

**THE FACTORS AFFECTING THE INTERNATIONAL JUDGEMENT OF THE FORINT AND ZLOTY IN
THE LIGHT OF THE FINANCIAL CRISIS OF YEAR 2008^(a)**

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ABSTRACT

The financial crisis of 2007-2009 has shaken both money and capital markets. Its consequences have not even left European markets untouched and divided spirits in the financial world. In some countries efforts by the monetary policy to protect the national currency throughout the crisis seemed to be ineffective.

In the present paper we are investigating the effect of the most important macroeconomic and economic policy factors on the exchange rate of the forint and zloty in the last decade. For an analysis of exchange rates we are relying on some preceding research results based on equilibrium exchange rate theories.

I. THEORETICAL FOOTINGS

Since the collapse of the Bretton Woods system of fixed exchange rates, more and more countries have shifted to the application of a free float or at least a dirty float regime. The economic literature is abundant in model approaches which try to interpret the behaviour of exchange rates. Most of these exchange theories take the PPP (purchasing power parity) as a starting point for analysis whose relative form derives exchange movements from inflation differences for a given time horizon. Since the 90s the attention of research efforts has been directed to the elaboration of equilibrium exchange rates which interpret exchange fluctuations by a great number of variables in addition to price level changes.

Hungary and Poland, two advocates of the eurozone, have committed themselves to sooner or later fix their currencies value to the euro. On their way of convergence it is getting timely to reassess what exchange rate would be the right choice for final fixation of national currency to euro to ensure macroeconomic stability in the long run. As the two countries face similar problems on their way to euro, as the disinflation process has decelerated lately and state debt is sharply increasing, our analysis is going to focus on the examination of the currency movements of the Hungarian forint and the Polish zloty with the help of equilibrium exchange relationships. (The debt to GDP ratio grew from 47% to 54% in Poland and from 73% to 79% in Hungary between 2008 and 2010. The other countries in the Central and Eastern European region do not bear the burden of a state debt exceeding 50% of GDP.) Since Poland introduced a floating regime in spring 2000 and Hungary a wide fluctuation band in 2001, there is a ten year time series available on how market forces influenced the value of the two currencies under investigation.

A basic – as it were a "textbook example" – theoretical model solution for defining equilibrium exchanges is offered by MacDonald (2000). It deduces the exchange rate at time t with the help of the zero sum of the current account and the capital account balance where the former is explained by the purchasing power parity and relative income differences and the latter by interest paid on reserve assets and the uncovered interest parity condition:

$$s_t = \nu_t - \nu_t^* + \alpha (y_t - y_t^*) - \beta (nfa_t - nfa_t^*) - \gamma (i_t - i_t^*) - \Delta (s_{t+k}^e - s_t) \quad (1)$$

where s_t is the equilibrium exchange rate of time t , p_t is the price level, y_t is the logarithm of the macro income of the given period, nfa_t is the interest paid after net foreign assets, i_t is the rate of return of the period and s_{t+k}^e denotes the value of expected exchange rate at time $t+k$ (the asterisk signals the corresponding variables of the foreign country whose price is given by s_t).

In the above relation for floating rates, the positive effect of real exchange depreciation on trade balance, the negative effect of domestic income and the balance improving effect of relative interest premium on capital accounts are reflected. The equation provides a statistical equilibrium for the exchange rate and though it does not count with stock-flow deviations, it serves a good basis for internal-external equilibrium approaches.

^(a) Acknowledgements: For useful constructive comments and suggestions we are grateful to anonymous reviewers and B&ESI Conference Participants; all errors remain ours.

The internal-external equilibrium conceptions – including fundamental equilibrium exchange theories – endeavour to define an exchange level (which can be interpreted mostly from a normative point of view), in that internal balance is underpinned by full employment and an output level at low inflation, whereas external balance is ensured by net savings and the current account identity corresponding under the given internal conditions.

The approaches purely based on PPP relations can duly be questioned even in the Casselian conception of exchange formation, as in addition to exchange rate changes it is necessary to take account of – among others – the presence of transaction costs and temporary interest deviations. The CHEER (capital enhanced equilibrium exchange rate) for the same reason combines purchasing parity relations with uncovered interest parity, in which the interest difference existing between the two countries is not interpreted as simple short-term effect but as a persistent phenomenon. Furthermore, the PPP based exchange estimation is often – especially in the case of comparing the currency price of a less developed country to a more developed one – supplemented by the Balassa-Samuelson effect¹. This effect can better detect the productivity growth differentials prevailing between the two countries which – according to the most important finding of the theory – accounts for the dissimilar price level development of the tradable and non-tradable (tertiary) sector goods and its impact on real exchange rates. While the models composed following the above economic argumentation among variables lacking a consistency in stock-flow measures and therefore raising numerous statistical problems, they can still provide a good approximation of the medium-term level of equilibrium exchange level.

An interesting approach is delivered by the (BEER) behavioural equilibrium exchange rate theory, which is at present applied in the everyday practice of a great number of research institutes and international financial institutions – among others the IMF – and was primarily developed by its theoreticians – see MacDonald (1997) for instance – to explain the formation of real effective exchange rates determined by economic fundamentals. The equilibrium exchange theories has both a normative and positive interpretation: in the first case the model is set up to assess the value of the currency which is theoretically supportable. In contrast the positive approach, which can only be verified empirically, is directed at the econometric examination of the relation between the exchange rate and variables (fundamentals) determining its path without assuming any economic reason behind the correlation of the particular variables and the exchange rate. The normative application has been attacked by much criticism (Bouveret, 2010), as it often intends to justify empirical results by theoretical reasoning, which can be questioned from a methodological point of view. Behavioural equilibrium exchange rates nevertheless often have well-established results which can be used for explaining the deviation of exchange rates from their historically given equilibrium path, and therewith for a valid judgement on the explanation of the overratedness or underratedness of currencies. For a good estimation of the above the vector error correction (VEC) model is a frequently applied technique.²

There have been a great deal of research efforts aimed at investigating the relation between the long-term development of exchange rates and the balance of payments, government finances, consumer habits, terms of trade and other macroeconomic variables. On the basis of Bouveret (2010) we can summarize some of the most important atheoretic model approaches of the last decade together with the most often used macroeconomic variables as follows:

<i>Authors</i>	<i>Variables</i>
Clark&MacDonald 1999	Terms of trade, productivity, NFA (net foreign assets), state debt, interest rates
Wadhvani 1999	Unemployment rate, current account balance, NFA, productivity
Kemme and Teng 2000	Real wages, economic openness, current account balance, government spending
Maeso-Fernandez, Osbat et al. 2002	Government purchases, productivity, NFA, government expenditure, interest rate, terms of trade
Benassy-Quere, Duran-Vigneron et al. 2004	NFA, productivity
Égert- Halpern et al. 2005	State debt, productivity, economic openness, external debt
Yajie-Xiaofeng et al. 2007	Terms of trade, Balassa-Samuelson effect, foreign reserves, money supply
Bęza-Bojanowska 2009	Government deficit, productivity, long-term government bond interest rates, NFA, terms of trade, state debt

Source: Bouveret (2010)

Clark and MacDonald (1999), in their original study on behavioural equilibrium exchange rates, distinguished the temporary, medium-run and long-run effects on exchange rates and explained the slow reversion of the exchange rate to its mean by real factors, such as the uncovered interest parity condition where expected exchange rate is estimated on the basis of permanent real factors such as the Balassa-Samuelson effect, terms of trade and net foreign assets. In practice it is conducted by (1) estimating a current equilibrium exchange rate, (2) calculating the deviation of the current exchange rate from its estimated value, (3) estimating a medium-run exchange rate and (4) expressing total misalignment, that is, the difference between medium-run (estimated) equilibrium and current exchange rate. The permanent equilibrium exchange rate theory led by similar consideration divides real exchange estimates into permanent and transitory (such as demand and supply shocks) components. It is well observable in the above table that explanatory variables to be employed for empirical analysis offer free space for creative intuition of researchers.

The present study does not endeavour to provide a comprehensive review of exchange theories nor to deliver economic theoretical conclusions on the basis of the above findings. Its primary focus is on revealing econometric relations between the nominal exchange rate and some underlying economic fundamentals with some essential statistical variables. For a better comparison of our conclusions and some preceding analysis of the Hungarian forint (HUF) and Polish zloty (PLN) we provide a brief summary of the results of Borowski, Brzoza-Brzezina et al. (2003), Bęza-Bojanowska (2009), Égert-Halpern et al. (2005) and Égert (2007) on factors influencing exchange rate dynamics in Central and Eastern Europe.

II. PRECEDING RESEARCH RESULTS

Borowski, Brzoza-Brzezina et al. (2003) already proclaim the Polish zloty as being ripe for ERM II. entrance and prove with PPP, fundamental and behavioural equilibrium exchange calculations that the market value of the currency does not show strong deviations from the theoretically justifiable equilibrium level. Furthermore, they approved the Balassa-Samuelson effect to account for a 1,2-1,7% annual appreciation of the real exchange rate and therefore recommend the central bank to revalue the currency (or let it appreciate) to keep the inflation low presuming that fiscal policy does not place an additional burden on monetary policy. Bęza-Bojanowska (2009) analyse data after the 1998 February last great intervention in the Polish foreign exchange market with the help of sophisticated statistical methodology (Johansen vector cointegration model, VAR models, ADF, KPSS tests) to assess the right choice of the central parity for ERM II. membership. As recommended by the ECB they relied on a broad set of economic indicators including the market rate to compute a theoretical equilibrium rate for the currency. When assessing the behavioural equilibrium exchange rate, the terms of trade, Balassa-Samuelson-effect, foreign reserves, the risk premium and the long-term differential of interest rates proved to be of significant explanatory power. During the permanent equilibrium rate analysis, real interest disparity shocks, shocks deriving from the Balassa-Samuelson effect and budgetary deficit appeared as dominant factors which justified that the zloty real exchange rate will be continuously set out to appreciation pressure during the real convergence process. They concluded that apart from direct and indirect monetary policy measures affecting exchange rate developments, fiscal policy will have to be conducted very cautiously to control for unfavourable exchange movements. Moreover, they found both – behavioural and permanent – approaches as adequate tools for calculation with the permanent equilibrium exchange rate being the effective way for projecting the right central parity under ERM II.

National bank experts of Hungary have also contributed to the enrichment of equilibrium exchange rate theories by comparing various theoretical conceptions and methodological issues; however, most of the available literature is limited (Vonnák-Kiss, 2003, Csajbók, 2003) and can better be discovered through the reviewing evaluation of Égert-Halpern et al. (2005) and Égert-Halpern (2005) together with other papers of the transition countries.

Égert-Halpern et al. (2005) ascertain that most currencies in Central and Eastern European countries were undervalued in the 90s and this underpricing has been disappearing lately also in the case of Poland and Hungary. They submit various economic factors contributing to exchange rate movements under thorough investigation and provide a subtle interpretation of their effect. As regards the Balassa-Samuelson effect, they point out that its contribution to real appreciation in transition economies is up to 2%, with Poland and Hungary leading the list. Apart from the difference in the productivity dynamics of the tradable and non-tradable sector, other effects such as capital endowment dynamics, pricing-to-market bias, home-product bias, change in the consumer preferences, distribution services, regulated prices and numerous other factors may account for changes in domestic price level affecting real exchange rates. They underline that higher tradable sector productivity in the domestic economy itself can cause real appreciation as productivity growth in the tradable sector can lead to higher demand for home market

products and therewith a domestic price level increase. Nominal exchange appreciation can also be a consequence of higher future productivity potential and might attract higher capital inflow into the domestic economy. Referring to Égert et al. (2003), they confirm that a similar tendency of the PPI and CPI indexed real exchange rates can be observed when measuring the real appreciation effect of relative price differences and taking account of non-tradables representing a low share in transition countries' CPI indices, Égert-Halpern et al. (2005) question the Balassa-Samuelson effect whether it really exerts strong influence on the relative growth rate of the price level of two countries. The fact that tradable sector products might include non-tradable market-determined and regulated market components makes the question even more complicated. They conclude, nevertheless, that dual (tradable and non-tradable) productivity differential – similarly to terms of trade and public consumption with less explanatory power – always has a positive impact on the real exchange rate in the studies focusing on exchange rate movements in the CEECs. As regards net foreign assets they find that contrary to what one may conclude, this variable can be a cause of depreciation as in the case of Hungary according to some studies (see Rahn (2003) and Alberola (2003) among others). Net foreign capital inflow though mostly appreciates currency, but in the medium run when interest is paid on foreign liabilities which creates current account deficit, it might turn out to have a negative impact on the currency's value. Conflicting results can be detected in the case of economic openness as well. As Égert-Halpern et al. (2005) suggest, this variable might therefore be replaced by the productivity indicators. Their comprehensive analysis also calls the attention to the importance of the quality and frequency of the underlying time series and the difference in panel regression results.

In a subsequent study Égert-Halpern (2005) take advantage of a meta-regression analysis to reassess empirical findings and conceptional statements on equilibrium exchange rates and investigate whether eight new EU member states' exchange misalignment is simply a result of the theoretical background of equilibrium exchange theories or of the statistical tool used for analysis. In the framework of the meta-regression they collect all relevant studies in the field and compare methodologies by revealing the set of dependent and independent variables, and use a dependent variable (here: currency misalignment) as common by approximating its value relying on all the independent variables used in various research studies and analyse samples between 1990 and 2002. The specific features of the various model constructions are captured with dummy variables in their investigation. They justify that different exchange rate theories (BEER, FEER, PEER) deliver different levels of currency misalignment and the methodology might also distort estimation results. Égert (2007) furthermore condemns the Balassa-Samuelson effect to slow dying off in the emerging European economies and calls the attention to other factors influencing price level convergence.

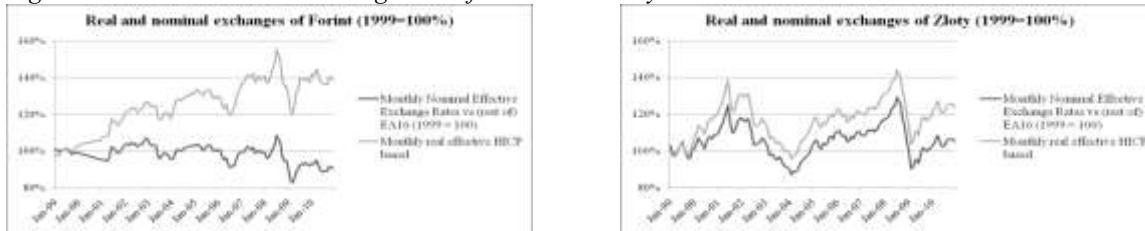
In addition to the literature on Central European currencies, an analysis of the Chinese Yajie-Xiaofeng et al. (2007) on the equilibrium exchange rate of the renminbi provides an interesting contribution to theoretical and methodological issues. They compute regressions on the basis of the following data: terms of trade, Balassa-Samuelson effect, foreign reserves (foreign reserves held with the central bank), change in the money supply. The Balassa-Samuelson effect is often captured by comparing the domestic consumer price index and the domestic wholesale price index (see for instance Clark and MacDonald, 1999). Yajie-Xiaofeng et al. (2007) inserted the per capita output measure for the numerical approximation of the same effect. They composed the logarithmised differentials of the indices and tested their results with the help of the Johansen maximum likelihood cointegration technique³ which is a widely used methodology for filtering out fallacious regression results. Their work provided incentives for the methodological construction of our model together with the suggestions on economic fundamentals offered by studies on the Central and Eastern European countries summarised above.

III. FOREIGN EXCHANGE CHARACTERISTICS IN POLAND AND HUNGARY

From the side of most Central European economies – being a member of the European Union – a strong commitment is detectable in the goal setting and measures taken by the monetary and fiscal authorities to eurozone membership. This dedication to euro introduction is also manifested in the way foreign exchange policy has shifted to a more flexible direction in the last 10-15 years. Poland introduced a free float system in April 2000 and Hungary followed suit in February 2008 (between 2001 and 2008 Hungary maintained a pegged currency regime to euro with a $\pm 15\%$ fluctuation band). Since the beginning of 2000 both countries have taken steps to prepare for a future ERM II. fixing of the currency and redirected the attention of central banks from exchange targeting to inflation targeting. Borowski, Brzoza-Brzezina, Szpunar (2003) even claimed that "...direct inflation targeting with a floating exchange rate seems to be a well designed monetary policy regime for a country like Poland. Thus, from our point of view, the quasi-fixed exchange rate system we have to go through in order to fulfill the Maastricht criteria cannot be

considered as a very tempting one.” (p. 6.) Poland in 2002 even came to a stage very close to fulfilling the Maastricht criteria and preceding 2008 showed a good performance apart from budgetary deficit exceeding 3% in most years in the period 2000-2010. Hungary successfully reduced its state debt under 60% by 2000 which was followed by a lavish fiscal policy between 2002-2006 – ending up in the standstill of the disinflationary process – and causing a great exposure to foreign financing of the government and even of the public by the time the crisis exploded. The 2008 global financial crisis, however, decelerated the convergence process of both countries and caused great fluctuations in the price of the two national currencies. Even Poland had to postpone ERM II. entry to around 2013 like Hungary whose financial situation after the crisis was especially unstable.

Figure 1 Nominal and real exchange rate of Forint and Zloty



Source: European economy

Presuming that the Mussa fact (1986) – that is, a strong correlation between the nominal and real exchange rate implies that nominal exchange rate movements are also dominated by real exchange factors -can also hold for the two countries under investigation (see figure 1), we are directly examining nominal exchange processes in the next chapter. This also gives some space for taking account of monetary processes and the relative purchasing parity condition, if applicable. The apparent correlation of the nominal and real exchanges is contrasted by the strong deviation of the nominal rate of the Hungarian currency in its dynamics from the real rate. In most inflation targeting Central European economies the real appreciation has taken place mostly through nominal exchange rate increase, apart from Hungary, where exchange rate was implicitly targeted even within the new monetary regime (Neményi, 2008). Hungary has had somewhat stronger export dynamics than Poland since 2000 and the much more peculiar economic openness of the country (150-170% compared to the Polish 80-85%) might explain why economic policy puts such a great emphasis on foreign exchange processes even if export performance can be enhanced even under continuous appreciation of the real exchange rate.

Figure 2 Real exchange and export dynamics in Hungary and Poland



Source: Eurostat, European economy

IV. EMPIRICAL EXAMINATION

During our examination we were relying on the monthly and quarterly statistics of the HUF/EUR and PLN/EUR (nominal) exchange rate between the period 2000 and the 4th quarter of 2010 and the monthly and quarterly statistics of some explanatory variables collected from the Eurostat and MNB (Hungarian National Bank) databases. The selected period was reasonable as the National Bank of Poland shifted to an independently floating regime in April 2000 and the Hungarian National Bank implemented a wide $\pm 15\%$ – band for a fixed currency regime in May 2001 – leaving a great room for manoeuvre for market forces before the changeover to a free float in 2008.

On the basis of the above described exchange theories and empirical findings and drawing on the basic current account equilibrium model of MacDonald (2000), the explanatory variables were selected according to the following equation:

$$s_t = \alpha_0 + \alpha_1 s_{t-1} + \alpha_2 (p_t - r_t^*) + \beta_1 (y / emp_t) - \beta_2 (y / emp_t^*) + \gamma (i_t - r_t^*) + \gamma (nfa_t) + \epsilon_t \quad (2)$$

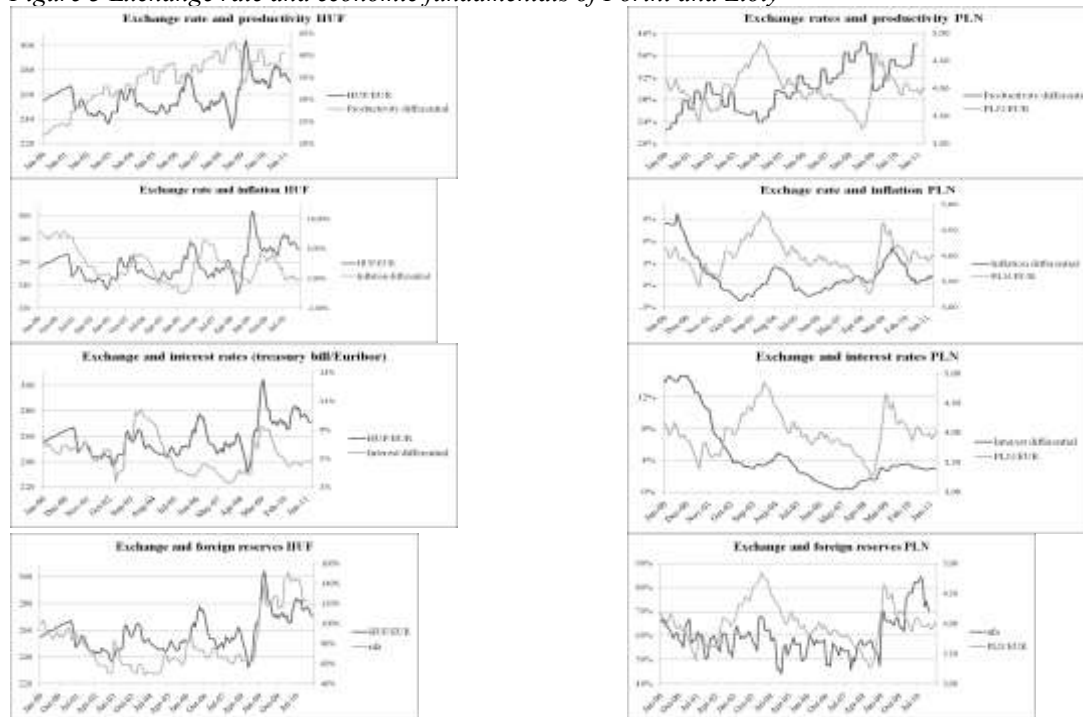
where s_t denotes the period t (s_{t-1} is the $t-1$) nominal exchange rate, p_t is the period t inflation, $y/empt$ is the productivity (GDP/employed persons), nfa_t is the net foreign assets (foreign reserves of the Hungarian National Bank) to GDP ratio, i_t is the 3-month interbank rate and u_t is the error term (variables marked by an asterisk stand for the same variables of the foreign sector). Besides these variables the interest differential between the 3-month treasury bill and Euribor were also considered for the analysis in the case of the Hungarian time series. This option was motivated by the fact that this interest differential proved to perform better results after the unfolding of the global crisis in explaining the exchange rate – especially in the short run – than the interbank rates in a former investigation. (Vámos 2010). The net foreign assets variable was also replaced by government debt/GDP as both countries suffer under the disadvantages of enormous debt services payable.

During the computation of the regression we employed the logarithmised values of data indexed to the average of 2005 for quarterly time series, whereas monthly data were simply transformed to their natural logarithm. With the two different time intervals we intended to illustrate the short- and long-term effects determining the extent and direction of fluctuations. The variables were designated to represent the classical purchasing power parity, uncovered interest parity conditions and the Balassa-Samuelson effect supplemented by other financial indicators (apart from net foreign assets, also government debt was taken into consideration) with possible bearing on nominal exchange rate. We also inserted a dummy variable to control above average exchange shocks between October 2005 and March 2007, as well as between January 2008 and September 2009 in the case of the forint and between January 2003 and August 2005, as well as January 2008 and September 2009 in the case of the zloty, which were partly precipitated by the speculative attacks against the two currencies or rather the global financial crisis.

We conducted the testing with the rejection of the variables, one by one and then reinserting them anew. The constant term was cast off first. Among all explanatory variables applied in the model the domestic productivity appeared with a characteristic positive and the foreign productivity with a strong negative sign in all the four models. The other variables involved in the models, the s_{t-1} (the $t-1$ period) nominal exchange rate, state debt, and interest differentials obtained dissimilar coefficients in the time series with variant periodicities, the net foreign assets variable showed a sizeable relation only for the monthly time series of the forint. During the examinations the three-months treasury bill and the three-month Euribor interest differential proved to be more significant than the three-months interbank rate differentials.

The expected relationship among variables involved in the model is well observable in diagrams below (Figure 3)

Figure 3 Exchange rate and economic fundamentals of Forint and Zloty



Source: NBP, MNB, ECB, Eurostat

In the regression estimates, monthly and quarterly time series traced slightly differing results in respect of some variables. In the quarterly time series, the Polish currency exchange movements were largely determined by productivity differentials (between Poland and eurozone) appreciating and government debt depreciating the currency with the interest differential component playing a less significant role in depreciation (table 2). In the Hungarian forint's case, similar tendencies were detectable with the exception that the lagged exchange rate proved to be significant (table 3).

Table 2: OLS regression results of the estimation of the Polish currency – quarterly statistics, using observations 2000:1-2010:3 (T = 43)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
y/emp _t	-0,769547	0,0960506	-8,0119	<0,00001	***
y/emp _t *	1,56576	0,323355	4,8422	0,00002	***
i _t -i _t *	0,460622	0,238018	1,9352	0,06024	*
debt to GDP	0,371581	0,0986388	3,7671	0,00055	***
R-squared	0,844521		Adjusted R-squared		0,832561

Table 3: OLS regression results of the estimation of the Hungarian currency – quarterly statistics, using observations 2000:1-2010:3 (T = 43)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
s _{t-1}	0,324518	0,0947185	3,4261	0,00148	***
y/emp _t	-0,262534	0,0514041	-5,1073	<0,00001	***
y/emp _t *	0,663909	0,199472	3,3283	0,00195	***
debt to GDP	0,222136	0,0490406	4,5296	0,00006	***
i _t -i _t *	0,688506	0,221584	3,1072	0,00357	***
R-squared	0,878623		Adjusted R-squared		0,865846

Among the explanatory variables of monthly time series the productivity differential, the government debt and the crisis dummy indicating salient fluctuations appeared as common determinant. The net foreign assets variable emerged in the Hungarian forint estimation, the preceding month's exchange rate exclusively in the Polish zloty regression equation significantly (table 4 and 5).

Table 4: OLS regression results of the estimation of the Polish currency – monthly statistics, using observations 2000:01-2010:09 (T = 129)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
s _{t-1}	0,705597	0,0445948	15,8224	<0,00001	***
y/emp _t	-0,16369	0,0273929	-5,9756	<0,00001	***
y/emp _t *	0,185625	0,0295918	6,2729	<0,00001	***
debt to GDP	0,159069	0,0296063	5,3728	<0,00001	***
dummy	0,0113936	0,00423016	2,6934	0,00805	***
R-squared	0,999765		Adjusted R-squared		0,999757

Table 5: OLS regression results of the estimation of the Hungarian currency – monthly statistics, using observations 2000:01-2010:09 (T = 129)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
y/emp _t	-0,254629	0,0290903	-8,7530	<0,00001	***
y/emp _t *	0,800363	0,0257112	31,1290	<0,00001	***
nfa _t	0,0473003	0,0152048	3,1109	0,00232	***
i _t -i _t *	1,07376	0,137636	7,8015	<0,00001	***

debt to GDP	0,13137	0,0458689	2,8640	0,00492	***
dummy	0,0115469	0,00561035	2,0581	0,04169	**
R-squared	0,999980		Adjusted R-squared		0,999979

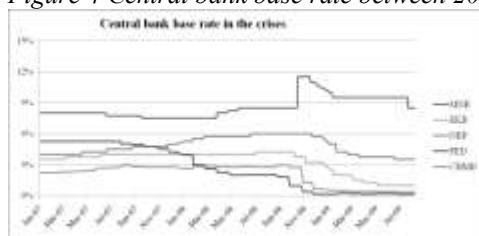
In sum, the results of the examinations reflect the expected economic relations: the domestic interest differential (or rather risk premium) and the government debt operated towards depreciation, the relative greater productivity dynamics of the domestic economy pushed the currencies towards appreciation. The dummy variable appeared as significant component in the equations with monthly data even during turbulent financial periods other than the recent crisis and captured market anomalies detrending the forint and zloty exchange rates (probably caused by psychological factors as interpreted by behavioural finance).

The effect of inflation could not be expressed numerically as this variable did not get a significant coefficient in the regressions which can be owing partly to the Balassa-Samuelson effect, in that productivity differentials substitute for relative price level increases, partly due to the nominal interest rates incorporating inflationary expectations. We did not decompose the Balassa-Samuelson effect into different sectors of production as this raises debated methodological questions and because the overall productivity differential itself is a very good long-term projector of exchange movements and enjoys a positive judgement even in the theoretical literature. Concerning the R^2 and t statistics we gained creditable results; however, in order to refine the estimation incidentally fallacious correlations should be filtered out and stationary processes separated which need further testing procedures. This methodological fine-tuning would however exceed the scope of the present study.

V. FINANCIAL MARKET PROCESSES DURING THE CRISIS

The fear of a financial collapse after the spread of the global financial crisis over Europe is perceptible in the interest decisions of central banks all over in the continent. The despairing efforts to avoid a liquidity crunch forced central banks to cut base rates to close to zero or to an ever so low level in the eurozone, Switzerland, Poland and other Central and Eastern European Countries.

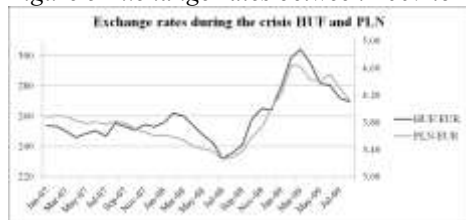
Figure 4 Central bank base rate between 2007 to 2009



Source: FED, ECB, CHNB, NBP, MNB

In contrast, the Hungarian monetary authority took a strange step and raised the base rate to 11.5% in October 2008 after the announcement of bankruptcy of American banks to attract foreign capital for the drying-up government securities market (Figure 4). Even at the beginning of 2009, central banks in most European countries did not change their interest policy and kept base rates at extremely low levels but the extended confidence crisis spurred investors to shun risk and flee capital into dollar, yen and Swiss franc investments.

Figure 5 Exchange rates between 2007 to 2009



Source: NBP, MNB



Even the one-time interest increase of the Hungarian National Bank could not counterbalance the capital flight as can be seen in the euro and Swiss franc exchange rates compared to the Hungarian forint from the above diagram (Figure 5). Similarly to leading central banks, the Polish central bank did not resort to interest lifting policy to offset the forceful impacts of the global economic imbalance.

At the beginning of the crisis the Polish economy also had to cope with negative, primarily external effects stemming from the global financial disequilibrium. The severe weakening of the currency price (the Polish zloty lost 33% of its value, the Hungarian forint fell by 24%) related to external factors and not to economic fundamentals (MTA, 2009). Financial investors suddenly cast the riskier investments on the market, thus the zloty and the forint became undervalued. The CDS spreads reached their peak in both countries in February-March 2009, about 630 basis points in Hungary and 420 in Poland (MNB, 2010). Both the depreciation of the zloty and the forint put an additional burden on the public as in both countries the foreign denominated housing loans accounted for 65-70% of all loans. In addition, because the Hungarian government was already severely indebted before the crisis, the debt-to-GDP ratio was close to 75% by the end of 2008.

The crisis passed on through the interbank market where the liquidity crisis together with the international economic slowdown caused a dramatic drop in industrial production, unemployment rose to unexpected levels and the deterioration of the export environment was inevitable even for Hungary. Though the crisis directly did not endanger the financial institutions in neither Poland nor Hungary, the loss in confidence, the declining liquidity and credit provision stimulated liquidity enhancing measures by the central banks and a crisis management package was elaborated in both countries. Hungary, furthermore, had to apply for IMF credit to finance government deficit and debt.

Figure 6 Financial market processes between 2007 to 2009



Source: www.stooq.com

VI. CONCLUDING REMARKS

The period of the crisis pointed out the short-term limitations of monetary policy. Our paper, however, focused on the illustration of long-term factors influencing exchange developments reflecting strong economic fundamentals. Our paper has shown that the most important macroeconomic variables affecting the long-term trend of the Hungarian and Polish currency are productivity and to a lesser extent government debt. For a better preparation for the entry to ERM II. in line with the above monetary and fiscal policy needs better harmonisation and account should be taken of the continuous pressure on exchange rates and inflation caused by the relative productivity dynamics compared to the eurozone, whether it is due to the Balassa-Samuelson effect or other price adjustment processes.

ENDNOTES

1. The formula describes the Balassa-Samuelson effect where β is the index of the non-tradable and α of the tradable sector, and γ stands for the productivity of the given sector. The two coefficients express the proportion of the labour input of the two sectors within total labour usage. The basis for the above relationship is a two-sector neoclassical model with perfect capital mobility and interest rate exogeneously given. The difference in the productivity dynamics (and therewith the tradable and non-tradable sector price level) betwween a less developed (more dynamic) and a more developed country may lead to real appreciation of the currency.(See Égert-Halpern-MacDonald (2005) for more details.)

2.

3. A process of testing which filters out series if time series data are individually integrated but their linear combination is of lower order.

REFERENCES

- Bęza-Bojanowska, J., "Behavioral and Permanent Zloty/Euro Equilibrium Rate", Central European Journal of Economic Modelling and Econometrics, Vol. 1, 2009, pp. 35-55.
- Borowski, J., Brzoza-Brzezina, M., Szpunar, P., "Exchange Rate Regimes and Poland's Participation in ERM II.", Bank i Kredyt 1/2003, NBP. Warsaw
- Bouveret, A., BEER Hunter: the Use and Misuse of Behavioural Equilibrium Exchange Rates. 18 April 2010. <http://antoine.bouveret.free.fr/topic/beer-hunter-afse-2010-bouveret.pdf> downloaded: 25.08.2010
- Chen, J., "Behavioral Equilibrium Exchange Rate and Misalignment of Renminbi: A Recent Empirical Study", Dynamics, Economic Growth, and International Trade, DEGIT Conference Papers, October 2006
- Clark, P. B., MacDonald, R., Exchange rates and economic fundamentals. A methodological comparison of Beers and Feers. In: Equilibrium exchange rates. (ed. by R. MacDonald and J. R. Stein, Kluwer Academic Publishers, United States, 1999)
- Égert, B., "Real Convergence, Price Level Convergence and Inflation Differentials in Europe", William Davidson Institute Working Paper, Number 895, October 2007
- Égert, B., Halpern, L., "Equilibrium exchange rates in Central and Eastern Europe: A meta-regression analysis", BOFIT Discussion paper, 4/2005
- Égert, B., Halpern, L., MacDonald R., "Equilibrium Exchange Rates in Transition Economies: Taking Stock of the Issues", William Davidson Institute, Working Paper Number 793, October 2005
- Losoncz, M., "A globális pénzügyi válság újabb hulláma és néhány világgazdasági következménye", Pénzügyi Szemle, LIV (1), 2009, pp. 9-24.
- MacDonald, R., Concepts To Calculate Equilibrium Exchange Rates: An Overview. Economic Research Group of The Deutsche Bundesbank: Discussion Paper 3/0, July 2000
- Magas, I., "Megtakarítások és külső finanszírozás az amerikai gazdaságban – A hitelpiaci válság háttere (1997-2007)", Közgazdasági Szemle, LV. (11), 2008, pp. 987-1009.
- Neményi, J., "A monetáris politika keretei Magyarországon", Hitelintézeti Szemle, 7 (4), 2008, pp. 321-334.
- Novák, T., Wisniewski, A., Az új EU-tagállamok és a tagjelöltek helyzete a válságban. A globális válság: hatások, gazdaságpolitikai válaszok és kilátások 11. kötet. (MTA Világgazdasági Kutatóintézet, 2009)
- Surányi, Gy., "A pénzügyi válság mechanizmusa a fejlett és feltörekvő gazdaságokban", Hitelintézeti Szemle, 7(6), 2008, pp. 594-597.
- Taylor, J. B., The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong. <http://www.stanford.edu/~johntayl/FCPR.pdf> downloaded: 20.06.2009
- Yajie, W., Xiaofeng, H., Soofi, A. S., "Estimating Renminbi (RMB) Equilibrium Exchange Rate", Journal of Policy Modelling, 29, 2007, pp. 417-429.
- Vámos, I., A forint nemzetközi megítélését befolyásoló tényezői a 2008-ban kirobbant válság tükrében. LII. Georgicon Napok nemzetközi tudományos konferencia. (Conference Paper, Keszthely, 30.09.2010)