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National Research University

**Marina Malkina**

**Financial and monetary methods of economic regulation**

Tutorial

Recommended by the Methodical commission  
of the Institute of Economics and Entrepreneurship  
for international students studying in the M.Sc. Programme  
38.04.02 “Management” in English

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МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ  
ФЕДЕРАЦИИ

**Федеральное государственное автономное образовательное  
учреждение высшего образования  
«Национальный исследовательский Нижегородский  
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**Финансовые и денежно-кредитные методы регулирования  
экономики**

Учебно-методическое пособие

Рекомендовано методической комиссией Института экономики и  
предпринимательства ННГУ для иностранных студентов,  
обучающихся по направлению подготовки 38.04.02 «Менеджмент»  
(магистратура) на английском языке

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Рецензент: д.э.н., профессор Г.Г. Господарчук

В настоящем пособии изложены учебно-методические материалы по курсу «Финансовые и денежно-кредитные методы регулирования экономики» для иностранных студентов, обучающихся в ННГУ по направлению подготовки 38.04.02 «Менеджмент» (магистратура).

Пособие включает первые 5 базовых единиц курса, для каждой из которых приведены основные понятия, принципы и модели, первые две темы содержат также практические задания. Пособие завершает список рекомендуемой литературы.

Ответственный за выпуск:  
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Reviewer: doc.ec. sc., professor G.G. Gospodarshuk

In this tutorial, the educational materials on the course "Financial and monetary methods of economic regulation" for foreign students studying at the UNN in the direction of training 38.04.02 "Management" (master degree) are presented.

The tutorial includes first 5 basic units of the course, each of which contains the basic concepts, principles and models, the first two topics also contain practical tasks. The tutorial is supplemented with a list of recommended literature.

Responsible for the issue:  
IEE UNN methodical commission chief,  
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JEL: E5, E6

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## Topic 1. **Equilibrium in money market: models and alternative approaches**

Nature of money. Neo-classical and Keynesian approaches to understanding of the money market equilibrium. Baumol-Tobin model. Portfolio-based approaches to modeling of the money demand. Money supply and its structure. Money base and monetary aggregates. Coefficient of the economy monetization. Indicators of the money supply structure and their relationship with the real economy and financial sector of the economy. Process of the banking multiplication. Money, deposit, and credit multipliers. Basics in the crediting process.

Modern macroeconomics deals with three main money functions:

- ***Unit of account (measure of value)*** – money serves for measuring the market value of goods, services, and other transactions, and assessing their relative worth. Following G. Mankiw, “money provides the terms in which prices are quoted and debts are recorded”<sup>1</sup>.
- ***Medium of exchange*** – money is used as intermediary in the exchange of goods and services.
- ***Store of value*** – money serves as a means of accumulation of purchasing power and is an alternative absolutely liquid asset.

The types of money (historically): commodity, paper and electronic money; fiat and credit money.

### **Demand for money**

There are two main approaches to money demand: Neoclassical and Keynesian.

1. *Neoclassical approach.*

✓ Equation of exchange after I. Fisher:

$$M \times V = P \times Y_r,$$

where  $M$  – money supply,  $V$  – velocity of money, i.e. the number of sales transactions, served by one monetary unit for any period of time, usually one year,

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<sup>1</sup> Mankiw G. (2009). Macroeconomics. 7<sup>th</sup> ed. P. 80.

$P$  — the general level of commodity prices,  $Y_r$  — physical amount of produced goods and services, i.e. the real GDP. And  $Y_n = P \times Y_r$  — nominal GDP.

Hence there is determined *transactional demand for money*:

$$M_{Dt} = \frac{P \times Y_r}{V}.$$

✓ Cambridge equation of money demand after A. Marshall and A.C. Pigou:

$$M_D = k \times P \times Y_r,$$

where  $k$  — is proportion of nominal income which economic agents prefer to keep in liquid form.

Money demand in terms of real balances:  $M_{Dt}/P = \frac{Y_r}{V}$  and  $M_D/P = k \times Y_r$ .

2. *Keynesian approach*. Three motives and three types of money demand:

- ✓ *Transactions demand for money* — is demand for money as medium of exchange, it is in direct proportion to the nominal income;
- ✓ *Precautionary demand for money* is associated with the uncertainty of the future, the need to maintain safety stock of contingency payments. Precautionary demand is positively related to income;
- ✓ *Speculative demand (assets demand) for money* refers to the need for money as an alternative liquid asset, the form of income savings. Speculative demand is inversely related to the interest rate.

The total demand for money in the J.M. Keynes model takes the following form:

$$M_D = M_{Dt} + M_{Dsp} = L_t(Y) + L_{sp}(r),$$

where  $M_{Dt}$  — transactions and precautionary demand for money,  $M_{Dsp}$  — speculative demand for money,  $r$  — the market interest rate on bank deposits.

**Money market equilibrium and its change after money supply increase**

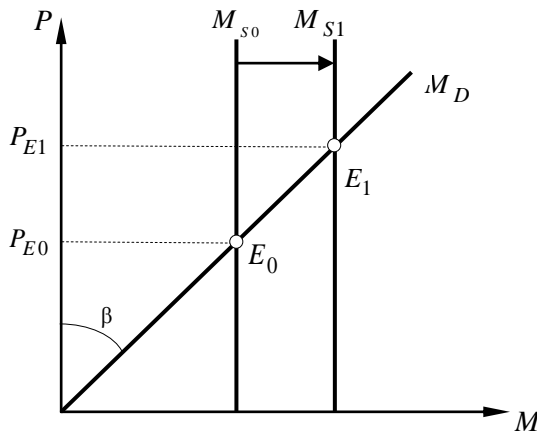


Figure 1.1. Money market equilibrium: Neoclassical approach

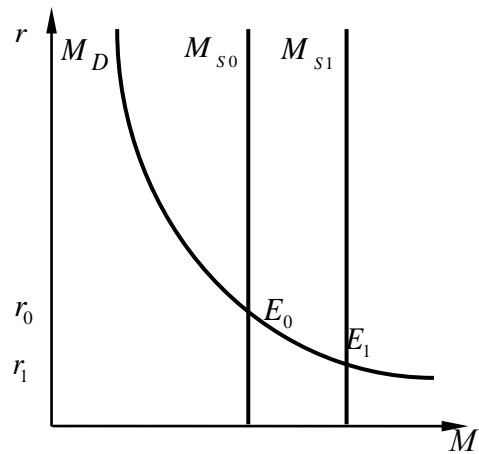


Figure 1.2. Money market equilibrium: Keynesian approach

In the Neoclassical approach (Fig. 1.1), the balance of supply and demand for money installs due to adjustment of the general price level. The growth of money supply pushes the price up, which increases the demand for money appropriately. Monetary policy doesn't affect production and therefore it isn't effective.

In the Keynesian approach (Fig. 1.2), money market equilibrium is achieved through adjustment of the real interest rate ( $r$ ). Increase in the money supply leads to a rate of interest decrease, which in turn causes the growth of investment. Thus, by controlling the money supply, the government can influence the total expenditures, the level of output and employment.

### ***Baumol-Tobin model of transactions money demand***

Baumol-Tobin model determines the optimal transactions demand for money, provided that the liquidity preference is inversely related to the interest rate ( $i$ ) and directly related to the cost of conversion bonds into cash, or withdrawing money from deposits ( $t_c$ ).

Suppose that  $Y_n$  – nominal income per month, and  $n$  – the number of cash withdrawals per month.

$$✓ \text{ Cash balances in average: } M = \frac{(Y_n/n) + 0}{2} = \frac{Y_n}{2 \times n} ;$$



- ✓ Interest forgone due to holding money in cash:  $\frac{Y_n \times i}{2 \times n}$ .
- ✓ Overall expenditures for withdrawals:  $t_c \times n$ .
- ✓ Optimization of total cost of money management:  $TC(n) = \frac{Y_n \times i}{2 \times n} + t_c \times n \rightarrow \min$ .

After taking the derivative of this function with respect to  $n$  and equating it to zero, we obtain the optimal number of withdrawals for a month:  $n^* = \sqrt{\frac{Y_n \times i}{2 \times t_c}}$ .

Check: the second derivative of the function is positive, that is sufficient condition for finding its minimum.

A substitution of this value into the equation for  $M$  allows us to determine the optimal value of transactions demand for money:  $M^* = \sqrt{\frac{Y_n \times t_c}{2 \times i}}$ .

Thus, the transactions demand for money in the Baumol-Tobin model is inversely related to the interest rate, like the assets demand for money.

### ***Modern portfolio-balanced approach for money demand***

This approach extends the Keynesian idea of money as an alternative financial asset and describes money demand function as a multifactorial dependence:

$$\frac{M}{P} = f(Y_r, W, r_m, r_b, r_s, \frac{1}{P} \times \frac{dP}{dt}, u),$$

where  $\frac{M}{P}$  – real money demand;  $Y_r$  – real income;  $W$  – share of the physical component in the national wealth;  $r_m$  – expected real rate of return for deposits (real interest rate);  $r_b$  – expected real rate of return for fixed-interest securities, bonds;  $r_s$  – expected real rate of return for stocks;  $\frac{1}{P} \times \frac{dP}{dt}$  – expected change in general price level (deflator);  $u$  – other factors of money demand. Money demand is positively related to the first two factors and negatively related to the next four factors.

Let us consider a simple portfolio including two assets: money and bonds. Suppose: expected real interest rate is equal to zero ( $r_m^e = 0$ ) and risk of holding cash is also equal to zero ( $\sigma_m^e = 0$ ). Introduce:  $r_b^e$  – expected real rate of return for bonds ( $r_b^e > 0$ );  $\sigma_b^e$  – risk of investing in bonds ( $\sigma_b^e > 0$ );  $\alpha$  – the share of wealth stored in the form of money;  $1-\alpha$  – the share of wealth stored in the form of bonds. Distribution of wealth ( $W$ ) between the two assets takes the form:  $W = \alpha \times W + (1-\alpha) \times W$ .

Expected real rate of return of the portfolio: ( $r_p^e$ ):  
 $r_p^e = \alpha \times r_m^e + (1-\alpha) \times r_b^e = (1-\alpha) \times r_b^e$ . Expected risk of the portfolio ( $\sigma_p^e$ ):  
 $\sigma_p^e = \alpha \times \sigma_m^e + (1-\alpha) \times \sigma_b^e = (1-\alpha) \times \sigma_b^e$ .

After substitutions we receive:  $r_p^e = \frac{r_b^e}{\sigma_b^e} \times \sigma_p^e$ . On the Figure 1.3, the line AB is drawn at a fixed risk and a fixed return of bonds. It represents the transformation of the risk of assets portfolio into its return.

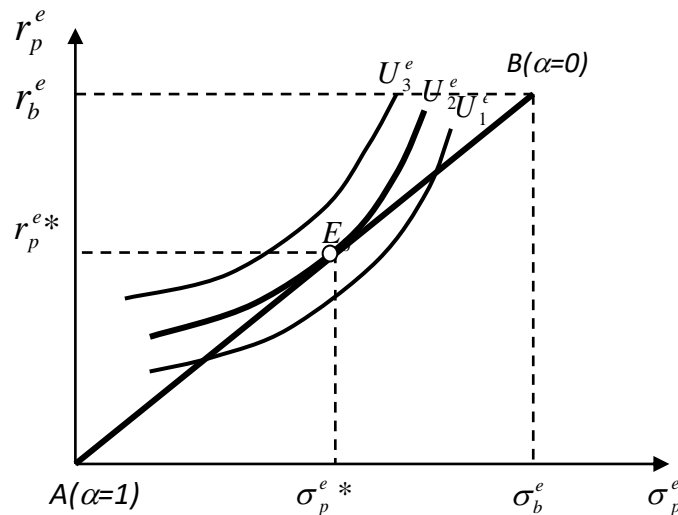


Figure 1.3. Forming the optimal assets portfolio

Expected utility of the portfolio can be represented as a function:  $U^e = U^e\left(r_p^e, \sigma_p^e\right)$ . It assumes that return brings positive utility, but risk has a negative utility, i.e. disutility. This function is described by a family of indifference curves. For risk-averse individuals, whom there are a majority, the indifference curves are

convex view, showing the growth of the marginal rate of substitution of return for risk.

In this model, the optimal portfolio is in the point of tangency of the best indifference curve and the transformation line:  $E_0(r_p^*, \sigma^*)$ . Appropriate distribution of wealth between money and bonds allows individual to maximize the total utility of his or her assets portfolio.

### **Money supply**

Broadly money supply consists of three elements: cash (banknotes and coins), deposits and quasi-money (highly liquid bills, certificates and other assets that can partially fulfill the functions of money). Monetary aggregates (M0, M1, M2, M3) include different components of the money supply. Each broader aggregate further comprises less liquid components of money.

Monetary aggregates calculated by Central Bank of Russia:

- M0 = cash in circulation;
- M1 = M0 + checks, demand deposits (including bank debit cards);
- M2 = M1 + time deposits;
- M3 = M2 + savings deposits, certificates and government bonds.

Money base (MB) includes total currency in circulation (vault cash) and all commercial bank's reserves (obligatory and voluntary) that are maintained in their accounts with the Central Bank. These reserves include: 1) required reserves; 2) correspondent accounts; 3) deposit accounts.

***The required reserves ratio*** – officially set by the central bank the share of commercial banks borrowed resources which they are required to deposit to the central bank.

***Correspondent account*** is an external account through which commercial bank handle different financial transactions for another financial institution (receive deposits from, make payments etc.). Bank or credit institution opens a

correspondent account in the regional division of the central bank (cash settlement centers) or in other credit organization.

**Deposit account** is a kind of time deposits that are opened for a commercial bank in the central bank to absorb excess liquidity.

The Money supply structure indicators:

1. *Coefficient of the economy monetization* – the ratio of broad money (the aggregate M2) to nominal GDP.
2. *The share of cash in broad money* (M0/M2 ratio).
3. *Money multiplier* – the ratio of money supply to money base (M2/MB).

*Money creation.* The alternative theories of creation money: 1) *chartalism* (G.F. Knapp) asserts that money have fiat nature and they are created by government to manage the economic activity and to levy taxes on it; 2) *credit theory of money* (Joseph Schumpeter) asserts that money are created by banks, which may issue both productive and inflationary loans.

According to modern *fractional reserve banking* practice, additional money is initially provided by the Central Bank. It issues new money in three ways: 1) lending money to financial institutions; 2) buying the short-term government bonds; 3) buying the foreign currency to replenish the official reserves. All these ways expand the monetary base as the basis of the money supply. Then credit organizations (primarily commercial banks) numerously extend this money base through lending to the economy via process of creating new deposits and loans. They are involved in so-called process of the banking multiplication with fractional reserve. In this process the *required reserves ratio* plays an important role.

During crises Central Bank may use nontraditional ways of providing new money to economy: so called *quantitative easing*. CB increases base money by buying unusual assets, namely long-term government bonds, corporate bonds and stocks, asset-backed securities, or even housing loans extended by commercial banks. Quantitative easing is usually used while liquidity trap, when the discount rate is almost zero and traditional monetary policy cannot further lower it to stimulate borrowing.

**Estimated bank multiplier** shows how much commercial banks can expand the monetary base in the process of banking multiplication. It is defined by the formula:  $m_b = \frac{\Delta M}{\Delta B} = \frac{1}{r_r}$ , where  $\Delta B$  — initial increase in the money base,  $\Delta M$  — ultimate money supply growth,  $r_r$  — the required reserves ratio.

The actual bank multiplier is less than the estimated multiplier because:

- besides obligatory reserve, banks create excessive reserves, which may be voluntary or constrained;

- part of the money is withdrawn in cash (for example, by paying wages).

Let's introduce:

$c_r = C/D$  — “the currency ratio”: proportion in which the public prefers to distribute money between cash  $C$  and deposits  $D$ ;

$r_r = R_o/D$  — “the required reserves ratio”: the ratio of obligatory reserves  $R_o$  to deposits  $D$ ;

$r_+ = R_e/D$  — “the excessive reserves ratio”;

$B = C + R_o + R_e$  — money base.

Table 1.1

**The actual bank multipliers**

	<b>Formula</b>	<b>The impact</b>
<b>Money multiplier</b>	$m_m = \frac{C+D}{B} = \frac{C+D}{C+R_o+R_e} = \frac{1+c_r}{c_r+r_r+r_+}$	Increase in money: $\Delta M = m_m \times \Delta B$
<b>Deposit multiplier</b>	$m_d = \frac{D}{B} = \frac{D}{C+R_o+R_e} = \frac{1}{c_r+r_r+r_+}$	Increase in deposits: $\Delta D = m_d \times \Delta B$
<b>Credit multiplier</b>	$m_c = \frac{D-(R_o+R_e)}{C+R_o+R_e} = \frac{1-(r_r+r_+)}{c_r+r_r+r_+}$ , $m_c = \frac{C+D-(R_o+R_e+C)}{C+R_o+R_e} = m_m - 1.$	Increase in loans (credit) to economy: $\Delta K = m_c \times \Delta B$

## Problems

**Problem 3.1.** In a certain country the real GDP grew by 5% for a year, and the money supply increased by 12% over the same period. The velocity of money has remained unchanged. How much have prices changed in average, in accordance with the equation of exchange by I. Fisher?

**Problem 3.2.** In a certain country in the current year the average money supply is 1530 money units; the velocity of money is 2.5; inflation measured by the GDP deflator amounted to 12.5% per year. On the basis of the equation of exchange by I. Fischer determine the real GDP in the current year in the prices of the previous year.

**Problem 3.3.** The money demand of economic agents for transactions is 40% of their income. Motivated the precautions they keep further 10% of their income in liquid form. Their demand for liquidity as value of store is inversely dependent on the real interest rate:  $L_{sp} = 10000 / (r + 2)^2$ , where “r” is measured in percentages.

Tasks: a) Derive the overall money demand function; b) determine the amount of money in circulation that allows to achieve national income  $Y = 1200$  and keep interest rate at 3% without a rise in general price level; c) determine new equilibrium interest rate in the short term, if national income rises to  $Y = 1360$  under the same money supply; g) calculate further change of the interest rate, if under the terms of p. "b" the central bank increases the money supply by 15%, and investment and national income has not yet had time to react to it.

**Problem 3.4.** The “currency ratio”, the required reserves ratio and the excessive reserves ratio in the banking system are:  $c_r = 0.2$   $r_r = 0.1$   $r_+ = 0.2$ . Task: a) Describe the process of banking multiplication, if the central bank will increase the monetary base by 100 units ( $\Delta B = 100$ ); b) calculate the values of money, deposit and credit multipliers; c) determine the change in the multipliers, the money supply, the volume of deposits and the volume of loans in economy, if the central bank increase the ratio of compulsory reserves to 20% of deposits.

**Problem 3.5.** The assets and the monetary base of the central bank are 360 money units, the deposits of economic agents in the banking system are 800 money units, the mandatory reserves is 6% of deposits, and banks prefer to keep excess 4% of liquidity for making settlements. The money demand for transactions and for unforeseen expenses is given by the formula:  $L_{tr+pr} = 150 + 0.384 \cdot Y$ . The demand for money in assets portfolio is inverse function of the average return of bonds:  $L_{sp} = 50 + 4000/(i + 4)$ . In the current financial market bonds yield:  $i = 6\%$ .

Tasks: a) calculate the total money supply; b) determine the level of income at which there will be observed a balance in the money market, and appropriate coefficient of monetization of the economy; c) assume the actual revenue is  $Y = 1400$  units. Amount by which the central bank should expand the monetary base to ensure equilibrium in the money market without changes in bond yields?

**Problem 3.6.** In a certain economy the banking reserves amounted to 20% of deposits, and the share of cash in the total money supply is 0.25. To finance the budget deficit, the government issued public bonds for total 200 billion money units. The central bank bought 1/5 of these bonds on the secondary financial market. Calculate the change of money supply in the economy as a result of the open-market operations by the central bank.

### *Answers to the problems*

*Problem 3.1:* Prices have risen by 6.7%.

*Problem 3.2:*  $Y_r = 3400$  units.

*Problem 3.3:* A)  $L = 0,5 \cdot Y + \frac{10000}{(r+2)^2}$ ; b)  $M_s = 1000$  units; c) interest rate rises up to  $r \approx 5.59\%$ ; r) interest rate falls to  $r \approx 2.26\%$ .

*Problem 3.4:* b)  $m_m = 2.4$ ;  $m_d = 2$  and  $m_c = 1.4$ ; c) after rise in the reserve requirements ratio, the money supply and the volume of deposits decreased by 16.7%, while the volume of loans by 28.6%.

*Problem 3.5:* a)  $M_s = 1080$  m.u.; b)  $Y = 1250$  units; monetization coefficient = 86.4%; c) the central bank should increase the monetary base by 19.2 m.u.

*Problem 3.6:*  $\Delta M_s = 100$  money units.

## Topic 2. IS-LM-BP Model: how monetary and fiscal policies affect macroeconomic equilibrium

Equilibrium in the goods market. Neo-Keynesian approach to derivation of the Investment-Saving curve. How fiscal policy shifts the IS curve. Impact of the fiscal and government spending multipliers on effectiveness of the fiscal policy. Haavelmo theorem. Neo-Keynesian approach to finding equilibrium in money market (LM curve). How monetary policy shifts the LM curve. Interpretation of the LM curve slope.

Co-equilibrium in the closed economy. Crowding-out effect. Monetary and fiscal policies in the short run and in the long run.

Equilibrium in the balance of payments (BP curve). General equilibrium in the open economy (Mundell-Fleming model). IS-LM-BP model: efficiency of the monetary and fiscal policies.

### Closed economy: IS-LM model

IS–LM model was developed in the 30s of XX century by J. Hicks, the representative of the Neo-Keynesian thought, to demonstrate the Keynesian equilibrium. In the 50s A. Hansen, using this model, revealed different impact of monetary and fiscal policy on the parameters of the macroeconomic equilibrium: namely, real GDP and real interest rate. The model demonstrates simultaneously achieved equilibrium in the goods market and the money market.

#### *IS curve*

The IS (investment–saving) curve demonstrates various combinations of real income ( $Y_r$ ) and real interest rate ( $r$ ) for which there exists the balance of real investment (I) and real savings (S). At the same time it means the balance of



aggregate demand (AD) and aggregate supply (AS), i.e. the equilibrium on goods market.

Simple IS curve is constructed for the two-sector economy in which the household sector (savers) and firms sector (investors) are interacting. In this model investment is inversely related to the interest rate ( $r$ ), and savings is directly related to income ( $Y_r$ ). Thus, all local equilibriums  $s\left(\overset{+}{Y}_r\right) = I(\bar{r})$  form an inverse relationship between income and interest rate.

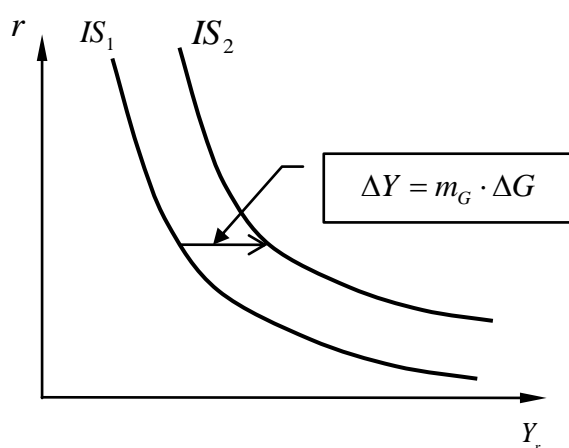


Figure 2.1. IS curve its shift after government purchases increase

More complex IS curve represents the interaction of three sectors of economy: households, firms and government. It is constructed for the balances:

$$s\left(\overset{+}{Y}_r\right) + T = I(\bar{r}) + G, \quad \text{where}$$

$T = T_a + t \times Y - TR$  – net taxes, which are total taxes minus transfers ( $TR$ ).

Transfers are returns to private sector from the state revenues in the forms of social security and financial aid (welfare) for citizens or subsidies for businesses. Total taxes include autonomous part ( $T_a$ ), that doesn't depend on income, and income-based part with  $t$  – the rate of income tax. And  $G$  – government purchases of goods and services for public needs.

IS curve shifts to the right when:

- ✓ government decreases autonomous taxes ( $T_a$ ) or income tax rate ( $t$ ). In the first case the curve shifts in parallel, in the second case it changes the slope;
- ✓ government increases purchases of goods and services ( $G$ );
- ✓ government increases transfers to households and firms ( $TR_a$ ).

Impact of these measures on the real demand is implemented via “multiplier effect” (table 2.1).

Table 2.1

**Multipliers in a closed economy**

Multiplier of...	Formula for calculation	Total expenditures influence
- autonomous expenditures	$m_a = \frac{1}{1 - MPC \times (1 - t)}$	$\Delta Y^D = m_a \times \Delta A_a$
- government purchases	$m_G = \frac{1}{1 - MPC \times (1 - t)}$	$\Delta Y^D = m_G \times \Delta G_a$
- transfers	$m_{TR} = \frac{MPC}{1 - MPC \times (1 - t)}$	$\Delta Y^D = m_{TR} \times \Delta TR_a$
- autonomous taxes	$m_T = \frac{-MPC}{1 - MPC \times (1 - t)}$	$\Delta Y^D = m_T \times \Delta T_a$
- balanced budget	$m_{BD} = \frac{1 - MPC}{1 - MPC \times (1 - t)}$ <p>(when extra government purchases are financed by additional autonomous tax)</p> $m_{BD} = \frac{1 - MPC}{1 - MPC} = 1$ <p>(when extra government purchases are financed by additional income tax)</p>	$\Delta Y^D = m_{BD} \times \Delta G_a$ <p>(on conditions that: <math>\Delta G_a = \Delta T_a</math>)</p>

*Note:*  $MPC$  – marginal propensity to consume as to disposable income;  $t$  – income tax rate;  $MPC \times (1 - t)$  – marginal propensity to consume as to gross income;

Multiplier in an open economy and where there is an induced investment takes the form:  $m_a = \frac{1}{1 - [MPC \times (1 - t) - \mu + \eta]}$ , where  $\mu$  – marginal propensity to consume import goods and services;  $\eta$  – marginal propensity to induced investment.

**The Haavelmo theorem** affirms that an increase in the public expenditures, which is financed fully over additional income taxes, primarily results in the same product increase, thus  $\Delta G = \Delta T = \Delta Y$ .

*IS function arithmetic:*

$$Y = A + m_G \times G_a + m_T \times T_a - \beta \times m_I \times r,$$

where  $A = \frac{C_a + MPC \times TR_a + I_a}{1 - MPC \times (1 - t)} = m_a \times A_a$  – multiplied autonomous expenditures,

which is a constant value;  $I = I_a - \beta \times r$  – function of investment.

Alternative views on results of tax cuts:

**Keynesian Economics:** Tax cut → Aggregate Demand increase → Output and prices rise. Budget deficit will increase because of decrease in state revenues.

**Supply-side Economics:** Tax cut → Workers and firms keep more their earnings, that stimulate productivity → Aggregate Supply increase → Output and employment rise, prices fall. Budget deficit will decline because of greater increase in productivity in comparison with decrease in taxes.

*LM curve*

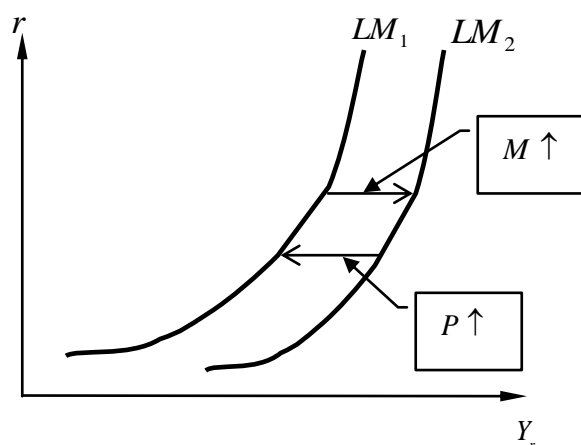


Figure 2.2. LM curve its shift after monetary impulse

The LM (liquidity–money) curve demonstrates different combinations of real income ( $Y_r$ ) and real interest rate ( $r$ ) for which there exists the balance of liquidity preference (L) and real money supply (S). It presents the equilibrium on money market for constant volume of real money supply ( $M/P = const$ ).

The transactions demand for money is a direct function of the real income. The speculative demand for money is an inverse function of the real interest rate. Since their sum is equal to the real money supply, all local equilibriums ( $M_s / P = L(Y_r^+, r^-)$ ) form a direct relationship between income and interest rate.

When central bank increases the money supply ( $M_s$ ), the LM curve shifts to the right in short-run. In response to this, in the long-run, the general price level rises, and the LM curve shifts back to the left.

*LM function arithmetic:*

$$Y = -L + \frac{h}{k} \times r + \frac{1}{k} \times \left( \frac{M_s}{P} \right),$$

where  $M_s/P$  is real money supply;  $L(Y, r) = L_a + k \times Y - h \times r$  - real money demand;

$M_s/P = L(Y, r)$  – equilibrium in money market;  $L = \frac{L_a}{k}$ ,  $\frac{h}{k}$  and  $\frac{1}{k}$  – coefficients,

which are constant.

### IS-LM equilibrium

**Model IS–LM** demonstrates that in concrete economy under given parameters of monetary and fiscal policy, there exists the only combination of real income and real interest rate, for which both goods and money markets come to equilibrium at the same time.

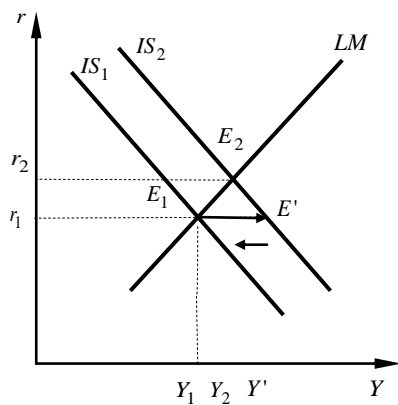


Figure 2.3. Consequences of fiscal expansion in the IS-LM model (short-run)

$Y_2 - Y'$  - crowding-out effect

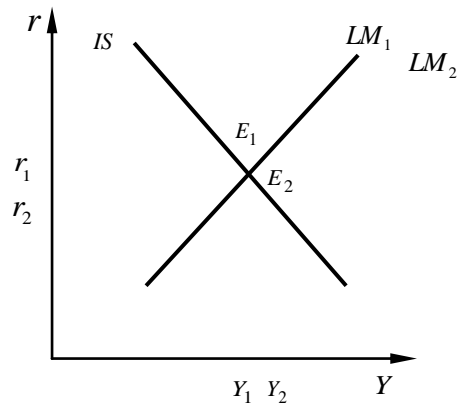


Figure 2.4. Consequences of monetary expansion in the IS-LM model (short-run)

Changing the parameters of equilibrium  $(Y_r, r)$  in the model are influenced by:

- ✓ fiscal policy, shifting the IS curve;
- ✓ monetary policy, shifting the LM curve;
- ✓ external shocks affecting the expected return on capital, assets demand for money etc.

The expansionist fiscal policy generates so called “crowding-out effect”.

**Crowding-out effect** – the offset in aggregate demand that results when expansionary fiscal policy rises the interest rate and thereby reduces investment spending<sup>2</sup>.

The function of aggregate demand in Neo-Keynesian approach is derived from IS-LM model (fig. 2.5).

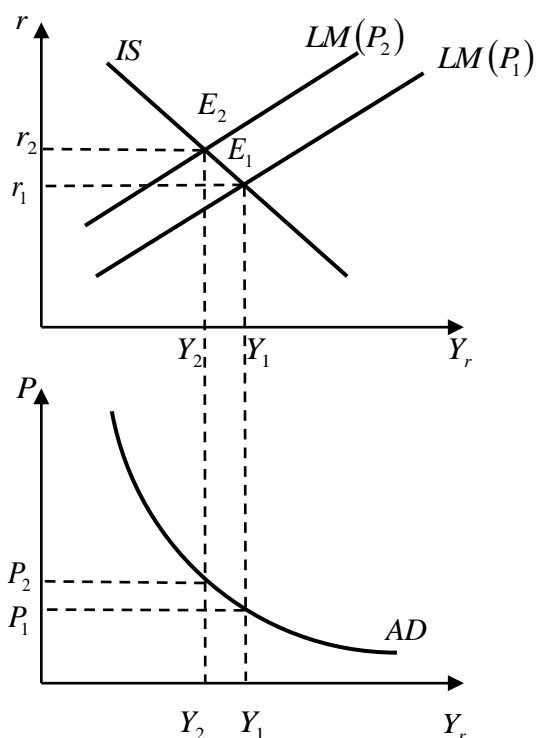


Figure 2.5. Aggregate demand formation

*Private (extreme) cases of equilibrium in the IS-LM model*

1. *Full employment – vertical LM.* In this case in short-run fiscal policy is ineffective and monetary policy is highly effective. In the long-run because of rising prices monetary policy is also ineffective.

2. *Liquidity trap (completely elastic demand for liquidity) – horizontal LM.* In this case fiscal policy is absolutely effective, the crowding-out effect equals to zero. Monetary policy is ineffective because it is impossible to further decline  $r$ .

3. *Investment trap (inelasticity of investment to the interest rate) – vertical IS.* In this case fiscal policy is absolutely effective, the crowding-out effect equals to zero. Monetary policy is ineffective because the reduction in the interest rate does not affect the investment.

### **Open economy: IS-LM-BP model (R. Mundell – M. Fleming model)**

Mundell–Fleming model is an extended version of the IS-LM model. It is developed for a small open economy with perfect capital mobility. In this model, balance of payments equilibrium is added to the equilibrium of commodity and money markets, and the BP curve represents it.

<sup>2</sup> Mankiw G. (2010). Macroeconomics.

- **Balance of Payments** – a table demonstrating the results of the trade and financial transactions of given country with other countries, leading to cash flows from this country abroad and from other countries to this country.

Balance of payments consists of two accounts: 1) the current account, main part of which is trade balance ( $NX$  – net export, i.e. export minus import); 2) the capital account or financial account ( $NK$ ). It is determined as:  $NK = I - (S + BS)$ , where  $I$  – investment,  $S$  – saving,  $BS$  – budget surplus. In sum, they are equal to the change in foreign exchange reserves ( $\Delta R$ ):

$$NX + NK = \Delta R.$$

So as the change in foreign reserves is often regarded as the export of capital:  $NX + NK = 0$ .

Taking into account that the export of capital (capital outflow from given country) is equal to:  $NEK = (S + BS) - I$ , we receive another equation for balance of payments:  $NX = NEK$ .

Assumptions of the IS-LM-BP model: 1) perfect capital mobility; 2) general price level rigidity (short term Keynesian equilibrium); 3) the deviation of the economy from the state of full employment calls the management of aggregate demand; 4) the effects of monetary and fiscal policy depend on the exchange rate regime.

### *BP curve*

The BP curve brings together different combinations of real income and real interest rate for which net export of goods equals to net export of capital in given country:  $NX = NEK$ .

Export of goods is directly related to the real income in foreign countries and inversely related to the real exchange rate of the national currency:  $X(Y^*, \varepsilon_r^-)$ . Real exchange rate refers to the parity of currencies in their purchasing power. Import of goods and services is directly related to the domestic real income and to the real exchange rate:  $Z(Y_r^+, \varepsilon_r^+)$ . Thus, the function of net export, which is the

difference between exports and imports ( $NX = X - Z$ ), takes the form:

$$NX(\bar{Y}_r, \bar{\varepsilon}_r, \bar{Y}^+).$$

Net capital export responds to the difference between world interest rate ( $r^*$ ) and domestic interest rate ( $r$ ) and takes into account the expected change in national currency exchange rate:  $r^* - (r + \hat{\varepsilon}_e)$ . The higher the real exchange rate the less its expected change. So net export of capital is directly related to the foreign real interest rate ( $r^*$ ) and to the real exchange rate ( $\varepsilon_r$ ), and it is inversely related to the domestic interest rate ( $r$ ):  $NEK(\bar{r}, \bar{r}^+, \bar{\varepsilon}_r)$ .

When we consider only the real income and the real interest rate in domestic country, the balance of payments takes the form:  $NX(\bar{Y}_r) = NEK(\bar{r})$ . And the BP curve has a positive slope (Figure 2.6).

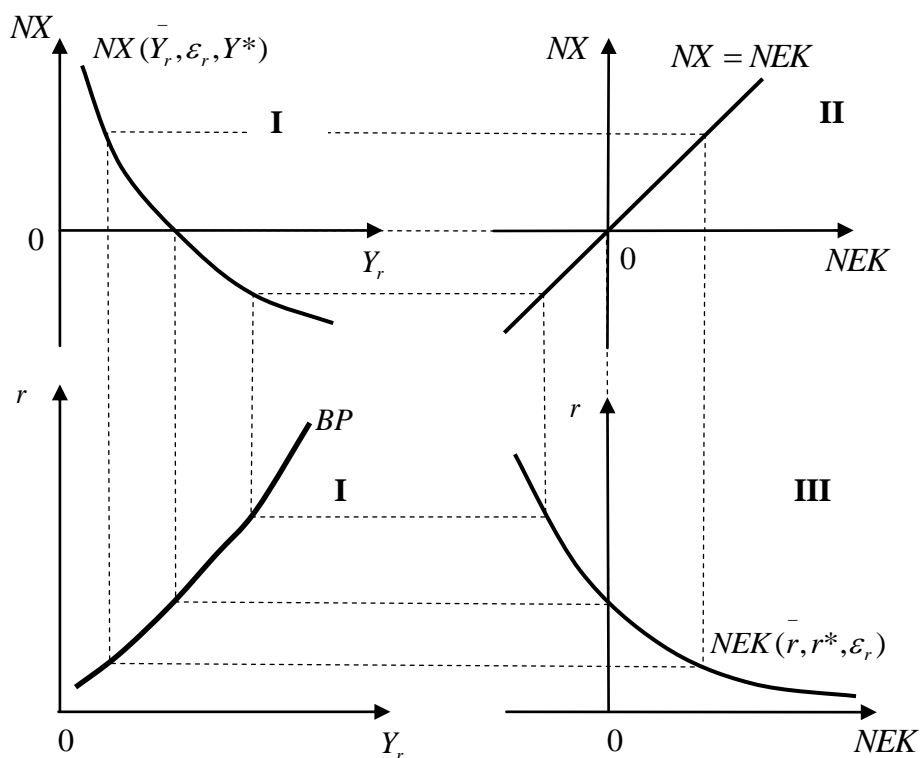


Figure 2.6. Equilibrium in balance of payments, deriving the BP curve

*Properties of the BP curve:*

- ✓ The slope of the BP curve is inversely related to the degree of capital mobility: the higher the mobility of capital, the flatter the BP curve. With perfect capital mobility, the curve is horizontal.
- ✓ The curve shifts to the right–down when the income in other countries increases and vice versa. The curve shifts to the left–up when the exchange rate or the world interest rate increases and vice versa.

*Consequences of fiscal and monetary policy in the IS-LM-BP model*

1. *Expansive fiscal policy under a floating exchange rate* (Figure 2.7):

- As a result of increase in government expenditures or decrease in taxes the *IS* curve shifts to the right ( $IS_1 \rightarrow IS_2$ );
- an increase in the demand for money, when the money supply is constant, causes the rise of domestic interest rate from  $r^*$  to  $r'$ , and income rises from  $Y_{r1}$  to  $Y_r'$ ;
- while the domestic interest rate is higher than the foreign interest rate ( $r' > r^*$ ), the capital will flow into the domestic country from abroad;
- capital inflows result in growth of foreign currency supply, and foreign currency depreciates, while national currency appreciates ( $\varepsilon \uparrow$ );
- an increase in the exchange rate leads to a deterioration of “the terms of trade”, that has negative impact on the net export ( $NX \downarrow$ ). Ultimately the *IS* curve shifts to the former position  $IS_1$ . Income returns to the former level  $Y_{r1}$ . Additional government spending is completely crowded-out by a reduction in net export to the same value.

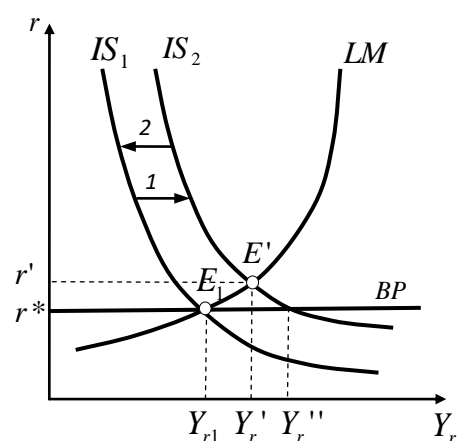


Figure 2.7. The consequences of the fiscal shock under a floating exchange rate



Thus, in an economy with perfect capital mobility and a floating exchange rate regime, fiscal policy is ineffective.

2. *Expansive monetary policy under a floating exchange rate* (Figure 2.8):

- As a result of increase in money supply the  $LM$  curve shifts to the right ( $LM_1 \rightarrow LM_2$ );
- an increase in money supply, when demand for money is constant, causes lowering the internal interest rate from  $r^*$  to  $r'$ , and income grows from  $Y_{r1}$  to  $Y_r'$  due to an increase in domestic investment;
- while the domestic interest rate is below the foreign interest rate ( $r' < r^*$ ), the capital will flow out of the country abroad;
- capital outflows results in declining the foreign currency supply, and foreign currency appreciates, while national currency depreciates ( $\varepsilon \downarrow$ ). Under a floating exchange rate regime the central bank doesn't prevent the establishment of new equilibrium exchange rate;
- reducing the exchange rate leads to an improvement in “the terms of trade”, that results in ascending the net export ( $NX \uparrow$ ). This causes a shift of the IS curve to the right ( $IS_1 \rightarrow IS_2$ ). As a result, the interest rate returns to the foreign level –  $r^*$ , and income grows up to  $Y_{r2}$ .

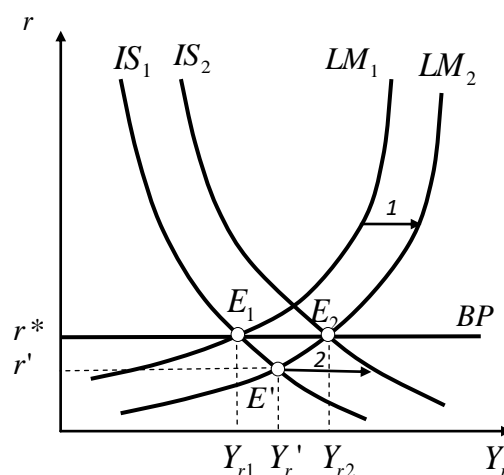


Figure 2.8. The consequences of the monetary shock under a floating exchange rate

Thus, in an economy with perfect capital mobility and a floating exchange rate regime, monetary policy is highly effective.

3. *Expansive fiscal policy under a fixed exchange rate* (Figure 2.9):

- increase in government expenditures or decrease in taxes shifts the  $IS$  curve to the right ( $IS_1 \rightarrow IS_2$ );
- the domestic interest rate grows from  $r^*$  to  $r'$ , and the income grows up to  $Y_r'$ ;
- foreign capital rushes to the domestic economy in search of interest arbitrage ( $r' > r^*$ );
- foreign currency inflow causes a rise in the exchange rate ( $\varepsilon \uparrow$ );
- since the central bank pursues a regime of fixed exchange rate, it will buy foreign currency in the foreign exchange market impeding the national currency appreciation. Such a policy leads to increase in the money supply within the country;
- the  $LM$  curve shifts to the right ( $LM_1 \rightarrow LM_2$ ). The interest rate returns to its previous level. The income grows up to  $Y_{r2}$ .

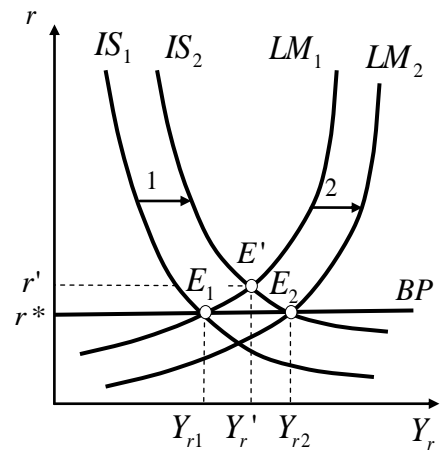


Figure 2.9. The consequences of the fiscal shock under a fixed exchange rate

Thus, in an economy with perfect capital mobility and a fixed exchange rate regime, fiscal policy is highly effective.

4. *Expansive monetary policy under a fixed exchange rate* (Figure 2.10):

- money supply increase shifts the  $LM$  curve shifts to the right ( $LM_1 \rightarrow LM_2$ );
- lowering the internal interest rate from  $r^*$  to  $r'$  causes the domestic investment rise and income enlargement to  $Y_r'$ ;
- the internal interest rate

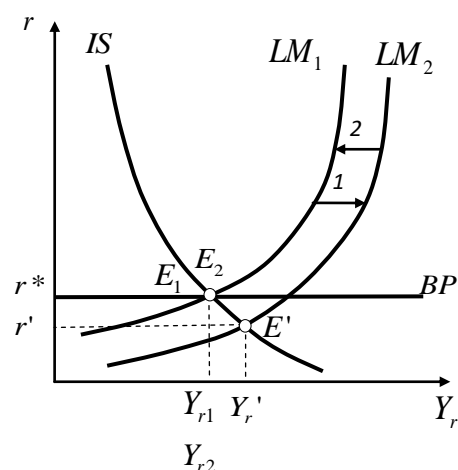


Figure 2.10. The consequences of the monetary shock under a floating exchange rate

reduction compare to the world interest rate ( $r' < r^*$ ) induce domestic capital to flee the country;

- demand for foreign currency grows, that results in its appreciation while national currency depreciates ( $\varepsilon \downarrow$ ). Under the fixed exchange regime the central bank will stabilize the situation, selling foreign currency and withdrawing national money from circulation;
- reduction of the national money supply shifts the LM curve to the left to its former state ( $LM_2 \rightarrow LM_1$ ), the interest rate and income return to their previous level. The exchange rate remains unchanged.

*Thus, in an economy with perfect capital mobility and a fixed exchange rate regime, monetary policy is ineffective.*

## Problems

**Problem 2.1.** Suppose the economy of some country is characterized by the following data:  $Y = C + I + G + NX$ ,  $C = 200 + 0,6 \times Y_d$ ,  $I = 400 - 2000 \times r$ ,  $NX = 100 - 0,1 \times Y$ ,  $M_d/P = 0,5 \times Y - 3000 \times r$ .

Tasks:

- a) Derive the equations for IS and LM functions;
- b) Let  $T = 400$ ,  $G = 300$ ,  $M_s = 600$ , and  $P = 1$ . Evaluate the equilibrium income and the equilibrium interest rate for these conditions;
- c) Develop the equation for AD curve as the relation between the real expenditures and the real money supply, autonomous taxes and government purchases;
- d) Suppose the Government has decided to increase aggregate demand in short-run by 180 units. How much should it change the autonomous taxes or the public purchases of goods and services to achieve this aim? Estimate the crowding-out effect in this case. Determine equilibrium interest rate change.
- e) Suppose not the Government but the Central Bank has set the goal to increase the income by 180 units by means of monetary policy. How much it has to

change money supply in the short-run period? Estimate the changes in equilibrium level of the interest rate and investment in this case.

**Problem 2.2.** Imagine some closed economy with the following characteristics: consumption function is  $C = 600 + 0,6 \times (Y - T)$ ; investment function is  $I = 500 - 1600 \times r$  ( $r$  is expressed as a fraction); tax function is  $T = 100 + 0,25 \times Y$ ; government purchases function is  $G = 400 + 0,15 \times Y$ . Demand for real money is  $(M/P)_d = 0,5 \times Y - 3000 \times r$ ; money supply is  $M_s = 1600$ ; price level is  $P = 2$ .

Suppose the government has increased autonomous government expenditures by 200 units. Estimate the crowding-out effect. What should the Central Bank undertake to neutralize this effect entirely?

**Problem 2.3.** In some small country with complete mobility of capital the function of consumer demand for domestic goods is given by:  $C = 100 + 0,7 \cdot (Y - T)$ , and the function of demand for imported goods:  $Z = 300 + 0,3 \cdot Y + 2 \cdot \varepsilon_r$  (where  $\varepsilon_r$  – real exchange rate). The investment function:  $I = 600 - 40 \cdot r^*$  (where  $r^*$  – the world real interest rate), the function of exports:  $X = 500 + 0,1 \cdot Y - 3 \cdot \varepsilon_r$ . Autonomous taxes are 100, and the income tax rate is 20%. The government adheres to the policy of a balanced budget. The real interest rate on world capital markets is 5%.

Tasks: A) Let the potential income in given country equals 1000 in real terms. Determine the equilibrium real exchange rate, the state of the current account and the capital account of the balance of payments in long run. B) Let the government took the course of expansionary fiscal policy and increased government purchases by 50 units. How will the equilibrium real exchange rate and the state of balance of payments accounts change? C) Let the government instead of p."b" has imposed imports quotas, that resulted in decrease in the value of imports by 50 units. How will the equilibrium real exchange rate and the state of balance of payments change? All answers provide graphic illustrations.

**Problem 2.4.** *Mundell-Fleming model with perfect capital mobility.* In some small country with perfect capital mobility the function of consumer demand for domestic goods is given by:  $C = 120 + 0,76 \cdot (Y - T)$ , and the function of demand for

imported goods:  $Z = 0,17 \cdot Y$ . The investment demand of domestic entrepreneurs is given by:  $I = 200 - 7,2 \cdot r$  (where  $r$  – domestic real interest rate). The government purchases of goods and services are 360 units. The budget revenues are formed by a 25% income tax. Goods exports are 220 units. Money demand for transactions is 25% of income, assets demand for money is given as function:  $L_{sp} = 60 - 2 \cdot r$ . Real money supply is 400 units. The real interest rate on world capital markets is  $r^* = 6\%$ .

Tasks: A) Derive equations of the  $IS$ ,  $LM$  и  $BP$  curves, construct them on chart. Determine the equilibrium level of income, the domestic interest rates, the state of government budget and the state of trade balance; B) What changes will occur in the economy under floating and fixed exchange rates? What equilibrium parameters will be established?

### *Answers to the problems*

*Problem 2.1:* a)  $IS: Y_{IS} = 1400 - 1,2 \times T + 2 \times G - 4000 \times r$ ;  $LM: Y_{LM} = 2 \times \frac{M_s}{P} + 6000 \times r$ ; b)

$Y_E = 1392$  units;  $r_E = 0,032$  (or 3,2%); c)  $AD: Y_{AD} = 840 - 0,72 \times T + 1,2 \times G + 0,8 \times \frac{M_s}{P}$ ;

d)  $\Delta T = -250$  units, or  $\Delta G = +150$  units. The crowding-out effect is equal to 120 units in both cases.  $r_E = 0,062$  (or 6,2%); e)  $\Delta M_s = +225$  units,  $\Delta r = -4,5\%$ ;  $\Delta I = +90$  units.

*Problem 2.2:* The crowding-out effect is equal to 200 units. The Central Bank should increase money supply by  $\Delta M_s = 500$  units.

*Problem 2.3:* A)  $\varepsilon_r = 58$ , current account:  $NX = -290$  units, capital account:  $NK = 290$  units; b)  $\varepsilon_r = 68$ , current account:  $NX = -340$  units, capital account:  $NK = 340$  units; c)  $\varepsilon_r = 68$ , current account:  $NX = -290$  units, capital account:  $NK = 290$  units.

*Problem 2.4:* A)  $Y_{IS} = 1500 - 12 \cdot r$ ;  $Y_{LM} = 1360 + 8 \cdot r$ ;  $BP: r^* = 6\%$ .  $Y_E = 1416$  units;  $r = 7\%$ .  $BD = -6$  units,  $NX = -20,72$  units; b) because of capital inflows in economy exchange rate will rise. Under floating exchange rate net exports will decrease by

12 units, the IS curve will shift to the left by 20 units ( $\Delta Y_{IS} = m_{NX} \cdot \Delta NX = 1 \cdot (6) \cdot 12$ ), the equilibrium income will decrease by 8 units and will amount to 1408 units, the interest rate will reach the world level (6%). Under a fixed exchange rate the central bank will increase the money supply by 5 units by restraining the growth of the national currency exchange rate. The LM curve will shift to the right by 20 units, the equilibrium income will increase by 12 units and will reach 1428 units, the domestic interest rate will be equal to the world interest rate (6%).

### Topic 3. **Theoretical basics in monetary policy**

Central Bank functions. Understanding, goals and types of the monetary policy, its impact on inflation and economic growth. Bank reserves ratio. Open market operations as monetary policy tool.

Impact of the channels of money supply on the real economy (monetary policy mechanism). Limitations of monetary policy effectiveness. Alternative monetary regimes: conditions, restrictions and efficiency.

#### **Central Bank, its functions and instruments**

Central Bank – is an institution of monetary authority that manages national currency, money supply, interest rates and conduct monetary policy in the country. It serves as a “lender of last resort” to the banking sector in case of insolvency or financial crisis.

*Monetary policy* is a complex of measures related to the management of money supply and interest rate, carried out by the central bank to maintain price stability, the stability of the national currency and stimulate economic growth in the country.

Goals of monetary policy:

- Price stability, reducing inflation.
- High business activity, full employment, non-inflationary economic growth.
- Stability of the banking system and the development of financial markets. It often includes interest rate stability.
- Stability of the balance of payments in the country. It often includes foreign exchange stability.

Some of these goals are complementary while others are conflicting.

In monetary policy the central bank uses three major instruments:

- ✓ *The reserve requirements* (or *cash reserves*) – are reserves that commercial banks make in the form of cash stored physically in a bank vault (vault cash) or deposits made with a central bank.

In some emerging market countries the central banks use the changes of reserves required ratio as a tool of monetary policy. Usually it is aimed at managing the level of liquidity in banking sector. The People's Bank of China uses this tool in its inflation-fighting policy and increased the reserve requirement eleven times since the beginning of 2010.

Increase in reserve requirements ratio leads to a decrease in the money multiplier, which causes money contraction. On the contrary, decrease in reserve requirements leads to an increase in the money multiplier and causes money expansion.

Table 3.1

**Required reserve ratio in some countries as of 01.10.2017, %**

Country	Value	Country	Value	Country	Value
Bangladesh	6	India	4	Poland	3.5
Brazil	45	Israel	9	Romania	8
Bulgaria	10	Jordan	8	Russia	5-7
Chile	4.5	Latvia	3	South Africa	2.5
China	17	Lebanon	30	Sri Lanka	8
Costa Rica	15	Lithuania	6	Suriname	25
Czech Republic	2	Malawi	15	Switzerland	2.5
Eurozone	1	Mexico	10.5	Taiwan	7
Ghana	9	Nepal	5	Tajikistan	20
Hong Kong	18	Nigeria	20	Turkey	8.5
Hungary	2	Pakistan	5	Zambia	8

✓ **Interest rates.** Central banks may set officially different interest rates.

1. The *discount rate* (base rate, or repo rate) – the officially set rate at which the central banks lend to commercial banks through the discount window usually on a short-term basis (overnight). The purpose of such lending is meeting temporary shortages of liquidity in banking sector.



In advanced countries discount rate is used for money supply control only in emergent situations, when the central play the role of last resort. The decrease in the discount rate raises the commercial banks demand for loans from the central bank. In this case, the monetary base and money supply expand.

2. *Federal funds rate* and its equivalents in other currencies – is the rate at which banks lend money to each other using their balances at the Central bank. In the USA the Federal Open Market Committee, the principal of monetary policy in the Federal Reserve System, determine the target rate for federal funds. The Federal Reserve conducts open market operations to achieve this rate.

✓ *Carry trade* – the investor’s strategy which involves borrowing money at low interest rates and investing them in higher-yielding assets. This strategy is used by players in the currency and stock markets to profit from uncovered arbitrage of interest, i.e. the difference in interest rates for different currencies or debts with different maturities.

✓ *Open market operations* – the purchase and sale of government bonds by the central bank for purposes of manipulating the short term interest rate and managing the money base and therefore the money supply.

By buying government bonds or other securities at the target interest rate for meeting money demand, the central bank increases the money base. Money supply grows. By selling government bonds, the central bank tightens monetary base. Money supply decreases. Open market operations can be carried out to reach the different targets in monetary policy: money target, inflation, interest rates, or exchange rates targets.

In some countries, the central bank regulates the exchange rate of national currency and for that purpose it *purchases or sells the foreign currency on open exchange market*. It causes changes in money supply, often undesirable. In this case, to adjust the money supply the central bank carries out *operations to sterilize the money supply* by inverse open market operations with government bonds.

Types of monetary policy:

1. *Passive* – a policy which is based on "monetary rule" by Milton Friedman, that asserts: change in money supply should exactly meet the long-term trends in real GRP and ignore its short-term fluctuations. Otherwise it enhances short-term fluctuations in output because of lag effects. Excessive money supply in long-run results in inflation, while insufficient money supply causes deflation.

2. *Active* – discrete policy which varies counter-cyclically in short-run:

- ✓ *Expansionary monetary policy* – conducting during the recession and aimed at economic growth. It includes increase in the money base, reducing the discount rate and diminishing the reserve requirements ratio;
- ✓ *Restrictive monetary policy* – conducting during the boom and overheating of economy and aimed at curbing inflation. It includes reducing growth of money base, an increase in the discount rate and reserve requirements ratio.

***Transmission mechanisms of monetary policy*** (channels through which monetary policy affects aggregate demand), according to F. Mishkin:

1. *Interest rate channel* – a traditional interest-rate effects on investment disclosed in the framework of the Hicks-Hansen IS–LM model and further expanded in neo-Keynesian approach. It affirms, that increase in the nominal money supply causes adequate growth of the real money supply ( $M_S/P$ ) in the short-run because of sticky prices. This leads to excess money supply over money demand and causes a reduction in real interest rate ( $r$ ). The latter has a positive impact on different investment: fixed investment, residential housing investment, inventory investment ( $I$ ) and on consumer durable expenditure ( $C$ ). In the short run it causes an increase in aggregate demand ( $AD=C+I+G+NX$ ), which leads to an increase in real output ( $Y_r$ ):

$$M_S/P \uparrow \rightarrow r \downarrow \rightarrow I \uparrow, C \uparrow \rightarrow Y_r \uparrow.$$

2. *Currency exchange rate channel* – valid for open economies with flexible exchange rate regimes. This channel also involves interest-rate effect. Expansionary monetary policy leads to a lower cost of capital, as described above,

it triggers the mechanism of interest rate arbitrage and capital outflow abroad. All this contributes to a drop in both the nominal exchange rate ( $e_n$ ), and the real exchange rate, that is defined:  $e_r = \frac{e \cdot P}{P^*}$  (where  $P$  – the domestic price level,  $P^*$  – the level of foreign prices). This, in turn, improves the competitiveness of domestic products. The growth of “the terms of trade” (which is inversely proportional to the real exchange rate) leads to an increase in net exports ( $NX = \text{export} - \text{import}$ ) that is the part of the aggregate demand. As a consequence of aggregate demand enlarging, the real production and yields grow.

$$M_S/P \uparrow \rightarrow r \downarrow \rightarrow \text{capital outflow} \rightarrow e \downarrow \rightarrow \theta \uparrow \rightarrow NX \uparrow \rightarrow Y_r \uparrow.$$

3. “*Other assets' price*” channel describes influence of monetary policy on real economy through its effects on the valuation of equities (stock).

Expansionary monetary policy raises personal incomes and savings. According to J. Tobin, in this case economic agents increase the demand for stock. According to A. Meltzer, demand for housing and land is also growing. Share prices ( $P_s$ ) and the market price of the firm increase relative to the replacement cost of the firm capital (J. Tobin’s effect). It makes profitable for large corporations to fulfill new public offering of their shares (IPO) on stock exchanges to involve cheap resources for real investment. Real investment spending, aggregate demand and actual production rise.

$$M_S/P \uparrow \rightarrow P_s \uparrow \rightarrow q \uparrow \rightarrow I \uparrow \rightarrow Y_r \uparrow,$$

where  $q$  – Tobin’s coefficient,  $q = \frac{\text{Equity Market Value} + \text{Liabilities Market Value}}{\text{Equity Book Value} + \text{Liabilities Book Value}}$ .

Another interpretation of Tobin’s  $q$ :  $q = \frac{\text{Value of Stock Market}}{\text{Corporate Net Worth}}$ .

The effect of “other assets’ prices” is enhanced by the “wealth effect”. Increase in the price of stocks, housing and land as a result of monetary expansion is accompanied by an increase in real personal wealth ( $W$ ). This, according to the

life cycle model of F. Modigliani, leads to an increase in consumption expenditure. It contributes to aggregate demand growth, and production rises:

$$M_S/P \uparrow \rightarrow P_S \uparrow \rightarrow W \uparrow \rightarrow C \uparrow \rightarrow Y_r \uparrow.$$

4. *Bank lending channel.* (A. Kashyap, B. Bernanke and A. Blinder, A., M. Gertler and S. Gilchrist). Imperfect information and asymmetry on the financial markets engender the phenomena of adverse selection and moral hazard. This problem is particularly acute for two reasons. The first problem is that the large firms are less dependent on bank loans than smaller ones. They usually have their own financial resources and easier raise capital through the stock market by offering its financial obligations. For small firms the bank loan is often the only possible source of external borrowing, substitutes of bank credit are not available for them. The second problem: small firms do not have good collateral for loans, and their net worth is low. Therefore, during tight monetary policy, they often go bankrupt. Knowing this, the banks reduce lending during the crisis, even with the availability of resources, and cause an effect like credit rationing. So they bring the bankruptcy of small and medium-sized businesses, and the reality seemed to confirm the correctness of their actions.

Monetary expansion increases the price of the company's property and causes the growth both their net worth  $P_S$  (effect of balance sheet accounts), and the balance sheet liquidity (cash effect). This reduces the likelihood of adverse selection and moral hazard, and enhances the banks' willingness to lend to businesses. Inflation provoked by expansionary monetary policy improves balance sheets due to the obligations of firms, as a rule, are presented in nominal terms, while assets are presented in real terms. The value of the obligation falls relatively to growing assets. In such circumstances, banks are more willing to make loans to the economy.

$$M_S/P \uparrow \rightarrow P_S \uparrow \rightarrow \text{adverse selection, moral hazard} \downarrow \rightarrow \text{bank lending} \uparrow \rightarrow I \uparrow \rightarrow Y_r \uparrow.$$

Contrary to different evidence of the effectiveness of monetary policy, some authors have also found several significant *limitations of monetary policy effectiveness*:

1. ***Dynamic inconsistency***. The concept of "dynamic inconsistency" was introduced in economics F. Kydland and E. Prescott. They wrote that dynamic inconsistency arises when the best solution any agent made in the short-run for the future, is no longer optimal from his point of view in the long-run. When he (or she) made decision, he supposed environment and behavior of his counterparties would become unchanged. But after his choice made, other agents who are involved in this game, and really depend on his decisions, will adjust their behavior and change their own decisions. So that the choice made by our agent before, is no more optimal from his point of view in the changed circumstances. Similar processes take place in policy making, including monetary policy. Dynamic (time) inconsistency arises here due to a temporary mismatch of proposed and actual outcomes because of three lags: the recognition lag, the decision lag, and the effect lag.

2. ***Bubble phenomenon*** refers to a significant self-sustaining growth in prices without the appropriate changes in the money supply. The most famous economic bubbles are "tulip bubble" in the 16th century, "dot-com bubble" in the 1990s and later stock-market bubbles, the real estate bubbles in the 2000s. During bubble the prices are rising as a result of price inertia, and because of the prevailing opinion that they should rise, if that does not break the essential prices ratio. There are different explanations for asset inflation: the psychological theories linking this phenomenon with massive optimism; theory of bounded rationality of stock market players; theory of the institutionalization of the financial market and appearance of the sophisticated derivatives, more and more detached from the real basics. All of these approaches are partly true and in line with its own crisis. One of the most popular theories explaining the bubble phenomena is "greater fool theory (bigger fool theory, or survivor investing)". According to this theory, each new customer assumes that someone should be the next big "fool" willing to buy

the asset even more expensive, so there is a self-sustaining growth of assets prices. Another way of explaining bubble phenomena is Ponzi-financing observed in the H. Minsky financial fragility theory.

3. ***Sunspots phenomenon*** (the author of the theory is W.S. Jevons, modern followers: D. Cass, K. Shell) refers to an indirect impact on economy of the external events coming from other areas of human life. These events are purely random. Economy is exposed to changes in technology, allocation of resources and people's preferences. Precisely random events of these spheres have an impact on the money demand that influence the monetary policy effectiveness. And the economic agent's expectations play significant role in this process.

4. ***Overlapping generations model*** (author of the term: M. Allais, authors of the model: P. Samuelson and R. Diamond). This model assumes that people live for a limited time and for that time they intersect just with two generations. Altruistic intergenerational ties are absent. In the first period of time people usually earn income, and in the second period of time they spend savings. Discrete monetary policy through the interest rate channel affects the savings. It causes redistribution of wealth between young and old generations. As a result, the level of capital per labour, that maximizes consumption according to the "golden rule of accumulation" by E. Phelps in the R. Solow model, will deviate from its sustainable level. It causes dynamical instability of the system.

5. ***Cash-in-advance constraint model*** (author: R. Clower, modern version: S. R. Aiyagari and N. Wallace) affirms that every consumer or firm must have sufficient available cash before the goods or services are delivered. They make their decisions under tight budget constraint: liquidity at the disposal plus income earned. In advance payments they unable to use the funds obtaining through external borrowing (loans and securities offering). This reduces the effectiveness of monetary policy and its positive impact on real sector of the economy.

*"Money-in-the-Utility-Function"* is an alternative assumption, which states that people derive utility from holding liquidity, so they will not spend a certain amount of cash.

*Types of monetary regimes* applied by the central banks:

1. *Monetary aggregates targeting* (“money anchor”) – the central bank sets the benchmark for growth of some monetary aggregates (money base, M0, M1). This policy was applied in 80’s by some advanced countries and in the first half of the 90’s by post-socialist countries.
2. *Exchange rate targeting* (“exchange rate anchor”) – the central bank establishes and maintains the fixed or tightly managed exchange rate (“creeping fixation”, “currency corridor”), up to the binding the money supply through the exchange rate to reserves (currency board). The purpose of such policy is to control inflation through the exchange rate, creating the “discipline effect” of monetary policy. This policy was used in the second half of the 90’s by central banks of many post-socialist countries.
3. *Inflation targeting* – a benchmark of inflation rate, measured on the basis of CPI or core CPI, is considered the only goal of the monetary policy. This regime was pioneered in New Zealand in 1990. Now it is the most popular monetary regime in the world that is used in many advanced countries (United Kingdom, Canada, Australia, South Korea etc.), including Eurozone (it is applied by European Central Bank). Moreover, it was adopted by a number of developing countries such as Egypt, South Africa, Brazil etc. The Bank of Russia switched to the policy of inflation targeting in 2014. Currently, the inflation target of the bank of Russia is 4%.
4. *Interest rate targeting* – the central bank regulates the interbank interest rate (federal funds rate). This policy is aimed at the stability of financial markets and used by United States Federal Reserve, the Swiss National Bank and the Bank of Korea as part of mixed regime. This policy is based on *the John Taylor rule*:

$$i_{mb} = \pi + r_{emb} + \alpha \times (\pi - \pi_{tr}) + \beta \times \left( \frac{Y - Y_f}{Y_f} \right),$$

where  $i_{mb}$  – the target short-term interbank nominal interest rate,  $\pi$  – the rate of inflation measured by the GDP deflator,  $r_{emb}$  – equilibrium real interbank interest rate,  $\pi_{tr}$  – the target (desired) rate of inflation,  $\pi - \pi_{tr}$  – the inflationary gap,  $Y$  – the actual GDP,  $Y_f$  – the potential GDP,  $\frac{Y - Y_f}{Y_f}$  – the gap of output. The coefficients of the gaps,  $\alpha$  and  $\beta$ , are determined on the basis of an econometric model based on the empirical material of concrete country, and may vary, depending on the state of its economy. The Taylor rule also satisfies the following condition:  $\alpha + \beta = 1$ . In 1993 paper Taylor proposed setting  $\alpha = \beta = 0,5$  for USA economy.

5. *Nominal GDP targeting* – the theoretical regime proposed by James Meade and James Tobin, based on determining the future level of economic activity in nominal terms.



#### Topic 4. Specifics of monetary policy of the Central Bank in Russia and foreign countries

Contemporary refinancing institution. Discount rate and interbank lending interest rate. Characteristics of the Central Bank loans to commercial banks. Intraday and overnight lending. Lombard loan. Loan Collateral secured by precious metal. Direct and reverse REPO agreements. Loan secured by non-marketable assets. Currency swap.

Mechanisms of sterilization of excess money supply. Deposits of the Central Bank of Russia, its operations with own bonds.

Liquidity management tools in the interbank market. Types of the interbank lending interest rates.

**Refinancing** – the central bank lending to credit institutions (sometimes to government) to increase their liquidity or recharge their resource base.

**The refinancing rate** (the **discount rate** of the central bank) – interest rate at which the national central bank provides a short-term loans to commercial banks.

Since September 13, 2013, along with the refinancing rate, the Bank of Russia introduced the so-called "**target interest rate**", which is designed to act as a regulator of the interbank market. It is an analogue of the federal funds rate used in the USA. Target Fed Fund Rate is established by the Federal Open Market Committee of the Federal Reserve 8 times for 1 year. Bank of Russia initially set the target interest rate at 5.5%, and then raised it several times to fight inflation. In 16.12.2014, the rate was raised from 10.75% to 17% in response to the crisis and capital outflow. Since 02.02.2015 it was reduced 11 times, so that at the beginning of October 2017 it had reached 8.5%. Moreover, from 01.01.2016 the target interest rate completely replaced the refinancing rate in Russia.

In recent years, the interest rate has declined in many countries, both developing and advanced. Today negative rates are established in Switzerland, Denmark, Sweden and Japan (see. Table 4.1).

But there is some exclusion. For example, the Federal Reserve System of USA (FED) increased the Federal Funds Rate three times since December 14, 2016

(0.5% - 0.75% - 1.00% - 1.25%). By doing so the Fed tries to link the excess liquidity that was pumped into the US financial system during the programs of quantitative easing aimed at stimulating the economy. The bulk of these funds went not to the real sector of the economy, but to financial markets, provoking market speculators, which increased the risks of inflating financial bubbles in the stock and bond markets. Another reason for the increase in the FED's interest rate is the recovery in the US economy and a significant reduction in the unemployment rate from 10.2% in November 2009 to 4.4% in September 2017.

Table 4.1

**Discount and target interest rates in some countries as of 01.10.2017, %**

<b>Country</b>	<b>Name of rate</b>	<b>Value</b>	<b>When set</b>
Switzerland	Swiss National Bank target range for the 3 month Libor CHF	-0.75	15 January 2015
Denmark	Certificates of deposit rates	-0.65	7 January 2016
Sweden	The Riksbank repo rate	-0.5	11 February 2016
Japan	Overnight Call Rate Target	-0.10	29 January 2016
Eurozone	Refinancing tender	0.00	10 March 2016
United Kingdom	British interest rate (BoE)	0.25	4 August 2016
USA	Federal Funds Rate (Fed)	1.25	14 June 2017
Australia	Australian interest rate (RBA)	1.50	2 August 2016
Russia	Target rate	8.50	18 September 2017
Brazil	Brazilian interest rate (BACEN)	9.25	26 July 2017
Belarus	Refinancing rate	12.00	28 June 2017
Ukraine	Discount rate	12.50	26 May 2017
Nigeria	Monetary Policy Rate	14.00	26 July 2016
Malawi	Policy Rate	18.00	5 July 2017
Ghana	Monetary Policy Rate	21.00	24 July 2017
Argentina	Argentina 35-Day Lebac Rate	26.25	11 April 2017

***Types of the Bank of Russia loans to commercial banks*** (liquidity provision):

1. *Intraday loans* — the central bank loans extended to authorized credit institutions within one workday to cover insufficient funds on the bank account (the basic account) and meet current payments. Their purpose is maintaining

instant liquidity of commercial banks and other credit institutions. They are provided automatically (free of application) under a zero interest rate within the credit limit set by the Bank of Russia. Intraday loans should be secured by one of the following collateral: 1) locked securities eligible for The Bank of Russia Lombard List; 2) non-marketable assets (promissory notes, credit claims); 3) bullions of gold allocated in Bank of Russia safe vault.

2. *Overnight loans* – the loans provided at the end of a workday, if the intraday loan is not repaid, by transferring the appropriate amount to the correspondent account (sub-account) of a credit institution. They are provided at a discount interest rate. Overnight loans have to be secured by the same collateral as appropriate for intraday loans.

3. *Lombard loans and Lombard credit auctions* – the loans extended by central bank to credit institutions against securities included in the Lombard List. These loans are issued over a longer period of time (from 1 day to 1 year) to serve the needs of credit institutions strictly in credit resources. They have the same collateral as the previous two types of loans. Lombard loans are good tool for banking assets transformation (from securities to loans). Bank of Russia provides two types of Lombard loans: at a fixed rate or by auction. The fixed rates Lombard loans are used by credit institutions to meet every day required reserves in average and therefore provided just for one day.

The Bank of Russia *Lombard List* includes: 1) Bonds issued on behalf of Russian Federation; 2) Regional and municipal governments' bonds; 3) Mortgage agencies' and agencies' for restructuring of housing mortgage loans bonds; 4) Mortgage bonds; 5) Bonds of legal entities – residents of Russian Federation; 6) International financial organizations bonds; 7) Securities issued by legal entities - non-residents of Russian Federation outside Russian Federation; 8) Stocks of non-credit institutions - residents of Russian Federation; 9) Russian depositary receipts representing stocks of legal entities – non-residents of Russian Federation.

Table 4.2

**The Bank of Russia major loans to commercial banks (% p.a.)\***

<b>Purpose</b>	<b>Type of instrument</b>	<b>Instrument</b>	<b>Term</b>	<b>Rate from 18.09.2017</b>
Liquidity provision	Standing facilities (fixed interest rates)	Overnight loans; Lombard loans; Loans secured by gold; Loans secured by non-marketable assets and guarantees; FX swaps (ruble leg); Repos	1 day	9.50
		Loans secured by non-marketable assets	2-549 days	10.25
	Open market operations (minimum interest rates)	Auctions to provide loans secured by non-marketable assets*	3 months	8.75
		Repo auctions	from 1 to 6 days, 1 week	8.50 (key rate)
		FX swap auctions (ruble leg)	from 1 to 2 days	
	Liquidity absorption	Open market operations (maximum interest rates)	Deposit auctions	from 1 to 6 days, 1 week
OBR** auctions			3 months	
Deposit operations			1 day, call	8.50
Standing facilities (fixed interest rates)		Deposit operations	1 day, call	7.50

Note: \* Operations conducted at a floating interest rate linked to the Bank of Russia key rate.

\*\* OBR – Bank of Russia Bonds/

Source: Central bank of Russia. Official site.

URL:[http://www.cbr.ru/eng/publ/ddcp/2017\\_03\\_ddcp\\_e.pdf](http://www.cbr.ru/eng/publ/ddcp/2017_03_ddcp_e.pdf). Accessed 02.10.2017.

Securities taken as collateral are required to be admitted to the Moscow Interbank Currency Exchange (MICEX). Issues should be rated at international scale not less than B or B- («Fitch Ratings» and «Standard & Poors») or B2 or B3 («Moody's Investors Service»). As collateral they are reassessed with the correction coefficient taking into account their ratings, liquidity and safety. The correction coefficient varies from 1.0 (bonds issued by Ministry of Finance and the Bank of Russia) to 0.7 (some bonds and stocks of non-financial corporate sector). There are also several requirements for credit institutions borrowing from Bank of Russia counterparties. One of them is that they should be included in the first or the second qualification category under Bank of Russia standard acts.

3. *Loans secured by non-marketable assets and guarantees* – the loans secured by promissory notes, credit claims and also credit institutions' guaranties. These loans were introduced by the Bank of Russia in 2007 as an extension of refinancing. Firstly they were issued only at a fixed interest rate for a period of 3 months to 1 year. Now they are provided as intraday and overnight loans for period of one day and as loans at a fixed rate for 2-549 days. Beside fixed-rate loans, Bank of Russia provides loans for a period of 3 months by auction (as security guarantees are not accepted credit institutions).

Loans secured by non-marketable assets are issued for banks included in the first and the second qualification categories. Borrowers should perform reserve requirements and don't have an overdue liabilities to the Bank of Russia. Loans against guarantees as collateral are issued under the condition that the guarantor has an international rating of at least "B +" (according to the classification agencies Standard & Poor`s, Fitch Ratings), or "B1" (according to the classification Moody`s Investors Service).

4. *Loans secured by gold* – the loans against gold bullion stored in the vault of the Bank of Russia. This scheme of refinancing of credit institutions are the youngest of all, that practiced by the Bank of Russia since 2011. The volume of gold taken as collateral is underestimated with the correction coefficient equal to

0.9. They are issued for one day or for 2-549 days. These credits are available for only certain regions of the Russian Federation. They assume the same requirements for credit organizations as loans secured by non-marketable commitments.

There are some operations of the Bank of Russia similar to the refinancing system:

5. *Direct REPO (repurchase agreement)* – the purchase of securities by the Bank of Russia from credit institutions with an agreement to buy it back later at a higher price. In Russia there are two types of such operations: a) repos at a fixed interest rate; b) repos at a market interest rate determined on auction basis (for up to one year, that practiced since 2009). The Bank of Russia sets the minimum value of interest rates on repo auctions: if the market price of the transaction is below the minimum, the auction is declared invalid. The Bank of Russia announced that the next 3 years repo transactions over 1-7 days will be the main tool of fine-tuning the interbank market and regulating banking liquidity. In the case of excess liquidity it supposed to use the opposite direction operations: deposit auctions of the Bank of Russia over 1-7 days. The short-term repo operations conducted by auctions are designed to completely replace the Lombard loans in the nearest future.

6. *FX swaps (ruble leg)* – the purchase of the Bank of Russia of foreign currency held by credit institutions at the current ("today") official exchange rate (i.e. at base rate) with a commitment to repurchase it "tomorrow" at the base rate increased by the swap difference. The value of swap difference (SD) is calculated as follows:

$$SD = ER_{FOR} \cdot \left( \frac{1 + \frac{i_{RUB} \cdot d}{100\% \cdot d_y}}{1 + \frac{i_{FOR} \cdot d}{100\% \cdot 360}} - 1 \right),$$

where:

- $ER_{FOR}$  – the base rate of foreign currencies to the ruble, calculated by the Bank "National Clearing Centre" in accordance with the Clearing Rules the Unified Trading Session of MICEX-RTS (stock exchanges);
- $i_{RUB}$  – interest rate for rubles loans established for the purpose of "currency swap" transactions;
- $i_{FOR}$  – interest rate for foreign currencies deposits in the Bank of Russia loans established for the purpose of "currency swap" transactions;
- $d$  – the number of days of the transaction except for the first day;
- $d_y$  – the number of days in a calendar year (365 or 366).

A currency swap is similar to the foreign currency deposits in exchange of domestic currency loans. During the crisis, the demand for such operations grows significantly, because banks increase the demand for foreign currency as to close their open currency positions and due to speculative demand for appreciating foreign currency.

In Russia the allocation of the budget funds on the accounts in credit institutions is also practiced. It as well increases the resource base of credit institutions. The Federal Treasury conducts tenders for allocation of the budget resources among commercial banks.

There are also *mechanisms of sterilization of excess money supply* (absorbing excess liquidity):

1. *Reverse REPO* – a modified REPO agreements with public bonds. Central Bank sells public (treasury) securities to credit organizations with a commitment to repurchase them later at a higher price. The Bank of Russia used this tool to absorb bank liquidity until 2004, but now it does not conduct such operations.

2. *Central bank deposit operations* refer to taking deposits from resident credit institutions to absorb excessive banking sector liquidity.

Currently the Bank of Russia attracts such deposits in the national currency by two ways: at fixed interest rates and at deposit auction market rates. There are possible two types of deposit auctions: American auction, when a credit institution

may make both competitive and non-competitive bids, and Dutch auction, when auction begins with a high proposal price which is lowered until money raising limit is reached. Bank of Russia conducts deposit operations by three ways: 1) through Bank of Russia regional branches (by concluding bilateral tender agreements); 2) via the Reuters Dealing System; 3) via the Moscow Interbank Currency Exchange Electronic Trading System, MICEX.

3. *Issue of the short-term Central Bank bonds and selling it to credit organizations.* This tool of absorbing liquidity is widely used in the monetary policy of many countries, especially in emerging markets. The central banks of South Korea, Israel, Brazil, Chile and South Africa issue their own bonds to manage banking liquidity. For this purpose the Bank of Russia also issues zero-coupon (discount) bonds up to one year (so called “BOBR”) and sells them to Russian credit organizations.

4. *Increase in the requirement reserves ratio.* This tool is usually used for managing money supply in medium term.

5. *Freezing the budget surplus on government accounts* at the Central bank followed by excessive money accumulation in so called “Sovereign Funds”. This tool is applied for managing money supply in long term. (For details about Russian sovereign funds see topic 7).

Central Bank of Russia in its liquidity management uses the following indicators of banking sector liquidity:

1. Correspondent account balances of credit institutions with the Bank of Russia. Their increase indicates the growth of banking liquidity and vice versa.

2. “The Bank of Russia transactions balance for liquidity supply/withdrawal”, that is “a net worth between Bank of Russia liabilities to the banking sector and Bank of Russia claims on the banking sector with maturities or the settlement date on the current day”. The negative balance indicates the credit organizations funds’ withdrawal by the Bank of Russia, whereas the positive one indicates the liquidity inflows to the banking sector.



3. Interbank interest rates changes. Increase in it means the lowering of banking liquidity.

Types of the interbank lending interest rates in Russia:

1. Moscow Inter-Bank rates are calculated by Central Bank of Russia on a daily basis. The information is collected from about 30 banks appointed by CB. There are three types of such rate: a) offering rate (MIBOR); b) bid rate (MIBID); c) actual credit rate (MIACR). It is analogue of London Interbank Offered Rate.

2. MosPrime Rate, Moscow Prime Offered Rate is the estimated average interest rate of providing ruble loans (deposits) on the Moscow money market by first class financial institutions. This rate is calculated by the National Currency Association (NCA) based on offering rates of 9 leading Russian banks.

When interbank rates become more than the target interest rate, the Central Bank conducts operations to replenish bank liquidity. When interbank rates become less than the target interest rate, the Central Bank conducts operations to sterilize bank liquidity.

## Topic 5. Currency exchange regimes and managing official reserves

Nominal and real, bilateral and multilateral exchange rates. Nominal and real effective exchange rates. Currency exchange rate regimes: floating, fixed and managed exchange rates. Influence of currency exchange rate on performance of the real economy and the financial sector. The official reserves, their functions, composition and structure. Sufficiency of the official reserves. Currency interventions and their effects.

### *Nominal, real, bilateral and multilateral exchange rates*

First, we need to figure out the difference between the nominal and the real exchange rate.

- ✓ *Nominal exchange rate* - the amount of foreign currency that can be obtained for 1 unit of the national currency in exchange.
- ✓ *Real exchange rate* - the number of foreign goods that can be purchased instead of 1 unit of domestic goods under the current price level in the country and abroad, and actual nominal exchange rate. When we calculate the relative price of representative market basket in two countries, the real exchange rate is called purchasing power parity (PPP).

The real exchange rate ( $\varepsilon_r$ ) can be calculated using the formula:

$$\varepsilon_r = \varepsilon_n \cdot \frac{P}{P^*},$$

where  $\varepsilon_n$  – nominal exchange rate,  $P$  – general price level in the domestic country,  $P^*$  – price level abroad.

"Terms of trade" – is an inverse indicator to the real exchange rate:

$$\theta = \frac{\text{The average price of foreign goods}}{\text{the average price of domestic goods}} = \frac{P^*}{\varepsilon_n \cdot P}.$$

When  $\theta > 1$ , foreign substitutes are more expensive than domestic goods when their prices converted into foreign currency on the basis of the nominal exchange rate. This means that the demand for domestic goods will increase and the demand for foreign goods will decline in both domestic and foreign markets.

When  $\theta > 1$ , terms of foreign trade are favorable for national country. In such circumstances net exports (exports minus imports) will increase, that will cause net inflows of foreign currency and decline in its exchange rate. The national currency exchange rate will rise, and  $\theta$  will decline, tending to 1.

When  $\theta < 1$ , foreign substitutes are less expensive than domestic goods. The terms of foreign trade are unfavorable for national country. Net exports will decline, outflows of foreign currency will take place, and foreign currency exchange rate will increase while reducing national currency exchange rate.  $\theta$  will grow, tending to 1.

- ***“The law of one price”***: when institutional constraints are absent and there exists the perfect cross-border mobility of resources and goods, uniform prices for all tradable goods and services are installed on the domestic and international markets. Under these conditions real exchange rate equals to nominal exchange rate.

Limitations for the law of one price: 1) imperfect mobility of goods and resources; 2) tradable and non-tradable goods.

Next we have to distinguish between bilateral and multilateral exchange rates.

- ✓ *The bilateral exchange rate* is the ratio of two currencies, when one currency is used for quoting another currency.
- ✓ *The multilateral exchange rate* is the weighted average of the exchange rates of domestic currency relative to a set of currencies of other countries. It demonstrates the generalized strength of national currency compared to the basket composing of different currencies whose bilateral exchange rates to national currency may change in different ways and even more in opposite directions.

The multilateral exchange rates are used for calculation of the so-called effective exchange rates.

- ✓ *Effective Exchange Rate (or Trade Weighted Index)* – is the weighted average of the exchange rates of domestic currency relative to a set of currencies of the

countries - trade partners, where the shares of trading countries in international trade (both in exports and imports) are employed as weights of the bilateral exchange rates.

$$E_{effective} = E_1 \cdot \frac{Trade_1}{\sum Trade} + E_2 \cdot \frac{Trade_2}{\sum Trade} + \dots + E_n \cdot \frac{Trade_n}{\sum Trade}.$$

The types of effective exchange rate:

- ✓ **Nominal effective exchange rate** (NEER) is an unadjusted weighted average rate of domestic country's currency for a basket with several foreign currencies.
- ✓ **Real effective exchange rate** (REER) is an inflation-adjusted weighted average rate of the domestic country's currency for a basket with several foreign currencies. The dynamics of REER can serve as an indicator of the global terms of trade and general competitiveness of the country. Rise in REER implies that the purchasing power of domestic currency enhances, while fall in REER means reduction in PPP of domestic currency.

### ***Floating, fixed and managed currency exchange rates***

There are three main mechanisms for the formation of the exchange rate: floating, fixed and managed.

A *floating exchange rate* is regime in which the value of the national currency exchange rate may fluctuate depending on demand and supply in the foreign exchange market. This is the most common regime of exchange rate formation in the modern world. Examples of floating currencies are the US dollar, the euro, the Japanese yen, the British pound, the Norwegian krone, the Australian dollar and even the Indian rupee. However, central banks often participate in markets, trying to influence the value of floating exchange rates. The Canadian dollar most closely resembles a pure floating currency, because the central bank of Canada has not interfered with its exchange rate since 1998. The US dollar ranks second in terms of the purity of the exchange rate formation.

From 1946 to the early 1970s, the Bretton Woods system established fixed currencies; but in 1971 the US decided not to support the exchange of the dollar by

1/35 of an ounce of gold and in fact abolished the regime of fixing the exchange rate. After the 1973 Smithsonian agreement most countries followed the USA, while others, e.g. the Persian Gulf countries, decided to bound their currency to the value of another relatively stable currency.

A floating exchange rate regime involves some benefits and some shortcomings.

The benefits of floating:

- floating exchange rates allow the country to weaken the influence of external shocks and economic cycles;
- they allow to prevent the depletion of foreign reserves and abrupt balance of payments crisis;
- the floating regime supports the sovereignty of monetary policy, which can be used to stimulate the economy or fight inflation.

The shortcomings of floating:

- it implies less predictability of economic processes;
- it increases currency volatility, which may be painful for emerging economies. These economies are characterized by higher dollarization and greater sensitivity of financial markets to shocks.

A *fixed exchange rate*, or a *pegged exchange rate*, means that the value of national currency is fixed relative to the value of another particular currency, a basket of other currencies or another measure of value, e.g. gold. A fixed exchange rate is usually used to stabilize the relative value of a currency against the currency it is pegged to. Such a fixation contributes to predictability of trade between the tied countries. Therefore this regime is more fruitful for economies in which foreign trade constitutes a significant part of the GDP. It can also be successfully used to combat inflation in emerging economies. However, when the central bank simultaneously maintains a free exchange mechanism, it must comply with the obligation to buy and sell the national currency at a fixed price in order to stabilize its exchange rate. This can significantly affect the amount of official foreign reserves.

Nowadays 54 countries follow the regime of fixed exchange rates, some of them are presented in the table 5.1.

Table 5.1

**Some circulating currencies with fixed exchange rate**

<b>Fixed Currency</b>	<b>Reference Currency</b>	<b>Rate (Reference / Fixed)</b>
Venezuelan bolívar	United States dollar	10
United Arab Emirates dirham	United States dollar	3.6725
Swazi lilangeni	South African rand	1
Saudi riyal	United States dollar	3.75
Qatari riyal	United States dollar	3.64
Panamanian balboa	United States dollar	1
Omani rial	United States dollar	0.38449*
Nepalese rupee	Indian rupee	1.6
Namibian dollar	South African rand	1
Maldivian rufiyaa	United States dollar	10.28-15.42
Macanese pataca	Hong Kong dollar	1.032
Kuwaiti dinar	United States dollar	0.29963
Hong Kong dollar	United States dollar	7.80
Guernsey pound	Pound sterling	1
Gibraltar pound	Pound sterling	1
Danish krone	Euro	7.46038
Cuban convertible peso	United States dollar	1
Comorian franc	Euro	491.96775
Bulgarian lev	Euro	1.95583
Brunei dollar	Singapore dollar	1
Bosnia and Herzegovina convertible mark	Euro	1.95583
Abkhazian apsar	Russian ruble	0.1

The fixed exchange rate regime entails certain advantages and disadvantages, some of which are summarized in the table 5.2.

Table 5.2

**Advantages and disadvantages of fixed exchange rate**

<b>Advantages</b>	<b>Disadvantages</b>
Reduction in business cycle fluctuations and financial markets volatility	It hampers for adjustment of the trade balance
Positive influence on absolute and relative prices stability	Depletion of official foreign reserves in long-run
Credibility to domestic currency	It constraints the use of expansive monetary and fiscal policies to stimulate the economy
Monetary policy discipline effect	Growing trade balance deficit may force the government to move to a restraining policy, contributing to rising unemployment
Elimination of exchange rate risk and uncertainty in short-run	Increasing deviation of the exchange rate of its equilibrium level may cause abrupt devaluation of the national currency in long-run
Facilitation of international trade and investment	Other countries may take retaliatory measures to protect their own currency
Decrease in speculation operations supports balance of payments stability and prevents depletion of foreign reserves in short-run	Negative impact on functioning of financial markets
	This policy is misleading in determination of the national comparative advantages or disadvantages, resulting in inefficient allocation of resources on a global scale

***The impossible trinity*** (also known as the trilemma, or the unholy trinity) is a concept of the international economy, which ascertains impossibility of simultaneous achievement of three following goals: 1) a fixed foreign exchange rate; 2) an independent monetary policy; 3) free capital flow (the rejection of capital controls).

Most national currencies are managed at least to some extent. The central

banks of various countries do it to stabilize the markets and to follow independent monetary policy. Thus, the People's Republic of China, the largest economy that adhered to a fixed exchange rate, in July 2005 adopted a somewhat like more flexible exchange rate system, called a managed exchange rate. Many European countries joining the euro zone temporarily use the EU Exchange Rate Mechanism managing their national currencies against euro.

Alternative regimes of currency exchange rate are presented in the table .5.3.

Table 5.3

**Major Characteristics of Alternative Exchange Rate Regimes**

<b>Regime</b>	<b>Main Characteristics and Principal Issues</b>
<i>Dollarization</i>	Key feature: A foreign currency acts as legal tender. Monetary policy is delegated to the anchor country. Potential benefits: Dollarization reduces the time inconsistency problem (subject to the perceived probability of a reintroduction of domestic money) and real exchange rate volatility). Potential drawbacks: Under dollarization external shocks cannot be buffered by exchange rate movements, imposing costs if business cycles are asynchronous; while seignorage revenues decline. Issues: The lender-of-last-resort function must be shifted to the fiscal authority.
<i>Currency Boards</i>	Key feature: A fixed exchange rate regime (mostly enshrined in law) is complemented by a minimum backing requirement for domestic money in foreign currency. Potential benefits: The time-inconsistency problem is reduced (subject to the perceived probability that the regime is abandoned) and real exchange rate volatility is diminished. Potential drawbacks: External shocks cannot be buffered by exchange rate movements, imposing costs if business cycles are asynchronous. The scope for lender of last resort activity is restricted to excess reserve holdings and fiscal mechanisms. Requires high reserve holdings. Issues: Lender of last resort limits, exit strategy if used as a transitory regime.
<i>Monetary Union</i>	Key feature: A group of countries using a common currency issued by a common regional central bank. Potential benefit: A monetary union reduces the time inconsistency problem by requiring multinational agreement on policy, and reduces real exchange rate volatility. Potential drawbacks: Member countries suffering asymmetric shocks lose a stabilization tool. The cost depends on the extent of asymmetric costs and the availability and



<b>Regime</b>	<b>Main Characteristics and Principal Issues</b>
	effectiveness of alternative adjustment tools. Issues: Unknown responsiveness of wage/price setting behavior and migration/investment pattern to the altered regime. Potential sensitivity of voting equilibria to distribution of shocks.
<i>Traditional Peg</i>	Key feature: Fixed rate against a single currency or a currency basket. Potential benefits: The time inconsistency problem is reduced through commitment to a verifiable target. Devaluation option provides potentially valuable policy tool in response to large shocks. Reduces real exchange rate volatility. Potential drawbacks: Provides a target for speculative attacks. Avoids real exchange rate volatility but not necessarily persistent misalignments. Does not by itself place hard constraints on monetary and fiscal policy, and thus provides only a partial solution against time inconsistency problem; the credibility effect depends on accompanying institutional measures and record of accomplishment. Issues: Doubts about sustainability in the presence of full capital mobility.
<i>Crawling Peg Bands</i>	Key feature: A rule-based system for altering the par value, typically at a predetermined rate or as a function of inflation differentials. Potential benefits: An attempt to combine flexibility and stability. Often used by (initially) high inflation countries pegging to low inflation countries in an attempt to avoid trend real appreciation. Potential costs: At the margins, a crawling peg provides a target for speculative attacks. Among variants of fixed exchange rates, it imposes the least restrictions, and may hence yield the smallest credibility benefits. The credibility effect depends on accompanying institutional measures and record of accomplishment. Issues: Exit strategy, either to harder peg, or greater flexibility.
<i>Bands</i>	Key feature: Exchange rate is flexible within a preset band; endpoints defended through intervention, typically with some intra-band intervention. An attempt to mix market-determined rates with exchange rate stabilizing intervention in a rule based system. Potential benefits: Provides a limited role for exchange rate movements to counteract external shocks and partial expectations anchor, retains exchange rate uncertainty and thus motivates development of exchange rate risk management tools. Potential drawbacks: On the margin, a band is subject to speculative attacks. Does not by itself place hard constraints on monetary and fiscal policy, and thus provides only partial solution against the time inconsistency problem. The credibility effect depends on accompanying institutional measures, record of accomplishment,

Regime	Main Characteristics and Principal Issues and the characteristics of the band (firm or adjustable, secret or public, width, strength of intervention requirement).
<i>Float with discretionary intervention</i>	Key feature: Exchange rates are determined in the foreign exchange market. Authorities can and do intervene, but are not bound by any intervention rule. Often accompanied by a separate nominal anchor, such as an inflation target. Potential benefits: The arrangement provides a way to mix market determined rates with exchange rate stabilizing intervention in a non-rule-based system. Potential drawbacks: Does not place hard constraints on monetary and fiscal policy. Absence of rule conditions credibility gain on credibility of monetary authorities. Limited transparency.
<i>Pure Float</i>	Key feature: The exchange rate is determined in the market without public sector intervention. Potential benefits: Adjustments to shocks can take place through exchange rate movements. Eliminates the requirement to hold large reserves. Potential drawbacks: Does not provide an expectations anchor. Exchange rate regime places no restrictions on monetary and fiscal policy; time inconsistency problem arises unless addressed by other institutional measures.

Source: Atish Ghosh, Anne-Marie Gulde, Holger Wolf. 2003. *Exchange Rate Regimes: Classification and Consequences*. BMW Center for German and European Studies Georgetown University. URL: [https://www.researchgate.net/publication/228966970\\_Exchange\\_rate\\_regimes\\_Classification\\_and\\_consequences](https://www.researchgate.net/publication/228966970_Exchange_rate_regimes_Classification_and_consequences).

### Indicators of the official reserves sufficiency

- **Three-month import of goods and services.**
- **Reddy Criterion:** reserves  $\geq$  three-months import + payouts for the annual external debt;
- **Guidotti Criterion:** reserves  $\geq$  short-term external debt (one-year or less maturity);
- **Greenspan–Guidotti rule:** reserves  $\geq$  short-term external debt + the current account deficit (when it is  $\geq 0$ );
- **The ratio of foreign reserves to money base** (100%) or broad money supply (100% - for countries with currency board regimes)

- *New IMF criterion:*
  - for countries with fixed ER:  
**30% of STD + 15% of OPL + 10% of M2 + 10% of X**
  - for countries with floating ER:  
**30% of STD + 10% of OPL + 5% of M2 + 5% of X**

Here: STD – short-term debt; OPL – other external portfolio liabilities; M2 – broad money; X – exports.

## **Recommended literature**

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