

# Real Business Cycle Models

## Chapter 10

1. Fundamental assumption
2. Causes of business cycles
3. Calibration and data confrontation
4. Successes of RBC models
5. Failures of RBC models

# 1 Fundamental assumption and its implications

- Assumption - wages and prices are perfectly flexible and all markets, including labor, are always in equilibrium
- Therefore, output is always at full employment:

$$Y_t = \bar{Y}_t = A_t K_t^\alpha \bar{N}_t^{1-\alpha}$$

- Business cycles describe fluctuations in full employment output, NOT deviations of output from full employment.

## 2 Causes of business cycles

- Shocks which can cause full employment output to change include:
  - $A$  - productivity shocks
  - $b$  - change in the preference for leisure
  - $a$  - shocks to wealth
- Productivity shocks are considered the most important source of income fluctuations

- Productivity is measured as the Solow residual

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

- Important - measured as a residual - might or might not really be something like technology
  - In a recession, productivity and real wages are low, and workers choose more leisure. In a boom real wages and productivity rise, inducing workers to give up some leisure. Lower employment is a labor supply choice.
- Money is neutral and irrelevant in business cycles

### 3 Calibration and data confrontation

- Choose specific functional forms and use specific numbers for all parameters
  - Example - let production function be Cobb-Douglas, and let  $\alpha = .3$  based on data which says that capital's share of income is about .3

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

- Let  $A_t$  be determined by a random number generator with a variance determined by the actual variance of output (or the Solow residual).
- Use specific functional form for utility function and choose parameters to match other stylistic data facts.

- Parameters are not usually estimated in a traditional econometric way. (Simple models do not fit data well enough to allow this).
- With specific functional forms and parameter values, it is possible to generate artificial time series for all of the endogenous variables in the macro model.
- Calculate standard deviations of endogenous variables and compare with standard deviations in the data. Also determine cyclical behavior of variables by calculating the correlation of each variable with output.

- Successes of RBC models with only productivity shocks
  - Produce fluctuations in output and other variables that look like business cycles.
  - Standard deviations of most variables are "similar" to those in the data, even though only the standard deviation of output has been imposed through calibration.
  - Employment, real wages, and average labor productivity are pro-cyclical, as in the data.

- Solow residual and productivity - Does the fact that Solow residual is high when output is high imply that an increase in productivity is the reason for the increase in the Solow residual and the increase in output?
  - Capacity utilization - fixed cost of changing quantity of factors of production
  - Production function with capacity utilization:  $\mu_K$  ( $\mu_N$ ) is capacity utilization of capital (labor)

$$Y = AF(\mu_K K, \mu_N N) = A(\mu_K K)^\alpha (\mu_N N)^{1-\alpha}$$

- Solow residual with capacity utilization

$$\frac{Y}{K_t^\alpha N_t^{1-\alpha}} = A\mu_K^\alpha \mu_N^{1-\alpha}.$$

- Solow residual could rise when output is high just because capacity utilization is high when output is high. This would not be a consequence of a positive technology shock, but of efforts to meet demand with increasing capacity utilization.
- Labor hoarding describes a reduction in labor capacity utilization as output falls. Why might this be optimal for a firm?

- Failures of RBC models with only productivity shocks
  - Predicts inflation is low when output is high (AD-AS model)
    - \* add other shocks like government spending which shift demand as well as supply
    - \* note that all business cycles are not alike and some recessions have been accompanied by higher inflation, like those in the 1970's caused by oil price hikes

- Money growth predicts output booms in the data, but money is neutral in RBC model
  - \* Prediction and causation are different
  - \* Maybe, expect rising sales, thereby increasing money demand. Fed accommodates so interest rate won't rise. The increase in money then anticipates the increase in output, but does not cause it.
  - \* Use event studies. Read minutes of FOMC and determine why money increases. Seems that money growth does not simply anticipate business cycles. Volker disinflation of early 1980's is an obvious example

– Absence of cyclical unemployment

- \* In the Great Depression, were all of the unemployed choosing leisure because the real wage was too low? If so, then this was a "massive attack of laziness."
- \* Structural and frictional unemployment could rise in recessions as more people are displaced from work and must either seek new employment (frictional) or learn that their skills are obsolete and that they will remain unemployed (structural).
- \* However, for cyclical unemployment to remain unchanged, we would need to see job vacancies rise as well in recessions compared to booms, and don't see this.