Topics for Today

1.) Empirical Evidence on the Lucas Supply Curve

2.) More on the Keynesian AS Curve
   - Wage vs. Price Stickiness

3.) A Keynesian Interpretation of Lucas's Evidence

4.) Coordination Failures + Multiple Equilibria

5.) Summary of Business Cycle Theories
Empirical Evidence on the Lucas Supply Curve

- To explain a positive correlation between inflation and output, the Classical approach introduces informational frictions. Firms and households are assumed to have better information about local market conditions than about economy-wide economic conditions.

- As a result, individuals and firms can be fooled into working more or hiring more workers because they attribute (at least partially) and economy-wide price increase (i.e., inflation) to an increase in relative prices.

- This theory makes two easily testable predictions:
  1. Only unexpected demand changes should affect output. For example, predictable changes in monetary policy should be neutral. [This prediction is rejected by the data.]
  2. The response of output to demand shocks should be stronger in economies that have a history of stable demand. That's because individuals are more likely to interpret a given AD shock as a change in relative prices
Conversely, economies that have a history of unstable inflation will not see output respond by much to a given change in inflation. Individuals in these economies will be very alert to inflation and less likely to be fooled by it.

This prediction receives some support.

![Figure 6.1: The output-inflation tradeoff and the variability of aggregate demand (from Ball, Mankiw, and Romer, 1988)](image)

2-step strategy:

1) \( y_t = c + x_t + \delta \Delta x_t + \lambda y_{t-1} \)

2) \( \delta_i = 0.388 - 1.64 \sigma_{\Delta x_i} \)

\( \text{Time-series regression for each country} \)

\( \sigma_{\Delta x_i} = \text{Nominal GDP growth} \)

\( y_{t-1} = \text{real GDP} \)

\( \sigma_{\Delta x_i} = \text{Standard deviation of nominal GDP growth} \)

\( \lambda = \text{Cross-sectional regression} \)

\( \text{st. dev. of } \Delta x_i \)

43 countries

1950 - 1986
The Keynesian AS Curve

Wage vs. Price Stickiness

• The original Keynesian model generated an upward sloping AS curve by assuming wages were "sticky".
  \[ P \uparrow \Rightarrow \%P \downarrow \Rightarrow \text{Firms hire more labor, } L \uparrow \Rightarrow Y \uparrow \]

• However, real wages are not countercyclical. If anything, they are procyclical.
  Procyclical real wages cast doubt on the sticky wage hypothesis. (Besides, not that many workers are covered by explicit long-term contracts, and when they are, many contracts include cost-of-living adjustments (COLAs))
• Modern Keynesian models instead assume prices are sticky. Firms are assumed to have some monopoly power, which allows them to set prices. (Remember, competitive firms set quantities, not prices!) Small costs to changing prices can make firms keep their prices fixed in response to demand changes. There can also be strategic reasons to keep prices fixed.

• A model with sticky prices and flexible wages easily generates a procyclical labor supply curve. (Firms simply demand whatever labor is required to produce the demanded output. If \( Y = F(L) \), then \( L^D = F'(Y) \).

\[
Y_2 > Y_1 \Rightarrow (\ell)^*_2 > (\ell)^*,
\]
Sticky price models provide an alternative interpretation of Lucas's evidence.

It's based on 2 ingredients:

1) Higher average inflation makes firms adjust their prices more frequently (since prices get out of line faster). This means AD shocks have smaller effects on real output in high inflation economies. There is evidence to support this:

43 countries
1950-96

\[ \delta_i = 0.60 - 4.83 \hat{\pi}_t + 7.12 \hat{\pi}_t^2 \]

(0.08) (1.07) (2.09)

average inflation

FIGURE 6.5 The output-inflation tradeoff and average inflation (from Ball, Mankiw, and Romer, 1988)
2. There is a strong positive correlation between average inflation and the variability of inflation (corr. coef. = .92). As a result, Lucas's evidence could be spurious.

- What you need to do is run a multiple regression, which can isolate the effects of each variable (i.e., estimate the effect of inflation variability holding constant the average inflation rate).

- Here's what you get:

\[ \delta_i = 0.59 - 5.73 \pi + 8.41 \pi^2 + 1.24 \sigma_x - 2.38 \sigma_x^2 \]

\[ (0.09) \ (1.97) \ (3.85) \ (2.47) \ (7.06) \]

\[ R^2 = 0.36 \]

- The fact that mean (avg.) inflation continues to be significant, while inflation variability is insignificant (and has the wrong sign), seems to support the Keynesian interpretation.
Coordination Failures & Multiple Equilibria

- So far, all our theories imply that when prices are flexible, the economy has a unique equilibrium. Therefore, fluctuations can only arise from changes in the flexible price equilibrium (as in RBC models), or from deviations from the equilibrium (as in Keynesian models).

- However, if more than one level of output and employment is a flexible price equilibrium, then fluctuations might arise from switches among alternative equilibria.

- Multiple equilibria can arise when there are positive spillovers between individuals, e.g., when my investment decision depends positively on your investment decision. When this is the case, there are gains from coordination.
Suppose Mr. i's payoff is \( U_i = V(y_i, y) \)
where \( y_i = \) Mr. i's output choice
\( y = \) Avg. economy-wide output choice

It is possible for there to be multiple equil.

\( A, B, C \) are all Nash equil., but only \( A + C \) are stable.

Whether the economy ends up in the good equil. at \( C \), or in the bad equil. at \( A \) depends on what people expect other people to do!

The role of policy here is to convince people to choose \( C \)!
Summary of Business Cycle Theories

Keynesian

Pro

1.) Clear Policy Implications. Suggests you can actually do something about business cycles.

2.) Explains why money seems to be non-neutral.

Con

1.) Weak micro foundations. Why are firms slow to adjust prices & wages? Optimizing models of slow adjustment are hard to solve & work with.

2.) Simple versions (with only demand shocks) have a hard time explaining "stagflation" (simultaneously high inflation & unemployment).

3.) Until quite recently, Keynesian models were not explicitly dynamic or stochastic. Hard to evaluate their predictions quantitatively.
Classical

Pro

1.) Strong micro foundations. Optimizing behavior. It's clear why the economy is responding the way it does.

2.) A single unifying framework based on a Solow-like growth model.

3.) Can easily explain stagflation (adverse productivity shocks).

Con

1.) Few policy implications.

2.) Failure to identify (independently measured) technology shocks. Bias in Solow residuals.

3.) Must resort to reverse causation arguments to explain apparent monetary non-neutrality.

4.) Must introduce informational frictions (Lucas supply curve) to explain positive correlation between inflation & output. Expectational errors generate little persistence in output fluctuations.

5.) Must impose lots of homogeneity across households. No distributional consequences from business cycles.