## 6.  The Money Market and the LM Curve

This is the second relationship between real income ($Y$) and the interest rate ($r$), and occurs in the "money market", or financial sector of the economy (as opposed to the "real" sector of goods and services).  How does monetary policy change the interest rate and, indirectly, planned autonomous spending and the level of real income?

The *money supply* ($M^s$) consists of two parts:[1]

-   currency ("cash"), and

-   current accounts at trading banks ("cheque accounts")

The money supply is controlled by the Reserve Bank of Australia (RBA) through its ability to buy or sell government bonds, and its control over the cash/deposit ratio or liquidity ratio or prime assets ratio of Australian banks: each bank must hold liquid (or "prime") assets equal to a certain percentage of its deposit liabilities.  Such assets are liquid and riskless, but earn little or no interest for the banks.

### 6.1  Income and the demand for money

We now link money supply, income, and the interest rate: the demand for money in real terms depends on both income and the interest rate.

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1.  This is the narrowest definition of money, known as M1.

Traditionally, money has several functions:

- as a medium of exchange (to avoid barter)

- as a standard of value (in which to express prices)

- as a unit of account (to measure income, expenditure, and wealth)

- as a store of savings (as a non-interest-bearing asset)

Substitutes for money as an asset are interest-bearing savings accounts and other interest-bearing assets such as bonds and shares.[2] The cost of holding money rather than these substitutes is the interest forgone, a cost which rises as interest rates rise.

*Some* holding of money is necessary to facilitate transactions, from the first three functions of money, since shares and bonds are not as liquid as money: even if consumers pay with cheques and credit cards, they must have money in their bank deposits to settle these accounts.

Because, to quote Jay Gatsby, the rich are different from you and me — they have more

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2. Today, in the post-deregulation regime, it is possible to find bank deposits which pay interest on cheque accounts, which means that some interest is paid on M1.  But the average interest on M1 is much less than the interest paid on high-interest deposits, which are not perfect substitutes for "money".

money — the demand for *real money balances* increases with income and wealth. (Real money balances are defined as total money supply divided by the price level.)

Changes in real income ($Y$) alter the demand for money in real terms:

$$\left[\frac{M}{P}\right]^d = hY,$$

where the superscript $d$ means "the demand for", and $h$ is the increase in the demand for real money balances from a $1 increase in real income.

## 6.2  The interest rate and the demand for money

The relationship in the above equation is unrealistic, since a higher interest rate will induce a lower level of demand for money as the opportunity cost of holding money — with low or zero interest payments — grows: money is convenient, but what is the price of convenience?

Money demand is negatively related to the interest rate:

$$\left[\frac{M}{P}\right]^d = hY - fr,$$

where $f$ is the money-demand responsiveness to a higher interest rate. (We use $h = 0.5$ and $f = \$5$ billion per percentage point.) When real income is $200 billion and the interest rate is zero, the demand for real balances is $100 billion, but when the interest rate rises to 5% p.a., people put up with greater inconvenience to cut down their

money holdings to \$75 billion, and when $r = 10\%$ p.a., to \$50 billion.

A change in the interest rate moves the economy *along* its real money demand schedule; a change in real income or output *shifts* the schedule.
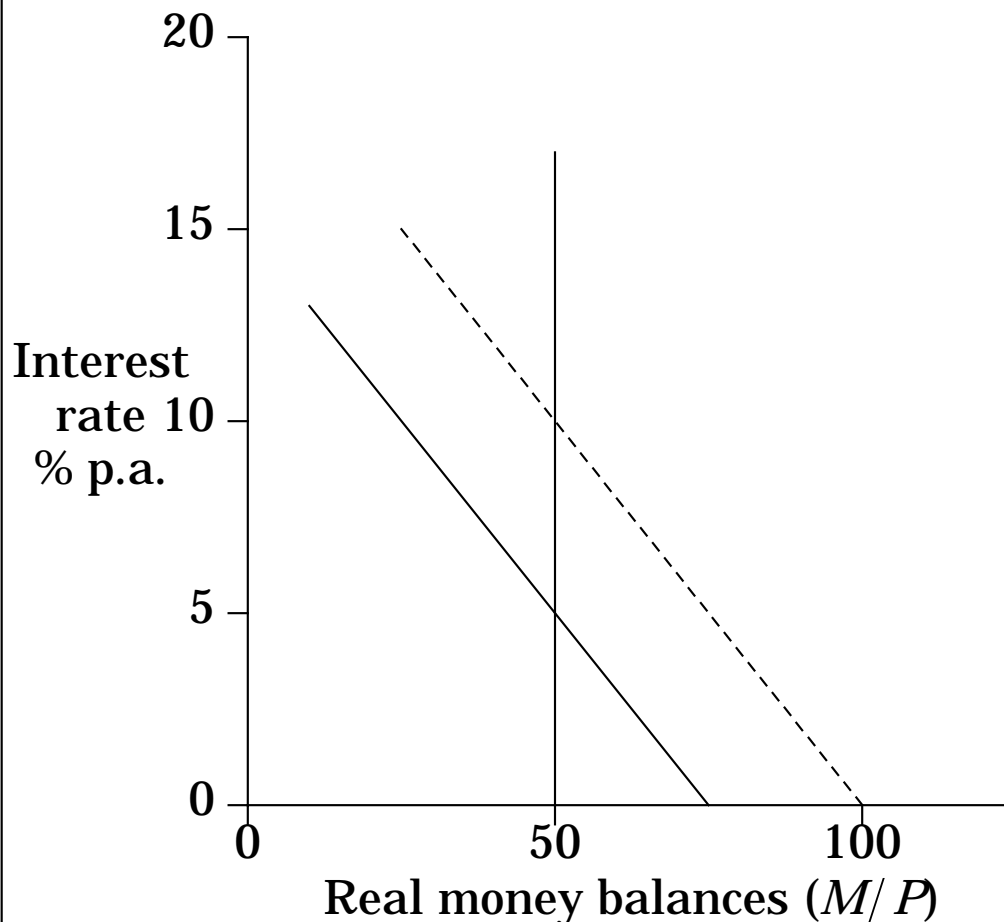


*6.2.1 The LM schedule:* Equilibrium in the money market requires:

$$\left[\frac{M^s}{P}\right] = \left[\frac{M}{P}\right]^d = 0.5\,Y - 5r$$

If the amount of money exogenously supplied by the government ($M^s$) is \$50 billion and the price index ($P$) is set at 1.0, then $M^s/P$ equals \$50 billion. For simplicity, the supply of money is

assumed completely interest-rate inelastic in the figure.

*6.2.2  How to derive the LM curve:* The sloping money demand line for an income of $200 billion intersects the $M^s/P$ line at $r = 10\%$ p.a.: the demand and supply of money equal $50 billion and the money market is in equilibrium.  At a lower level of income ($Y$) the money market is in equilibrium at a lower interest rate, as shown.

*6.2.3  What the LM curve shows:* The *LM curve* or schedule shows all combinations of income ($Y$) and interest rate ($r$) consistent with equilibrium in the money market, for a given exogenous level of money supply ($M^s$): on the LM curve, the demand for money equals the supply for money.

At points off the LM curve, the money market is not in equilibrium:  to the right of the LM curve the demand for real money exceeds the supply; to the left, there is excess supply of money.

## 7.  Shifting and Tilting the LM Curve

The effects of monetary and fiscal policy differ, depending on the slopes of the IS and LM curves.

Intuitively, as income increases, the demand for money rises to finance a greater number of transactions, but, because the money supply is fixed, money demand exceeds money supply, and the economy is to the right of the LM curve. Money-market equilibrium would require an increase in interest rates to reduce the demand for money by enticing asset holders to switch from money to interest-yielding assets until money
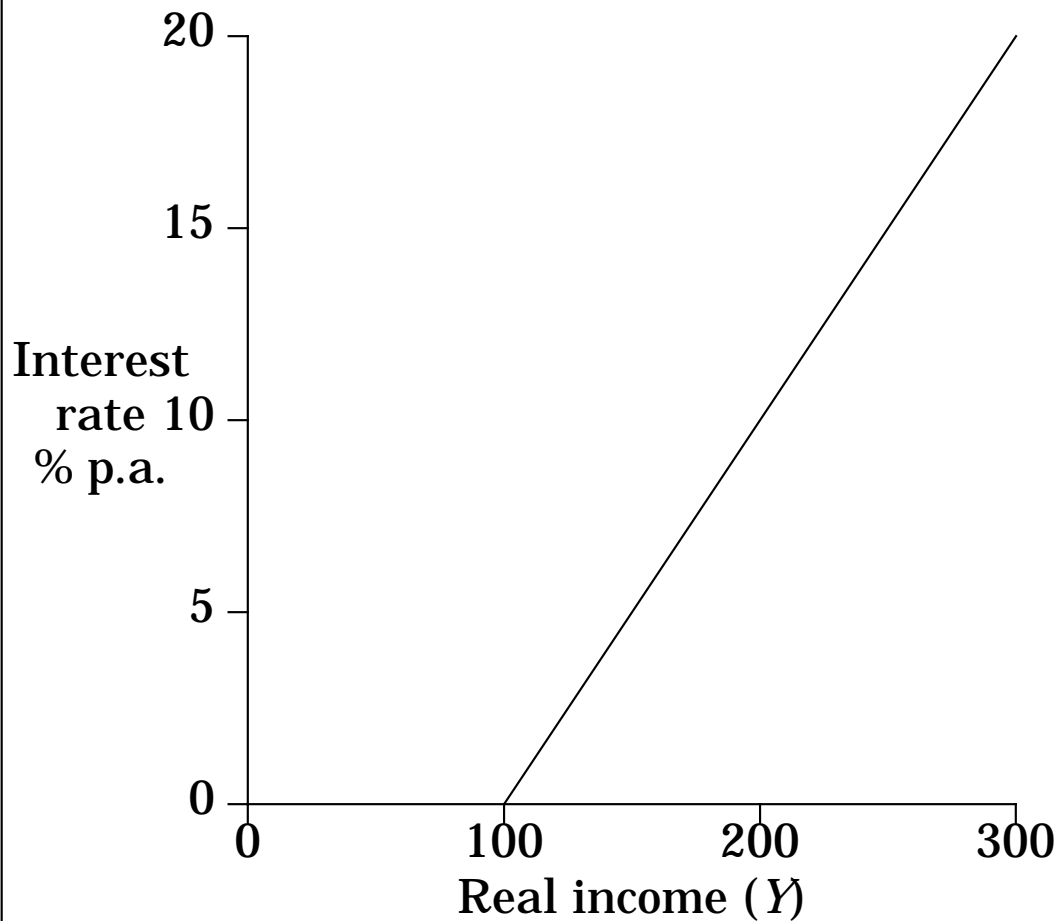
demand again equals money supply (exogenously fixed).

## 7.1 Why does the LM curve slope up?

An increase in $r$ induces people to carry less money per dollar of income:  it has the effect of "stretching" the available money supply to support a higher level of real income.

Along any given LM curve, the level of real money balances ($M^s/P$) is fixed, but the real income ($Y$) varies.  The ratio of real income to real balances is called the *velocity* of money ($V$):

$$\text{velocity } (V) \equiv \frac{Y}{M^s/P} \equiv \frac{PY}{M^s}$$

*V* is the average number of times per year that the money stock is used in making payments for final goods and services.

The higher the interest rate *r*, the higher the velocity *V*: people wish to hold less money, but supply is fixed. To maintain equilibrium in the money market, there must be an increase in income to induce households to hold the fixed existing quantity of money. Anything that induces the economy to move along a fixed LM curve achieves a change of velocity by altering *Y* while $M^s/P$ is fixed.

## 7.2 Shifts in the LM curve

If the RBA alters $M^s$, the nominal money supply and the price level *P* is fixed, then the real money supply ($M^s/P$) will change. An increase in the real money supply will make possible more income, and the LM curve will shift to the right.

## 7.3 The slope of the LM curve

The slope of the LM curve measures the extra dollars of income made possible by a higher interest rate. This is the product of two components:

- *f*, the money-demand responsiveness to a higher interest rate (We use $5 billion per percentage point), and

- $1/h$, the number of dollars of extra income needed to absorb each dollar of money released by the higher interest rate (Gordon and us: 2.0)

For a zero degree of responsiveness of money demand to a higher interest rate (or a zero interest-rate elasticity of money demand), the LM curve will be vertical; for an infinite interest rate elasticity of money demand, horizontal (as in the previous chapter with a fixed, exogenous interest rate).