EPA143A – Macroeconomics for Policy Analysis
Week Two

NEOCLASSICAL MACRO-ECONOMICS

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LECTURE NOTE W-2

The required readings of Week 2 are:

- Lecture Note EPA143A Week 2.
- S. Storm. 2017. A critique of the loanable funds approach. (Posted on Brightspace)

Supplementary videos:

- The market for loanable funds: https://www.youtube.com/watch?v=ztGksVnQahQ
- The market for loanable funds: https://www.youtube.com/watch?v=iaGjqkRIUSk

Lecture Note W-2 and the exercises are exam materials.

NEOCLASSICAL MACRO-ECONOMICS

Introduction

We begin by highlighting a number of key concepts and assumptions of the neoclassical model.

- In the neoclassical macro-economic model, it is assumed that the economy as a whole has an inbuilt tendency toward 'full-employment' equilibrium. A number of mechanisms ensure (so it is assumed) that the economy converges to an outcome in which productive capacity is fully utilised and unemployment is zero.
- The so-called 'production factors' labour (L), capital (K), and land or nature (N) have a 'price' and are traded in 'markets'. Capital, K, stands for the means of production, or capital goods. Factor prices are fully flexible and adjust in order to bring about a balance between supply and demand. Factors markets as well as goods markets clear by means of the price mechanism: in case of an excess supply (demand), the price will decline (rise), until supply equals demand.
- In the neoclassical approach, consumers are assumed to be utility-maximisers, firms are profit-maximisers. Both firms and households respond to changes in relative prices, including the real wage or 'price' of labour (W/p), the real price of capital goods (Π/p), and the real interest rate.
- In the neoclassical model, investment (I) in the means of production (K) is financed out of available savings S. Savings are the source of the so-called 'loanable funds' that entrepreneurs can borrow in order to purchase means of production. The supply of loanable funds is savings (from households and firms), which may be deposited in banks. The demand for loanable fund is equal to investment. The loanable funds market clears via adjustments in the (real) interest rate. Banks operate on the loanable funds market as intermediaries between savers and investors.
- Government spending in the neoclassical model crowds out private expenditure. Crowding out occurs because an increase in public expenditure will raise the (real) interest rate in the loanable funds market; we will see below how this works.
- Money does not feature in the neoclassical model. To explain money, neoclassical economists use a monetary theory which says that money is neutral. The classical dichotomy between the real and the monetary sphere of the economy is upheld. That is, changes in the quantity of money do not originate in the economy and, *vice versa*, do not influence the economy. An (exogenous) increase in the quantity of money may increase the *overall* price level but will not affect relative prices.
- In order to prevent inflation (increases in the overall price level), the central bank should observe a money growth rule. Theoretically, inflation (a rise in the general price level *p*) has no impact on real GDP, unemployment, savings, and investment.

We begin our explanation of the neoclassical macro-economic model by looking at the so-called factor markets: the markets for labour and capital goods (machines).

Step 1: The neoclassical markets for labour and capital goods

The neoclassical labour market is depicted in Figure 1. On the horizontal axis of Figure 1, we measure labour supply (millions of workers) and labour demand (millions of workers). On the vertical axis, we measure the real wage (*W*/*p*), which is the nominal wage *W* divided by an index of the general price level *p*. Labour supply depends on the labour force which is a function of population growth. In the neoclassical model, labour is assumed to be unpleasant, or a 'disutility'; therefore, labour supply varies with the real wage (*W*/*p*). The supply of labour will expand only when the real wage rises and decline when the real wage falls. To see how the labour market works, let's avoid such complications to start with, and assume that labour supply L^S is exogenous $\left(L^S = \overline{L^S}\right)$. That is, we assume for the moment that labour supply does not change in response to changes in the real wage (*W*/*p*). In Figure 1, L^S is a vertical line. Labour demand (in the economy as a whole) is a function of output (*x*) and the real wage (*W*/*p*), or $L^D = \alpha\, x \left(\frac{W}{p}\right)^{-1}$, where $L^D =$ the demand for labour, and α is a constant. The labour demand function is based on profit-maximising decision-making by firms.

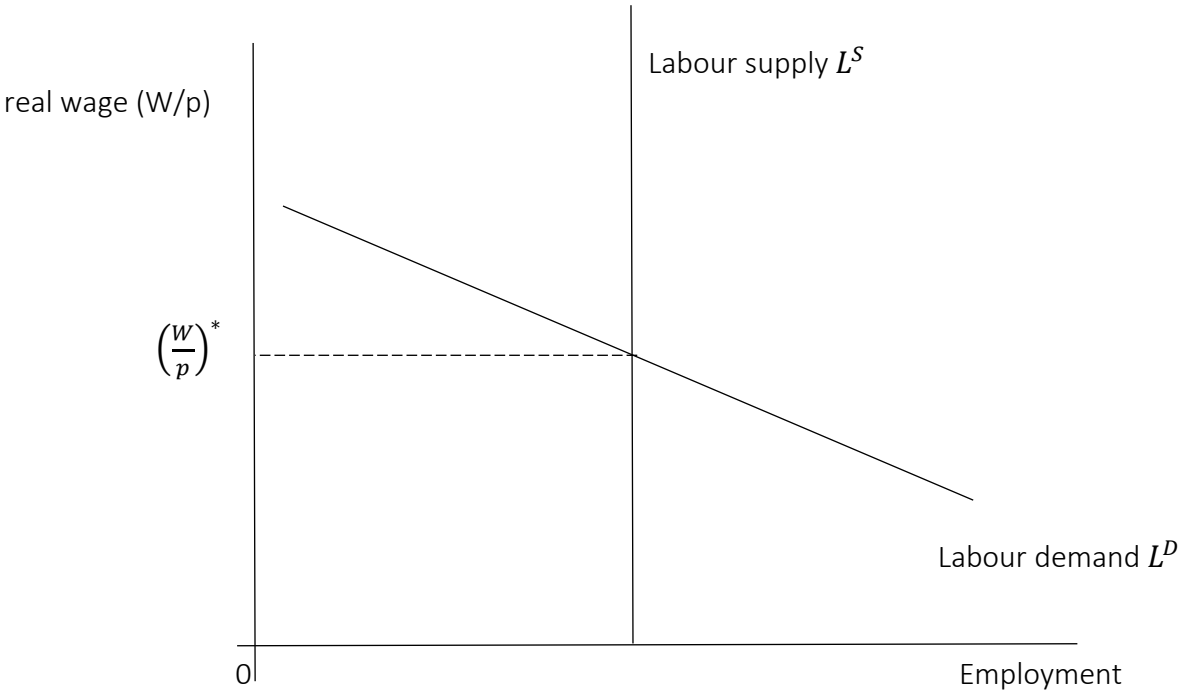


Figure 1: The Neoclassical Labour Market

The aggregate labour market is in equilibrium if $L^S = \overline{L^S} = L^D$; this occurs at the equilibrium real wage $\left(\frac{W}{p}\right)^*$. This outcome is called the 'full-employment' outcome (because at this point, unemployment is zero). Like the goods market, the 'labour market' is assumed to be a perfectly competitive market which clears by means of adjustments in the real wage (brought about by the "invisible hand"). The equilibrium real wage $\left(\frac{W}{p}\right)^*$ is the market-clearing 'price' of labour.

To illustrate how the neoclassical labour market works, consider the following experiment: exogenous labour supply L^S declines because of an ageing labour force. The L^S-curve will then shift to the left. This is illustrated in Figure 2.

The labour demand curve does not change. Due to the decline in labour supply, an excess demand for labour arises – and as a result, the real wage (*W/p*) rises. The real wage continues to increase until $L^S = L^D$. The labour market now clears at the higher equilibrium real wage $\left(\frac{W}{p}\right)^{NEW}$; the economy remains at full employment. Whatever happens to labour supply or labour demand, the invisible hand will ensure that the market converges to an equilibrium real wage at which $L^S = L^D$.

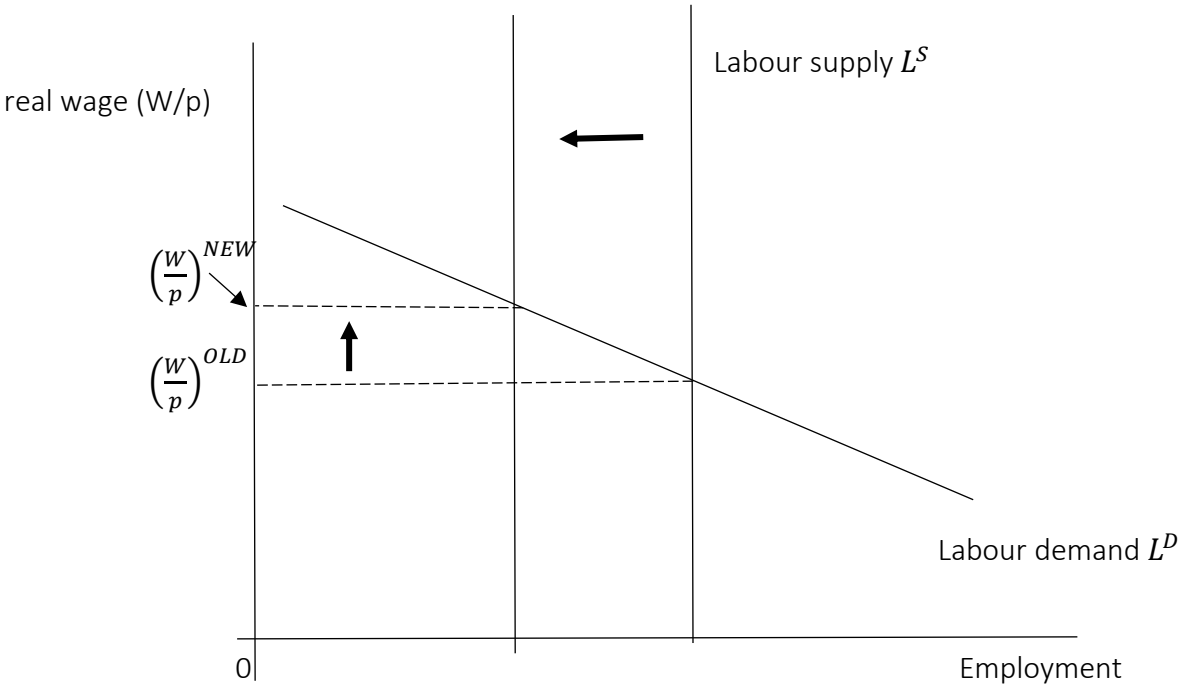


Figure 2: The Neoclassical Labour Market: L^S declines.

Let's now consider the market for capital goods (machines). Machines being goods, we are now in a goods market. Figure 3 illustrates the neoclassical capital goods market. $K^S = \overline{K^S}$ is the

supply of capital goods, which (for simplicity) we will assume to be fixed in the short run. K^D is the demand for capital goods, which is a function of output (*x*) and the real price of capital goods (*Π*/*p*), or $K^D = \beta\, x \left(\frac{\Pi}{p}\right)^{-1}$, where x = output and *Π* = the price of capital goods. The market for capital goods is in equilibrium at price (*Π*/*p*)* which ensures that $K^S = \overline{K^S} = K^D$.

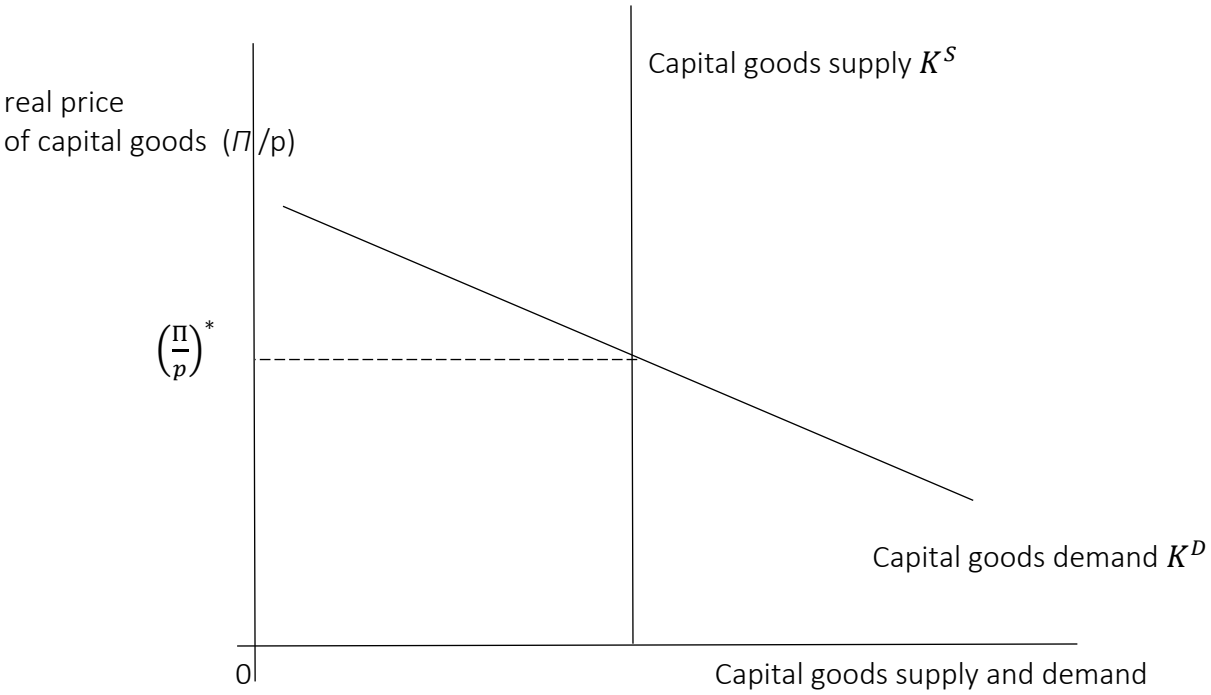


Figure 3: The Neoclassical Market for Capital Goods

To summarise, the price mechanism will ensure (supply-demand) equilibrium in the two factor markets discussed above, or:

(1) $$L^S - L^D = \overline{L^S} - \alpha\, x \left(\frac{W}{p}\right)^{-1} = 0$$

(2) $$K^S - K^D = \overline{K^S} - \beta\, x \left(\frac{\Pi}{p}\right)^{-1} = 0$$

In other words, there exists an equilibrium real wage $\left(\frac{W}{p}\right)^*$ at which labour demand is equal to labour supply, and at which the labour force is fully employed (there is no unemployment). Likewise, there exists an equilibrium real price of capital goods $\left(\frac{\Pi}{p}\right)^*$ at which capital goods demand is equal to the supply of capital goods, and there is no underutilisation of productive

capacity (all machines are in use). In other words, the neoclassical economy operates at full employment of all production factors.[1]

Step 2: The neoclassical circular flow of income

Let us now move from the factor markets to the circular flow of income – and we will enter the circular flow at the stage of production. In the neoclassical model, the production process is described by a production function, for example the following Cobb-Douglas production function:

(3) $x = a\, L^{\alpha} K^{\beta}$

Output *x* is a multiplicative function of the inputs of labour (L) and capital (machines, K); *a* is a constant scale factor. The exponents α and β are technical coefficients (assumed to be constant). For simplicity, we assume a fixed supply of labour $\left(L = \overline{L^S}\right)$ and capital $\left(K = \overline{K^S}\right)$. Since neoclassical theory assumes full employment, the fixed levels of supply of labour ($\overline{L^S}$) and capital ($\overline{K^S}$) represent the maximum levels of supply of labour and capital. This gives:

(4) $x^{FE} = a\, (\overline{L^S})^{\alpha} (\overline{K^S})^{\beta}$, where x^{FE} = full-employment output.

Let us now look at the circular flow of income in Figure 4. Note that upper-case characters (for example, I) are used for nominal values; lower-case letters denote real values $(i = I/p)$.

In the Neoclassical model, the supply of goods equals the demand for goods at the full-employment level of output. How is this equilibrium brought about?

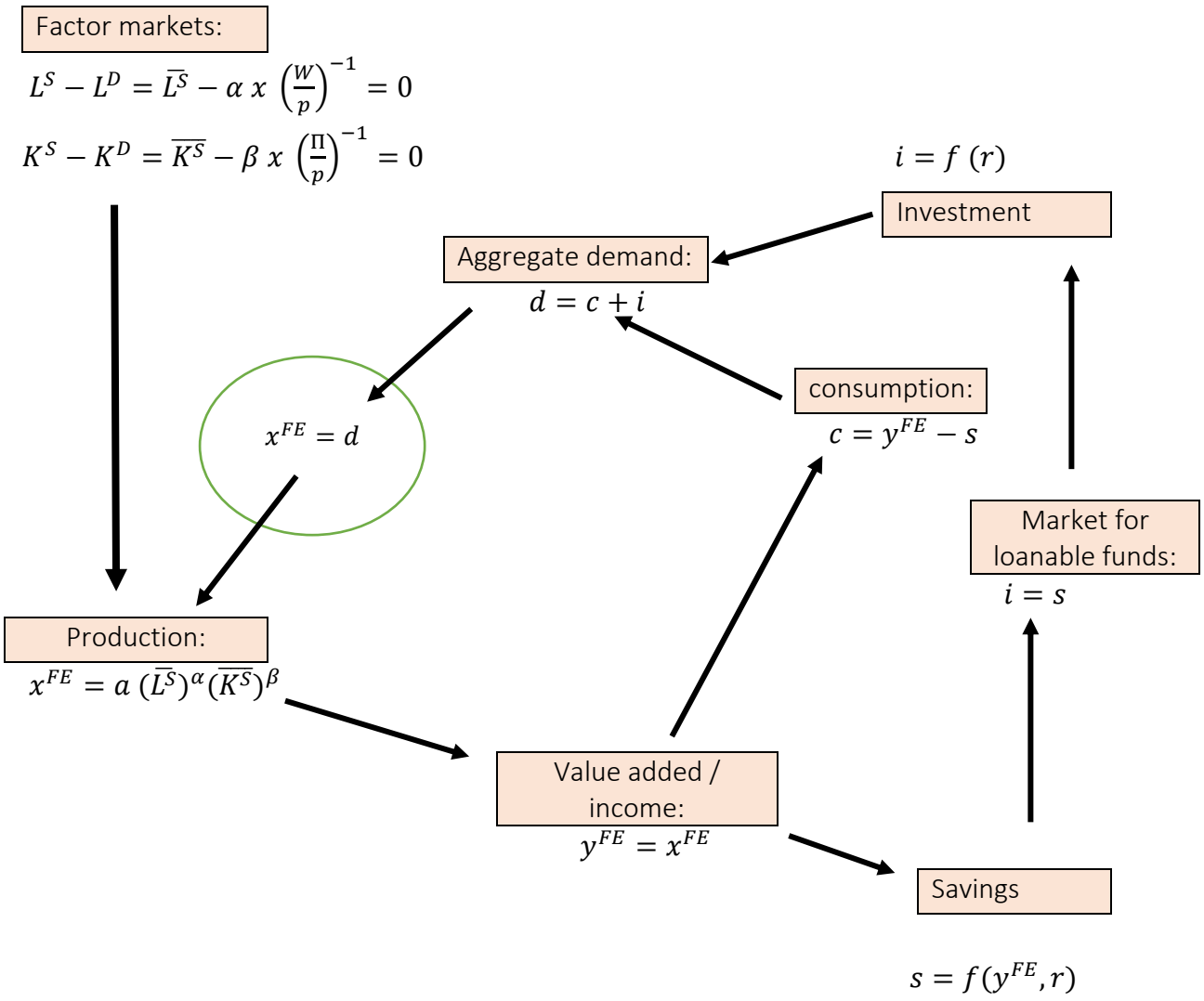
If production x is at full employment (x^{FE}), then income – or value added – must also be at its full-employment level (y^{FE}; see Figure 4). (Real) income is used for two purposes: consumption (*c*) and savings (*s*). Savings depend positively on y^{FE} and the real interest rate *r*. An increase in income will lead to higher savings; likewise, if the real rate of interest rises, people will increase their savings.

However, savings constitute a leakage out of the circular of flow of income. Let us assume that 20 per cent (one-fifth) of income is saved. These savings (by households and firms) are deposited with banks. Consumption demand (equalling 80 per cent of income) contributes directly to aggregate demand (d). Consumption is income spent on consumption goods; this income stays within the circular flow (see Figure 4). However, what happens to savings?

[1] To avoid further complication, we will abstain for the time being from a discussion of the market for land (or nature).

Figure 4

The circular flow of income: the neoclassical model



Savings leave the circular flow as they are deposited in banks. Unless they are re-invested, aggregate demand will fall short of full employment output (x^{FE}), due to the presence of the savings leakage. Suppose x^{FE} = 100, y^{FE} = 100, consumption *c* = 80, and savings *s* = 20. Unless savings re-enter the circular flow, aggregate demand will drop to 80 $(d = 80)$. Production will decline correspondingly, because firms are facing a shortage of aggregate demand. In the neoclassical model, this will not happen. How is the full-employment level of output maintained? Our model is not yet complete. One crucial market – the market for loanable funds – is still missing.

Step 3: The neoclassical market for loanable funds

What happens in the market for loanable funds? Banks receive savings as deposits. In the Neoclassical model, banks are profit-maximising firms. Profit-maximizing banks will use savings (or loanable funds) to provide loans to firms to enable them to buy means of production. That is, the supply of loanable funds (= savings) is used to provide firms with the money they require to invest. The intermediating role of banks is conceptualized as a market – a market for loanable funds (see Figure 5). This market is also a perfect market in which the real interest rate (= the price of loanable funds) clears the market. How is this supposed to work?

Let us consider the following (neoclassical) market for loanable funds:

(1) $\varphi^S =$ savings supply $= f(y^{FE}, r)$

(2) $\varphi^D =$ investment demand $= f(r)$,

where $\varphi^S =$ the supply of loanable funds (in billions of euros); $\varphi^D =$ the demand for loanable funds (in billions of euros); and *r* = the real rate of interest (per cent). Savings or loanable funds supply increases when the real interest rate goes up (because people will be more inclined to save). Investment or demand for loanable funds declines when the real rate of interest goes up, because it becomes more costly for firms to borrow to finance investment; firms will postpone or cancel their investments because the expected rate of return on investment falls. These two equations give the two curves (a cross) in the figure for the neoclassical loanable funds market (Figure 5).

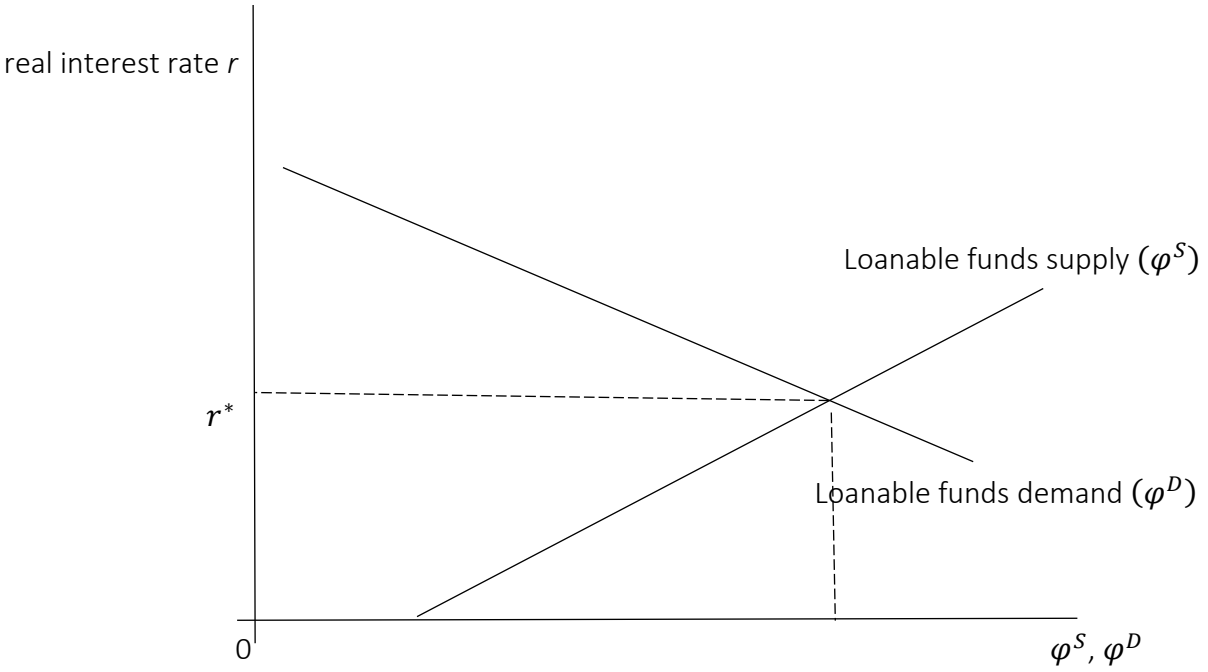


Figure 5: The Neoclassical Market for Loanable Funds

What will happen when $\varphi^S > \varphi^D$, *i.e.* when there is an excess supply of savings? Banks (the intermediating institutions) are flushed with funds and the only way to make these profitable for them is to turn these funds into (interest-bearing) loans to firms. Firms will only take additional loans when they expect their investment projects to be (sufficiently) profitable. Hence, banks will reduce the interest rate. In response to the decline in r, investment and φ^D will go up, while savings (φ^S) will go down, until equilibrium is reached. (You may think out for yourself what will happen when $\varphi^S < \varphi^D$.)

The loanable funds market is of critical importance to the neoclassical approach. A crucial Neoclassical assumption is that savings always return to the economy because in the loanable funds market *all* savings are converted into investment. Changes in the interest rate will take care of this. Hence, if *s* = 20, then investment will also equal 20; as a result, *d* = 100 and the economic system will continue to operate at full employment, *i.e.* $x^{FE} = y^{FE}$.

We can now – finally – return to the factor markets. With the economy operating at a level of output where $x^{FE} = y^{FE} = 100$, the demand for the factors of production, $L^D = \alpha\, x^{FE} \left(\frac{W}{p}\right)^{-1}$ and $K^D = \beta\, x^{FE} \left(\frac{\Pi}{p}\right)^{-1}$, can now be derived. Adjustments in the wage rate and in the price of capital goods (the 'price mechanism') will ensure that $L^S - L^D = L^S - \alpha\, x^{FE} \left(\frac{W}{p}\right)^{-1} = 0$ and $K^S - K^D = K^S - \beta\, x^{FE} \left(\frac{\Pi}{p}\right)^{-1} = 0$, so that full employment is achieved in the markets for labour and capital.

Fiscal policy in the neoclassical model: public spending crowds out private spending

What is the macroeconomic impact of fiscal stimulus in this neoclassical model? To answer this question, we must first specify what fiscal stimulus means. Fiscal stimulus (or expansionary fiscal policy) can involve:

- an increase in public current expenditure (g)
- an increase in public investment (i_G)
- a reduction in (income) taxation.

Let us here consider a policy of increased public investment (higher i_G). Public investment is part of aggregate investment: $i = i_P + i_G$, where $i_P =$ private investment.

A first point to note is that, in Neoclassical economics, the economy is assumed to already operate at maximum (full-employment) capacity. Aggregate demand equals maximum production. An increase in i_G will increase aggregate demand – and because the system is already running at maximum capacity, firms cannot meet the additional demand for capital

goods by increasing output. The result will be excess aggregate demand: $d > x^{FE}$. This leads to pressure within the economy – and this pressure starts to build first in the market for loanable funds. Why?

Because to finance the higher public investment, government will have to borrow money from banks. Fiscal stimulus leads to a higher government demand for loanable funds, hence the curve for φ^Dshifts up. Recall that banks are also assumed to be always fully-loaned up ($\varphi^S = \varphi^D$); this is the original equilibrium (point A, Figure 6). Due to the increase in the demand for loanable funds, there is now an excess demand for loanable funds: $\varphi^D > \varphi^S$; the excess demand is indicated by the difference between points C and A (in Figure 6). In response to the excess demand, banks raise the rate of interest – and as a result, savings (or φ^S) go up. Because savings increase, consumption goes down (in Figure 4). Private investment, which is sensitive to the interest rate, also goes down. The loanable funds market reaches a new equilibrium in point B. In the new equilibrium, both the supply of and the demand for loanable funds have increased.

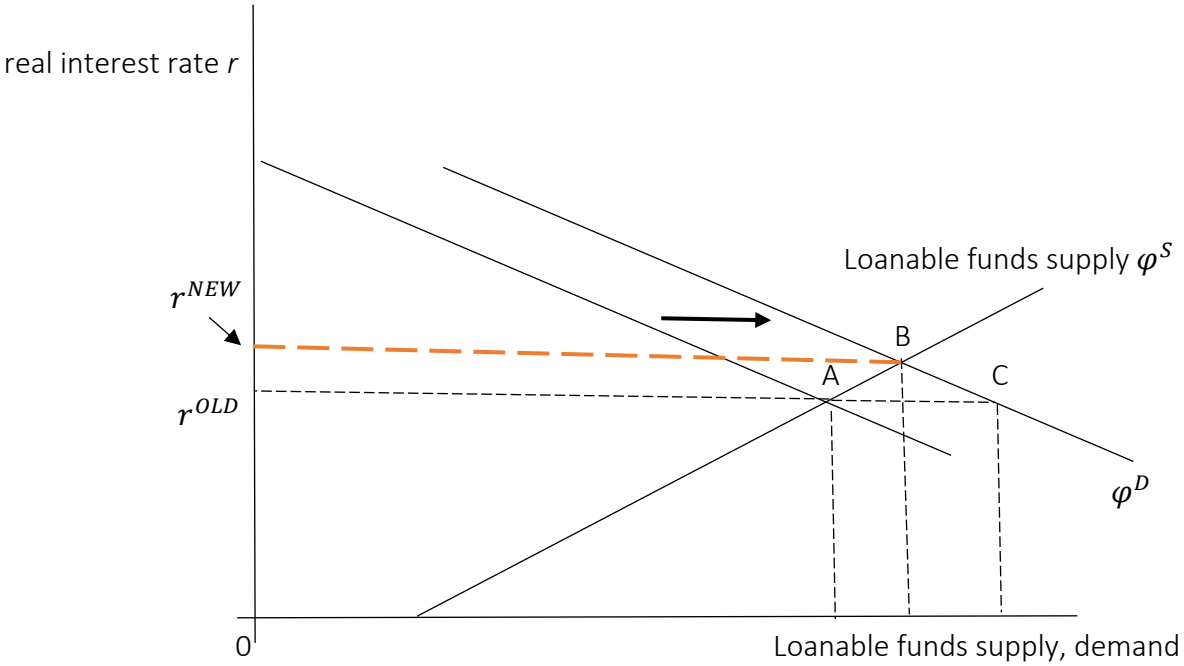


Figure 6: The Neoclassical Market for Loanable Funds: Fiscal Stimulus

The pressure due to the fiscal stimulus has been absorbed by an increase in the (real) interest rate, which has increased savings, lowered consumption, and lowered *private* investment. Total investment has increased, crowding out consumption and private investment. In terms of aggregate demand, this is what happened:

$$\Delta d = 0 = \downarrow c + \downarrow i_P + \uparrow i_G$$

The increase in public expenditure has crowded out private expenditure. In the neoclassical model, fiscal stimulus is therefore not effective in raising aggregate demand, production, and income. It merely leads to a change in the composition of aggregate spending – an increase in the share of public spending, and a decline in the share of private spending.

Monetary policy in the neoclassical model: inflation targeting and the 'money-growth rule'

The macroeconomic model in Figure 4 does not feature money. Money is missing, and this problem is solved by adding a specific monetary theory (named Monetarism) to the neoclassical economic model. Monetarism, or the 'Quantity Theory of Money', provides the neoclassical model with a 'money market' and a money growth rule.

Equilibrium in the money market requires that money supply (M^S) is equal to the demand for money (M^D). In the neoclassical model, the money supply is supposed to be exogenous $\left(M^S = \overline{M^S}\right)$, that is, the supply of money is determined outside the economy. This assumption is justified by the argument that M^S can be (directly) controlled by the central bank. (This is the so-called "exogenous money" approach; we will look at it more closely in Week 7). For now, we assume (in line with the neoclassical approach) that the central bank can control M^S.[2]

The demand for money varies with the level of GDP, the overall price level, and the velocity of money circulation (v): $M^D = \left(\frac{1}{v}\right) p \times y$, where v is generally assumed constant. M^D increases when economic activity (y) and/or the general price level (p) increase; in both cases, more money is needed for carrying out economic transactions.

Equilibrium in the money market requires that $M^S = \overline{M^S} = M^D = \left(\frac{1}{v}\right) p \times y$, or: $\overline{M^S} = \left(\frac{1}{v}\right) p \times y$. How is money-market equilibrium achieved? The answer is: through adjustments in the general price level (p). The reason is that if $\overline{M^S}$ is assumed exogenous, *v* is a constant, and the level of economic activity *y* is (by assumption) always at full employment level y^{FE} (see Figure 4), this leaves the price level as the only variable that can change.

With all variables in the equation $\overline{M^S} = \left(\frac{1}{v}\right) p \times y^{FE}$ except p being determined, we can write: $p = \frac{v \times \overline{M^S}}{y}$, or in terms of (instantaneous) growth rates: $\hat{p} = \widehat{M^S} - \hat{y}$. That is, inflation is

[2] We will see in Week 7 that the "exogenous money" approach does not correspond to how the banking system works in practice; in reality, central banks do not have direct control over M^S.

determined as the difference between (exogenous) money supply growth and real GDP growth. This expression can be rewritten as a money growth rule, as follows: $\widehat{M^S} = \hat{p} + \hat{y}$. This rule specifies by how much $\widehat{M^S}$ can grow for a given growth rate of real GDP. The money growth rule was meant as a rule for preventing inflation. In itself, the idea that inflation should be prevented is not a bad idea; however, note on how many theoretical assumptions the neoclassical-monetarist money growth rule is based.

The task of the central bank (the monetary authority) is strictly circumscribed in the Neoclassical-Monetarist model. Its task is to prevent inflation, and its policy instrument is the supply of money. On Neoclassical-Monetarist assumptions, changes in the supply of money will affect the general price level, but not output, income and demand. In other words, money is neutral. The mandate for central banks can also be stated in growth terms. The task of the central bank then is to keep inflation constant, or below a certain inflation target (usually 2%). This means that central banks should let money supply grow in line with real GDP growth + 2%, or $\widehat{M^S} = \hat{p} + \hat{y} = 2\% + \hat{y}$. This equation is called the money growth rule or monetary policy rule which is used for inflation targeting. The underlying assumption is that central banks can indeed control the growth of money supply.