New Keynesian (NK) model: leading alternative to RBC model

Basic gist: some kind of friction prevents efficient equilibrium from obtaining in short run

This means there is some welfare-justification for activist economic policy
Price Stickiness

- NK model has RBC “backbone”
- Only difference is that nominal prices are assumed to be “sticky”
- Justification: menu costs, optimization frictions, etc.
Price Stickiness and “Demand”

- Assume current period prices are exogenously fixed at $\bar{P}$
- Effectively “chosen” before observing current conditions
- Firms are “required” to produce as much output as is demanded at the fixed nominal price
- Will have effect of taking $Y^s$ curve out of the picture. Demand will determine output
The LM Curve

- LM (Liquidity = Money) Curve: set of \((r_t, Y_t)\) pairs where money market is in equilibrium given a price level, \(P_t\), and quantity of money supplied, \(M_t\)
- Mathematically: \(M_t = P_t M^d(r_t + \pi_{t+1}, C_t)\)
- Upward sloping. Shifts out if \(M_t\) goes up or \(P_t\) goes down
The LM Curve: Graphical

\[ M^d(\pi_{t+1}, C_0^t) = M^d(\pi_{t+1}, C_1^t) \]

\[ M^d(\pi_{t+1}, C_4^t) \]

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In earlier model, $r_t$ and $Y_t$ were determined “first,” and then $P_t$ to make money market clear

Now $P_t$ is no longer endogenous, so this won’t work

Equilibrium occurs where $LM$ and $Y^d$ curves intersect

- $Y^d$ curve identical to before. Called “IS” curve in traditional Keynesian analysis

$Y^s$ curve not relevant
Equilibrium: Graphical
Labor Market

- Labor is not chosen optimally to maximize profits any more.
- Given a price, $\bar{P}$, output determined by intersection of $Y^d$ and $LM$ curves.
- Given that output, firms have to hire sufficient labor to produce that amount of output.
- Labor demand curve vertical – must hire sufficient amount of labor to produce the amount of output demanded independent of what the real wage is.
- Labor supply same as before.
Labor Market: Graphical
Increase in $M_t$ and Monetary Non-Neutrality

- Increase in $M_t$ shifts $LM$ curve right; higher $Y_t$ and lower $r_t$
- Higher $M_t$ with fixed $\bar{P} \Rightarrow$ higher $Y_t$ and $r_t$ must fall so that households and firms want to consume and invest more
- Money not neutral because of price stickiness
- Labor demand shifts right
Supply and Demand Shocks

- Demand shock: $\uparrow A_{t+1}$: Keynesian “animal spirits”
  - $Y_t$ increases (ambiguous in RBC), and series can co-move (because labor market clearing condition is now different)
- Supply shock: $\uparrow A_t$
  - No effect on $Y_t$. $\downarrow N_t$. Very different from RBC
- Empirical research tries to discriminate between RBC and NK predictions
Welfare in NK Model

- We saw in RBC section that equilibrium of that model was efficient.
- Equilibrium there occurs at intersection of $Y^d$ and $Y^s$ curves.
- In NK model, equilibrium occurs at intersection of $Y^d$ and $LM$ curves.
- In general, NK equilibrium is inefficient – no guarantee that $Y^d$ and $LM$ curves will intersect at point where $Y^d$ curve would intersect hypothetical $Y^s$ curve.
Welfare maximizing policy would like to make the economy reach efficient equilibrium.

How to do that?

Endogenously adjust $M_t$ such that $LM$ intersects $Y^d$ at point where $Y^d$ would intersect hypothetical $Y^s$ curve.
Example: Output too Low

- Increase $M_t$ to get to efficient equilibrium
Responses to Shocks

- Productivity / $Y^s$ shock: optimally respond by moving $M_t$ in same direction as shift in $Y^s$ curve
  - Conditional on a supply shock, optimal monetary policy is “procyclical” – move money supply in same direction as output
- “Animal spirits” / “Demand” / $Y^d$ shock: optimally respond by moving $M_t$ in opposite direction as shift in $Y^d$ curve
  - Conditional on a demand shock, optimal monetary policy is “counter-cyclical” – move money supply in opposite direction as output
Interest Rate Targeting

- In practice, central banks don’t seem to much care about monetary aggregates when setting policy
- Can re-cast optimal monetary policy here in terms of interest rate targeting
- Target real interest rate of $r_t = r_t^e$
Practical Issues

- In model of blackboard, monetary policy is easy
- In practice, it is hard
  - You’d need to know position of $Y^d$ curve and hypothetical $Y^s$ curve to determine $r_t^e$ in “real time”. Very difficult
- Rules vs. discretion: discretionary/activist policy could take actions “too late” or based on bad information and therefore be welfare-reducing
- Policy rules: set interest rates as a function of easily observable variables (e.g. Taylor Rule):

\[ i_t = i^* + \phi_\pi (\pi_t - \pi^*) + \phi_y (y_t - y^*) \]
Phillips Curve

- In NK model, central bank can affect output, but only for a while
- If they try to keep $Y_t > Y_{te}$, this will put upward pressure on prices. When they can adjust, prices will rise to shift $LM$ curve in to restore “efficient” equilibrium, which is independent of policy
- Phillips Curve: empirical correlation between output “gap”, $Y_t - Y_{te}$, and inflation, $\pi_t$
- Trying to push output above potential will lead to inflation
- But again, hard to know what potential is
Fiscal Policy in NK Model

- NK equilibrium inefficient, role for monetary policy to restore efficient equilibrium through endogenous $M_t$ / interest rate targeting
- Should fiscal policy be used for short run stabilization?
  - In normal circumstances, no
  - Changes in $G_t$ (or taxes if we are in a non-Ricardian world) affect $Y^s$, and therefore affect efficient equilibrium
  - In circumstances where monetary policy is impotent, perhaps