Indeterminacy and Sunspots in Macroeconomics

Thursday September 7th: Lecture 7
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Topics for Lecture 7

• This lecture explains how macroeconomics got where we are today
• I will explain what is wrong with the NK Consensus and how it must change
• I will explain why we must bring the idea of involuntary unemployment back into mainstream macroeconomics
Reading


• Roger Farmer, *Prosperity for All*, Oxford University Press, 2016
Economic Theory and Economic Facts

- 1929—1939: Great Depression
- 1960—1980: Great Stagflation
- 2007—2009: Great Recession

Classical economics | Keynesian economics | Classical economics (on steroids) | What Next?

- Classical economics
- Keynesian economics
- Classical economics (on steroids)

Great Depression | Great Stagflation | Great Recession
The Rocking Horse Model

Wicksell’s analogy was further developed by Ragnar Frisch: 1933

“Propagation problems and impulse problems in economic dynamics”

Frisch saw the economy as a rocking horse.

It is self-stabilizing
The Great Depression

• The Great Depression follows a US market crash in 1929.

• It was hard to see the depression though the lens of classical economics.
The Great Depression

- Stocks lost 84% of their value between 1929 and 1932
- US Unemployment hit 24%
- Growth fell 20% below trend
- This did not look like the efficient response to mild shocks of a self-correcting system
Keynes: Three Ideas

• Confidence matters (animal spirits)
• Involuntary unemployment can persist for a very long time
• Responsibility of government to maintain full employment

John Maynard Keynes
1883 – 1946
The Windy Boat Model

• Keynes introduced a different view of the economy.
• It is not self-stabilizing.
• Confidence matters
Keynesian Policies Worked

Unemployment Since 1890
(Shaded areas are NBER recessions)

Unemployment rate (Percent of labor force)

Before Keynes

Employment Act of 1946

After Keynes

1900 1925 1950 1975 2000
Keynesian Economics Before 1958

After WWII, Keynesian economics was in the ascendance

It was formalized by John Hicks in the IS-LM model

The IS-LM Model was incomplete because it did not explain how prices are determined

In Keynesian economics (pre-1958) unemployment was involuntary
The Phillips Curve

1949-1959

Nominal Wage Inflation (percent) vs. Unemployment rate

1959-1969

Nominal Wage Inflation (percent) vs. Unemployment rate

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The Phillips Curve as a Trade-Off

Samuelson saw the Phillips curve as a trade-off

By printing money, lower unemployment could be obtained at the cost of higher inflation

The government would have to choose which of the two alternatives was preferable: inflation or unemployment
Keynesian Economics After 1958

At about the same time that Phillips published his work on inflation and unemployment, Samuelson grafted the Phillips curve onto the IS-LM – model to generate what he called the neo-classical synthesis.

The economy is Keynesian in the short-run before prices have adjusted to clear all markets.

It is classical in the long-run after prices have adjusted to clear all markets.
The Phillips Curve Disappeared Soon After it was Discovered

Nominal Wage Inflation (percent) vs. Unemployment rate

1979-1989 vs. 1969-1979
The Phelps-Friedman Natural Rate Hypothesis

Milton Friedman: 1968, “The Role of Monetary Policy”

There is no long-run tradeoff between inflation and unemployment.

Friedman calls this idea the ‘natural rate of hypothesis’

Edmund Phelps: in 1973, Microeconomic Foundations of Employment and Inflation Theory published the same idea
The NK Model

Michael Woodford: 2003 Interest and Prices

Woodford used a classical market-clearing model as his core

He developed Samuelson’s neo-classical synthesis into the three-equation NK model

In doing so – he compromised and removed the idea of involuntary unemployment from the NK model
The NK Model

Michael Woodford assumed that every-one who want a job will get one and he used an idea borrowed from classical economics

Instead of modelling involuntary unemployment, he modelled the number of hours supplied to the market by the representative household
Hours and Employment in NK Models

In Keynesian models of the 1950s the demand and supply for labor are unequal. There is involuntary unemployment.

In New Keynesian models of the last three decades the labor market is an auction. The quantity of labor demanded is always equal to the quantity of labor supplied.

There is no unemployment in the sense of Keynes...
What is a Recession

In the NK model, a recession occurs as a result of a shock to aggregate demand, aggregate supply or to policy.

Because firms adjust prices slowly, firms are not always maximizing period-by-period profits.

Instead, they balance the cost of slowly changing prices against the cost of not having exactly the right current price.
What is a Recession?

Nobody is unemployed in the NK model

Instead, people voluntarily choose to supply less labor because interest rates are temporarily too high or wages are temporarily too low

People choose not to work and hours per person falls

The Great Depression, in this theory, was a “sudden attack of contagious laziness” (Modigliani)
Why is this a Bad Theory

It cannot explain the misery suffered by unemployed workers in a recession.

The costs of recessions in the NK model are miniscule.

Hours per week, labor force participation and the unemployment rate behave very differently.
How New Keynesians Measure Hours Per Person

- $N$: Population
- $L$: Employed People
- $u$: Unemployment Rate
- $N$: Labor Force
- $h$: Hours per week

These concepts all go into the definition of hours-per person.
What are Hours-Per Person

\[ l = \frac{h \times L}{P} = h \times \left( \frac{N - U}{N} \right) \times \frac{N}{P} \]

- Hours per person
- Labor force participation rate
- Hours per week
- Unemployment rate

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Hours in the data

This is the hours series favored by NK economists.
Participation and business cycles

There is not much movement in the labor force participation rate at business cycle frequencies.
Average Weekly Hours and Business Cycles

There is not much movement in average-hours worked at business cycle frequencies.
Unemployment

I conclude that unemployment is the most important component of hours per person over the business cycle.

Macroeconomics MUST model unemployment if we are to understand recessions.
Unemployment and the Output Gap

New Keynesians sometimes use the unemployment rate to measure economic activity; sometimes the use the output gap.

Output grows because of technological innovations. It fluctuates over the business cycle because sometimes unemployment is high and sometimes it is low.
Definitions

\( u_t \) is the unemployment rate

\( \bar{u} \) is the natural rate of unemployment

\( \bar{y}_t \) is the logarithm of real potential GDP

\( y_t \) is the logarithm of real GDP

\( (y_t - \bar{y}_t) \) is the output gap
Unemployment and the Output Gap

The output gap is related to the unemployment rate because, for any level of technology, society can produce less if unemployment is high.

If we define units appropriately, we can write a simple equation that links the difference of the unemployment from its natural rate \((u_t - \bar{u})\) to the output gap \((y_t - \bar{y}_t)\)

\[
(u_t - \bar{u}) = -(y_t - \bar{y}_t)
\]
Why the Natural Rate Hypothesis is Wrong

Next: I turn to another important question. Is the economy self-stabilizing?

This Figure plots the US unemployment rate from 1947 to 2017.
What’s Wrong with the NK Approach?

If the NRH is true, decade averages of unemployment and inflation should reveal a vertical Phillips Curve.

That is not what we see in data.
Why the Natural Rate Hypothesis is Wrong

Notice that the unemployment rate is very persistent

The persistence of a variable can be captured by its auto-regressive coefficient $\lambda$ in a simple descriptive model of the form

$$(u_t - \bar{u}) = \lambda(u_{t-1} - \bar{u}) + \epsilon_t$$
Stationary and Non-stationary Theories of Business Cycles

Is the world described by the rocking horse model?

Or is it better described by the windy boat model?

These two theories have different implications for the value of $\lambda$

Rocking Horse: $0 < \lambda < 1$

Windy Boat: $\lambda = 1$
Unemployment and the Output Gap

In the rocking-horse model, unemployment returns to its natural rate and the output gap returns to zero

\[
(u_t - \bar{u}) = \lambda(u_{t-1} - \bar{u}) + \varepsilon_t
\]

\[
(y_t - \bar{y}_t) = \lambda(y_{t-1} - \bar{y}_{t-1}) + \varepsilon_t
\]

\[
\bar{y}_t = \bar{y}_0 + gt
\]
The Rocking Horse Model

\[ u_t = \lambda u_{t-1} + \varepsilon_t^{\text{high}} \]

\[ u_t = \lambda u_{t-1} + \varepsilon_t^{\text{low}} \]

As \( \varepsilon_t \) fluctuates between \( \varepsilon_t^{\text{low}} \) and \( \varepsilon_t^{\text{high}} \), unemployment fluctuates in the set \( [u^{\text{low}}, u^{\text{high}}] \).
The effects of a shock on unemployment and the output gap in the rocking horse model.
Unemployment and the Output Gap

In the windy boat model unemployment shows no tendency to return to the natural rate and the output gap show no tendency to return to trend

\[ u_t = u_{t-1} + \varepsilon_t \]

\[ (y_t - \bar{y}_t) = (y_{t-1} - \bar{y}_{t-1}) + \varepsilon_t \]

\[ \bar{y}_t = \bar{y}_0 + gt \]
The Windy Boat Model

As $\varepsilon_t$ fluctuates between $\varepsilon_t^{low}$ and $\varepsilon_t^{high}$, unemployment follows a random walk.
The effects of a shock on unemployment and the output gap in the windy boat model.
Which of these two is a better description of the real world?

There are statistical tests that can be used to ask: Is? Under the hypothesis, $\lambda = 1$ the unemployment rate is a random walk

That assumption cannot literally be true because the unemployment rate is bounded above by 1 and below by 0
Which of these two is a better description of the real world?

But we can take a logistic transformation of the unemployment rate

\[ \tilde{u}_t = \log \left( \frac{u_t}{1 - u_t} \right), \]

a variable that lives on the real line

In the US data, the unemployment rate is so persistent that we cannot reject the hypothesis that \( \tilde{u}_t \) is a random walk
The Output Gap and Slow Recovery

We can also look at the US output gap ask; does it look more like the rocking horse model (A) or the windy boat model (B)?
US Data following the Great Recession

My answer to that question is that it looks more like picture (B)
The New-Keynesian (Rocking Horse) View of Recessions

- Recessions are temporary deviations of the unemployment rate from the natural rate of unemployment

- A shock to aggregate demand causes a temporary increase in the unemployment rate

- The economy is self-stabilizing
My (Windy Boat) View of Recessions

• Recessions are permanent movements from one unemployment steady state equilibrium to another

• A shock to aggregate demand causes a permanent increase in the unemployment rate

• The economy is not self-stabilizing
Steady State Indeterminacy

• In the remaining three lectures, I will build a DSGE model based on the theory of Keynesian Search Unemployment

• I will show that this model displays steady state indeterminacy

• I will show to close the model with a belief function that makes animal spirits into a new fundamental
Conclusion

• The New Keynesian model fails to capture Keynes’ three main ideas

1. There is a continuum of steady state equilibrium unemployment rates
2. Equilibria are selected by animal spirits which are fundamentals
3. The government has an obligation to prevent high unemployment from occurring