MEASURING IMPORT AND EXPORT FUNCTIONS IN ALBANIA*

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CONTENTS

ABSTRACT

This paper uses an error correction model to measure the elasticity of merchandise import (export) flows to (from) Albania with respect to domestic (foreign) real demand, developments in relative prices abroad and at home, and local currency market fluctuations. The model specification is intended to find out whether trade flows respond differently to the explanatory variables in the long and short run. The estimated trade elasticities are useful for forecasting future trade flows as well as to policymakers who need to evaluate commercial policies or exchange rate devaluation options to improve the merchandise trade balance.

1. INTRODUCTION

The developments in foreign trade flows could have large implications for small open economies, therefore their trends are followed closely by markets and policy makers designing macroeconomic policies. To maintain internal and external economic stability, a negative balance between exports and imports has to be financed by an equal positive amount of net capital inflows. The prediction of both export supply and import demand find thus an important practical use in the production and balance of payments models for policy purposes. In addition to that, the degree of imports and exports elasticities are useful for policy makers who need to choose between commercial policies or exchange rate devaluation options in order to improve the position of foreign trade with the rest of the world.

The conventional economic theory on international trade links the long-run quantity demanded for imports (exports) to domestic (foreign) income growth, developments of prices at home and abroad, and the changing value of local currency. Indeed, the early contributions focused primarily on the relative price effects on trade flows. Two comparable studies in this regard are the analyses made by Orcutt (1950) and Kreinin (1967), who attempted to explain the import and export elasticities for a number of countries as a function of prices.

Later econometric analyses, however, realized that income effects were also at least as important as price elasticities in explaining developments in trade balance, especially in a growing economy. In a two-country model, even if prices remain constant and income grows at same rates, the trade balance in each country would theoretically change if income elasticities of import demand differ between them. In this case, supposing initially balanced trade account, the country with higher import elasticity will experience a larger import growth than its exports, thus worsening foreign trade balance and putting downward pressure to the local currency value. Houthakker and Magee (1969) estimated the income and price elasticities for a number of developed countries and the results showed that even if their production and prices increased at the

same rate the trade balance improvement or deterioration in some countries was influenced by disparities in income elasticities of their demand for imports.

The collapse of the Bretton Woods system, however, ended the period of fixed exchange rates and researchers and policy makers everywhere were unfamiliar with the possible reversals in the trade balances due to foreign exchange fluctuations. Previous intuition used to rely on the assumption that the magnitude and timing of floating exchange rate effects on the trade flows would resemble the reaction to relative prices. Searching for empirical evidence on price and exchange rate influences in foreign trade, many studies have since then used both variables by altering or adjusting them in order to check for combined or separate effects (see for example Junz and Rhomberg (1973); Wilson & Takacs (1979); Warner & Kreinin (1983); Bahmani-Oskooee (1986); Bahmani-Oskooee & Niroomand (1998); Bahmani-Oskooee & Kara (2003, 2005).

Using data from six major industrial countries for the period 1957-71, Wilson and Takacs (1979) found that (i) the full reaction of imports and exports to exchange rate changes tended to be shorter than for changes in prices; and (ii) trade flows were initially much more sensitive to exchange rate fluctuations than to price changes. The results, however, are based on a sample period in which exchange rates were fixed because of the Bretton Woods agreement; hence the magnitude and size of the responses might not be very conclusive.

Another comparable study by Warner and Kreinin (1983) showed that the separation of prices into prices and exchange rate components yielded more accurate results than the composite relative price variable. Comparing the performance of imports and exports in several major economies pre- and post-Bretton Woods era, they concluded that floating exchange rates are an important determinant of import and export flows.

Bahmani-Oskooee (1986) estimated the speed and size of relative price and exchange rate effects in Brazil, Greece, India, Israel, Korea, South-Africa and Thailand for the 1971-80 period.

The results showed that trade flows reacted faster to exchange rate movements than to price changes, which is consistent with the Wilson and Takacs' (1979) findings; however, the magnitude and size of the response estimated by Bahmani-Oskooee (1986) – unlike the Wilson and Takacs's (1979) results – indicated that import and export demand in these developing countries were more sensitive to prices than exchange rate fluctuations.

As for Albania, Shtylla and Sojli (2006) have combined the effects of relative prices and exchange rate on trade flows together into a single real exchange rate variable, therefore making no distinction between their elasticities. Using quarterly data from 1997 to 2003 they found that the long-run impact of the real effective exchange rate on the volume of imports is slightly higher than that of domestic GDP. In the export equation, the relationship between current exports and the real exchange rate with one time lag was in opposition to expectation in both the long and the short run, which could have entailed a test on likely J-curve effects.

Another paper by Agolli (2004) analyzed the response of bilateral trade flows in Albania as a function of income, relative prices and a variable measuring exchange rate uncertainty. The empirical results indicated that in the long run, the volume of Albanian exports and imports with Greece, Germany and Italy were a lot more sensitive to the exchange rate uncertainties than relative price changes, although the degree of the response was more related to countries' specifics.

This paper uses an error correction model to measure the elasticity of merchandise import (export) flows to (from) Albania with respect to domestic (foreign) real demand, developments in relative prices abroad and at home, and fluctuations in local currency value. The model specification is also intended to find out whether trade flows respond unevenly to the explanatory variables in the long and short run. The next section briefly introduces the methodology used in the error correction model and then discusses the elasticity estimates, which are useful for forecasting future trade flows and throw some light on economic policies aiming at curbing trade deficits.

2. MEASURING THE IMPORT DEMAND AND EXPORT SUPPLY FUNCTIONS

2.1 METHODOLOGY

To estimate the import demand and export supply in Albania we have taken the respective functional forms from Bahmani-Oskooee (1986), where the volume of merchandise imports (exports) is determined by domestic (foreign) demand, relative prices and the exchange rate. In the simplest form, the long-run relationship in each equation can be estimated as follows:

$$\log(x_t) = \lambda_0 + \lambda_1 \cdot \log(y_t) + \lambda_2 \cdot \log(p_t) + \lambda_3 \cdot \log(e_t) + v_t \quad (1)$$

where

t = quarterly period;

x_t = merchandise imports (exports) in domestic currency at quarter t;

y_t = i) in the import equation, it is the quarterly domestic real GDP in leks, ii) in the export equation, it is the foreign real GDP based on export weights with Italy, Greece, Germany and Turkey;

p_t = relative prices measured as the ratio of foreign[1] over domestic price index (PF/PD); i) in the import equation, CPI indices are used, whereas ii) export equation uses the ratio of tradable prices;

e_t = average exchange rate: i) import equation uses the lek effective exchange rate based on trade weights with Italy, Greece, Turkey, Germany and China; while ii) export equation uses the Lek/Euro exchange rate;

λ_1, λ_2, λ_3 are the long-run parameters;

v_t = the error term.

Equation (1) outlines the long-run relationship among the variables in the import and export equations. Because all data series are in logs, the parameters indicate the elasticity of trade flows with respect to the explanatory variables. Parameter λ_1 in front of the output variable captures the sensitivity of import demand (export supply) to domestic (foreign) output. A rise in real (foreign) output should, theoretically, cause an increase in the demand for imported

(supply of exported) goods, hence a positive relationship.

The λ_2 and λ_3 parameters are expected to be negative in the import equation since a rise in the price ratio and a depreciation of the effective exchange rate should lead to a smaller amount of imports. If domestic products would become expensive relative to goods sold in international markets, there could be a shift in consumption spending in favor of foreign goods. The same argument goes for the impact of local currency appreciation on the demand for imports. A fall in the effective exchange rate of the Albanian lek would make foreign goods more attractive, since locals can purchase more goods abroad with less money.

On the other hand, the relative prices and the Lek/Euro exchange rate should have a positive impact on the quantity of exports, hence positive λ_2 and λ_3. A relatively faster growth in domestic prices would lower the price ratio and make domestic products more costly to international importers. Foreign demand for merchandise goods produced in Albania will also fall in response to appreciating value of the lek currency, since more money are now needed to buy the same amount of goods priced in leks.

It is generally agreed, however, that trade flows do not instantaneously adjust to their long-run equilibrium but they might respond to changes in the short-run also. Therefore, if the long-run relationships among the variables are cointegrated, both equations should be estimated in an error-correction modeling format. This enables us to find the long-run behavior of the endogenous variables while allowing for short-term adjustment dynamics. Import (export) changes in every period are thus estimated in the log-linear form as follows:

$$\Delta\log(x_t) = \beta_0 + \beta_1 \cdot \Delta\log(y_{t-l}) + \beta_2 \cdot \Delta\log(p_{t-l}) + \beta_3 \cdot \Delta\log(e_{t-l}) + \alpha_1 \cdot v_{t-l} + \beta_4 D'^{97} + \beta_5 @seas(1) + \beta_6 @seas(2) + \beta_7 @seas(3) + u_t \quad (2)$$

where the 'Δ' sign indicates a change; l shows the number of lags (up to 4 lags were used); $\beta_1, \beta_2, \beta_3$ are the short-term parameters; v_t is the residual obtained from the long-run relationship in equation

(1); $_1$ measures the speed of adjustment of imports (exports) towards the long-run equilibrium; *D'97* is a dummy for 1997 quarters; *@ seas* are seasonal dummies; $ß_0$ is a constant; $ß_5$, $ß_6$, and $ß_7$ are parameters that capture seasonal effects; u_t is the error term.

In long run equilibrium, the error correction term measured from equation (1) should equal zero. However, a deviation of output, relative prices and exchange rate from the long-run equilibrium should cause the error correction term to be nonzero and each variable will have to adjust to partially restore the equilibrium relation. The speed of this adjustment is captured by the parameter α.

The import and export equations were each estimated in a two step procedure following the Engle and Granger's (1987) cointegration approach. In the first step (as indicated in Eq. (1)), the import and export equations measure only the long-run parameters of the cointegrating vector together with the dummy variables of concern. This measure serves as a test of the existence of any cointegration or long-run relationship between imported/exported goods and their explanatory variables.

The estimated long-run parameters from equation (1) are then used in the second step (Eq. (2)), which measures the short-run sensitivity of trade flows in a parsimonious error correction model. The estimation in this step starts by introducing a maximum of 4 lags for the differenced variables (because of the small sample size at hand), and then gradually dropping the statistically insignificant variables. In both steps, regression equations have been estimated using the least square method, covering the period from 1996Q1 to 2005Q4.

2.2 EMPIRICAL RESULTS

The modeling of import and export equations in an error correction format requires that each of the variables be integrated of order one. The unit root tests based on ADF and Phillips-Perron tests were therefore used to determine the stationarity level of each

variable. Table I and II displays that almost all variables in levels appear to be *I*(1) variables. The high probabilities indicate that we can reject the null hypothesis of unit roots at the 5 percent level. Although some variables appear to be stationary in levels (i.e. *I*(0)) in one test, the results in the other test contradict that outcome and indicate they could be *I*(1) variables. Given the unit root tests, standard regressions in level form may be spurious.

Table 1 Unit Root Tests for Import Variables

	ADF test results				Phillips-Perron test results			
	Null Hypothesis: Unit root				Null Hypothesis: Unit root			
	Levels		1st difference		Levels		1st difference	
Variables	Prob.	Lag[a]	Prob.	Lag[a]	Prob.	Bandwidth[b]	Prob.	Bandwidth[b]
With constant								
Imports	0.13	7	0.00	4	0.55	39	0.00	14
Real GDP	0.93	0	0.00	0	0.93	3	0.00	5
Relative CPI	0.00	9	0.23	7	0.08	4	0.01	1
NEER	0.64	3	0.14	2	0.83	2	0.00	1
With constant and trend								
Imports	0.61	5	0.00	6	0.00	15	0.00	14
Real GDP	0.14	1	0.00	0	0.26	2	0.00	5
Relative CPI	0.33	7	0.01	6	0.33	3	0.01	1
NEER	0.02	5	0.32	2	0.19	2	0.00	1
Without constant and trend								
Imports	1.00	5	0.09	7	1.00	13	0.00	20
Real GDP	1.00	0	0.00	0	1.00	3	0.00	0
Relative CPI	0.01	6	0.03	7	0.01	4	0.00	1
NEER	0.54	3	0.02	2	0.48	2	0.00	0

[a]Automatic selection of lags based on AIC; [b]Newey-West bandwidth selection using Bartlett kernel

Table 2 Unit Root Tests for Export Variables

	ADF test results				Phillips-Perron test results			
	Null Hypothesis: Unit root				Null Hypothesis: Unit root			
	Levels		1st difference		Levels		1st difference	
Variables	Prob.	Lag[a]	Prob.	Lag[a]	Prob.	Bandwidth[b]	Prob.	Bandwidth[b]
With constant								
Exports	0.70	9	0.00	8	0.38	1	0.00	4
Foreign GDP	0.69	4	0.52	7	0.30	13	0.00	13
Relative Price	0.00	8	0.03	8	0.29	3	0.00	1
Lek/Euro	0.30	3	0.04	2	0.37	1	0.00	3

With constant and trend								
Exports	0.00	0	0.02	8	0.00	3	0.00	5
Foreign GDP	0.91	4	0.54	7	0.00	0	0.00	12
Relative Price	0.00	8	0.11	9	0.91	2	0.01	3
Lek/Euro	0.37	5	0.08	2	0.70	3	0.00	6
Without constant and trend								
Exports	1.00	9	0.00	0	1.00	6	0.00	2
Foreign GDP	0.98	4	0.27	7	1.00	11	0.00	16
Relative Price	0.60	9	0.00	8	0.12	3	0.00	0
Lek/Euro	0.69	3	0.00	2	0.72	1	0.00	3

[a]Automatic selection of lags based on AIC; [b]Newey-West bandwidth selection using Bartlett kernel

The long-run relationship among the variables in import and export functions was determined by employing the Johansen test and Engle and Granger's (1987) cointegration approach. The results of the former test (as reported in Table III) indicate that there are at most two cointegrating equations for both imports and exports to and from Albania at the 1% and 2% level of significance, respectively.

Table 3 Johansen Test for Cointegration

Series: ln *Imports*, ln *Real_GDP*, ln *Relative_CPI*, ln *NEER*					
Exogenous series: dum97 @seas(1) @seas(2) @seas(3)					
Unrestricted Cointegration Rank Test					
Lags interval (in first differences): 1 to 4*					
Hypothesized		Trace		Max-Eigen	
No. of CE(s)	Eigenvalue	Statistic	Prob.	Statistic	Prob.
None	0.846560	130.3872	0	74.97782	0
At most 1	0.630302	55.4094	0.0018	39.80280	0.0004
At most 2	0.266288	15.6066	0.5244	12.38556	0.3801
Trace and Max-eigenvalue tests indicate 2 cointegrating equations at the 1% level					
Series: ln *Exports*, ln *ForeignGDP*, ln *Relative_Tradable_Prices*, ln *Lek/Euro*					
Exogenous series: dum97 @seas(1) @seas(2) @seas(3)					
Unrestricted Cointegration Rank Test					
Lags interval (in first differences): 1 to 1*					
Hypothesized		Trace		Max-Eigen	
No. of CE(s)	Eigenvalue	Statistic	Prob.	Statistic	Prob.
None	0.673901	93.6309	0	47.06325	0.0004
At most 1	0.522179	46.5677	0.0206	31.01777	0.0094

At most 2	0.199793	15.5499	0.5291	9.36115	0.6868
Trace test indicates 2 cointegrating equations at the 2% level					
Max-eigenvalue test indicates 2 cointegrating equations at the 1% level					
*Lag order selected by the LR criterion					

The Engle and Granger's (1987) test for cointegration is based on the stationarity of the error terms estimated in the long-run equations [Equation (1)]. The residuals obtained from each of the trade flow equations were stationary at the 1 percent level of significance, indicating that there exists a long-run relationship between merchandise imports (exports) and domestic (foreign) GDP, relative prices, and exchange rate in Albania. Also, the dynamic equations estimated in the error-correction form in the second step are in line with the theoretical expectations for all parameters. The elasticities of import and export volumes in the long- and short-run are presented in Table IV.[2]

Table 4 Elasticities of Trade Flows

Elasticities of Import Quantity Demanded (1996Q1:2005Q4)						
Real GDP		Relative CPI Prices		Effective Exchange Rate		EC
Long-run (t)	Short-run (t)	Long-run (t)	Short-run (t-2)	Long-run (t)	Short-run (t)	(t-1)
1.33 (3.65)	1.93 (2.50)	-.99 (-3.52)	-2.95 (-4.52)	-0.74 (-1.83)	-0.57 (-1.44)	-0.79 (-5.78)
Elasticities of Export Quantity Supplied (1996Q1:2005Q4)						
Real Foreign GDP		Relative Tradable Prices		Lek/Euro		EC
Long-run (t)	Short-run (t-1)	Long-run (t)	Short-run (t-2)	Long-run (t)	Short-run (t-1)	(t-1)
6.95 (7.81)	10.37 (3.08)	0.45 (1.25)	0.32 (0.48)	1.32 (2.60)	2.39* (3.77)	-0.65 (-4.04)

*A combined parameter for quarters at period t-1 [1.72 *(3.77)*] and t-3 [0.67 *(1.63)*].
Note: Foreign GDP = GDP for Italy, Greece, Germany and Turkey; Relative prices = ratio of foreign to domestic prices; EC = error correction term; t = current quarter; t-statistics are shown in brackets.

The elasticity estimates in the import equation show that merchandise imports are in the long run chiefly determined by domestic income (which is proxied by real GDP performance).

An increase of one percent in real GDP should cause Albanian demand for foreign goods to increase by 1.3 percent, which may imply a crucial role of imports in satisfying the shortage of domestic commodities consumed or used up as inputs in production.

The relationship between import demand and relative prices appears to be unit elastic in the long run and very elastic in the short run. This could reflect the high competition that Albanian goods face domestically and how easily they could be traded off for foreign commodities in case local prices increase (*ceteris paribus*). This is especially true in the short run, where a rise of one percent in domestic prices relative to foreign inflation could spur a flow of foreign goods by almost three percent into Albania with a time lag of only two quarters.

Movements in the effective exchange rate seem to have a measured impact on the domestic demand for foreign goods. Though not statistically significant, the inelastic parameters emphasize the indispensability of the bulk of imports in the Albanian economy and call attention to policymakers of the ineffectiveness of exchange rate policies in restraining import growth in the long as well as short run.

The final parameter of interest in the import equation is that of the error correction term, which has the expected negative sign and is significant. The magnitude of the EC indicates that nearly 80 percent of the previous period's divergence is corrected for in the current period. Hence, a relatively fast adjustment around the long-run equilibria. In short, the volume of merchandise imports in Albania is strongly related to real gross domestic production, developments in relative consumer prices, adjustments to long-term equilibria, and less to exchange rate fluctuations.

As with imports, Albanian merchandise exports are firmly determined by foreign income (economic activity), particularly Italy where about three-forth of total exports are headed for. In the long run, exports are estimated to expand by approximately 7 percent for every percent growth in foreign demand, which is comparable to the long-run export elasticity with respect to Italian income estimated by

Agolli (2004). In the short run the foreign income effects could be even larger and occur within the next quarter. Although the income elasticity of export demand seems to be sizable, the magnitude of parameters is fairly persuasive, given the trivial size of Albanian exports compared to the combined demand from Italy, Greece, Germany and Turkey (which are Albania's main trading partners).

The changes in relative prices appear to have insignificant effects on the performance of export volume. In both the long and short run, domestic exports are estimated to contract by 0.3 to 0.5 percent in response to 1 percent increase in domestic tradable prices – assuming constant foreign prices. The price inelastic foreign demand suggests that currently exported goods from Albania (consisting mainly of custom-made re-exports to Italy) can still exercise some degree of cost competitiveness against international rival goods until their prices converge to a more sensitive range.

On the other hand, movements in the Lek/Euro exchange rate appear to significantly determine the domestic supply of exports. The appreciation of lek against euro by one percent for an extended time period should discourage foreign demand from Albanian exports by 1.3 percent. The estimated effects of exchange rate changes are larger in the short run, pointing to heightened sensitivity of re-exports to local currency fluctuations.

The coefficient of the error correction term in the export equation carries a negative sign and falls between 0 and 1 in absolute value as expected. The size of the error correction term shows that almost 65 percent of departures from equilibrium in the previous period are rectified in the current period. These results indicate that Albanian exports are in the long and short run determined by the performance of foreign economic activity, changes in the Lek/Euro exchange rate, and adjustments of error correction term around the long-term equilibria.

Now we can examine the Marshall-Lerner condition to evaluate whether exchange rate policies would have a positive impact on trade balance. According to the condition, for a currency devaluation to be effective, the sum of price elasticities of import

and export demand (in absolute value) must be greater than 1. The corresponding price elasticities of trade flows in Albania were found 0.99 and 0.45, respectively, and their sum exceeds unity. This could prompt policymakers of the effectiveness of a lek depreciation as a means of bringing down the external trade deficit. Any inference on the magnitude of the effects, however, has to be drawn with caution inasmuch as the latter coefficient is not statistically very significant.

Finally, the reliability of the elasticities estimated in both models is assessed through a set of specification and diagnostic test. As reported in Table V, the import and export equations pass quite well the Ramsey RESET test of misspecification in the functional form. The LM test indicates no serial correlation in the import equation; however, that seems to be present in the case of exports. The error terms, anyhow, appear to be normally distributed in both equations, as shown by the Jarque-Bera test. Checking for heteroskedasticity, the Park test reveals that is present in the import equation, but not for the disturbances in the exports equation.

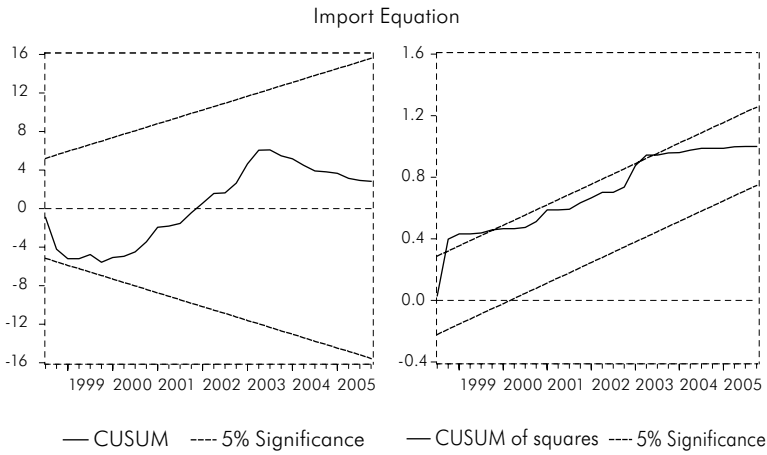
To correct the OLS standard errors for serial correlation (in exports) and heteroskedasticity (in imports) both equations were re-estimated using the Newey-West method. The HAC results denoted that OLS estimation might have overestimated the true standard error for the exchange rate elasticity in import equation (hence, significant at 5 percent level); the corresponding standard error, however, was modestly underestimated when measuring the export equation.

Table 5 Specification and Diagnostic Statistics for the Import and Export Equations

Diagnostic Tests	Imports	Exports
Breusch-Godfrey Serial Correlation LM Test:		
Obs*R-squared	18.7625 (0.0001)	0.8354 (0.3607)
Ramsey RESET Test:		
F-statistic (1,29)	0.8228 (0.3718)	1.0413 (0.3163)
Normality Test of the Residuals:		
Jarque-Bera	0.2674 (0.8749)	0.0865 (0.9577)

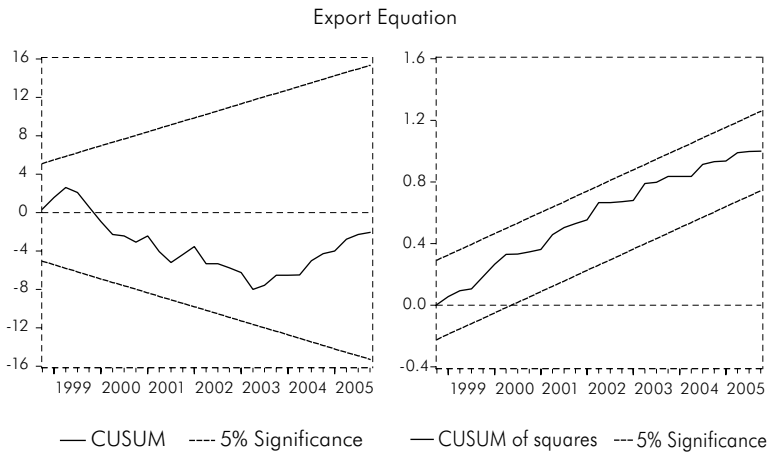
Park Test for Heteroskedasticity*:		
t-Statistic	1.4999 (0.1467)	2.6045 (0.0162)
*Based on the regression of squared residuals on squared fitted values. Note: probability values of the tests are shown in parentheses.		

Chart 1 CUSUM and CUSUM Square of Recursive Residuals



Furthermore, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests were employed to discern the stability of parameter estimates in the error correction models (Chart 1). In the import equation, although slight departures outside the 5% significance level zone are noticed using the CUSUMSQ test, it can be stated that coefficient estimates show patterns of overall stability during the sample period.

Chart 2 CUSUM and CUSUM Square of Recursive Residuals



4. CONCLUDING REMARKS

This paper tries to analyze the relative responsiveness of trade flows to changes in income, relative prices and exchange rate in Albania. The empirical findings reveal that real income (as proxied by real GDP) is the main determinant of trade flows in the long run, particularly for exports. This suggests that Albania could potentially benefit from export promotion policies. Furthermore, changes in relative prices appear to have a larger impact than exchange rate fluctuations have on the volume of merchandise imports. The opposite is true for the export supply, which seems to react greater and faster to changes in the Lek/Euro exchange rate than to relative prices.

Apart from estimating the elasticity of merchandise imports and exports for prediction purposes, the paper also sheds light upon domestic economic policies aiming at curbing the trade deficit with the rest of the world. The imposition of import tariffs is not going to produce the desired effects anymore, since Albania is undertaking a series of Free Trade Agreements with the European Union and

other important trading partners. For that reason, exchange rate policies will eventually be a valuable leverage together with export oriented plans to hold in check the external trade deficit. The sum of the estimated price elasticities of trade flows (in absolute value) in Albania are greater than 1, indicating that the Marshall-Lerner condition is satisfied and therefore a currency devaluation might have positive effects on the trade deficit.

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ENDNOTES

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[1] The foreign price indices are constructed by taking the prices for Germany, Greece, Italy and Turkey, and then the series have been weighted according to each country's share in the imports (for the import equation) and exports (for the export equation) of Albania.

[2] For small sample data, as in the present case, the correctness of the results of unit root and cointegration tests remains often questionable. For that reason, Pesaran et al. (2001) propose a different approach to the cointegration analysis which allows for estimating a long-run relationship among variables irrespective of whether they are I(0) or I(1). Nevertheless, the results following the Pesaran et al.'s approach (not shown in the paper) were fairly similar to the elasticity estimates displayed in Table IV.

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