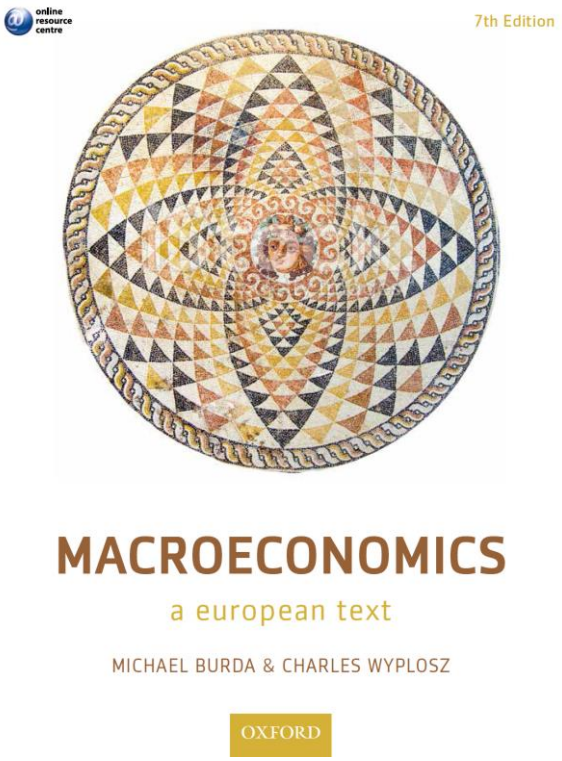

SOLUTIONS TO CHAPTER EXERCISES

MACROECONOMICS: a european text

7th edition

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WITH MICHAEL C. BURDA and CHARLES WYPLOSZ

 – Chapter 2 –

Chapter 2

Exercise 2.1

Net Domestic Product (NDP)

= GDP	2500
– depreciation	- 250
	= 2250

National Income

= NDP	2250
– net interest to foreigners	-100
– net remittances to world	-250
– indirect taxes	-500
+ subsidies to enterprises	+200
	= 1600

(Assumption: Statistical discrepancy = 0, net labor receipts from abroad = 0, since not stated otherwise)

Personal Income

= National Income	1600
- social security contributions	-350
+ transfers to households +firms*	+500
- net corporate saving	-300
- subsidies to enterprises*	-200
- corporate taxes	-50
	= 1200

(Assumption: transfers to households and firms includes subsidies to enterprises)

Personal Disposable Income

=Personal Income	1200

- fines and fees	-50
- personal taxes	- 750
	=400
Consumption	
= Personal Disposable Income	400
- household savings	-100
	=300
Government Purchases	
= Consolidated Government Deficit	50
+ taxes	+(350+50+50+750)
- transfers	-500
	=750
Current Account Balance	
=GDP	2500
- Consumption	-300
- investment expenditure	-600
- Government Purchases	-750
	=850

Exercise 2.2
When a music teacher marries his student whom he was tutoring previous to the marriage and stops billing her for the private lessons, the profits he makes are not noted as a contribution to the GDP anymore and thus GDP decreases. The opposite happens when a housewife becomes self-employed as her own day-care center. In this case her profits are incorporated into the calculations and GDP rises.

Exercise 2.3
The GDP concept does not differentiate between the production of tangible goods and services. Both enter the GDP as either their final sales value or as the sum of value added or as the sum of the factor incomes earned in the process of producing the tangible good or the service. For example in 2011, services contributed to about 60% of nominal World GDP.

Exercise 2.4
My profit from selling the house was 200,000 – 100,000 = 100,000. These capital gains do

not count towards GDP. The real estate agent received a 10% commission and thus 0,1 * 200,000 = 20,000 for his service. GDP rises by this amount.

Exercise 2.5

(a) Nominal GDP is calculated by multiplying the quantities of goods by their respective prices. In this case:

nominal GDP = $P^a Q^a + P^{pea} Q^{pea} + P^{pet} Q^{pet}$

nominal GDP 2006 = 1.0*300 + 2.0 * 100 + 5.0 * 50 = 750

nominal GDP 2007 = 1.0*400 + 3.0 * 150 + 6.0 * 40 = 1090.

Real GDP at 2006 prices:

real GDP_t = $P^a_{2006} Q^a_t + P^{pea}_{2006} Q^{pea}_t + P^{pet}_{2006} Q^{pet}_t$

real GDP_{2006} = 1.0*300 + 2.0 * 100 + 5.0 * 50 = 750

real GDP_{2007} = 1.0*400 + 2.0 * 150 + 5.0 * 40 = 900.

The GDP deflator is the ratio of nominal GDP to real GDP:

GDP deflator = nominal GDP / real GDP.

As real GDP was calculated with prices of 2006, the GDP deflator is 1 for 2006:

GDP $deflator_{2006}$ = 750 / 750 = 1.

GDP $deflator_{2007}$ = 1090 / 900 = 1.21.

The rate of inflation is 21.1%.

(b) To construct the CPI, the prices are weighted according to the amount of each good in the basket - apples, pears and petrol.

CPI $_{2006}$ = 0.67 * 1.0 + 0.22 * 2.0 + 0.11 * 5.0 = 1.66

CPI $_{2007}$ = 0.67 * 1.0 + 0.22 * 3.0 + 0.11 * 6.0 = 1.99

The rate of inflation measured by the growth rate of CPI is $\frac{(1.99-1.66)}{1.66} \cdot 100\% = 19{,}88\%$.

Exercise 2.6

The first definition of the GDP defines it as the sum of final sales within a geographic location during a period of time, usually a year. So it includes no intermediate sales between firms for example. Exports are also seen as final sales, as they leave the country.

The second definition of GDP defines it as the sum of value added occurring within a geographic location during a period of time. It includes all incomes earned within a country's borders. The sum of all value added represents again final sales less costs.

The third definition of GDP defines it as the sum of factor incomes earned from economic activities within a geographic location during a period of time.

How do the three definitions apply to the following cases?

(a) Assume that the bag of sweets is produced and sold in the same measurement period.

1: Selling the bag of sweets to the resident constitutes a final sale. GDP rises by the price of the bag of sweets.
2: At each stage (from production to wholesale to retail) value added has been generated. GDP rises by the sum of value added (which equals the retail price of the bag of sweets).
3: At each stage (from production to wholesale to retail) factor income has been generated. GDP rises by the sum of factor incomes (which equals the retail price of the bag of sweets).(b) Assume that the bag of sweets is produced and sold in the same measurement period.

Selling to the tourist constitutes a final sale, therefore the answers given under (a) apply as well.

(c) Assume that the bag of sweets is produced and sold in the same measurement period.

1: Since the sweets leave the country, the sale counts as export. Hence, GDP rises by the price paid for the order of sweets.
2: From production to the sale to the Slovakian food chain, value added has been generated in the UK. GDP rises by the sum of value added (which equals the price paid for the order of sweets).
3: From production to the sale to the Slovakian food chain, factor income has been generated in the UK. GDP rises by the sum of factor incomes (which equals the price paid for the order of sweets).

(d) For the Manchester businessman the purchase is an investment. Hence, investment rises by the price paid for the machine but so do imports. Therefore, the net effect on GDP is zero.

(e) 1: This is a final sale as the sweets are inventory investment. It adds to GDP. 2: There is a value added for the Manchester sweet company. This adds to GDP. 3: The profits of the Manchester sweet company count towards GDP.

(f) 1: This is a final sale, as the sweets are not going to be resold. GDP increases. 2: There is value added by the Manchester sweet company which increases GDP. 3: The firm's profits increase GDP.

Exercise 2.7

Disposable income includes transfers from the government. If both taxes and disposable income amount to 60 % of GDP, this means that the government has transferred part of the taxes back to the households. In the present case, the government has transferred 1/3 of the taxes back to the households. Transfers amounted to 20% of GDP.

Exercise 2.8

GDP measures alternatively the sum of final sales, the sum of value added or the sum of factor earnings within a geographic location during a certain period of time. If a commuter works in land A but lives in land B, his income does not count towards the GDP of land B, even if he sends it home, because it wasn't generated in Land B. (It does count, however, towards the GNI of land B).

Exercise 2.9

- deficit item: goods and services

- deficit item: financial account/portfolio investment

- no effect

- deficit item: goods and services

- deficit item: current transfers

- deficit item: financial account/portfolio investment

- surplus item: financial account/ portfolio investment

- deficit item: current transfers

- deficit item: investment income

- surplus item: direct investment

- deficit item: reserve assets account

- net error

Exercise 2.10

The balance of payments is given by: $BoP = CA + FA = -OFF$

A very large surplus means that the official account OFF is in deficit and the People's National Bank of China has acquired large foreign exchange reserves. This is a consequence of China's fixed exchange rate regime which requires the People's National Bank to intervene in the market to keep the exchange rate fixed after China has been exporting excessively.

Essay Questions

Essay Question 2.1
Bringing the underground economy above ground leads to a higher number of economic activities being reported, which leads to an increase in GDP. Looking at tax receipts, part of the underground economy exists because of economic agents trying to avoid taxes: the bigger the size of the underground economy, the smaller the tax base and the lower tax receipts. Thus, bringing the underground economy above would raise tax receipts. But maybe one measure to do so would be lowering tax rates to give firms an incentive to truthfully report their revenues. This would again worsen tax receipts. The effect on the balance of payments depends on whether the country is an "illegal exporter" or an "illegal importer". In the first case, balance of payments would increase and the second case it would decrease.

Essay Question 2.2
The effect on GDP is ambiguous:
(a) Assume that a firm in land A outsources a service to a firm abroad: less factor income is generated in land A and the effect on land A's GDP is negative.
(b) Assume now, that a firm in land A outsources a service to a national firm: e.g. a firm turns its cafeteria into an independent contractor. The effect on GDP depends on whether final sales in the cafeteria rise (GDP rises), fall (GDP falls) or remain unchanged (zero effect on GDP).

Essay Question 2.3
Some services and goods are produced as a consequence of unhappy events (sickness, death, pollution, accidents) and therefore negatively correlated with happiness but a rise in their production leads to an increase in GDP. Moreover, there are services and goods which are negatively (pollution, destruction of biodiversity) or positively (voluntary work) correlated with happiness but do not enter GDP at all. For these reasons, GDP is an imperfect measure of happiness.

A measure of gross domestic happiness could be

(a) constructed from individual data: e.g. people could be asked in a census how happy they are. Drawbacks: ordinal scale; a rise in happiness cannot probably not be related to economic events.

(b) based on aggregated data which are quantitatively measurable and correlated with happiness: e.g. the unemployment rate, infant mortality, income equality or political stability. All those measurements could then be combined to a gross domestic happiness index.

Essay Question 2.4
A lot of developing countries depend on the export of their resources (e.g. oil, gas, minerals, tropical wood products). The large fluctuations in their national income and product account results stem from a high volatility in commodity prices on the world market. Furthermore, their national income and product accounts give a false impression of the economic situation

of the country due to the fact that the costs of production do not include the exploitation and depletion of the resources but only the costs for labour and physical capital that are needed. To solve this problem, the cost of production should include the quantity of natural resources used, evaluated at world prices. Because these frequently fluctuate widely, this would lead to highly volatile and therefore misleading national income and product statistics .

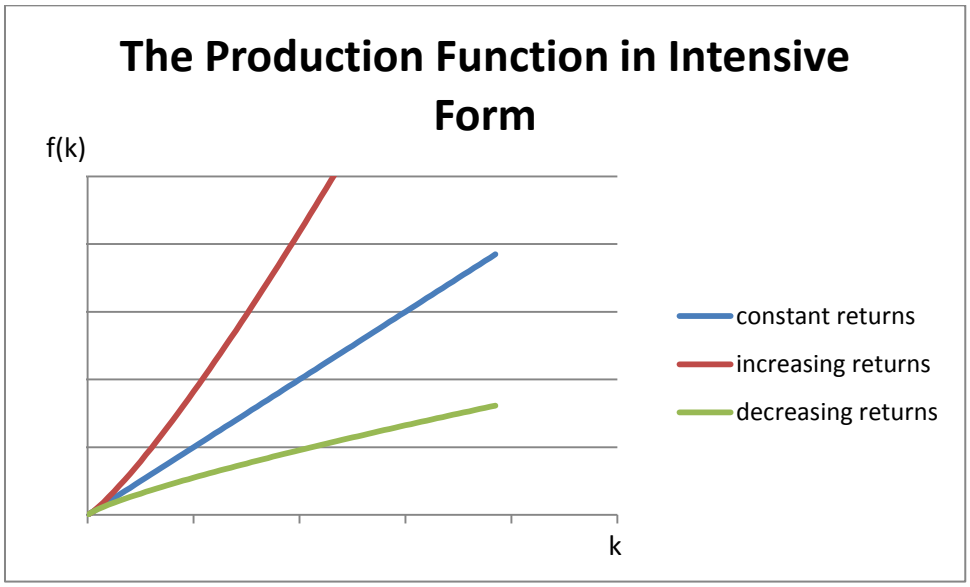
Essay Question 2.5

Patterns of trade and financial flows are still of more political interest in the EU member states than in the United States because the EU is not fully politically and economically integrated

Chapter 3

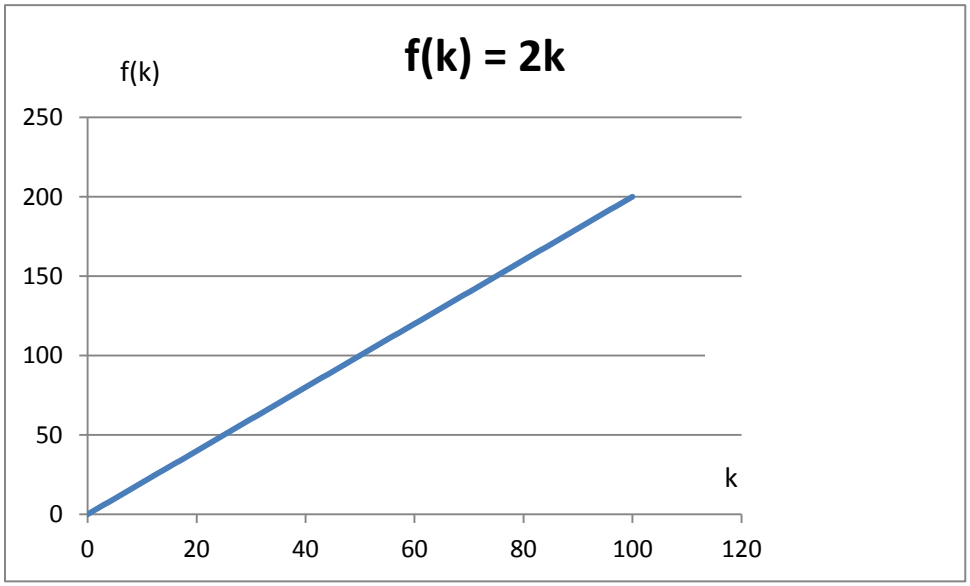
Exercise 3.1

The following figure shows production functions in intensive form with constant, increasing and decreasing returns to scale. The production function with constant returns to scale in this case is given by f(k)=k, the one with increasing returns is given by $f(k)=k^{1.35}$ and the one with decreasing returns is given by $f(k)=k^{0.97}$.

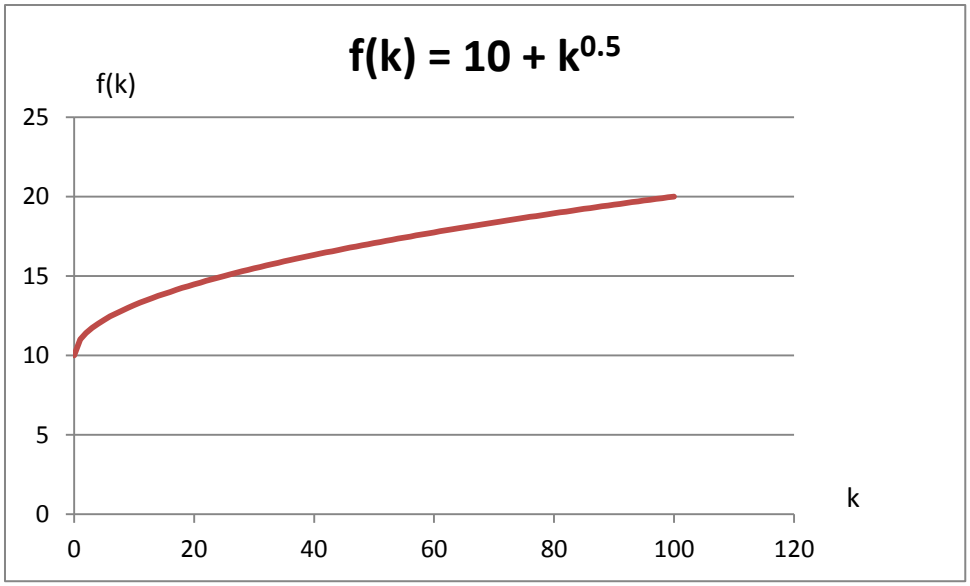


Exercise 3.2

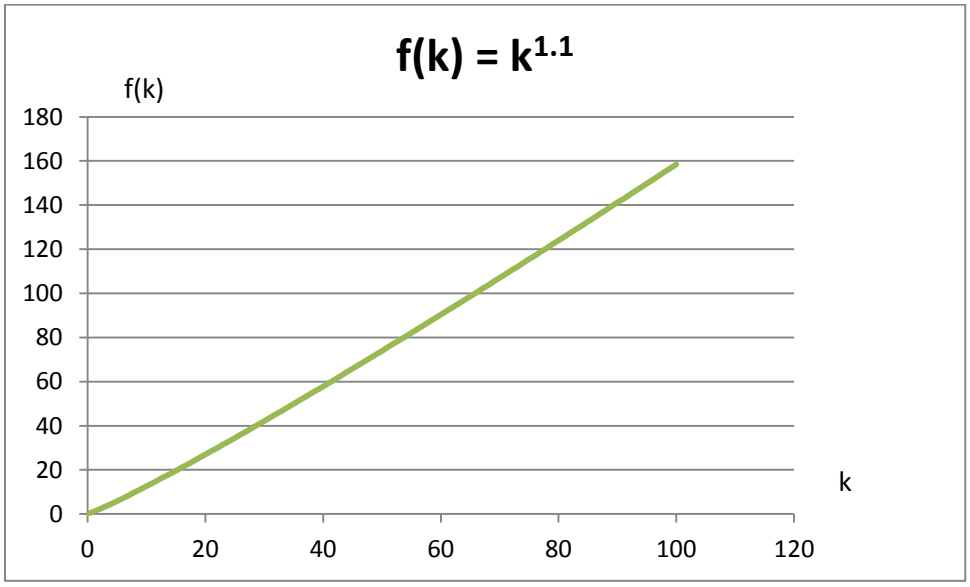
(a) f(k) = 2k – constant returns: f(ak) = af(k)



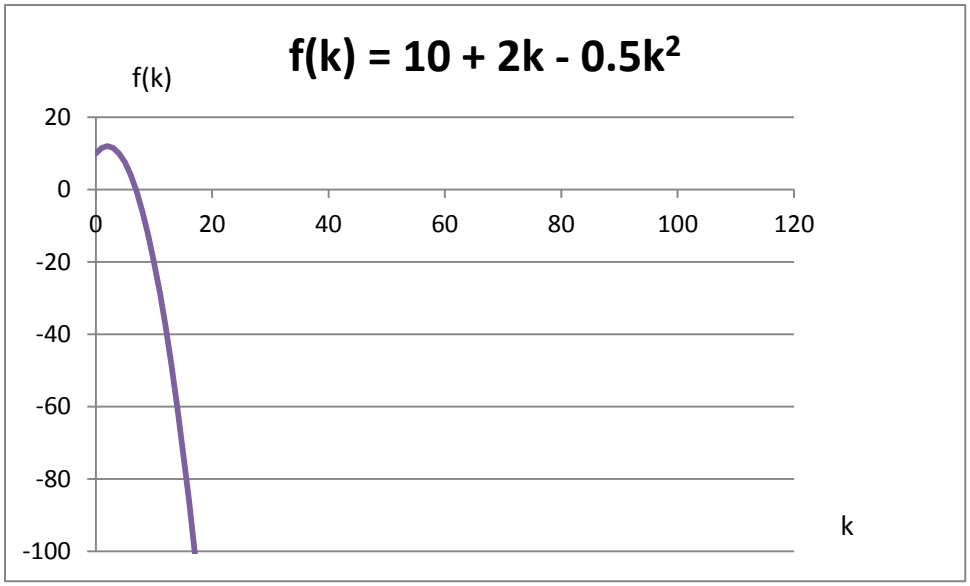
(b) $f(k) = 10 + k^{0.5}$ – decreasing returns: $f(ak) = 10+0.5a^{0.5}k^{0.5} < af(k)$



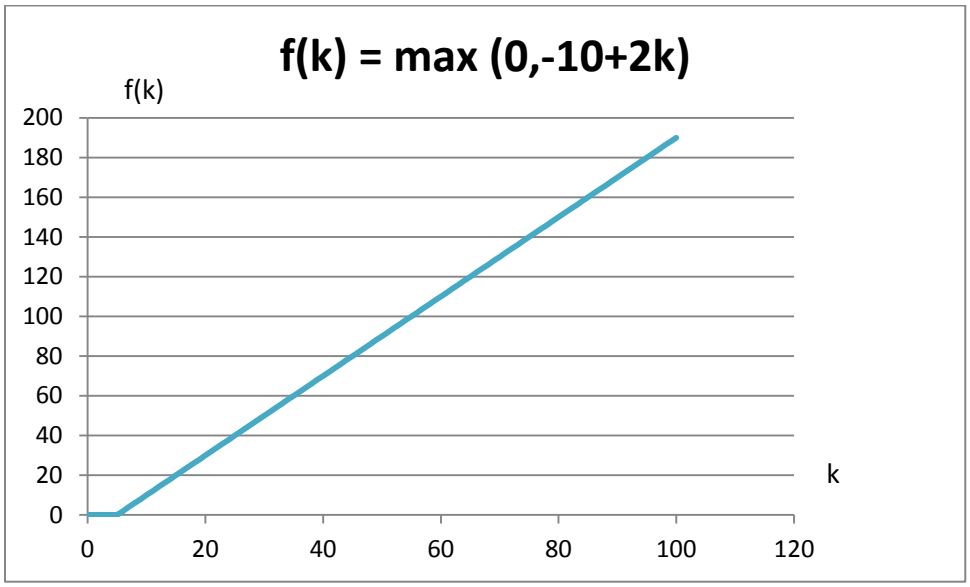
(c) $f(k) = k^{1.1}$- increasing returns: $f(ak) = a^{1.1}k^{1.1} = a^{1.1}f(k)$



(d) $f(k) = 10 + 2k – 0.5k^2$ – decreasing returns. This "production function" should attract attention because it involves negative output for a wide range of input! Value *subtraction* is usually ruled out because it doesn't make economic sense. But there is extensive evidence that planned economies often engaged in production for purely political reasons, so the possibility is not so far-fetched. NOTE: Despite the disappointing plot there is a region for which production is positive and increasing in k!



(e) f(k) = max (0, -10+2k)- decreasing returns for k > 5



Exercise 3.3

Even though GDP seems to grow without bound, looking at long-term growth rates of GDP, the capital-output ratio or the labour-income share, common growth rates can be identified. The economy's variables move around those steady state growth paths in cycles. Looking at steady state values allows to abstract from cyclical fluctuations and to identify the long-run evolution of macroeconomic variables. Stylized facts and steady states help to identify fundamental relations which would be hard to recognize by just looking at business cycles.

Exercise 3.4

(a) The steady-state saving-output ratio s* is given by:

$$\Delta k = s^* f(k) - \delta k = 0$$

$$s^* f(k) = \delta k$$

$$s^* 2k = \delta k$$

$$s^* = \frac{1}{2}\delta = \frac{1}{2}0.05 = 0.025$$

(b) If there is technological progress, steady-state saving-output ratio s* is given by:

$$\Delta k = s^* f(k) - (\delta + n)k = 0$$

$$s^* f(k) = (\delta + n)k$$

$$s^* 2k = (\delta + n)k$$

$$s^* = \frac{1}{2}(\delta + n) = \frac{1}{2}(0.05 + 0.03) = 0.04$$

Exercise 3.5

In the steady state without technological progress, the capital-labour and output-labour ratios are constant. If labour (L) grows at an exogenous rate of n=2%, constant ratios k=K/L and y=Y/L require Y and K to grow at that same rate, too. Since the population grows at the same rate as labour, GDP per capita does not grow in the steady state. Hence, the growth rate of GDP per capita is equal to zero. This result does not depend on the level of the saving rate (s) or the rate of depreciation (δ). While both rates s and δ determine the steady state level of GDP per capita, they do not determine its steady state growth rate.

Exercise 3.6

The aggregate production function $Y = K^{0.5}L^{0.5}$ is a Cobb-Douglas production function with $\alpha = 0.5$. As shown in Box 3.2, such a production function exhibits constant returns to scale. In this case the proof looks as follows:

$$(tK)^{0.5}(tL)^{0.5} = tK^{0.5}L^{0.5} = tY$$

The marginal product of capital is given by

$$\frac{\partial Y}{\partial K} = 0.5\left(\frac{L}{K}\right)^{0.5}$$

Taking the second derivative yields

$$\frac{\partial^2 Y}{\partial K^2} = -0.25\frac{L^{0.5}}{K^{1.5}}$$

which shows that the marginal product of capital is declining. It is on the other hand increasing in L, because

$$\frac{\partial^2 Y}{\partial K \partial L} = 0.25 \frac{1}{K^{0.5} L^{0.5}}$$

The same can be shown for the marginal product of labour.

The marginal product of labour is given by

$$\frac{\partial Y}{\partial L} = 0.5 \left(\frac{K}{L}\right)^{0.5}$$

Taking the second derivative yields

$$\frac{\partial^2 Y}{\partial L^2} = -0.25 \frac{K^{0.5}}{L^{1.5}}$$

which shows that the marginal product of labour is declining. It is on the other hand increasing in K, because

$$\frac{\partial^2 Y}{\partial L \partial K} = 0.25 \frac{1}{K^{0.5} L^{0.5}}$$

Exercise 3.7

The golden rule states a condition under which consumption per capita is maximized, given existing technological capabilities. It is achieved at $\bar{k}'$ in Figure 3.9, where marginal product of capital (MPK) equals the rate of depreciation (δ). Per capita consumption is highest at the capital stock for which the slope of the production function is parallel to the depreciation line. If $\bar{k}$ is too low and to the left of $\bar{k}'$, MPK is higher than the depreciation rate and steady-state income and consumption per capita may be raised by increasing the savings rate. This is caused by the fact that increasing the amount of capital leads to an increase in Y which is higher than the increase in depreciation that has to be paid for. This means sacrificing consumption in the short run leads to higher steady-state consumption in the long run. If $\bar{k}$ is too high and to the right of $\bar{k}'$, too much capital has been accumulated and MPK is lower than the depreciation rate. In this case a lower savings rate helps to reduce the capital stock, thus increasing the marginal product of capital to the rate of depreciation. Raising consumption in the short run leads to higher steady-state consumption because capital was inefficiently used

Exercise 3.8

Technological progress means that more output can be produced with the same quantity of labour. Capital needs to be more productive at the margin to cover the increased demand. This means that MPK is now higher in the golden-rule optimum and the capital per effective labour (k=K/AL) is lower. But the measures that are important to be able to say something about quality of life are capital per capita and output per capita (K/L and Y/L). Even though capital

per effective labour is now lower in steady state, capital per capita is higher, as more output can be produced with the same amount of labour and a smaller amount of capital.

Exercise 3.9

Evolution of Y/L and investment in the catch-up phase:

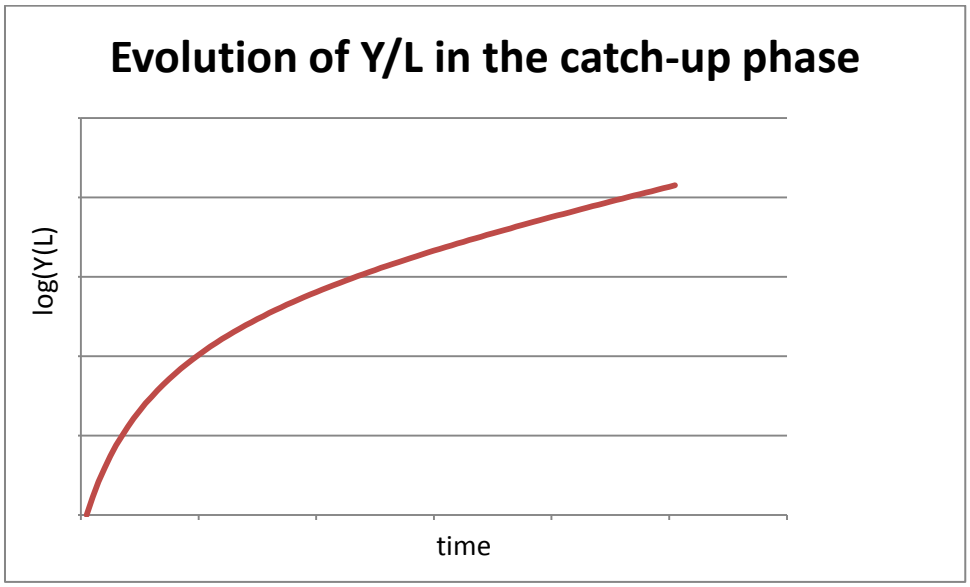


Figure A3.1: Evolution of $ln(Y/L)$ over time

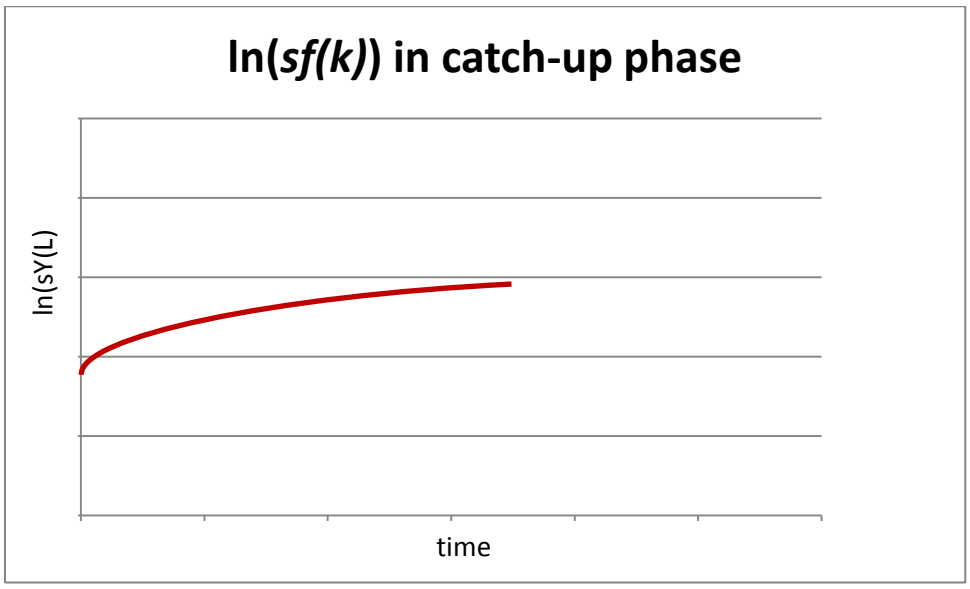


Figure A3.2: Evolution of $\ln(I/L) = \ln(sf(k))$ over time

Exercise 3.10

Average labour productivity Y/L tells how much on average is being produced per hour worked. It is used to compare the efficiency of labour across countries. In contrast, output per capita measures how much every inhabitant would get if output was equally distributed. It is used to compare standards of living across countries.

Exercise 3.11

Assume a steady state where N grows at exogenous rate n and average hours per worker h are

constant.Then $L = N \cdot h$ grows at rate n. With technological progress growing at rate a, Y has to grow at rate $a + n$ so that output per effective labour (Y/AL) is constant. In this scenario, output per capita grows at rate a.

Now assume that hours per worker grow at rate $-g, g > 0$, such that L grows at rate $n - g$. For output per effective labour to remain constant, output has to grow at rate $a + n - g$ and hence output per capita grows at rate $(a - g)$. Per capita growth will be below rate a as long as the decline in hours per worker continues.

Exercise 3.12

The initial ratio of GDPs in region 1 and 2 is $Y^1/Y^2 = 1.2$. Call it y_t in year t. This ratio declines by 2% (=0.02) per year, so each year $y_{t+1} = 0.98\ y_t$. The following table (from Excel) shows how the ratio y evolves over 10 years:

Year	Y1/Y2
0	1.2
1	1.18
2	1.15
3	1.13
4	1.11
5	1.08
6	1.06
7	1.04
8	1.02
9	1.00
10	0.98

We see that between year 6 and year 7, the ratio passes the 1.05 mark when the difference is 5% (=0.05).

Exercise 3.13

In intensive form, the production function is given by:

$$y = k^{\alpha} h^{\beta}$$

with $y = Y/L, k = K/L$ and $h = H/L$.

Capital accumulation and human capital accumulation are given by:

$$\Delta k = sf(k,h) - (\delta + n)k$$

$$\Delta h = sf(k,h) - (\delta + n)h$$

In steady state, Δk=Δh=0, thus

$$sf(k,h) = (\delta + n)k$$

$$sf(k,h) = (\delta + n)h$$

Solving for h in terms of k yields:

$$sk^{\alpha}h^{\beta} = (\delta + n)h$$

$$h^{\beta-1} = \frac{(\delta + n)}{s}k^{-\alpha}$$

$$h = \left[\frac{s}{(\delta + n)}\right]^{\frac{1}{1-\beta}} k^{\frac{\alpha}{1-\beta}}$$

Substituting into the steady-state condition for capital:

$$sk^{\alpha}\left[\frac{s}{(\delta + n)}\right]^{\frac{\beta}{1-\beta}} k^{\frac{\alpha\beta}{1-\beta}} = (\delta + n)k$$

$$s^{\frac{1}{1-\beta}}k^{\frac{\alpha+\beta-1}{1-\beta}} = (\delta + n)^{\frac{1}{1-\beta}}$$

$$k^{*} = \left[\frac{s}{(\delta + n)}\right]^{\frac{1}{1-\alpha-\beta}}$$

The same holds for the steady state of h:

$$h^{*} = \left[\frac{s}{(\delta + n)}\right]^{\frac{1}{1-\alpha-\beta}}$$

The steady state output-labour ratio is

$$y^{*} = \left[\frac{s}{(\delta + n)}\right]^{\frac{\alpha}{1-\alpha-\beta}}\left[\frac{s}{(\delta + n)}\right]^{\frac{\beta}{1-\alpha-\beta}} = \left[\frac{s}{(\delta + n)}\right]^{\frac{\alpha+\beta}{1-\alpha-\beta}}$$

which is the standard result of the Solow model. The steady state level of output is Y*=y*L. Since the output-labour ratio is constant in the steady state, output Y* grows at the exogenous population growth rate n as do labour and the population. Without technological progress, the growth rate of GDP per capita is therefore zero.

Essay Questions

Essay Question 3.1

Countries with the same level of technology should have the same steady-state growth rate of output per capita. Countries like Japan, Korea, China or India that started with a capital stock far below their steady-state capital stock need a higher growth rate than steady-state growth rate to catch up with more developed countries. This is what one observes during the rapid growth phases of these countries. That these countries had growth spurts at different times may be due to the fact that their population growth rate which was much higher than in the developed countries required an even higher investment rate. On the other hand, their low output-labour ratio did probably not allow for a sufficiently high savings rate. In this case a

developing country may decrease its population growth rate or import foreign investment to build up the capital stock or foreign technology to increase factor productivity. Additional factors like e.g. the enforcement of property rights to motivate foreign investment or technology transfer or the level of education to reduce population growth and increase labour productivity may play a role. These factors will be discussed in more detail in Chapter 4. Shortcomings in these areas might have prevented countries like Japan, China, India and Korea from catching up earlier with developed countries.

Essay Question 3.2
During colonial times, resources and labour of the colonies were exploited. Taxes, resources and profits were sent home and made the colonial powers richer. Also capital stocks in those countries were low and thus investment was profitable. At the same time, costs like administration costs were high as well.

Essay Question 3.3
The Solow model that was described in this chapter is a closed economy model. To make any statements on the effects of globalization on growth one has to look at an open economy Solow model. In the open economy Solow model with capital mobility and without labour mobility savings do not equal investment anymore. Savings are a percentage of GDP plus the income made abroad, which equals capital accumulated abroad K_t^F times the interest rate r:

$$S_t = s(Y_t + rK_t^F)$$

Even though income made abroad does not count into the GDP it does count into the gross national income GNI. Thus it makes sense to look at the evolution of income instead of the growth rate of per capita GDP to decide whether globalization is bad for growth. The change in income depends on the interest rate r. If the world interest rate r^w is larger than the interest rate at home, then it makes sense to invest abroad and get a higher return than at home. Even though savings at home decrease, income thus increases. If $r^w < r$, capital will flow into the home country, increasing GDP and income. In both cases, the country will be better off if it opens up to international trade.

Essay Question 3.4
According to the Solow growth model, developing countries with a low capital stock should exhibit high rates of investment as return to capital is high, which again leads them to catch up with developed nations. Figure 3.7 (a) shows that instead most African countries have a low average investment rate. This is not consistent with the Solow growth model. Reasons could be again that there exist additional factors that prevent some countries from catching up. These will be further discussed in the next chapter.

Essay Question 3.5
This hypothesis is consistent with the Solow growth model. In the defeated nations, a high amount of the capital stock was destroyed. Thus return to capital, investment and the GDP growth rate were higher than in the victor nations.

Essay Question 3.6
Free answer,

Essay Question 3.7

Because human capital increases the more we spend time and money learning new things. Human capital depreciates because knowledge keeps increasing, meaning old knowledge becomes obsolete. (Also, as we age, well you know, we start losing it.) When a firm invests in equipment, it owns it as long as property rights are guaranteed. When a firm invest in the human capital of its workers, it does not own them, they can move with their knowledge to other firms. Please note that this is NOT an argument for slavery.

Chapter 4

Exercise 4.1

If the household receives an inheritance, it will have additional consumption possibilities without having to work more. His budget line shifts up, see Figure A4.1 below. In the new equilibrium, the household will both consume more and enjoy more leisure if the indifference curves are 'normal'. Hence, given two households with same indifference curves which face the same wage w, the richer household (with inheritance) will work less and consume more than the poorer household (without inheritance).

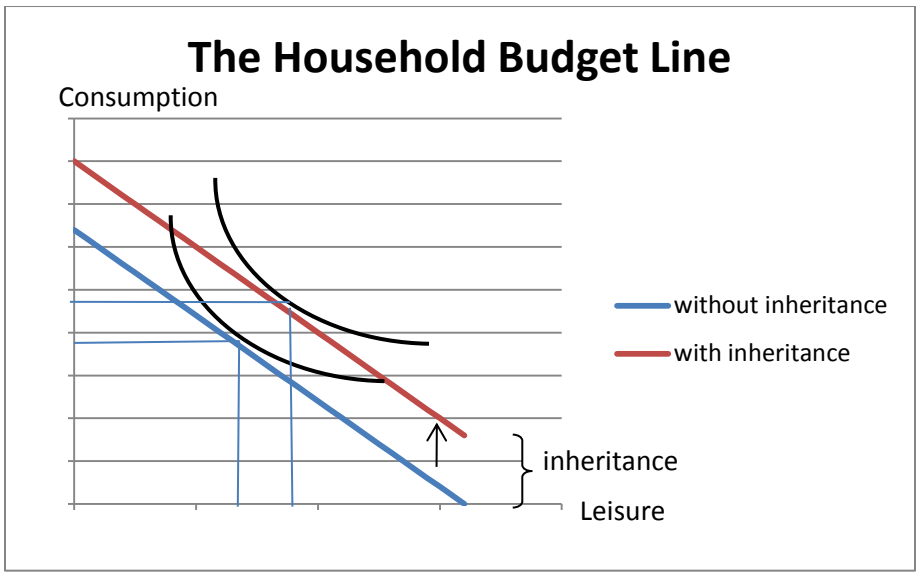


Figure A4.1: The household budget line

Exercise 4.2

(a) In the case of 'overtime pay' his budget line would look like this:

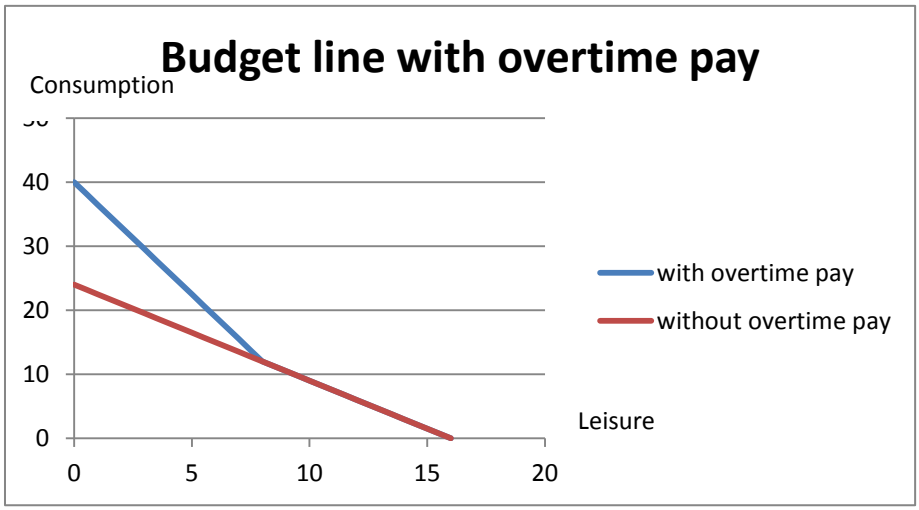


Figure A4.2a: Budget line with overtime pay

As Robinson Crusoe is paid a higher wage if he works more than 8 hours, the slope of his budget line becomes steeper after this point. It is now piecewise and convex. This is illustrated in Figure A4.2.

(b) Whether the introduction of overtime makes Crusoe better off depends on his preferences. If his optimal amount of working hours was higher than 8 hours before, then he will definitely be better off with overtime pay, as he will receive a higher wage. On the other hand, if his optimal amount of work was less than eight hours, he will only be better off than before if the potential wage increase shifts his optimum to more than 8 hours of work. Otherwise he will still receive the same wage as before.

(c) Crusoe's behaviour for 'normal' indifference curves:

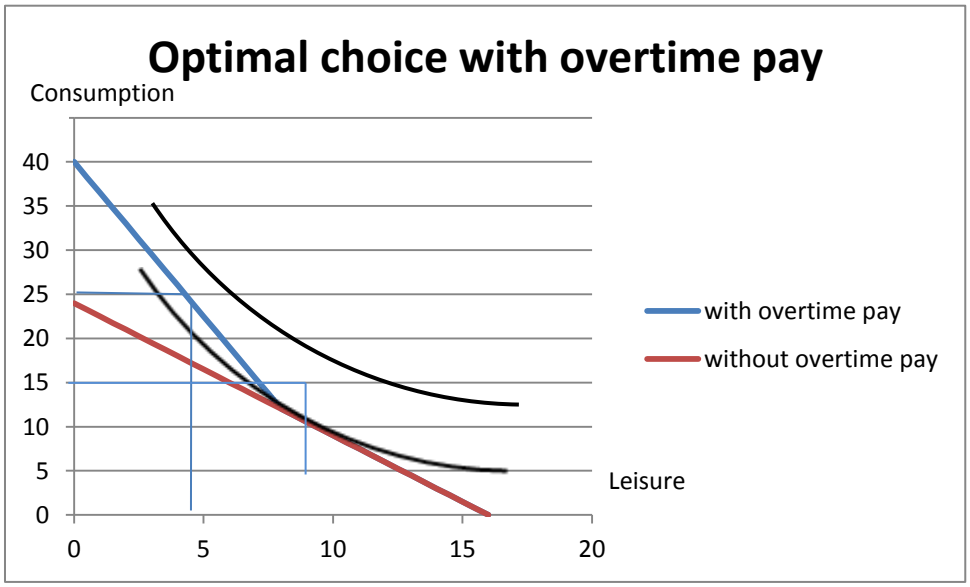


Figure A4.2b: Crusoe chooses to work longer with overtime pay

In Figure A4.2b, Crusoe prefers to work 6.5 hours without overtime pay and 11.5 hours with overtime pay. Since he reaches a higher indifference curve in the latter case, working longer with overtime pay makes Crusoe better off.

In Figure A4.2c, Crusoe chooses to work no more than 5.5 hours, regardless of whether he is paid a higher wage for overtime or not. Overtime pay cannot make him better off because Crusoe has a strong preference for leisure in this example.

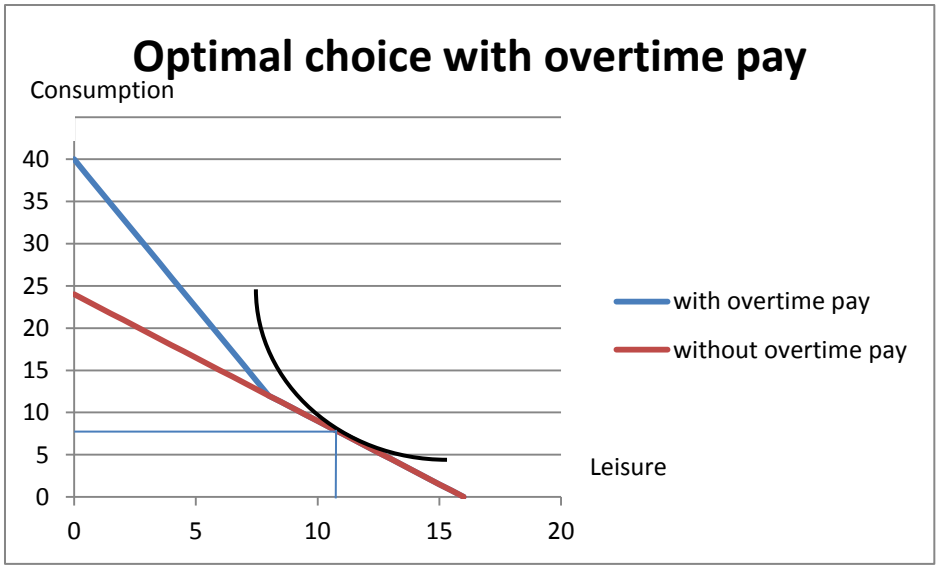


Figure A4.2c: Overtime pay does not change Crusoe's optimal working time

Exercise 4.3

(a) Crusoe's budget constraint with fixed costs looks like this:

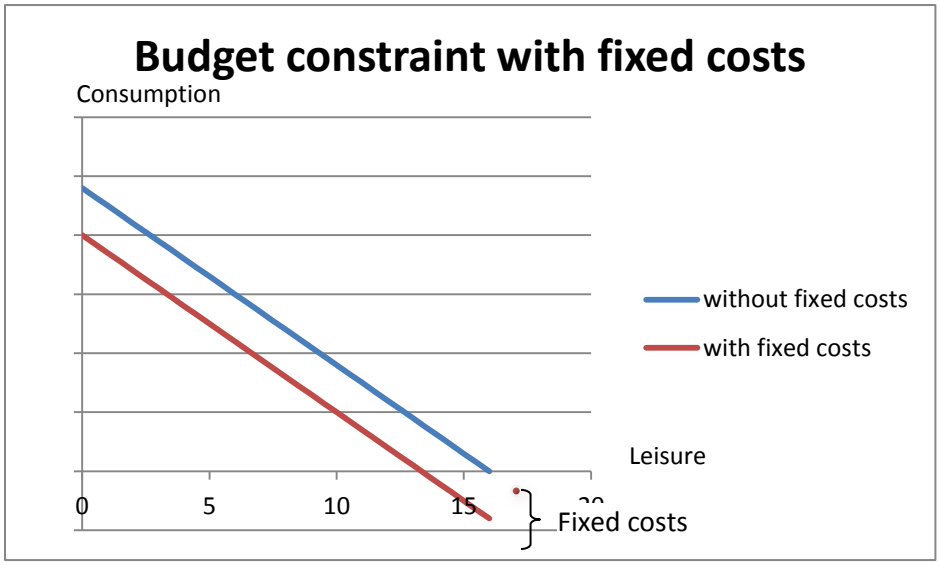


Figure A4.3a: Budget constraint with fixed costs

If Crusoe does not work at all, he can enjoy 16 hours of leisure. If he starts working he has to pay the fixed costs and thus, as long as he does not 'earn' enough, has a negative consumption. His budget line shifts down by the amount of the fixed costs, see Figure A4.3a. Assuming 'normal' indifference curves, Crusoe will not work under a certain threshold. This threshold depends on his wages and preferences.

(b) If Crusoe decides to go to work, even though he is grumbling about it, his utility level when working must exceed the one when staying at home. In Figure A4.3b, Crusoe's indifference curve, which is tangent to his budget constraint at 6 hours of work, lies above the possible choice of not working at all (16 hours of leisure). In the new equilibrium he chooses

less leisure and less consumption compared to a situation without fixed costs. Because of the cost of going to work, Crusoe is worse off.

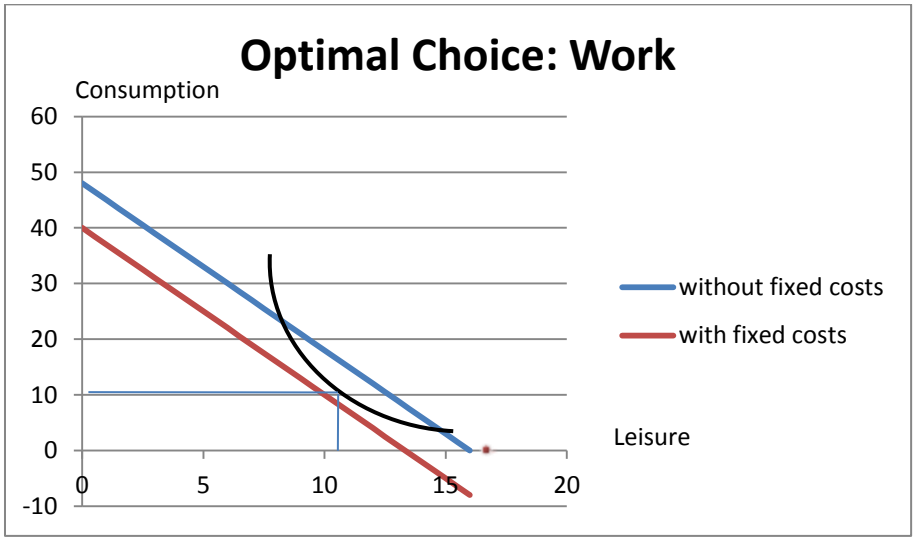


Figure A4.3b: Optimal choice under fixed costs - work

(c) Depending on Crusoe's preferences, it might be optimal for him to stay at home if the wage is too low. This case is shown in Figure A4.3c, where the point where Crusoe chooses not to work at all lies above the indifference curve that is tangent to the budget constraint at wage w. This means that he gets a higher utility if he decides not to work.

If on the other hand his wage rises to w*, then the indifference curve that is tangent to his budget constraint lies above the point where not working at all is optimal and Crusoe can be enticed to leave his tree house.

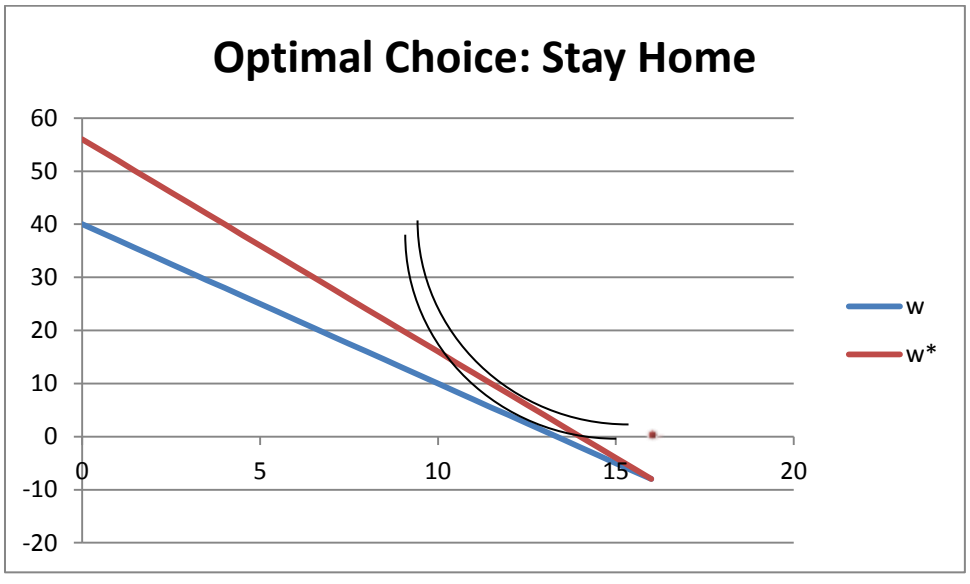


Figure A4.3c: Optimal choice under fixed costs – stay home

(d) Looking at the case of a modern-day worker a lot of sources of costs for going to work can be found, like commuting costs, costs for daycare, work clothes or work equipment (e.g. stationary, books, journals etc. for a professor). Figure A4.3c illustrates that depending on his preferences, a worker may choose not to work if costs are so high that the indifference curve

that is tangent to the worker's budget constraint lies below the point where not working at all is optimal. In this case the worker is better off when not working. Many countries' tax laws already give 'in-work' grants to workers who work a positive amount of time in the form of tax cuts, e.g. for commuting costs, tools and equipment and daycare costs. An 'in-work' grant reduces the cost for the worker, thus shifting up parallel his budget line (the blue line in Figure A4.3c by the amount of the cost reduction. Since the grant should not exceed the costs which the worker has to bear when working, the new budget line will still lie under the one obtained if costs are zero. Whether the indifference curve tangent to the new budget line will lie above the point where not working at all is optimal depends on the worker's preferences and the amount of the costs covered by the grant.

Exercise 5.4

(a) If the economy is in a high tax environment compared to a low tax environment, this means that for a given real wage the after tax wages are lower and thus the budget constraint rotates around $\bar{\ell}$ to the left, see Figure 4.4a. With the same amount of working hours, a worker now receives a lower wage after taxes. Due to the negative income effect, the worker will consume less and work more. However, since the net wage has fallen, the worker substitutes work with the now cheaper leisure and works less. In Figure A4.4a, the substitution effect has been assumed to dominate the income effect and the worker works less under the higher taxes.

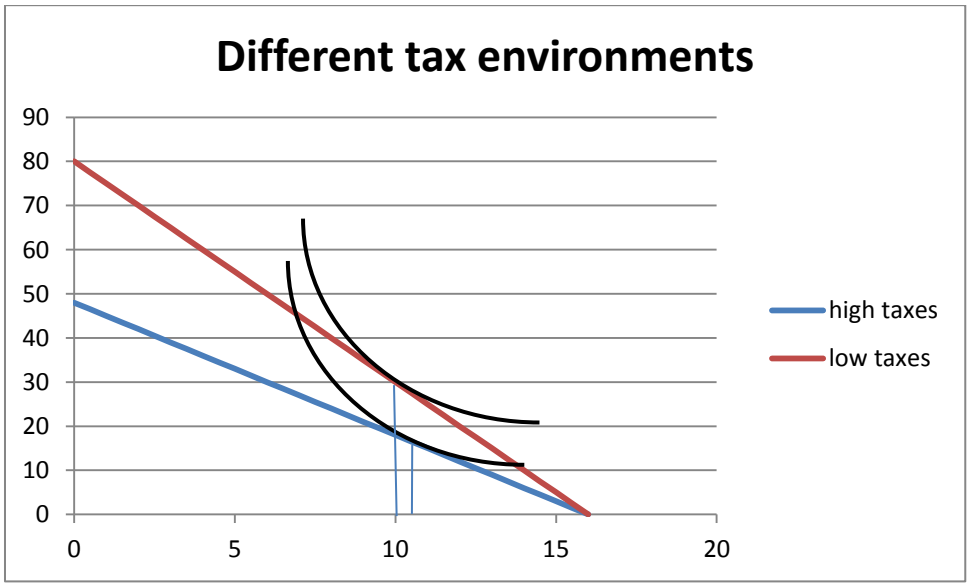


Figure A4.4a: Budget line and optimal choice under high versus low taxes

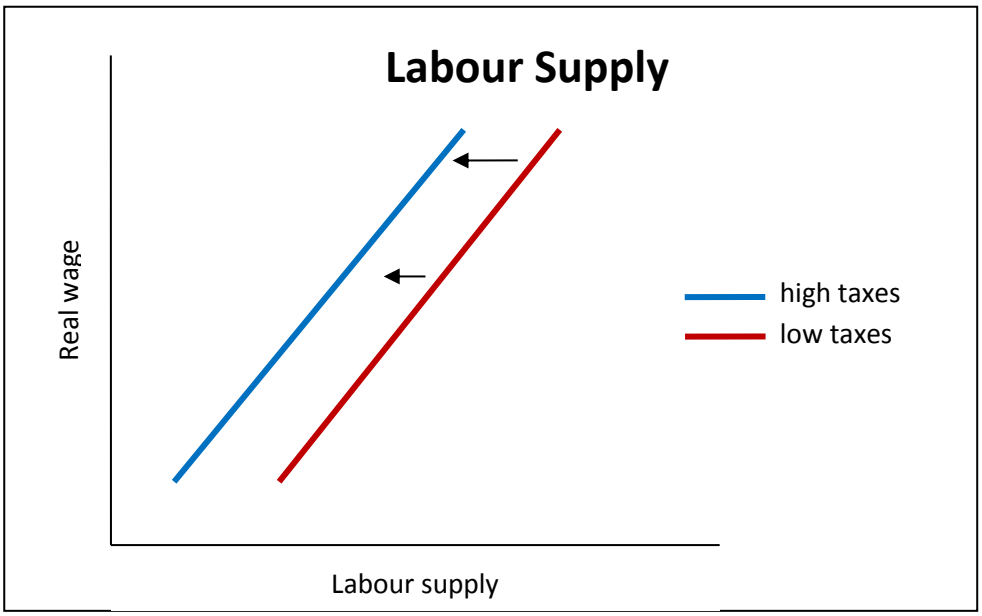


Figure A4.4b: Effect of higher taxes on labour supply

At the given gross wage, a higher tax reduces the net wage and labour supply. If all workers react in the same way towards higher taxes, i.e. reducing work, the aggregate labour supply curve shifts to the left as illustrated in Figure A4.4b. Intersection with the (elastic) labour demand curve (not shown) and hence a new equilibrium will occur at a higher gross wage and lower labour hours.

(b) The utility function $U = c^{\alpha} l^{1-\alpha}$ is a 'normal' utility function. As shown in Figure A4.4b, the labour supply curve shifts to the left and labour hours and wages will be lower. Equilibrium employment decreases at all wage levels.

(c) If the tax revenues are rebated to the households as a lump-sum payment, this will lead to an equal result as the inheritance discussed in Exercise 4.1, see Figure A4.1 above. The households want to enjoy more leisure, the labour supply curve shifts even further to the left and equilibrium employment levels go down. This can also explain the observed pattern in Table 4.2. Countries with high labour taxation and high rates of transfers have lower market labour supply of 14.8 to 15.9 hours whereas the countries with lower labour taxation have market labour supply of 18 to 19.1 hours.

Exercise 4.5

(a) Rigid wages around some 'target level' with flexible employment:
The labour union's preferences are quasi-linear. They are linear in the real wage and convex in employment, see Figure A4.5a

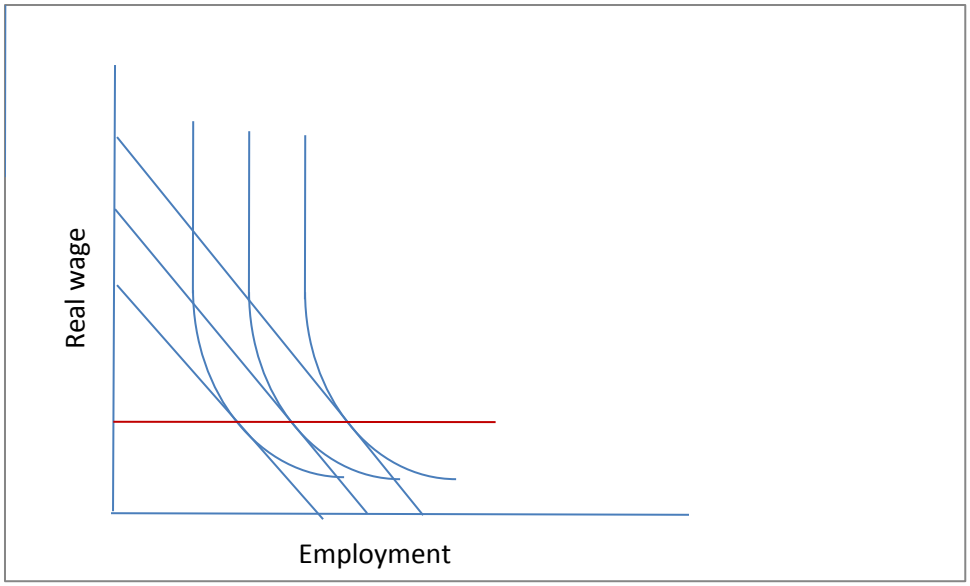


Figure A4.5a: Rigid wages, flexible employment

(b) Flexible wages around some target level of employment:
In this case the preferences of the labour unions are also quasi-linear, but this time they are linear in employment and convex in the real wage, see Figure A4.5b.

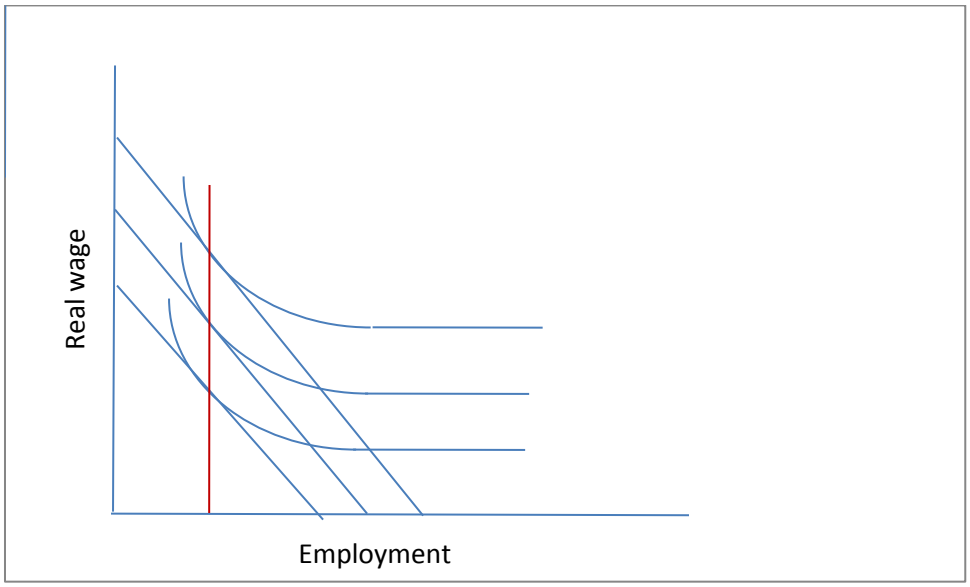


Figure A4.5b: Union preferences for flexible wages, stable employment

(c) When the trade union reacts asymmetrically depending on whether labour demand is rising or decreasing the result is a combination of both figures above. When labour demand is rising, the labour supply schedule is steep, when it is declining, it is flat.

Exercise 4.6
If the real wage w* is higher than the equilibrium wage which equates labour supply and demand, then there is involuntary unemployment (L^S-L*). With the introduction of early retirement, labour supply will decrease and the supply curve shifts to the left so that unemployment is reduced, see Figure A4.6.

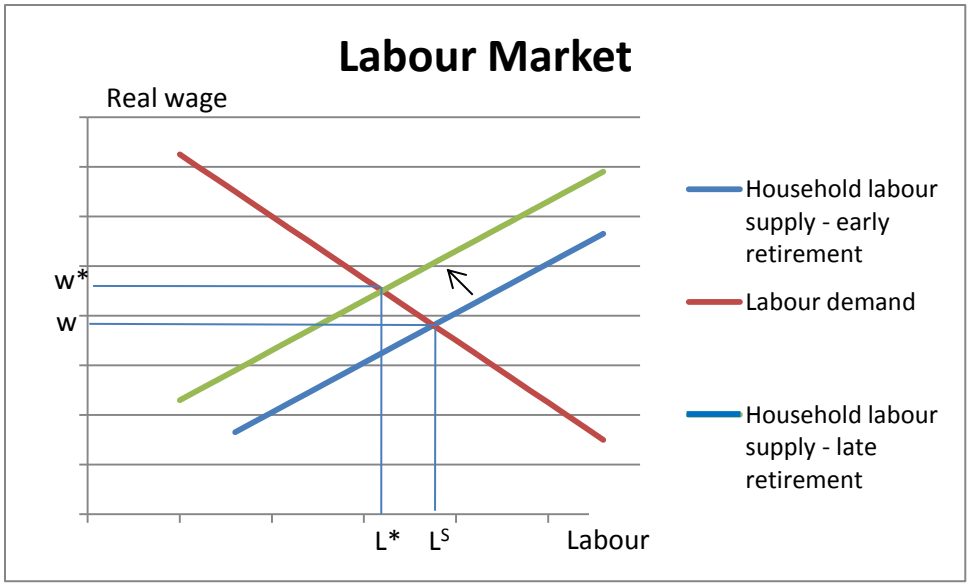


Figure A4.6: Labour supply with and without early retirement

Although early retirement seems to solve the unemployment problem in the short run, the static approach neglects the fact that the rise in pension income must be financed either through higher taxes, a higher budget deficit or a lower pension income for the early retirees. All solutions decrease household income and hence consumption. As consequence, labour demand decreases as companies react to fallen demand in the goods market. However, if the labour demand curve shifts to the left, we are back to the initial situation.
Note, that the key flaw in the early-retirement proposal is the underlying assumption that the amount of labour is constant so that the share of older workers has to fall to increase the share of younger workers. This lump-of-labour fallacy is contradicted by the negative slope of the labor demand curve, however. Furthermore, in a growing economy the number of jobs can grow too, shifting labour demand to the right and thus reducing unemployment.

Exercise 4.7
One explanation for the fact that unemployment rates for low-skilled workers are higher than for well-educated workers might be that the jobs for low-skilled workers are especially subject to minimum wages. If the minimum wage is higher than the equilibrium wage for low-skilled workers, involuntary unemployment arises. Another reason is that jobs of low-skilled workers can be more easily replaced through technological progress than jobs of high-skilled workers. Furthermore, high-skilled workers can adapt more easily to different job requirements and might require less training-on-the-job than a low-skilled worker. An 'education offensive' could increase the marginal product of the unskilled and low-skilled workers and make them more attractive to companies. As a consequence, the demand curve would shift to the right and unemployment would be reduced.

Exercise 4.8
Profit-contingent payments lead to a decrease in wage rigidity, as wages are closer to the MPL again, compared to wages that have been determined in collaboration with labour unions. This leads to less involuntary unemployment.

Exercise 4.9

When unions' bargaining leads to a wage w* which is higher than the one following from individual labour supply, then there is excess labour supply and thus unemployment (L^S - L*). Immigration will let the individual supply curve shift even further to the right and thus unemployment rises if wages are rigid.

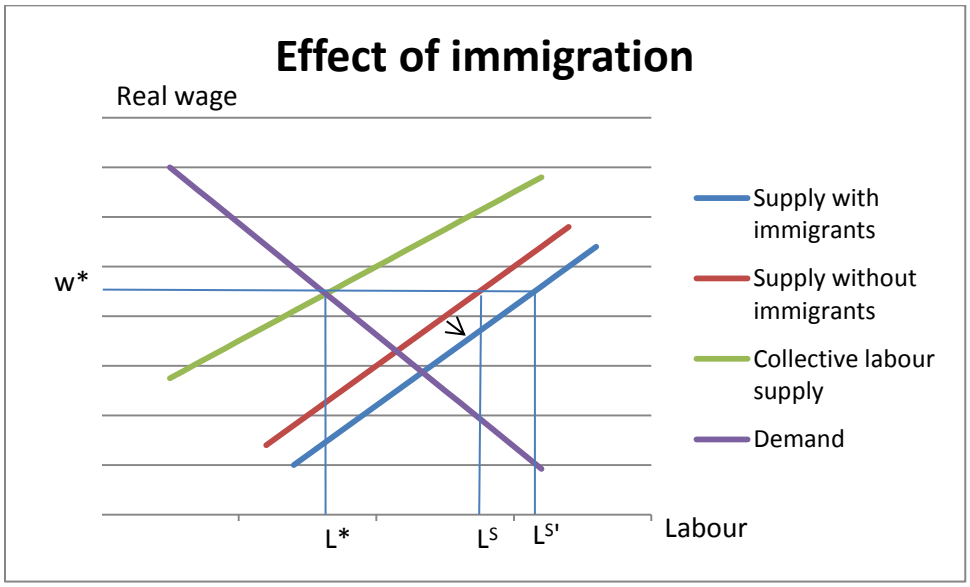


Figure A4.7: Labour supply under immigration and rigid wages

Exercise 4.10

(a) Given flexible wages and an upward sloping supply curve an increase of the MPL leads to an upward shift of the labour demand curve. The new equilibrium shows a higher wage (w*) and higher employment (L*).

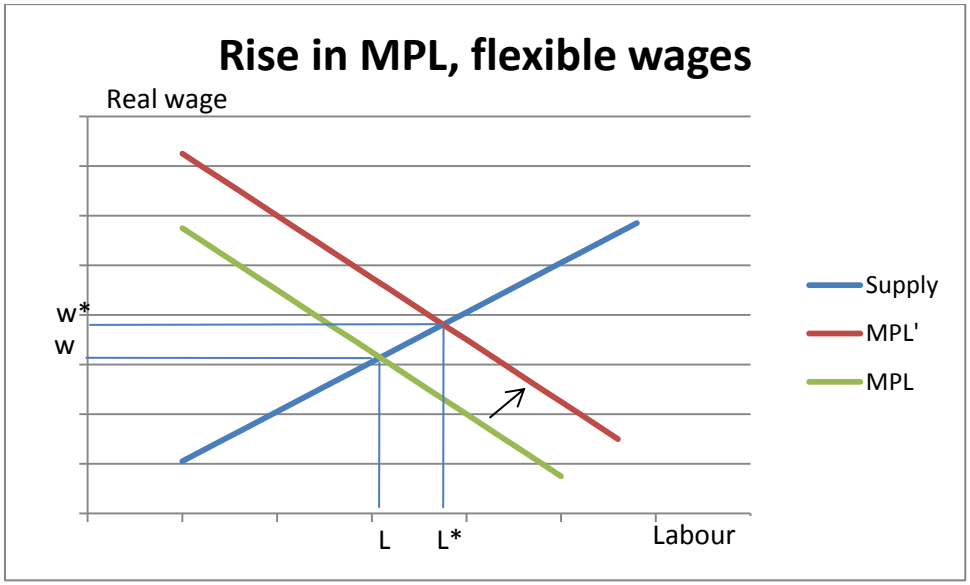


Figure A4.8a: Rise in MPL under flexible wages

(b) If wages are rigid, they cannot adjust when labour demand rises and thus there is excess demand of labour (L^D-L^S) at wage w.

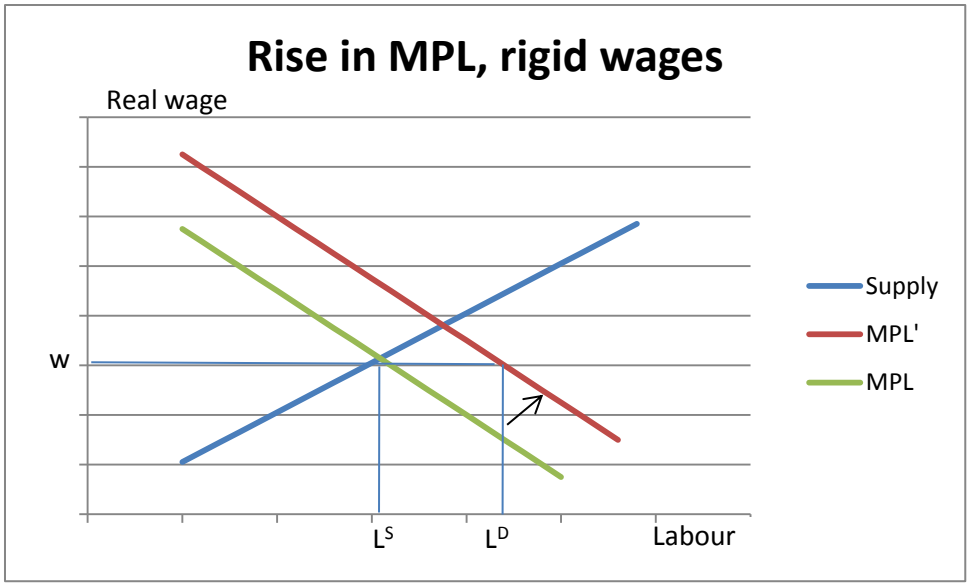


Figure A4.8b: Rise in MPL under rigid wages

A technical change which reduces the MPL leads to opposite effects.

(a) With flexible wages, the demand curve shifts to the left. In the new equilibrium, the real wage and employment are lower.

(b) With rigid wages, wages cannot adjust. Starting from an equilibrium situation, a leftward shift of the demand curve reduces labour demand. Since the wage cannot fall, labour supply exceeds labour demand at the given rigid wage. Hence, there is an oversupply of labour and thus unemployment.

Unions have two different competing goals. If they want high wages, they have to accept higher unemployment, if they want to have low unemployment, they cannot reach high wages. If unions believe that technological progress increases the MPL, a minimum wage is a good idea. An increase in the MPL leads to higher employment in any case, because labour demand shifts to the right. It may also lead to a wage increase, depending on the level of the minimum wage in the initial situation (above/below equilibrium wage). If in contrast unions believe that technological progress rather decreases the MPL, a minimum wage will lead to or increase involuntary unemployment because it inhibits a new labour market equilibrium at a lower wage. While workers, who stay employed, profit from a higher-than-equilibrium minimum wage, others have to pay in form of involuntary unemployment.

If high wages are unions' main objective, a minimum wage pays off in both cases. If they are rather interested in a high employment level, minimum wages cannot be recommended as they create involuntary unemployment if labour demand shrinks.

Essay Questions

Essay Question 4.1

Distinguishing between voluntary and involuntary unemployment is difficult, as it is necessary to know the preferences and budget constraints of the households. Since prefe-

rences and budget constraints are unobservable, one has to look for other variables which reflect the motivation of the household to find a job. Potential indicators are e.g. the number of job applications over the unemployment duration, the number of job talks, the willingness of the household to look into different jobs, to accept a lower wage, to undergo training to update skills or to commute longer.
While easy in textbooks, the distinction between voluntary and involuntary unemployment is difficult to make in reality, e.g. if a job is turned down because it is not economically reasonable. What is economically reasonable and just? Moreover, the family situation (e.g. member of the family needs care) and the social infrastructure (e.g. no daycare) may hinder people from looking into jobs although they would like to work.

Essay Question 4.2
An argument in favour of giving the responsibility for the social security system to the labour unions would be that it might help increase the number of members. This is especially important in times of high unemployment, where memberships tend to decrease. But if the system is organized as such that also non-members are eligible for the payments, this argument loses its power. Also higher costs would be involved and the labour unions would have to be subsidized by the state and the employers as well.

Essay Question 4.3
Severance pay makes layoffs more costly for a firm. Thus the firm cannot adjust its number of employees as easily as before. One effect of high severance pay could be that the firm hires less people in good times as it cannot easily reduce its working force in bad times. On the other hand, in case of negative shocks, it might have less incentive to fire workers. Some argue that the second effect, not to fire, is larger than the first effect, not to hire, and thus unemployment decreases with the introduction of severance pay. Others argue the other way around.

Essay Question 4.4
Arguments in favour of the minimum wage are mainly social considerations. They should promote social equity and lift low income households out of poverty. Also they should encourage people to switch from illegal to legal employment and protect young people from being exploited. Employers with excessive market powers are prevented from depressing wages.

On the other hand, arguments against minimum wages are that they discourage firms from hiring workers with a low MPL, which are either the young and unskilled or the older generation with outdated skills. Given an elastic labour demand curve, a minimum wage leads to unemployment. The ones that lose their jobs pay for the ones that earn a higher wage.

The hard facts are in this case that, given the elastic labour demand curve, a minimum wage leads to unemployment. Thus governments should think of alternatives like redistribution through payments by the government to low-skilled workers.

Essay Question 4.5
A policy to reduce the separation rate s is the regulation of redundancies. As discussed above in Essay Question 4.3, this policy often reduces the outflow rate f in the same run. Thus it

does not necessarily increase the utility of the members of society. To increase the outflow rate, governments could start initiatives that help with the worker-job matching process, as for example introducing information platforms or job boards and offering training programs to help unemployed to gain and update skills that are demanded in the labour market.

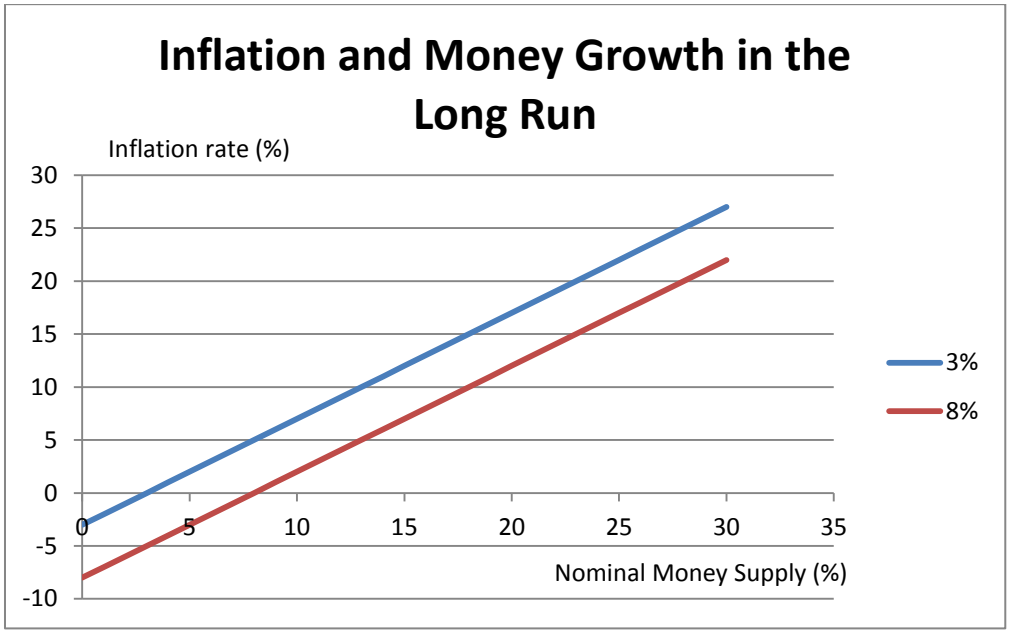
Chapter 5

Exercise 5.1

For constant *k*, nominal money growth equals the sum of inflation and real GDP growth:

(5.4) $$\frac{\Delta M}{M} = \pi + \frac{\Delta Y}{Y} \leftrightarrow \pi = -\frac{\Delta Y}{Y} + 1 \cdot \frac{\Delta M}{M}$$

If GDP grows at a rate of 3%, equation (6.4) describes a linear relationship between inflation and nominal money growth which equals graphically a line with intercept -3% and slope equal to 1. A rise in GDP growth to 8% changes the intercept, but not the slope.



Exercise 5.2

The rate of change of the real exchange rate can be decomposed (approximately) as follows:

$$\frac{\Delta\sigma}{\sigma} = \frac{\Delta S}{S} + \frac{\Delta P}{P} - \frac{\Delta P^*}{P^*}$$

If the price level at home doubles ($\Delta P/P = 1$), the country faces a loss of competitiveness and the real exchange rate appreciates by the same rate. If in contrast the price of foreign goods doubles ($\Delta P^*/P^* = 1$), the country gains competitiveness and the real exchange rate depreciates by the same rate. If the nominal exchange rate doubles ($\Delta\sigma/\sigma = 1$), the foreign price of domestic goods $S \cdot P$ rises even if the domestic price is unchanged and the real exchange rate appreciates at the same rate as the nominal exchange rate.

Exercise 5.3

Since 1970, the real exchange rate remained trendless whereas the nominal exchange rate depreciated sharply. This shows that the inflation differential must have been positive over these years to offset the nominal exchange rate depreciation. Since the late 1990s, inflation differentials have vanished and the nominal and effective rates move closely together.

Exercise 5.4
The Cambridge equation in real terms looks like this:

$$\frac{M}{P} = kY$$

In the short run, the price level will not adjust directly to an increase in money. Instead consumers will buy more goods and services at constant prices and producers will increase their production. Real GDP rises. But this will only be a short-run effect. In the long run, prices will adjust and production goes back to its initial value.
An increase in nominal money has also no effect on the price level if consumers are willing to hold a larger proportion of cash without spending the money (*k* rises).
This scenario (described as liquidity trap by J. M. Keynes) may arise in an economic situation with interest rates close to zero, hence with very low opportunity costs of holding cash.

Exercise 5.5
Inflation growth is equal to money growth less GDP growth:

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

so in this case:

$$\pi = 5\% - 2.5\% = 2.5\%.$$

Assuming a constant real exchange rate in the long run, the rate of nominal exchange rate appreciation in the long run is equal to the difference between foreign and domestic inflation:

$$\frac{\Delta S}{S} = \pi^* - \pi$$

which is in this case:

$$\frac{\Delta S}{S} = 3.5\% - 2.5\% = 1.0\%$$

Exercise 6.6
Inserting equations (6.5) for home and foreign countries into (6.8) gives:

$$\frac{\Delta S}{S} = \left(\frac{\Delta M^*}{M^*} - \frac{\Delta Y^*}{Y^*}\right) - \left(\frac{\Delta M}{M} - \frac{\Delta Y}{Y}\right) = \left(\frac{\Delta M^*}{M^*} - \frac{\Delta M}{M}\right) - \left(\frac{\Delta Y^*}{Y^*} - \frac{\Delta Y}{Y}\right)$$

The rate of exchange rate appreciation is equal to the difference between foreign and domestic money growth less the difference between foreign and domestic GDP growth.

Essay Questions

Essay Question 5.1
Governments may regard a depreciation as a sign of weakness because the national currency

is worth less in terms of foreign currency. However, if inflation is high and the government resists depreciation, the real exchange rate appreciates, leading to a loss in competitiveness. Later in Chapters 10 and 11 and later in Chapter 15 this logic will be made explicit.

Essay Question 5.2

Money neutrality says that in the long run nominal variables do not affect real variables. This also means that monetary policy is neutral in the long run. For example it is not possible to just print large amounts of money and pretend the country is "rich" if no real values are created at the same time. Hence the statement is true in the long run.

Essay Question 5.3

The tendency of a currency to appreciate nominally may arise from the country's current account surplus and thus be a sign of a thriving export sector which stimulates growth. Moreover, if the real exchange rate is held constant in the long run, the appreciation of the nominal exchange rate must go hand in hand with a low inflation at home (relative to foreign inflation) which is also a desirable objective.

Essay Question 5.4

The Law of One Price states that identical goods should cost the same in different countries if prices are expressed in the same currency. While this is more likely to hold for tradable goods, the Law of One Price certainly fails to hold for non-tradable goods because price differences cannot be eroded through arbitrage. For instance, even if the haircut is cheaper in Berlin than in New York, you cannot export it. However, even for identical or very similar goods like e.g. a Big Mac or a Starbucks coffee, different prices are observed in different countries, which contradicts the Law of One Price.[1] These price differences arise because of e.g. transportation costs, custom duties, asymmetric information and corruption, and last not least because of the price differences in the non-tradable goods and services which are used in the production of the tradable goods. The Law of One Price rules out these impediments by assuming perfect markets and zero transaction costs.

Essay Question 5.5

After a war, the economy is usually down as a most of the infrastructure is often destroyed and resources have been exhausted or decreased (e.g. labour force). In view of the economic situation (high expenses, low tax revenues), the government often has no means but to borrow from the central bank to pay for their expenses. They often have no other source of finance besides asking for international help or opening their country to foreign investors. Since many world-wide examples have illustrated the fatal consequences of excessive money growth, it is questionable whether governments and their central banks don't know about the economic implications. It is rather likely that a period of hyperinflation is simply accepted politically as a means of reducing a massive government debt which has been accumulated to finance the war.

[1] http://www.economist.com/blogs/graphicdetail/2012/07/daily-chart-17; http://www.economist.com/node/2361072

Chapter 6

Exercise 6.1

If Crusoe borrows against tomorrow's endowment, he can consume a maximum of $Y_1 + \frac{Y_2}{1+r} = 100 + \frac{200}{1.05} = 290.5$ coconuts today (intersection of budget line with horizontal axis in Figure A6.1). If instead Crusoe lends all 100 coconuts at interest rate $r = 5\%$ today to his neighbour, he will be able to consume $Y_1(1 + r) + Y_2 = 305$ coconuts tomorrow (intersection of budget line with vertical axis in Figure A6.1). The budget line in Figure A6.1 shows Crusoe's consumption possibilities for given endowments ($Y_1 = 100, Y_2 = 200$) and interest rate $r = 5\%$. The slope of the budget line equals $-(1 + r) = -1.05$.

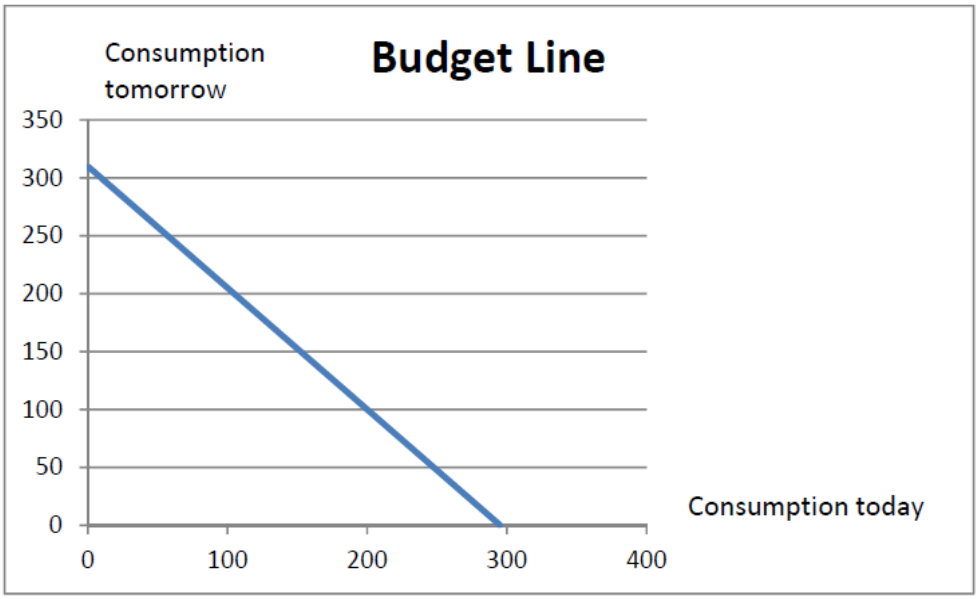


Figure A6.1: Intertemporal Budget line ($Y_1 = 100, Y_2 = 200, r = 5\%$)

For $Y_1 = 100, Y_2 = 200$ and $r = 5\%$, total wealth Ω equals

$$\Omega = Y_1 + \frac{Y_2}{1+r} = 100 + \frac{200}{1.05} = 290.5.$$

For $Y_1 = 200, Y_2 = 100$ and $r = 5\%$, total wealth Ω equals

$$\Omega = Y_1 + \frac{Y_2}{1+r} = 200 + \frac{100}{1.05} = 295.2.$$

Income today is more valuable than income tomorrow, so reversing the order of the payments so that 200 arrives in the first period is more valuable.

Exercise 6.2

With an interest rate of r=10%, total wealth equals

$$\Omega = Y_1 + \frac{Y_2}{1+r} = 100 + \frac{200}{1.10} = 281.8.$$

A higher interest rate leads to a higher discounting of future values. The value of Y_2 today decreases with r.

For Y_1=200 and Y_2=100, total wealth equals $\Omega = Y_1 + \frac{Y_2}{1+r} = 200 + \frac{100}{1.10} = 290.9$. Again, his net income value is higher because a smaller amount is discounted.

For Y_1=300 and Y_2=0, total wealth equals $\Omega = Y_1 + \frac{Y_2}{1+r} = 300 + \frac{0}{1.10} = 300$. Although Crusoe's total endowment equals 300 in all 3 examples, his wealth is higher, the smaller the part of his income which is received in period 2, because it enters today's total wealth only as discounted value.
If income in period 2 equals zero, no income has to be discounted and today's total wealth does not depend on a change in the interest rate.

Exercise 6.3
Without borrowing, Crusoe can at one extreme consume 200 coconuts today and 100 coconuts tomorrow or at the other extreme consume zero coconuts today but store them for consumption tomorrow. Since 10% will spoil, Crusoe will have 290 coconuts tomorrow for consumption. The budget line in Figure A6.2 is kinked because it is not feasible to consume (part of) tomorrow's endowment today.

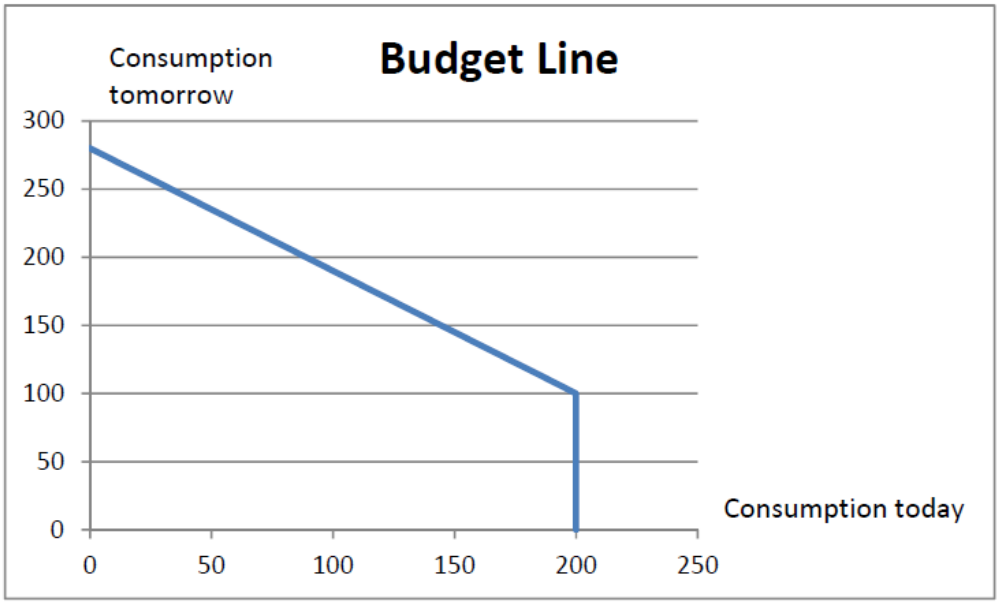


Figure A6.2: Budget line without option to borrow, but with storage option

With a market for loans, in addition to store coconuts in period one, Crusoe can also decide to consume a higher amount of coconuts than his endowment Y_1=200 in period one by taking a loan and repaying it in period two. This gives him more possibilities on how to optimize his consumption over both periods and thus makes him better off if he is impatient. He can always choose to leave his behaviour unchanged.

Exercise 6.4
Since a bequest reduces the consumption possibilities, the budget line shifts down by the amount of the discounted bequest, see Figure A6.3.

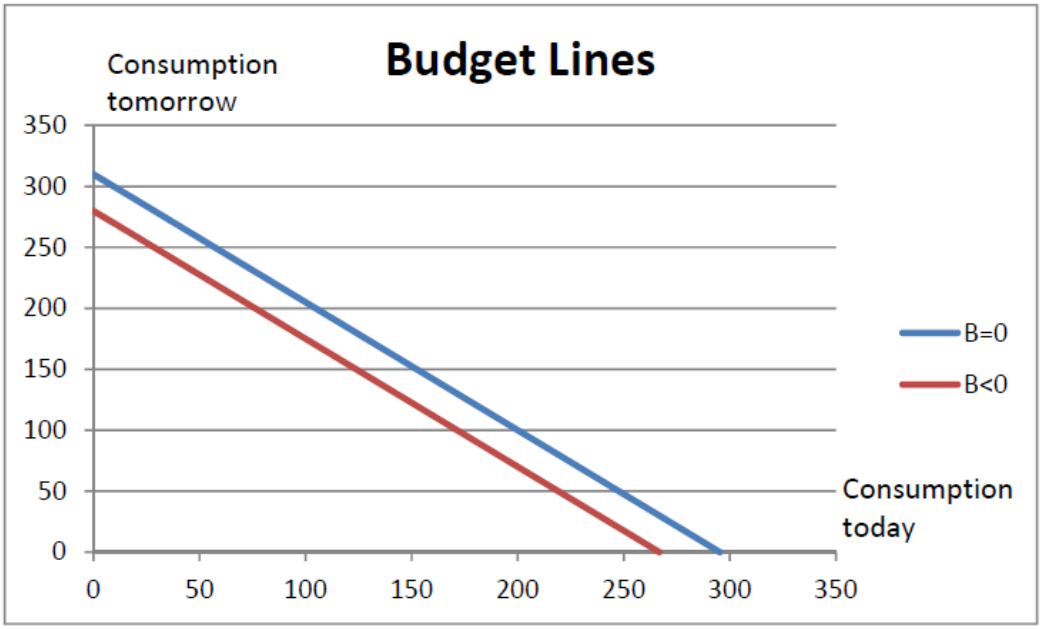


Figure A6.3: Budget line with bequest

If Crusoe wants to leave his friend Friday a gift of a fixed amount B_3 **in** the second period, equation (7.1) changes to

$$C_2 + B_3 = Y_2 + (Y_1 - C_1)(1 + r).$$

Dividing by (1+r) gives the modified budget constraint

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{(Y_2 - B_3)}{1+r}.$$

If Crusoe wants to leave his friend Friday a gift of a fixed amount B_3 **after** the second period, equation (7.1) changes to

$$C_2 + \frac{B_3}{(1+r)} = Y_2 + (Y_1 - C_1)(1 + r).$$

Dividing by (1+r) gives the modified budget constraint

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r} - \frac{B_3}{(1+r)^2}.$$

Exercise 6.5

The value of the firm is

$$V = -€200{,}000 + \frac{€100{,}000}{1.05} + \frac{€70{,}000}{(1.05)^2} + \frac{€40{,}000}{(1.05)^3} = -€6{,}716.34.$$

If the equipment can be sold for €50,000, the value of the firm becomes

$$V = -€200{,}000 + \frac{€100{,}000}{1.05} + \frac{€70{,}000}{(1.05)^2} + \frac{€40{,}000}{(1.05)^3} + \frac{€50{,}000}{(1.05)^3} = €36{,}475.54.$$

With an interest rate of 10% the value with an equipment value of zero in the last period is

$$V = -€200{,}000 + \frac{€100{,}000}{1.10} + \frac{€70{,}000}{(1.10)^2} + \frac{€40{,}000}{(1.10)^3} = -€21{,}187.08.$$

If the equipment can be sold for €50,000, the value becomes

$$V = -€200{,}000 + \frac{€100{,}000}{1.10} + \frac{€70{,}000}{(1.10)^2} + \frac{€40{,}000}{(1.10)^3} + \frac{€50{,}000}{(1.10)^3} = €16{,}378.66.$$

Exercise 6.6

Investing profits into another firm instead of distributing dividends to the shareholders should only take place, if the expected returns from the investment are higher than from any other possible investment. If this is the case and the investment is announced, share prices should rise as there is a value added expected. In the case that shareholders expect an alternative investment to yield a higher interest rate, share prices should decline and in case of equal expected returns they should show no action. In general, if news are ad hoc, share prices should react. If the information has been seeped through before, the action will not have any effect.

Exercise 6.7

It is assumed that $F(K) = AK^{\alpha}L^{1-\alpha} = K^{0.5}$ and $r = 0.05$. The net return from investing the amount K into the capital stock is given by

$$V = \frac{F(K)}{1+r} - K = \frac{K^{0.5}}{1.05} - K.$$

(a) An investment project is profitable if V is positive. It is just profitable, if

$$V = \frac{K^{0.5}}{1.05} - K = 0.$$

Solving for K yields the two solutions K=0 and $K = \frac{1}{1.05^2}$. Not investing and investing an amount of $K = \frac{1}{1.05^2}$ is equally attractive.

(b) If the interest rate is 10% the answer changes to $K = \frac{1}{1.10^2}$. Because of the diminishing marginal productivity of capital, the capital stock must be smaller (and hence the marginal productivity of capital higher) when the interest rate rises.

(c) If the depreciation rate is 5% per annum,
$V = \frac{K^{0.5}}{1.05} - (1 - 0.05)K = 0$, and $K = \frac{1}{0.95^2 1.05^2}$.

(d) If $A = 2$, the capital stock at which the project is just profitable equals $K = \frac{4}{1.05^2}$.

Exercise 6.8

The value of the firm is given by

$$V = \frac{F(I_1 + (1-\delta)K_1)}{1+r} - I_1.$$

The initial and given stock of capital affects the firm's value indirectly through the production function. Thus it is necessary to know the production function to get more information on the

exact size of the impact. The higher the depreciation rate the lower the capital available for production in each period. Thus the firm's value is lower if the depreciation rate is high. The rate of investment influences the firm's value in two ways: indirectly through the production function and directly, as it is subtracted from the equation accounting for costs of investment.

Exercise 6.9
The government's intertemporal budget constraint is given by

$$T_2 - G_2 = (1 + r_G)(D_1 + G_1 - T_1).$$

Taxes in the second period need to be

$$T_2 \geq G_2 + (1 + r_G)(D_1 + G_1 - T_1) = €500 + (1.05)(€1{,}000 + €500 - €400) = €1.655.$$

With $r_G = 0.10$ taxes need to be:

$$T_2 \geq G_2 + (1 + r_G)(D_1 + G_1 - T_1) = €500 + (1.10)(€1{,}000 + €500 - €400) = €1{,}710.$$

Exercise 6.10
The consolidated public and private budget constraint is given by

$$C_1 + \frac{C_2}{1+r} = (Y_1 - G_1) + \frac{Y_2 - G_2}{1+r} + \left[\frac{r - r_G}{1+r}\right](G_1 - T_1).$$

The present value of the government's financing advantage is given by the term

$$\left[\frac{r - r_G}{1+r}\right](G_1 - T_1).$$

Thus with r=0.10 and r_G=0.05 it becomes 0.045*(G_1-T_1) and wealth increases with a tax cut as the government can finance its debt at a better interest rate than households can. With r=0.10 and r_G=0.15 the term becomes -0.045*(G_1-T_1) and wealth decreases with a tax cut. When both r=0.10 and r_G=0.10, then Ricardian equivalence holds and the consolidated budget constraint reduces to

$$C_1 + \frac{C_2}{1+r} = (Y_1 - G_1) + \frac{Y_2 - G_2}{1+r}.$$

The private sector has fully internalized the public sector's budget constraint. Taxes have completely disappeared because the household is now indifferent towards debt-financed versus tax-financed government spending as it can borrow at the same rate as the government.

Exercise 6.11
This exercise should have been removed from the 6th edition since Table 7.1 has been altered and does not contain Italian budget data any longer. Please excuse this error!

Essay Questions

Essay Question 6.1
If we assume that everybody prefers consumption today over consumption tomorrow, then

households which forego consumption today by lending part of their endowment to other households will expect to be compensated for their patience in form of higher consumption tomorrow. A positive real interest rate reflects their positive real (in terms of goods) costs of waiting. If the real interest rate is negative but it is still assumed that households prefer consumption today over consumption tomorrow, nobody will forego consumption today because lending means less consumption today AND tomorrow. If every household wants to borrow, the market for loans breaks down, unless someone from outside the economy is willing to provide the lending.

Essay Question 6.2

Over time, primary budget balances must add up, in present-value terms, to initial public debt. So obviously if the budget is balanced every year, this is a sufficient condition for the government to honour its budget constraint. It is not a necessary condition as it is also feasible to run budget deficits for some years but balance with budget surpluses in the following years, see Figure 7.8 in the textbook. If an economy is in recession and if $r_G < r$, a budget deficit may help stimu-late demand, investment and hence growth. Since tax income rises with GDP growth, part of the budget deficit may be financed in subsequent periods through the rise in tax income. Another aspect is that governments may borrow to finance infrastructure investment projects. These tend to benefit both current and future (or even unborn) generations, so it is reasonable to expect them to help shoulder the costs. Furthermore, if a country's population is growing, it might be just to let younger generations pay for government expenses as e.g. infrastructure or education, in form of tax increases in the future as these generations benefit from today's expenses, too.

Essay Question 6.3

The pyramid scheme is a pure redistribution system in which the money of new investors is used to pay off older investors. It only works as long the number of investors is constantly growing. However, it is clear from the beginning that at some point the market cannot believe anymore in the promised above-average returns and potential investors will invest into other projects. At this point, the pyramid scheme collapses.

If a social security system is organized as 'pay as you go' system, it shares the feature of the pyramid scheme that new entries into the system pay for those who exit the system since people who retire get their pensions out of the contributions paid by the (younger) working population. A growing amount of contributions ensures a pension which exceeds the sum of contributions paid by the retiree and hence some rate of return.

However, in contrast to the pyramid scheme, the social security system is not a mere redistribution, since the contributions of the working population are paid out of labour income generated within the production process. Therefore, if more people are working, or if they work longer hours, or if real wages increase due to an increase in labour productivity, labour income will increase and contributions will also grow. In contrast to the pyramid scheme, the system need not break down. But insufficient growth in productivity or population or contributions can cause the rate of return of the system to fall below the market interest rate.

Essay Question 6.4

When a country defaults it is either unable or unwilling to honour its debt. Possibly the

country does not have access to enough domestic or foreign financial resources, or cannot generate enough tax income, or is unwilling or unable to cut spending sufficiently enough to repay its debt. If it is simply unwilling to repay its debt, it possesses the resources but refuses to repay the debt. In contrast to a private contract, the lender has no means to force a country to pay. The border between ability and willingness to pay is fuzzy. Generally borrowing decisions are not made by referendum (except in Switzerland) , so voters are generally poorly informed about international debt. They will generally blame politicians for debt crises, even if an intervening event (like a decline of export prices) is the root cause of the country's inability to repay the debt. Politicians will tend to lose taste for budget cuts if they imply loss of electoral popularity, yet cuts may entail painful consequences for poorer members of society. Lenders on the other hand, may not to be able to distinguish between unwillingness and inability unless the country in question allows inspection of its national books.

Essay Question 6.5

The issue is how to balance two conflicting objectives. One objective is to make it very difficult, possibly impossible, for governments to default on their debt obligations. The other objective is to accept that, now and then, a government – or its predecessors – has accumulated such a debt that its has been a burden that is first and foremost punishing its citizens. In the first case, you want to seize national assets and to refuse any arrangement. In the second case, you want to establish an orderly process. At stake, in each case, is that the creditors are usually numerous, ranging from other governments, to banks and financial intermediaries, and to ordinary citizens. These creditors have diverse interests and diverse abilities to face the situation. For that reason, you need laws that respect the needs of all creditors and to make sure that they are all treated equally.

Chapter 7

Exercise 7.1

The production of goods and services are measured as flow variables; i.e. output produced and sold over a certain time interval. A flow variable can also measure the change in a stock variable over some period of time. For instance, investment (ignoring depreciation for simplicity) in period *t* is measured as the change in the capital stock *K* from period *t* to period *t*+1: $I_t = K_{t+1} - K_t$. Asset markets deals with stock variables like bonds or the share of a firm. A stock variable can hence be written as sum of flow increments. In the example of investment without depreciation, today's capital stock is the cumulated sum of investments: $K_t = K_{t-1} + I_{t-1} = K_{t-2} + + I_{t-2} + I_{t-1} = \cdots = \sum_{i=1}^{t} I_{t-i}$.

Because asset markets are markets for stocks (of the entire bond issue or common stock issue or gold bullion) the market must (and is designed to) handle large fluctuations in transactions volumes – which can take values from zero to entire outstanding amount being traded. The expectations of traders are the trigger for trading activity. In contract, flow markets generally involve little or no inventory, and the range of trading volume is narrower.

Exercise 7.2

At first sight, the bid-ask spread seems to contradict the law of one price. Only one price establishes the equilibrium of demand and supply for a good. If there were two prices, arbitrage would make sure that the price difference was erased. However, the law of one price is valid only if there are no transaction costs, information costs or risk. Assets, however, carry risks and their price depends on information about the future expected asset prices. These risks are born by brokers or market makers. Consider for instance a foreign exchange booth that sells or buys foreign currencies. It bears the risk that at the end of the day it will have a stock of foreign currency with uncertain value since the exchange rate may change to its benefit or to its disadvantage. It will demand a risk premium to be willing to take this risk. Moreover, the trading service does not come at zero cost either. The bid-ask spread is the fee that the exchange booth charges to cover its labour and capital expenses plus risk premium.

A bid-ask spread also exists in the house market where real estate agents serve as market makers and demand a commission from the buyer for their services. The bid-ask spread equals the commission in this case.

Thus bid-ask spread can be thought of as compensation for risk as well as compensation for costs incurred in the market-making process.

Exercise 7.3

The table below contains payoffs for 3 assets (columns) in 3 different states (rows):

	A	B	C
1	100	50	150
2	0	150	100
3	200	100	50

Under the assumption that each state is equally likely, all three assets have the same expected payoff: $E(A) = E(B) = E(C) = 100€$.

Assets A, B, C and states 1, 2, 3:

Now consider a portfolio $P = a\,A + b\,B + c\,C$ where $a, b, c \geq 0$ are the proportions of the assets in the portfolio and $a + b + c = 1$.
The expected payoff is $E(P) = a\,E(A) + b\,E(B) + c\,E(C) = 100\,(a + b + c) = 100$.

What are the proportions a, b, c which fully diversify the risk of the portfolio P? To answer this question, remember that risk is measured by the variance σ^2. Let P_i be the payoff of portfolio P in state i, then under the assumption of equally likely states, the variance equals

$$\sigma^2 = \frac{1}{3}(P_1 - 100)^2 + \frac{1}{3}(P_2 - 100)^2 + \frac{1}{3}(P_3 - 100)^2.$$

The variance will be zero (and hence the risk fully diversified), if the terms in parentheses are zero. Hence, we have three equations to solve for 3 unknown parameters a, b and c:

$$P_1 = 100 \quad \leftrightarrow \quad 100\,a + 50\,b + 150\,c = 100$$

$$P_2 = 100 \quad \leftrightarrow \quad 0\,a + 150\,b + 100\,c = 100$$

$$P_3 = 100 \quad \leftrightarrow \quad 200\,a + 100\,b + 50\,c = 100$$

Solving the set of equations yields $a = 0.2,\ b = c = 0.4$.

Assets A and B only and states 1,2,3:

In this case, we have to solve 3 equations for only 2 unknown parameters a and b:

$$P_1 = 100 \quad \leftrightarrow \quad 100\,a + 50\,b = 100$$

$$P_2 = 100 \quad \leftrightarrow \quad 0\,a + 150\,b = 100$$

$$P_3 = 100 \quad \leftrightarrow \quad 200\,a + 100\,b = 100$$

Since there are more linearly independent equations than unknown variables, there is no solution and hence it is not feasible to fully diversify risk in this case.

Assets A and B and states 1 and 2 only:

Assuming again equally likely states, E(A)=50 and $E(B) = 100$. Expected payoff is maximized if only asset B is purchased.

The expected payoff $E(P) = a\,E(A) + b\,E(B) = 50\,a + 100\,b = 50 + 50\,b$.

The variance is $\sigma^2 = \frac{1}{2}\,(P_1 - E(P))^2 + \frac{1}{2}\,(P_2 - E(P))^2$ and will be zero if

$$100\,a + 50\,b = 50 + 50\,b$$

$$150\,b = 50 + 50\,b$$

Solving yields a=b=0.5.

Exercise 7.4
The shape of the yield curve is influenced by impatience, risk and expectations about future interest rates. Impatience and risk increase with the passage of time, leading to an upward-sloping yield curve in general. The only factor which can cause a downward-sloping yield curve is the expectation that the central bank will lower the interest rates in the future. If market participants expect a sharp decline of the short-term interest rates over the next years, long-term rates may be lower than short-term interest rates despite a risk and patience premium.

Exercise 7.5
Stock prices reflect future profits discounted back to the present using the interest rate. They can rise under two conditions:

- Normally, a recession hurts profits. Investors may have been fearing the recession ahead of time so that stock prices were depressed before the onset of the recession. Once it has started, investors look beyond the recession to the ensuing recovery, which means that profits are expected to rise.
- In a recession, central banks may be lowering the interest rate. Thus future profits are discounted less heavily.

Exercise 7.6
(a) To compute the expected return of the asset, the two possible outcomes for q_{t+1} must be weighted with their corresponding probabilities. Changing equation 14.1in the textbook accordingly yields:

$$r = \frac{d}{q_t} + (1-s)\frac{q_{t+1} - q_t}{q_t} + s\frac{0 - q_t}{q_t}$$

$$= \frac{d}{q_t} + (1-s)\frac{q_{t+1} - q_t}{q_t} - s$$

$$r = \frac{d}{q_t} + \frac{(1-s)q_{t+1} - q_t}{q_t}$$

By inspection, arbitrage implies that the expected price of the asset in t+1 must be higher than in the "no bursting case" (s=0) in order to compensate the investor in expectation for the possibility of total loss. In this case, a rational price for the bubble must rise faster than the interest rate.

If potential buyers of the asset are risk averse and must bear the risk that the price of the asset in period t+1 may be zero, they will buy only if the expected return $= \frac{d}{q_t} + \frac{(1-s)q_{t+1}-q_t}{q_t}$ equals the safe yield r plus a risk premium ψ, see equation 14.4 in the textbook.

(b) A non-explosive q_t requires that the price of the asset equals its fundamental value and hence the absence of asset price bubbles: $q_{t+1} = q_t = \bar{q}$ and $\bar{q} = \frac{d}{r}$.

Essay Questions

Essay Question 7.1

In Chapter 6, Robinson borrows or lends coconuts, the only available asset, and he trades intertemporally between today and tomorrow, just two periods. In asset markets, there is a bewildering variety of assets. It is also possible of entering into contracts that last from 'overnight' to 30 years or more. Even better, it possible to commit to borrow or lend a given amount in, say, five years and to pay back at agreed upon conditions in, say, ten years.

Essay Question 7.2

There are several definitions of efficiency – a weak one commonly used is that it is impossible to make consistent profits trading in the market using publicly available information. This also implies that it impossible to use market power. So two conditions generally cited are sufficient abundance of relevant information (or at least diffusion of this information) and the absence of market power so that prices cannot be manipulated (i.e. perfect competition).

Both conditions are not always fulfilled in reality. The first condition, the accessibility of information, has been greatly enhanced through the internet. Nevertheless, frequent prosecutions of cases involving insider trading suggests that there is much information that is not shared with the public. Second, the domination of market position by market makers or large investment banks may violate the assumption of perfect competition.

Essay Question 7.3

Financial markets exist, because they play an important economic role. They bring together borrower and lender and thus make it possible to bring forward consumption and investment projects while paying a premium for those who are willing to delay spending or investment. This increases today's consumption and production possibilities and stimulates economic

growth and welfare. By pricing risk, financial markets render trade with risky assets possible. Moreover, the financial market is one important transmitter of monetary policy actions.

Since stocks and not flows are traded in financial markets, large sums of money are moved every day. Professional intermediaries, banks and insurance companies dominate the market. They trade for their customers as well as for their own profit or to hedge against risk. This is beneficial not only for wealthy customers but e.g. for all insurance-takers of an insurance company. However, if these large players speculate in asset price bubbles, a lot of money can be lost and trading in the financial market rather looks like gambling. This underlines the important role of information and information accessibility for the proper functioning of the financial market.

Due to risk aversion, people who hold risky assets must be able to cope financially with a loss. Wealthier persons are more likely to invest in stocks, while somebody who cannot risk losing his savings will rather invest in bonds or funds or even simple bank accounts. Even if we assumed that only wealthy people held stocks, they could not all profit from a rise in stock prices as there is always a buyer, and prices cannot rise forever. Hence, there are winners and losers.

Essay Question 7.4

Derivatives are contracts between two or more parties which are contingent on the future prices of assets or goods.[2] They can be used to hedge against risk caused by price fluctuations.

Imagine a European export company which sells product to the US to be delivered in 6 months. The US company pays in US dollars. Hence, the domestic company knows that it will receive, say 100,000 dollars in 6 months, but since the future exchange rate is unknown, it does not know how much the sum will be worth in domestic currency. To eliminate this uncertainty, the domestic company signs a contract with a bank which agrees to buy the 100,000 dollars in 6 months at a forward exchange rate which is specified today. While the domestic company has eliminated the exchange rate risk, it has not disappeared, but now resides with the bank. The bank in turn could negotiate a forward contract with another bank, selling the foreign currency at the same or a different forward exchange rate to eliminate or diversify its own risk. Note that the forward contracts cannot reduce the overall risk that the sum of 100,000 dollars may be worth less in 6 months, in the case of an exchange rate appreciation. It may also be worth more if the dollar appreciates. Forward contracts allow involved parties to avoid, split or even increase risk. Other derivatives are more exotic and complex, but they serve the same function: to transfer risk from those who want to avoid it to those who are willing to bear it. Hence, derivatives are beneficial because they

- help to shift the risk from risk-averse to risk-neutral or even risk-loving agents;
- give a market-driven evaluation of expected trajectory and risk contained in the price.[3]

[2] http://www.investopedia.com/terms/d/derivative.asp#axzz2CDUJqilU

[3] Note, that in case of an exchange rate depreciation, the party who buys the foreign currency will make a profit. The incentive to buy is either a different expectation about the evolution of the exchange rate or a different attitude towards the risk of losing.

On the other hand, the financial crisis has shown that derivatives can increase speculative activity. This may be detrimental to economic growth and welfare because

- there may be a limit to the value of speculation in an economy, in particular it leads prices and exchange rates away from their fundamental values;
- some market players may be large enough to influence the market and price formation process;
- certain unregulated derivatives may create systemic risks which may bring down financial institutions, in which case the taxpayer is asked to pay the bill.

For many, the financial crisis in 2008 showed that the speculative motive has come to dominate trade with derivatives. Regulations are therefore necessary to push back speculations.

Essay Question 7.5

One may always speculate… A number of possible stories have emerged. In Europe, which started before the US, banks have been instrumental in financial the industrial revolution. They have acquired size and power at the dawn of modern times, along with lasting proximity with corporations. In the US vast lands, banks have tended to be local and therefore small while New York has emerged early on as a financial center for the whole country. In Europe, banks have retained proximity because they operated – and still do – at the national level, with each country to nurture one or more champions.

Chapter 8

Exercise 8.1

(a) $Y_1 = 10,000$; $Y_2 = 50,000$; $r = 5\%$

(i) The household's wealth in terms of today's consumption is given in eq. (8.1):

$$\Omega_1 = Y_1 + \frac{Y_2}{1+r} = £\,10{,}000 + \frac{£\,50{,}000}{1.05} = £\,57{,}619.05.$$

(ii) The household's wealth in terms of tomorrow's consumption is:

$$\Omega_2 = Y_1(1+r) + Y_2 = £\,10{,}000\,(1.05) + £\,50{,}000 = £\,60{,}500.$$

The household's permanent income is given in eq. (8.2):

$$Y_1 + \frac{Y_2}{1+r} = \Omega = Y^P + \frac{Y^P}{1+r} = Y^P\left(1 + \frac{1}{1.05}\right)$$

$$Y^P\left(1 + \frac{1}{1.05}\right) = £\,57{,}619.05$$

$$Y^P = £\,29{,}512.20.$$

(b) $Y_1 = 11,000$; $Y_2 = 50,000$; $r = 5\%$

The household's wealth in terms of today's consumption is

$$\Omega_1 = £\,11{,}000 + \frac{£\,50{,}000}{1.05} = £\,58{,}619.05.$$

Permanent income is now:

$$Y^P = £\,30{,}024.39.$$

And thus the change in permanent income is:

$$\Delta Y^P = £\,30{,}024.39 - £\,29{,}512.20 = £\,512.20.$$

(c) $Y_1 = 11,000$; $Y_2 = 51,000$; $r = 5\%$

The household's wealth in terms of today's consumption is

$$\Omega_1 = £\,11{,}000 + \frac{£\,51{,}000}{1.05} = £\,59{,}571.43.$$

Permanent income is now:

$$Y^{P\prime} = £\,30{,}512.20.$$

And thus the change in permanent income is:

$$\Delta Y^P = £\,30{,}512.20 - £\,29{,}512.20 = £\,1000.$$

(d) $r = 10\%$ and

(1 a) $\boldsymbol{Y_1 = 10,000;\ Y_2 = 50,000}$

$$\Omega_1 = £\,55{,}454.55$$

$\Omega_2 = £\,61{,}000$

$Y^P = £\,29{,}047.62$

(1 b) $\boldsymbol{Y_1 = 11,000;\ Y_2 = 50,000}$

$\Omega_1 = £\,56{,}454.55$

$Y^P = £\,29{,}571.43$

$\Delta Y^P = £\,523.81$

(1 c) $\boldsymbol{Y_1 = 11,000;\ Y_2 = 51,000}$

$$\Omega_1 = £\,57{,}363.64$$

$Y^P = £\,30{,}047.62$

$\Delta Y^P = £\,1{,}000$

1 (e) Optimal consumption can be derived by maximizing utility with respect to the budget constraint. The Lagrangian is given by:

$\mathcal{L} = \log(C_1) + \beta \log(C_2) - \lambda(C_1 + \frac{C_2}{1+r} - \Omega)$.

The FOCs are:

$$\frac{\partial \mathcal{L}}{\partial C_1} = \frac{1}{C_1} - \lambda = 0$$

and

$$\frac{\partial \mathcal{L}}{\partial C_2} = \frac{\beta}{C_2} - \frac{\lambda}{1+r} = 0$$

It follows that

$$C_1^* = \frac{\Omega}{1+\beta}$$

and

$C_2^* = (1+r)\frac{\beta}{1+\beta}\Omega.$

Optimal consumption is:

(a) $C_1^* = \frac{£\,57{,}619.05}{1+\beta}$, $C_2^* = (1.05)\frac{\beta}{1+\beta}£\,57{,}619.05.$

(b) $C_1^* = \frac{£\,58{,}619.05}{1+\beta}$, $C_2^* = (1.05)\frac{\beta}{1+\beta}£\,58{,}619.05.$

(c) $C_1^* = \frac{£\,59{,}571.43}{1+\beta}$, $C_2^* = (1.05)\frac{\beta}{1+\beta}£\,59{,}571.43.$

(d) The same as above but with r = 10%.

Exercise 8.2

An income windfall gain in the future (period 2) increases wealth. Since the household wants to smooth consumption, it will already increase consumption today by borrowing against higher future expected income. As consequence, the rise in consumption tomorrow will hence be less than the rise in future income.

Figure 8.3 in the textbook illustrates the effect of a temporary vs. permanent income windfall gain: If the income windfall gain is only temporary (shift of budget line BD to B'D' in Figure 8.3), consumption will increase less today and tomorrow than with a permanent rise in income (sift of budget line BD to B''D'' in Figure 8.3).

Assuming that Ricardian equivalence does not hold, a temporary tax cut is a form of temporary income windfall gain. It will lead to higher consumption today and tomorrow, because net wealth has increased and households want to smooth consumption. Since a temporary tax cut in period 1 (today) raises wealth in terms of today's consumption more than a temporary tax cut in period 2 (future) due to the discounting factor (1/(1+r)), the rise in consumption is stronger if taxes are cut in the present period.

Exercise 8.3

The permanent income is that constant stream of income in each period which has a present value equal to the one of the expected income path. It is a good measure of sustainable consumption over one's lifetime. The permanent income hypothesis states that people reach their consumption decisions based on their permanent income to smooth consumption.

The first order conditions of the intertemporal utility maximization model state that consumption today is the best forecast for tomorrow's consumption. The permanent income hypothesis is based on this theory.

Exercise 8.4

Wealth in terms of today's consumption if the interest rate is 3 %:

$$\Omega = 15{,}000 + \frac{100{,}000}{1.03} + \frac{150{,}000}{1.03^2} + \frac{250{,}000}{1.03^3} + \frac{200{,}000}{1.03^4} + \frac{100{,}000}{1.03^5} = €746{,}220.47.$$

Permanent income:

$$Y^P + \frac{Y^P}{1.03} + \frac{Y^P}{1.03^2} + \frac{Y^P}{1.03^3} + \frac{Y^P}{1.03^4} + \frac{Y^P}{1.03^5} = Y^P \cdot 5.5797 = \Omega$$

$$Y^P = €133{,}738.46.$$

Wealth in terms of today's consumption if the interest rate is 5 %:

$$\Omega = €705{,}145.03.$$

Permanent income:

$$Y^P + \frac{Y^P}{1.05} + \frac{Y^P}{1.05^2} + \frac{Y^P}{1.05^3} + \frac{Y^P}{1.05^4} + \frac{Y^P}{1.05^5} = Y^P \cdot 5.5295 = \Omega$$

$$Y^P = €127{,}524.19.$$

Savings pattern (interest rate 3 %):

$S_i = Y_i - C_i = Y_i - Y^P$ for periods $i = 1, \ldots, 6$.
Period 1: € -118,738.46
Period 2: € -33,738.46
Period 3: € +16,261.54
Period 4: € +116,261.54
Period 5: € + 66,261.54
Period 6: € -33,738.46

Savings pattern (interest rate 5 %):

Period 1: € -112,524.19
Period 2: € -27,524.19
Period 3: € +22,475.81
Period 4: € +122,475.81
Period 5: € +72,475.81
Period 6: € -27,524.19

The effects of bequeathing €50,000 to your favourite charity depend on the point in time where the payment is made. For example if the payment is made in the last period, income Y_6 is reduced to €50,000 and with interest rate at 3%, wealth is reduced to $\Omega = €703{,}090.29$. Permanent income becomes $Y^P = €126{,}008.62$. The reduction in permanent income from 133,738.46 to 126,008.62 means a reduction in consumption by €7,729.84 in each period.

Exercise 8.5
A recession is a temporary decrease in income. As people want to smooth consumption, they dissave in bad times. Purchasing durable goods can be seen as a form of saving, and deferring purchases of durable goods for a time and living off the existing stock can be seen as dissaving. The latter strategy is a good strategy to cope with a temporary decline in income which is expected to be reversed. Spending on durable goods would be expected to drop faster than spending on non-durables.

Exercise 8.6
An investment project should be undertaken, if it has a positive present value, i.e. if the present value of output (plus resale value, if resale is feasible) exceeds the investment costs.

(a) The expected present value of the investment would be:

$$-€50{,}000 + \frac{€60{,}000}{1.1} = €4{,}545{,}45.$$

Since it is larger than zero the company should undertake the investment.

If the firm only expects to earn €54,000, the present value would be:

$$-€50{,}000 + \frac{€54{,}000}{1.1} = -€909.10.$$

Since this is a negative expected value the company should not undertake the investment.

(b) If the equipment can be sold on the resale market for €15,000, the expected present value becomes:

$$-€50{,}000 + \frac{€54{,}000}{1.1} + \frac{€15{,}000}{1.1} = €12{,}727.27.$$

Now the company should undertake the investment. This example shows that a resale market can make investments more attractive.

Exercise 8.7

Let K be the investment cost in period 1 and F(K) be the output in the second period. The tax reduction on income in period 2 is like an income windfall gain and raises F(K) by T. The net present value of the investment is then $V = \frac{F(K)+T}{1+r} - K$.

Investment is profitable if its present value $V > 0$. Some investments that were not profitable before the tax reduction become profitable now, because of T. Thus expenditures on investment should increase. One decisive aspect that is often misunderstood is the temporal path of the tax cut. Tax cuts tend to have a *stronger* effect if it they are known to be temporary. The way to see this is to consider two tax reductions of given equal present discounted value, one of which offers T in one period while the other is spread over all periods. Evidently, the temporary action will induce the behaviour immediately, since the gain will be lost if investment is not undertaken. It will make sense for firms to shift forward plans they had for later to take advantage of it. Put differently, the user cost of capital drops sharply in those periods.

Exercise 8.8

Assumptions:

$Y_2 = A\log(K_1)$	output in period 2
K_1	capital in place in period 1
p_2	price of output
δ	depreciation rate of capital
p_2^K	resale price of capital
r	discount rate

(a) Profits:

$$\pi_1 = -K_1 + \frac{p_2 Y_2}{1+r} + \frac{p_2^K(1-\delta)K_1}{1+r} = -K_1 + \frac{p_2 A\log(K_1)}{1+r} + \frac{p_2^K(1-\delta)K_1}{1+r}$$

Profits depend positively on p_2 as the firm can sell each unit of output at a higher price. They also depend positively on p_2^K. They depend negatively on δ as only $(1-\delta)$ of the capital can be resold and bring profits. They depend negatively on r as the discount rate is the opportunity cost of the invested resources. They depend positively on A, as the firm can produce more with given capital stock if technological progress rises. The effect of an increase in K_1 is ambiguous. It depends on the size of the other variables.

(b) Optimal stock of capital K_1:

$$\frac{\delta \pi_1}{\delta K_1} = -1 + \frac{p_2 A}{(1+r)}\frac{1}{K_1} + \frac{p_2^K(1-\delta)}{(1+r)} = 0$$

$$K_1^* = \frac{p_2 A}{(1+r) - p_2^K(1-\delta)}$$

(c) Profits of the firm:

$$\pi_1 = \frac{p_2 A \log(K_1)}{1+r} - UK_1$$

The firm would be indifferent between renting and 'owning' the capital if:

$$\frac{p_2 A \log(K_1)}{1+r} - UK_1 = -K_1 + \frac{p_2 A \log(K_1)}{1+r} + \frac{p_2^K(1-\delta)K_1}{1+r}$$

$$U = 1 - \frac{p_2^K(1-\delta)}{(1+r)}$$

Exercise 8.9

According to the consolidated budget constraint in equation (7.12), a temporary rise in public spending (rise in G_1) which is financed by a temporary rise in taxes (rise in T_1) lowers the present value of consumption because $Y_1 - G_1$ decreases.
Since households smooth consumption, the rise in public spending G_1 is not fully offset by a decrease in private consumption C_1. As a consequence, aggregate spending rises in period 1 and the current account worsens. An existing current account deficit is hence enlarged, not reduced, in period 1. In period 2, public spending decreases and the current account improves. The current account deficit is reduced.

If the increase in public spending and taxes is permanent, the consumption falls by the comparable amount by which taxes (and public spending) increase and the current account is relatively unaffected.

Exercise 8.10

The adoption of the euro led to an integration of the European financial and goods markets and a convergence of the national interest rates to a euro area level. Financing in euro area countries with a formerly high interest rate became easier as the interest rate fell. Moreover,

lower interest rates increase wealth since the present value of future expected income is rising with a lower discount rate. This led to a boom in spending and investment in these countries and hence to a primary current account deficit.

Exercise 8.11
If the tax increase was not foreseen and hence not internalized in the consumers' long-term consumption decisions, it will lead to a decrease in consumption. As consumers are facing lower incomes than expected in the next 10 to 20 years, they will cut consumption now and in the future by an amount equal to the tax burden, see equation (7.10).

Exercise 8.12
There are different ways to establish a negative correlation of house prices with consumption.
(i) Through wealth: owning a house is an asset that increases wealth. Since consumption possibilities are lower if wealth decreases, falling house prices affect consumption.
(ii) Through borrowing constraints: households can borrow more easily if they have collateral like e.g. owning a house. Falling house prices decrease the household's chances to borrow and hence reduce consumption.

Essay Questions

Essay Question 8.1
The improvement of the infrastructure in the East-German states is an investment project from which not only the current but also future taxpayers benefit. Therefore it is justified that future taxpayers pay for the costs, too. This speaks in favor of debt-financed public spending. Since the public debt has to be repaid and serviced, the increase in public spending cannot be permanent. Instead, public spending has to be decreased at some point and taxes have to be increased. This is how future tax payers participate in the costs of the infrastructure project.

An increase in public spending decreases private consumption the more, the closer the interest rate r, at which households can borrow, to the interest rate r_G, at which the government can borrow, and the longer the increase in spending lasts, see equation (7.12). Under Ricardian equivalence, a permanent increase in public spending reduces private consumption one to one.

Essay Question 8.2
Wars reduce private consumption through higher public spending which has to be financed either by tax increases at present or in the future. In the household's intertemporal budget constraint (7.10), T_1 and/or T_2 increase while expected future income $Y_2$is likely to fall (since wars often lead to the destruction of production sites, equipment,…). As a consequence, present and future consumption will fall.

Essay Question 8.3
The user cost of capital is generally defined as the sum of the interest rate and the depreciation rate, see Box 8.5; if the relative price of capital goods in terms of all other goods is changing over time, the user cost should adjust for this by subtracting the (expected) rate of capital

goods price appreciation (or adding the rate of decline). Assuming a constant interest rate r, the user cost of capital has risen over the past twenty years because of the increase in the rate of obsolence of equipment and programs (this is equivalent to a rise in δ). At the same time the price of computers and computing power have dropped continuously; similarly, this negative rate of change in capital goods prices will also *raise* the user cost. Tobin's q is defined as ratio of market value of installed capital to replacement cost of installed capital. We have learned that the wedge between market value and replacement cost of installed capital depends on installation costs. Thus, if the installation costs for any given step have declined, it is less likely to observe large deviations between the numerator and denominator of Tobin's *q*. The market valuation of capital in installed capital will also decline, all other things equal.

Investment is profitable as long as $q > 1$ (without installation costs) respectively $q > 1 + \varphi$ (with installation costs). Due to the drop in prices for computers and software (decrease in replacement costs) as well as their easier installation and usage (decrease in installation costs) it is likely that $q > 1 + \varphi$ and hence investments will increase, but we saw above that q may also fall. Without considering also the effect of computers of productivity, this means that the net effect of the stated changes is ambiguous.

Essay Question 8.4

There is a problem with austerity measures in the case of a country which is already in recession. Raising taxes should not matter according to Ricardian equivalence, but in a less than perfect world with borrowing constraints, tax increases are likely to lead to decreases in consumption and investment, possibly aggravating the situation. Later in the book we will see exactly how this occurs. At the same time, there is a need to reduce the international imbalance of indebted countries, so the contraction does have the desired effect. Countries need to grow in order to be able to repay their debt at some point, and they may need growth assistance from others before austerity measures can be reasonably implemented.

Essay Question 8.5

A "good" current account deficit stems from high investment expenses in booming economies. Since these economies are growing, firms are optimistic about future profits and invest in productive plant and equipment. In the longer run the payoff is higher output and current account surpluses.

A "bad" current account deficit on the other hand is caused by high private consumption or public spending with no effect on growth.

In the case of Poland, the current account deficit was declining from 4.6% of GDP in the period 1998-2002 to 2.6 % in the period 2003-2007 because Poland's GDP was growing faster than absorption. This faster growth is likely to have been made possible by "good deficits" which set the stage for the later boom period. In addition, the high GDP growth may have been associated by a decrease of a dynamically inefficient capital stock and political reforms than by a larger investment rate per se, see Box 3.4 and Figure 3.11.

Chapter 9

Exercise 9.1

Currency is the traditional instrument to make payments, alongside writing cheques. Over time, progress in information technology has made it possible to use other means of payments, starting with credit and debit cards, to electronic transfers over the internet or using mobile phones. These new forms are mostly mediated by banks. In Scandinavia, the evolution is rapid. It is not uncommon to see stores that simply refuse cash payments. In the UK and the US, the trend has been, even reversed at the time of the Great Financial Crisis. It could well be that people have worried about the solidity of their banks and chose to keep more money in the form of currency.

Exercise 9.2

Error in the question: the proper value of k is $k = 0.2/\sqrt{i}$. So the demand for money is:

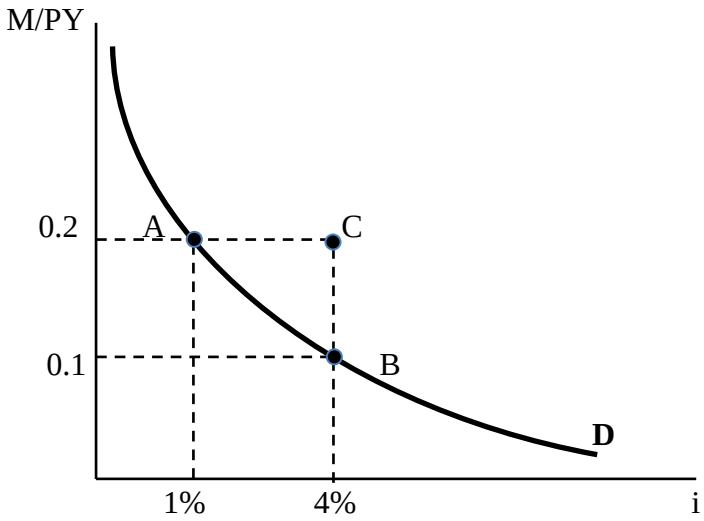
$$M = (0.2/\sqrt{i})\, PY$$

so that when i = 1% we have $M = (0.2/\sqrt{1})\, PY = 0.2PY$, i.e. 20% of GDP.

When i = 4% we have $M = (0.2/\sqrt{4})\, PY = 0.1PY$, i.e. 10% of GDP.

Exercise 9.3

The demand for money can be rewritten as $M/PY = 0.2/\sqrt{i}$. It is represented in the figure below. We start at point A where M/PY = 0.2 and i = 1%. When the interest rate is 4%, we move to point B. This requires a reduction in the supply of money from the original horizontal supply line going through A and C to the horizontal supply line going through B so that M/PY changes from 0.2 (M is 20% of GDP) to 0.1 (M is 10% of GDP).



If the central does not reduce M, the same effect is achieved if the price level doubles as the money supply remains unchanged. Then PY doubles and M/PY is halved. This is an illustration of the general point that rising prices require rising money supply if the interest rate is to remain unchanged. If P is fixed, then the interest rate cannot rise, unless Y increases, here doubling up.

Exercise 9.4

Much the same as Exercise 9.3! Simple calculus says:

- When Y = 17 tr. and i = 1%, M/P = 1.7 tr.

- When Y = 17 tr. and i = 2%, M/P = 0.85 tr.

Exercise 9.5

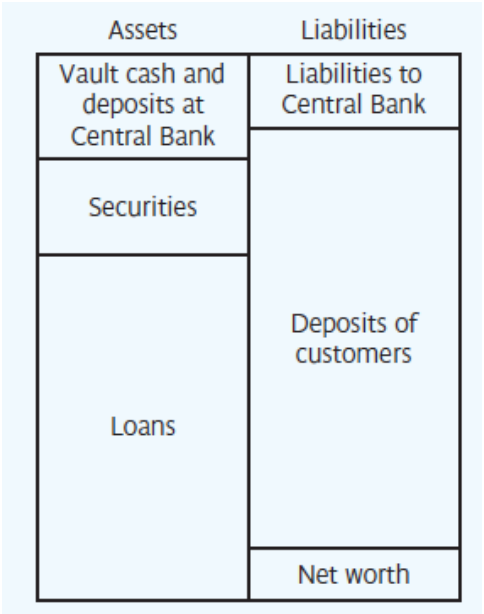
If Y increases by 2% and P is constant, M^d increases by 2% as well. A 2% decline in P keeps nominal GDP constant, If P does not change, either the central bank provides 2% of money or the interest rate increases so that 0.1 Y/PY remains unchanged, i.e. i rises by 2% as well from 1% to 1.02%.

Exercise 9.6

The balance sheet is a way of presenting how an agent equilibrates his/her assets and liabilities, a way of seeing his/her financial strength. Commercial bank balance sheets are important because bank failures may have a catastrophic impact on the macroeconomy since the money that they produce (a liability) has value only if backed by their assets.

Exercise 9.7

Please note that there is a serious mistake Figure 9.2. The left-hand side presents the balance sheet of a central bank, not a commercial bank. The correct balance sheet is:



a) The size or length of the balance sheet is the sum of all assets, here 850, which must be equal to the sum of all liabilities, so that the net worth must be 50.

b) The reserve ratio is Reserves/Deposits = 25/500 = 5%.

c) the capital ratio is 50/850 = 6% (about).

d) If the value of securities goes down from 250 to 230, some 'compensation' must happen to maintain the equality of both sides of the balance sheet. The normal response is to mark down the bank's capital from 50 to 30. The size of the balance is reduced and the loss is on the shareholders.

Exercise 9.8

a)

No.	Item	Consolidated	Explanation	Notes
1	Reserves at central bank	120	Sum of 1	
2	Securities issued by other banks	0	Sum of 2 less sum of 8	0 by definition
3	Loans to banks	0	Sum of 3 less sum of 9	0 by definition
4	Loans to non-banks	1570	Sum of 4	
5	Other assets	80	Sum of 5	
6	Debt owned to central bank	155	Sum of 6	
7	Deposits	2080	Sum 7	
8	Securities issued to other banks	0	Sum of 8 less sum of 2	0 by definition
9	Debt owed to other banks	0	Sum of 9 less sum of 3	0 by definition
10	Debt owed to non-banks	180	Sum of 10	

b)

Ignoring cash and deposits, the money supply is the sum of bank reserves (120) *plus* bank deposits (2080). Deposits can take many forms, some of which do not belong to M1 or M2. Banks sometimes make deposits with other banks (assumed not to be the case here), so this must be netted out as well.

c) Consolidation gives a view of the banking system. It may miss fragilities in some specific banks.

Exercise 9.9

Will be available later on.

Exercise 9.10

Payments are largely achieved through bank transfers. If some banks are seen as fragile, other banks will not want to deal with them and this would throw a wrench in the payment system and therefore in money since M include bank deposits. The solution is to impose large reserve and capital ratios.

Essay Questions

Essay Question 9.1

Jevons: Means of payments, unit of account, store of value, standard of deferred payment

Central bank and this book: currency plus bank deposits

All of Jevons' definitions are relative or, if you prefer, the ideal attributes of good money. The central bank and this book's definition is based on accounting numbers, which are a fact but without value judgement.

New means of payments will keep trying to fulfil Jevons' attributes while accounts will have to adapt to the new reality.

Essay Question 9.2

By definition, bad money does not have all of Jevons' attributes. Good money presumably does. Gresham's law says that people care a lot about Jevons' attributes so they hold on to good money and spend away bad money.

Essay Question 9.3

A central bank strives to make money trustworthy. For the part that it issues, trust is shuttered when currency loses its value, that is its purchasing power, because of inflation ($1/P$ is the purchasing value of money). This requires keeping inflation stable and low, hence most central banks adoption of a 2% maximum inflation target. For the part issued by commercial banks, the central bank must make them solvent at all times and in all circumstances. It means regulating them (through prudential ratios), monitoring them (through bank supervision) and promptly intervening when a bank shows signs of weakness. Intervention can take many forms like closing down the bank while protecting deposits, arranging for (i.e. arm twisting) strong banks to buy weak banks, or just shoring up failing banks by creating money. The government passes legislation on all of the above, so its role is crucial. Since these actions involve huge interests of banks and their shareholders, political pressure is always and everywhere intense, with the objective of making sure that banks pocket their profits in good times and share their losses with taxpayers in bad times. This, of course, is an encouragement for banks to take excessive risks, which undermines trust.

Essay Question 9.4

Like in many other parts of the world at the dawn of fiat currencies (including California in the 1850s) Hong Kong relies on private banks to issue money. This requires tight regulation and supervision of these banks, which the Hong Kong Monetary Authority (HKMA) does very well. It works because the incentives of the commercial banks are well aligned with those of HKMA, as they want to keep a safe distance from the Beijing authorities. Creating a central bank would likely be refused by the Beijing authorities, which would extend the reach of their own central bank.

Essay Question 9.5

Bitcoins and other new forms of money strive to fulfil all of Jevons' attributes. Their promoters are competing with traditional monies, so it is in their interest to do so. The argument for not regulating them is that regulation is a backdoor for stifling competition, which central banks may be tempted to do. At the same time, the long experience with private monies is that private issuers of monies eventually find it irresistible to 'take the money' and run. While the Bitcoin promoters have tried to completely tie their hands in this respect, this is a decentralized system that relies on each part to play the game. How do we know that someone will always play the game honestly? A recent scandal in a Japanese node of Bitcoin is a healthy reminder that this possibility is very real.

Chapter 10

Exercise 10.1

From chapter 5, equation (5.4), we know that

$$\frac{\Delta M}{M} = \pi + \frac{\Delta Y}{Y}$$

If π =2% and $\frac{\Delta Y}{Y} = 3\%$, the money growth target should be 5%. Since reserves are a constant fraction of deposits which grow at the same rate as the money stock, reserves too must grow at 5%, independently of the size of the reserves ratio.

Exercise 10.2

The two main objectives of monetary policy are price stability (long term) and the level of economic activity (short term). Available instruments to reach these objectives are the interbank reserve or money market interest rate, the supply of reserves and the required reserve ratio. The central bank pursues specific targets (monetary targeting or inflation targeting) by using these instruments.

There is a conflict between controlling the interest rate and the money stock. If the central bank chooses to control the interest rate, it has to provide the corresponding money stock demanded at the given interest rate. On the other hand, if it chooses the volume of money supply, it has to accept the resulting interest rate.

In general it is better to have more instruments at hand because the central bank has more possibilities to pursue its objectives. On the other hand there will be more conflicts and complexity.
In contrast, it is better to have only one well-defined target such that the actions of the central bank are transparent to the public and help to generate stable expectations. The central bank can best influence the banks' behavior, if its signals are clearly understood.

Exercise 10.3

Sorry, this is a repeat of Exercise 9.1.

Exercise 10.4

Whether the central bank controls the money stock or the interest rates, it loses part of its control over the money stock in either case if the reserves ratio can be chosen at the commercial banks' own discretion. If the commercial banks choose a smaller reserves ratio than the central bank would have chosen, more money is created than wished by the central bank. In this situation, the central bank can only cut the supply of reserves (money targeting) or raise the money market interest rate (inflation targeting) to increase the cost of refinancing for commercial banks.

Exercise 10.5

An increase in the demand for money shifts the money demand curve to the right. Under the money growth strategy the central bank will hold the money supply constant and the interest

rate rises until money demand equals money supply. Under the inflation targeting strategy the central bank increases the money stock to meet demand and to hold the interest rate constant.

Exercise 10.6

Let the balance sheet of the central bank before the transaction be:

Assets	Liabilities
Foreign assets: 500 m	Currency in circulation: 900 m
Loans to commercial banks: 1000 m	Deposits by commercial banks: 800 m
	Deposits by government: 450 m
Securities: 800 m	Net worth: 150 m

After the transaction, currency in circulation and foreign assets have risen by 100 m and money supply increased.

Assets	Liabilities
Foreign assets: 600 m	Currency in circulation: 1,000 m
Loans to commercial banks: 1000 m	Deposits by commercial banks: 800 m
	Deposits by government: 450 m
Securities: 800 m	Net worth: 150 m

To sterilize the foreign exchange market intervention and to bring back money supply to its initial value, the central bank sells domestic government bonds worth 100 m to the commercial banks:

Assets	Liabilities
Foreign assets: 600 m	Currency in circulation: 1000 m

Loans to commercial banks: 1000 m	Deposits by commercial banks: 700 m
	Deposits by government: 450 m
Securities: 700 m	Net worth: 150 m

Exercise 10.7

If the central bank buys assets from national banks, the entry "Securities" rises as much as either the entry "Currency in circulation" or "Deposits by commercial banks". If the assets lose value and are valued with their fair value in the balance sheets, net worth has to decline.

Exercise 10.8

Deposit insurance increases the customers'confidence, as at least parts of their deposits are safe. If they have the chance to at least get back a part of their deposits in case of bankruptcy of their bank, they will not withdraw their money at the mere suspicion of problems, especially if bankruptcy will not occur with certainty. However, the problem of moral hazard arises. Both banks and customers are willing to take much higher risks now, as a large component of deposits are insured.

Exercise 10.9

Taylor rule with a = 1.5, b = 0.5 and neutral interest rate 4%:

$$i = 4\% + 1.5(\pi - \bar{\pi}) + 0.5\frac{Y - \bar{Y}}{\bar{Y}}$$

(i) inflation gap: 2%, output gap: 0%

$$i' = 4\% + 1.5(2\%) + 0.5 * 0\% = 7\%$$

(ii) inflation gap: 2%, output gap: 3%

$$i'' = 4\% + 1.5(2\%) + 0.5 * 3\% = 8.5\%$$

(iii) inflation gap: 2%, output gap: -2%

$$i''' = 4\% + 1.5(2\%) + 0.5 * (-2\%) = 6\%$$

Exercise 10.10

From 2012-2014, the inflation rate is expected to be below its target of 2%, let's say at x%. According to the Taylor rule, the Riksbank should lower the interbank market interest rate as (x % - 2 %)< 0. From 2012-2014 the inflation rate is expected to be above its target. The Riksbank should increase the interest rate during this time.

Exercise 10.11

The overnight money market rate EONIA is the interest rate at which commercial banks borrow money among each other for a contract period of a single day. It usually fluctuates between the marginal deposit rate (floor) and the marginal lending rate (ceiling). To see why, let us assume that commercial bank A has excess reserves and that commercial bank B desperately needs a loan. Bank A can either deposit its excess reserves at the central bank and receive an interest rate equal to the marginal deposit rate, or it can lend money to bank B at a rate higher than the marginal deposit rate. The marginal deposit rate is the lowest rate (floor) that bank A will accept. On the other hand, bank B is not willing to pay an interest rate higher than the marginal lending rate (ceiling), because it can always get a loan at this interest rate from the central bank.

Essay Questions

Essay Question 10.1

Most central banks, including the European Central Bank, have only one mandate which is price stability. Arguably, price stability is the most important long-run objective, because central banks cannot affect output in the long run. By not keeping inflation under control, expectations can get out of control and later lead to costly adjustment without any long-lasting benefit.

In contrast, the Federal Reserve System (Fed) has the dual mandate to ensure price stability as well as a high employment level. Employment is determined by supply-side factors only in the long run, and while the Fed does not have instruments to influence these factors, it can use monetary policy in the short run. A central bank which is also committed to pursue a high level of employment will use monetary policy to stimulate demand and – as consequence - output and employment. However, it is possible that such a policy will lead to higher inflation in the long run and hence stand in conflict with the mandate to pursue a stable inflation rate. Moreover, if a central bank pursues two conflicting objectives, its actions may not exert clear signals to the market participants in contrast to a central bank which pursues only one objective.

Essay Question 10.2.

Cigarettes fulfil Jevons' attributes, well almost. The limits are that there are different kinds of cigarettes and that they do not age well. Yet, in a prison, one is not expected to be very picky, so it is not surprising that it can work. If the cigarettes are purchased in cash from the camp's administration, it is a good way to earn seigniorage.

Essay Question 10.3

Central banks need to transform their objectives into well-defined and measurable targets. Two main targets are monetary targeting and inflation targeting.

Monetary targeting demands to control the currency in circulation and to choose the size of commercial bank reserves. It was abandoned in the 1990s because the distinction between the different monetary aggregates M1, M2, and M3 became increasingly difficult due to financial innovations and it was no longer clear which one to target. Also the money multiplier became

highly variable.
If the central bank follows inflation targeting, it looks at future inflation and sets the interest rate according to the Taylor rule. While monetary targeting is only indirectly related to the central bank's mandate to guarantee price stability, inflation targeting appears to be a more obvious target in this respect.
Unanticipated actions of the central bank create shocks which disturb the expectations of the market participants and may lead the economy away from its equilibrium path until expectations have adapted. The formulation and publication of central bank targets help to render central bank actions comprehensible and consistent and to avoid shocks.

Essay Question 10.4
First note that inflation was below target, not above. The Governor explains the target has been missed for three main reasons: 1) a global decline of primary commodity prices; 2) an appreciation of the effective exchange rate; and 3) weaker growth than expected. Essentially, not my fault. Well, the exchange rate is largely guided by monetary policy, as will become clear in further chapters, and growth too is partly a consequence of monetary policy. The Governor seems to exonerate the Bank a bit easily. Second, he discusses the likely consequences of the Brexit vote, weighing deflationary and inflationary factors.

In his answer, the Chancellor does not really question the Governor's explanation. He is mostly focused on the consequences of Brexit, essentially agreeing with Governor's analysis. He also promises to support monetary policy actions with his own actions. So we observe two gentlemen going through a formal exercise and expressing much respect for each other. Maybe tougher questions are raised when they meet face to face?

Essay Question 10.5
This question addresses a crucial headache that central bankers face in the face of a bank crisis. The theory is that the central bank should provide support, at cost, to a bank that is viable but faces a temporary liquidity problem, while bankrupt banks should be immediately closed and their creditors protected as much as possible. Practice is more challenging, because the assessment is all about expectations. A bank is bankrupt is the present value of its future incomes is not lower that the present value of its expenditures, both over a long horizon, in theory an infinite horizon. There is failsafe way to make these calculations. In addition, how do we know that a liquidity problem is temporary? Furthermore, why is the bank facing a shortfall of liquidity? One way or another, it is because it cannot borrow, including from other banks on the open market. This is a signal that other banks believe, rightly or wrongly, that it is bankrupt. Finally, the liquidity problem can transform an otherwise reasonably healthy bank into a bankrupt one. One way of dealing with a liquidity shortage is to sell assets. If this has to be done precipitously, the bank may have to sell cheap – this is called fire sales. That means that it suffers losses on its assets, which may wipe out its capital and make it effectively bankrupt.

Chapter 11

Exercise 11.1

The slope of the DD schedule is derived in Box 11.1: $\Delta DD = (1 - z)c\Delta Y$, and hence the slope is equal to $(1 - z)c$. The larger the marginal propensity to consume, the steeper ceteris paribus the DD schedule. Hence, country A has a steeper DD schedule, because its marginal propensity to consume c is higher than that of country B.

The same box derives the Keynesian multiplier as 1/1-c(1-z). Thus, the larger the value of $(1 - z)c$, the steeper is the desired demand schedule and the larger is the Keynesian multiplier. This can be graphically shown by using the apparatus of Figure 11.4. The steeper the DD schedule, the more "steps" occur in the staircase.

Exercise 11.2

Desired demand (DD) is represented by the following simplified function:

$$DD = 5{,}000 + 0.75(Y - T) + \bar{G} - 100i - 1{,}000\sigma \quad (2.1)$$

In equilibrium, $Y = DD$ and solving for Y yields:

$$0.25\,Y = 5{,}000 - 0.75\,T + \bar{G} - 100i - 1{,}000\sigma \quad (2.2)$$

$$Y = 20{,}000 - 3\,T + 4\bar{G} - 400i - 4{,}000\sigma \quad (2.3)$$

(2a) Effect of a ceteris paribus increase in T from 3,000 to 3,500 on GDP:

$$\Delta T = 3{,}500 - 3{,}000 = 500 \text{ and } \Delta Y = -3\Delta T = -1{,}500 \quad (2.4)$$

It follows from equation (2.4), that GDP falls by 1,500 units. The lump-sum tax multiplier equals $\frac{\Delta Y}{\Delta T} = -3$. A unit increase in the lump-sum tax T decreases GDP ceteris paribus by 3 units.

(2b) Effect of a ceteris paribus increase in G from 3,000 to 3,500 on GDP:

$$\Delta G = 3{,}500 - 3{,}000 = 500 \text{ and } \Delta Y = 4\Delta G = 2{,}000 \quad (2.5)$$

It follows from equation (2.5), that GDP rises by 2,000 units. The government-spending multiplier equals $\frac{\Delta Y}{\Delta G} = 4$. A unit increase in government spending G increases GDP ceteris paribus by 4 units.

(2c) Effect of a simultaneous increase in G and T from 3,000 to 3,500 on GDP:

$$\Delta G = \Delta T = 500 \text{ and } \Delta Y = -3\Delta T + 4\Delta G = -1{,}500 + 2{,}000 = 500 \quad (2.6)$$

It follows from equation (2.6), that GDP rises by 5,000 units. The balanced-budget multiplier equals $\frac{\Delta Y}{\Delta(G-T)} = \frac{\Delta Y}{\Delta G} - \frac{\Delta Y}{\Delta T} = 4 - 3 = 1$. A unit increase in the balanced budget increases GDP ceteris paribus by the same amount of one unit.

Exercise 11.3

In deriving the multiplier in Box 10.2, the following assumptions have been used:

(3.1) $DD = C + I + \bar{G} + (X - Z)$ with $C = cY$ and $Z = zC = zcY$.

If supply meets demand, equation 3.1 can be rewritten as

(3.2) $Y = cY + I + \bar{G} + X - zcY = (1 - z)c\,Y + I + \bar{G} + X$.

(3.3) $(1 - (1 - z)c)\,Y = I + \bar{G} + X$

(3.4) $\Delta Y = \frac{1}{1-(1-z)c}\Delta\bar{G}$

Equation (3.4) describes the effect of a ceteris paribus increase in government spending on GDP.

To analyze the effect of an increase in government spending of $\Delta\bar{G}$ of which $z\Delta\bar{G}$ is spent on imports, equation (3.1) has to be changed to

(3.1') $DD = C + I + \bar{G} + (X - Z)$ with $C = cY$ and $Z = z(C + G) = zcY + zG$

Equation (3.2) then changes to

(3.2') $Y = cY + I + \bar{G} + X - zcY - zG = (1 - z)c\,Y + I + (1 - z)\bar{G} + X$

and the effect of a ceteris paribus increase in government spending on GDP becomes

(3.4') $\Delta Y = \frac{1-z}{1-(1-z)c}\Delta\bar{G}$

Obviously, the demand multiplier is smaller if part of government spending is spent on imports.

Since $0 < z < 1$ and $0 < (1 - z)c < 1$, the demand multiplier in (3.4') cannot become negative. It can become less than one if $(1 + c) < 1/(1 - z)$.

Exercise 11.4

The desired demand function is

(4.1) $DD = c_0 + c_1(Y - \bar{T} - tY) + \bar{I} + \bar{G} + PCA_0 - mY$

If supply meets demand, $Y = DD$ and equation (4.1) becomes

(4.2) $Y = c_0 + c_1(1 - t)Y - mY - c_1\bar{T} + \bar{I} + \bar{G} + PCA_0$

(4.3) $(1\text{-}c_1(1 - t) + m)Y = -c_1\bar{T} + \bar{I} + \bar{G} + PCA_0$

The government spending multiplier in this case is $\frac{\Delta Y}{\Delta G} = \frac{1}{(1-c_1(1-t)+m)}$. The multiplier decreases with increasing tax rate t. When t=0, the government spending multiplier changes to $\frac{1}{(1-c_1+m)}$, which is the multiplier derived in Box 10.1 for $c_1 = c$ and $m = cz$.

Exercise 11.5

"For given values of exogenous variables, the IS curve represents the combinations of nominal interest rate i and real GDP that are consistent with goods market equilibrium", see p. 284 in the textbook. It is downward sloping, because a higher interest rate reduces private spending on investment and consumption through a decrease in today's net value of wealth. Hence, demand decreases and so does output.

All points above the IS curve imply an excess demand for goods, all points below an excess supply of goods, see Figure A11.1 below.

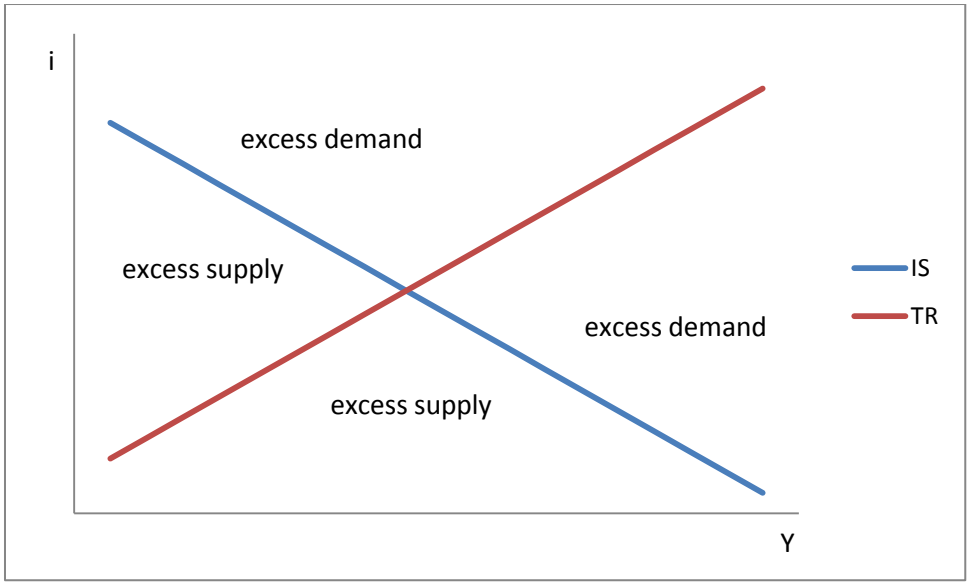


Figure A11.1: Excess demand and supply in the IS-TR framework

Exercise 11.6

To derive the IS curve for the economy under the assumptions made in Exercise 4 but with $I = \bar{I} - 20i$ replacing $\bar{I}$, note that equation (4.3) changes to

$$(6.1) \quad (1\text{-}c_1(1-t)+m)Y = -c_1\bar{T} + \bar{I} - 20\,i + \bar{G} + PCA_0$$

Solving for Y yields

$$(6.2) \qquad Y = \frac{c_0 - c_1\bar{T} + \bar{G} + PCA_0 + \bar{I} - 20i}{(1-c_1(1-t)+m)} = \frac{\alpha - 20i}{\beta}$$

with $\alpha = c_0 - c_1\bar{T} + \bar{G} + PCA_0 + \bar{I}$ and $\beta = (1 - c_1(1-t) + m) > 0$.

Solving for i as left-hand side variable instead yields

$$(6.3) \qquad i = \frac{\alpha}{20} - \frac{\beta}{20}Y.$$

Equation (6.3) describes all combinations of i and Y which are compatible with equilibrium in the goods market. Due to the negative slope $-\frac{\beta}{20}$, the IS curve is downward sloping, see Figure A11.2 below.

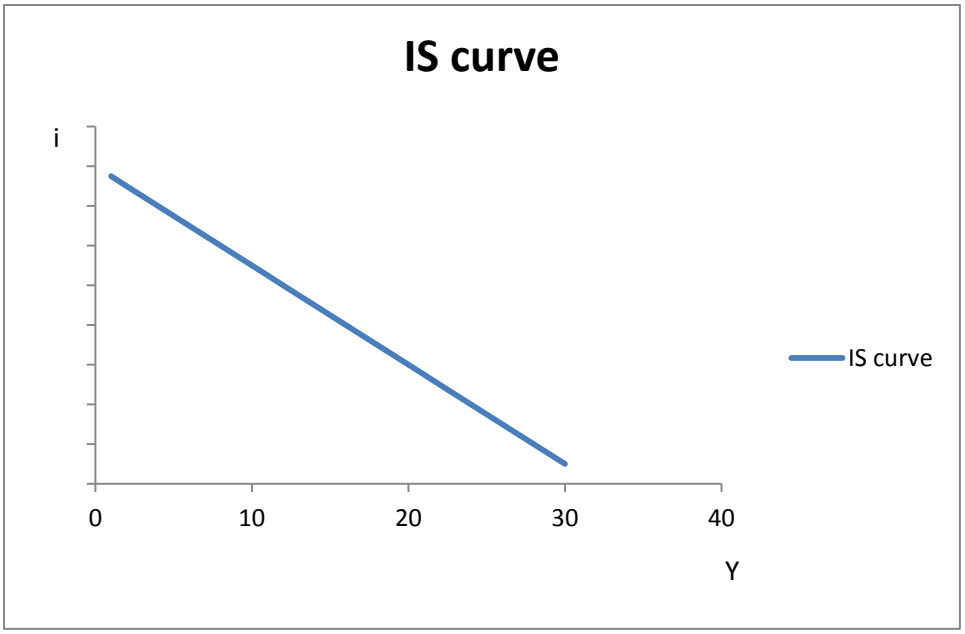


Figure A11.2: IS curve

Exercise 11.7

The TR curve shows the set of pairs of interest rates and output consistent with the central bank's monetary policy. It is upward-sloping because the central bank uses the Taylor rule to set interest rates. The Taylor rule is given in equation (11.11) in the textbook. In the short run considered here, the Keynesian assumption holds that prices are constant such that $\pi = \bar{\pi} = 0$, and the Taylor rule reduces to equation (10.12). Given that all other things remain equal, a higher level of GDP leads the central bank to raise interest rates.

Since the TR curve describes the monetary policy which the central bank wants to pursue, the economy cannot be off the TR curve unless the central bank does not follow its own policy. Ruling out this case, a disequilibrium exists at any point on the TR curve which is not on the IS curve. For instance, if the central bank chooses an interest rate higher than the equilibrium interest rate i in Figure 11.11 in the textbook, demand decreases and supply will adapt to the lower demand. The output gap will get smaller or even negative. Since the central bank's behavior is based on the Taylor rule, it follows from equation (10.12) in the textbook that the central bank will lower the interest rate. Hence, the economy moves back to equilibrium.

Exercise 11.8

A Taylor rule of $i = 5 + 0.5(Y - \bar{Y})$ can be plotted as follows (TR-curve 1):

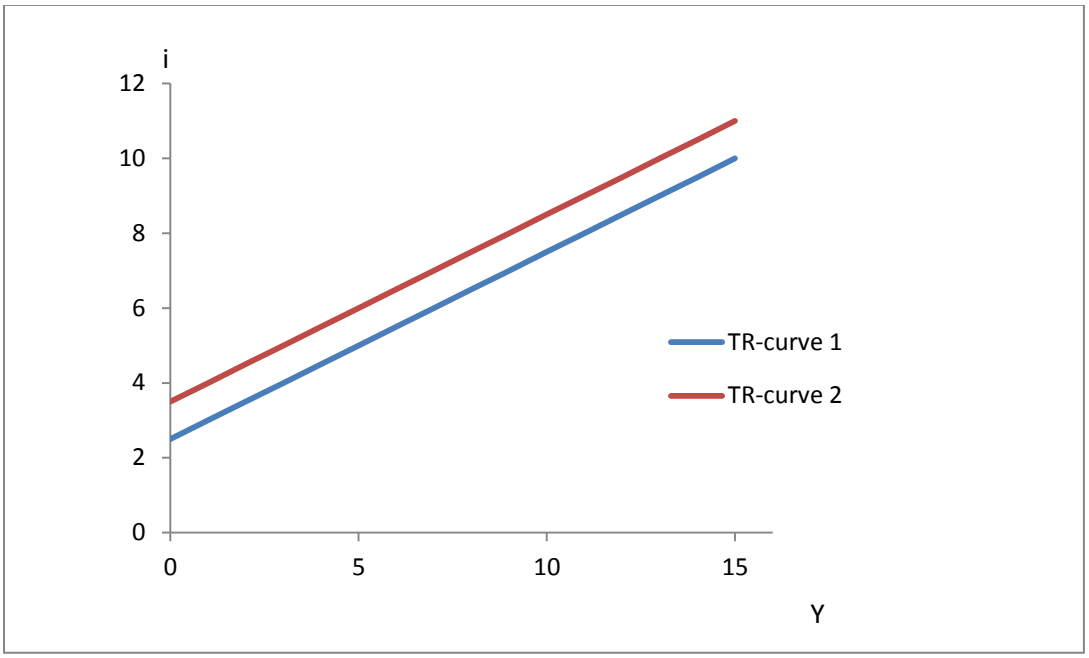


Figure A11.3: Shift of TR-curve due to change in neutral interest rate

If the central bank increases its target rate from $\bar{\imath} = 5$ to $\bar{\imath} = 6$, the TR schedule shifts upward by one unit.

To solve for an analytical expression for output (Y) and interest rate (i) in an equilibrium, insert the function $i = 5 + 0.5\ (Y - \bar{Y})$ into the left-hand side of equation (6.3), see solution to exercise 6, and solve for Y:

$$(8.1) \qquad Y^* = \frac{\alpha - 100 + 10\bar{Y}}{\beta + 10}$$

Inserting the solution for Y into equation (6.3) and solving for i yields:

$$(8.2) \qquad i^* = \frac{\alpha + \beta(10 - \bar{Y})}{2(\beta + 10)}.$$

Exercise 11.9

First consider an exogenous change in government purchases of goods and services, a decline from $\bar{G}$ to $\bar{G}'$. For every point on the IS curve in Figure A11.4, aggregate supply now exceeds output. This means, that the IS curve shifts to the left to IS'. The new equilibrium occurs at point B. As the factors that influence the TR curve haven't changed yet, the IS curve moves along the TR curve and as output declines, the central bank lowers interest rates.

A change in the monetary policy, an increase of the central bank's target rate, would lead to a shift of the TR curve upwards and to the left. The economy moves from point B to point C. In this new equilibrium, the output is reduced without a change in the interest rate.

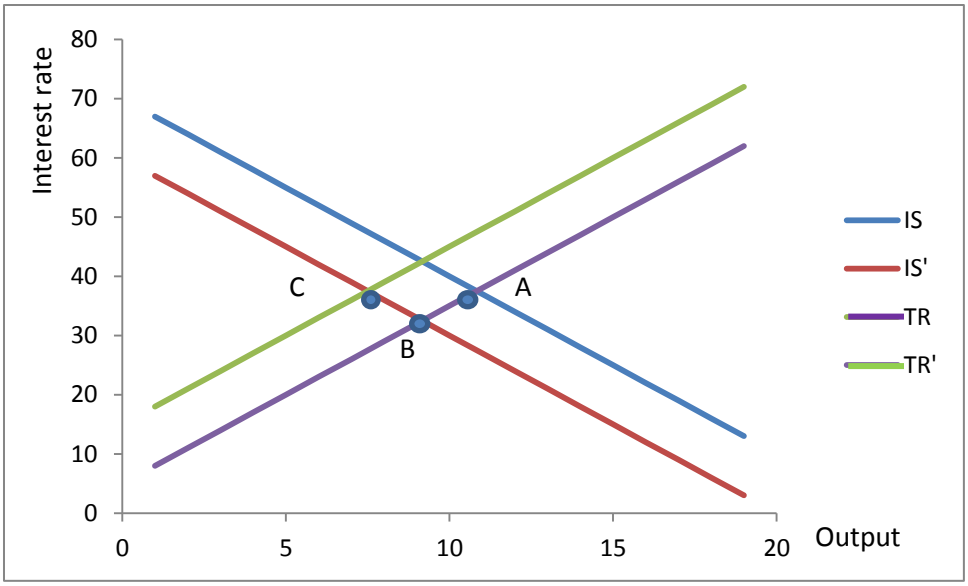


Figure A11.4: Fiscal and monetary policy affect only output

Exercise 11.10

When the demand for money increases exogenously, the demand curve shifts to the right. Such a situation is described in Figure 11.7 in the textbook. However, in the textbook, the shift of the money demand curve arises because output has changed while in the exercise the demand for money increases exogenously without a change in output. Since the TR curve is held constant and output has not changed, the central bank has no incentive to change the interest rate. Instead, it will increase money supply sufficiently at the prevailing interest rate. Graphically, this would correspond to a perfectly elastic money supply curve in panel (b) of Figure 11.7 in the textbook.

An exogenous decline in the demand for money lets the demand curve shift to the left. At the prevailing interest rate, households want to hold less money. Now assume that the central bank raises its target interest rate, so that the TR schedule shifts up. Due to the increase in the interest rate, the demand for money is reduced even more and the central bank has to cut money supply more than was necessary without the rise in the target rate. Such a contractionary policy makes sense if the economy is overheating and output should be decreased.

Exercise 11.11

The larger the coefficient b in equation (11.12) in the textbook, the steeper the TR schedule and the larger the change in the interest rate to an increase in the output gap. This is illustrated in Figure 11.8 in the textbook where the slope coefficient b increases from TR_0 to TR_1 to TR_2. If b continues to increase until $b \rightarrow \infty$, the TR schedule will end up as vertical line.

Exercise 11.12

Consider Figure 11.8, panel (a) in the textbook and assume that at point A output is at its trend level such that the output gap equals zero. The coefficient b measures the change in the

interest rate relative to a change in the output gap. The larger the coefficient b, the larger the change in interest rate for the same change in output gap, the steeper the TR curve.

Exercise 11.13

Effect of increase in demand for goods on output, interest rate and money supply:

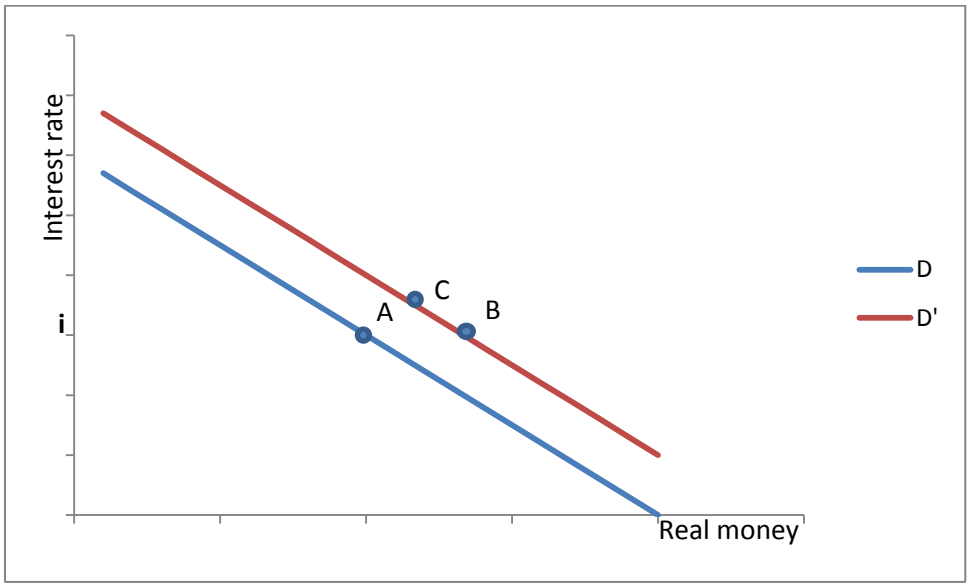


Figure A11.5a: Money demand

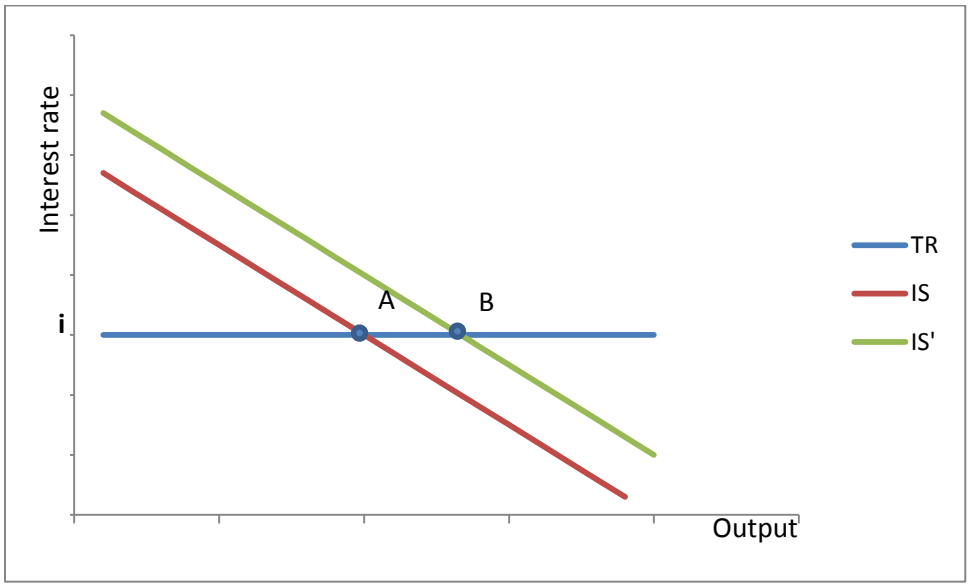


Figure A11.5b: IS schedule shifts left, constant interest rate

Starting from point A, an increase in the demand for goods shifts the IS curve to IS' in Figure A11.5b. This takes the economy to point B along the TR schedule. The central bank holds the interest rate constant (horizontal TR schedule). Corresponding to the higher output level, the new money demand schedule is represented by D' in Figure A11.5a. To meet the higher demand for money, the central bank has to increase money supply to reach point B on the money demand schedule.

If in contrast the TR schedule is upward sloping, the central bank raises interest rates in response to increased output. The higher interest rate reduces the demand for money (move on the D' schedule to point C) and thus leads to a smaller increase in money supply

Exercise 11.14
Since absorption is a function of Y, we can write $A = A(Y) = Y - PCA(A(Y), \sigma)$, so that $PCA = PCA(A, \sigma)$ can be written as $PCA = PCA(Y, \sigma)$.

If the PCA function is $PCA = a - bA - c\sigma$, inserting for A gives:

(11.1) $PCA = a - b(Y - PCA) - c\sigma$

(11.2) $(1 - b)PCA = a - bY - c\sigma$

(11.3) $PCA = (a - bY - c\sigma)/(1 - b)$

Essay Questions

Essay Question 11.1
The sharp increases in military spending increased the GDP in the short run, as in both countries most of the weapons used were produced domestically. As the US produces a higher fraction of its weapons domestically compared to the UK and was more threatened by the terrorist attacks in 2001 than the UK, the effect is expected to be larger in the US. Indeed, military spending in per cent of GDP was larger in the US in 2011 than in the UK (4.8% compared to 2.6%, see http://www.guardian.co.uk/news/datablog/2012/apr/17/military-spending-countries-list).

In the short run, a sharp increase in military spending in reaction to a terrorist attack will rather be debt-financed since the tax rate cannot be easily raised in the short run. However, in the long run the increase in spending has to be financed in the end through higher taxes which reduce disposable income and hence private consumption. The increase in military spending will only increases GDP in the long run, if it doesn't crowd out private consumption through higher taxes.

Essay Question 11.2
The Taylor rule describes central bank behaviour if the central bank pursues inflation-targeting. In particular, it describes how the central bank decides to set the interest rate above or below the neutral interest rate in response to deviations of the inflation rate from target inflation or to a positive output gap. The Taylor rule is a very simple model of central bank behavior. It does not describe instruments of monetary policy. More importantly it does not explain the origin of the anchor of the Taylor rule, the neutral interest rate $\bar{i}$ (which is taken as exogenous, but embodies a target inflation rate of the central bank as well as a view of the real interest rate).

In the first instance, the slope of the TR curve is an empirical issue: assuming a positive output gap, the Taylor rule states that the central bank raises interest rates to reduce output to

its trend level by decreasing demand (i.e. consumption and investment). The aggressiveness with which the central bank pursues this goal will depend on the central bank's own relative objectives, possibly as stipulated in its constitution or bylaws. For example if there is a high weight on keeping output close to target, then the Taylor rule will be steep. Since inflation is not yet explicitly modelled the role of inflation cannot be discussed. But one might imagine that the central bank's taste for inflation might enter if it is concerned that large deviations of output from the target could lead to large fluctuations in inflation later on.

Essay Question 11.3

The effect of a rise in public spending on different groups depends on who receives it. For example, the government could invest in education, but also in military operations or infrastructure.

If the government cuts income taxes, all people who receive labour and/or capital income will benefit. Depending on the exact tax arrangement, higher income households may benefit more than low-income households or vice versa.

Profit taxes directly affect companies and self-employed people. They may lead to a higher capital income of shareholders.

VAT is a consumption tax. Cutting it makes all households better off. Since low-income households have larger marginal propensity to consume than high-income households, they benefit more in relative terms from the tax cut.

Under the Keynesian assumption, prices are constant (or sticky) in the short run and supply meets demand. Expansionary fiscal policy leads to a rise demand, followed by an increase in output and in income in the short run (IS curve moves to the right). How much GDP rises depends on the multiplier, in particular on the marginal propensity to consume (c) and on the fraction of consumption that households spend on imports (z). The rise in GDP leads to a rise in imports and in the demand for foreign currency.

Under flexible exchange rates the central bank can still pursue inflation-targeting. Following the Taylor rule, it will increase interest rates in response to the rise in GDP. This will decrease consumption and investment. In the new equilibrium, output and interest rate are both higher than before the expansionary fiscal policy.

Under fixed exchange rates and capital mobility and the assumption that the country is small and the foreign country is large, the interest rate equals the one of the foreign country. Hence, the central bank can no longer set the interest rate and the TR curve is irrelevant. Since the interest rate will not change under this regime, the increase in GDP will be larger than under a flexible exchange rate regime.

Essay Question 11.4

Assume that production takes time and that firms have adaptive expectations. Assume further that the economy is in an upswing and demand unexpectedly increases. Producers will first run down inventories and then increase production. Then it will start building up inventories once it expects demand increase to be lasting. Hence, inventories will be falling (unintended due to wrong expectations), then rising (intended) in a boom.

When the economy reaches the turning point and drifts into recession, producers may not

notice the decrease in demand or may not consider it to be of longer duration; and they may continue to build up inventories. Once its expectations have adapted, it wants to cut inventories. Hence, inventories first rise (unintended due to wrong expectations), then decrease (intended) during the course of the recession.

Intended inventories are pro-cyclical. They are a valid indicator of the boom or bust phase of the business cycle. However, statistically it is already very difficult to determine inventories and the separation into intended and unexpected inventories may not be feasible. One possibility would be to treat all inventories as expected. By doing so, one implicitly assumes that firms form correct expectations about the business cycle. Since shocks are by definition not expected but considered one major cause of business cycles, it can be doubted that this is true.
Moreover, the significance of inventories as indicator decreases because due to lower information and transportation costs, companies hold less inventories. Moreover, the increasing service sector does not hold inventories.

Essay Question 11.5
"Open economies, because they have low multipliers, are likely to be more stable than large economies."

This is a complex statement which is only true under certain assumptions. As such, it gives us a fine opportunity to clarify several issues. First, it embeds the presumption that open economies have low multipliers. We learned in this chapter that the marginal propensity to import *reduces* the multiplier. Thus to the extent that small and open economies are synonymous, it might be true. There are however exceptions – Greece is one which comes to mind in the European context, with an import share of 31% in 2011 compared with say Denmark (48%).

In the statement, open economies are contrasted with large economies. The second hidden assumption is that large economies tend to be closed economies with a low marginal propensity to consume. This is generally but not always true (Germany is an exception). Since large economies can be open economies, it is important to assume that the author wants to differentiate between "small open" and "large closed" economies.

That small open economies have lower multipliers than large closed economies can be seen by inspecting the multiplier of an exogenous increase in demand, $\frac{1}{1-c(1-z)}$, see Box 10.2 in the textbook. The multiplier will be larger when the denominator is smaller, or when $c(1-z)$ is larger (it cannot exceed 1!). This term increases with a larger propensity to consume and a smaller propensity to import. Hence, assuming equal propensity to consume in both economies, the economy with a larger propensity to import has a lower multiplier. If large economies trade more within their borders, their imports relative to GDP will be smaller as will be their propensity to import. As consequence, their multiplier is larger. This means that shocks of a given magnitude will have less impact on aggregate demand in an open economy than in a closed one.

Finally it should be stressed that it is not correct to generalize that small open economies are more stable than large closed economies. Small open economies are subject in general to more shocks than large economies - due to their larger trade shares, they are vulnerable to other countries' business cycles and interest rate policies. In contrast, large economies may still have some influence over their interest rate and may be less affected by what happens in the rest of the world.

Chapter 12

Exercise 12.1

Assume that the economy is initially in general equilibrium at point A (intersection of TR, IS and IFM schedule in Figure .1 below). If the central bank decides to reduce the target interest rate from $\bar{\imath}$ to $\bar{\imath}'$, the TR curve shifts downwards while the IS curve and the IFM line remain unchanged.

In point C, the interest rate has declined. This leads to a higher spending and a higher output in response. As point C lies below the IFM line, i < i*. International investors borrow at home to invest abroad, where they get a higher return. Since the economy has floating exchange rates, the exchange rate depreciates, stimulating exports and reducing imports so that the IS curve shifts to the right. It will continue to shift to the right as long as i < i*, which is until simultaneous equilibrium is restored at point B.

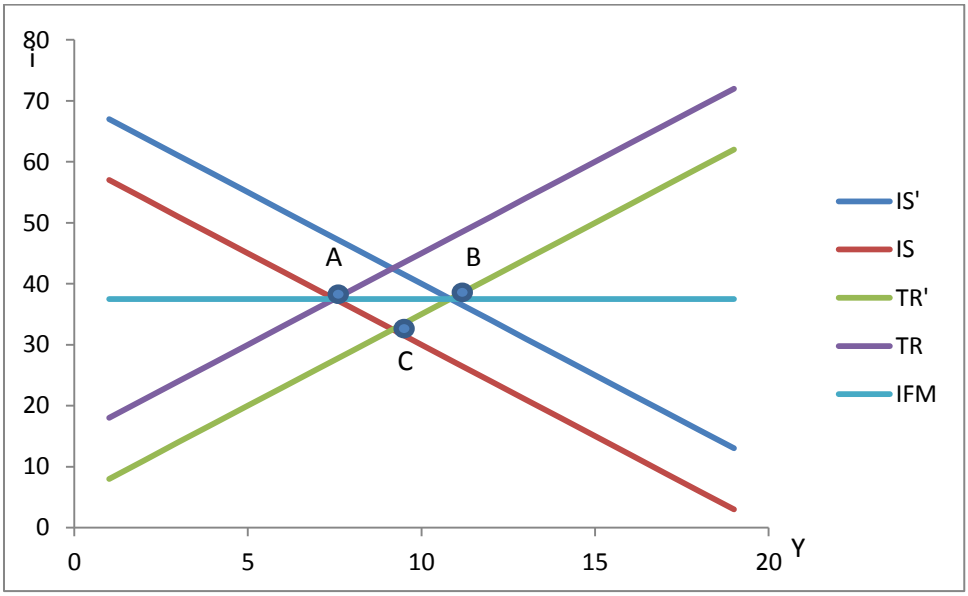


Figure A12.1: Monetary policy under flexible exchange rates

Exercise 12.2

Under fixed exchange rates, the TR curve becomes irrelevant, as the central bank cannot carry out an autonomous monetary policy. It can only choose a point on the money demand schedule depicted in Figure A12.2.

Suppose the economy is initially at point A in Figure A12.2 below, where the domestic interest rate equals the foreign rate of return i*. Now the central bank decides to lower the interest rate to i. Since $i < i^*$, investors borrow money in the home country and invest abroad. The demand for foreign currency increases. In response, the central bank must buy back its currency on the foreign exchange market to keep the exchange rate fixed. Money supply declines and the economy moves up the money demand curve until i = i* again. This is the only position compatible with international finance market equilibrium. Hence, under fixed exchange rates, the central bank cannot pursue an autonomous monetary policy and monetary shocks have no lasting effect.

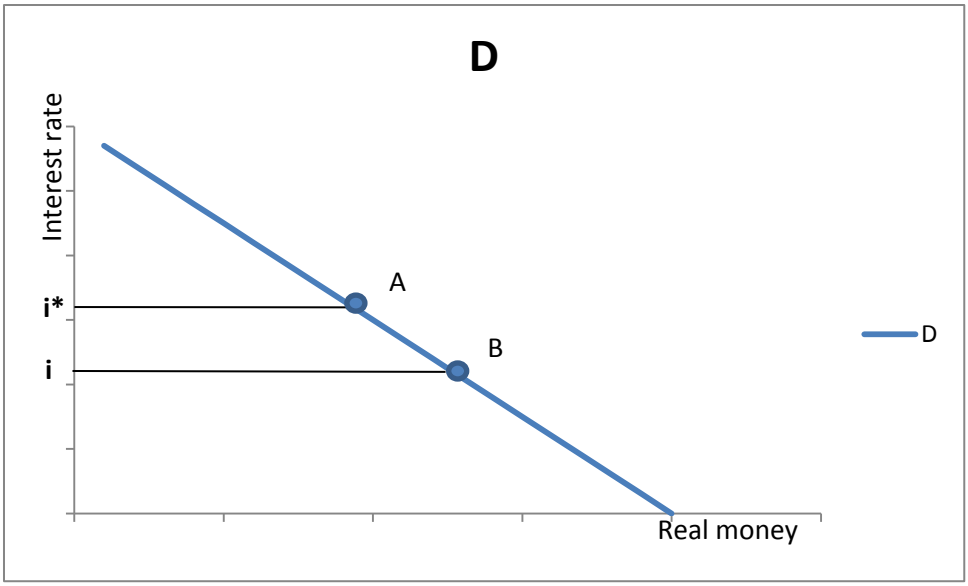


Figure A12.2: Money demand $D = k(i)Y$

Exercise 12.3

For the graphical illustration, please see Figure 12.4 in the textbook: under a fixed exchange rate regime, the TR schedule is irrelevant because the central bank can no longer pursue an autonomous monetary policy. Therefore, only the IS and IFM schedules matter. Starting at point A, the IS curve shifts to IS' as demand increases. The increase in demand leads to an increase in output and income. However, since the interest rate remains unchanged at i*, the economy moves to point B.

At point C, $i > i^*$ and traders can borrow money at the low rate i* abroad to invest in the home country. Demand for the domestic currency rises and forces the central bank to sell domestic currency to hold the exchange rate constant. Money supply increases and the domestic interest rate decreases, stimulating further demand and in response output. This adaptation process continues until $i = i^*$ again and the economy has reached a new equilibrium at point B.

Exercise 12.4

Tax increases and spending cuts cause the IS curve to shift to the left. Output decreases and thus money demand decreases as well. The domestic interest rate falls, and since $i < i^*$, money flows out of the country.

Under fixed exchange rates, the central bank has to maintain the exchange rate at a constant level and therefore it must intervene and buy back its currency. Money supply decreases until the interest rate is back at the level of the foreign rate of return. The higher interest rate reduces demand even further. In the new equilibrium income and money supply have decreased. This shows that under fixed exchange rates a contractionary fiscal policy reduces output and income.

Under flexible exchange rates, capital outflow leads to a depreciation. This stimulates exports and decreases imports. Since demand increases, the IS curve shift back to its initial position. The contractionary fiscal policy is neutralized by exchange rate depreciation and has no output effect.

Exercise 12.5

Following an increase of the foreign rate of return from i* to i*', the IFM line shifts upwards to IFM'. In the initial state, the domestic interest rate is now lower than the foreign rate of return. Investors borrow money at home to invest abroad and capital flows out of the home country.

Under fixed exchange rates, the central bank has to intervene at this point and buy back its currency. Money supply decreases while the interest rate rises. The higher interest rate reduces demand and in response output and income (movement on the IS curve from point A to point B in Figure 11.4, see textbook). This adaptation process continues until the domestic interest rate has risen to the level of the foreign rate of return. In the new equilibrium (point B) money supply and output have declined. This shows that the fixed exchange rate regime creates a situation of international monetary interdependence in which the domestic economy is exposed to international financial disturbances.

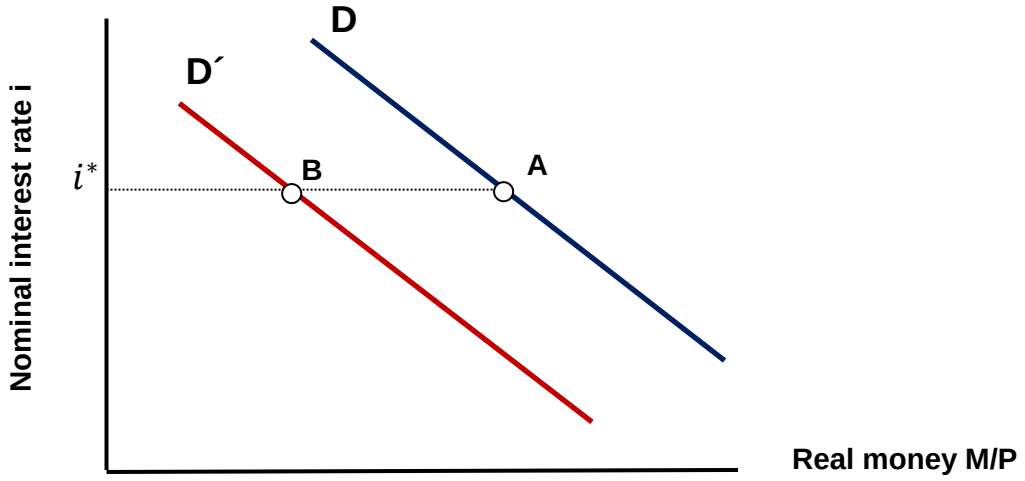
Under flexible exchange rates, the central bank does not intervene. The exchange rate depreciates and the home country gains competitiveness. Exports increase while imports decrease and the IS curve shifts to the right. Since output responds to demand, the higher demand leads to higher output and income. The central bank responds to this increase by raising the domestic interest rate as suggested by the Taylor rule. This adaptation process continues until the domestic interest rate has risen to the level of the foreign rate of return. In the new equilibrium, output and the domestic interest rate have increased while the money supply is unchanged.

Exercise 12.6

Assume that initially money market equilibrium is at point A. An exogenous decline in the demand for money D results in a shift to the left (D').

Under a fixed exchange rate regime, the central bank cannot pursue an autonomous monetary policy. The money supply is perfectly elastic. Hence, the money supply is reduced by exactly the same amount as the money demand. The domestic interest rate doesn't change, neither does income.

Under flexible exchange rates, an exogenous fall in the demand for money (a decline of k(i)) does not evoke any central bank reaction because k(i) is not a variable of the Taylor rule. The domestic interest rate doesn't change, neither does income. Money supply falls by exactly the same amount as money demand.



Exercise 12.7

Since the exogenous decline in exports reduces aggregate demand (IS curve shifts to the left). In response, GDP declines too.

Under flexible exchange rates, domestic interest rates fall (Taylor rule: decrease in output), which triggers capital outflow and hence an exchange rate depreciation. The latter stimulates exports, hence aggregate demand and in response output and income rise again (IS curve shifts back). In the new equilibrium, the domestic interest rate has risen back to the level of the foreign rate of return (Taylor rule: increase in output), GDP is unchanged and the exchange rate has depreciated.

Under fixed exchange rates, the central bank cannot react to the decline in exports with an exchange rate depreciation and hence has to accept a decrease in GDP.

Exercise 12.8

Under a fixed exchange rate regime, which allows for adjustments of the exchange rate level, an increase in the nominal exchange rate S by the central bank is called revaluation. For given price levels at home and abroad, the nominal appreciation translates into an increase of the real exchange rate $\sigma = \frac{SP}{P^*}$. The country's goods are now more expensive relative to foreign goods. Imports rise and exports decline. The IS curve shifts to the left. The country moves to a new equilibrium on the IFM line, with a lower output compared to the initial equilibrium point. This shows that a revaluation is contractionary.

Exercise 12.9

A tax cut is an expansionary policy and thus raises domestic demand. The IS curve shifts to the right. The increase in demand leads to an increase in income. The interest rate remains unchanged at i*. The economy moves to a new equilibrium with higher income.

In comparison, in the case of flexible exchange rates, the rise in output leads higher interest rates (Taylor rule), which attract foreign investors. Capital inflow leads to an exchange rate appreciation which reduces aggregate demand and lets the IS curve shift back to its initial position. In the new equilibrium, the expansionary fiscal policy has not changed output or the interest rate.

Exercise 12.10

Becoming a safe-haven small open economy could lead to a bigger capital flow into the country than expected at the given interest rate in times of trouble. Under flexible exchange rates, the central bank does not intervene and thus the exchange rate appreciates. This leads to higher imports and lower exports. The IS curve will shift to the left and income will decrease. The central bank can switch to a fixed exchange rate policy and purchase foreign exchange. This is what the Swiss National Bank did in 2011 as a response to a sharp appreciation of the Swiss Franc in the aftermath of the financial crisis. Under a fixed exchange rate, the central bank has to purchase the foreign currency to keep the exchange rate constant.

Exercise 12.11

If the price level at home declines, holding the foreign price level constant, the real exchange rate $\sigma = \frac{SP}{P^*}$ depreciates. The position of the IS curve depends on the real exchange rate. It shifts to the right, since the real depreciation leads to higher exports and lower imports, and output increases. This leads to a higher money demand. The money demand schedule shifts to the right. The interest rate i is now higher than i*. Capital flows into the country. To keep the nominal exchange rate constant, the central bank has to purchase foreign exchange. Money supply increases, reducing the domestic interest rate level to the one of the foreign rate of return. In the new equilibrium, output and money supply have increased.

If foreign prices declined in the same proportion, the real exchange rate and the position of the IS curve would not change.

Exercise 12.12

Under a flexible exchange rate regime, the IS curve shifts to the right, moving along the TR schedule to a point with a higher output and a higher interest rate. As i > i*, capital flows in and the nominal exchange rate appreciates, offsetting the real exchange rate depreciation. External competitiveness declines and the IS curve shifts back to its initial position.

If foreign prices declined in the same proportion, the real exchange rate and the position of the IS curve would not change.

Exercise 12.13 The balance sheet of the central bank before the foreign exchange market operation looks as follows:

<table>
<tr><th>Assets</th><th>Liabilities</th></tr>
<tr><td>Foreign assets:
500 m</td><td>Currency in circulation: 900 m</td></tr>
<tr><td rowspan="2">Loans to commercial banks</td><td>Deposits by commercial banks</td></tr>
<tr><td rowspan="2">Deposits by government</td></tr>
<tr><td rowspan="2">Securities:
800 m</td></tr>
<tr><td>Net worth</td></tr>
</table>

The balance sheet of the commercial banks as follows:

Assets	Liabilities
Vault cash and deposits at Central Bank: 300 m	Liabilities to Central Bank
Securities	Deposits of customers
Loans	
Foreign assets: 200 m	Net worth

Now the central bank sells 100 million krona and buys euros. This means that its foreign assets raise by S x 100 m krona (with S= exchange rate euro/krona) and the currency in circulations by 100 m krona. The vault cash of the commercial bank goes up by 100 m krona and the foreign assets held by the bank go down by S x 100 m euro.

Central Bank:

Assets	Liabilities
Foreign assets: 500 m + S*100 m	Currency in circulation: 1,000 m
Loans to commercial banks	Deposits by commercial banks
	Deposits by government
Securities: 800 m	Net worth

Commercial Banks:

Assets	Liabilities
Vault cash and deposits at Central Bank: 300 m - S*100 m	Liabilities to Central Bank
Securities	Deposits of customers
Loans	
Foreign assets: 300 m	Net worth

An operation which sterilizes the effect of the foreign exchange purchase would be selling domestic government bonds at an amount that brings the money supply back to its initial

value, in this case selling government bonds worth 100 m krona. The central bank's balance sheet would then look as follows:

Assets	*Liabilities*
Foreign assets: 500 m + S*100 m	Currency in circulation: 900 m
Loans to commercial banks	Deposits by commercial banks
	Deposits by government
Securities: 700 m	Net worth

Essay Questions

Essay Question 12.1
If the domestic interest rate is determined abroad and there are no capital controls, the interest rate parity must hold because differences in the domestic interest rate and the foreign rate of return create chances to gain from arbitrage. As a consequence, massive capital flows occur and erase any differences. These massive movements of capital can interfere with the central bank's conduct of monetary policy. It can now only control the interest rate or the exchange rate, not both. If it fixes the exchange rate, it loses its ability to conduct an independent monetary policy completely, as it cannot choose the interest rate and can simply choose a point on the demand schedule. With capital controls, these massive movements of capital no longer occur, but most countries ultimately abandon capital controls because of the strong forces of international financial integration. Capital controls prevent domestic investors from investing abroad and international investors from investing in the home country. This limits the number of investment opportunities tremendously.

Essay Question 12.2
Beggar-thy-neighbour policies have a bad reputation as they describe policies which improve the position of one country at the expense of another. An example is the case of a large economy, which conducts an expansionary monetary policy such that its interest rate i* declines and its output y* rises. The small open country now faces a domestic interest rate i which exceeds the foreign rate of return i*. Under a flexible exchange rate regime, the capital inflow leads to an appreciation of the exchange rate. In response, exports decrease while imports increase and aggregate demand declines. In the new equilibrium, the small open country faces a lower domestic interest rate and a lower GDP due to the foreign expansionary monetary policy.

To limit the perceived drawbacks, the small country might decide to switch to a fixed exchange rate, at least temporarily, as Switzerland did in September 2011, see Box 12.4 in the textbook. But this has forced the Swiss national Bank to intervene and absorb massive

amounts of foreign exchange rate reserves. Afraid of this accumulation, the Swiss National Bank has thrown the towel in January 2015, accepting a sudden and large appreciation of the franc. Capital controls (or tariffs) are another means to prevent the inflow of capital and the subsequent appreciation of the exchange rate. Controls, however, are not really possible in a large financial centre like Switzerland.

Essay Question 12.3

"Adopting an exchange rate anchor is a mixed blessing":

On one hand, exchange rates are now predictable for firms and households and transaction costs are thus lower. Moreover, fixed exchange rates protect from an expansionary foreign monetary policy, see the case of Switzerland described in Box 12.4.

On the other hand, the central bank gives up an independent monetary policy. Though it is shielded from monetary shocks as long as it can keep the exchange rate fixed, the country is susceptible to speculative attacks and real demand shocks.

Essay Question 12.4

In the Mundell-Fleming model, prices are assumed to be constant and hence the inflation rate is zero. Consequently, the nominal interest rate equals the real interest rate and also the nominal and real exchange rates coincide. This allows us to graph the TR schedule which depends on the nominal interest rate and the IS schedule, which depends on the real interest rate and the real exchange rate, in the same diagram.

When prices are allowed to change, the nominal and real exchange rates are not equal anymore. Even if the nominal exchange rate remains fixed, a change in inflation will shift the IS curve because the real exchange rate changes. Moreover, since inflation enters the Taylor rule, a change in the inflation rate provokes a reaction of the central bank. Since we now have to consider three variables – the nominal interest rate, inflation rate and real output -, we can no longer work with the two-dimensional diagram of the Mundell-Fleming model but have to add another diagram which explains the relationship between the inflation rate and real output.

Essay Question 12.5

If countries have to offer a risk premium – an additional yield - when they borrow, their IFM line is not scheduled at i^*, but at $i^* + \varphi$ where φ is the risk premium. A sudden loss of trust means a higher risk and hence a larger risk premium φ, shifting up the IFM line. Capital will flow out of the country.

Under fixed exchange rates, the central bank has to buy back its currency and money supply decreases while the domestic interest rate increases. Due to the higher interest rate, domestic demand and output decline.

Under flexible exchange rates, the capital outflow leads to an exchange rate depreciation which stimulates exports and reduces imports. Demand and output increase. Due to the higher demand for money, domestic interest rates increase too.

A situation where investors lose trust leads to higher φ and to higher interest rates. The short-run consequences are more favourable under flexible than under fixed exchange rates. However, regardless of the exchange rate regime, higher interest rates are a problem for

indebted countries because they render it more likely that debt will not be serviced. The first and foremost policy must therefore be to re-establish trust and lower the risk premium.

Chapter 13

Exercise 13.1

To answer this question, let us consider the condition for equilibrium in the money market, given in (B13.2), Box 13.1, in the textbook: $\frac{M}{P} = k(i)Y \rightarrow M = k(i)PY$.

If the money supply increases and then stays on the higher level as illustrated in Figure 13.1 in the textbook, $k(i)PY$ must also increase to the higher level of money supply if the equilibrium condition holds. For constant $k(i)$, this implies that nominal GDP (PY) increases in proportion to nominal money supply M.

Figure 13.1 shows that the shock in the nominal variable M has real effects in the short run since real GDP increases first, and then decreases. However, in the long run the dichotomy between the real and the nominal sector holds such that the increase in nominal money supply leads to an increase in the price level of the same size while there is no long-run effect on real GDP.

Exercise 13.2

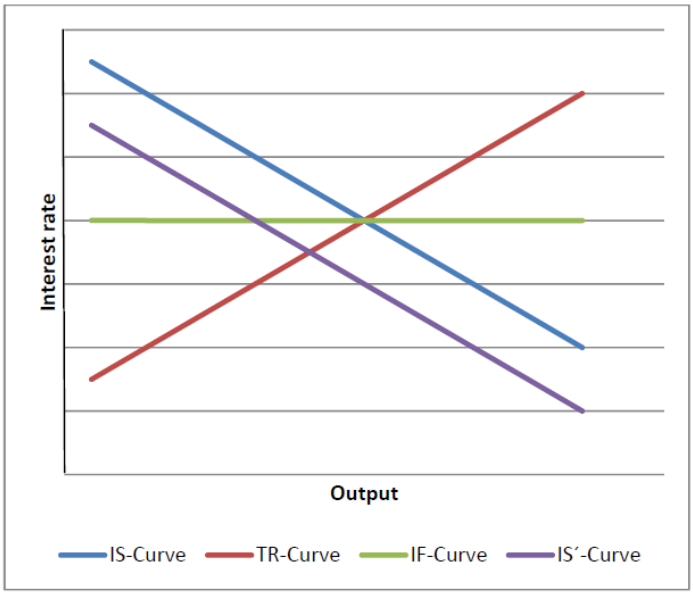


Figure A13.1: IS-TR-IFM: A drop in aggregate demand

Due to a decline in demand the IS-curve shifts to the left. So its intersection with the TR-curve will be below the initial one, which means that the interest rate in the home country is lower than in the rest of the world. As a consequence capital will flow out of the country. Under a flexible exchange rate regime, the currency will depreciate, thus stimulating exports, which shifts the IS-curve back to its previous position.

Under flexible prices, the decline in demand will lead to a decrease in price level of the home country and hence to a depreciation of the real exchange rate even if the nominal exchange rate remained constant. Due to higher exports, the IS curve will shift back.

Exercise 13.3

(a) Phillips-Curve: With s=0 we have:

(i) Underlying inflation $\tilde{\pi} = 3$, equilibrium unemployment $\bar{U} = 7$:

$$\pi = 3 - 10(U - 7) = 73 - 10U$$

(ii) Underlying inflation $\tilde{\pi} = 6$, equilibrium unemployment $\bar{U} = 7$:

$$\pi = 6 - 10(U - 7) = 76 - 10U$$

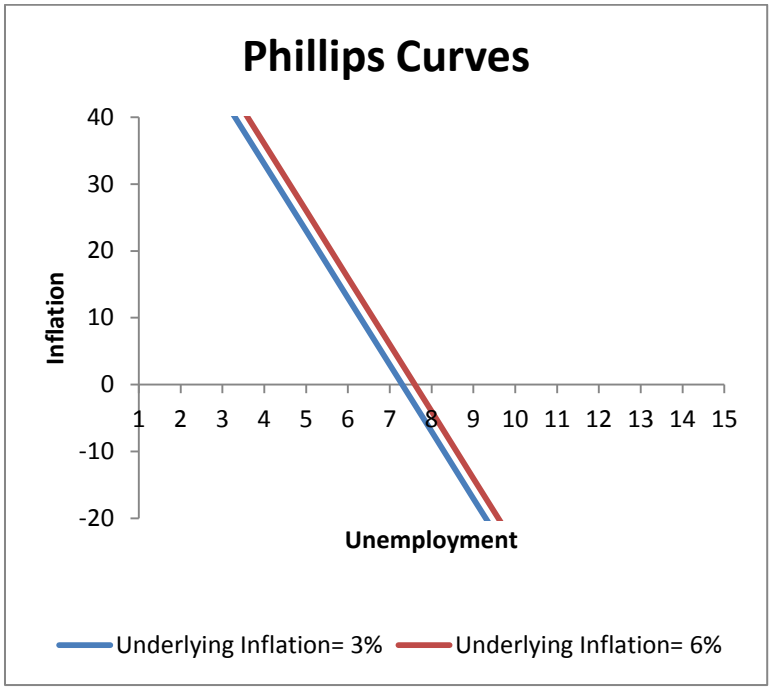


Figure A13.2a: Phillips-curves

In Figure A13.2a, the blue line, standing for a smaller underlying inflation, lies below the red one. These are rather steep Phillips curves.

(b) Aggregate Supply (AS) Curve

The aggregate supply curve describes the relationship between inflation (vertical axis) and real GDP (horizontal axis). It can be obtained by rearranging the Phillips curve and inserting into Okun's Law:

Phillips-curve: $\pi - \tilde{\pi} = -10(U - \bar{U})$

Okun's Law : $U - \bar{U} = -0.5\frac{Y - \bar{Y}}{\bar{Y}}$

AS curve: $\pi = \tilde{\pi} + 5(\frac{Y - \bar{Y}}{\bar{Y}})$

(i) AS curve for $\tilde{\pi} = 3, \bar{Y} = 10{,}000$: $\pi = 3 + 5\frac{Y - 10000}{10000} = -2 + \frac{5Y}{10000}$

(ii) AS curve for $\tilde{\pi} = 6, \bar{Y} = 10{,}000$: $\pi = 6 + 5\frac{Y - 10000}{10000} = 1 + \frac{5Y}{10000}$

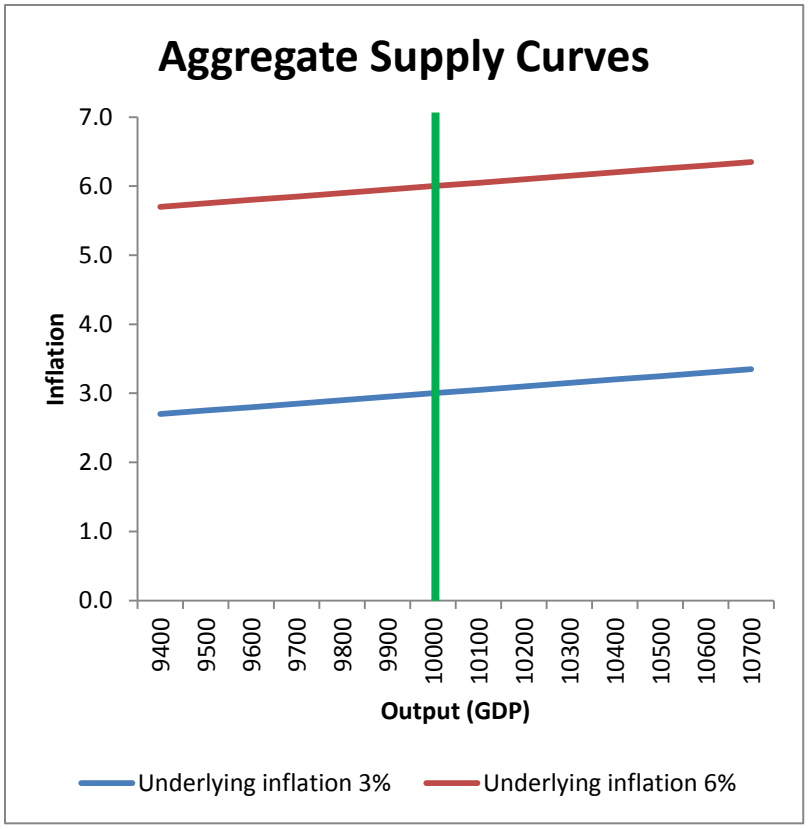


Figure A13.2b: AS curves

Figure A13.2b shows that a higher rate of underlying inflation (red curve) yields a higher inflation rate at any given level of output.

Exercise 13.4

(a) Phillips-Curve with supply shock

(i) Underlying inflation $\tilde{\pi} = 3$, equilibrium unemployment $\bar{U} = 7$, $s = 5$:

$$\pi = 3 - 10(U - 7) + 5$$

(i) Underlying inflation $\tilde{\pi} = 3$, equilibrium unemployment $\bar{U} = 7$, $s = -2$:

$$\pi = 3 - 10(U - 7) - 2$$

(Phillips curves are not drawn.)

For a given unemployment rate, inflation is higher, the larger the supply shock.

(b) AS curve with supply shock:

Phillips-curve: $\pi - \tilde{\pi} = -10(U - \bar{U}) + s$

Okun's Law : $U - \bar{U} = -0.5\frac{Y - \bar{Y}}{\bar{Y}}$

AS curve: $\pi = \tilde{\pi} + 5\left(\frac{Y - \bar{Y}}{\bar{Y}}\right) + s$

(i) AS curve for $\tilde{\pi} = 3, \bar{Y} = 10{,}000, s = 5$: => $\pi = 3 + \left(\frac{5}{10000}\right)Y + 5$

(ii) AS curve for $\tilde{\pi} = 3, \bar{Y} = 10{,}000, s = -2$: $\pi = 3 + \left(\frac{5}{10000}\right)Y - 2$

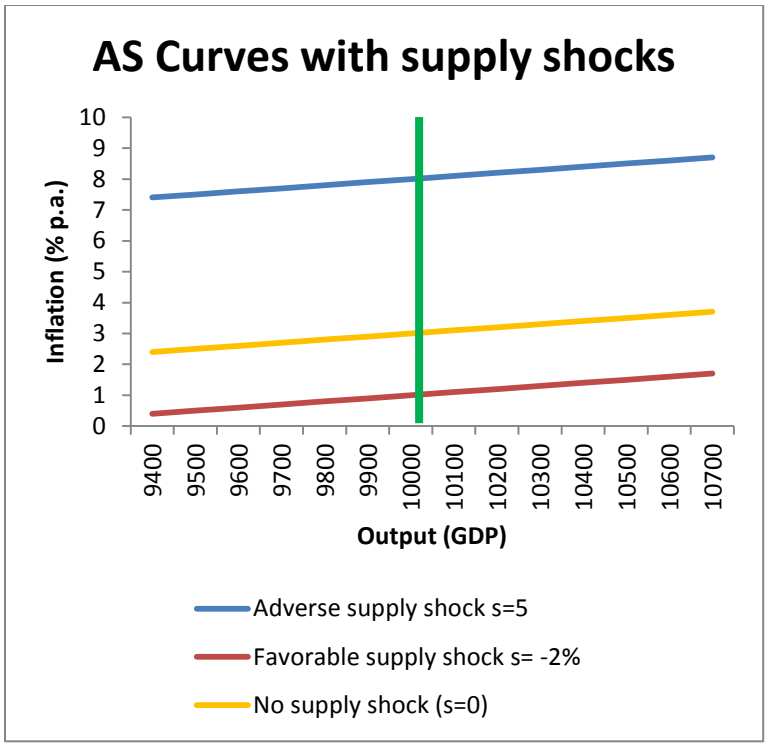


Figure A13.3: AS curve with different supply shocks

Figure A13.3 shows that for a given level of GDP inflation is higher, the larger the supply shock. A negative value of s – a positive supply shock – reduces inflation at any level of output.

(iii) (i) AS curve for $\tilde{\pi} = 3, \bar{Y} = 10{,}200, s = 0$: $\pi = -2 + \left(\frac{5}{10200}\right) Y$. Note that the supply curve shifts to right and becomes flatter for absolute changes (this would not be the case if the ouput *gap* had been plotted on the horizontal axis).

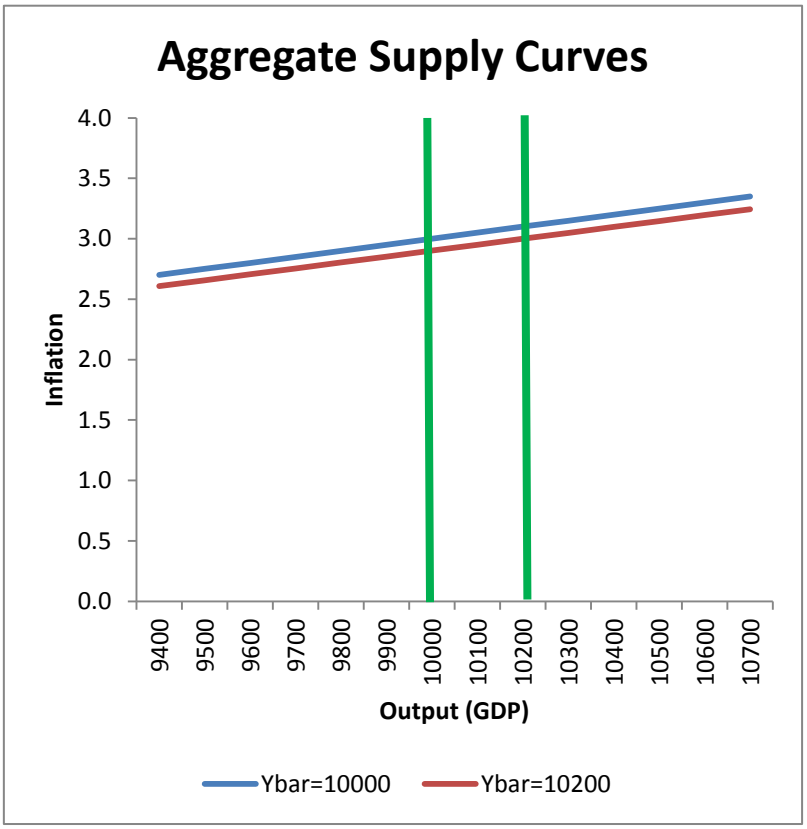


Figure A13.4: AS curve with different potential GDP $\bar{Y}$

Figure A13.4 illustrates that a higher potential GDP turns the AS curve clockwise: the larger real GDP, the larger the difference in inflation. Holding everything else constant, an increase in potential GDP has a lower inflation rate. This shows that measures which improve the supply side and hence potential GDP lead not only to more employment but also to a lower inflation (for constant underlying inflation).

Exercise 13.5

(a) Indexation of wages and prices (i.e. rent) means that their nominal value grows with the CPI inflation rate. If for instance nominal wages were not indexed, workers would have to negotiate with their employers at any change of inflation about higher wages in order to protect their purchasing-power. Not only would that be very time-consuming, but chances are high, that wages would always grow more slowly than the inflation rate due to an information or negotiation lag. With workers not striking for higher payments, they can continue working and the production process is not interrupted. Therefore indexation can be considered vital.

(b) 1200 % inflation over a year:

Let P_t denote the price index in week t, π_t the weekly inflation rate and π the yearly inflation rate. Furthermore, let the yearly inflation rate be computed as *discrete rate*[1], then

$$\pi = \frac{P_t - P_{t-52}}{P_{t-52}} = \frac{P_t}{P_{t-52}} - 1 = \prod_{i=1}^{52}\left(\frac{P_{t+1-i}}{P_{t-i}}\right) - 1 = \prod_{i=1}^{52}(\pi_t + 1) - 1$$

[1] With annual inflation as high as 1200%, $\ln(\pi + 1) \approx \pi$ is a poor approximation for large values of π.

If the weekly inflation rate π_t is constant, $\pi = (\pi_t + 1)^{52} - 1 = 12$ and hence $\pi_t = \sqrt[52]{13} - 1 = 1.0506 - 1 = 5.06\%$.

After three months (=12 weeks) the inflation rate will be:

$$\Pi_{3months} = (1 + 0.0506)^{12} - 1 = 0.808 = 80.8\%$$

In contrast, if the inflation is underestimated by 1%, one obtains

$$\Pi_{3months} = (1 + 0.0406)^{12} - 1 = 0.612 = 61.2\%$$

That means that over three months there is a difference of nearly 20% in the inflation rate!

Exercise 13.6

(a) An increase in value added tax increases all prices of virtually all goods and services and hence must have a short-term affect on the inflation rate. It can be seen as a one-off adverse supply shock which may or may not influence expectations of future inflation.

(b) An increase in corporate profit taxes reduces companies´ profit. If firms want to maximize profits, they will try to pass on the tax increase either to (i) customers through higher prices or (ii) to workers through lower wages or lower wage growth in the future.
In case of (i), prices will rise less than the tax increase unless demand is totally inelastic.
In case of (ii), lower wages mean lower income and hence less demand which rather reduces prices. In sum, the effect on inflation is likely to be smaller compared to an increase in value added tax.

(c) Depending on the supply and demand for labour, an increase in personal income taxes may be born either by labour and capital, or only partially so. If it is not, then the gross cost of capital and labour to firms will increase and may lead to a short-run increase in prices (It will also lower personal income and hence demand, but this is an effect outside that of aggregate supply side under discussion). A one-off increase in inflation like in (a) is possible but less likely, since supply of labour is relatively inelastic.

Exercise 13.7

A decline in equilibrium unemployment shifts the Phillips curve to the left in the short run (see Figure 13.3 in the textbook) as well as in the long run (see Figure 13.9 (a) in the textbook). In the short run, inflation will be lower for any level of unemployment. In the long run, unemployment will be at a lower unemployment level, regardless of the rate of inflation since both variables are determined by different factors in the long run.

Exercise 13.8

This situation is illustrated in Figure 13.13 in the textbook:
Starting from an equilibrium situation in which $Y = \bar{Y}, U = \bar{U}, \pi = \tilde{\pi}$ and $s = 0$, a higher aggregate demand leads to higher output in the short run and hence to less unemployment at the expense of higher inflation (move from point A to point B). Since unemployment is reduced below equilibrium unemployment, $U_{gap} = U - \bar{U} < 0$ and it follows from equation (13.11) in the textbook, that actual inflation will exceed underlying inflation.
As expectations adapt, underlying inflation will rise and the short run Phillips curve shifts up.

This process continues until underlying inflation and actual inflation coincide. In the long run, only inflation has increased while unemployment and output have returned to their equilibrium levels.

Exercise 13.9
Adaptation expectations:

t	$Y - \bar{Y}$	$(\pi_{t-1} - \tilde{\pi}_{t-1})$	$\tilde{\pi}_t = \tilde{\pi}_{t-1} + 0.5(\pi_{t-1} - \tilde{\pi}_{t-1})$	$\pi_t = \tilde{\pi}_t + 0.1(Y - \bar{Y})$
0		0	2	2
1	10	0	2	3
2	10	1	2.5	3.5
3	10	1	3	4
4	0	1	3.5	3.5
5	0	0	3.5	3.5

In this example inflation must overshoot first to obtain a long-run equilibrium at an inflation rate of 3.5% after 4 periods.

Exercise 13.10
Let $P^{€}$ be the price of oil in euros and $P^{\$}$ be the price of oil in US dollars. Furthermore, let $S_{\$,€}$ be the nominal exchange rate, measured as US \$/€, so $P^{\$} = P^{€} \cdot S_{\$,€}$.
The change in the price of oil in US dollars is results from the change in the price of oil in euros and the change of nominal exchange rate:

$$P^{\$}(1 + \Delta P^{\$}/P^{\$}) = P^{€}(1 + \Delta P^{€}/P^{€}) \cdot S_{\$,€}(1 + \Delta S_{\$,€}/S_{\$,€}),$$

so using $P^{\$} = P^{€} \cdot S_{\$,€}$ we have

$$\left(1 + \Delta P^{\$}/P^{\$}\right) = (1 + \Delta P^{€}/P^{€})(1 + \Delta S_{\$,€}/S_{\$,€})$$

A lower rate of increase in euro price of oil compared with that denominated in dollars goes hand in hand with an appreciation of the nominal exchange rate during the period 2000 to 2007 ($\Delta S_{\$,€} > 0$). Note that because these are large changes, the approximation $\Delta P^{\$}/P^{\$} \approx \Delta P^{€}/P^{€} + \Delta S_{\$,€}/S_{\$,€}$ is rather inaccurate.

A "hard" currency is one which is stable and in which people trust. It is usually the currency of a country with a stable economic and political system. Since such a country is less likely to undergo periods of high inflation, pegging the own country to such a hard currency under a system of fixed exchange rates lowers the risk of nominal exchange rate devaluations. For those who use the hard currency, it means that inflationary expectations are unlikely to react to sharp changes in commodities prices, as economic agents are unlikely to believe that inflation will rise permanently in response to temporary supply shocks. This is developed in more detail in Chapter 14.

Essay Questions

Essay Question 13.1

Choosing a point on the short-run Phillips curve –to the extent that it exists - implies a trade-off between inflation and unemployment. A left-of-centre politician would have been likely to argue that higher employment is worth the cost of higher inflation and would choose a point in the northwest segment of the Phillips curve. In contrast, a right-of-centre politician is more worried about fighting inflation and protecting the nominally denominated assets of voters; she would claim to be willing to accept higher unemployment as the cost of low inflation. The latter politician would therefore rather choose a point on the southeast part of the curve. Both politicians would overlook that the Phillips curve is vertical in the long run.

Essay Question 13.2

Inflation occurs if prices grow over time. The battle of the mark-ups explains inflation as the result of a constant battle between firms and workers on how to split up GDP into labour and profit share. Unlike other explanations for price increases, e.g. rising non-labour costs or demand-driven price increases, the battle of the mark-ups is able to explain why prices may rise continuously:

Under perfect competition, companies are price-takers which operate at the break-even point where the price covers average costs. Ignoring non-labour costs[2], the break-even point implies that the price equals nominal unit labour costs, i.e. $P = \frac{WL}{Y}$, with W nominal wage, L labour and Y real GDP.

In contrast, if companies have market power, they are able to set a price higher than the nominal unit labour costs as described in equation (12.5) in the textbook: $P = (1 + \theta)\frac{WL}{Y}$ where $\theta \geq 0$ is the price mark-up. Hence, firms try to increase profits (and thus profit share) at the expense of a reduced real wage W/P (and hence a lower labour share). This first step in the battle of mark-ups depends on the assumption of imperfect or monopolistic competition since firms would not be able to set prices under the alternative assumption of perfect competition.

Higher prices reduce workers' real wages and hence workers are interested in raising nominal wages to re-establish their former real wage level and hence their former wage share. However, contracts usually fix nominal wages for a certain period of time during which the price level may continue to change. Once workers can bargain again over a new nominal wage level, they will demand a nominal wage level W such that the expected real wage level W/P^e equals a "normal" real wage level $\bar{W}/\bar{P}$ times a mark-up factor$(1 + \gamma)$. The latter factor takes into account the economic situation: prices rise in a boom but may even fall in a recession; in response, γ may take on a positive value in a boom and a negative in a recession. Altogether, workers will demand a nominal wage $W = \frac{\bar{W}}{\bar{P}}(1 + \gamma)P^e$. Since the single worker has no bargaining power, the assumption of labour unions or collective bargaining is needed in this second step.

A higher nominal wage leads to higher nominal labour unit costs which decrease profits. If

[2] This simplifying assumption does not change the main statement.

firms want to re-establish their former profit level, they have to raise prices again: inflation is the outcome of this battle of the mark-ups.

Labour productivity plays a role in the determination of the "normal" real wage and the "normal" wage share, see Box 13.3 in the textbook. However, the assumption of constant labour productivity is not needed for the above line of argument.

Essay Question 13.3

Under the assumption that prices and wages are flexible, prices and wage adjustments ensure that markets return to equilibrium after a shock. If a negative demand shock reduces output, price and wage adjustment can help restore equilibrium. A decline in nominal wages given prices will reduce labour costs and stimulate employment and income. A decline in nominal prices given the nominal exchange rate will increase competitiveness and help restore demand. An argument in favour of flexible prices and wages is the flexibility that the economy gains, making it less sensitive to demand disturbances.

This adjustment is palliative only if relative prices adjust in the right direction. If prices fall faster than nominal wages, then real wage does not decrease, and firms may have to fire even more workers to increase labour productivity to the level of the real wage. Employment decreases more than it would have under fixed wages. Flexibility of wages leads to larger cyclical movements in income and make it harder for households to plan. The same is true for price flexibility as changes in prices imply costs for firms, e.g. information costs, costs to print new price lists, and make it harder for firms to plan, too. Too frequent price changes has been shown to anger consumers and may lead to speculation on price reductions, leading to volatile and unpredictable demand. Apparently markets appear to "prefer" some degree of wage and price rigidity.

Essay Question 13.4

From this chapter we have learned that there is a long-run equilibrium rate of unemployment, which can be changed by neither by increased spending nor by expansionary policies but only by supply-side policies. For instance, attempts to reduce unemployment *below* the long-run equilibrium rate with the help of expansionary policies will only raise inflation in the long run.

However, if unemployment is *above* its long-run equilibrium rate, expansionary policies can help reduce unemployment to its equilibrium level, possibly restoring equilibrium more rapidly. Hence the statement is only correct if an expansionary policy can't help reduce unemployment faster than a laissez-faire policy. Still it is questionable whether the government knows if unemployment is above or below its long-run equilibrium rate. In addition, the expansionary policy must be financed and that choice may have detrimental impact on the economy.

Essay Question 13.5

For an open economy, a sharp depreciation acts like a supply shock. Imports become more expensive and feed into the evolution of inflation directly (s>0). (It may also act as a demand shock – to the extent that exports may be temporarily cheaper – but this effect is less

important). To see whether inflation is temporary or permanent, consider the Phillips curve described in equation (12.10) in the textbook:

$$\pi = \tilde{\pi} + aY_{gap} + s$$

In the short run, output higher than trend output ($Y_{gap} > 0$) or positive supply shocks ($s > 0$) raise the inflation rate above the underlying inflation rate. In the long run, output equals trend output ($Y_{gap} = 0$), and in the absence of supply shocks underlying inflation adapts to actual inflation. Graphically, this corresponds to a move from point A to point B (depreciation; short run) to point Z (long run) in the right-hand panel of Figure 13.13.
A temporary rise in inflation requires that the Phillips curve shifts back from point B to point A. The rise in inflation will be only temporary if feasible if underlying inflation does not respond, because households and firms do not expect the one-off depreciation to translate into a permanent increase in inflation, e.g. because they anticipate a recession resulting from contractionary demand policy in the future.

Chapter 14

Exercise 14.1

If taxes rise, disposable income decreases and so does consumption and aggregate demand. The IS and the AD-curve shift to the left and the economy has to undergo a recession but faces smaller inflation. The effect of a decrease in government spending has the same qualitative effect on demand as a tax increase. The same is true if Tobins´ q falls since less investment projects are undertaken and hence investment decreases. All three events lead to the same effect on aggregate demand in the short run. (See Figure 14.4 for a graphical illustration of the scenario for an exogenous *expansion* of aggregate demand.) In the long run the IS- and AD-curve will shift back to its initial position as the government has to keep its budget constraint. Moreover, animal spirits will not increase forever, but will decrease to normal (or even decline). Because they cannot be a long-run source of inflation the economy must return to its long-run equilibrium.

Exercise 14.2

The Taylor rule states that $i = \bar{\imath} + a\pi_{gap} + bY_{gap}$. A permanent decrease in the inflation target leads to an increase in the inflation gap and hence rising nominal interest rates. Capital flowing into the country leads to an exchange rate appreciation which shifts the AD curve to the left. As consequence, output and inflation decrease *in the short run.*

In the long run, a permanently lower target inflation rate means that the LAD curve shifts down while the LAS curve remains unchanged. In the long run equilibrium output is at trend output while inflation is lower.

In the medium run output recovers from its initial decrease because underlying inflation adapts to the lower actual inflation. As underlying inflation decreases the AS curve shifts to the right and output increases. This process continues as long as the output gap is negative and may even proceed beyond, giving rise to looping trajectories in the adjustment to the new long run. In the new equilibrium, the output gap is zero and inflation equals target inflation.

The transition from short- to long-run equilibrium depends on the speed with which underlying inflation adjusts to actual inflation. Comparing the two functions (i) $\tilde{\pi}_t = \pi_{t-1}$ (underlying inflation equals previous inflation) and (ii) $\tilde{\pi}_t = \delta\pi_{t-1} + (1-\delta)\pi_{t-2}$ with $\delta > 1$ (underlying inflation overshoots inflation in the previous period), it becomes clear that function (i) ensures a faster adjustment of underlying to actual inflation.

Exercise 14.3

Sorry, but there is a mistake in this exercise. Here's why: In the steady state (long-run equilibrium), inflation equals target inflation and output equals trend output. Hence $\pi_t = \pi_{t-1} = \bar{\pi}$ and $Y_t = \bar{Y} = 5000$. It follows from the Taylor rule that $i_t = \bar{\imath} = r + \bar{\pi}$ and hence $i_t - \pi_t =$r in the steady state. However, inserting the long-run equilibrium value $Y_t = \bar{Y} = 5000$ into the AD equation yields: $0 = 0.5(i_t - \pi_t) = 0.5$ r which is not true since by assumption $r = 2$ in the steady state.

The model can be repaired by substituting for the AD curve the function

$\frac{(Y_t - 5000)}{5000} = 0.5(i_t - \pi_t - 2)$. Sorry about that!

Exercise 14.4

(a) Negative output gap under fixed exchange rates:

The intersection of the short-run AD and AS-curves is to the left of the long-run equilibrium. However, whether inflation is higher or lower than foreign inflation depends on how the economy got into the recession.

If the economy was in a long-run equilibrium before the recession (point A in Figure 13.6 (b)), a shift of the AD curve to the left results in a negative output gap and an inflation rate which is lower than the foreign inflation rate. Under fixed exchange rates, the real exchange rate depreciates and rising external competitiveness shifts the AD curve back to its initial position. Moving along the AS curve, higher output goes hand in hand with higher inflation until domestic inflation equals foreign inflation.

If the economy was in a boom with domestic inflation already higher than foreign inflation (point C in Figure 13.6 (b)), a shift of the AD curve to the left results in a negative output gap and an inflation rate which is still higher than foreign inflation (point D in Figure 13.6 8b)) but lower than before. Once underlying inflation adapts to the lower actual inflation, the AS curve will shift to the right and output will increase while inflation decreases. This process continues until underlying inflation equals actual inflation equals foreign inflation and the economy is back at point A (long-run equilibrium).

(b) Negative output gap under flexible exchange rates:

Assume that the economy was in a long-run equilibrium with inflation equal to target inflation (point A in Figure 13.13 (a)).

If the central bank lowers its target inflation rate permanently, the AD curve shifts to the left and the LAD curve shifts downwards. Short-run equilibrium (the intersection of short-run AD and AS curve) is characterized by a negative output gap and an inflation below target inflation (Figure 13.13. shows the reversed scenario of an increase in the target rate). Underlying inflation is higher than actual inflation. As underlying inflation adjusts, the AS-Curve will shift rightwards until it reaches the intersection of both AD and LAD curves.

Under both regimes, fixed and flexible exchange rates, the return of inflation to target inflation (flexible exchange rates) respectively to foreign inflation (fixed exchange rates) is the motor which brings back the economy to a long-run equilibrium. The transition takes longer, the more slowly underlying inflation adapts to actual inflation.

Exercise 14.5

(a) Positive output gap under fixed exchange rates:

Starting from a long-run equilibrium (point A in Figure 13.6 (b)), assume that a positive demand shock has moved the AD curve to the right. The economy is now in a short-run equilibrium with a positive output gap and higher inflation (point B in Figure 13.6 (b)). As

underlying inflation catches up with higher actual inflation, the AS curve shifts to the left (point C in figure 13.6 (b)), reducing output but increasing inflation. Due to the real exchange rate appreciation, external competitiveness declines and the AD curve shifts back (point D in Figure 13.6 (b)). Inflation and output decrease and the economy may end up in a recession (see exercise 13.4 (a)). Once underlying inflation catches up with the now lower actual inflation, the AS curve will start to shift back to the right. In the end the economy will be back in the long-run equilibrium (point A in Figure 13.6 (b)).

Exercise 14.6

Positive supply shocks move the AS curve to the left, causing a negative output gap and a higher rate of inflation. In contrast, negative supply shocks shift the AS curve to the right and the short-run AS and AD curves intersect at a positive output-gap with lower inflation. This implies a negative correlation of output gap and inflation. In the case of demand shocks, positive demand shocks lead to booms with higher output (positive output gap) and higher inflation while adverse demand shocks cause recessions with lower output (negative output gap) and lower inflation.

Since the Phillips curve implies a positive relationship between inflation and output, we can observe this curve if demand shocks dominate the economy and supply-shocks do not occur. (Note that demand shocks move the economy along the short-run AS curve which has been derived from the short-run Phillips curve.)

Exercise 14.7

Let us assume that we are initially in a long-run equilibrium with domestic inflation equal to foreign inflation (e.g. point A in Figure 14.7). A rise in foreign inflation causes a real exchange rate depreciation. External competitiveness increases and the IS curve shifts to the right as does the AD curve. In the new short-run equilibrium (point B in Figure 14.7), output and inflation both increased. However, underlying inflation is lower than actual inflation. Once underlying inflation catches up, the AS curve will shift to the left. Moreover, the higher inflation erases the gain in external competitiveness and the AD (and IS) curve will shift to the left. This scenario continues until in the new long-run equilibrium, the output gap is zero and domestic inflation equals foreign inflation. (In Figure 14.7, the LAD curve rises to the new level of the foreign inflation.)

Though the country experiences a transitory boom, there is no permanent gain from a rise in foreign inflation as purchasing power parity (PPP) implies a long-run domestic inflation rate equal to the inflation rate in the country to which the domestic currency is pegged.

Exercise 14.8

Under fixed exchange rates, the small open country cannot pursue an expansionary monetary policy by lowering interest rates as the domestic interest rate is dominated by the foreign interest rate. The only expansionary monetary policy it can undertake is therefore a devaluation of the nominal exchange rate which raises external competitiveness and shifts the IS and AD curve to the right (see Figure 14.7), leading to higher output and higher inflation. In contrast, a tight fiscal policy shifts the AD curve to the left, leading to lower output and lower inflation. Hence, the effects of both policies cancel out.

Exercise 14.9

Under flexible exchange rates, a tight monetary policy may arise from a decrease in the central bank's target inflation rate which leads via the Taylor rule to a rise in nominal interest rates.[3] The TR curve shifts to the left, leading to higher interest rates which cause a capital inflow and let the exchange rate appreciate. The IS and AD curves shift to the left in their respective diagrams. Output and inflation decrease. Once underlying inflation catches up with actual inflation, the AS curve will shift to the right, leading to even lower inflation but reducing the negative output gap. Declining inflation and the negative output gap trigger the central bank to lower nominal interest rates and the TR curve shifts back to its original position in the end (there may be cycles to the new equilibrium). The decline in the nominal interest rates leads to an exchange rate appreciation and shifts the IS curve also back to its initial position. The AD curve does not shift, but declining inflation lets the economy move along the AD curve towards the lower target inflation rate. In the long-run equilibrium, output is back to trend output but inflation has permanently decreased to the lower target inflation rate (see Figure 14.13 for the reversed scenario of an expansionary monetary policy).

An expansionary fiscal policy shifts the AD and IS curves to the right, leading to higher output and higher inflation in the short run. The higher output and higher inflation trigger the central bank to raise the nominal interest rate which leads to an exchange rate depreciation, shifting back the IS and AD curves in the long run.

An expansionary fiscal policy can help to offset the negative output effect of a tight monetary policy but neutralizes the intended decrease in inflation in the short run. In the long run, only monetary policy will have a lasting effect.

Exercise 14.10

A favourable supply-shock means that the AS curve shifts to the right, leading to higher output and lower inflation. If the government wants to permanently lower the rate of inflation, they can achieve this goal only in a flexible exchange rate regime. The monetary policy must be tightened (the central bank must reduce its target inflation rate, see exercise 14.9), so that the AD curve shifts to the left and the LAD curve shifts downwards.
Under a fixed exchange rate regime, the domestic inflation rate has to equal the foreign inflation rate in the long run which the government or central bank cannot influence.

Exercise 14.11

Expansionary monetary policy under flexible exchange rates leads to a higher output than trend output and inflation in the short run. In the long run, output returns to its trend level while inflation has permanently increased, see Figure 14.13 in the textbook. To keep actual GDP above its trend growth, the central bank has to increase the target inflation rate again once underlying and actual inflation have caught up with the target inflation rate. Such a policy leads only to ever-increasing inflation and is not sustainable as market participants lose confidence in the domestic currency. The result would be a hyperinflation.

[3] This is true if the central bank places a high priority on fighting inflation, such that the parameter $a > 1$ in the Taylor rule $i = \bar{\imath} + a(\pi - \bar{\pi}) + b\,Y_{gap} = r + (1 - a)\bar{\pi} + a\pi + b\,Y_{gap}$.

Exercise 14.12

(a) Fiscal policy under fixed exchange rates and forward-looking underlying inflation

An expansionary fiscal policy shifts the AD curve to the right. Rising demand leads to higher output and inflation in the short run. However, the agents expect that the economy will soon move back along the short-run AS curve to the initial output and inflation level because (i) they know that an expansionary fiscal policy has to be reversed at some point to keep the budget balanced and (ii) the higher inflation reduces demand via a real exchange rate appreciation and (iii) the domestic inflation has to be reduced for PPP to hold. The AS curve shifts exactly to keep the economy on the LAS curve. The AD curve will shift back to its initial position (or possibly below) once the expansionary fiscal policy is reversed; the consequence is not a recession but a sharp decline in inflation.

In contrast, a contractionary fiscal policy shifts the AD curve to the left. Demand is reduced, but the demand reduction is offset by a rightward shift of the AS curve, since inflation is correctly anticipated throughout, leading to zero output gap and sharply lower inflation. Since demand will increase again due to the real exchange rate depreciation, leading to higher inflation the AS curve will shift left, restoring domestic inflation to its previous level (in the long run, foreign inflation).

(b) Monetary policy under flexible exchange rates and forward-looking underlying inflation

An expansionary policy means a shift in the Taylor rule of the central bank, moving the AD curve to the right and the LAD curve upwards. If the monetary authority is expected to admit a higher level of inflation, the AS curve will shift left and up immediately to a new long-run equilibrium with a higher inflation rate and zero output gap. The positive output effect dies out quickly.
In case of a restrictive monetary policy, the AD curve shifts to the left and the LAD curve shifts downwards. People will adjust their expectations, if the central bank is known for a strict inflation fighting policy and the AS curve will shift down. In the both short and long run the inflation in equilibrium will be lower.

Exercise 14.13

Exercise 14.12 makes it clear that entirely forward-looking underlying inflation speeds up the adjustment process which leads to a new long-run equilibrium after a shock. It is therefore in the central bank's interest to publish reliable information about its future actions so that agents use this information in forming their expectations. This will tend to keep the economy closer to its LAS curve on average.

Exercise 14.14

To answer this question, let's look at the following two equations:

(1) Taylor rule: $i = \bar{\imath} + a(\pi - \bar{\pi}) + b\, Y_{gap}$

(2) Real interest rate: $r = i - \pi$

(1) If we insert (1) into (2) we obtain: $r = \bar{\imath} + (a-1)\pi + b\,Y_{gap} - a\bar{\pi}$

A rise in inflation leads to a higher real interest rate if $a > 1$ such that $(a-1) > 0$. In this case, a nominal variable can have an influence on a real variable! This is definitely a statement about the short to medium run. In the long run $\pi = \bar{\pi}$ so $i = \bar{\imath} = r + \pi$.

Essay Questions

Essay Question 14.1
Expansionary demand policies can only have transitory effects because they will be reversed at some point or lead to economic developments which reverse the effects of the demand policy in the long run. For instance, an expansionary fiscal policy must be financed; a devaluation leads to a real exchange rate appreciation via rising inflation; an expansionary monetary policy increases inflation and hence a real exchange rate appreciation. Deviations from the LAS curve are only possible when $\pi \neq \tilde{\pi}$. This means that agents incorrectly assessed the level of inflation in the current period, because their contracts were unable to adjust to the reality of the inflation rate – because their contracts were written with less information than presently available – or it is too costly to do so. Only agents who suffer from money illusion can be fooled into believing that the economy is better off thanks to an expansionary demand policy.

Essay Question 14.2
Imagine the AS-AD framework without the AS and LAS curves. In such a framework, the short-run AD curve can be pushed by monetary or fiscal policy as far to the right or left as wished, even without worrying about inflation. Only by adding the supply-side to the AS-AD framework do we obtain a trade-off between output and inflation and can no longer choose any point on the AD curve. Moreover, the AS curve is shifted by underlying inflation, including expectations about inflation. Demand policies lose their relative usefulness as they not only change output but also inflation. And the change in actual inflation triggers changes in underlying inflation which shift the AS curve and tend to reverse the output effect.

Essay Question 14.3
Supply-side policies are appealing because their effect (a rise in trend output) does not die out but enhances the economy's production possibilities. They also cost less than demand-side policies in general. Useful measures are deregulation of markets (especially removal of barriers to entry), labour market reforms, investment in public goods as roads and schools. Public investment has both a demand and supply-side effect.

Essay Question 14.4
This statement is only true if inflation arises in the wake of a positive demand shock. Assume e.g. that the AD curve shifts to the right, because of an expansionary monetary (flexible exchange rates) or fiscal policy (fixed exchange rates), leading to higher inflation but also higher output in the short run. The positive output effect vanishes in the long run though. This happens faster, the faster underlying inflation catches up with actual inflation. With sluggish expectations the output-gap will be longer present then if expectations are forward-looking.

In contrast, inflation may also be due to an adverse supply-shock, which shifts the AS curve to the right. In this case, a fast increase of output back to its trend level is preferred. But the adjustment process will be slower if expectations are sluggish.

Declining inflation can also arise in two cases: in the wake of an adverse demand shock (AD curve shifts to the left) or in the wake of a favourable supply shock ($s<0$; AS curve shifts to the right). The adverse demand shock leads to a negative output gap. In this case, sluggish expectations are troublesome since they defer the return to trend output. However, in the case of the negative supply shock, the accompanying positive output gap shrinks more slowly.

The statement applies to demand management policies but not to supply-side policies.

Essay Question 14.5

If the target rate of inflation rate is fixed and inflation is rising, the inflation gap rises and the central bank will raise nominal interest rates, causing a real exchange rate appreciation. This may reduce output and inflation. It will also reduce the price of primary commodities (which tend to be traded in competitive markets) in domestic currency of the imported raw materials, reducing the impact of the supply shock.

Such a policy is unfortunately not possible under fixed exchange rates, as we know that the domestic inflation must be equal to the foreign inflation. The economy cannot react to the shock but has to go through a recession plus higher inflation - stagflation.

Chapter 15

Chapter 15

Exercise 15.1

(a) Convert one British pound into euros and the resulting euros into US dollars, you will get $\frac{€}{0.75£} \cdot \frac{1.25\$}{€} = 1.67\$$. Convert those US dollars back into pounds at the exchange rate of 1.65$/£ yields 1.67/1.65=1,01£ and hence a profit of 1%. (In the real world transactions costs and the bid-ask spread must also be considered – but these complications do not change the force of the argument).

Triangular arbitrage (£/€- €/$ - $/£) leads to a different exchange rate than direct trade ($/£). The market will notice that profits due to arbitrage are feasible and will convert British pounds into euros into dollars and try to trade those back into pounds. Since the demand for British pounds rises, the exchange rate $/£ appreciates, thus erasing the chance to profit from arbitrage.

Starting with one euro, converting it to dollars and dollars into pounds leads to 0.758£, which, when traded back into euros, yield 1.01€, again a profit of 1%. If the market rushed to trade in this way, the euro would appreciate.

(b) Starting with one British pound: Since one euro costs 0.76£, for 1£ you'll get 1/0.76€. Trading the euros into dollars at a bid rate of 1.24$/€ yields 1.24/0.76=1.632$. In contrast, selling one British pound for US dollars yields 1.64$. Hence, triangular arbitrage leads to a loss compared to the direct exchange rate because the bid-ask spread has to be taken into account twice.

It turns out that bid-ask prices create a band of exchange rate values for which arbitrage does not occur – and that this band depends on the width of the bid-ask spread.

Exercise 15.2

Under covered interest rate parity (CIP), the *domestic interest rate equals the foreign interest rate minus the forward premium*. Equation 15.2 in the book formalizes the approximated version of CIP. (Recall that the exchange rate is measured in "British terms" i.e. how many units of the foreign currency are needed to buy one unit of ours).

From the Austrian perspective, the domestic interest rate of 3% must equal the Hungarian interest rate of 10% minus a forward rate equal to 7%. In the absence of a risk premium, the positive forward rate implies that the forint is expected to depreciate vis-à-vis the euro.

Intuitive explanation: the 10% Hungarian interest rate yields a larger interest income for every forint invested than the 3% Austrian interest yields for every euro invested; for both returns be the same in expectation (no profit condition), the forint must be expected to lose value against the euro during the lending period.

Exercise 15.3
If the central bank fixed the exchange rate and the interest rate differential were to persist, there would be a potential money pump (a violation of the no-profit condition). It would be possible to borrow money in Austria and lend it to Hungary, and earn quite a sum of money doing so. This applies not only to banks but also to individual borrowers – Hungarian households and firms. The persistence of such differentials in light of the zero profit condition, however, suggests however that there is a catch. First, despite the assurances of the National Bank of Hungary, a fixed exchange rate can be devalued, and a 7% interest differential is consistent with a significant probability of a Forint depreciation. In addition, there may be risk associated with investing in Hungary due to problems with the Hungarian banking system, a protection of property rights, possible changes in the taxation of interest, etc. Austrian investors are only willing to invest their money in Hungary if they will receive a risk premium in addition to the Austrian interest rate. Hence, the 7% interest rate differential can also be interpreted as risk premium.

The no-profit rule is thus valid in its modified form given in Equation 15.6 in the textbook: given zero expected appreciation, the risk premium equals the interest rate differential.

Exercise 15.4
From equation 15.10 we know that the current exchange rate is perfectly forward looking, internalizing future and current interest rates as well as the expected exchange rate. This means that, if stated that the exchange rate of the Sloty vis-à-vis the Euro will augment, the current exchange rate will rise. Information about current and future interest rates would help to determine the exact value of the current exchange rate.

Exercise 15.5
The phenomenon of an interest rate differential despite a stable exchange rate can be explained by tax differences or differences in perceived risk in the two countries. If Switzerland has protects banking secrecy or doesn't tax capital gains as much as Germany, investors may be willing to lend money at lower (gross) rates in Switzerland. They may also believe that their capital is safer in Switzerland. They will accept a risk discount and hence a lower interest rate for investment in Switzerland than in Germany.

Exercise 15.6
This partly immense spread between the interest rates paid on European bonds is explained by the significant increase in uncertainty in the Euro-zone. Portugal, Greece and Ireland stumbled into massive debt crises in the aftermath of the global recession 2008-2009. They have undergone bail-out-programs. Greece was even allowed to cut half of its debt. Such events do not reassure investors. First, they probably attach higher probability to the possibility that they never see their money again (default). Even if investors are risk-neutral, they will demand compensation for this possibility – the yield must be high in all states of the world in which the government is not bankrupt. Second, uncertainty about the ability of those countries to pay back the borrowed money and the conditions that surround that outcome prompt investors to demand a high risk-premium (to the extent this risk is not diversifiable).

Exercise 15.7

The current account deficit from 1970 to date could be interpreted in many ways. First, it could be the case that Australia is taking advantage of some investment opportunity by borrowing from abroad (consumption smoothing). Second, it could be the case that changes in prices for natural resources have increased Australia's wealth significantly to allow it to "consume beyond its means" and run balance of trade deficits (a case of "Dutch Disease". Still another might be that the government has run budget deficits which were financed from abroad. In order to judge this it would be necessary to take a careful look at the time profile of C, I and G in relation to Y and to their own respective pasts.

The analysis surrounding Figure 15.5 in the textbook implies that in the long run, the real exchange rate has to depreciate to bring the primary current account bank into balance. In the long run, today's current account deficit must be compensated with a current account surplus. This intertemporal budget restriction demands a lower long-run real exchange rate which serves as anchor for the short-run real exchange rate.

Evidently, the observed 10% depreciation over the past years was not sufficiently large to close the current account deficit. Given more than 40 years of current account deficit, it seems surprising that the real exchange rate has not undergone a larger depreciation yet. However, Australia's independence is still recent and the country may be still in the process of building up a strong export sector. Foreign investment in Australia – especially from China – has been high in recent years. As long as the investment is an indicator of future real growth, Australia can "grow out of its deficits" just as a government can grow out of its indebtedness.

Exercise 15.8

Prior to the Asian crisis in 1997, Korea was growing fast and this was a plausible reason for the appreciation of its nominal exchange rate. During the Asian crisis, the currencies of several Asian countries were highly overvalued. Since exchange rates are purely forward-looking, the mere suspicion that Korea's currency might be highly overvalued could lead to a severe nominal exchange rate depreciation. Once the market had better information and could differ between the economic and monetary situation in Korea vis-á-vis other Asian countries, the nominal exchange rate appreciated again, reflecting a change in expectations. It continued to appreciate once Korea overcame its recession and continued to grow, in particular in the export sector.

Exercise 15.9

The assertion appeals to the possibility that the equilibrium exchange rate can change (e.g. in Figure 15.6) but for reasons related to long-run competitiveness or to international investment positions. Constancy of the equilibrium exchange rates implies that the country is in external balance and no real appreciation or depreciation is warranted. While this logic is consistent with the theory presented in Chapter 15, the actual (current) exchange rate may also respond to monetary shocks in the short run (for example a sharp change in nominal exchange rates can lead to transitory changes in the real exchange rate if prices are sticky at home and abroad). The real exchange rate is constant only when the difference between inflation rates at home and abroad is equal to the rate of exchange rate depreciation. It may thus be misleading

to associate measured exchange rates with equilibrium exchange rates, even over a longer time period, if prices are sticky.

Exercise 15.10
Market pressure for appreciation shows an increasing demand for the Swiss franc because investing in Switzerland is more attractive than in the Euro zone. Lowering the interest rate is the quickest way to reduce capital inflow into Switzerland and hence demand for the Swiss franc, see also equation 15.10 in the textbook.

Essay Questions

Essay Question 15.1
As long as market participants believe that the fixed exchange rate will remain fixed, this regime eliminates exchange rate risk and is therefore beneficial for trade as resources which are spent in hedging against risk or gathering more information can be used for production. This presupposes that the monetary authority pursues a policy consistent with a fixed exchange and does not try to "cheat."

However, just because the exchange rate is fixed does not mean per se that market agents believe it will remain constant. Their expectations will be lead by assumptions about the future evolution of domestic and foreign interest rates as well as by the equilibrium real exchange rate (see equation 15.13 in the textbook). If the prevailing exchange rate is fixed at a level which deviates from the equilibrium exchange rate, market agents will expect that the central bank cannot keep up the fixed level forever, e.g. because it may run out of reserves. Speculative attacks or a massive withdrawal of foreign investment may help bring down the fixed exchange rate regime. The Asian crisis can serve as an example where fixed exchange rates have not reduced uncertainty.

Essay Question 15.2
Firms in manufacturing and traded output often have long delays between the ordering of goods and the final sale or purchase. Think e.g. of a machine that is produced in France and bought by a Danish company. The French producer will start producing once the order comes in (due to storage costs and possibly the customized nature of the order) and hence the delivery may take place quite some time later. Imagine further that both companies agreed on a price to be paid in euro at delivery. Hence, the Danish company faces the risk that the euro appreciates in the meantime vis-á-vis the Krone. It would favour fixed exchange rates to eliminate this risk. In contrast, flexible exchange rates are profitable for financial institutions as they gain from offering services to hedge against exchange rate risk, from futures markets and from speculation. Hence, the statement is true.

Essay Question 15.3
Assume a country under a fixed exchange rate system. If foreign investors withdraw their funds changing it back into foreign currency, or if domestic agents prefer to hold rather foreign currency than domestic currency, the central bank has to buy back the domestic currency at the prevailing fixed exchange rate with its reserves. If reserves are exhausted and

no credit from abroad is available, the central bank must devalue the domestic currency. The only solution available to a central bank in such cases

Such a situation could occur whenever market agents suspect that the domestic currency is overvalued *and* that the central bank doesn't have the reserves, lines of credit or wherewithal to defend the currency. The expectation may be fed by reliable data about the economic situation of the country, e.g. a higher long-run inflation, a loss in non-price competitiveness which reduces the equilibrium real exchange rate or an increasing primary current account deficit. In particular, revelations about bad choices made by policy makers can lead to this judgment. This is the "fundamental view" of speculative attacks.

In contrast, a crisis may also occur simply because some foreign investors have incorrect expectations and withdraw their capital and others follow by herd instinct. In the limit, a rush to the door can cause interest rates to rise so high that the country does not have the stomach for high interest rates needed to sustain the exchange rate and must give up the fixed exchange rate.

The frustrating aspect of the debate between fundamental and non-fundamental explanations is that it is often difficult to distinguish whether currency crises are self-fulfilling or not. Ex-post evaluations of the situation are not always helpful, since expectations are often confirmed by economic developments in the non-fundamental case as well. The examples of Korea and the European Monetary System in 1992-3 support the assertion.

To avoid self-fulfilling crises, countries should help shape expectations by publishing reliable data about the economic situation and about their fiscal and monetary policies, and publicly assert their will to defend feasible exchange rate regimes.

Essay Question 15.4

An upward sloping yield curve can be explained by a premium for impatience and risk, but more fundamentally is accounted for by expectations of higher short-term interest rates in the future. However, if market agents expect the central bank to raise the target inflation rate in the future, the yield curve may become downward-sloping. Expectations about future development of economic variables as well as macro policy influence the shape of the yield curve. Since expectations change with the arrival of new information, so does the yield curve, (see Figure 14.5 in the textbook).

The same is true for equation (15.10). Market agents have expectations about the future development of domestic and foreign interest rates as well as the equilibrium real rate which are based on their information about economic variables as well as the policy decisions which lie behind them.[4] Equation (15.10) states that these expectations about the future are already incorporated into the prevailing exchange rate. Hence, equation (15.10) should not be read too

[4] Expectations are a fact of life, whether about events in one year or in 10 years. In the simplest case, the underlying expectation is that everything remains the same. Whether these expectations come true or not is a different question.

literally. It just states that expectations about the future immediately change the spot exchange rate.

Essay Question 15.5

An increase in natural resources makes a country richer: it can spend more. This is especially true if the change is permanent. Graphically, it means that a PCA deficit can be raised without any change in the real exchange rate. Thus, the PCA function moves to the right as illustrated in Figure 15.7 in the textbook. In contrast, if the PCA deficit is held constant, the real exchange rate rises. This decreases the country's external competitiveness in the former export sectors. As described in Box 15.5 in the textbook, this development can lead to fundamental changes in the structure of the supply-side of the economy. Export goods become less competitive and the corresponding industries decline while the oil industry and non-tradable goods and services prosper. The transition process from an agriculture- or industrial-oriented to an oil-exporting country can cause high unemployment and a recession but in the long run, the country will have a higher real exchange rate due to current account surpluses generated in the oil-exporting sector.

As long as oil prices remain high and represent a source of wealth, this effect could be considered natural and simply a stroke of good luck. There is a view however, based on the experience of the Netherlands and the UK with natural gas and North Sea oil, respectively, that the resource can be depleted, leaving a devastated industrial landscape in its wake. The fear of this "Dutch disease" deindustrialization prompted Norway to invest most of its oil profits in foreign countries or to use it to subsidize some manufacturing industry. By doing so, some of the edge might have been taken out of the resource curse.

Chapter 16

Exercise 16.1

Consider Figure 16.3 in the textbook which shows an economy in recession at point A. By stimulating demand, the AD curve can be pushed to the right and hence towards a new long-run equilibrium at point B. The demand-driven way back to long-run equilibrium comes at the expense of higher inflation.

The alternative to demand management as a way out of a recession is the neoclassical view that underlying inflation will sooner or later catch up with actual inflation and shift the AS curve to the right. The economy moves towards a new long-run equilibrium at point C which in contrast to point B exhibits lower inflation.

The motivation for Keynesian activist demand policy rests in the belief that wages and prices are sticky and expectations adapt sluggishly. Disequilibria can persist for a long time respectively the adjustment process of the economy, if left alone, takes too long. In contrast, the neoclassical view assumes that prices adjust quickly and that expectations are rather forward- than backward-looking. Given the various lags (recognition, decision, implementation, effectiveness) which delay demand management policy, neoclassical economists doubt that active demand policy can return GDP to its trend faster or more reliably than a laissez-faire policy.

Exercise 16.2

In Exercise 16.1, it was pointed out that active demand policy comes at the expense of higher inflation. It should be chosen over a laissez-faire policy only if it brings back GDP faster to its trend value. Both policies suffer from lags: the demand policy suffers from recognition, decision, implementation and effectiveness lags while the laissez-faire policy can only be as fast as the speed with which underlying inflation adapts to actual inflation. Hence, the effectiveness of demand management policy needs to be evaluated in comparison to the (behavioural) determinants and in particular the speed of adjustment of underlying inflation.

The determinants of underlying inflation are, among other things,

- whether expectations are rational or whether systematic errors are feasible,
- whether expectations are forward-looking or backward-looking,
- whether agents tend to be locked into contracts where price and wage increases are fixed or indexed,
- the level of current inflation.

Under a credible fixed exchange rate regime, domestic inflation has to adapt to foreign inflation in the long-run. Since foreign inflation serves as anchor, it can be assumed that actual as well as underlying inflation adjust more quickly under a fixed exchange rate regime than under a flexible exchange rate regime where agents need to generate expectations about the long-run inflation rate.

Exercise 16.3

The slope of the AS-curve is very important for the effectiveness of demand management

policy. To see why, imagine a negative demand shock under two different scenarios: (i) with a (nearly) horizontal AS curve and a downward-sloping AD curve and (ii) with a (nearly) vertical AS curve and a downward-sloping AD curve.
In scenario (i) the AD-curve shifts to the left, the result is a negative output-gap with inflation almost equal to its former level! Since actual inflation hardly changes, underlying inflation adjusts slowly and the disequilibrium will be persistent (unless a positive demand shock shifts back the AD curve and closes the negative output gap). Hence, there is a case for active demand policy to return the economy to long-run equilibrium. By contrast, under scenario (ii) a leftward shift of the AD curve has no effect on output but only lowers inflation. This scenario provides no need for active demand policy.

The slope of the AS curve is steeper, the larger the change in inflation relative to a given change of the output gap. Hence, the slope of the AS curve increases with price and wage flexibility. Scenario (i) describes the extreme case of rigid wages and prices whereas scenario (ii) describes the diametrically opposed extreme of totally flexible wages and prices.

In conclusion, active demand policy is more effective, the flatter the AS curve and hence the more sticky wages and prices are.

Exercise 16.4
Costs of inflation:

(a) ***Redistribution of income***: Inflation lowers the real value of wages, pensions, transfer, and interest income. While unions have the power to fight for a higher nominal income which compensates for the higher inflation, retirees and dole recipients don't and may suffer a loss of real income. In the short run, inflation also may also lead to a real exchange rate appreciation and a decline of income in the export sector; this can be rapidly reversed when the inevitable devaluation occurs.
(b) ***Redistribution of wealth***: If nominal interest rates don't grow with the rate of inflation, lenders receive a lower real interest rate than expected. The present discounted value of their capital decreases. In contrast, borrowers benefit from higher inflation since they have to pay back less capital in real terms. Moreover, households which hold real assets are not affected by inflation whereas households which hold money or bonds suffer a loss.
(c) ***Distortion of relative prices***: In case of high inflation, inflation volatility increases, too. Market agents may no longer be able to separate changes in relative prices due to shortages or changes in production costs from changes due to inflation. As consequence, production and consumption may slow down because resources are spent on gathering information and because economic opportunities are missed.
(d) ***Trust in money as an institution***: Inflation punishes those who hold money since the real value of money declines. In the extreme case of hyperinflation, the value of money rapidly approaches zero as market agents lose trust in the national currency and use others monies (dollars, euros).

Inflation – in particular an unanticipated or surprise inflation – represent a financing option for countries with government debt and a weak tax collection system. Inflation works like a tax on all forms of wealth which are denominated in terms of the monetary unit. To the extent

that the inflation is unanticipated, it allows the government to reduce the real value of its debt. On the other hand the expectation of such an option leads financial markets to demand higher nominal rates of interest, reflecting the positive probability that inflation option will actually be used. This will increase financing costs. While the incidence of the inflation tax may fall on wealthier households, these are more likely to convert their wealth into forms immune to inflation (foreign assets, real estate, stocks). Furthermore, poorer members of society may suffer from inflation when transfer payments such as pensions and social security payments are not indexed.

Exercise 16.5

A coin is tossed 50 times. For each toss t, the outcome (tails or heads) is written down, which we call e(t), a random variable with value +1 if tails and -1 if heads. Figure A16. 1 below shows the outcome for a random sample of 50 coin tosses:

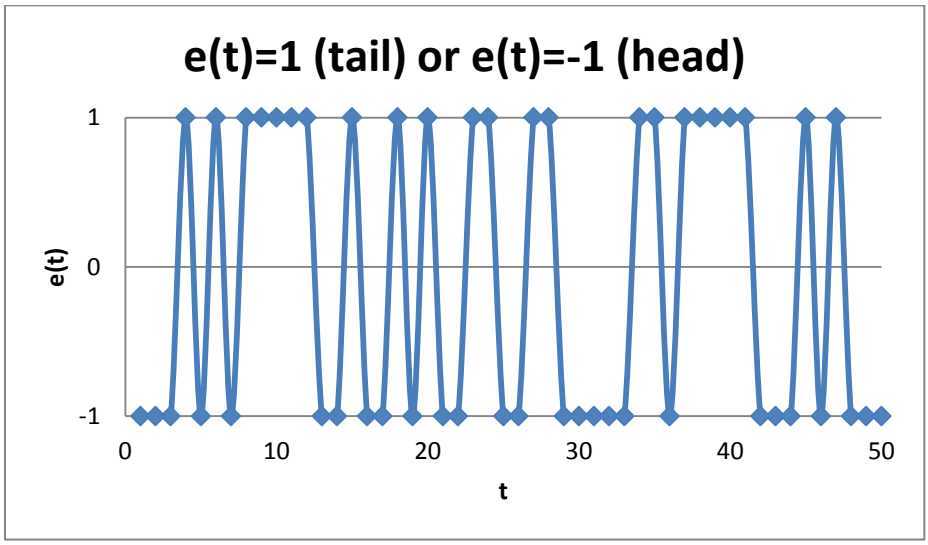


Figure A16. 1: time series of random variable e(t).

Let the random variable $Y(t) = 0.25\ e(t-1) + \ 0.75\ e(t) + \ 0.25\ e(t+1)$.
Figure A16. 2 below shows the outcome for Y(t), given the time series in Figure A16.1:

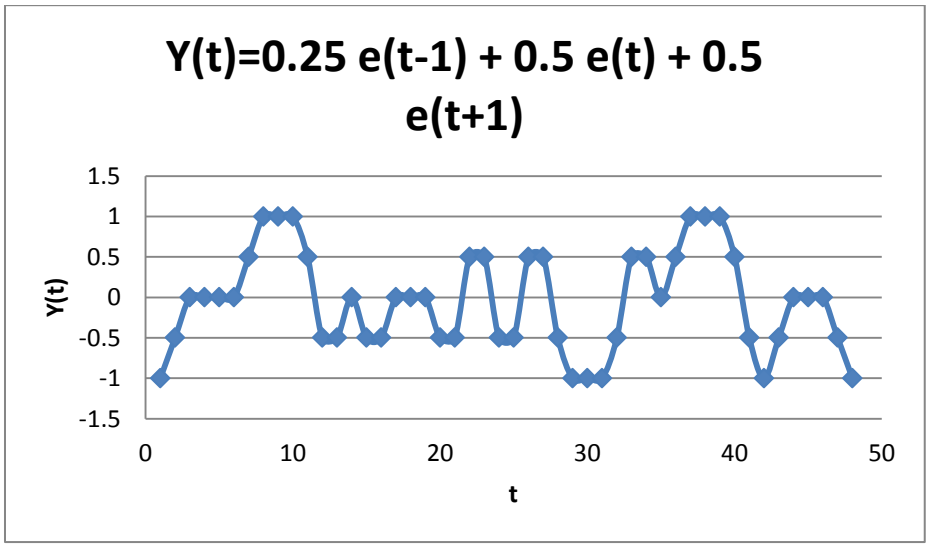


Figure A16.2: time series of random variable Y(t).

Both time series e(t) and Y(t) fluctuate around a zero mean and have the same range (-1 to +1). However, the time series of Y(t) appears more smooth. Moreover, the random variable Y(t) can assume 5 different outcomes (-1, -0.5, 0, 0.5, 1) whereas the random variable e(t) can only assume 2 outcomes (-1, 1).

If the random variable $X(t) = 0.75\ e(t) + \ 0.25\ e(t-1)$ is considered instead, its time series, given the values in Figure A16.1, looks like this:

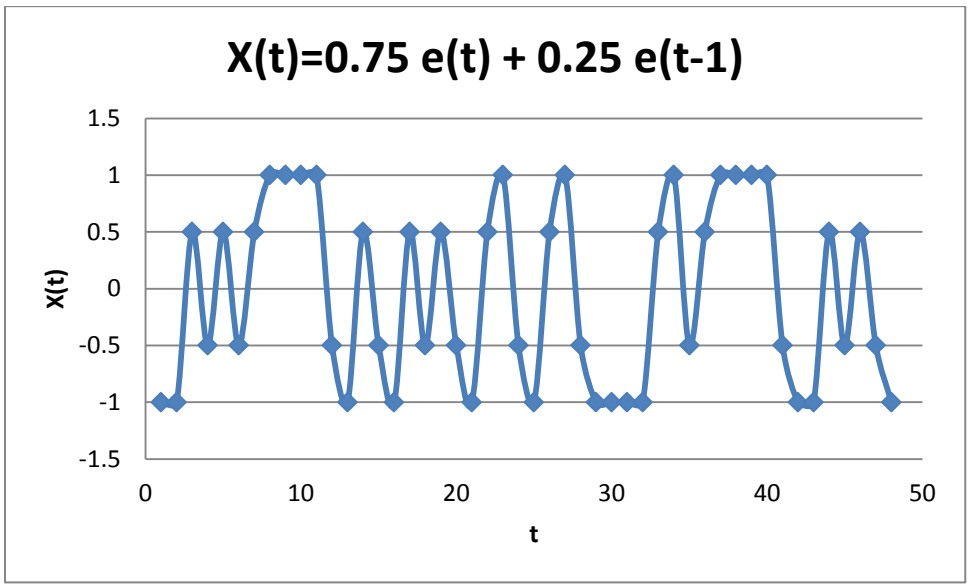


Figure A16.3: time series of random variable X(t)

The time series in Figure A16.3 is less smooth than the one in Figure A16.2, though more smooth than the one in Figure A16.1. Compared to Y(t), X(t) assumes only 4 outcomes (-1, -0.5, 0.5, 1).

The example illustrates that the more lags and leads of e(t) the new random variable takes into account, the more smoothed or filtered it tends to be and the smaller are the changes from one period to the next in absolute magnitude. See Figure A16.4:

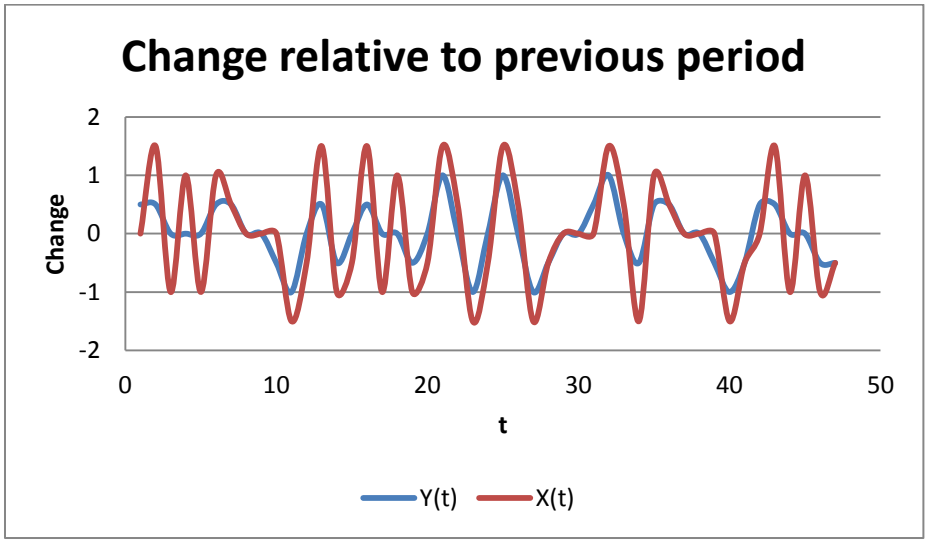


Figure A16.4: time series of $\Delta Y(t) = Y(t) - Y(t-1)$ and of $\Delta X(t) = X(t) - X(t-1)$

Exercise 16.6

Let e(t) be a standard normally distributed random variable with mean zero and variance equal to one. Figure A16.5 shows the outcome for t=1,…,50, just like the discrete random variable of Exercise 16.5, the standard normally distributed random variable fluctuates around a zero mean. However, while the discrete random variable of Exercise 16.5 could only assume 2 outcomes, a standard normally distributed random variable can assume any value on the real axis and hence has infinitely many different outcomes. Figure A16.5 shows that the standard normal random variable can assume much larger values in absolute size than the discrete random variable of Exercise 16.5, which is bounded by -1 and +1. However, the further away the values are from the mean zero, the less likely that they are to be observed.

At first sight, one might guess that the time series in Figure A16.5 exhibits less volatility than the time series in Figure A16.1. However, if volatility is measured by the standard deviation of a random variable, both random variables show the same volatility of 1.[5]

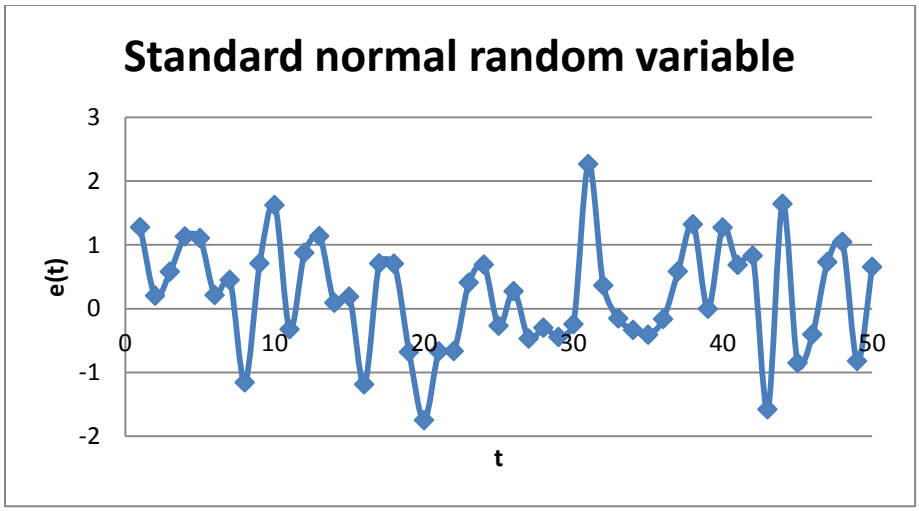


Figure A16.5: time series of standard normal random variable e(t)

Based on the realizations in Figure A16.1, $Y(t) = 0.25\, e(t-1) + \ 0.5\, e(t) + \ 0.25\, e(t+1)$ assumes the values plotted in Figure A16.6: despite the larger range, the time series evolves more smoothly and shows a greater tendency to form cycles than the one in Figure A16.3.

[5] The standard normally distributed variable has variance equal to one and hence standard deviation also equal to one. The discrete random variable of Exercise 16.5 assumes outcomes +1 and -1 with equal probability. Hence, its mean $E(e)$ is zero, its variance is $Var(e) = 0.5(1-0)^2 + 0.5(-1-0)^2 = 1$ and its standard deviation equals 1, too.

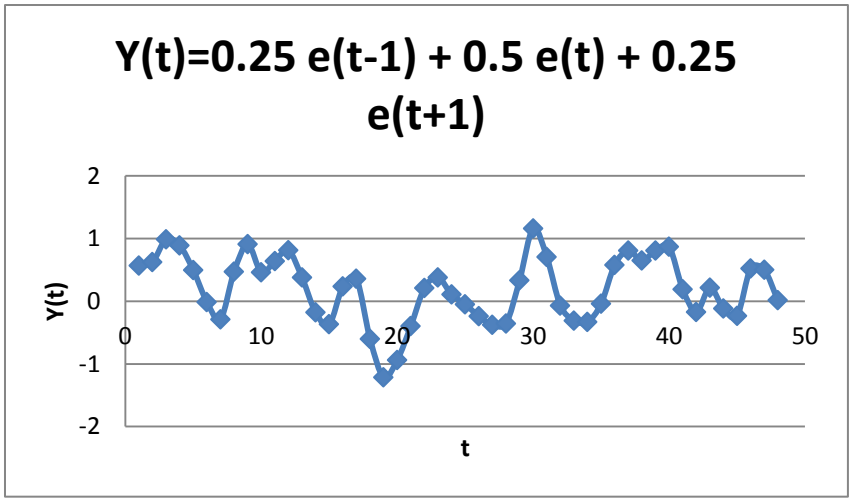


Figure A16.6: time series of random variable Y(t)

Based on the realizations in Figure A16.5, $X(t) = 0.75\ e(t) + \ 0.25\ e(t-1)$ is Figure A16.7: compared to Figure A16.6, the time series fluctuates more strongly in magnitude as well as in frequency.

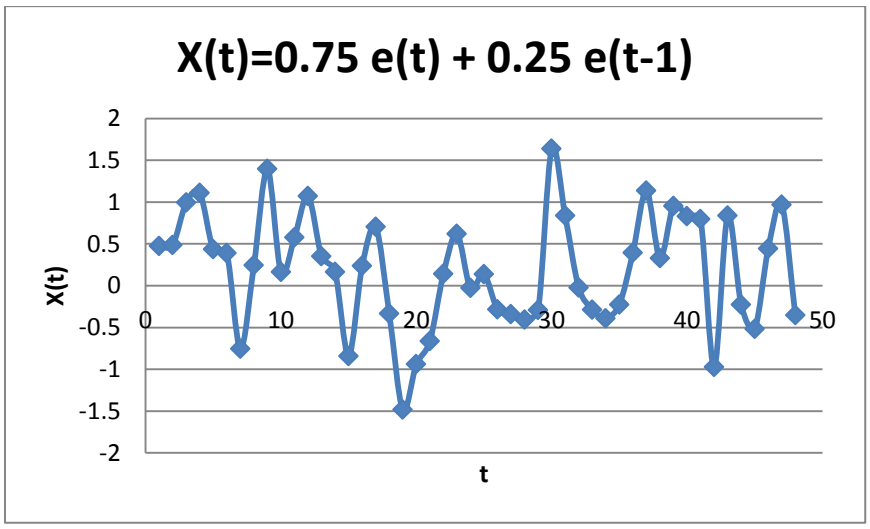


Figure A16.7: time series of random variable X(t)

Using a standard normally distributed random variable didn't alter the results of exercise 16.5.

Exercise 16.7

The Friedman critique rests on the assumption that the government does not have more information than the private sector. In addition, government policies are exposed to different lags, namely to a recognition lag, a decision lag, an implementation and an effectiveness lag. Due to these lags, there is no guarantee that actions will be implemented at the right time to smoothen the fluctuations of the business cycle. It is rather likely, that due to bad timing they will increase the magnitude of these fluctuations and increase uncertainty.

The essential element for the validity of the Friedman critique is the presence of lags, especially policy-related lags (recognition, decision and implementation). These could be reduced in the following way:

- recognition lag: use of forecasts and leading indicators.
- decision lag: use of automatic stabilizers.
- implementation and effectiveness lag: larger budget authority; have policy programs ready to present to parliament

Exercise 16.8
Indicators: see Box 16.6 in the textbook.

Leading	*Coincident*	*Lagging*
stock prices,	investment,	employment/unemployment
real money balances,	short-term interest rates,	inflation
primary current account,	capacity utilization	
real exchange rate, vacancies,		
inventory investment		

Assume a flexible exchange rate regime under which the central bank pursues a monetary expansion by increasing the target inflation rate. The TR curve shifts to the right as illustrated in Figure 14.13 in the textbook. As the economy faces a boom, the indicators react as follows:

- The nominal exchange rate depreciates because market agents expect a decrease in the nominal interest rate, see equation (15.10) in the textbook. The real exchange rate depreciates, too.
- External competitiveness increases and the primary current account improves.
- Rising demand shifts the AD curve to the left. The firms react to rising demand first with a depletion of their inventories.
- Due to rising demand, the demand for money grows, too, leading to an increase in real money supply.
- Once inventories are depleted, firms will also increase capacity utilization, output and investment. Inflation is rising.
- The positive output gap and inflation lead the central bank to raise the short-term interest rates.
- Higher inflation reduces demand (move on the AD curve). Moreover, underlying inflation catches up with actual inflation, moving the AS curve to the left. Output decreases even more while inflation increases.
- Firms may rather pay for overtime than employing new workers due to high costs (searching, training). They may also rather hoard workers in recessions than fire them if the latter goes hand in hand with financial and legal settlements. This is why employment and unemployment are lagging indicators. Firms want to make sure that they don't just experience a short-run peak or fall in demand before they hire or fire.

Exercise 16.9

The difference between the long-term and short-term interest rate is one of the most important features of the yield curve, the plot of interest rates (yields on government bonds) as a function of maturity as in Figure 7.2. For instance, the yield spread can be measured as difference between the yields on a 10-year and a 3-months treasury bill. Long-term yields are usually higher than short-term yields since the investor or lender demands a premium for patience and risk (inflation, default, uncertainty), which increases with maturity. Hence, the yield spread is usually positive.

If the economy is moving towards a recession, investors may foresee that the central bank will lower short-term interest rates in the future. This expectation translates into lower long-term interest rates and the yield spread diminishes; it may even become negative or "invert." Once in the recession, the central bank will cut the policy rate, which affects short-term interest rates in the first instance. As the economy recovers, expectations of higher future growth, higher inflation and the demand for money and credit due to increased investment translate into higher expected future, and therefore higher long-term interest rates. The yield spread rises and keeps rising through the boom. Once the central bank reacts to inflation and raises the short-term interest rates, the yield spread will start to diminish again. The Burns-Mitchell diagram looks like this:

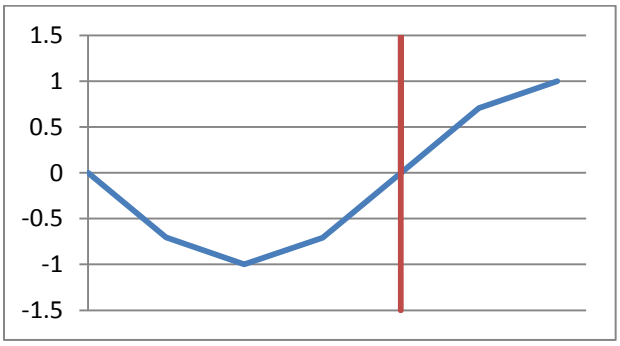


Figure A16.8: slope of the yield curve (yield spread)

The slope of the yield curve (the yield spread) can be a good predictor of the business cycle because short-run and long-run interest rates change differently over the cycle, leading to a change in the yield spread. As can be seen in Figure A16.8, the yield curve starts to rise before the economy peaks because investors expect short-term interest rates to rise and this is reflected in the long-term interest rates. Since inflation rises more slowly than output when the economy expands, the lead of the yield curve will occur earlier, the more weight the central bank gives to the output gap in the Taylor rule relative to the inflation gap.

Under fixed exchange rates, the domestic interest rates depend on the foreign interest rates and an autonomous monetary policy is no longer feasible. In this case, the yield spread probably less useful as a predictor of the domestic business cycle - it is also influenced strongly by the economic development abroad. Yet if there is expectation of an exit from the exchange rate peg, or simply a one-time devaluation, the expectations of that event can enter through the back door.

Exercise 16.10
The non-standard monetary policies implemented after the crisis in 2008 include the following:

Bringing promptly the policy interest rate to nearly zero and, in some cases such as the Eurozone, Japan or Switzerland, below zero. In front of deep slowdown and a very weak recovery, central banks were trying to revive bank credit. Very low interest rates were intended to encourage the demand for loans by the private – even the public sector – and to make it more profitable for banks to lend than to hold on to reserves at the central bank.

Announcing that there very low interest rates would remain at these levels for long, until growth had resumed and inflation would rise towards the target, usually around 2%. The idea is that 'low for long' very short-term policy rates would translate into very low longer-term rates, in effect flattening the yield curve following as explained in Box 7.1. The objective was to encourage private borrowing (e.g. firms' borrowing to finance investment spending), which depends on longer-term interest rates, not the very short-term policy rate.

Increasing massively the bank reserves through open market purchases by the central banks of various assets, primarily government bonds of increasing longer maturity. Here again, the intention was to flatten the yield curve.

There is mounting evidence that the central banks were successful in flattening the yield curve. The effects on private borrowing have been slow to come and somewhat smaller than hoped for.

Essay Questions

Essay Question 16.1
Increased demand through an aggregate demand policy pushes the AD curve to the right in the short-run. GDP and inflation increase. However, once underlying inflation catches up with actual inflation, the AS curve will shift to the left, reducing or even erasing the positive output effect while further increasing inflation. How quickly the positive output effect dies out depends on the speed with which underlying inflation adapts to actual inflation.

The assertion is true to the extent that the difference between underlying and actual inflation arose solely from incorrect expectations ("misperception") of the private sector. However, this need not be the case. Indeed, the private sector can have rational expectations and still underlying inflation may differ from actual inflation due to price stickiness. Hence, the assertion is not always and everywhere true.

Essay Question 16.2
The answer is no. Its ineffectiveness is already given by definition: the equilibrium unemployment is the level of unemployed worker when output is at trend output and hence

the output gap is zero. Milton Friedman wrote in 1968 that the natural (equilibrium) rate of unemployment is

> ...is the level [of unemployment] that would be ground out by the Walrasian system of general equilibrium equations, provided there is embedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the costs of gathering information about job vacancies and labor availabilities, the costs of mobility, and so on."

Equilibrium unemployment is determined by potential output which in turn depends on the supply side of the economy. Hence, it cannot be affected by demand management policies.

Essay Question 16.3

Milton Friedman proposed a negative rate of inflation, a deflation. He argued that as the marginal cost of producing money is equal to zero, its price should be zero as well, i.e. the nominal interest rate. This proposal has not been adopted in reality for the following reasons: First, a steady deflation means that consumption will be always postponed until tomorrow as goods will be cheaper. The economy may suffer from chronically insufficient demand. Second, inflation can be seen as a tax on holding money. This sort of taxation is useful and efficient in countries where corrupt administration forestalls tax receipts. Third, there is no good reason to exempt money from taxation if other goods are taxed as well (see Chapter 18 for a development of this argument along the lines of lost consumer and producer surplus).

Essay Question 16.4

Austerity measures shift the IS-curve to the left. Under flexible exchange rates, a lower interest rate induces an immediate exchange rate depreciation shifts the IS curve back.

In the AS-AD model, the austerity measures shift the AD curve to the left. Inflation and output fall. Due to the exchange rate depreciation, the AD curve moves back. The reduction in inflation and income is only temporary.

Under fixed exchange rates, there is no monetary policy, nor is there any depreciation; output falls by the full extent of the shift of the IS curve.
In the AS-AD model, the austerity measures shift the AD curve to the left, leading to a negative output gap and lower inflation. This shift is larger than it would be under flexible exchange rates and so is the reduction in GDP and inflation.
Once underlying inflation adapts to actual inflation, the AS curve will shift to the right, reducing the output gap but decreasing inflation even more. Due to the real exchange rate depreciation, external competitiveness will rise, shifting the IS and AD curve eventually back to their initial positions. The AS curve shifts back once underlying inflation catches up with rising actual inflation. There may be looping patterns around the long-run level of output and inflation.

The reaction of the underlying inflation depends on the predominance of either the forward-looking or backward-looking component. A strong forward-looking component will allow a quick movement of the AS curve and therefore a less painful recession. If in contrast the backward-looking component dominates, the recession will be more persistent. Which of these two cases actually occurs will depend on the reputation of the austerity measures and those who oppose them. The Greek debt crisis has raised uncertainty and made it difficult to

formulate a proper forward-looking component of underlying inflation. These events include the overall debate about Greek staying or leaving the Euro-zone, the upheaval of the Greek population against the austerity measures, and the inability of Greek political parties to form a government.

Essay Question 16.5

The rationale for negative interest rates is given in Exercise 16.10. Now, negative interest rates mean that you pay people to borrow from you, surely a very counter-intuitive situation. If applied to bank accounts, it means that depositors would actually pay banks for accepting to hold their deposits. At this point, depositors may wonder why they hold their money in the form of deposits rather than just cash that pays a zero interest rate, which is better than a negative interest rate. Central banks were concerned that this could lead to massive withdrawals from banks, which would have destabilized the banking system, possibly even destroying banks under the fractional reserve system. They figured out that it is costly to hold cash because people would have had to buy safes, or buy insurance, or both. Thus, if the interest rate is not too negative, it is not really interesting to withdraw money from bank deposits and hold it in the form of cash. The deepest interest cuts experimented in the wake of the crisis were of -0.75%. This turned out to work quite well as withdrawals from bank deposits remained small, at most. In the event, few banks imposed negative rates on their customers since they feared that the deposits would be moved to other banks that would not have imposed negative rates. The banks chose to keep their customers and take losses. Yet, a negative rate of -5% would have this approach unsustainable and could have triggered massive withdrawals with unknown consequences.

Chapter 17

Exercise 17.1

Technically, the public debt consists of all liabilities of the government to the central bank, commercial banks and the private sector. These liabilities usually arise from credits given by banks and the issuance of bonds to the banking and nonbank public.

Bank notes and coins represent money in cash and not part of gross public debt. Both are part of the monetary base M0. Bank notes and coins should not be classified as part of public debt for the following reasons:

- Banknotes are generally a liability of the central bank and not of the Treasury. Treasury and central bank are formally, and in most countries in practice, separate entities. Banknotes don't bear interest, so it would be incorrect to treat them as debt. If the government had the right to issue banknotes to finance its spending, this would certainly become its preferred financing tool, as no interest has to be paid. This approach has been tried before (in the US for example, before the Fed was founded in 1913).
- Coins are generally obligation of the government (Treasury). To prevent governments from abusing coin issue, there are usually limitations on the amount of coinage the government can produce each year. The demand for coins is quite modest and limited by the maximal denomination.
- Both banknotes and currency are created by virtue of the monopoly power the government has over money production (at least high-powered money).

Exercise 17.2

To determine the year's budget surplus or deficit we need to calculate GDP and the corresponding tax income (0.25 x GDP) for the three different GDP growth rates (see table below). Deducting the tax income from spending yields the budget deficit given in the last row. For given spending, the budget deficit worsens, the lower the GDP growth rate is.

	GDP Growth rate		
	0%	3%	-3%
GDP	100	103	97
Tax Income	25	25.75	24.25
Spending	30	30	30
Surplus(+)/Deficit (-)	-5	-4.25	-5.75

Exercise 17.3

In order to calculate the primary budget surplus as a ratio to GDP, we use equation 17.4, see Box 17.3 in the textbook: $(T - G)/Y = (r - g)B/Y$.

Given r = 0.02, g=0.02 and B/Y = 1, we obtain: $(T - G)/Y = (0.02 - 0.02) \cdot 1 = 0$. Hence, the primary budget surplus must be zero to keep the debt-GDP ratio constant.

Given r = 0.06, g=0.02 and B/Y = 1, we obtain: $(T - G)/Y = (0.06 - 0.02) \cdot 1 = 0.04$. In this case, the primary budget surplus must equal 4% of GDP to keep the debt-GDP ratio constant.

Please note a mix-up in the write-up of exercises 17.4 and 17.5. The correct questions are indicated below.

Exercise 17.4
Question:

Suppose the debt–GDP ratio is 150%, growth is 3% per annum, and the real interest rate is 5%.

(*a*) What is the primary government budget surplus (as a percentage of GDP) that can stabilize the debt–GDP ratio?

(*b*) How does your answer change if interest rates rises to 4%? If growth falls to 2%?

Answer:

Again, equation 17.4 is used. Given a debt-GDP ratio of 150%, the primary budget surplus needed to keep the ratio constant is given in the table below for 2 different real interest rates and 2 different growth rates:

		r (in %)	
		5	4
g (in %)	3	3	1,5
	2	4,5	3

The values in the table show, that the same primary budget surplus of 3% of GDP is needed for a 5% interest rate and a 3% growth rate as well as for a 4% interest rate and a 2% growth rate. This result is due to the fact that the difference (r-g) is the decisive factor in equation 17.4, and this difference is equal to 2% in both cases.

Exercise 17.5
Question:

The demand for (real) central bank money, the source of seigniorage, declines with the rate of inflation. Suppose, as an example, that this demand (in billions of euros) is given as follows:

Inflation	0%	1%	2%	5%	10%	20%	25%	50%
M0/*P*	1,000	905	819	607	368	135	82	7

Seigniorage is a tax applied to this demand, whose rate is just the rate of inflation. Compute seigniorage as a function of the inflation rate. (Hint: an inflation rate of 5% corresponds to a tax rate equal to 0.05.) Which inflation rate maximizes seigniorage?

Answer:

At first we should make clear what is meant by maximizing seigniorage. We know that seigniorage is the use of the government's monopoly on the creation of money to acquire real

resources, in particular, the increase of the monetary base (high-powered money). At the same time inflation is degrading the value of the monetary base. Since high powered money bears no interest, inflation is a tax on money balances. In the long run, an increase in the money base will be matched by inflation. Inflation redistributes from the holders of money to the issuer, the government. So the inflation caused by seigniorage is a form of income for the government. This income can be calculated. Inflation can be seen as a tax rate. This rate is applied to the demand for money. Though, the government cannot choose freely the amount of money it wants to tax with a special rate as the demand for money depends on the rate of inflation. Therefore a trade-off is involved. In Figure A17.1 below, the demand for real money (in billions of euros) is plotted against inflation, using the data given in the exercise and interpolating. It can be seen, that the demand for real money declines if inflation rises.

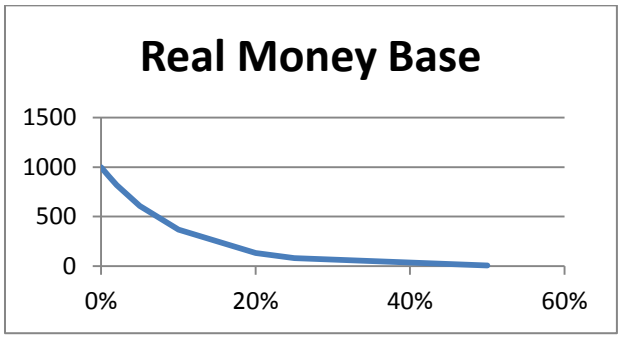


Figure A17.1: demand for real money against inflation

Computing seigniorage as inflation rate times demand for real money yields:

π	0	0.01	0.02	0.05	0.1	0.2	0.25	0.5
M_0/P	1,000	905	819	607	368	135	82	7
Seign.	0	9.05	16.38	30.35	36.8	27	20.5	3.5

Segniorage as a function of the inflation rate is plotted in Figure A17.2.

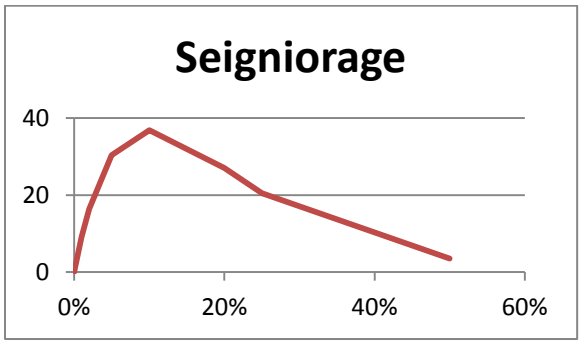


Figure A17.5.2: seigniorage as a function of inflation

The table suggests that an inflation rate of 10% maximizes seigniorage (36.8 billion euros).

Exercise 17.6

In Figure 17.5 in the textbook, the change in the cyclically adjusted budget balance (CABB) is plotted against the change in the actual budget balance (BB). Since the change can be positive or negative for both variables, there are theoretically 4 quadrants, namely:

- Quadrant I: CABB > 0, BB > 0 (not relevant for Fig 17.5!):
  If a country falls into the first quadrant, its actual budget improved. Since the CABB is positive, this budget improvement would have been obtained even if the output gap had been zero. Hence, the country pursued a contractionary fiscal policy. The output gap can be positive or negative.
- Quadrant II: CABB < 0, BB > 0 (also not relevant for Fig 17.5!):
  If a country falls into the second quadrant, it experienced a budget improvement but would have experienced a budget deterioration if GDP had been on its trend path. In this case, a positive output gap improved the budget despite an expansionary fiscal policy.
- Quadrant III: CABB < 0, BB < 0:
  If a country falls into the third quadrant, it experienced a budget deterioration which would have prevailed in case of a zero output gap. Hence, the country pursued an expansionary fiscal policy. The output gap can be positive or negative.
- Quadrant IV: CABB > 0, BB < 0:
  If a country falls into the fourth quadrant, it experienced a budget deterioration which would have turned into a budget amelioration, had GDP been on its trend path. In this case, the country pursued a contractionary fiscal policy and faced a negative output gap.

Exercise 17.7

The budget balance is the sum of the primary budget balance (G-T) plus debt service (rB):
(17.7.1) $\Delta B = G - T + rB = PC + TR - T + rB$.
Government spending consists of public consumption (PC) and transfers (TR), of which only transfers are cyclical in this exercise. Taxes are cyclical, too, since they depend on GDP, whereas debt service is not cyclical. Inserting for TR and T yields:
(17.7.2) $\Delta B = PC + \ 13{,}000 - 0.5Y - 2{,}000 - 0.3Y + rB = PC + 11{,}000 + rB - 0.8\,Y$.

The structurally adjusted budget balance is computed just as the actual budget balance but uses potential instead of actual GDP in equation (17.7.2) to eliminate the cyclical influence. To compute actual budget balance, 0.8 Y =16,000 is subtracted in equation (17.7.2). To compute the structurally adjusted budget balance, 0.8 Y^{Pot}=16480 need to be subtracted instead. Hence, the structurally adjusted budget balance exceeds the actual budget balance of -300by -480 and amounts to -780. In other words: the budget surplus would have been larger (due to higher taxes and reduced transfers), if GDP had been on its trend path.

Exercise 17.8

Given data: $\frac{B}{Y} = 60\% = 0.6,\ r = 3\% = 0.03,\ g = 2\% = 0.02.$

(i) Primary budget required to stabilize the debt level: according to equation (17.2) in the textbook, the primary budget surplus must simply be equal to the interest payment. Dividing by Y on both sides of equation (17.2) yields: $\frac{T-G}{Y} = r\frac{B}{Y} = 0.03 \cdot 0.6 = 0.018 = 1.8\%$.
To keep the debt level constant, a primary budget surplus equal to 1.8% of GDP is needed .

(ii)Primary budget required to keep the debt-GDP level constant: see equation (17.4) in the textbook: $\Delta\left(\frac{B}{Y}\right) = 0 \quad if \quad \frac{T-G}{Y} = \frac{(r-g)B}{Y} = (0.03 - 0.02) \cdot 0.6 = 0.006 = 0.6\%$.
to keep the debt-GDP ratio constant, a much smaller primary budget surplus equal to 0.6% of GDP is needed due to GDP growth.

Exercise 17.9
Equation 17.2 tells us how large the budget surplus must be in order to keep the total amount of debt constant. Not surprisingly it is equal to the interest payments. If we have more money than the interest payments we can simply start paying back the debt itself. The same logic applies to the surplus from equation 17.4. If the surplus is bigger than the right-hand side of the equation we have not only money to keep the debt-to-GDP ratio constant but are on top able to reduce it.

Essay Questions

Essay Question 17.1

Education

Education is a well-known example of a so-called public good. It is generally supplied publicly i.e. by the government. The justification is that education generates a positive externality on society overall. Not only the educated person herself but society as a whole capitalizes from the education of each of its members.

A good education is expensive. People are willing to pay for their education as long as the (expected) benefits exceed the costs. Since external benefits don't enter this private calculus, the private investment in education will remain suboptimal. The government internalizes this externality by providing education mostly for free and by rendering school education compulsory.

Public Transportation

Buses, underground transport and commuter railways systems are often publicly provided due to high fixed costs for e.g. tracks and the fleet which is needed to offer adequate service. Yet the marginal costs of providing a seat to an additional passenger – after the bus has been purchased –are low if not equal to zero. Natural monopolies result as the high fixed costs allow only one supplier to survive through mark-up pricing. Usually, the government takes the position of the monopolist to prevent a private business from taking that market position.

Public transportation can be privately provided if the share of the fixed costs is reduced. One such possibility is that the government still provides the tracks but that several companies can buy the right to use (part of) the tracks to offer transportation services.

Water, Electricity, Gas

The arguments brought forward for public transportation also apply to water, electricity, and gas because a large network of pipes or cables is necessary to transport these items from the plants to the households. Like the railway system, this pipe or cable network is a huge investment which represents high fixed costs for implementation and maintenance.

Deregulation agency has led to different private suppliers of e.g. gas or electricity as compared to a few decades ago. Often these pay a fee for the use of the network owned by the public sector and controlled by a network agency. Private provision is feasible.

Moreover, waterworks have been privatized in some German cities with the municipal administrations holding shares of the company. However, in light of high water prices, doubt has risen whether a private monopoly outperforms public management. Moreover, since energy and water are very important goods, public management is often demanded for reasons of national independence and security.

Services for people with low or no income

Housing is generally privately organized. Yet people with insufficient or irregular income may not be able to rent an apartment because the landlord does not want to take the risk that the tenant defaults on the rent. The government steps in and offers subsidies to tenants with income below a certain threshold or engages in housing projects to ensure cheap rents.

Another example is health insurance, which can be privately or publicly organized. Since a private insurance company will demand a price which rises with increasing risk, people with high risk may not be able to buy private insurance. Moreover, people with low income may not be able to afford it either. However, since health insurance raises the level of health in the economy, the government assigns people who don't or can't buy a private insurance to a statutory health insurance.

Essay Question 17.2
"The national debt is a great scam, because it will never be repaid."

Chapter 7 has shown that in the long run, a country has to obey its intertemporal budget restriction and pay back its debt. However, since World War II the public debt has been rising among most OECD countries and many taxpayers may not feel that the debt will be repaid in their lifetime. Nevertheless, if the stock of debt is stable as a fraction of GDP, each individual bond or debt coming due can be repaid with interest without raising the national tax burden. Growth in the tax base (GDP) is sufficient to finance interest and principal repayment due.

A rising stock of debt implies rising debt service, which has to be paid for out of GDP. Such a situation is explosive, unless the debt-GDP ratio can be stabilized. This requires a ratio of the primary budget deficit to GDP which fulfils equation (17.4) in the textbook: $\frac{T-G}{Y} = \frac{(r-g)B}{Y}$.

With inflation and seigniorage, a smaller primary surplus will be necessary to stabilize the debt-GDP ratio; see equation (17.7) in the textbook.

As long as a country can maintain a constant debt-GDP ratio and has a reputation which makes default unlikely, there is no need to repay the debt. Under these assumptions, the second part of the assertion is true. However, weak GDP growth or high real interest rates may turn the picture around and force the government to start repaying debt to lower the debt service. In this case, the second part of the assertion does not hold.

In the worst case, a country may partly default on its debt, in which case the statement that the debt will never be repaid is true. The first part of the assertion implies that people are cheated of their money. This is only true if the country defaults on its debt. Otherwise, each individual holder of government debt gets the nominal value of the bill at the end of maturity.

Thus we conclude that the national debt need never be repaid, as long as the economy is growing. Stabilizing the debt-GDP ratio is a standard measure of sustainability which implies that the government in effect pays some of the interest due from the growth dividend in the form of higher tax revenues.

Essay Question 17.2
"The national debt is irrelevant because we owe it to ourselves."

If the metaphor of the representative family were to hold exactly, the statement might be true: the Ricardian equivalence proposition of Chapter 7 is one expression of this notion. This presupposes that all government debt is held inside the country and that parents are altruistic with respect to their children, treating their welfare as their own.

This assertion is incorrect to the extent that (i) foreign investors hold treasury debt so that the country is indebted abroad and (ii) the debt cannot be irrelevant since the service has to be paid out of current GDP. A higher service takes away resources from the private sector and may affect growth negatively, especially if financed by distortionary taxation.

Essay Question 17.3
See Box 17.4 in the textbook:
The Stability and Growth Pact demands that the annual consolidated budget deficit does not exceed 3% of GDP. In case of a recession where tax revenues are falling, the budget deficit rises automatically while GDP is decreasing. To ensure that the budget deficit remains under the threshold, the government may have to cut spending in recessions, thus acting pro-cyclically rather than counter-cyclically.

Proponents of the Stability and Growth Pact argue that it is important to force countries to obey their intertemporal budget constraint since otherwise other members of the monetary union will have to pay the price. However, they are aware of the problem that the pact disables the automatic stabilizers in a recession in its present form. Therefore, they propose to alter the pact such that all countries have to have structurally adjusted surpluses. Since the

structurally adjusted surplus is based on potential GDP, not on actual GDP, a structurally adjusted surplus allows for an actual budget deficit in a recession which increases with increasing negative output gap. The structurally adjusted budget surplus would hence give each country a larger flexibility to handle a recession while at the same time forcing them to obey their intertemporal budget constraint.

Essay Question 17.4

The following is extracted from the IMF economic outlook database. All values are given in percent of GDP, beside the first line which states the growth rate of the country.

	2006	2007	2008	2009	2010
Gross domestic product, constant prices	5.312	5.182	-2.972	-6.995	-0.430
General government revenue	36.296	36.259	34.962	33.748	34.325
General government total expenditure	33.406	36.194	42.301	47.937	65.637
General government net lending/borrowing	2.889	0.065	-7.340	-14.189	-31.312

The first line is crucial for understanding events in Ireland. While in 2006 and 2007 Ireland experienced high growth rates of over 5%, in 2008 it went into recession which worsened in 2009 with negative growth of 7%. The government increased spending significantly. The spending-to-GDP ratio doubled from 2006 to 2010! As the government revenue declined by 2% percent, the new money was mostly borrowed. Ireland changed its position from being a net lender to a net borrower!

Essay Question 17.5

Both views are rather extreme and lack some rationale as they leave out ideas concerning the long and short run.

The first assertion is useful to stabilize debt in the long run, although such policy can worsen downturns in the short run. To understand why, imagine an economy in a recession. Under the assumption of a negative demand shock we know that fiscal policy can do well. However, the government decides to cut spending to compensate for decreasing tax revenues. This pro-cyclical behaviour will push the economy further down, making it harder to sustain the surplus in the following periods.

Even if fiscal policy can stimulate output in the short run, it has no effects in the long run and hence does not change the growth rate of GDP. However, this is what is needed to stabilize the debt-GDP ratio, see equation (17.4) in the textbook.

Chapter 18

Exercise 18.1

Supply-side policies increase the overall efficiency and potential output of an economy. It is thus possible for output to increase without leading to higher inflation (the negative side-effect of an active demand policy).

The implementation is difficult for two reasons. One the one hand, supply-side policies need time to show results. As a consequence, politicians will not necessarily receive credit for their efforts. On the other hand, supply-side policies reduce the power of interest groups which profit from existing inefficiencies. Although the overall gain from these measures outweighs the loss of the interest groups, the latter are usually well-organized and will lobby against the policy measures.

Exercise 18.2

Under perfect competition, the equilibrium price is the one at which the marginal benefit from buying the good equals the marginal costs of producing it. Taxes distort this condition because they drive a wedge between the price that the buyer has to pay and the price that the seller will receive. Due to this wedge, the tax distorts the market away from its equilibrium price and quantity outcome, as illustrated in Figure 18.4 in the textbook: too little of the good is produced and consumed, resulting in a loss of consumer and producer surplus is lost (the so-called dead weight loss, see the triangle DEC in Figure 18.4 in the book). Applying this result to the capital market, it can be argued that a tax cut enlarges the quantity of capital available to the economy, thus leading to more production and consumption in the long run.

Capital is mostly held by households who have incomes large enough to save from it. It is also heritable. Cutting taxes on capital or capital income may be perceived as inconsistent with the principle of "from each according to his means, to each according to his needs." Especially in Europe, where the political consensus is less averse to redistribution than in the USA and the idea of social solidarity more strongly rooted, a tax cut on capital which enlarges income and wealth inequality may be politically difficult to defend.

Exercise 18.3

According to the Ramsey principle, goods with the most inelastic demand and/or supply should be taxed most heavily. Applying this principle to jewellery and petrol, the latter should be taxed more heavily, because petrol is a necessity for a lot of people who have to travel to work by car and cannot switch to public transportation. It is also a necessity for firms which cannot deliver their products by train or ship or plane. Therefore, the demand is very inelastic. In contrast, diamonds are a luxury good which is not bought for personal pleasure rather than out of necessity. Therefore the demand for jewellery has a much higher price elasticity.

A higher tax on labour income has a substitution effect (leisure becomes cheaper) and an income effect (income decreases and thus consumption and leisure). Whether a higher tax yields higher tax revenues depends on whether the income effect outweighs the substitution effect. This is likely for the short run where labour supply is quite inelastic but need not hold in the long run. In contrast to labour, capital is more mobile. A higher tax on capital may therefore lead to an outflow of capital.

Exercise 18.4

The most important idea of the Laffer curve is that an increase in tax rates need not lead to higher tax revenues, but may actually reduce them. Conversely, once an economy has surpassed the tax rate at which the Laffer curve reaches its maximum (see point D in Figure 18.5 in the textbook), lowering the tax rate could increase total tax income for the government. If labour income is taxed too heavily, it can reduce incentives of agents to work longer because the net income gain is too small. One way to increase the income gain is to work in the underground economy and avoid taxation.

Another example is the value added tax which drives a wedge between consumer price and producer cost. In the underground economy, a company can offer its goods or services without value added tax. Any price between the consumer price with value added tax included and the producer cost is a bargain for both sides.

Activities in the underground economy are risky since they are generally illegal. Whether the underground economy flourishes or not depends on the possible gains relative to the risks. The higher the average tax rate, the larger the gains from underground activity.

The "unemployment trap" denotes a situation in which an unemployed person receives transfer income which is reduced one-to one for every additional unit of income. If that person works in the legal economy, any additional work which yields after-tax income less than the marginal reduction in transfer is not attractive (see Figure 18.8 in the textbook).[6] However, an underground economy offers the possibility to earn extra income without losing transfer income. It is hence profitable to stay unemployed – the person gets "trapped" in unemployment.

Exercise 18.5

The "Dutch disease" denotes a situation where a country discovers new (natural) resources which are highly demanded on the world market. Due to the high foreign demand, the country's exchange rate appreciates. Goods of other exporting industries become more expensive and exports drop, leading to a decline in output and a rise in unemployment.

Britain tried to balance the drop in foreign demand by increasing government spending. Moreover, transfer payments rose due to the rise in unemployment. This active demand policy may have short-run effects but will worsen the situation in the long run since it tends to raise the equilibrium rate of unemployment and did nothing to improve the cost situation for employers.

Norway foresaw that the non-oil exporting industries would lose external competitiveness due to the expected exchange rate appreciation which would raise export prices. It therefore helped these industries through export subsidies to lower their export prices and remain competitive. This policy proved beneficial because it avoided unemployment due to shrinking industries. Second, since the subsidy was only paid if the good was exported, it did not distort national prices.

[6] Even an income which exceeds T slightly might not be attractive if the person has a high preference for leisure as in Figure 18.8 in the textbook.

Exercise 18.6
Those who benefit from the existing regulations are the ones who have already a job. The number of employed people (insiders) is much larger than the number of unemployed people (outsiders). Furthermore, employed people are better organized than unemployed people and can lobby through unions and worker's councils, rendering it difficult to reform rules on overtime work in a democratic system based on majority voting.

Usually, the company pays workers a higher hourly wage for overtime hours as incentive to work longer. Although the additional working time causes higher costs than the regular working time, this solution can still be more profitable for the company as long as it is still cheaper than hiring a new worker.

An effective reform measure can (a) decrease the incentives for workers to work overtime, e.g. through a higher tax on overtime income, or (b) close the gap in costs between overtime hours and hiring a new worker:
- by increasing the costs for the company, e.g. through a charge on overtime;
- by decreasing the costs to hire a new worker, e.g. through subsidies;
- by promoting temporary work agencies.
(c) render labour markets more efficient through deregulation.

Recently in Germany there has been a great deal of decentralized substitution of "working time accounts" for overtime pay – workers get overtime credit for paid vacation within a time frame (six months, usually) so firms end up paying less overtime, but need to be more flexible in allowing workers to choose their (paid) off time. It is estimated that more than half of all workers in Germany have access to working time accounts.

Exercise 18.7
Households obtain utility from consumption as well as from leisure. But since one has to earn money to be able to consume, there is a trade-off between consumption and leisure reflected in the budget constraint (see e.g. Figure 18.8 in the textbook). If, however, they receive transfers from the government when unemployed, the trade-off is abolished (line EA in Figure 18.8). If the income obtained by working is much higher than the transfers received when unemployed, there is no incentive to become or remain unemployed. If the difference between the two is marginal, the utility from remaining unemployed may be larger than the one from working and the person stays in the "unemployment trap". See also Exercise 18.4.

Exercise 18.8
Labour demand curve and output: firms hire additional employees until the marginal productivity of labour is equal to the real wage. Since the labour demand curve is equal to the marginal product of labour, the area under the demand curve is equal to output. In the first diagram, output is represented by the grey area in the figure below.

Now we consider a leftward shift of the labour supply curve form S to S', see Figure A18.1 below. The market clearing equilibrium has changed and fewer workers are employed. Output is lower as indicated by the smaller grey area. The forgone output is depicted by the black area.

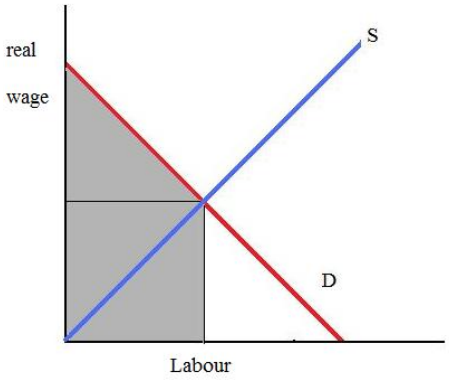


Figure A18.1: before shift

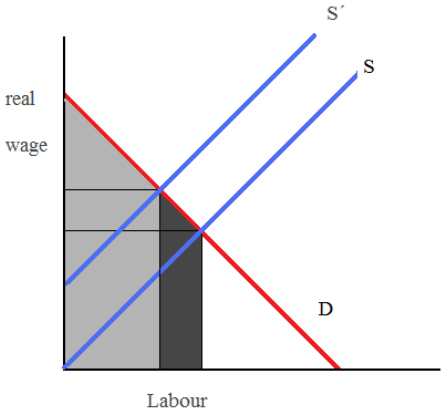


Figure A18.2: leftward shift

Exercise 18.9

Passive labour market policies respond to unemployment with transfer income and housing but do not change unemployment. In contrast, active labour market policies try to reduce unemployment by setting incentives to work and to hire workers and by offering training for unemployed people

Exercise 18.10

A policy that reduces equilibrium output in the long run works like a negative supply shock and shifts both the LAS and the AS curve to the left, see Figure A18.3 below. The reduction in output leads to excess demand and a pressure on inflation, since $\pi = \tilde{\pi} + (Y - \bar{Y}) + s$. In the new short-run equilibrium at point B, inflation has risen.

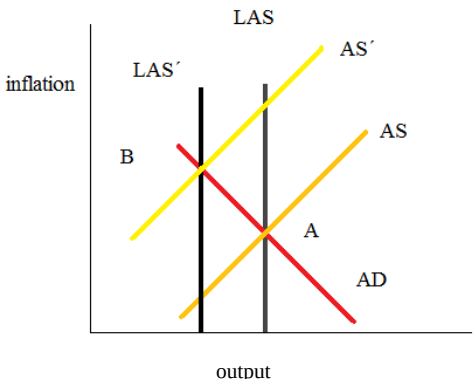


Figure A18.3: leftward shift of LAS curve

Under flexible exchange rates, a permanent rise in inflation requires that target inflation rises such that the LAD curve intersects with the LAS curve at point B. A higher target inflation rate would lower nominal interest rates and stimulate demand. The AD curve would shift to the right, leading to higher output and inflation. Once underlying inflation adapts, the AS curve will shift left and the output gap will be reduced. Depending on whether underlying inflation is rather backward- or forward-looking, actual inflation will either overshoot or adapt very fast to the higher target rate. In the long run, actual inflation has moved to the new level of the target inflation rate; see Figure 13.13 in the textbook.

If the central bank does not raise the inflation target rate, the exchange rate will appreciate due

to higher inflation, shifting the AD curve to AD' in Figure A18.4. Output and inflation decrease (point D).

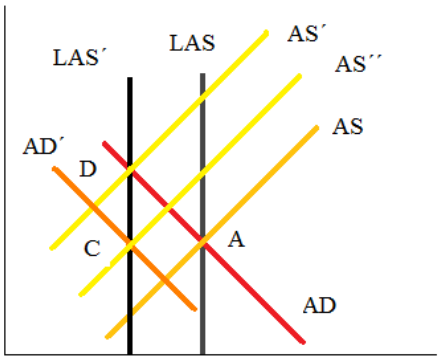


Figure A18.4: without central bank reaction

Since the target inflation rate remains unchanged, underlying inflation will adapt to actual inflation and the AS curve will shift to the right (from AS' to AS''). A new long-run equilibrium is found at point C, where inflation equals target inflation but output has permanently declined.

Under fixed exchange rates, a permanent rise in inflation requires that foreign inflation rises. This is beyond the influence of the domestic country. Hence, in the long run output will be lower while inflation returns to the level of foreign inflation.

Essay Questions

Essay Question 18.1

A reduction in the personal income tax or in the social security contributions of employees raises net hourly wages and hence makes working more attractive. The labour supply curve shifts to the right as workers are willing to work more at every level of the gross hourly wage. This allows firms to pay a lower gross hourly wage and increase output and employment, see panel (b) of Figure 5.8 in the textbook.

A cut in social security contributions of employers lowers the additional costs per worker. This enables firms to raise the gross hourly wage without raising total costs. The labour demand curve shifts to the right, see panel (a) of Figure 5.8 in the textbook. Output rises while the real wage rises too.

In both cases, the cut in income tax raises output in the short run. Whether the positive output effect prevails in the long run depends on the slope of the labour demand curve. If the labour demand curve is vertical, hence totally inelastic, the output effect will be zero.

The above-mentioned arguments support the assertion that a cut in income taxes would have supply-side effects. However, the assertion states furthermore, that these effects would be significant in Europe. This raises the question whether income taxes in Europe are much higher than in other countries?

Table 18.4 shows a great range in the personal income tax in the Euro area from as low as 2% (Greece) up to 22% (Belgium). This range can also be seen in the social security contributions which range from 17% (Ireland) to 40% (France). Thereby, countries with low personal income tax do not automatically have a low social security contribution. In fact, the total tax wedge ranges from 29% to 55% in the Euro area and from 21% to 46% in the other EU countries. In comparison, the total tax wedge of other OECD countries ranges from 17% to 37% and reveals a lower level of income taxes in general. The empirical evidence supports the assertion that income taxes in Europe are higher than in other OECD countries.

Essay Question 18.2
Supply-side policies often consist of deregulation which stimulates competition in markets formerly protected by barriers to market entry. Consider the well-publicized example of taxi drivers in Greece, who had to buy an expensive license to start their own business. Moreover, the number of licenses was kept low. Often, a new taxi business could open only if someone in the market would sell his license, for instance because of retirement. If markets like this one are opened, agents who were formerly protected from competition will suffer a loss in income. Hence they will lobby against deregulation.

In general, countries with economic and political structures that suffer from excessive lobbying and inefficient organization will need more time and effort to change the current system. They face a larger bulk of reforms but won't have the consent of those interest groups which lose economic and political power through the reforms. If these interest groups are large and/or politically powerful, it may be hard to find a political majority. Moreover, the longer structures have existed, the harder it is to change them, as people may feel that they are common law. Last not least, corruption is a threat to supply-side reforms as parts of the economy may be able to withdraw from the need to change.

Essay Question 18.3
People cling to employment protection because they don't want to lose their job. A decrease in such protection is considered to bring along insecurity and unemployment. Hence it is important to stress the following points:

(1) Lower employment protection does not mean that only oneself faces a higher probability of being laid-off but everybody else does as well. Moreover, the larger flexibility of the labour market increases the chances of finding a new job and shortens the transition time. So, the higher risk of losing the current job is offset by the higher probability to find a new job.

(2) Lower employment protection can make a worker better off. Due to the higher dynamic it is easier to find jobs that provide a higher wage or are a better match.

(3) Lower employment protection motivates the companies to give workers a chance who belong to a higher risk group, e.g. entrants or workers 50+.

(4) Furthermore, lower employment protection decreases costs for firms. If lower costs translate into lower prices, the worker is not only better off as a worker but in his position as a consumer as well.

Essay Question 18.4
On the one hand, reducing tax distortions on returns economic rents (the deadweight loss) to households and firms. On the other hand, households and firms also benefit from public services.

Public services are provided because of (a) externalities and (b) malfunctioning markets.

In case (b), markets can provide the service in principle but may need regulation or privatization to correct their malfunctioning. To let the market instead of the public sector provide these services under structures which prevent malfunctioning may increase welfare. The liberalization of the market for electricity has generally led to more market entry, more competition and lower prices for consumers.

In case (a), public services should not be cut because markets don't offer them in large enough quantity (in the case of a positive externality).

Essay Question 18.5
Imagine an equilibrium situation in the goods market. Consumers who are willing to pay more than the equilibrium price benefit from the lower price in form of a consumer rent. Similarly, firms with marginal cost lower than the equilibrium price achieve a producer rent.

An objectionable economic rent is the rent of a monopolist. Due to the fact that he is the sole supplier of a good, he possesses market power and can charge a price above the marginal costs. This kind of price-setting behaviour maximizes producer rent at the expense of consumer rent and leads to an insufficient supply of the good.

In case of a natural monopoly, price regulations can help to lower the price. In case the monopoly exists due to market entry barriers, deregulation can help increase competition.

Chapter 19

Exercise 19.1

Beggar-thy-neighbour policies are measures which improve the position of a country at the expense of other countries. Here, a devaluation of the domestic currency improves external competitiveness (the Mundell-Fleming assumption of price rigidity prevents purchasing power parity from obtaining in the short run) while worsening the competitiveness of trading partners. Take for instance an expansionary monetary policy: the central bank raises the target inflation rate leading to lower nominal interest rates via the Taylor rule. Capital flows out and leads to an exchange rate depreciation which stimulates domestic GDP. However, this scenario assumes that foreign countries don't react to their loss in competitiveness vis-á-vis the devaluating country. (In the IS-TR-IFM schedule, the TR curve shifts to the right and the IS curve follows until in the new equilibrium all three curves intersect again. This corresponds to a move from point A to point B in Figure 11.8, panel (b), in the textbook.) If other countries also follow an expansionary monetary policy to avoid a loss in competitiveness and a reduction in GDP, the effects of the devaluations with respect to external competitiveness will cancel each other. (Ultimately, an expansionary monetary policy in the rest of the world will lower the foreign interest rate and shift the IMF curve down in Figure 11.8, panel (b). The IS curve will move back until it runs through the intersection of the TR' curve with the shifted IMF curve (not drawn)).

Tariffs are also a means to boost domestic production but instead of increasing domestic exports, they aim at decreasing imports by rendering them more expensive. This shall help promote domestic industries which produce substitutes of the import goods and profit from the rise in price competitiveness. A tariff war starts when foreign countries react to an import tariff by also imposing tariffs on import goods. As a result, imports will shrink and international trade will decline. Since one country's imports are the other country's export, a country may experience a decline in imports as intended but at the expense of a decline of exports, too. The effect on a country's GDP is hence ambiguous. The consumer loses welfare because the supply of the imported good will decline and its price will most likely rise. The key difference to a competitive devaluation is that the latter will eventually disappear when prices react in the country which has devalued and is following the looser monetary policy. In the case of tariffs, relative differentials between import prices and prices of import-competing domestic goods will not be eroded over time leading to long-lasting economic distortions.

Exercise 19.2

After World War II, the Hume paradox concerned the imbalance between the gold assets of the Federal Reserve and its continuously growing liabilities toward other central banks and foreigners that hold ever increasing amounts of US dollar – the so-called dollar balances – to carry out international transactions as these transactions keep growing. Key to this argument is that the US authorities have established a dollar price for gold, which they were committed to maintain fixed. To enforce this fixed exchange rate, the US authorities must have been ready to pay for any amount to dollar that came their way with gold. Once the amount of dollar balances held abroad exceeded the value of their gold stock, the US commitment was not credible anymore and the arrangement was doomed. Nowadays, the US dollar remains the

dominant international currency for trade and finance, so it remains the case that foreign dollar balances are growing and are expected to keep growing over the foreseeable future. BUT the US dollar is freely floating *vis à vis* foreign currencies and gold. Therefore, there is absolutely no commitment from the US authorities to support any gold value of the dollar. Foreigners who hold dollar balances know that and still wish to hold dollars. In that sense, the system is stable. Of course, it may happen some day that dollar-holders will become suspicious of the value of the dollar and sell their balances, possibly prompting a dollar crisis. But this is true of any currency held abroad and has nothing to do with the Triffin mechanism.

Exercise 19.3

In late the 2016, the SDR was redefined to include the Chinese renmimbi in addition to the US dollar, the euro, Sterling pound and the Japanese yen. The SDR is a basket of four, now five, currencies mainly used by the IMF to keep its accounts. Sometimes, loans to IMF countries are specified in SDRs, but these are merely loans in the five constituent currencies that can be converted on demand into any other convertible currency. It is hard to think what is the practical effect of including the renmimbi into the SDR, except of course for its symbolic value, which is what the Chinese authorities were seeking. The SDR itself was created to officially weed the IMF from 'doing everything' in dollars. This was already symbolic and has had no effect on the dominating role of the US dollar.

Exercise 19.4

According to the Hume mechanism, a country with a trade surplus faces a capital inflow and hence experiences an expanding money supply. In contrast, a country with a trade deficit faces a capital outflow and thus experiences a shrinking money supply. The resulting changes in money supplies will ultimately lead to adjustments in the price levels of the respective countries and correct the trade imbalances. Surplus countries will experience higher inflation and loss of competitiveness, while deficit countries experience deflation and improvement of competitiveness.

David Hume described the mechanism at the time of the gold standard where all currencies were fully convertible into gold at any time at a fixed rate. It was also at a time when private capital flows were negligible or dwarfed by trade flows. The European Monetary Union resembles the gold standard with the euro taking the place of gold and conversion already undertaken. Hence, the Hume mechanism should apply in principle. However, due to the global increase in financial transactions and the growth and deregulation of capital markets, the capital and financial accounts in the balance of payments have become more important. A trade deficit need not automatically be balanced by a surplus of capital and financial accounts, if e.g. the government has borrowed money. It is hence feasible that the balance of payments shows a deficit. This deficit has to be financed by the other members of the monetary union.

In effect, the ECB (the "foreign" monetary authority) is the financier of the balance of payments imbalances. Technically, the national central banks – which still exist despite their loss of effective power – book the imbalances as credit or debit items on their balance sheets. This is the source of so-called Target 2 balances, which have stimulated much debate in Europe recently. As long as the European Monetary Union remains intact, these bookkeeping entries between member national central banks only represent the sum of past imbalances in

balance of payments – reflecting the current state of resource transfer between regions of the monetary union.

Exercise 19.5
"Currency crises cannot be foreseen"

Currency crises can occur because:
(a) domestic policy is incompatible with a fixed exchange rate (e.g. money supply grows faster than money demand) and ultimately leads to a depreciation. As long as the central bank has enough reserves, it can try to keep up the exchange rate but must give in once because reserves can be depleted. This kind of crisis is called first-generation crisis and can usually be foreseen because it stretches over some time and goes hand-in-hand with open market operations of the central bank to stabilize the exchange rate.
(b) an underlying vulnerability (high unemployment, a speculative bubble close to bursting, not sufficient credibility, not enough reserves) makes it likely that the central bank will not or simply cannot fight a speculative attack. Once under attack, depreciation expectations increase as investors pull out their money and worsen the crisis (self-fulfilling crisis). Since domestic policy is compatible with the exchange rate peg, this crisis cannot be foreseen, all the more as it starts suddenly with a loss in confidence.

"Markets attack as soon as they expect a crisis"

In the financial market, gains are highest as long as the information is brand new. Action is based on expectations, and hence the attack will not wait until the crisis has become manifest (and known to or expected by a large majority of the funds in play).

Exercise 19.6
In the EMS, all exchange rates between the member countries are fixed while on the other hand, the exchange rates to all foreign currencies are flexible. In this case, the n-1 problem predicts that apart from one central bank, all other central banks lose their independence. The particular independent central bank will be able to conduct autonomous monetary policy while the others will have to follow. In contrast, in the Euro area a new central bank was created such that all national central banks had to give up their independence. This solution has the advantage that no country has a predominant position…

If all countries world-wide agreed on fixed exchange rates, there was again one degree of freedom left for one country or a supranational central bank to conduct an autonomous monetary policy. The Bretton-Woods system is an example of such an international monetary system (with the restriction that it did not include all countries world-wide). The experience with the Bretton-Woods system shows that the stability of the system hinges on the monetary policy of the autonomous central bank. Similarly, the EMS left one degree of freedom open, which was effectively seized by the German Bundesbank, probably because it had the strongest reputation and the tightest monetary policy and was usually on the buying side in foreign exchange interventions.

Exercise 19.7
Just as in the case of non-fundamental foreign exchange crises, the banking sector is by its

very nature vulnerable to self-fulfilling crises. Because of maturity mismatch (Chapter 14) banks depend on the trust of their customers that the money on their accounts is safe. It is well-known that banks work with depositors' funds by lending it to households and firms or investing it into other assets. If there are rumours that a bank is in trouble or even simply illiquid, customers may withdraw their money. However, this worsens the bank's liquidity. As the news is confirmed, more and more people will try to withdraw their money and may even start a bank-run. As a consequence, the bank will either have to declare that money withdrawal is not feasible in the short run or even declare bankruptcy. As long as enough depositors believe that a lender of last resort will provide liquidity or a bail-out in the case of insolvency, the probability of a bank run will be low.

In the European sovereign debt crisis, these problems reinforced each other: bank customers, depositors and investors became nervous about their funds because sovereign debt was on the books of their balance sheets, and lenders to sovereign governments became nervous as national banks ran into trouble and asked national governments for bailouts, which had to be funded by borrowing at ever-increasing interest rates.

Exercise 19.8

Developing countries often face the situation that households, firms and the government have to borrow abroad because the domestic supply of capital is too small. If the debt is held in foreign currency, a depreciation of their own currency with respect to the foreign currency enlarges their debt and may put them into a situation where they can no longer service the debt. Even if the exchange rate is not overvalued, investors may withdraw their money if they hear rumours of depreciation or if other countries with similar features experience a currency crisis.

Exercise 19.9

This is an apparent paradox. Eurozone countries can and do borrow in euros, which is their own currency. Yet, it has been argued by Paul de Grauwe (see references below) that they do not own their central bank, the ECB. It follows that a government that cannot borrow on the financial markets – because its debt is deemed to be too large – does not benefit systematically from ECB support as is customary for other countries. This is precisely what happened to Greece, Ireland, Portugal, Spain and Cyprus. As a result, these countries find themselves unable to borrow in euros (and other currencies) and they need some form of emergency assistance.

References:
http://voxeu.org/article/design-failures-eurozone
https://www.ceps.eu/publications/governance-fragile-eurozone

Exercise 19.10

In a currency board arrangement, the central bank has declared a fixed parity for its currency *vis à vis* some other currency, or basket of currencies. Furthermore, it commits to only create additional M0 is it receives more foreign currency, and then one to one (given the exchange rate). In a monetary union, a country has given up its currency and additional currency is created only when the common central bank decides to do so, and then each member country

receives a predetermined share of the newly added currency. The only common point is the loss of control over the exchange rate.

Essay Questions

Essay Question 19.1

Special drawing rights (SDRs) allow a country to take an IMF credit up to a certain limit which is positively correlated with the country's quota. Countries with larger quotas can take larger credits than those with smaller deposits because it is more likely that they can pay back the credit.

Poor countries usually have smaller quotas than richer countries. They would like to have more SDRs and hence a larger line of credit. However, it is doubtful that a larger credit line will lead to larger investment and hence accumulation of physical capital needed in order to grow. This could be achieved through foreign investment. If foreign investors haven't invested in the poor country to date, there may be good reasons why. Following this line or reasoning, it is rather likely that a larger credit will be used for government spending with positive short-run effects on output but an increase in inflation in the long run.

Essay Question 19.2

The Bretton Woods system was characterized by a dominant role of the US dollar. As all currencies were pegged to the dollar, the only currency pegged directly to gold, the United States was the only country which could conduct an independent monetary policy. However this was not consistent with a fixed parity of $35 per ounce of gold; according to the impossible trilogy, an independent monetary policy is impossible in light of full capital mobility and fixed exchange rates. The USA was able to respond to the growing demand of the partner countries for international reserves (its currency) by running chronic trade deficits with the other Bretton Woods countries. In effect, the US exploited its seignorage rights to run balance of trade deficits. As long as other countries were willing to accept US liabilities, this situation was sustainable; yet when US liabilities abroad exceeded its gold reserves, countries and speculators began to sell dollars; ultimately the US had to give up the gold-dollar-parity.

The demise could have been avoided if the USA had adjusted its gold parity in a timely fashion. Instead, it insisted on pegging its exchange rate to gold at an increasingly unrealistic fixed parity of $35/ounce for a quarter century.

Essay Question 19.3

A return to the gold standard continues to be discussed by some politicians, especially in the United States.[7] Whether it is really feasible depends on the will of a country to give up its privilege of an independent monetary policy and to submit the economy (and in particular its wages and prices) to the high volatility of gold supplies.[8] Under a true gold standard, the exchange rate of the dollar to gold is fixed, say at $500/ounce. In effect, the US government

[7] The US Republican party appears to have endorsed a return to the gold standard: http://www.cnbc.com/id/48770752/Republicans_Eye_Return_to_Gold_Standard

[8] http://www.econbrowser.com/archives/2012/09/return_to_the_g.html

or the Federal Reserve would be in the business of fixing the dollar price of gold in world markets, standing ready to buy or sell gold in unlimited amounts at that price. This would in turn endogenize US monetary policy.

Second, the US money supply would be subject to the vagaries of the world supply of gold, with undesirable monetary side effects. Suppose the gold supply were to increase by 10%. The Fed would be obligated to purchase whatever gold necessary to keep the price of gold at $500/ounce. In the case of a 10% increase in the world gold supply, the Fed would have to buy – ceteris paribus – the increase in gold supply to maintain the parity. This would imply a significant increase in the US money supply – the high powered money which forms the basis for the fractional banking system. Similarly, an increase in the demand for gold – caused by fluctuations in industrial or other commercial demands for gold or a boom in some other country on the same gold standard – would lead to an incipient rise in the dollar price of gold and open market sales of gold reserves by the Fed. This would lead to sharp contractions of the high-powered money supply and tight liquidity, raising interest rates in the US for no good reason. Countries with steady trade surpluses will experience a higher money growth and higher inflation in the long run which contradicts the frequently-used argument that the gold standard ensures price stability.

Last but not least, under free capital mobility a country with gold standard would be prone to speculative attacks since its operating range will crucially depend on its gold reserves. Naturally the Fed could move interest rates to pre-empt gold flows as it did in the classic gold standard, but it would not change the fact that US interest rates were moved for reasons which have nothing to do with the US real economy. US GDP and the business cycle are likely to be more volatile as a result.

Essay Question 19.4

Fixed exchange rates within the European Monetary Union stimulate trade and steady expectations whereas floating exchange rates vis-á-vis the rest of the world ensure that the European Monetary Union can still exert an independent monetary policy. According to the optimum currency area theory, the EMU is a good system if the participating countries show factor mobility and if asymmetric shocks are absent. While the first criterion is fulfilled, the second is not due to the fact that the countries are still politically independent (apart from monetary policy though). Different economic initial situations and divergent fiscal policies have led to different sensitivities with respect to shocks. For instance, the financial crisis has affected Greece or Portugal and Spain much worse than Germany or the Netherlands or France. The fixed exchange rate system has proven to be a disadvantage in light of asymmetric shocks as a generalized devaluation is only a blunt instrument for trying to regain external competitiveness for those countries who are badly hit by the crisis.

Essay Question 19.5

The results of the change, which is to be found under the following link:

http://www.imf.org/external/np/pp/eng/2008/022608.pdf

can be summarized in the following way: Western and more developed countries have lost some weight whereas the winners are emerging countries as China, India, and Turkey among

which China represents the biggest one. As the introduction of the reform states, the quotas and especially voting rights have been changed in order to represent better the economic state of the world. Therefore a growing importance of developing countries is not surprising.

