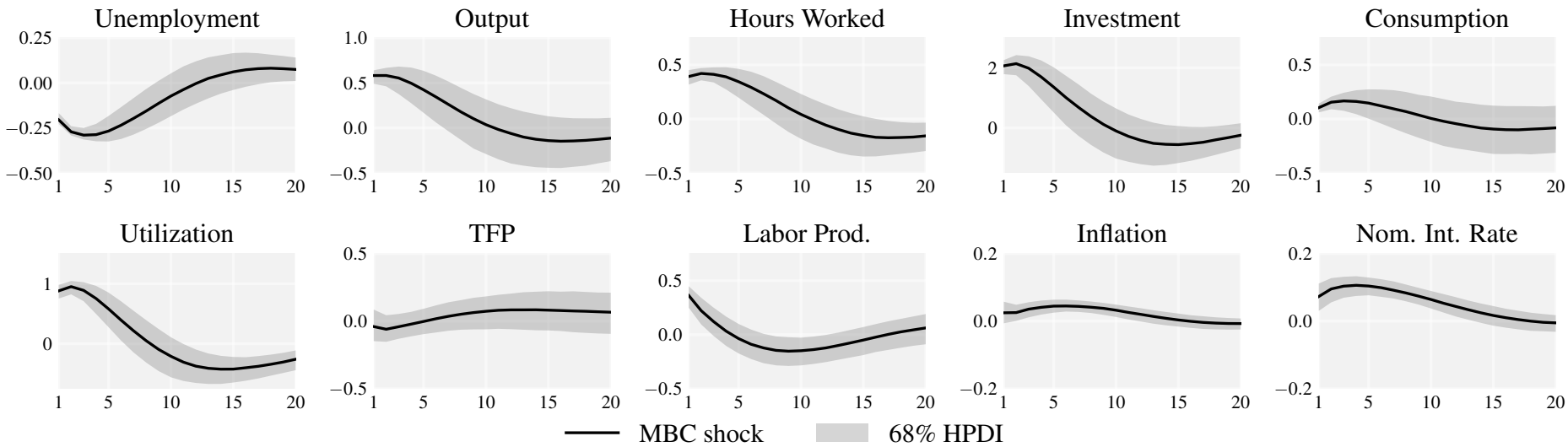
- **No confidence multiplier**
  - Actual permanent income moves with aggregate TFP
  - Rational confusion $\Longrightarrow$ Ambiguous $\mathscr{B}_t$
  - Useful benchmark $\mathscr{B}_t \approx 0$ $(\rho_\xi \approx \rho_A)$
- Dampening of GE has **reverse effect**
  - Negative TFP Shock $\Longrightarrow$ positive R_t $\Longrightarrow$ **Positive** $\mathscr{G}_t$

Prop. TFP Shock

Info friction dampens the relative impact of AS vs AD shock

- Consistent with the importance of non-inflationary AD shock

Main Business Cycle Shock (Angeletos, Collard, Dellas, 20)



- u, y, h, c, i comove without TFP & π
- Utilization accounts for pro-cyclicality in labor prod
- Non-accommodative MP and procyclical real R
- Intertemporal substitution in production

Sticky Prices

- A theory why & how the natural output responds to AD shock
- Main insights go through sticky prices
- Additional mechanism: misperception of output gaps (MP)
  - existing literature on forward guidance etc.

Conclusion

Two contributions:

- A theory of demand-driven fluctuations without sticky prices
- A theory of amplifications for AD shock (but not AS shocks)