Empirical Evidence On The Correlation Between The Exchange Rate And Romanian Exports

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EMPIRICAL EVIDENCE ON THE CORRELATION BETWEEN THE EXCHANGE RATE AND ROMANIAN EXPORTS

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INTRODUCTION

Few subjects of international economics are so much exposed to heated debates as the exchange rate problem. From monetary crises and balance-of-payments adjustments to monetary zones, dealing with currency swings seems to embody any economist's worries about the rightfulness of economic models and the relevance of empirical analyses he or she has to choose. Is appreciation or depreciation good for a country's welfare? Would that answer still be valid in the long run?

The unsettled character of the problem largely resides in the manifest contradiction between the firm theoretical predictions and their unconvincing empirical testing. One of the least uncontroversial tenets refers to the positive correlation between currency depreciation or devaluation (although of different origins, their effects are generally the same) and a country's current account. This paper attempts to test this prediction on the case of Romanian economy and to conclude on possible explanations of the theoretical-empirical conflict.

The choice of the present topic is timely for reasons of both practical significance and research considerations. The beginning of 2005 confronted Romanian exporters with a double shock of the termination of tax incentives they enjoyed on export profits and the sharp national currency appreciation in real and nominal terms. The economic predictions were claimed to hold true and, because the tax implementation had been long before communicated, an ill-maneuvered exchange rate policy control on behalf of the National Bank of Romania (NBR) was seen at the root of most of the industries' adjustment difficulties that made trade deficits ever larger from year to year. While it is beyond the scope of this paper to argue on the role the NBR played in the process, it however is of great importance to see if the currency fluctuations indeed exerted a certain influence on the dynamics of exports growth over long intervals. This research thus includes in statistical tests monthly variations of exchange rates and trade volumes over a four-year period (January 2002 - December 2005) in order to seek for most recent supporting evidence of the exporters' claims.

As for its research relevance, this theme follows up previous efforts to emphasize the empirical nature of the correspondence in the context of the Romanian economy. The following section presents the results of such endeavors, which by and large cover the whole period from 1991 to 2000, and contrasts their findings against the standard macroeconomics expectations. This analysis also takes on the task of enlarging the informational content of the referred works by three additional methodological intakes: a data bank of forty-seven observations, which reasonably exceeds most of the previous researches; a separate account of the observed correspondence on one of the probably most affected industries; and a parallel investigation of different regressions as the exchange rate is assumed to produce deferred effects.

LITERATURE REVIEW

The analytical framework does not make the study of the exchange rate and its impact on the volume of trade an easily tractable issue. A long list of divergent explorations in the field, as surveyed *inter alia* by Copeland (2005) and Salvatore (1990), witnesses the economists' effort to deal with its complexity. The problems are grounded on an intricate web of circular causations and multiple dependencies that normally characterize the real-world exchanges of goods and currencies. As suggested by the proposed reference to the Romanian literature, this paper conveniently groups the scholarship relative to the observed correspondence in three largely distinct argumentative lines of research: the modeling methods of correcting balance-of-payments disequilibria; the absorption capacity of the anticipated impact in the economy; and the conditions of the open-economy environment.

The first concern raises the issue of accommodating the correlation into the appropriate analytical framework. The usual treatment begins with the undisputable fact that a depreciation or devaluation stimulates the nation's exports and discourages its imports, while the contrary fluctuation has the opposite effect. The former alternative, which for the expositive simplicity is to be given preference, makes the plausible assumption that foreigners find the domestic goods more attractively priced and so help promote sales of domestically produced goods. Increased foreign reserves and national production will soon reverse the direction of the depreciating currency and thus automatically adjust the balance-of-payments disequilibria, of which the current account (CA) balance is of paramount importance for an economy heavily integrated in the world economy primarily by means of its "visible" transactions only. That admittedly is the case of the Romanian economy. The automatic correction however is dependent on at least three separate, but interdependent influences, namely price, income, and monetary adjustment mechanisms.

Their simultaneous handling usually requires broad *ceteris paribus* conditions in order not to make from the equilibrium condition an elusive possibility. One important insight however is the supposition of automatic adjustment that turns economists toward a tangible theoretical product: the equilibrium real exchange rate that is the rate for which there is neither a surplus nor a deficit in the current account at its long-run level. The works of Lazea suitably expose these technicalities on the Romanian case. His approach rests on a hypothetical economic functioning (Lazea 1993) and makes recourse to a diagrammatic exposition to control for the effect of the interest rate as a monetary instrument. On this basis, he concludes that a balanced current account is better achieved through a policy-mix of managed exchange rate and interest rate liberalization. In subsequent studies (Lazea 1994a, Lazea 1994b), he attempted to regress the CA evolution dependent on the average monthly fluctuations of the real exchange rate from August 1993 to February 1994.

His results – the exchange rate accounts for somewhat between 88% and 90% of the CA evolution – would have been considered a substantive empirical evidence, had it not been for two adjacent outcomes inferred from the same set of data. First, a correlation of coincidentally similar magnitude, but in reverse dependence, also was statistically significant. Second, an attempt to use the first correspondence for predictive purposes would have ended up in "hazardous" conclusions. What remains though, Lazea argues, consists in finding an estimate of the equilibrium exchange rate at the level which best explains the independent variable. A recent research of Zaman (2000) generally follows the same analytical path, but extends the number of observations to fifty-one and introduces additional dependent variables

in two separate regressions on export and import dynamics. That study's conclusions strengthen the view that exports are positively correlated, even if other factors such as the value-added tax or inflation also exercise their impact in a similar direction.

As a general rule, the second step in assessing the theoretical predictions deals with the circumstances under which the economy *actually* absorbs the presumed effect of the competitive depreciation. The expected response arguably involves a time lag which may vary from a minimum estimated to six months (Salvatore 1990; Krugman & Obstfeld 2003) to over three years (Salvatore 1990) due to a host of circumstantial factors like the cumulative effect of depreciation, trade elasticities or identification problems. The surprising findings of the applications to the Romanian case (Lazea 1994a; Croitoru 1993; Daianu 1996) are that the industries proved remarkably sensitive in promptly transferring currency devaluations in export growth with apparently no time lag. However, a closer look at the documentary evidence those referred authors provide unambiguously shows that their conclusion remains valid under extreme circumstances, namely when the currency fluctuation is severe in the short run. After a theoretically presumed *threshold level* with that observed characteristics is passed by, one may notice that the correlations regain their somewhat hectic relationship.

Finally, a difficult problem in estimating a relevant correspondence rests on the particular conditions of the macroeconomic environment. One widespread but often neglected assumption requires open exchanges on both goods and currency markets. It should be also added that considering alternatively different exchange rate policy regimes reveals perverse effects on the expected correlation. To compound matters even more, the estimations which used Romanian data were strictly qualified by serious deviations from the standard context.

Their results suffer from either data limitations due to incipient statistics or reduced observations, or arbitrary policy manipulation, mainly in the form of administrative controls on foreign exchange reserves. The problem of multiple dependencies was more often than not visible. For example, Daianu (1996) notices how the relatively more favourable conditions of borrowing in foreign currency strongly underpinned a sustained increase of imports in spite of the depreciating domestic currency.

All these considerations suggest that any investigation on the correspondence between the exchange rate and exports dynamics has to be seriously qualified by unforeseen or hardly tractable circumstances which may simply make it irrelevant. It is for this reason that the following examination attempts to keep to its essentials the logical correlation, while providing a reasonably wide set of observations for increased statistical accuracy.

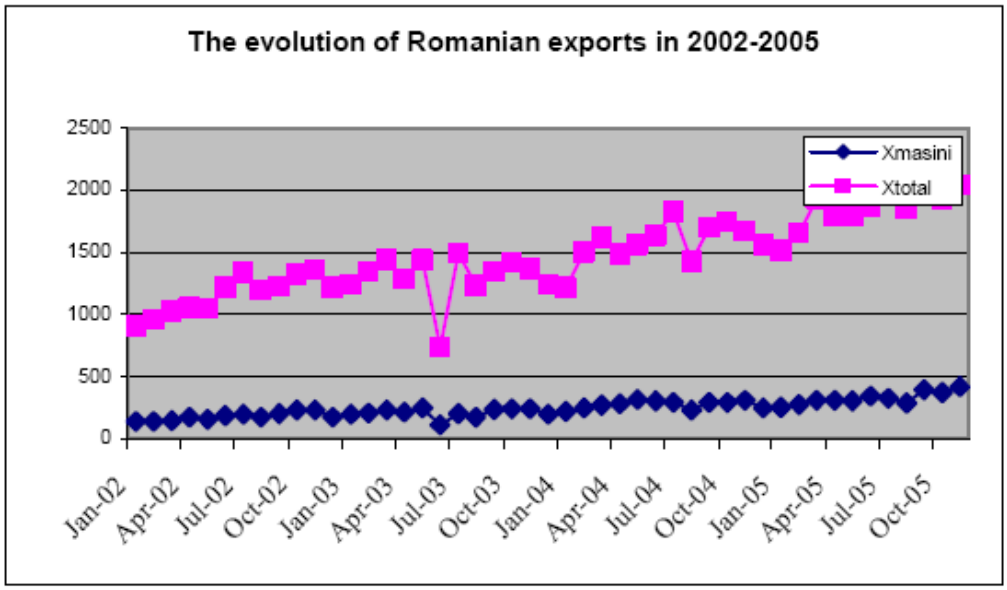
THE EVOLUTION OF ROMANIAN EXPORTS DURING 2002 – 2005

The exports play a fundamental role in sustainable development of a country. The volume and dynamic of these exports reflect the structural changes in the economy, its performances and the external competitiveness of a country of its international commercial and financial transactions. The improvement of external competitiveness in terms of exports could be sustained by a lot of policies and measures that take into consideration the stimulation and promotion of local products on international markets.

In the year 2002 the exports FOB of Romania was 13868.8 millions US dollars, with 21.8% (+2483,8 millions USD) higher than in the year 2001. By countries, comparatively with the year 2001, the exports in developed countries have increased (+21,9%), and among these the

exports with European Union were higher with 20.5%. The weight of developed countries in total Romanian exports was 74.5% and for European Union 67.1%. In 2002, the first five commercial export partners were Italia (25,0% from total exports), Germany (15,6%), France (7,6%), United Kingdom (5,8%) and USA (4,3%). In that year the commercial deficit of the balance of payments was -3987.9 millions USD (4166,6 millions USD in 2001) and expressed in prices FOB/FOB, was -2613.3 millions USD in 2002.

The FOB exports realized in 2003 were 15613.7 millions Euros (17618.0 millions of USD), this value being higher with 6.4% than 2002 (in USD this value is higher with 27.9%). By countries, comparatively with 2002, the value of exports, expressed in euro, in developed countries is increasing with 5.6% and for the exports in European Union had an increase rate of 7.2%. The weight of these countries in total Romanian exports was 74% for developed countries and 67.7% for European Union. The weight of exports to developing countries has decreased with 0.7% and it was 14.5% from total exports in 2003. The exports in transition countries have increased with 24.1% in that year. The first five export commercial partners in 2003 were: Italy (24,2% from total exports), Germany (15,7%), France (7,3%), United Kingdom (6,7%) and Turkey (5,1%). The commercial FOB/CIF deficit in 2003 was -5587.6 millions USD (-6385 millions USD) and expressed in prices FOB/FOB this deficit was -3955.5 millions Euros (4537.3 millions of USD).

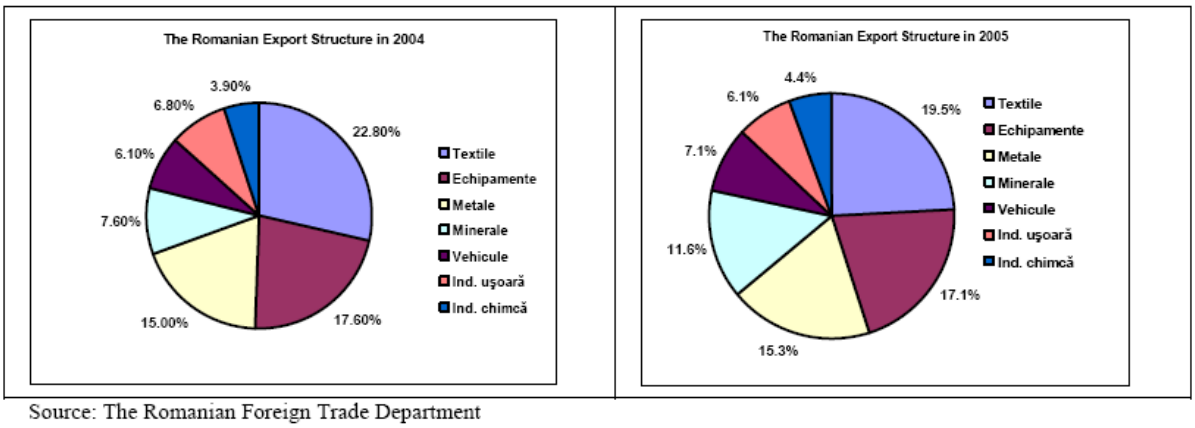


Source: Romanian National Institute for Statistics

In 2004 the FOB exports were 18934.7 millions Euros, this value being higher than in 2003 with 21.3%. The exports to European Union (UE-25) is increasing with 20.1%, having a total weight from total exports of 72.9%. In 2004 the first five commercial partners were: Italy (21,2% from total exports), Germany (15,0%), France (8,5%), Turkey(7,0%) and United Kingdom (6,7%). The commercial FOB/CIF deficit in 2004 was -7346.3 millions Euros and expressed in prices FOB/FOB this deficit was -5323.2 millions of Euros.

The exports realized in 2005 (less December) were 20433.3 millions Euros, this value being higher with 17.4% than the same period from 2004. The value of exports with European Union (UE – 25) in 2005 has increased with 9.4% comparatively with previous year. The weight of these exports to European Union was 68.2% from total exports. The most important

five commercial partners (with a weight of more than 40% from total exports) were: Italy (19.4% from total exports), Germany (14.1%), Turkey (7.8%), France (7.5%) and United Kingdom (5.6%). Taking into consideration the custom regime applied to these exports, in 2005 the definitive exports had a weight of 51.7% from total exports and the remaining 48.1% represents lohn contracts based on temporarily imports of raw materials. The commercial FOB/CIF deficit in 2005 (less December) was -9006.7 millions Euros, and in prices FOB/FOB the deficit was -6740.4 millions Euros. The manufacturing degree had permanently improved according with the restructuring of Romanian economy and the increasing of the importance of private sector in this economy.



Source: The Romanian Foreign Trade Department

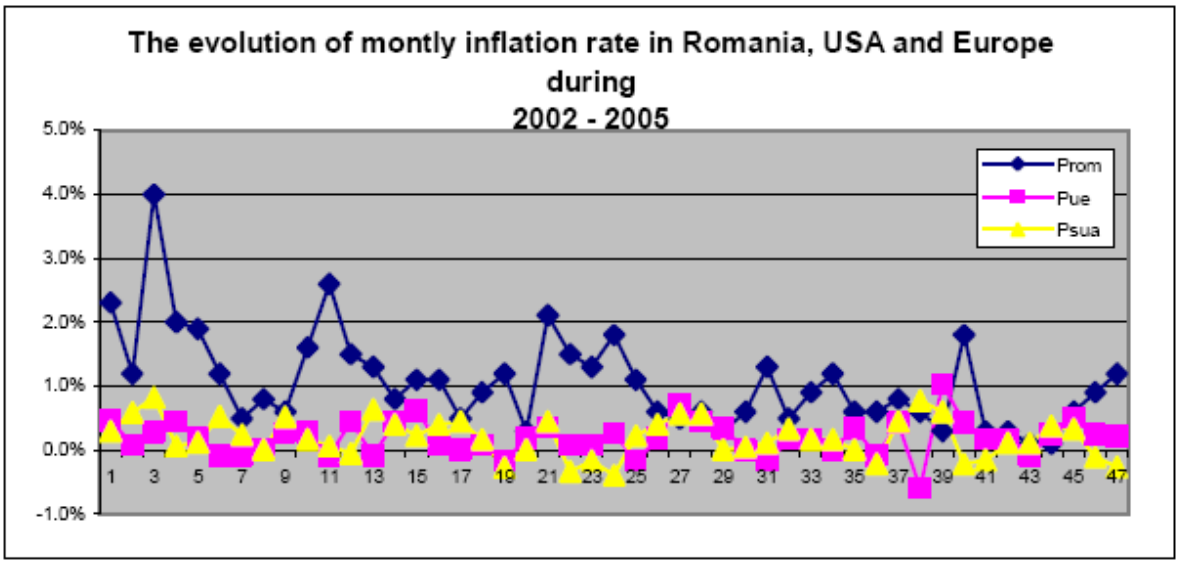
The increasing of Romanian exports reflects a better capacity of the local economy to offer qualitative products on external market, the improvement of managerial skills in export activities, a higher interest for internationalization of business and a better access to external market due to the commercial agreements. The most important growth rate, in the last period, had the exports of manufactured goods such as: metallic manufactured goods (24,2%); electric machineries and equipments (17,7%); transport equipments and ships (41,8%); chemical products (38.3%); plastic materials (23.9%). The exports of raw materials and less manufactured goods tend to decrease in the last period: aluminum, metal residuals, paper and steel had the higher decreasing rate.

Taking into consideration this evolution, we can observe the following characteristics for Romanian exports: 1). a positive evolution with an increasing of volume and manufacturing degree; 2). an important concentration to a single area for exports – EU market; 3). a focusing of exports mainly on developed countries; 4). a concentration in terms of structure of exports on few main industrial sectors and 5). an important role played by lohn contracts in the structure of these exports. Even the volume of exports is significantly increased in the last years, the manufacturing degree is improving, there still are a lot of problems in terms of competitiveness for Romanian exports that requires a lot of efforts from the government and other institutions involved in export stimulation and promotion.

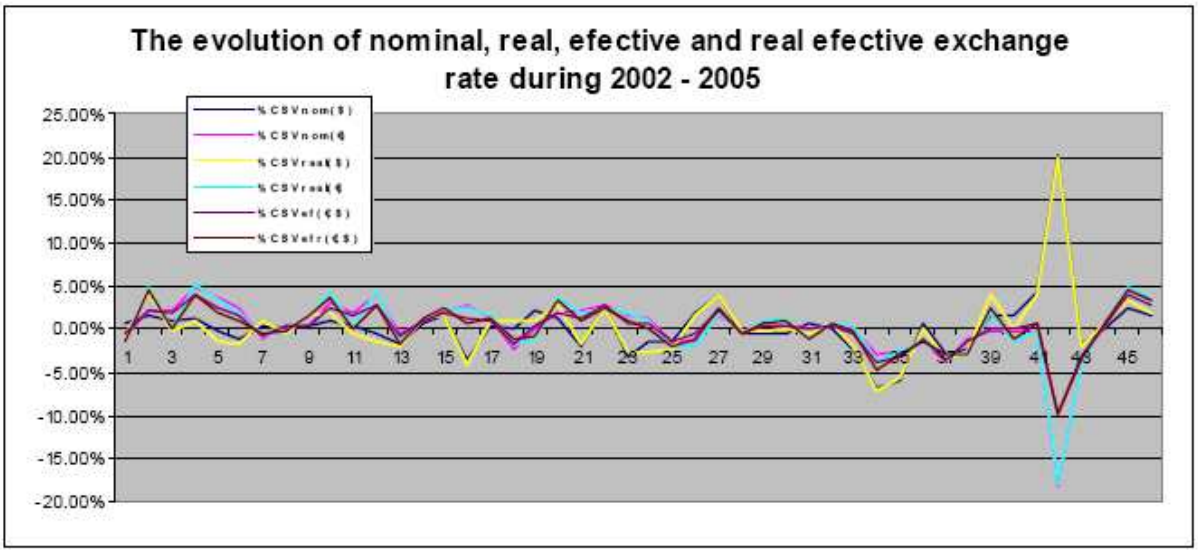
THE EVOLUTION OF EXCHANGE RATE AND INFLATION DURING 2002 – 2005

The monetary policy of the Central Bank has been significantly adjusted in the last period of time, the price stability becoming the most important objective. Inflation targeting offers an additional stability to the Romanian economy (so important for a durable economic growth) by establishing a very precise further inflation rate. In this framework, the flexibility of exchange rate represents a very important condition, in order to achieve the target of

inflation. In the last years the inflation in Romania tended to decrease under pressure of Central Bank restrictive monetary policies: from an inflation of 22.5% in 2002 the inflation in 2005 was 8.6%.



The capital inflows into Romania economies as foreign direct investments, portfolio investments, incomes, unilateral transfers and international credits increase significantly the offer of foreign currencies on FX market and we assisted to an important appreciation of Romanian currency in nominal and real terms.



The evolution in real terms of the exchange rate during this period of time was also nfluenced by the evolution on external market for the most important currency for Romanian economy (Euro and dollar).

RESEARCH METHODOLOGY AND RESULTS

Our main objective is to test the influence of the effective exchange rate on the volume of exports. The null hypothesis is that there is no evidence for a significant relation. The

alternative hypothesis is that the coefficients from the regression we are estimating are statistically significantly different from 0. We considered the linear relation between both the monthly exports and the effective exchange rates as in Zaman (2000) and the monthly changes in the two variables. We first regressed the monthly logarithmic values of the exports on their previous logarithmic values and the logarithmic effective exchange rates from January 2002 until November 2005, i.e. we estimated the coefficients for the regression:

$$\ln(TExp_t) = \alpha + \beta_1 \ln(TExp_{t-1}) + \beta_2 \ln(EER_{t-l}) + \varepsilon_t \qquad (1)$$

where $\ln(Texp_t)$ is the logarithmic value of the total exports in month t, $\ln(TExp_{t-1})$ is logarithmic value of total exports in month $t-1$, $\ln(EER_{t-l})$ is the logarithmic value of the effective exchange rate in month $t-l$, where l is the l_{th} lag, where l takes values from 0 to 6; ε_t is the residual value in month t.

The results of this regression can be seen in table 1. The 95% confidence interval for the coefficient of the exchange rate generally includes the value of 0, which means that the estimated coefficient is not statistically significantly different from 0. The same information is provided by the p-values for the coefficients. We can notice that we only have two coefficients that are statistically significantly different from 0 in the 7 regressions. No coefficient is statistically significant for the effective exchange rate, which means that, for the analyzed period, there is no evidence that the current and the previous exchange rates (up to 6 months in advance) have any influence on the monthly exports volume.

Table 1
Statistics for type (1) regression

Regressions by the values of l	Coefficients	Estimated Values	P-values	Confidence intervals 95%	R squared
0	β_1	0.12625	0.40795	(-0.17841, 0.43091)	0.03397
	β_2	0.48234	0.4571	(-0.81395, 1.7786)	
1	β_1	0.11725	0.44306	(-0.18818, 0.42268)	0.04057
	β_2	0.55965	0.35809	(-0.65529, 1.7746)	
2	β_1	0.3342*	0.025847	(0.042287, 0.62611)	0.13535
	β_2	0.35178	0.53969	(-0.79633, 1.4999)	
3	β_1	0.26613	0.0833	(-0.036641, 0.56889)	0.11211
	β_2	0.57413	0.32843	(-0.59816, 1.7464)	
4	β_1	0.082289	0.60351	(-0.2354, 0.39998)	0.05492
	β_2	0.76374	0.21517	(-0.46186, 1.9893)	
5	β_1	0.33295*	0.002751	(0.16894, 0.750740)	0.24315
	β_2	0.33295	0.54657	(-0.77431, 1.4402)	
6	β_1	0.14896	0.36705	(-0.18136, 0.47929)	0.07401
	β_2	0.71729	0.25025	(-0.52638, 1.961)	

*Coefficients are significant at 5% confidence level.

We can see that the two coefficients that are significant for the lagged volume of exports are providing the highest R_2 statistics, which in general means that the respective regressions (the ones that use the effective exchange rate two months and respectively 5 months ago as explanatory variables) are best fitted by the data. We can argue that it might be some relation

between the volume of exports and the currency rates for a period of 2 up to 3 months. There is a possibility that there is collinearity between the one lag exports and the exchange rates in the sense that the exchange rates explain better the dynamics of exports than a constant alone (if we use a simple regression as opposed to a multiple one). This would make the sum of squared residuals to be smaller and the R^2 to be higher accordingly. The distance between the two seems to keep a pace of 2-3 months. The next step of our analysis is to run the same regressions using the exports of machines and industrial manufacturing tools in order to understand the explanatory power of the effective exchange rate on the capital intensive products. Thus, we estimated the coefficients of the following 7 regressions:

$$\ln(MTExp_t) = \alpha + \beta_1 \ln(MTExp_{t-1}) + \beta_2 \ln(EER_{t-l}) + \varepsilon_t \quad (2)$$

where *MTExp* stands for exports of machines and industrial manufacturing tools and we ran one regression for each values of *l* from 0 to 6. The results are presented in table 2.

Table 2
Statistics for type (2) regression

Regressions by the values of *l*	Coefficients	Estimated Values	P-values	Confidence intervals 95%	R squared
0	β_1	0.72621	5.623e-008*	(0.50292, 0.94951)	0.55844
	β_2	0.21594	0.60287	(-0.61489, 1.0468)	
1	β_1	0.72196	8.508e-008*	(0.49571, 0.94822)	0.55898
	β_2	0.22345	0.56991	(-0.56356, 1.0105)	
2	β_1	0.72813	1.359e-007*	(0.49575, 0.9605)	0.54734
	β_2	0.063078	0.87151	(-0.71915, 0.8453)	
3	β_1	0.5565	0.00036541*	(0.26724, 0.84577)	0.36101
	β_2	0.26751	0.56555	(-0.66508, 1.2001)	
4	β_1	0.62426	3.362e-005*	(0.35412, 0.89439)	0.46233
	β_2	0.2828	0.51481	(-0.58687, 1.1525)	
5	β_1	0.56352	0.00034042*	(0.27326, 0.85377)	0.41109
	β_2	0.3358	0.46318	(-0.58093, 1.2525)	
6	β_1	0.68039	2.112e-005*	(0.39645, 0.96432)	0.50241
	β_2	0.13356	0.75712	(-0.73441, 1.0015)	

*Coefficients are significant at 5% confidence level.

In this case the lagged values of exports are significant, which means that the values of exports for these goods are well explained by the previous values of exports (one month earlier). The goodness of fit indicators are quite important for all the regressions. We found o evidence for the influence of the exchange rates on the values of exports – all the coefficients are statistically not significantly different from 0.

The next step is to infer the coefficients for the percentage changes in the values of exports with respect to changes in the effective exchange rates. We use the following models:

$$\frac{TExp_t - TExp_{t-1}}{TExp_{t-1}} = \alpha + \beta \frac{EER_t - EER_{t-l}}{EER_{t-1}} + \varepsilon_t \quad (3)$$

$$\frac{MTExp_t - MTExp_{t-1}}{MTExp_{t-1}} = \alpha + \beta \frac{EER_t - EER_{t-l}}{EER_{t-1}} + \varepsilon_t \quad (4)$$

where, as previously, *l* takes values from 0 to 6, which means that we run 7 regressions for each dependent variable (once for *TExp* and again for *MTExp*). The results are presented in table 3 and table 4.

Table 3
Statistics for regressions (3)

Regressions by the values of *l*	Estimated Values for β coefficients	P-values	Confidence intervals 95%	R squared
0	0.77827	0.79284	(-5.1609, 6.7174)	0.00162
1	0.90379	0.76074	(-5.044, 6.8515)	0.00218
2	1.0653	0.72718	(-5.0559, 7.1866)	0.00293
3	3.7977	0.21725	(-2.3225, 9.918)	0.03689
4	-0.46011	0.8847	(-6.8321, 5.9119)	0.00053
5	-1.2694	0.6948	(-7.7655, 5.2266)	0.004
6	0.81841	0.80303	(-5.7778, 7.4147)	0.00166

We can notice that the p-values for the coefficients are much higher than 5% and the 95% confidence includes the value of 0 for all the coefficients.

Table 4
Statistics for regressions (4)

Regressions by the values of *l*	Estimated Values for β coefficients	P-values	Confidence intervals 95%	R squared
0	0.30301	0.81537	(-2.298, 2.904)	0.00128
1	-0.49211	0.70486	(-3.0949, 2.1107)	0.00337
2	-0.43909	0.74263	(-3.1199, 2.2417)	0.0026
3	0.12715	0.92503	(-2.5849, 2.8392)	0.00022
4	0.61675	0.65315	(-2.1362, 3.3697)	0.0051
5	0.21417	0.87812	(-2.5922, 3.0205)	0.00061
6	0.9314	0.50937	(-1.8993, 3.7621)	0.01154

Table 3 – Statistics for regressions (4)

The same conclusion can be drawn from table 4, which means that for the capital intensive sector, the current changes in **the volumes of Romanian exports cannot be explained by the changes in the effective exchange rates**.

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