1 Demand shocks

- old idea: expectations drive business cycle

- uncertainty about the economy's fundamentals, which will determine the long run equilibrium

- partial equilibrium ideas

- consumption: from permanent income hypothesis future income expectations matter for consumption decisions

- investment: high expected returns

1.1 Evidence

- basic fundamental for long-run growth: TFP
- can expectations about long-run TFP drive cycle?
- how to measure expectations?
- Beaudry-Portier (2005): use the stock-market

$$\begin{bmatrix} \Delta TFP_t \\ \Delta S_t \end{bmatrix} = \begin{bmatrix} a_{11}(L) & a_{12}(L) \\ a_{21}(L) & a_{22}(L) \end{bmatrix} \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$$

Two identification approaches:

1. Short run:

$$a_{12,0} = 0.$$

2. Long run:

$$a_{12}(1) = 0.$$

B.2 Figures related to section 4

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Figure 8: Impulse Responses to ϵ_2 in the Baseline (TFP, SP) VAR

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B.4 Figures related to section 5.2

Figure 17: Impulse Responses to ϵ_2 and ϵ_1 in the in the (TFP, SP, H) VAR, without (upper panels) or with (lower panels) Adjusting TFP for Capacity Utilization

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Main conclusions:

- both identifications give similar shocks
- response of C and Y builds up, then permanent
- response of H has hump then dies out slowly

1.2 Neoclassical growth model

Preferences

$$\mathsf{E}\sum_{t=0}^{\infty}\beta^t U\left(C_t, N_t\right)$$

Technology

$$C_t + K_t - (1-\delta)\,K_{t-1} \leq A_t F\left(K_{t-1}, N_t\right)$$

- what happens when agents receive news about future A_{t+s}?
- what type of cycles does this generate?

Basic parametrization

$$U(C_t, N_t) = \log C_t - \frac{1}{1+\eta} N_t^{1+\eta}$$
$$A_t F(K_{t-1}, N_t) = A_t K_{t-1}^{\alpha} N_t^{1-\alpha}$$

$$A_t = e^{a_t}$$

$$a_t = \rho a_{t-1} + \epsilon_t$$

$$\beta = 0.99$$
$$\eta = 1$$
$$\alpha = 0.36$$
$$\rho = 0.95$$
$$\delta = 0.025$$

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- Now introduce news about the future

- Simplest way: agents observe shock realization T *periods in advance*

$$a_t = \rho a_{t-1} + \epsilon_{t-T}$$

- What happens at the time of the announcement?

- Consumption increases, investment and hours fall!

- Danthine, Donaldson and Johnsen (1997), Beaudry and Portier (2005): nothing that looks like business cycles.

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1.2.1 Mechanism

Basic mechanism driven by intra-temporal optimality condition

$$(1-\alpha)\frac{1}{C_t}A_t K_{t-1}^{\alpha} N_t^{-\alpha} = N_t^{\eta}$$

or (in terms of real wages)

$$\frac{1}{C_t}W_t = N_t^{\eta}$$

together with the resource constraint

$$I_t + C_t = A_t K_{t-1}^{\alpha-1} N_t^{1-\alpha}.$$

- If A_t unchanged cannot have $I_t \uparrow$,$C_t \uparrow$.

- Changing intertemporal elasticity and elasticity of labor supply can change response of C_t and I_t, but cannot give right combination.

- Adjustment costs in K_t can give $I_t \uparrow$ but then $C_t \downarrow$.

- No hope for neoclassical model with news about the future?

- Several attempts

- Jaimovich and Rebelo (2006): three ingredients

  – adjustment costs in *investment*

  – variable capacity utilization

  – preferences with "weak wealth effects on labor supply"

Figure 1: Response to TFP News Shock, Our Model

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Figure 5: Response to TFP News Shock, Variants of Our Model

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Figure 6: Response of Hours to Permanent TFP Shock at Time One, Standard RBC Model

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Figure 9: The Effects of Noisy Signals

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Preferences

$$\sum \beta^t \frac{\left(C_t - N_t^\theta X_t\right)^{1-\sigma} - 1}{1-\sigma}$$

- X_t is a geometric discounted average of past consumption levels

$$X_t = C_t^\gamma X_{t-1}^{1-\gamma}.$$

- The parameter $\gamma \in [0,1]$: speed at which the wealth effect kicks in

- Suppose $X_t \equiv 1$ then quasi-linear (GHH)

$$W_t = \theta N_t^{\theta-1}$$

no income effect here. Inconsistent with LR growth

- Here income effect that phases in slowly

- In the long run

$$W_t = \theta N_t^{\theta-1} C_t$$

Simplistic interpretation:

1. quasi-linear in short run: no income effect

2. log in the long run: income and substitution cancel

but 1 is wrong!

Decomposition: income effect

$$\sum \beta^t \frac{\left(C_t - N_t^\theta X_t\right)^{1-\sigma} - 1}{1-\sigma}$$

$$\sum R^{-t} (C_t - W N_t) = B_0$$

- Suppose real wage constant at W, interest rate constant at $R = 1/\beta$

- effects of an increase in B_0

Figure 2: Response of Hours - Income Effect

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Mechanism

first order condition for labor supply in the following form

$$\xi_t W_t = \theta X_t N_t^{\theta - 1},$$

and

$$\xi_t = \frac{\left(C_t - N_t^{\theta} X_t\right)^{-\sigma} - \mu_t \gamma C_t^{\gamma - 1} X_t^{1-\gamma}}{\left(C_t - N_t^{\theta} X_t\right)^{-\sigma}},$$

where μ_t is a complicated forward looking object.

Christiano, Motto and Rostagno

$$\mathsf{E}\sum_{t=0}^{\infty}\beta^t\left(\log\left(C_t - bC_{t-1}\right) - \frac{1}{1+\eta}N_t^{1+\eta}\right)$$

$$Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$$

$$K_t = (1-\delta)\,K_{t-1} + \left(1 - \frac{a}{2}\left(\frac{I_t}{I_{t-1}}\right)^2\right) I_t$$

$$I_t + C_t = Y_t$$

$$\begin{aligned} A_t &= e^{a_t} \\ a_t &= \rho a_{t-1} + \epsilon_{t-T} \end{aligned}$$

Figure 3: Real Business Cycle Model with Habit and CEE Investment Adjustment Costs
Baseline - Tech Shock Not Realized, Perturbation - Tech Shock Realized in Period 5

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Figure 4: Real Business Cycle Model without Habit and with CEE Investment Adjustment Costs

Technology Shock Not Realized in Period 5

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Figure 5: Real Business Cycle Model with Habit and Without Investment Adjustment Costs

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Importance of habit formation

$$\lambda_t W_t = N_t^{\eta}$$

$$\lambda_t = \frac{1}{C_t - bC_{t-1}} - bE_t \left[\frac{1}{C_{t+1} - bC_t} \right]$$

- high consumption in the future increases incentive to work today.
- no strange wealth effects here
- but behavior of asset prices is wrong