

Money in the RBC Model

- How can we build a macro model without money?
 - “Classical dichotomy” says that real side operates independently of monetary forces: “money is a veil”
- How would we add money?
 - Need a reason to hold it
 - Balancing cost of making transactions with less money against forgone interest
- Definition of money
 - Means of payment or medium of exchange
 - M1 = narrow money (checking accounts and currency)
 - M2 = broader money (savings accounts, small CDs, etc.)
- Supply of money
 - Central bank controls issue of “monetary base”
 - Ratio of money supply to monetary base is money multiplier that depends on public’s propensity to hold currency and banks’ propensity to hold reserves
 - Central bank controls B and thus attempts to control M
- Demand for money
 - Balancing benefits (cheaper transactions) against costs (forgone interest)
 - $M^d = P \cdot L(Y, i, TC) = PY^\eta i^\varepsilon TC^\xi$
- Monetary equilibrium in a growth model
 - Suppose that Y grows at $n + g$
 - Central bank increases money supply at rate μ
 - In equilibrium: $\mu = \frac{\dot{M}^s}{M^s} = \frac{\dot{M}^d}{M^d} = \frac{\dot{P}}{P} + \eta \frac{\dot{Y}}{Y} + \varepsilon \frac{\dot{i}}{i} + \xi \frac{\dot{TC}}{TC}$
 - In steady state:
 - $\frac{\dot{P}}{P} = \pi$
 - $\frac{\dot{Y}}{Y} = n + g$
 - i and TC are unchanging
 - $\mu = \pi + \eta(g + n)$
 - Some evidence that $\eta = 1$, so $\pi = \mu - (n + g)$
 - If growth of money supply exceeds growth of money demand, inflation makes up the difference
 - Steady-state properties:
 - $\frac{\partial \pi}{\partial \mu} = 1$

Traditional Models of Macroeconomics

This material reflects 2014 revision of coursebook Chapter 2, (now Chapter 8) covering income-expenditure, quantity theory, *IS/LM*, and *AS/AD* models briefly.

Why are there multiple models?

- Models are built to explain specific aspects of macroeconomy: These various models explain different aspects and different historical phenomena.
- Income-expenditure model: Core of demand-based theory of output determination that has relevance in period like Great Depression
- *IS/LM*: Refined version of income-expenditure model that “reins it is” a bit
- Quantity theory: Good explanation of long-run money-inflation connection
- *AS/AD*: Attempt to connect insights of *IS/LM* and similar models about the short run with the quantity theory’s predictions about the long run

How do these models relate to the modern macro theories we will discuss?

- To a considerable degree, modern theories attempt to put microfoundations under the simple models: For example, the new Keynesian *IS* curve and new Keynesian Phillips curve.
- Most of what we do in the course can be summarized in a basic *AS/AD* framework if we want to.

Quantity theory

- Assumptions
 - Output is totally supply-determined; *AS* is perfectly inelastic at “natural output”
 - Efficient output is what perfectly efficient economy would produce with current endowments of resources and current preferences about work, saving, etc.
 - Natural output is the (smaller) amount that an economy would produce when the microeconomic imperfections such as monopolies, taxes, etc. are taken into account.
 - Actual output may be above or below natural output depending on macroeconomic conditions—but not in the quantity theory where $Y = Y_n$ by assumption.
 - Money demand is assumed exogenous (and not clear how to change model to endogenize)
 - Simplistic theory of money demand (constant velocity)

- Endogenizing velocity (by relating to interest rate) delivers a model not unlike *IS/LM*
- Assessing the assumptions
 - Perfectly inelastic AS is probably reasonable in long run
 - Can be combined as theory of AD with other AS models
 - Theory of AD is simplistic in the extreme
- Key insights
 - Money is neutral
 - Relationship (which seems reasonably accurate in long run) among money growth, real growth, and inflation: $\pi = \mu - g_Y$

Income-expenditure model

- Assumptions
 - Output is demand-determined (AS is perfectly elastic)
 - All components of spending except consumption are exogenous
- Assessing the assumptions
 - Perhaps reasonable in severe depression with much unused capacity
 - Investment in severe depression is probably more sensitive to prospects for future output than to interest cost
 - If higher current output signals higher expected future output, then this would argue for $I(Y)$ alongside $C(Y)$, which would make the multiplier larger.
 - Lacks strong microfoundations: Keynes's "fundamental psychological law"
- Key insights
 - Exogenous increases in spending (from whatever category) raise income, which cause further increases in spending
 - Has provided argument for "fiscal stimulus" from the New Deal to the 2009 American Reconstruction and Recovery Act

IS/LM model

- Assumptions
 - Embeds the income-expenditure model in a framework that endogenizes the interest rate and investment
 - Incorporates equilibrium in money-holding (asset markets) alongside income-expenditure equilibrium
 - Money supply is assumed exogenous
 - Retains the assumption of perfectly elastic AS, if we think of *IS/LM* as determining Y with fixed/given P

- Assessing the assumptions
 - Makes investment assumption more relevant for non-depression economy, but the perfectly elastic AS is problematic
 - Modern central banks operate using rules that endogenize M
 - This can be incorporated quite easily: Romer's *IS/MP* model replaces the *LM* curve with monetary-policy reaction function
 - Still lacks strong microfoundations
 - If combined with realistic AS curve, can be more appropriate for non-depression economy
 - Assumptions were convincing enough to attract most macroeconomists from the 1930s through the 1960s
- Key insights
 - Multiplier is limited by crowding out
 - Models stimulative role of monetary policy
 - Can be combined as theory of AD with other AS models

Romer's IS/MP variant

- Most central banks now target an interest rate rather than money supply
- *MP* curve reflects this by modeling central bank's decision rule: $r = r(\ln Y - \ln \bar{Y}, \pi)$
 - *MP* curve slopes upward and depends on π

Aggregate supply/Aggregate demand model

- Assumptions
 - Aggregate demand curve based on *IS/LM* or quantity theory
 - Short-run aggregate supply curve that slopes upward due to one of several variant models:
 - Wage stickiness
 - Price stickiness
 - Imperfect information
 - Long-run aggregate supply curve is vertical at natural output
- Assessing the assumptions
 - Weak microfoundations for AD, but somewhat better for AS
 - Framework is flexible enough to allow lots of variations in specific models for both AD and AS
- Key insights
 - Aggregate demand can affect output in the short run but should not be a major factor in the long run
 - Long-run inflation is determined similarly to quantity theory

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- We can reconcile simple Keynesian ideas (income-expenditure, IS/LM) with long-run inflation behavior and long-run neutrality of money