

February 6, 2009

Ukraine: Currency and Economic Outlook 2009

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This note presents TBF's forecasts for key economic parameters for Ukraine in 2009, including its foreign exchange rate.

The forecasts are based on a detailed, product-by-product, projection of exports, imports, other GDP components (consumption, investments, and government expenditures/deficits), money supply, domestic credit, international financing available, etc. Based on this information, we used a consistent and rigorous macroeconomic accounting model to determine how a particular combination of domestic and international economic and financial factors will influence the evolution of the Hryvnia exchange rate

Our three scenarios – base, optimistic and pessimistic, yield the following average exchange rates for 2009:

	Average Exchange rate in 2009, UAH/\$	Scenario Probability
Base	9.1	50%
Optimistic	8.2	10%
Pessimistic	11.1	40%

Key economic statistics of these three scenarios are presented in the table below (for complete data see Appendix 1):

	2008(e)	2009(f)		
		Base	Optimistic	Pessimistic
GDP, UAH billion	943	1 020	1 023	1 108
GDP, \$ billion	181	112	125	100
GDP per capita, \$	3 910	2 427	2 702	2 161
GDP growth, % yoy	2.1	-5.0	-4.0	-7.0
Average Inflation, %	25.2	19.5	18.1	26
Money Supply, nominal % change	29.9	5.4	11.4	5.7
Domestic Credit, nominal % change	78.6	6.0	7.3	5.4
Current Account Balance, \$ billion	-11.9	-4.1	-3.1	1.2
Current Account Balance, % of GDP	-6.7	-3.6	-2.5	1.2
Exports of Goods, \$ billion	67.7	54.0	57.0	47.4
Imports of Goods, \$ billion	83.6	62.8	65.7	50.1
FDI, \$ billion	9.9	4.0	4.5	3.5
Fiscal deficit, % of GDP	-1.5	-0.5	0.0	-2.5

All three scenarios forecast negative GDP growth but with different contraction rates. In fact, since Ukraine is an open economy, it is hard to see how it could achieve a positive growth in exports and GDP given the current international recession. First, recent economic growth in Ukraine (and its exchange rate stability) was mostly supported by cyclically high commodity prices and abnormal inflows of foreign capital. Both factors will weaken considerably in 2009, which will cause the

external financing gap to widen in all scenarios. Second, global investors have been radically adjusting their risk assessment of the emerging markets. This means that foreign capital flows will remain extremely sensitive toward changes in investors' sentiments, which have been deteriorating. Third, the Ukrainian banking system remains very vulnerable to solvency risks as the number of delinquent loans increases. The current environment will bring more personal and corporate bankruptcies, which creates a more challenging environment for banks to refinance maturing foreign debts.

The Base Scenario is the most likely one, with a 5% contraction in GDP (as forecasted by us and most international agencies) and the exchange rate averaging about 9.1 UAH/\$. In **the Pessimistic Scenario** we expect GDP to decline by 7% and the exchange rate to depreciate to about 11.1 UAH/\$. In this scenario, the depreciation pressure will emerge principally because of the inability to roll-over short debt, despite the fact that under this scenario imports will decline faster. In the **Optimistic Scenario** the country will still face negative growth (-4%). But in this scenario, foreign exchange requirements will be almost balanced (thanks in part to the IMF and World Bank financing), and therefore the exchange rate should not move substantially from current levels.

These three scenarios are discussed in more detail below:

Base Case Scenario

Our base scenario assumes that the global economy remains weak, while a gradual recovery starts in the last quarter of 2009. This means that the external demand for the Ukrainian iron and steel (commodities, which generate about 34% of the country's exports of goods) continues to fall. As a result, exports of these commodities decline on average by 10-15% in quantities, while prices fall by another 10-15% (see Appendix 3 for detailed data on exports of goods). Real GDP shrinks by 5% as falling incomes and employment exert a heavy toll on private consumption (down by over 13% in real terms), while lower corporate profits, tight access to credit and weak investors' sentiments reduce capital spending (investments are down by 17% yoy in real terms).

On the positive note, weak domestic demand and lower world crude oil prices (we assume that in 2009 crude oil will cost \$50 per barrel on average in our base scenario) help to curb imports of goods, which decline by over 20% in real terms (see Appendix 2 for detailed data on imports of goods). In addition, this lower demand for imports tends to mitigate the negative impact of the gas price increase on the current account balance. As a result, the current account deficit narrows to \$4 billion or about 3.5% of GDP.

The government sees a fall in tax revenues, however a willingness to secure the next tranche of the IMF loan forces authorities to amend the budget and run a modest deficit of -0.5% of GDP by the end of the year. The IMF loan program continues, although its temporary suspension or a delay with the arrival of funds is not ruled out. Still, Ukraine manages to negotiate the deployment of the entire \$9.9 billion loan allocated for 2009 (out of the \$16.4 billion loan granted to Ukraine by the IMF). The continuation of the IMF program will help to maintain investors' confidence at a comfortable level, which facilitates the refinancing of maturing external liabilities of the private sector. However, tight international liquidity conditions and global risk aversion imply that the inflows of foreign capital (both as FDI and loans) remain modest. In particular, FDI inflows are projected at \$4 billion (compared to \$10 billion in 2008), while commercial banks manage to refinance about 40% of their maturing external debts (or about \$7 billion out of \$16.8 billion which banks have to repay in 2009). All this creates the net foreign exchange needs of about \$6.4 billion, which can be comfortably handled with \$31 billion in gross reserves of the NBU as of end 2008.

As a result, depreciation pressures on the exchange rate remain manageable, and the average exchange rate settles at around 9.1 UAH/\$ in 2009.¹

Risks to the base scenario: We attach the highest likelihood to this scenario; however a failure to secure IMF financing is likely to push the economy into the pessimistic scenario (see description below). This means, that the outcome of the ongoing political tensions over the budget amendments will determine economic trends in the medium-term. In case the government fails to minimize the budget gap, pressures on the exchange rate will almost certainly intensify. Furthermore, significant downward risks to the outlook of the global economy are still present. An inefficient, delayed and unsynchronized implementation of the global fiscal stimulus and banks' recapitalization will put the world economy on the path of slow and tepid economic recovery. This, in turn, significantly increases the probability of the pessimistic scenario in Ukraine.

Optimistic Scenario

In our optimistic scenario we assume that the global economy enters a solid recovery path in the second half of 2009, while global financial markets stabilize and resume functioning in a normal mode. The key precondition for this scenario is that stabilization packages and bank recapitalization programs, which are currently being implemented by the governments worldwide, are deployed and help restore confidence of investors and consumers. This implies that the demand for Ukrainian exports weakens less than in the base scenario. In particular, exports of goods decline by about 6% in real terms (see Appendix 3) to \$57 billion (\$67.7 billion in 2008), which helps to soften a contraction of the real GDP. Still, slower growth of incomes and increasing unemployment as well as tighter credit conditions push Ukrainian consumption and investments down by 12.5% and 16% in real terms, respectively, and the real GDP declines by 4%.

Although, we assume that the global commodity prices will be higher in the optimistic scenario, currency devaluation and a decline of real incomes trigger a considerable reduction of imports of goods, albeit smaller than in the base scenario (see Appendix 2). The current account still remains in the deficit, yet stronger exports help to achieve a modest improvement. In particular, the current account deficit narrows to about \$3 billion or about 2.5% of GDP. In addition, we believe that more favorable external conditions will help to ensure higher volumes of workers' remittances from abroad (in 2008, net transfers amounted to \$3.9 billion), which further lowers the current account deficit.

The government still suffers from the revenue shortfalls, yet it commits to the balanced budget to avoid tensions with the IMF and insure timely deployment of the IMF loans. A balanced budget implies that the government consumption will grow slower than in the base scenario, yet it also means that inflationary pressures from the fiscal policy will be minimal. As a result, in our optimistic scenario Ukraine is able to maintain the lowest inflation rate – 18% on average in 2009.

Prudent fiscal policy and lower inflation help to lift investors' sentiments, which may result in higher FDI inflows, projected at \$4.5 billion. In addition, the private sector is more likely to rollover its maturing external debts. For example, we believe that banks will be able to refinance about 50% of their \$16.8 billion of external debts to be repaid in 2009. In addition, since our optimistic scenario rules out fresh disruptions at the international financial markets in 2009, we believe that parent banks of the foreign-owned Ukrainian banks will be more willing to grant additional funds to their

¹ See Appendix 4 for a detailed description of the equilibrium exchange rate.

subsidiaries in Ukraine once the financial markets in their home countries stabilize. This may help to increase the refinancing rate of the external liabilities of the Ukrainian banks as well.

Thus, the net foreign exchange needs fall to \$3.3 billion, which allows to support the exchange rate at about 8.2 UAH/\$ on average in 2009.

Likelihood of the optimistic scenario: Our optimistic scenario may realize if the global economy begins to recover in the second half of 2009. Alas, the possibility of this scenario mostly depends on the magnitude and expediency of the stabilization policies of the governments of the largest developed and developing nations, as we still believe that the sentiments in the private sector will remain subdued. Thus, the role of the public sector remains fundamental to the recovery of the global economic activities. Although, there is a positive probability that a synchronized fiscal response may lift world GDP growth in 2009, we still believe that the odds are in favor of a more reserved economic recovery as increasing global unemployment and tight credit conditions will constraint private demand. All told, there is positive, albeit rather modest, possibility of the optimistic scenario in Ukraine. Moreover, we believe that global fiscal stimulus is more likely to considerably improve the likelihood of the base scenario in Ukraine rather than to push the Ukrainian economy into the optimistic scenario.

Pessimistic Scenario

In our pessimistic scenario Ukraine faces a combination of the deep global slowdown and unbalanced domestic macroeconomic policies. In this case, demand for Ukrainian exports of goods decline sharply by about 15% in real terms to \$47 billion, which brings a drop in real GDP to 7%. However, a deeper decline of consumption and investment demand (consumption and investment fall by 18% and 26% in real terms, respectively) causes a considerable adjustment of imports of goods, which shrink to \$50 billion. This helps to push the current account balance into the surplus, which amounts to \$1.2 billion or 1.2% of GDP. This result is broadly consistent with our analysis of the past financial crisis in the emerging economies. In particular, a weaker currency and a sharp reduction in private demand help to achieve a considerable improvement in the current account balance:

	time of crisis t	current account before the crisis (three years average), % of GDP	Current account after crisis (at t+1), % of GDP	GDP growth after crisis (at t+1), %	Currency devaluation at t+1, % change
Mexico	1994	-6.5	-0.5	-6.2	90.2%
Indonesia	1997	-2.9	4.3	-13.1	244.2%
Korea	1997	-2.5	11.7	-6.9	47.3%
Malaysia	1997	-6.7	13.2	-7.4	39.5%
Philippines	1997	-4.2	2.4	-0.6	38.8%
Thailand	1997	-6.1	12.7	-10.5	31.9%
Turkey	2000	-1.2	1.7	-5.7	96.0%
Argentina	2001	-2.9	8.6	-10.9	206.5%

This table also shows that there is a strong relationship between the level of GDP decline and currency devaluation – a deeper decline results in a weaker currency.

Source: World Bank: World Development Indicators

A less favorable economic environment in Ukraine erodes investors' confidence, which results in lower FDI inflows (projected at \$3.5 billion) and a lower refinancing rate of the banks' external debts, which is set at 30%. On top of that, the government runs a sizable budget deficit of 2.5% of GDP. As a result it fails to secure IMF financing and the net foreign exchange needs widen to nearly \$17 billion.

With \$31.5 billion in the NBU gross reserves as of end 2008, the exchange rate has to weaken to 11.1 UAH/\$ to balance Ukraine's external financing needs.

Finally, in the pessimistic scenario, we assume that the government is forced to run a large budget deficit to offset the impact of higher social spending and falling tax revenues. Indeed, a sharp deterioration of the economic environment (which is assumed in the pessimistic scenario) makes it especially hard for the government to credibly commit to the balanced budget. After all, Ukraine will have Presidential elections in 2009. Yet, rapidly falling living standards significantly reduce the odds of the incumbent politicians to win these elections. This makes a large budget deficit a default option (even at the cost of losing access to the IMF funds) in the pessimistic scenario, which brings higher unemployment and low budget revenues. This means that we can hardly expect the government to run a prudent fiscal policy if economic recession in Ukraine considerably deepens. True, fiscal expansion may mitigate GDP decline (which is reflected in the 1.2% real growth of government spending in our pessimistic scenario – see Appendix 1). However, we still believe that the fiscal space in Ukraine lacks capacity to produce a meaningful improvement in economic growth with fiscal stimulus (mostly because of the notoriously inefficient public governance). Thus, higher budget deficit in Ukraine will drive up consumer prices rather than increase output.

Possibility of the pessimistic scenario: Our pessimistic scenario may be triggered by the prolonged global economic slowdown, large budget deficit in Ukraine (which automatically results in the withdrawal of the IMF support) or both. However, we believe that a credible commitment of the government to the balanced budget (and thus, the arrival of the next IMF loan) will push the economy closer to the base scenario even if the world economy remains weak. All told, the probability of the pessimistic scenario (and, hence, the ensuring currency devaluation) depends on the strength of the budget discipline in Ukraine. Nevertheless, the health of the global economy remains a key factor, which influences the probability of a particular economic scenario. The government, however, may significantly mitigate the impact of the adverse external environment by pursuing a balanced fiscal stance.

Appendix 1: Summary Statistics

	2008 (e)	2009(f)		
		Base	Optimistic	Pessimistic
Nominal GDP, UAH billion	942.8	1 026.7	1 027.6	1 090.8
Real GDP, % change	2.1	-5.0	-4.0	-7.0
Private consumption, % yoy	9.4	-13.5	-12.5	-18.1
Government consumption, % yoy	0.4	-0.6	-0.9	1.2
Investments, % yoy	8.5	-17.0	-16.0	-25.5
Export of goods and services, % yoy	3.7	-12.5	-8.5	-20.0
Import of goods and services, % yoy	14.9	-25.0	-22.0	-36.5
GDP deflator, %	29.5	14.7	13.5	24.4
CPI average, %	24.1	19.5	18.1	26.0
Money Supply, (% change, nominal)	29.9%	5.4%	11.4%	5.7%
Currency in circulation, % change, nominal	39.3%	60.0%	50.0%	82.0%
Deposits in local currency, % change, nominal	5.2%	-18.8%	-5.0%	-27.3%
Deposits in foreign currency, % change, in \$ terms	15.0%	-14.2%	-4.5%	-18.3%
Domestic Credit (DC) (% change in Hryvnia terms)	78.6%	6.0%	7.3%	5.4%
DC to government authorities (% change)	247.7%	98.6%	74.3%	205.4%
DC in local currency to private sector (% change)	40.4%	12.3%	17.0%	8.0%
DC in foreign currency to private sector (% change, \$ terms)	33.5%	-4.1%	-4.5%	-10.0%
Fiscal deficit, % of GDP	-1.3	-0.5	0.0	-2.5
Current account balance, \$ billion	-11.9	-4.1	-3.1	1.2
Current account balance, % of GDP	-6.7	-3.6	-2.5	1.2
Foreign trade balance, \$ billion	-13.8	-6.6	-5.8	-0.8
Foreign trade balance in goods, \$ billion	-15.9	-8.8	-8.7	-2.7
Export of goods, \$ billion	67.7	54.0	57.0	47.4
Export of goods, % yoy (nominal change)	35.8	-20.2	-15.8	-30.0
Import of goods, \$ billion	83.6	62.8	65.7	50.1
Import of goods, % yoy (nominal change)	38.4	-24.9	-21.4	-40.1
Income balance, \$ billion	-2.0	-0.7	-0.8	-0.5
Transfers balance, \$ billion	3.9	3.2	3.5	2.5
FDI, \$ billion	9.9	4.0	4.5	3.5
	External debt financing need, 2009, \$ billion	External debt re-financing, new debt, 2009, \$ billion		
Government Authorities	1.5	2.0	2.0	1.5
Monetary Authorities		9.9	9.9	0.0
Banks	16.8	7.1	8.4	5.0
Short-term	9.3	3.9	4.7	2.8
Long-term	7.5	3.2	3.8	2.3
Other Sectors	26.6	18.7	19.0	16.4
Short-term	18.7	14.1	14.2	11.8
Long-term	7.9	4.7	4.8	4.6
Total	44.9	38.6	40.2	23.5
(1) External debt financial needs, \$ billion		44.9		
(2) Net external debt financing need s= ((1)-external debt refinancing), \$ billion		6.3	4.7	21.4
Net foreign exchange needs = ((2)+CA gap-FDI), \$ billion		6.4	3.3	16.7
Exchange rate, UAH/\$	5.3	9.1	8.2	11.1

Appendix 2: Imports of Goods

	2008(e)	2009(f)								
		Base scenario			Optimistic scenario			Pessimistic scenario		
		\$ billion	% change		\$ billion	% change		\$ billion	% change	
			nominal	real		nominal	real		nominal	real
TOTAL	\$83.6	\$62.8	-24.9	-20.3%	\$65.7	-21.4	-18.0%	\$50.1	-40.1	-29.4%
Mineral products	\$24.9	\$20.2	-18.9	-10.3%	\$21.2	-14.8	-9.2%	\$18.5	-25.8	-14.3%
Machinery	\$13.2	\$10.3	-22.0	-18.0%	\$10.4	-20.9	-16.8%	\$7.4	-44.0	-37.8%
Transport vehicles	\$11.9	\$6.9	-42.1	-40.3%	\$7.5	-36.5	-34.5%	\$4.9	-58.9	-54.4%
Chemicals	\$6.9	\$6.2	-9.6	-6.8%	\$6.3	-7.7	-4.7%	\$5.0	-26.7	-17.2%
Metallurgy	\$6.3	\$3.9	-38.5	-28.1%	\$4.1	-35.2	-27%	\$3.1	-51.3	-36.0%
Other (Foods, Textile and apparels, Wood products, etc.)	\$20.5	\$15.4	-24.9	-19.6%	\$16.1	-21.4	-15.1%	\$11.3	-44.9	-41.1%
Natural gas price, average \$ per 1000 m3, average	\$179.9				\$218.0					
Crude oil price, \$ per barrel, average	\$88.9	\$50.0			\$60.0			\$45.0		

Appendix 3: Exports of Goods

	2008(e) \$ billion	2009(f)								
		Base scenario			Optimistic scenario			Pessimistic scenario		
		\$ billion	%change		\$ billion	%change		\$ billion	%change	
			nominal	real		nominal	real		nominal	real
TOTAL	\$67.7	\$54.0	-20.2%	-9.2%	\$57.0	-15.8%	-6.2%	\$47.4	-30.0%	-14.7%
Iron and steel	\$23.20	\$17.51	-24.50%	-10.70%	\$18.59	-19.90%	-6.70%	\$14.72	-36.60%	-17.60%
Agricultural products, foods	\$9.04	\$7.07	-21.80%	-12.70%	\$7.67	-15.20%	-5.40%	\$6.55	-27.60%	-13.10%
Mineral fuels, oils, distillation products, etc	\$4.13	\$2.74	-33.60%	-0.50%	\$2.68	-35.10%	-2.00%	\$2.02	-51.00%	-14.80%
Chemical products	\$3.63	\$2.76	-24.10%	-6.50%	\$2.83	-22.00%	-6.50%	\$2.51	-30.80%	-10.80%
Machinery and apparatus	\$3.46	\$3.23	-6.60%	-7.40%	\$3.23	-6.60%	-7.40%	\$2.99	-13.50%	-12.10%
Articles of iron and steel	\$3.41	\$2.73	-20.10%	-3.90%	\$2.77	-18.90%	-3.90%	\$2.33	-31.80%	-10.70%
Electric equipment	\$2.86	\$2.82	-1.40%	-8.70%	\$3.04	6.10%	-8.70%	\$2.48	-13.50%	-11.70%
Railway cars, wagons	\$2.63	\$2.24	-14.80%	-11.60%	\$2.40	-8.50%	-6.80%	\$1.94	-26.20%	-21.10%
Rubber, wood products, paper	\$2.37	\$1.82	-23.20%	-11.00%	\$2.05	-13.40%	-7.20%	\$1.68	-29.10%	-16.50%
Oars	\$2.19	\$1.48	-32.50%	-14.90%	\$1.74	-20.40%	-11.50%	\$1.27	-42.20%	-15.70%
Minerals	\$2.14	\$2.07	-3.50%	-4.90%	\$2.17	1.30%	-4.20%	\$1.87	-12.80%	-8.90%
Foods and tobacco	\$1.60	\$1.49	-7.00%	-6.70%	\$1.46	-8.90%	-5.80%	\$1.42	-11.50%	-7.20%
Transportation vehicles	\$1.23	\$0.81	-34.00%	-30.20%	\$0.91	-25.80%	-23.80%	\$0.72	-41.20%	-36.50%
Glass, non-ferrous metals	\$1.12	\$0.82	-26.50%	-8.20%	\$0.84	-24.80%	-5.90%	\$0.79	-29.00%	-10.10%
Live animals, diary products, fruits, vegetables, coffee	\$1.06	\$1.05	-0.80%	1.60%	\$1.10	3.40%	3.20%	\$0.96	-9.20%	-0.50%
Clothing, footwear	\$0.96	\$0.89	-6.50%	-3.60%	\$0.95	-0.80%	-0.70%	\$0.82	-13.80%	-10.90%
Salt, stone, plaster, lime and cement	\$0.79	\$0.72	-8.70%	-8.40%	\$0.74	-6.80%	-6.50%	\$0.72	-9.60%	-9.20%
Optical, measuring equipment, clocks, furniture, other	\$0.71	\$0.73	2.80%	5.40%	\$0.75	4.90%	5.40%	\$0.63	-11.50%	-8.70%
Boats, aircraft	\$0.37	\$0.30	-19.10%	-18.40%	\$0.30	-19.10%	-18.40%	\$0.27	-26.40%	-22.20%
Stone, asbestos, ceramics	\$0.31	\$0.28	-9.20%	-8.40%	\$0.29	-6.50%	-5.60%	\$0.26	-14.80%	-13.90%
Tin, articles of base metals	\$0.31	\$0.29	-4.20%	-3.10%	\$0.30	-3.20%	-2.10%	\$0.27	-11.20%	-7.10%
Silk, textiles	\$0.20	\$0.19	-6.00%	-6.00%	\$0.19	-3.00%	-3.00%	\$0.18	-8.00%	-8.00%

Appendix 4: Equilibrium Exchange Rate

			<i>2009(f)</i>			
			Base scenario	Optimistic scenario	Pessimistic scenario	
<i>Real Sector</i>	1	GDP	UAH mln	1 026 721	1 027 555	1 090 844
	2	Final Consumption	UAH mln	813 242	806 462	833 188
	3	Gross Capital Formation	UAH mln	273 378	268 767	266 414
	4	Net Exports (1-2-3)	UAH mln	-59 899	-47 674	-8 758
<i>Monetary Sector</i>	5	ΔMS	UAH mln	54 074	66 181	71 038
	6	ΔNDC	UAH mln	68 416	78 522	105 011
	7	<i>Net Other Assets (NOA)</i>	UAH mln	40 000	40 000	40 000
	8	(5-6-7)	UAH mln	-54 343	-52 342	-73 972
	9	ΔMS(foreign currencies)	\$ mln	-2 884	-916	-3 817
	10	ΔNDC(foreign currencies)	\$ mln	-2 310	-2 535	-5 634
	11	(9-10)	\$ mln	-575	1 619	1 816
<i>Balance of Payments</i>	12	Current Account	\$ mln	-4 075	-3 073	1 217
	13	Trade Balance	\$ mln	-6 575	-5 773	-783
	14	Net Factor Income	\$ mln	-700	-800	-500
	15	Current Transfers	\$ mln	3 200	3 500	2 500
	16	Financial Account	\$ mln	-2 300	-200	-17 890
	17	FDI	\$ mln	4 000	4 500	3 500
	19	Total Borrowed Capital (TBC)	\$ mln	-6 300	-4 700	-21 390
	20	TBC of the Banking System	\$ mln	156	1 500	-11 800
	21	Financing gap of the BoP (12+16-20)	\$ mln	-6 531	-4 773	-4 873
	22	Equilibrium Exchange Rate [8/(21-11)]	UAH/\$	9.1	8.2	11.1

MS – Money Supply

DC – Domestic Credit

NDC – Net Domestic Credit

Our calculations of the equilibrium exchange rate (*ExR*) are based on the national accounts and the balance sheet of the banking system.

An equilibrium exchange rate is achieved when the financing gap of the balance of payments and a change in the net foreign assets of the banking system are balanced.

$$ExR \times (CAB + FAB - NFB_{BS}) = NFA$$

$$MS = DC + NFA$$

CAB – current account balance, CAB = TB (trade balance) + NFI (net factor income) + NTr (net transfers)

FAB – financial account balance, FAB = FDI + NFB (net foreign borrowings)

NFB_{BS} – net foreign borrowings of banking system (commercial banks and monetary authorities)

ExR – Exchange rate UAH/USD

MS – money supply

DC – domestic credit

NFA – net foreign assets

$$\begin{aligned}
 ExR \times (CAB + FAB - NFB_{BS}) &= MS - DC = (MS_{UAH} + MS_{\$} \times ExR) - (DC_{UAH} + DC_{\$} \times ExR) \\
 ExR \times (CAB + FAB - NFB_{BS}) &= ExR \times (MS_{\$} - DC_{\$}) + (MS_{UAH} - DC_{UAH}) \\
 ExR &= \frac{MS_{UAH} - DC_{UAH}}{(CAB - FAB - NFB_{BS}) - (MS_{\$} - DC_{\$})}
 \end{aligned}$$

The equilibrium exchange rate should also balance the savings-investment gap of the real sector with the balance of payments.

$$\begin{cases} S - I = CAB \times ExR \\ S = GNDI - C = GDP + NFI + NTr - C \end{cases} \Rightarrow GDP - C - I = NX = TB \times ExR$$

GDP = C (private and government consumption) + I (investment) + NX (net exports)

GNI (gross national income) = GDP + NFI (net factor income)

GNDI (gross national disposable income) = GNI + NTr (net current transfers)

To conclude, these calculations allow us to gauge the level of the exchange rate that is consistent with macroeconomic developments in all three scenarios. That is, this exchange rate allows for the closure of the savings-investment gap of the real sector as well as balances the aggregate balance sheet of the banking system. Thus, it shows us the direction and magnitude of the adjustment of the hryvna exchange rate as a response to a given composition of domestic and external economic and financial developments.