Real Business Cycles

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The equilibrium model of the business cycle we have developed is sometimes called the *real business cycle model*. It is “real” in the sense that money is neutral and classical dichotomy holds. Can model “fit” data? To extent it can, what are policy implications?
Trend vs. Cycle

Hodrick-Prescott Filter

GDP Trend Cycle

Hodrick-Prescott Filter

Sims (ND)

Real Business Cycles

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Business Cycle Correlations

<table>
<thead>
<tr>
<th>Series</th>
<th>Correlation with GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>1.00</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.78</td>
</tr>
<tr>
<td>Investment</td>
<td>0.85</td>
</tr>
<tr>
<td>Hours</td>
<td>0.87</td>
</tr>
<tr>
<td>Real Wage</td>
<td>0.14</td>
</tr>
<tr>
<td>Real Interest Rate</td>
<td>-0.05</td>
</tr>
<tr>
<td>Price Level</td>
<td>-0.22</td>
</tr>
</tbody>
</table>

- Quantities strongly *procyclical* (positively correlated with output)
- Price level and real interest rate mildly *countercyclical*
Can Model Fit Data?

- Potentially, if driven by changes in $A_t$
- Co-movement between $C_t$ and $N_t$:
  \[ v'(1 - N_t) = u'(C_t)A_t F_N(K_t, N_t) \]

- To get $C_t$ and $N_t$ to move together, must be driven by changes in $A_t$
Increase in $A_t$: increases in $Y_t$, $C_t$, $I_t$, and $w_t$; decreases in $r_t$ and $P_t$; ambiguous effect on $N_t$

Effect on $N_t$ likely positive

Qualitatively, model driven by changes in $A_t$ can match these correlations
Any evidence that $A_t$ moves around a lot in data?

Assume Cobb-Douglas production function

Given observed $Y_t$, $N_t$, and $K_t$, and a bit of theory for $\alpha$, can measure in data

Solow residual:

\[
\ln A_t = \ln Y_t - \alpha \ln K_t - (1 - \alpha) \ln N_t
\]
TFP Shocks in Data

Correlation b/w TFP and output: 0.8
Planner’s Problem

What would outcome of economy be if fictitious social planner chose allocations to maximize household well-being?

This tells us what “best” or “most efficient” allocation is

$$\max_{C_t, C_{t+1}, N_t, N_{t+1}, K_{t+1}} U = u(C_t) + \nu(1 - N_t) + \beta u(C_{t+1}) + \beta \nu(1 - N_{t+1})$$

s.t.

$$C_t + K_{t+1} - (1 - \delta) K_t + G_t = A_t F(K_t, N_t)$$

$$C_{t+1} - (1 - \delta) K_{t+1} + G_{t+1} = A_{t+1} F(K_{t+1}, N_{t+1})$$
Planner’s Solution

\[ v'(1 - N_t) = u'(C_t)A_tF_N(K_t, N_t) \]

\[ v'(1 - N_{t+1}) = u'(C_{t+1})A_{t+1}F_N(K_{t+1}, N_{t+1}) \]

\[ u'(C_t) = \beta u'(C_{t+1})(A_{t+1}F_K(K_{t+1}, N_{t+1}) + (1 - \delta)) \]

- *Same* outcome as competitive equilibrium
Competitive equilibrium is efficient. Best society can do
Economy may not like reductions in $A_t$, but given that, response is as good as can be hoped for
Implication: no need for stabilization policy. Can only make things worse
RBC theory heavily criticized. Non-exhaustive list:

- Does not generate enough hours/employment volatility
- No unemployment
- No monetary non-neutrality
- What does it mean for $A_t$ to decline?
- Is $A_t$ really well-measured?
- No heterogeneity