Impact of exchange rate on inflation rate

Over the past several years exchange rate was the variable which had the swiftest and strongest impact on inflation and inflation expectations, the relevance of this transmision channel of monetary policy being enhanced by the fact that net foreign assets represent the main source of money creation*.

The relation between exchange rate and inflation rate can be highlighted by an error correction model (ECM). The specification of ECM consists of two equations: a co-integration equation for the long-term equilibrium relation between the variables used and an equation for the short-term development of the dependent variable due to the variation of independent variables and the disruption of equilibrium.

The ECM using as variables the consumer price index and the ROL/USD nominal exchange rate has the following specification:

$$IPC_t = \beta + \chi ER_t + u_t$$

(equilibrium equation);

$$\Delta IPC_t = \alpha + \lambda u_{t-1} + \delta \Delta ER_t + \phi \Delta IPC_{t-1} + v_t$$

(short-term development equation);
where:

IPC – consumer price index (in logarithm);
ER – ROL/USD nominal exchange rate (in logarithm);
u, v – residual terms of regression equations;
Δ – first difference operator;
α, β – constants;
χ – long-term elasticity coefficient of prices in terms of exchange rate;
λ – error correction coefficient;
δ – coefficient showing how much of the ROL depreciation against the USD turns into inflation;
ϕ – inflation persistence coefficient.

The estimates of the two equations for January 1999-December 2002 are shown in the tables below:

Dependent Variable: IPC
Method: Least Squares
Sample: 1999:01 2002:12
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.710196	0.173946	4.082846	0.0002
ER	1.095097	0.017261	63.44186	0.0000
R-squared	0.988700	Mean dependent var		11.74036
Adjusted R-squared	0.988455	S.D. dependent var		0.347841
S.E. of regression	0.037375	Akaike info criterion		-3.694839
Sum squared resid	0.064258	Schwarz criterion		-3.616872
Log likelihood	90.67612	F-statistic		4024.871
Durbin-Watson stat	0.262000	Prob (F-statistic)		0.000001

** Dorina Antohi, Ioana Udrea, Horia Braun – Monetary Policy Transmission Mechanism in Romania, Occasional Papers No. 3, National Bank of Romania, 2003*

Dependent Variable: D(IPC)

Method: Least Squares

Sample (adjusted): 1999:02 2002:12

Included observations: 47 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011027	0.002985	3.694337	0.0006
RESID (-1)	-0.076109	0.040222	-1.892219	0.0652
D (ER)	0.344164	0.065344	5.266935	0.0000
D (IPC(-1))	0.233688	0.115920	2.015950	0.0501
R-squared	0.544874	Mean dependent var		0.025056
Adjusted R-squared	0.513121	S.D. dependent var		0.013004
S.E. of regression	0.009074	Akaike info criterion		-6.485529
Sum squared resid	0.003541	Schwarz criterion		-6.328069
Log likelihood	156.4099	F-statistic		17.15977
Durbin-Watson stat	2.012084	Prob(F-statistic)		0.000001

where:

IPC – consumer price index (in logarithm);

ER – ROL/USD nominal exchange rate (in logarithm);

D(IPC) – inflation rate;

D(ER) – exchange rate development;

resid – residual term of the co-integration equation.

Error correction coefficient resulting from the estimation suggests a swift adjustment of prices to exchange rate shocks. Moreover, the model shows that about 34.4 percent of the inflation rate development is explained by the exchange rate development.

According to variance decomposition of a bivariate VAR model between inflation rate and exchange rate development for the same period, inflation rate fully adjusts to an exchange rate shock after 4-5 months and around 45 percent of inflation rate change is due to exchange rate change.

Percent determined by exchange rate change