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THE MONETARY APPROACH OF THE BALANCE OF PAYMENTS: EMPIRICAL EVIDENCES FROM EMERGING MARKETS

Abstract. *A country's balance of payments expresses the equilibrium between international commercial and financial inflows and outflows. In an increasingly globalized world, the (dis)equilibrium of such balance could have a significant impact on macroeconomic stability. Deficits or surpluses of different accounts from the balance of payments could have an impact on the exchange rate and the interest rate. The economic theory developed several approaches regarding the equilibrium of the balance of payments and specific public policies are used in this respect (tariff and non-tariff barriers, stimulus for exporting companies, subsidies, promoting activities for FDIs, improvement of country image etc.). One of the most sensitive problems in this matter of balance of payments' equilibrium is the manipulation of exchange rate (a depreciated currency is submitted to increase exports). This paper will present the two most important approaches in this field: elasticity approach and absorption approach and will provide a critical perspective on both theories. The assumptions of these approaches will be tested on the case of emerging markets (from Eastern and Southern Europe, Eastern and Southern Asia and Latin America) using panel regression methodology. The results will be very conclusive for the effectiveness of such using of depreciation or appreciation of local currency as a tool for temporarily improving the international position of emerging countries.*

Key Words: *balance of payments, elasticity approach, J-curve effect.*

JEL Classification: F31, F32, F41

1. INTRODUCTION

Balance of payments is a macroeconomic tool that is registering the aggregated international inflows and outflows of a country with the rest of the world. The balance of payments is operating with the following concepts: residents and non-residents operators (residency is defined based on the location of main activity or the location of

headquarter); economic territory (that could be different than national territory of a country) and two kinds of flows (real and financial flows). The transactions in the balance of payments are registered based on few accounting principles: [1] each account and sub-account of the balance of payments has a debit and a credit, the difference being calculated as a deficit (if credit position is less than debit position) and surplus (if credit position is higher than debit position); [2] the inflows are registered on credit position and the outflows are registered on debit position and [3] the overall deficit / surplus is null (the balance of payments should be totally equilibrated). There are transactions with counterparty (a credit granted by an international financial institution should be reimbursed later and the balance of payments will register both flows in different financial account's position) and without counterparty (a donation, a financial aid etc.). The structure of the balance of payments is standardized by IMF provisions into 3 major accounts: current account (that registers commercial balance, incomes and current transfers); capital account and financial account (foreign direct investments, foreign portfolio investment, external debt, short term claims and international reserves). An additional account is registering the errors and omissions (a higher net error would influence the credibility of the balance of payments).

Balance of payments is considered to be very important for the macroeconomic stability of specific countries: [1] the balance allows us to make comparative analysis of the dynamic and the structure of international financial and commercial flows; [2] it allows the evaluation of the comparative and competitive advantages of a specific country; [3] it gives an image on the external competitiveness of a specific country; [4] it is a good indicator for business attractiveness for residents and non-residents operators; [5] it is important to indicate the degree of openness for an economy and [6] it provides data for public policies (commercial policies, monetary policies, fiscal policies). Globalization significantly increased the importance of integration and participation to international exchanges for specific countries. Today is impossible to achieve sustainable development objective by refusing systematically to participate to this global market. These new opportunities came with new macroeconomic risks and challenges for all participants.

2. BALANCE OF PAYMENTS EQUILIBRIUM. MONETARY APPROACH

The balance of payments is structured into three major accounts (current account, capital account and financial account). Because there is a condition for overall balance to be equal to zero (no deficit or surplus), any deficit in one account should be compensated by a surplus in others. For instance, when a country face with a deficit in commercial balance (imports higher than exports), an additional surplus should be found in capital account (less important) or in the financial account. The solutions will be an increase in the volume of foreign direct investments, portfolio investments or international credit. International financial institutions play a significant role in this

respect, providing important resources for emerging markets. The openness of capital account improved the capacity of a country to work on deficit in the current account. It is important to mention the fact that a significant increase in the volume of international investments or credit will increase also the volume of incomes paid for such financings (interest rate, dividends etc.). In such case, a longer strategy to cover current account deficits (mainly generated by commercial balance) strictly by gathering international financings could be problematic for an emerging market (especially when such financings are done mainly for local sales and not for exports). International financings could be useful for a limited time and will increase the outflows in the current account (and therefore the overall deficit). From the perspective of BoP' equilibrium, more international financings will require more exports or more international financings. International reserves are considered also a good buffer for a temporarily support of international outflows. When a country has no solution to compensate deficits in commercial balance with surpluses of foreign investments and / or international credit, the only solution will be to increase the international reserves by selling local currency to population and companies, in order to withdraw foreign currency. In this case, local prices could significantly increase, local interest rate will increase and investments / consumption could decrease, therefore unemployment rate could be higher. Macroeconomic stability of a country is considered to be significantly affected by such structural imbalances in the international financial and commercial transactions.

This specific problem of BoP's equilibrium developed different approaches and theories and introduced specific macroeconomic policies for improving the deficits:

[1] *Fiscal policies*: tax facilities for exporters, tax facilities for importers of new technologies, tax facilities for international investors;
[2] *Commercial policies*: tariffs and non-tariffs measures like increases of duties, controls, documentary requirements for importing goods and services, special permits, import licensing;
[3] *Stimulating and promoting exports and foreign investments*: granting subsidies for participation to foreign exhibits for local companies, country image and rebranding, special conditions for export credit facilities, export insurances and export guarantees (usually a state owned bank is created for such purpose);
[4] *Monetary policies*: exchange rate depreciation, influencing the local real interest rate (a higher real interest rate could increase the foreign investments and savings).

One of the most interesting approaches of BoP's equilibrium is coming from classical economic theory and it is called "automatic adjustment". When countries operated with gold as money (gold standard and before), exchange rate between few existing currencies was fixed (due to the fact that each currency was expressed in a fixed quantity of gold or silver). In this case, when imports in a specific country increased, the demand for gold increased and gold became more expensive comparative to other goods and services locally traded. The only ways of obtaining gold were: [1] mining for new quantities of gold that could increase other prices in the economy expressed in gold (more labor is allocated for such activity and labor became scarcer for other sectors, capital goods could be more expensive because more capital is allocated for mining of gold) and [2] to try to sell more goods and services abroad to gather more gold and to sell it on the local market. Therefore, the situation of *balance of payments is automatically adjusted based on the need for gold to pay for higher imports*. Balance of payments has no need for other macroeconomic policies in such conditions. Exchange rate is influenced itself by the imbalances of the balance of payments. Higher exports than imports or higher foreign investments will appreciate the local currency and vice versa. The appreciation of currency (due to higher exports) will facilitate the imports that will become cheaper in local currency than local products. The depreciation of currency (due to higher imports) will facilitate the exports and the imbalance will be compensated soon without any monetary intervention.

The situation was more complex when fiat money was introduced in the economy. Exchange rate became more and more volatile after the link between money and gold was broken (exchange rate was not fixed anymore). Nowadays, exchange rate is seen by mainstream economists to be a very effective tool to equilibrate the balance of payments by producing an additional profit margin in local currency for exporters that will sell foreign currency at a more depreciated exchange rate. If a exporting company is buying a good A from local market with 2 local monetary units (l.m.u.) and is exporting this good for 1 foreign monetary unit (f.m.u), the value of this export will be initially equal with 1 f.m.u. = 2 l.m.u. (assuming that exchange rate will be 1 to 2). Now, if the central bank will depreciate local currency with 100% against the foreign currency and the exchange rate will be 4 l.m.u. paid for 1 f.m.u. instead of 2 l.m.u. paid for 1 f.m.u., the exporter is submitted to obtain from his initial export 4 l.m.u. instead of 2 l.m.u. (100% increase of sales in local currency). With this new amount, the exporting company is submitted to buy a double quantity of good A and to increase the exports. Therefore, the exchange rate is submitted to have a positive impact on the net exports. In fact, the whole mechanism is based on a very important assumption: the prices of good A in local currency should remain the same. This is impossible in an open economy and especially in the case of emerging markets that are very dependent on international financings (insufficient local savings), dependent on capital goods (equipments, latest technologies etc.) and dependent on specific raw materials and intermediate goods that should be imported. It is very probable that the production of

good A to be impossible to be doubled without international capital, without imports of capital goods or imports of raw materials. In this case, the depreciation will increase the production costs of such products that are including important imported components. Therefore, the prices in local currency will be higher, especially for manufactured goods that are more capital intensive. So, the export capacity of a country could be diminished in this case: when the exporting company will try to find additional goods A to be exported (having 4 l.m.u. instead of 2 l.m.u.) will notice that the prices will be 5 l.m.u. for one unit and the cash from exports will be not enough to buy the initial quantity of good A. When fiat money is used, the impact of exchange rate on the balance of payments is not conclusive and it depends on various factors derived from demand and supply side for exports and imports. Producing money from thin air, the central banks are influencing the structure of the whole economy. The pricing are increasing without economic reason. The automatic adjustment of the balance of payments is replaced with such monetary mechanisms that are not so effective, especially on the case of emerging markets.

The first attempt to produce a theory on the influence of exchange rate on the balance of payments was independently run by A. Marshall (1923), L. Robinson (1937) and A. Lerner (1944). Their model is based on the concept of *elasticity of demand for exports and imports* and it contains few important simplifications: [1] supply side is totally ignored by considering it to be perfect elastic and is following only a change in the demand for exports and imports; prices for imports and exports are equal with 1 monetary unit and are fixed (or rigid) to any changes of nominal exchange rate. A positive effect of depreciation on the balance of payments will be noticed only if the following condition is accomplished:

$$\frac{dCA_i}{ds} \geq 0 \Leftrightarrow \varphi_X + \varphi_M - 1 \geq 0 \Leftrightarrow \varphi_X + \varphi_M \geq 1 \quad [1]$$

where: CA_i is the current account of a specific country i, s is real exchange rate, φ_X and φ_M are the elasticity for demand of exports and imports for a specific country i.

Stern et al. (1976) introduced for the first time the elasticity for supply of exports and imports as a measure of exchange rate's influence on the changes of behavior of exporting companies from a specific country i and on the changes of behavior of exporting companies from over the world toward a specific country i (also known as Stern condition):

$$\frac{dCA_i}{ds} \geq 0 \Leftrightarrow \frac{\varepsilon_X \times (\varphi_M - 1)}{\varepsilon_X + \varepsilon_M} + \frac{\varphi_M \times (\varepsilon_M + 1)}{\varphi_M + \varepsilon_M} \geq 0$$

where: CA_i is the current account of a specific country I; s is real exchange rate; φ_X and φ_M are the elasticity for demand of exports and imports for a specific country I; ε_X and ε_M are the elasticity for supply of exports and imports for a specific country i.

The reaction of supply of exporting companies from a specific country i (ε_X) and supply of exporting companies from abroad (ε_M) to the changes of exchange rate is more difficult to be assessed. This approach revealed how difficult is to appreciate the real impact on the equilibrium of balance of payments.

Another step in the theoretical approach of the impact of exchange rate on the balance of payment's equilibrium was developed by Engel (1993), Backus et al. (1993), Gourinchas (1998) and Demirden and Pastine (1998) and it is called "J-curve" – there are significant differences between short term and long term impact expressed in a form of a delay between the moment of depreciation and its impact on the net exports. This delay is explained from the perspective of consumers that could have a delayed reaction to higher prices for imported goods due to depreciation (continuing to prefer them despite the local ones that will be cheaper); from the perspective of producers / sellers that need time to change their contracts with their partners in order to include the unexpected depreciation and from the perspective of reaction to competitors. In the literature review we can identify three different models for testing this gap called J-curve: [1] models based on regression using lags for explanatory variables (ignoring non-stationary effect on the time series); [2] VAR framework with lags (that are ignoring long run influence on the level of explanatory variables) and [3] ARCH and GARCH models using exchange rate volatility to explain changes in the net exports. The equations of such model is based on a linear regression of current account explained by real domestic income Y(t), real foreign income $Y^*(t)$, real exchange rate changes $\ln(R_t)$, the volatility of real exchange rate $\ln(\sigma_t)$ and the error term for current account ε_t (Singh, 2004, p. 229):

$$\ln(CA_t) = \beta_0 + \beta_1 \times \ln(Y_t) + \beta_2 \times \ln(Y^*_t) + \beta_3 \times \ln(R_t) + \beta_4 \times \ln(\sigma_t) + \varepsilon_t$$

Variation of real exchange rate $\ln[R_t]$ is explained by using different lags for this variable:

$$\Delta \ln[R_t] = \alpha_0 + \sum_{i=1}^{N} \alpha_i \times \Delta \ln(R_{t-i}) + \mu_t$$

The conditional volatility of exchange rate could be explained in different representations:

ARMA(p): $\sigma_t^2 = \delta_0 + \sum_{j=1}^{p} \delta_j \times \mu_{t-j}^2$, if μ_t is distributed with zero mean and variance σ_t^2 (interpretation: real exchange rate volatility is a linear combination of past errors);

GARCH (q, p): $\sigma_t^2 = \delta_0 + \sum_{j=1}^{p} \delta_j \times \mu_{t-j}^2 + \sum_{i=1}^{q} \gamma_i \times \sigma_{t-i}$, autoregressive and moving average components are included in the equation of volatility.

For estimating the J-Curve effect an Error Correction Model (ECM) will be tested including different lags for all explanatory variables:

$$\ln CA_t = \beta_0 + \sum_{i=1}^{N} \beta_i \times \ln CA_{t-i} + \sum_{j=1}^{N} \phi_j \times \Delta X_{t-j} + \sum_{k=1}^{N} \tau_j \times \sqrt{\sigma_{t-k}} + \theta \times z_{t-1} + \varepsilon_t$$

where: ΔX_{t-j} – is a vector of explanatory variables including real exchange rate, domestic real income and foreign (world) real income with different lags; z_{t-1} is the lagged error correction term obtained from the co-integration model (a VAR model used to test long term relationship between real exchange rate and CA with different lags).

Based on t statistics (the lower value will indicate a rejection of lags) and sign for coefficients that should be the same with those returned by long run model, an "optimum" lag is determined for each explanatory variable. The next important step in the theory of relationship between exchange rate and BoP equilibrium is called "Armington effect" (introduced by Armington, 1969) – a trade substitution effect determined by the consumers' behavior to switch their interest from foreign products to domestic products due to depreciation of local currency (relevant empirical studies have been recently produced by Erkel-Rousse and Mirza (2002), Saito (2004), Zhang (2006) or Feenestra et al. (2011)). The model proposed by Feenestra et al. (p. 13, 2011) has the following main equations:

Equation 1: Explaining the import demand from countries i to country j compared to total demand for a specific basket of goods (g)

$$\Delta \ln\left[\frac{M_g^{ij}}{M_g^{j}}\right] = -(\sigma_g - 1) \times \Delta \ln\left[\frac{UV_g^{ij}}{UV_g^{j}}\right] + (\sigma_g - \omega_g) \times \Delta \ln\left[\frac{UV_g^{Fj}}{UV_g^{j}}\right] + \varepsilon_g^{ij}$$

where: M_g^{ij} / M_g^{j} is the weight of imports from country i to local demand in country j of a basket of goods g, σ_g is the elasticity of substitution between exporters of goods from basket g located in a specific country i that are delivered to country j (it is estimated from relative bilateral import prices); ω_g is the elasticity of substitution between local and foreign goods g in country j (it is estimated from a multilateral price index); UV_g^{ij} / UV_g^{j} is the ratio of unit value for goods g sold from countries i to country j to unit value for all stocks of goods g from country j; UV_g^{Fj} / UV_g^{j} is a ratio of overall imported goods from abroad to the stock of goods g in country j. Unit value is defined as consumption weighted average prices in the model.

Equation 2: Explaining the error term from the first equation

$$\varepsilon_g^{ij} = \Delta \ln k_g^{ij} + \Delta \ln\left[\frac{1-\beta_g^{j}}{\beta_g^{j}}\right] + \Delta \ln\left[\frac{N_g^{ij}}{N_g^{j}}\right] - \frac{(\sigma_g - \omega_g)}{(\sigma_g - 1)} \times \Delta \ln\left[\frac{N_g^{Fj}}{N_g^{j}}\right]$$

where: k_g^{ij} is a measure of random country-of-origin weights estimated for consumers behavior in county j; N_g^{ij} / N_g^{j} is the measure (quantity) of goods g exported from country i to country j divided to the total quantity of goods g consumed in country j, β_g^{j} measures the random preference weight of residents in country j to consume local goods g.

Equation 3: Explaining the impact of depreciation on the imports in country j

$$\frac{d\ln(M^j)}{d\ln(s)} = 1 - \sum_{g=1}^{G} \frac{M_g^{j}}{M^j} \times \left[\omega_g - \frac{M_g^{j}}{Cons_g^{j}} \times (\omega_g - \eta)\right] + \frac{M^j}{M} \times \eta$$

where: M^j is the import in country j of all goods, M_g^{j} is the import in country j of goods g (total is G in the basket), $Cons_g^{j}$ is total consumption of g in country j, M is total world import, ω_g is the elasticity of substitution between local and foreign goods g in country j (it is estimated from a multilateral price index) and μ is the elasticity of demand for imported goods g in country j.

The last important achievement in this theory of exchange rate influence on the BoP's equilibrium is the introduction of substitution effect between tradable goods and non-tradable goods when local currency is depreciating: initial hypothesis was that the depreciation of local currency will reduce the domestic consumption for tradable goods and will increase the consumption of non-tradable goods (relevant studies was

produced by Gonzales-Rozada and Neumeyer (2003); Barja et al. (2003) and Lorenzo et al. (2005)). For example, the methodology proposed by Lorenzo et al. (2005) is based on the following equation:

$$\ln\left[\frac{\text{Cons}^{j}_{\text{tradable}}}{\text{Cons}^{j}_{\text{non-tradable}}}\right] = \ln(\alpha_0) - \alpha_1 \times \ln(\text{RER}) + \alpha_2 \times Z_t + \varepsilon_t$$

where: α_1 is the elasticity of substitution of consumption between tradable and non-tradable goods and it is equal with $\frac{1}{1+\eta}$; α_0 is a coefficient of consumption's weights for tradable and non-tradable goods and it is equal with $\left[\frac{\omega}{1-\omega}\right]^{\frac{1}{1+\eta}}$; RER is real exchange rate and it is assimilated with ratio between inflation in tradable and non-tradable goods $\frac{p_{\text{Tradable}}}{p_{\text{non-tradablbe}}}$ and Z term is including all other possible explanatory factors (and that are not relevant for RER) like terms of trade, real credit of commercial banks, real international interest rate and real GDP. Finally, the most stable model was $\ln\left[\frac{\text{Cons}^{j}_{\text{tradable}}}{\text{Cons}^{j}_{\text{non-tradable}}}\right] = \ln(\alpha_0) - \alpha_1 \times \ln(\text{RER})$ and $\alpha_1 = f(\text{RCCB}, \text{GDP}, \text{ToT})$.

3. DATA AND RESEARCH METHODOLOGY

For estimating the impact of exchange rate on the BoP's equilibrium we started from similar models proposed by Haque et al. (1993), Gupta-Kapoor and Ramakrishnan (1999), Musila (2000):

$$\text{Ln}\left[\frac{X_i}{M_i}\right] = \alpha_0 + \alpha_1 \times \text{Ln}(\text{REE}_i) + \alpha_2 \times \text{Ln}\left[\frac{Y_i}{Y^*}\right] + \varepsilon_t$$

where: X_i is the export of country i, M_i is the import of country i, Y_i is the GDP (as a proxy for the income) of country i, Y^* is the GDP of USA (as a proxy for the income

of the most important trade partner of the world for emerging markets), REE_i – real exchange rate index for country i.

Because we wanted to include in the model the elasticity of substitution between local and foreign goods due to real exchange depreciation (Armington effect) and the elasticity of substitution between tradable and non-tradable goods we proposed the following adjusted equations:

$$Ln\left[\frac{X_i}{M_i}\right] = \alpha_0 + \alpha_1 \times Ln[REE_i] + \alpha_2 \times Ln\left[\frac{Y_i}{Y^*}\right] + \alpha_3 \times \left[\frac{M_i}{Cons_i}\eta_A\right] + \alpha_4 \times Ln\left[\frac{Cons_i^{tradable}}{Y_i}\eta_B\right] + \varepsilon_{1t}$$

The size of the economy effect **The Armington effect** **The tradable / non-tradable substitution effect**

where: $Cons_i$ is total private consumption in country i, $Cons^{non\text{-}tradable}$ is the consumption on non-tradable goods in country i.

The variables used in the model are the following:

- Exports of country i: Total exports denominated in current prices and expressed in dollars (annual data);
- Imports of country i: total imports denominated in current prices and expressed in dollars (annual data);
- Real effective exchange rate index: compared with 2005 (2005 = 100).
- GDP ratio (Y_i / Y^*) estimating the size effect on the commercial balance;
- Import ratio (M_i / $Cons_i$): estimating the Armington effect (local goods preferred instead of imported goods);
- Consumption for tradable goods ratio ($Cons^{tradable}/Y_i$): estimating this effect on the commercial balance (tradable goods preferred instead non-tradable goods). For tradable sector we used as proxy industry and agriculture value added to total GDP (in the study of Lorenzo et al., 2005 the identified tradable sectors are: Agriculture, Mining, Manufacturing, Commercial services and Financial services and for non-tradable sectors: Construction, Transportation services, Personal services; in this case, we consider that industry and agriculture value added to total GDP to be a good proxy for this indicator due to the importance of manufactured goods and agriculture among tradable sectors).

- $\eta_{A,}$ $\eta_{B}$are measures of elasticity for import ratio and consumption for tradable goods ratio (measuring the changes of this ratios due to exchange rate). For estimating these elasticities we proposed linear regression methodology or simple correlation test. In our study we used rolling correlation estimated for 2006 – 2010 and for both ratios.

For testing the impact of exchange rate devaluation on the balance of payments we used panel data regression to test these effects on the export to import ratio of emerging markets. We studied these effects in different ways:

1. Overall effects estimated on all emerging markets included in the study;
2. The effects are studied in two different periods (before crisis and after crisis).

The panel of countries included in our study comprises *45 emerging countries* from all over the world. Data was extracted from Worldbank database.

4. RESULTS

The first step was to compute the rolling correlation matrix for the two ratios associated to the two very important effects:

- $\boldsymbol{\eta_A}$- measuring the intensity of relationship between real exchange rate and ratio between total imports of goods and services and total final consumption in each country.
- $\boldsymbol{\eta_B}$– measuring the intensity of relationship between real exchange rate and ratio between value added in industry and agriculture to GDP in each country.

For these rolling correlations we use all available data for each country from Worldbank Database covering a maximum period between 1960 and 2010 (data being not available for entire period for all countries). Using these rolling correlations we computed all explanatory data and we obtained the panel of data for all 45 countries included in the model.

Stationary of pool data is essential for avoiding misleading parameter estimates when least square regression is used to assess the deterministic relationship between considered variables. For testing the presence of unit root we used four different tests: Levin, Lin and Chu Test (2002), Im, Pesaran and Shin Test (2003), ADF Fisher Chi-Squared Test (1999) and PP Fisher Chi-Squared Test (1999). The results are indicated in Table 1 and Table 2.

Table 1: Unit root test using LLC method

Method: Levin, Lin & Chu t* **Null: Unit root**	**Statistic**	**Prob.****	**Cross-sections**	**Obs.**
Export to import ratio (XM)	-12.0298	0.000000	45	180
Real effective exchange rate (RER)	-8.67382	0.000000	45	180
GDP Ratio (Y)	-3.54295	0.000200	45	180
Import to final consumption ratio (MC)	-14.4412	0.000000	45	180
Industry and agriculture to GDP ratio (TRAD)	-6.09124	0.000000	45	180

Table 2: Unit root test using IPS Test, ADF Fisher CS Test, PP Fisher CS Test

Variable	**Im, Pesaran and Shin W-stat**	**ADF - Fisher Chi-square**	**PP - Fisher Chi-square**
Export to import ratio (XM)	-1.74468	92.1463	101.09
	0.0405 (prob.)	0.4175 (prob.)	0.1993 (prob.)
Real effective exchange rate (RER)	-1.71292	95.9659	130.912
	0.0434 (prob.)	0.314 (prob.)	0.0032 (prob.)
GDP Ratio (Y)	0.74416	63.7302	77.6231
	0.7716 (prob.)	0.9838 (prob.)	0.8208 (prob.)
Import to final consumption ratio (MC)	-2.29844	108.662	147.583
	0.0108 (prob.)	0.0879 (prob.)	0.0001 (prob.)
Tradable ratio (TRAD)	0.29441	75.3143	107.854
	0.6158 (prob.)	0.8665 (prob.)	0.0967 (prob.)

The results of unit root tests indicate the following:

- All five variables passed the LLC test. These estimates indicate that unit root null hypothesis is strongly rejected (our paneled variables have no stationary problems);
- Two variables did not pass the other individual tests (GDP Ratio and Tradable Ratio). These estimates indicate a failure of rejection the unit root null hypothesis due to possible some cross sections with unit root.

When we tested all four explanatory variables together we obtained the following outputs for panel regression:

Table 3: Outputs for panel regression for 2006 and 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER	**0.082335**	0.026442	3.113809	**0.0021**
Y	**0.078519**	0.016419	4.782364	**0.0000**
MC	**0.057894**	0.101146	0.572380	0.5676
TRAD	**0.004476**	0.002018	2.217603	**0.0276**
Weighted Statistics				
R-squared	0.114508	Mean dependent var		-0.305242
Adjusted R-squared	0.102488	S.D. dependent var		1.042060
S.E. of regression	0.985738	Sum squared resid		214.7411
Durbin-Watson stat	1.907496			

Table 4: Outputs for panel regression for 2008 – 2010 (only crisis time)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER	**0.096585**	0.029717	3.250132	**0.0015**
Y	**0.088144**	0.018378	4.796075	**0.0000**
MC	**0.189817**	0.145922	1.300812	0.1956
TRAD	**0.002685**	0.002755	0.974451	0.3316
Weighted Statistics				
R-squared	0.177866	Mean dependent var		-0.272465
Adjusted R-squared	0.159038	S.D. dependent var		1.135382
S.E. of regression	1.006100	Sum squared resid		132.6031
Durbin-Watson stat	1.945409			

From the outputs of panel regression we can observe the following:

- The coefficient of real exchange rate index is positive and statistically relevant (1%) indicating a positive effect of using exchange rate on the equilibrium of balance of payments (net exports);
- Crisis increased the positive impact of real exchange rate on the equilibrium between exports and imports for the countries included in the study;

- For the period 2006 – 2010 Armington effect is not relevant for explaining the equilibrium between exports and imports of countries included in the study. During crisis (2008 – 2010) this slightly effect increased (the coefficient is higher and more significant);
- Substitution between tradable and non-tradable is significant for explaining the export / import ratio but the crisis reduces the importance of this effect on it.

For robustness of the model we kept only the variables that are statistically relevant (using t-statistic). The outputs for restricted panel regressions are the following:

Table 5: Outputs for panel regression for 2006 and 2010

Table 5.1. Including tradable / non-tradable effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER	**0.084162**	0.026294	3.200801	**0.0016**
Y	**0.079295**	0.016344	4.851742	**0.0000**
TRAD	**0.004437**	0.002011	2.206349	**0.0284**
Weighted Statistics				
R-squared	**0.112295**	Mean dependent var		-0.299874
Adjusted R-squared	0.104298	S.D. dependent var		1.040563
S.E. of regression	0.982929	Sum squared resid		214.4852
Durbin-Watson stat	**1.905990**			

Table 5.2.Excluding tradable / non-tradable effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER?	**0.078859**	0.026146	3.016097	**0.0029**
Y?	**0.075945**	0.016258	4.671299	**0.0000**
Weighted Statistics				
R-squared	**0.091215**	Mean dependent var		-0.300828
Adjusted R-squared	0.087140	S.D. dependent var		1.042675
S.E. of regression	0.995075	Sum squared resid		220.8089
Durbin-Watson stat	**1.995420**			

Table 6: Outputs for panel regression for 2008 – 2010
Table 6.1. Including tradable / non-tradable effect (only crisis time)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER?	**0.104394**	0.029316	3.560956	**0.0005**
Y?	**0.092351**	0.018212	5.070972	**0.0000**
TRAD?	**0.002535**	0.002774	0.914084	**0.0623**
Weighted Statistics				
R-squared	**0.167026**	Mean dependent var		-0.269252
Adjusted R-squared	0.154405	S.D. dependent var		1.127962
S.E. of regression	1.002271	Sum squared resid		132.6003
Durbin-Watson stat	**1.952071**			

Table 6.2. Excluding tradable / non-tradable effect (only crisis time)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RER	**0.101752**	0.029116	3.494687	**0.0006**
Y	**0.090549**	0.018084	5.007049	**0.0000**
Weighted Statistics				
R-squared	**0.161454**	Mean dependent var		-0.271516
Adjusted R-squared	0.155149	S.D. dependent var		1.128044
S.E. of regression	1.002777	Sum squared resid		133.7397
Durbin-Watson stat	**1.967984**			

According with the outputs of restricted regressions we observed that:

- There is a positive relationship between real exchange rate and export to import ratio indicating that *higher depreciation will produce an increase in the level of exports for emerging countries included in the model*. However, this improvement is very weak;
- This relationship does not significantly increase during crisis time: the relationship remained positive but the differences compared with the period before crisis are not significant (but the importance .

The obtained results indicate that both tests are statistically relevant.

5. CONCLUSIONS

The relationship between exchange rate and balance of payments' equilibrium is a very complex and very intense studied issue of international finance. The theory was gradually developed by including supply side in the models. This paper studied this relationship using panel regression methodology applied on emerging market case (the selection included 45 countries). The results indicate a positive effect of depreciation on the export to import ratio and a substitution effect between tradable and non-tradable goods. Armington effect seems do not be statistically relevant for ratio between exports and imports.

The crisis slightly changed the situation:

- The results for the entire period reveal that *1% depreciation of foreign real exchange rateproduces only 0.084% improvement of export to import ratio* (including tradable / non-tradable effects) and *only 0.079% improvement if we exclude the tradable / non-tradable effect;*
- The results restricted only to crisis time reveal that *1% depreciation of foreign real exchange rate produces only 0.1% improvement of export to import ratio (higher than for entire period)* if we include tradable / non-tradable effect (with lower statistical significance) and *0.1% improvement of export to import ratio (also higher than for the entire period)* if we exclude tradable / non-tradable effect.
- The results indicate also that *tradable / non-tradable effect is less significant during crisis time that overall period.*

The further development of our study will include a more accurate estimation for elasticity associated to import to final consumption ratio and tradable ratio by replacing rolling correlation coefficients with more accurate estimators calculated by using linear regression (additional two equations will be introduced to describe the relationship between these ratios and exchange rate).

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