

Lecture 11

Real Business Cycles

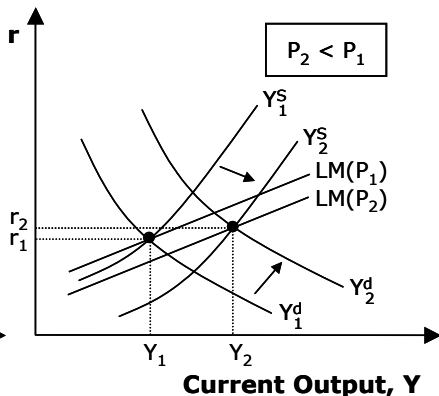
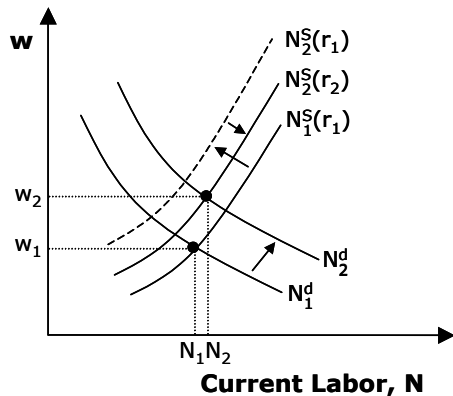
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- Market-clearing approach: Classical dichotomy applies.
- Focus on shocks to total factor productivity (z and z').
 - Fiscal shocks, preference shocks have lesser roles.
 - Monetary neutrality \Rightarrow monetary shocks have no role.
- No role for “aggregate demand management” with fiscal or monetary policy.
 - Economy operates efficiently on its own.
 - Misinformation and policy lags.
 - Public goods can be justified on a “micro” level, but not at a “macro” level.
 - Assumption that public goods are unproductive is a simplification.

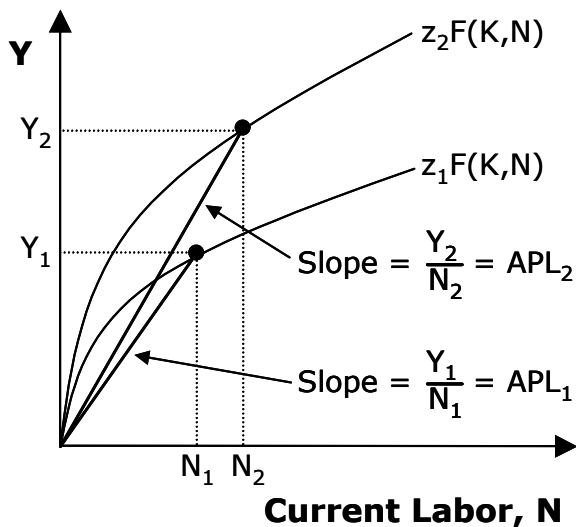
Permanent TFP Shocks and Business Cycles

- Suppose z and z' both increase.
 - $Y^* \uparrow, N^* \uparrow, w^* \uparrow$.
 - $z' \uparrow \Rightarrow I^d(r) \uparrow$ and $I^* \uparrow$.
 - $Y^* \uparrow, Y'^* \uparrow \Rightarrow C^d(Y, r) \uparrow$ and $C^* \uparrow$.
 - $P^* \downarrow$.
 - Average product of labor = $Y^*/N^* = \frac{1}{N^*} zF(K, N^*) = AP_L^* \uparrow$.
 - Comment: AP_L^* and w^* generally move together.
- If TFP shocks are the main cause of business cycles:
 - N, w, I, C, AP_L are procyclical.
 - P is countercyclical.

Effects of a Permanent Increase in TFP



A Permanent Increase in TFP Increases the Average Product of Labor



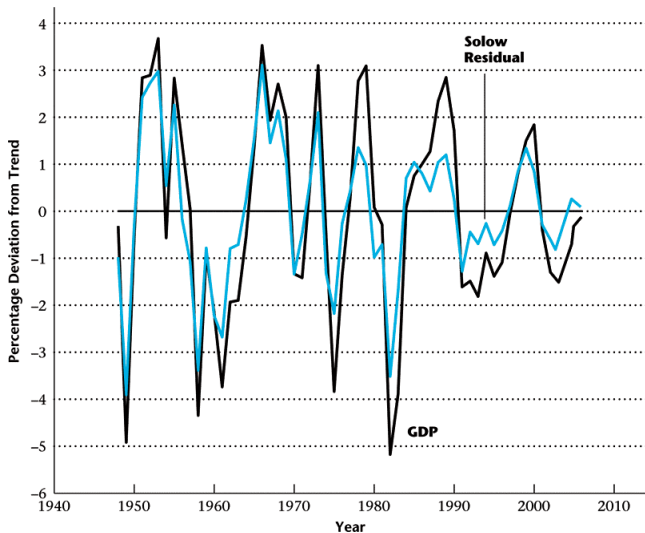
Successes of the TFP-driven RBC Model

- Can replicate most observed business cycle correlations:

Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Price Level	Countercyclical	Countercyclical
Money Supply	Procyclical	—
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Procyclical
Average Labor Productivity	Procyclical	Procyclical

- TFP, as measured by the Solow residual, is
 - Strongly procyclical.
 - Highly persistent (as are business cycles).

Figure 11.1 Percentage Deviations from Trend in the Solow Residual (blue line) and Real GDP (black line)



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Question 1: Where are the TFP Shocks?

- The Solow residual is a **derived** quantity.
- Would like independent evidence of TFP shocks.
- Oil price shocks: 1974-75, 1979-80, 2000-present.
- 1990s expansion: Rapid TFP growth, attributed to developments in high tech computing and communications.

Figure 3.2 Percentage Deviations from Trend
in Real GDP from 1947–2006

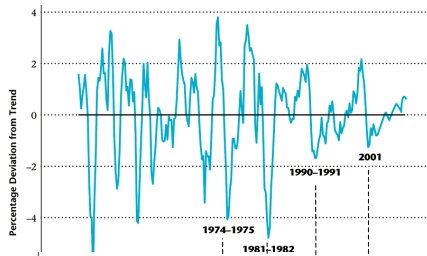
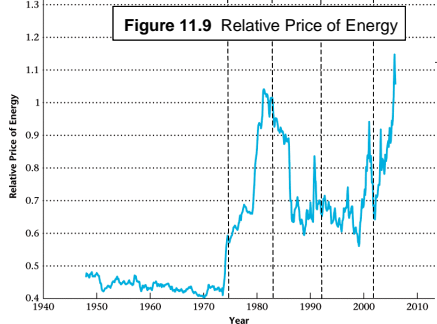


Figure 11.9 Relative Price of Energy



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Question 2: What Does the Solow Residual Measure?

- Simple measures of capital or employment do not account for utilization.
 - Capital: The size of the factory matters, but frequency of operation matters as well.
 - Labor: Time at work matters, but effort and focus matter as well.
 - **Labor hoarding**: Use labor more intently during expansions.
- Problem: Standard Solow residual calculation does not account for utilization.
- Increases in utilization might be confused for increases in TFP.
- Utilization is procyclical \Rightarrow mis-measured Solow residual will increase during expansions.

The Effects of Variable Utilization on Measured TFP

- Suppose

$$\begin{aligned} Y &= z^* F(u_K \cdot K, u_N \cdot N) \\ &= z^* (u_K K)^\alpha (u_N N)^{1-\alpha}, \end{aligned}$$

u_K = capital utilization,

u_N = labor utilization,

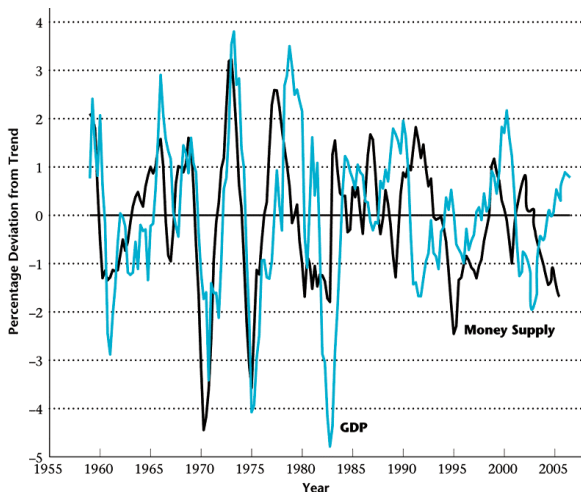
z^* = “true” TFP.

- Assume $u_K = u_N = u \Rightarrow Y = z^* u K^\alpha N^{1-\alpha}$.
- Standard Solow residual calculation: $z = \frac{Y}{K^\alpha N^{1-\alpha}} = z^* u$.
- Suppose expansions are due to increases in G .
 - If u increases during expansions, z will be procyclical.

Money in the RBC Framework

- Recall: Money is neutral in the RBC framework.
- Problem: The data show that money is procyclical and leading.
- RBC explanation: Endogenous money.
- Version 1: Central banks increase the money supply during expansions.
 - Why? This stabilizes the price level.
 - This leads to procyclical money.
- Version 2: As economic activity picks up, banks make more loans and in doing so create deposits (money!).
 - This also leads to procyclical money.
 - Banking activity leads the overall economy \Rightarrow money leads the overall economy.
 - Timing does not imply causality.
- Problem: Some monetary policy events (e.g., 1981-82 recession) appear to be independent of TFP.

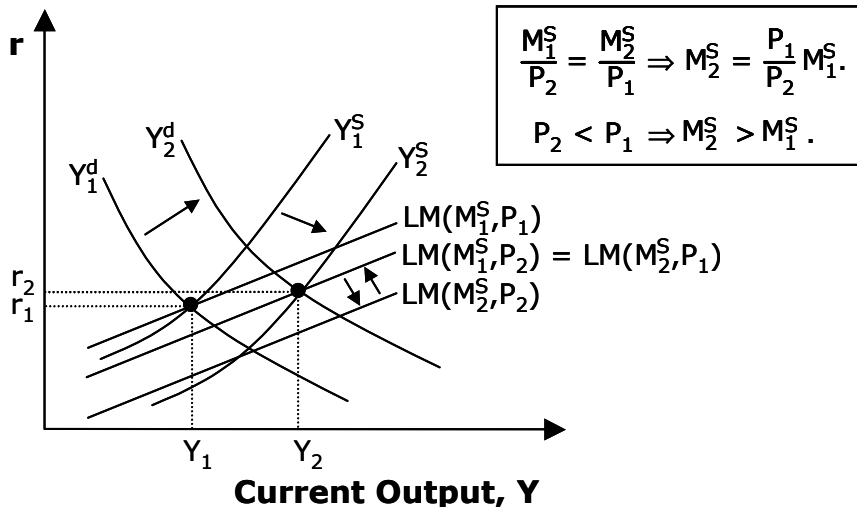
Figure 3.13 Percentage Deviations from Trend in the Money Supply (black line) and Real GDP (blue line)



Source: U.S. Department of Commerce, Bureau of Economic Analysis, and Board of Governors of the Federal Reserve System.

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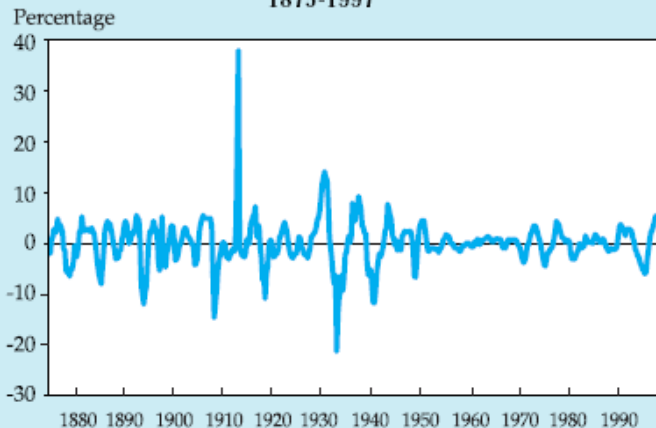
Under Price Stabilization, TFP Increases Cause Money Supply Increases



Money in the RBC Framework (Continued)

- The RBC framework seemingly implies little need for countercyclical monetary policy.
- Lucas (1994) argues otherwise:
 - The RBC model fits the data very well, implying that monetary and financial factors have few real effects.
 - Why do financial factors have little effect? Monetary policy stabilizes financial markets!
 - Good monetary policy does not try to offset TFP shocks, but enables the economy to respond to these shocks in an efficient way.
 - This leaves TFP shocks as the primary source of business cycles.
- Chatterjee (1999): Data suggest that postwar financial markets are less volatile.

FIGURE 3
Cyclical Changes in the Ratio
Of Bank Loans to Monetary Base
1875-1997



Source: Chatterjee (*Business Review*, January/February 1999), page 24.

FIGURE 4 Cyclical Changes in the Money Supply 1875-1997

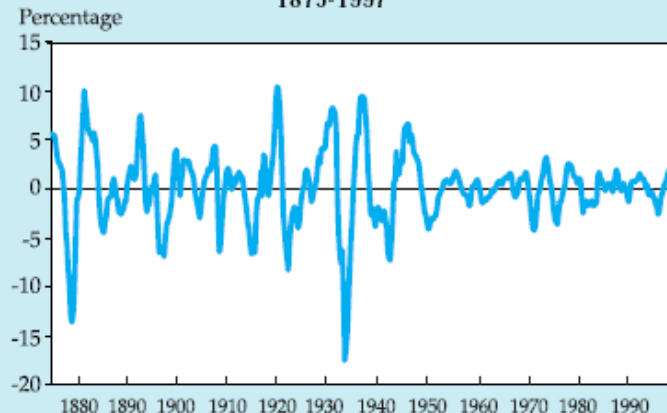


Figure shows percentage deviations from trend of the M2 measure of the money supply.

Source: Chatterjee (*Business Review*, January/February 1999), page 24.

Principal Sources

- 1 Andrew B. Abel and Ben S. Bernanke, *Macroeconomics*, fourth edition update, (Addison-Wesley, 2003), chapter 10.
- 2 Satyajit Chatterjee, "Real Business Cycles: A Legacy of Countercyclical Policies," *Business Review* (Federal Reserve Bank of Philadelphia), January/February 1999, pp. 17-27. (Figures downloaded from <http://www.philadelphiafed.org/econ/homepages/chatterjee/index.cfm>.)
- 3 Stephen D. Williamson, *Macroeconomics*, third edition, (Addison-Wesley, 2007), chapter 11. (Figures downloaded from http://wps.aw.com/aw_williamson_macroekon_3/69/17800/4557009.cw/index.html.)