1. IS-LM-AS as a general equilibrium model

- In which way do fiscal and monetary policy affect key macroeconomic variables; i.e. output, unemployment, interest rates, inflation and the price level?
- Is there a useful role for macroeconomic policy?
- What should be the aim of policy in the short and in the long run?

In order to answer these questions we need a model.

A model is a stylized (simplified) representation of reality. A model embodies assumptions about the **economic environment,** that is:

- How agents, both private (individuals) and public (policymakers), behave and what do they know ("microfoundations")
- How do agents interact ("market structure")
- What variables are exogenous.
- Constraints on available resources and on price and quantity adjustment
- Equilibrium concept (e.g. market clearing)

The solution to this problem is an **equilibrium,** that is:

"The value of all the endogenous variables (quantities and prices), as a function of the given exogenous variables, which satisfies the equilibrium concept assumed".

Models should be simple enough to provide useful insight, yet refined enough not to leave out any aspect which is crucial to the problem at hand. Do not need to be "realistic", but consistent with facts.

One can switch between models according to the issue one wants to understand.

Real world: many agents, products, assets, factors of production. A lot of markets are interrelated in a fundamental way.

The appropriate tool is general equilibrium. Disequilibrium on some markets feedbacks onto others.

Also dynamics is important. The future short run affects:

- the *present* short run if agents are forward-looking
- the *future* long run because today's flows affects tomorrow's stocks (e.g. today's investment increases tomorrow's capital stock)

Ideally, we would want to work with a dynamic general equilibrium model. Yet, this easily becomes intractable and intuition less straightforward.

For the time being we overlook dynamics and concentrate on static general equilibrium. This is what the IS-LM-AS framework is about.

IS-LM-AS model

- Aggregate model (microfoundations disregarded), one product, one factor, two assets.
- Why two assets and not one? One (money) has got a very special function: it is a medium of exchange in addition to a store of value.
- 4 markets but only 3 equilibrium conditions: Walras' law.

Exogenous variables

Taxes, government expenditure, money supply, inflationary expectations.

Equilibrium concept

Market clearing in all markets.

Goods market equilibrium

Home production = total desired expenditure on the home product

$$Y = C_d + I_d + G_d + X \tag{1}$$

or

$$\begin{aligned} Y &= C - C_f + I - I_f + G - G_f + X = \\ &= C + I + G + X - M \end{aligned} \tag{2}$$

where $C = C(Y - \overline{T})$ and $I = I(r)$.

$$IS \qquad Y = C(Y - \overline{T}) + I(r) + \overline{G} + X - M \tag{3}$$

This can be rewritten as

$$Y - T - C + T - G = I + X - M \tag{4}$$

$$S_P + S_G = I + X - M \tag{5}$$

In a closed economy $X - M = 0$.

Asset markets equilibrium

Money supply = money demand

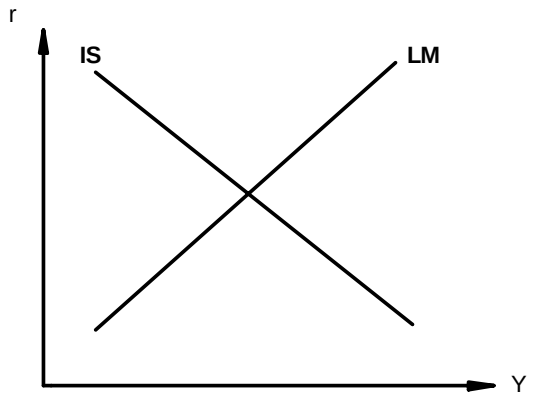
$$LM \qquad \frac{\overline{M}}{P} = L(Y, i) \tag{6}$$

Using $i = r + \overline{\pi}$ (Fischer equation) we can write

$$LM \qquad \frac{\overline{M}}{P} = L(Y, r + \overline{\pi}) \tag{7}$$

By Walras' law money market equilibrium implies bond market equilibrium.

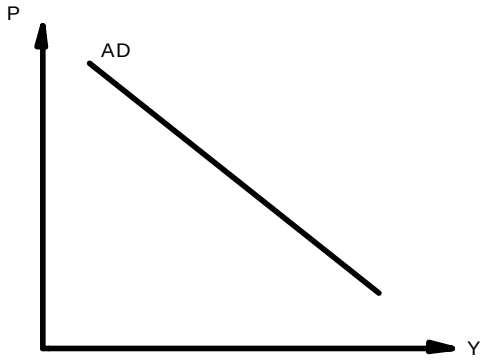
$W = B^d/P + L^d$, but also $W = B^s/P + M^s/P$ (total assets in circulation cannot exceed total wealth W).



The two equilibrium conditions IS and LM are not sufficient to determine the equilibrium of our model.

The equilibrium is a vector of endogenous quantities and prices $[Y, r, P]$. Three endogenous variables but only one equations. IS and LM alone determine a whole locus of possible combinations of Y and P for which desired expenditure equals production (no undesired accumulation of inventories) and assets markets clear.

This locus is the AD curve.



We need one more equilibrium condition.

Labour market equilibrium

Firms maximize profits subject to technological constraint

$$\text{Production function} \qquad Y = F(L) \qquad (8)$$

This gives

$$\max_L PF(L) - wL \tag{9}$$

$$FOC \qquad F'(L) = \frac{w}{P} \tag{10}$$

This gives the labour demand curve.

One more endogenous variable: the nominal wage w.

We need one more equation: labour supply.

$$\frac{w}{P} = g(L) \tag{11}$$

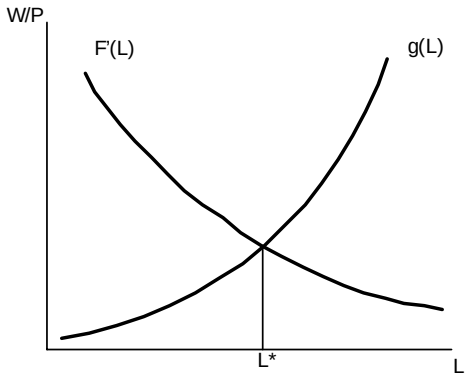
Upward sloping provided income effect is not too strong.

If wages and prices are perfectly flexible, labour market clearing determines equilibrium employment $\bar{L}$:

$$F'(L^*) = g(L^*) \tag{12}$$

This determines equilibrium output $Y^* = F(L^*)$.

The locus which describes equilibrium on the labour market in the output-price space is the AS curve.



Equilibrium

Vector $[L, Y, r, P, w]$ such that labour, money and asset markets clear.

We need five equations to determine the five endogenous variables. The labour market provides three equations (production function, L^d and L^s) and determines the equilibrium values of the three endogenous variables w/P, L and Y.

Output is determined on the labour market alone.

$$AS \qquad \bar{Y} = F(\bar{L}) \tag{13}$$

The goods market then determines the real interest rate

$$IS \qquad \bar{Y} = C(\bar{Y} - T) + I(r) + G \tag{14}$$

and the money market the price level

$$LM \qquad \frac{M}{P} = L(\bar{Y}, r + \pi) \tag{15}$$

The system is recursive. All real variables are determined on real markets, while the money market determines only the price level (nominal variables).

This property is called **Classical dichotomy.**