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Factors that Affect Real Exchange Rate in the Long-Run and Short-Run in Albania

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Abstract. Real exchange rate is an important economic variable. RER behavior affects the economy in microeconomic terms defining the allocation of resources between the tradable sector and the non-tradable sector. RER affects economy also in macroeconomic terms, through its impact on key economic variables, such as economic growth, employment and inflation. But RER itself is affected by economic variables. The aim of this paper is to examine the economic variables that affect the level of the RER in Albania in long-run and short-run and the extent of influence of each of them. The Johansen cointegration test and Vector Error Correction Model are used to assess the impact of economic variables on real exchange rate. The results of the paper suggest that only relative productivity, trade openness and remittances affect real exchange rate in long-run, while in the short-run real exchange rate in Albania is affected by debt service, government spending, trade openness and remittances.

Keywords: Johansen cointegration test, Vector Error Correction Model, undervaluation, overvaluation

1 Introduction

Real exchange rate has significant impact on the economy of a country.The real exchange rate is considered as a key indicator of a country's competitiveness, it even is considered as the most reliable indicator of competitiveness in the Albanian context (IMF Report, 2003). A real overvaluation of the exchange rate is interpreted as a decline in price competitiveness, while an undervaluated real exchange rate leads to faster economic growth (Rodrik, 2008).

Albania is a small open country and is very important for Albanian economy to attract foreign investments. Real exchange rate is important in creating a stable economic environment. Fluctuations in the exchange rate in developing countries can affect aggregate demand and investment expansion (Frenkel, 2004), while an overvalued currency negatively affects employment (Hua, 2011). On the other hand, the high level of external debt makes it sensitive to movements in the RER. A persistently overvaluated real exchange rate is an early indicator of potential currency crisis (Kaminsky and Reinhart, 1999). Albania imports a significant amount of products from other countries. In this way the exchange rate affects the prices of imported products that local consumers buy. Mancellari and others (1999) showed that changes in exchange rates precede inflation in Albania.

The strategic objective of Albania is the accession to the European Union, where the last stage of this process is monetary union. This union requires as a precondition the exchange rate stability, at a rate, which should reflect the best estimate possible equilibrium exchange rate, based on a wide range of economic indicators (ECB, 2003). Therefore the main objective of exchange rate policy should be the stability of real exchange rate.

In this regard, the purpose of this paper is to find economic variables that affect the behavior of the real exchange rate in short-run and long-run in Albania. Real exchange rate is constructed as an index against the Euro, as product of nominal exchange rate EUR/LEK with ratio of foreign prices index to domestic prices index. Since Albania's main trading partners are Italy, Greece and Germany, the

foreign price index is weighted average of price indexes of these countries. The data are obtained from Bank of Albania, Eurostat, Ministry of Finance, Albania. The data have quarterly frequency for the period 2002Q1-2011Q4.

2 Factors that Affect the Real Exchange Rate

Based in the work of Edwards (1994) and Montiel (1999), in this paper as economic variables that affect the real exchange rate are selected:

-The relative productivity of tradable to non-tradable sector (TNT), used to measure the Balassa-Samuelson (1964) effect. B-S effect suggests that the increase in relative productivity of tradable to non-tradable sector is associated with overvaluation of the real exchange rate. The higher productivity in the tradable sector leads to increased wages throughout the economy. But, while the prices of tradable products for small open economies are determined in the international market, the prices of non-tradable products are determined by domestic demand and supply for these products. So, wage growth in the non-tradable sector will lead to increase in prices in this sector, the relative price of tradables to non-tradables will be reduced and hence the real exchange rate will be overvaluated.

- **Terms of trade (TOT)**, defined as the ratio of export prices to import prices. Improving terms of trade are expected to increase the income level of the country. Higher income increases demand for tradable and non-tradable products that leads to increased prices of non-tradable products and the overvaluation of real exchange rate (income effect). But, on the other hand consumers can replace non-tradable products with relatively cheaper import products. This can lead to declining prices of non-tradable products and overvaluation of real exchange rate (substitution effect). Thus, the effect of changes in terms of trade is unclear, because it depends on the relative strength of the effects. If the income effect is stronger than the substitution effect, then an improvement in the terms of trade will be associated with overvaluation of the real exchange rate. If the substitution effect is stronger, then the improved terms of trade will be associated by an undervaluation of the real exchange rate. In a study in seven developing countries Elbadawi and Soto (1997) found mixed results: in four cases the improved terms of trade associated with an undervaluation of the real exchange rate, while in three other cases improved terms of trade associated with overvaluation of the real exchange rate.

- **Debt service (DEBT),** defined as the ratio of debt payments (principal and interest) to export revenues. If the ratio of debt service increases, it means that a large part of the foreign currencies need to serve the debt. In this way, the domestic currency weakens, which leads to an undervaluation of the real exchange rate.

- **Trade openness (OPEN),** defined as the sum of exports and imports as % of GDP. The country is open to trade, if trade restrictions, that protect domestic products, reduces. By reducing the trade restrictions, the prices of domestic products are expected to fall, leading to a depreciation of the RER.

- **Remittances (REM),** as % of GDP. Remittances increase the income level of the host families. Income growth increases demand for products, tradable and non-tradable.In small economies, growth of demand in the tradable sector, has no effect on prices because the prices of these products are determined in the international market. But increased demand for non-tradable products will increase prices in this sector and hence the real exchange rate will be overvaluated. But, on the other hand, higher prices of non-tradable products will shift the resources toward this sector, reducing the activity of tradable sector, decreasing exports and increasing imports. So, the trade balance will deteriorate and real exchange rate will depreciate.Izquierdo and Montiel (2006) studied six countries of Central America and took contradictory results: in one case they found that remittances are associated with the RER overvaluation, in another case remittances lead to undervaluation of RER, while in other cases they found no link between remittances and the real exchange rate.

- **Government spending (GOV),** as % of GDP. Real exchange rate is affected by the volume and composition of government spending. Edward (1994) showed that the increase in government spending causes an appreciation of the real exchange rate. While Ravn and others (2007) investigated the effect of government spending shocks in some industrial countries. They found that an increase in government spending lead to increased private consumption, a deterioration of the trade balance and a depreciation of the real exchange rate. Thus, the effect of the impact of government spending on the real exchange rate is unclear.

- **Money supply (MS)**, as % of GDP. An increase in domestic money supply exerts inflationary pressure, especially on the prices of non-tradable products. Thus, the increase in money supply will be associated with overvaluation of the real exchange rate (Edwards, 1994).

All the variables are introduced in the model in logarithmic form. Considering the expected effect of each variable, the real exchange rate can be expressed as function of these variables:

$$\underset{-}{} \quad \underset{+/-}{} \quad \underset{+}{} \quad \underset{+}{} \quad \underset{+/-}{} \quad \underset{+/-}{} \quad \underset{-}{}$$
$$lnRER_t = f(\text{lnTNT, lnTOT, lnDEBT, lnOPEN, lnGOV, lnREM, lnMS})$$

3 Empirical Analysis

3.1 Unit Root Test

The first step in applying cointegration test for the identification of long-run relationship between the real exchange rate and other variables is testing for unit root or stationary. Stationary tests determine the order of integration of time series: if the time serie is stationary in level form, or if it turns into stationary after differentiation of different orders. All variables are tested through ADF test and Phillip-Perron test to determine whether they are stationary or not. The results of ADF test are summarized in the following table:

Table 1 Results of ADF Test

Variables	ADF test	p-value	Results
Lnrer	-6.059682	0.0000	Statinary I(0)
Lndebt	-4.397535	0.0013	Stationary I(I)
Lngov	-15.77075	0.0000	Stationary I(I)
Lnms	-2.642652	0.0936	Stationary I(II)
Lnopen	-9.615325	0.0000	Stationary I(I)
Lnrem	-7.769804	0.0000	Stationary I(I)
Lntjt	-7.193339	0.0000	Stationary I(I)
Lntot	-2.450672	0.1357	Stationary I(II)

*** MacKinnon critical values (1996) 1% = -3.626; 5% = -2.945; 10%= -2.611
The time lag series was determined automatically by Schwarz Info Criterion.

ADF test results show that RER variable is stationary in level form I(0). The variables DEBT, GOV, OPEN, REM and TJT are not stationary in level form, but become stationary after first differences I(I), while MS and TOT variables become stationary in the second differences I(II). Since the variables have different orders of integration, Johansen test of cointegration are used, which allows the variables to be integrated in I (0) and I (I), but not I (II). Therefore, MS and TOT are excluded from the model. From the statistical point of view, these two variables can't affect the value of the RER in Albania.

The results of ADF test are confirmed with Phillips-Perron test for stationary. The results of PP test are summarized in table 2.

Table 2 Results of Phillips-Perron Test

Variables	PP test value	P-value	Results
LnRER	-6.059362	0.0000	I(0)
LnDEBT	-3.604316	0.0103	I(I)
LnGOV	-6.967233	0.0000	I(0)
LnMS	-2.708372	0.0819	I(II)
LnOPEN	-10.45277	0.0000	I(I)
LnREM	-23.75377	0.0001	I(I)
LnTJT	-7.196553	0.0000	I(I)
LnTOT	-2.486034	0.1271	I(II)

***MacKinnon critical values (1996) 1%= -3.626; 5%= -2.945; 10% = -2.611
Time lag series was determined automatically by Newey-West Bandwidth.

The PP test confirms the ADF test results: the real exchange rate is stationary in level form, while money supply MS and terms of trade TOT are non-stationary and are excluded from further analysis. The results of other variables Debt, OPEN, REM and TJT are the same as those of ADF test. Only variable GOV results stationary in the form level, in contrast to the ADF test, where the variable become stationary in first differences.

By comparing the results of the two stationary tests and knowing that I (0) and I (I) variables can be integrated, then is applied the Johansen test of cointegration.

3.2 Johansen Cointegration Test

The Johansen test of cointegration tests the null hypothesis that there is no vector of cointegration versus the alternative hypothesis that there are vectors of cointegration. However, the correct application of this test requires the determination of time lags series of the variables in order to avoid autocorrelation. With quarterly data would be more appropriate to use a four time lags, but the small number of observations do not allow it. Therefore, in these conditions is used maximum possible number of time lags. After several proofs, the Johansen test is performed with three time lags.

Table 3 Results of Johansen Test of Cointegration

Series: lnREER lnDEBT lnGOV lnOPEN lnREM lnTJT
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.968787	283.3720	95.75366	0.0000
At most 1 *	0.885332	158.5633	69.81889	0.0000
At most 2 *	0.776392	80.59766	47.85613	0.0000
At most 3	0.400480	26.67473	29.79707	0.1098
At most 4	0.173122	8.256188	15.49471	0.4384
At most 5	0.038481	1.412667	3.841466	0.2346

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.968787	124.8087	40.07757	0.0000
At most 1 *	0.885332	77.96565	33.87687	0.0000
At most 2 *	0.776392	53.92292	27.58434	0.0000
At most 3	0.400480	18.41855	21.13162	0.1150
At most 4	0.173122	6.843521	14.26460	0.5078
At most 5	0.038481	1.412667	3.841466	0.2346

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3 shows the results of Johansen cointegration test in trace test and maximum eigenvalue test.
Trace test results show that null hypothesis of no cointegration is rejected, because the test value 283.372 is bigger than the critical value 95.753 at 5% probability. Also, null hypotheses that there are at most one vector of cointegration and at most two vectors of cointegration are both rejected. Trace test results show that null hypothesis that there are at most three vectors of cointegration cannot be rejected, because the trace test 26.67473 is smaller than the critical value 29.79707, meaning that there are 3 vectors of cointegration between real exchange rate and other variables included in the model.
Maximum eigenvalue test accepts the null hypothesis that there are at most 3 vectors of cointegration between variables, because test result 18.418 is smaller than critical value 21.131.
Since both trace test and maximum eigenvalue test confirm the existence of at least one vector of cointegration, it can be concluded that there is a long-run relationship between the real exchange rate and economic variables included in the model, meaning that all the variables move together in long-run.

3.3 Vector Error Correction Model (VECM)

Because all the variables are cointegrated, then it can be performed the VECM, that shows if there is causality from economic variables to real exchange rate. VECM allows also making distinctions between variables that affect the real exchange rate in the long-run and short-run.
The long-run relationship equation is:

$$LnRER = -2.97 + 0.88\ lnOPEN + 1.43\ lnREM - 0.66\ lnTJT$$

The error correction term $\boldsymbol{\alpha}$ = -0.348 (p-value = 0.0000), so is negative and statistically important, meaning that explanatory variables OPEN, REM and TJT affect the real exchange rate in the long-run.
The coefficient of variable OPEN is positive, consistent with economic theory. Estimated equation confirms the positive correlation, suggesting that the opening of trade with other countries in the Eurozone, significantly affects the real exchange rate Lek / EUR in the long run: 1% increase in trade opening will be accompanied by undervaluation of the real exchange rate by 0.88%.

The coefficient of variable REM is positive, suggesting that the 1% increase in the level of remittances is associated with undervaluation of real exchange rate by 1.43%.

The relative price of tradeable to non-tradeable TJT variable has negative sign. This variable is included in the model to study the Balassa-Samuelson effect. The coefficient of 0.66 suggests that a 1% increase in relative productivity between sectors will be associated with overvaluation of the real exchange rate by 0.66%. This confirms that Balassa-Samuelson effect exists in Albania. This conclusion is consistent with previous studies by Hoda (2012) and Vika & Luci (2011) even though the latter suggest a strong influence of the relative productivity on real exchange rate. This can be explained by way of measuring the variable, which in Hoda's(2012) paper is similar to that used in this paper, while Vika & Luci (2011) used real income per capita as a measure of productivity.
In conclusion, it can suggested that real exchange rate in the long-run is affected by trade openness OPEN, remittances REM and the relative productivity TJT.
The results found are slightly different from those of previous studies. For example, Vika & Luci (2011) suggested relative productivity TJT and net foreign assets NFA as variables that affect the long-run real exchange rate in Albania, excluding the impact of other variables, such as remittances, terms of trade, government spending, interest rate differentials between Albania and the Eurozone. While Hoda (2012) suggested that long-run real exchange rate in Albania is affected by the relative productivity and terms of trade, excluding interest rate differentials and net foreign assets.
VEC model enables also the identification of variables that can affect the real exchange rate in short-run. Statistical significance of each of them is verified through Wald test. Results are summerised in the following table.

Table 4 Wald Test for Short-Run Coefficients

Variables	Coefficients	Standard deviation	p-value
D(lnDEBT(-1))	3.891853	1.466116	0.0180
D(lnDEBT(-2))	4.059209	1.730718	0.0332
D(lnDEBT(-3))	4.162879	1.684272	0.0259
D(lnGOV(1-))	1.128268	0.478540	0.0324
D(lnGOV(-2))	0.919982	0.405587	0.0385
D(lnOPEN(-1))	2.947949	0.849772	0.0034
D(lnREM(-1))	1.112528	0.418449	0.0179

Wald test suggests that debt service affects real exchange rate in short-run up to three time lags because it has a sign in accordance with economic theory and is statistically significant (p-value <5% in all the cases). The positive correlation that does exist between real exchange rate and debt service implies that any increase in debt service is associated with real exchange rate undervaluation. The results suggest also that fiscal policy, remmitances and trade openness have a positive correlation with real exchange rate: increase in the level of any of them leads to real exchange rate undervaluation in short-run.

3.4 Diagnostic Checks

The adjusted R^2 = 0.74 (p-value F-statistic = 0.000479) suggests that the economic variables together explain about 74% of the movements in the real exchange rate and only 26% of these movements can be explained by other factors not included in the model. The analysis of the residuals shows that the residuals are normally distributed, there is not serial correlation and heteroscedasticity.The results of the tests are summarized in the table 5.

Table 5 Diagnostic Checks Results

Test	Test value	p-value
F-statistic	5.9223	0.000479

Normality (Jarque-Bera)	1.4304	0.48
Serial correlation(Breusch-Godfrey)	3.2994	0.19
Heteroscedasticity(Breusch-Pagan-Godfrey)	31.1847	0.14

4 Conclusions

Since RER is an important economic variable, its management should be given more importance by policymakers. The successful management requires identification of the factors that affect the real exchange rate in the short-run and long-run.

In this paper the economic variables that affect RER in short-run and long-run were studied. Among the numerous variables that can affect the RER, the study showed that the long run RER in Albania is affected by the relative productivity between sectors of the economy, remittances and trade openness. This result is not unexpected. Like all countries in transition, Albania witnessed relatively rapid growth of prices than in developed countries. This makes the B-S effect to occur. The study also showed that remittances have a significant effect on the real exchange rate. In fact, nearly half of the Albanian population living outside its borders and remittances constitute a very important part of the flow of foreign currencies. While in the short term, RER is also influenced by debt service. The result is not unexpected, since nearly half of Albania's external debt is denominated in euros.

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