“From many series, one cycle: improved estimates of the business cycle from a multivariate unobserved components model” by Fleischman and Roberts

Ricardo Reis
Columbia University

FRB San Francisco conference
16th of March 2012
What the paper does

**Goal:** to measure potential or natural output.

**Approach:** cycle as a latent variable, many series.

**Innovation:** 4 output, 4 labor market, one price series; 6 trends and measurement errors; an accelerationist Phillips curve.

**Findings:** employment variables inform cycle, inflation useful too via PC effect.
1. Cycles and trends not so distinct

Trend labor productivity

Figure 3: I(2) Trend Components

Table 4: Decomposition of Changes in Potential Output, 1973-2010
1. Cycles and trends not so distinct

- Sum of AR(2) coefficients is 0.96.
- Autocorrelation of measurement error is 0.88 (0.04)

Figure 1: Model Estimate of Cycle

Shading indicates NBER recessions.
2. Employment is driving the cycle

1. But cycle affected employment series with 3 lags, output series had to be contemporaneous.

\[
GDP_t = cyc_t + GDO_t^* + u_{1t} \quad NFBP_t = \lambda_{10} cyc_t + NFBO_t^* + u_{3t}
\]

\[
GDI_t = cyc_t + GDO_t^* + u_{2t} \quad NFBI_t = \lambda_{10} cyc_t + NFBO_t^* + u_{4t}
\]

\[
ENFB_t = \lambda_{20} cyc_t + \lambda_{21} cyc_{t-1} + \lambda_{22} cyc_{t-2} + ENFB_t^* + u_{5t}.
\]

\[
WW_t = \lambda_{30} cyc_t + \lambda_{31} cyc_{t-1} + \lambda_{32} cyc_{t-2} + WW_t^* + u_{6t}.
\]

\[
ER_t = \lambda_{40} cyc_t + \lambda_{41} cyc_{t-1} + \lambda_{42} cyc_{t-2} + ER_t^* + \alpha EEB_t + u_{7t}.
\]

\[
LP_t = \lambda_{50} cyc_t + \lambda_{51} cyc_{t-1} + \lambda_{52} cyc_{t-2} + LP_t^* - \alpha EEB_t + u_{8t}.
\]

2. Could use many, many more series.
2. Employment is driving the cycle

![Chart showing employment and inflation over time]
3. Lags and parameter stability

Specification choice a little judicious
• 10 lags in PC, 3 lags in labor market, AR(2) cycle.
• Strong cointegrating relations.
3. Lags and parameter stability

Specification choice a little judicious
• 10 lags in PC, 3 lags in labor market, AR(2) cycle.
• Strong cointegrating relations.

Stability in a sample that goes from 1965 to 2011
• Great moderation on volatility
• Drastic change in the cyclicalality of labor productivity
• Jobless recoveries
• Phillips curve breakdown

\[ DCPIX_t = A(L)DCPIX_{t-1} + \beta_{11}(L)drpe_{t-1} + \beta_{12}(L) \times d85_t \times drpe_{t-1} \]
\[ + \beta_{2}(L) drpi_t + \theta (\lambda_{50} cyc_t + \lambda_{51} cyc_{t-1} + \lambda_{52} cyc_{t-2}) + u_{9t} \]
5. Using a two-sided smoother

Table 8: Cycle Revisions

<table>
<thead>
<tr>
<th>Model</th>
<th>Final Cycle Std. dev.</th>
<th>QRT Revision Std. dev.</th>
<th>RMSE</th>
<th>Revision Ratios NS</th>
<th>NSR</th>
<th>QRT vs. Final Corr</th>
<th>OPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1.73</td>
<td>0.98</td>
<td>0.98</td>
<td>0.56</td>
<td>0.56</td>
<td>0.83</td>
<td>0.20</td>
</tr>
<tr>
<td>CPIX, ER, GDP, GDI</td>
<td>1.61</td>
<td>1.05</td>
<td>1.06</td>
<td>0.65</td>
<td>0.66</td>
<td>0.78</td>
<td>0.26</td>
</tr>
<tr>
<td>CPIX, ER, GDP</td>
<td>1.77</td>
<td>1.13</td>
<td>1.14</td>
<td>0.64</td>
<td>0.65</td>
<td>0.78</td>
<td>0.25</td>
</tr>
<tr>
<td>Kuttner (CPIX, GDP)</td>
<td>1.39</td>
<td>1.01</td>
<td>1.01</td>
<td>0.73</td>
<td>0.73</td>
<td>0.76</td>
<td>0.27</td>
</tr>
<tr>
<td>Watson (GDP)</td>
<td>2.03</td>
<td>1.48</td>
<td>2.16</td>
<td>0.73</td>
<td>1.07</td>
<td>0.75</td>
<td>0.14</td>
</tr>
<tr>
<td>Clark (GDP)</td>
<td>2.23</td>
<td>2.04</td>
<td>2.38</td>
<td>0.92</td>
<td>1.07</td>
<td>0.42</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Notes: Final cycle is the 2-sided estimate using the full 1963:Q2 to 2011:Q1 sample period; QRT estimates from extending ending date from 1988:Q1 to 2008:Q4; QRT revisions are final1 - QRT1; NS is the ratio of the standard deviation of the QRT revision to the standard deviation of the final cycle estimate; NSR is the ratio of the RMSE of the QRT revision to the standard deviation of the final cycle estimate; Corr is the simple correlation of the QRT and final estimates; OPS is the percent of the sample period where the QRT and final estimates of the cycle have different signs.
6. The EEB variable

Federal and state emergency and extended benefits programs paid.

\[ ER_t = \lambda_{40} \text{yc}_{t} + \lambda_{41} \text{yc}_{t-1} + \lambda_{42} \text{yc}_{t-2} + ER_t^* + \alpha \text{EEB}_t + u_{7t} \]

\[ LP_t = \lambda_{50} \text{yc}_{t} + \lambda_{51} \text{yc}_{t-1} + \lambda_{52} \text{yc}_{t-2} + LP_t^* - \alpha \text{EEB}_t + u_{8t}. \]

Estimated \( \alpha = -0.07 \).

Benefits have no effect on employment, just shift people in and out of labor force.
6. The EEB variable

I think this is a bad idea for many reasons:

1) No effect on total employment?
2) No effect on output?
3) This is no longer a “potential output”, before effect of policy.
4) It is also not a measure of “potential output” pre-monetary policy, otherwise would have included other fiscal policies.
5) “...enacted on ad hoc basis...”
Conclusion

Pushing further our measurement of potential output and output gaps.

Difficult topic.

Rule of thumb: look at the unemployment rate.

Okun’s law will eventually fall into place.