Confidence and the Propagation of Demand Shocks

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Outline

1. Introduction
2. Element 1: Variable Utilization $\Rightarrow$ AS Responds to AD
3. Element 2: Rational Confusion $\Rightarrow$ Confidence Multiplier
4. Extensions and Discussion

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 (Barro & King)

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
- Inflation & output does not necessarily co-move in the data
  - Mavroeidis et al., (14)
- Non-inflationary demand shocks prevalent
  - Beaudry & Portier (13); Angeletos, Collard, Dellas (20)

This Paper

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

Element 1:

- **Variable utilization** + adjustment cost of capital
  - $\Rightarrow$ intertemporal substitution in production
  - $\Rightarrow$ **AS responds to AD**
- Literature: *static* utilization choices

Element 2:

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

Prediction:

- u, y, h, c, i **comove without TFP &** π

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Preferences and AD Curve

- Preference (representative agent & complete info)

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

where

$$\mathscr{U}(c, n) = \frac{c^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \frac{n^{1+\frac{1}{\nu}}}{1+\frac{1}{\nu}}$$

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

- 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 $\Psi(\imath_t)$ (infinite adjustment cost)

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- AS curve (log-linearized):

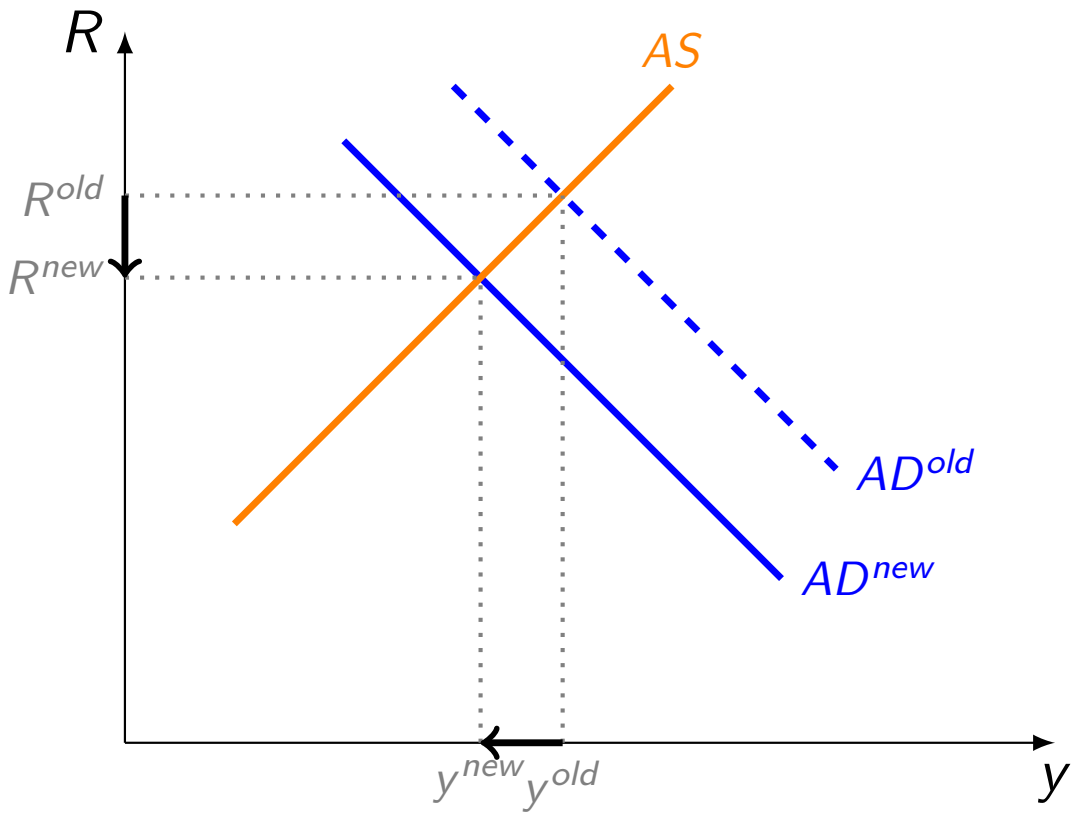
$$y_t = (1 - \tilde{\alpha})(u_t + k_t),$$

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

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

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 without Info Frictions



- R not P: Intertemporal "Econ 101"
- RBC/flexible price core of NK: Vertical AS
- Here: natural rate of output responsive to AD

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Full Model with Information Frictions

Supply side

- Complete info, same as above

Demand side

- Islands & idiosyncratic shocks
- Know own discount rate, own income & own interest rates
- **Incomplete info** about, or inattention to, aggregate conditions
- **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

Prop. Pro-cyclical perceived permanent income

$$\mathscr{B}_t = \frac{1-\beta}{\beta\left(1-\beta\rho_\xi\right)}\left(1-\lambda\right)\frac{\partial y_t}{\partial \eta_t}\eta_t$$

- 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

$\Longrightarrow$ local income $y_{h,t} = y_t + \xi_{h,t}$ drops

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

$\Longrightarrow$ drop in perceived permanent income

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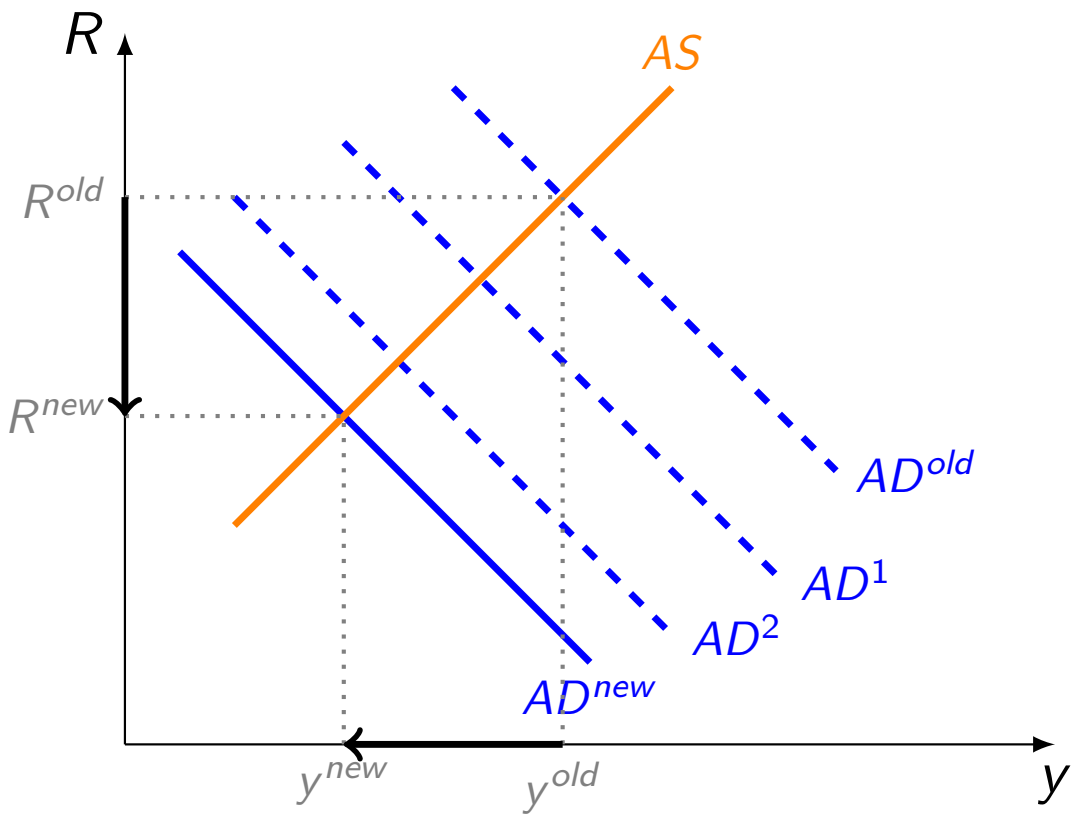
$\Longrightarrow$ drop in perceived permanent income

$\mathscr{B}_t$ independent of the persistence of the AD shock ρ_β (Hulten)

- Aggregate permanent income invariant to the AD shock

$$\sum_{k=0}^{+\infty}\beta^k \int \mathbb{E}_t\left[y_{t+k}\right] = \frac{1-\tilde{\alpha}}{1-\beta}k_t$$

Confidence Multiplier



$\mathscr{G}_t$: Discounting GE Interest Rate Adjustment

Prop. Misperception of Future Interest Rate Adjustment

$$\begin{aligned}\mathscr{G}_t &\equiv -\sigma \sum_{k=1}^{+\infty} \beta^k \int \left(E_t^h [R_{t+k}] - \mathbb{E}_t [R_{t+k}] \right) dh \\ &= (1-\lambda) \frac{\sigma^2}{\sigma + \varsigma} \frac{\beta \rho_\beta}{1 - \beta \rho_\beta} \eta_t\end{aligned}$$

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
  - Further **amplifies** the impact of the AD shock
- Literature: **dampens** the impact of forward guidance
  - strategic substitutability (here) vs complementarity (NK)

Full Equilibrium

Prop. Two Multipliers

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 $\gamma > 0$ is frictionless response and $m^{\text{conf}}(\lambda, \rho_\xi), m^{\text{GE}}(\lambda, \rho_\beta) > 1$.

- Both $m^{\text{conf}}(\lambda, \rho_\xi)$ and $m^{\text{GE}}(\lambda, \rho_\beta)$ increase with the confusion $1 - \lambda$
- $m^{\text{conf}}(\lambda, \rho_\xi)$ increases with the persistence of idiosyncratic shock ρ_ξ
- $m^{\text{GE}}(\lambda, \rho_\beta)$ increases with the persistence of AD shock ρ_β

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Bounded rationality interpretations:

- $m^{\text{conf}}(\lambda, \rho_\xi)$: Extrapolation/one-state representation
- $m^{\text{GE}}(\lambda, \rho_\beta)$: Level-k thinking

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Comovement: Borrowers and Savers

Standard: borrowers "credit crunch"

$$c_t^b = -\sigma R_t + \mathbb{E}_t\left[c_{t+1}^b\right] - \sigma\beta_t$$
$$c_t^s = -\sigma R_t + \mathbb{E}_t\left[c_{t+1}^s\right],$$

- Borrower & saver ***negatively*** **co-move** (R_t adjusts)

Here:

$$c_t^b = -\sigma R_t + \mathbb{E}_t\left[c_{t+1}^b\right] + \mathscr{B}_t + \mathscr{G}_t - \sigma\beta_t$$
$$c_t^s = -\sigma R_t + \mathbb{E}_t\left[c_{t+1}^s\right] + \mathscr{B}_t + \mathscr{G}_t$$

Prop. Borrowers and Savers

With strong enough info friction, $\left(c_t^s, c_t^b, y_t\right)$ ***positively*** **co-move.**

Difference from NK: no need for ZLB/constrained monetary policy

Comovement: Investment

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

Complete info (with small wealth effect on labor supply)

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

Our resolution:

- **Investment** subject to **confidence multiplier** too
- Feedback between y_t & investor expectations of returns
- With large enough friction, $(c_t, i_t, y_t, n_t, u_t)$ ***positively*** **co-move.**

Government Spending

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:

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

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

AD Shocks vs AS Shocks

- Replace the AD shock with **an aggregate TFP shock**
- Maintain same info assumptions
- **No confidence multiplier**
  - Actual permanent income moves with aggregate TFP
  - Rational confusion $\Longrightarrow$ Ambiguous $\mathscr{B}_t$
  - Useful benchmark $\mathscr{B}_t \approx 0$ ($\rho_\xi \approx \rho_A$)
- GE discounting has **reverse effect**
  - Negative TFP Shock $\Longrightarrow$ positive R_t $\Longrightarrow$ **Positive** $\mathscr{G}_t$

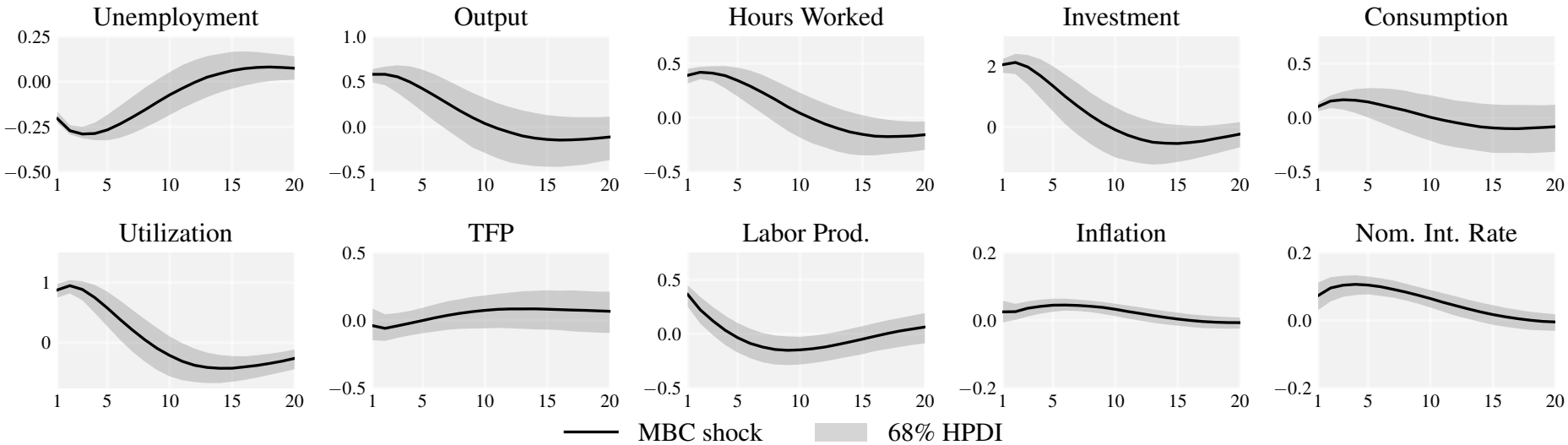
Prop. TFP Shock

Info friction dampens the ***relative*** impact of AS vs AD shock

- Consistent with the importance of non-inflationary AD shock

Circling Back to Motivating Facts

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



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

Conclusion

Contributions:

- A theory of demand-driven fluctuations without sticky prices
- A theory of amplifications for AD shock (but not AS shocks)
- A theory of comovement among business cycle variables
  - but not with *TFP* or inflation

Not to replace NK, but to **strengthen its "flexible-price" core**

- Main insights go through sticky prices