EXCHANGE RATE VOLATILITY EFFECT ON TRADE VARIATIONS

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Introductory notes

Exchange rate volatility can affect trade directly, through uncertainty and adjustments costs, and indirectly through its effect on the structure of output, investments as well as on government policies. This paper is focused on direct effect the exchange rate exert on trade, while some characteristics of the indirect impacts are being considered as important background variables that have defined the relation and its firmness. The expected effect is paired with demand/supply elasticity to relative prices; an inelastic export demand/supply to relative prices makes uncertain the theoretical presence of nominal/real exchange rate effect on trade flows. If exchange rate did or did not matters, when trading , was also related to trade barriers (Bhagwati, 1996; pp123), high trade barriers would make the exchange rate ineffective in price adjustments to currency fluctuations. Facing different elasticities for imports' and exports' demand to relative prices and trading countries specifics, on one hand, and the state of trade liberalization on the other hand makes interesting the environment where exchange rate volatility plays its role on Albanian trade context.

The paper tries to empirically investigate the effect exchange rate uncertainty has played on trade volumes. Two different measures of volatility index derived from nominal and real exchange rate are estimated, co integration techniques is used to check countries' short/long term evidences on the effect exchange rate volatility had played on bilateral trade and comparison is made from aggregated results derived through pooled estimation. In general there is evidence of a deteriorating effect exchange rate volatility plays on trade volume, inn short term and considering disaggregated country data exports have been suffering most, while imports do not react significantly to exchange uncertainty, mainly due to the inelastic imports demand. There are different country pattern of this effect and short run adjustments results important in both in significance and magnitude.

The paper is organized as follows: first part offer a literature review followed by a summary overview of the exchange rate regime in Albania and empirical evidences on the issue. Section 2 and 3 present the model, the econometric methodology and data issue, while section 4 presents and discuss different estimation results, finally some concluding evidences are summarized.

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I. Literature review

The standard macroeconomic argument behind trade flow adjustments to nominal exchange rate depreciation usually implies real exchange rate depreciation, at least to the extent that relative prices do not adjust by the same amount as the nominal exchange rate movement. Relative price adjustments theory suggests that such devaluation of the domestic currency implies excess demand for export oriented goods (domestic goods), which would result in increase exports and decrease imports. The effect exchange rate would exert on the trade flow is paired with demand/supply elasticity to relative prices. Facing an inelastic exports demand/supply to relative prices makes uncertain the theoretical presence of nominal/real exchange rate effect on trade flows. If exchange rate matters, or did not matter when trading , was also closely related to trade barriers (Bhagwati, 1996; pp123) high trade barriers will make the exchange rate ineffective in price adjustments to currency fluctuations.

The macroeconomic debate on currency behavior and its relation with trade decision has been laid toward microeconomic analyses of optimizing firm behavior under uncertainty and risk. The consequences of exchange rate volatility (*risk measure*) on trade have long been of concerns, and highly debated among the economists. However, there is no consensus so far as to whether the exchange rate volatility, matter, and if trade benefits or adversely react to currency fluctuations remains unresolved. (McKenzie, 1999)

Traditional models examined the exchange rate volatility effect on trade based on producer theory of the firm under uncertainty, where firm profitability is related to the movements of the exchange rate. A risk-averse firm, in a situation of a dependency between its profit and exchange behavior, would prefer to reduce risk, reducing the level of trade. Baron (1976b) suggested that when the exporter invoices in foreign currency, he faces price risk. The quantity demanded is known (contracted), since prices may change during contract period, the revenue stream and profit yield uncertainty. When a firm invoices in local currency the firm faces quantity risk, quantity demanded is not certain because prices are uncertain (import prices may become more competitive in currency appreciation and consumer preferences may shift). Risk-averse firm would minimize risk, affecting prices, but price movements are different for those firms invoicing in foreign currency (under demand certainty - price would increase to minimize risk) and those invoicing in local currency (under demand uncertainty – price would decrease).

Hooper and Kohlhagen (1978) examined the effect of exchange rate volatility in a bilateral framework, where source of uncertainty is the nominal exchange rate. They showed that there is a clear negative relation between, exchange rate volatility and the volume of trade, but the effect on prices is ambiguous depending on the fact that, are importers or exporters who bear the risk. De Grauwe (1988) – assuming that risk aversion is not constant, and its degree effect firm utility function convexity argued that there are two effects of increased exchange risk, a substitution effect and an income effect, which work in opposite direction. The final effect of exchange risk on trade would depend on the magnitude of the substitution and income effect.

II. Some short notes on the Albanian exchange regime

Examining the effect of exchange rate and exchange rate volatility on trade remains an interesting outcome for the Albania's foreign trade.Trade liberalization and a flexible exchange rate regime, adopted by Albania, in 1992, have increased the exposure of trade flow to currency behavior risk, while being affected by specific trade partners export demand/supply characteristics. Regional FTA's initiatives need careful monetary adjustment to support trade and help the naissance of advantages, on the other hand reducing currency risk, will improve the trade and investment environment.

After attempts of the authorities to keep a fixed exchange rate, given the financial conditions of the country this monetary policy regime couldn't resist for long. In August 1992, Albania adopted a floating exchange rate regime, under a money growth target (monetary strategy), which shifted the exchange rate determination from state monopoly to market forces. The adoption of a flexible, rather than pegged

exchange rate in Albania found support in the literature, especially in the context of a small open economy in transition, when the level of international reserves is below a minimum threshold (see Muço et al., 1999). Flexible exchange rate brought about a rapid Lek devaluation and an inflationary situation since exchange rate shocks were transmitted to the price level, mainly due to the high weight of imports on GDP.

Exchange rate regime was part of a full package of transition reforms, including the foreign trade sector which was reliefed from state monopoly and prices were substantially liberalized. Albanian Leke has been characterized by depreciation tendencies until 1997, the 1997 crises was the reason of an abnormal LEKE depreciation, then an appreciation trend is noticed, which is applied to almost all the currencies, until year 2002, when Euro was introduced and the nominal exchange rate started to behave differently toward USD and EURO, LEKE was having an appreciation trend towards USD, while following a depreciation path against EURO. The volatility index varies among currencies; EURO is the one having the more stable behavior, while USD and Italian Lira have been characterized by a wider range of nominal exchange rate the time (see standard deviation of the nominal exchange rate) but the volatility index shows that Greek currency has had the highs volatility (It refers to the value of the volatility index and the standard deviation). The high standard deviation shows that volatility has been sharp; its value is higher than the average volatility measure showing the presence of the repeated high magnitude of oscillations.

Table 1. Descriptive on nominal exchange rate

Currency data	**USD**	**DM**	**DR**	**LIT**	**EURO**
Std. Deviation	22.85	9.94	6.008	11.01	8.167
Average	125.58	70.34	43.735	70.257	135.61
Ratio Std.deviation/Averarage NER (%)	18	14	14	16	6
Volatility index					
Nominal exchange rate - Average		0.025	0.034	0.021	
Nominal exchange rate – S.D		0.022	0.054	0.028	

Source: Bank of Albania

A number of papers have so far analyzed these relationships and almost all of them converge on the conclusion of a modest impact of the exchange rate on export and a more pronounced and strong effect on import (see for example, Mançellari et al, 1999, Hadëri et al, Kolasi, IMF). This paper builds on the other contributions, estimating a measure of exchange rate uncertainty building a volatility variable, in addition, a distinct feature of this paper is that it looks on the currency effects on trade, separately for the three main major trading partners, i.e., Italy, Greece and Germany, and comparative analyses are build from aggregate results to country specifications.

II. Volatility Index and measurement

Two crucial issues underpin empirical inconsistencies in exploring exchange rate volatility relation with trade volume (i) how an exporter perceives exchange rate risk and (ii) how this risk is incorporated in the trade decision. When involving volatility index, the use of nominal versus real exchange rate is the first point to address. IMF suggests that time dimension should be considered in economic decision when measuring exchange rate volatility. Short run fluctuations in nominal exchange rates are relevant for trader's decision as costs and prices are relatively rigid and therefore known. When the observation horizon is extended, the relevant exchange rate becomes the one connecting domestic costs of production and foreign prices converted into domestic currency; therefore real exchange rate volatility is the variable that matters (IMF, 1984).

The paper will involve both nominal and real exchange rates, in deriving volatility measures, but considering the short – path time under observation, as well as on theoretical and empirical considerations that – emphasis the fact that would be irrelevant whether the volatility coefficients are estimated from real or nominal exchange rates as the volatility is sourced solely from the nominal exchange rate (McKenzie and Brooks,1997) priority will be given to estimation results derived from using nominal exchange rate.

Another important issue that matters is how agents form their expectations on uncertainty exchange rate behavior may cause and over what time horizon. There is almost invariably a lag between the time at which an exporter contracts for sale and the time at which delivery, payment or both are made. Most of the empirical literature uses realized exchange rate volatility, as proxied by measures such as the absolute percentage of change, lagged standard deviation, or moving average variance around trend. These measures impose an assumption of adaptive expectations, wherein economic agents use only past information in predicting future exchange rate risk. Moving average standard deviation (MASD) of the growth rate for the bilateral nominal exchange rate is the first a measure of volatility invoked in the study (Kenen and Rodrik, 1986)

$$V_t = \left[\left(\frac{1}{m} \right) * \sum_{i=1}^{m} \left(\ln NER_{t+i-1} - \ln NER_{t+i-2} \right)^2 \right]^{1/2}$$ - Where m is the order of moving average, while ln implies the logarithmic form of the bilateral exchange rate series.

The opinion on the first measures of volatility is that it does overestimates the uncertainties and expectations, while literature, more broadly supports the use of autoregressive specification, as well as conditional variance ARCH/GARCH approach., which is the other measure used in the paper. We assume that exporters/importers form their expectations following GARCH (p, q) process as follows:

$$\ln NER = \alpha_0 + \alpha_1 dummy_t + \varepsilon_t$$
$$h_t = \alpha + \beta \varepsilon_{t-1}^2 + \gamma h_{t-1} + \delta dummy_t + u_t \qquad 1.1$$

Where $\varepsilon_t \sim N(0, h_t)$, and u_t are a white process with mean zero and variance σ_u^2 .The conditional variance equation described above is a function of three terms, the mean (α), the news about volatility from the previous period measured as the lag of the square residual from the mean equation ε_{t-1}^2 - ARCH term, and the last period of forecast error variance h_{t-1} (the GARCH term). In addition we add the dummy variable to capture the introduction of the Euro currency. Quarterly data on nominal bilateral exchange rate are taken from Central Bank of Albania, for the period 1993:2003.

Table 1: Estimation of Volatility index

Sample 1993:1 2003:4	*Italy*	*Greece*	*Germany*
Variable			
Constant	-2.67 (-22.3)**	-0.935 (-13.1838)**	4.2 (52.20)
Dummy	7.58 (22.547)**	5.85 (66.10)**	0.67 (41.52)**
Variance Equation			
Constant	0.0023 (4.373)	0.00069 (1.187)	0.0013 (1.48)
ARCH	1.127 (3.608)**	1.388 (2.089)**	1.58 (3.003)**
GARCH	-0.23 (-3.1833)**	-0.056 (-0.503)	-0.35 (-3.0636)**
Process	GARCH(1,1)	GARCH(1,0)	GARCH(1,1)

The estimations showed that variability of nominal exchange rate follows a GARCH (1, 1) process for the Italian/German currency and a GARCH (1, 0) process for Greek currency over our sample period. The expectations terms derived from the general auto regressive conditional process (volatility data) are used in the trade equations.

III. Working Model

The empirical literature, acknowledges two primary determinants of export and import demand variations derived through a partial equilibrium approach (Dornbusch, 1998) foreign income variable and relative price variable (equations 2.1 and 2.2). Income stands for the economic activity and the purchasing power of the trading partners, while relative price variable tries to capture the price power on shaping market behavior (demand and supply). Exchange rate volatility is invoked explicitly in the function, considering the currency movement effect through uncertainty on trade decision and also the effect on price and competitiveness level.

$$LogM_t = \alpha_1 + \alpha_2 * \log(Y_t^i) + \alpha_3 \log(p_t) + \alpha_4 V_t + \alpha_5 Dummy + \varepsilon_t \qquad (3.1)$$

$$LogX_t = \alpha_1 + \alpha_2 * \log(Y_t^{Albania}) + \alpha_3 \log(p_t) + \alpha_4 V_t + \alpha_5 Dummy + \varepsilon_t \qquad (3.2)$$

M_t and X_t present imports and exports from/to Albania, Y_t^i $Y_t^{Albania}$ are gross domestic product of country i and Albania, P_t is the relative price variable measured as a fraction of domestic and foreign export unit price, V_t presents the variability index and a dummy variable that distinguishes the period where Euro was introduced is also involved. An improved economic activity will induce trade, and we expect gross domestic product to be positively related to trade. The expected relation between export/imports and relative prices will depend on the dynamics of the former, as well as on the elasticity of demand and supply for exports. The instability of exchange rate and its relation with trade has been tested to be ambiguous.

General gravity approach[2] is also incorporated , in the through paper, trying to enlarge the set of variable affecting trade, derived both from partial and general equilibrium models of international trade (Linneman, 1966 and Bergstrand 1985). This approach considers trade as an interaction process among different economies where apart from the influence of prices in demand and supply allocation process, other important factor play an important role, factors such as distance, cultural differences, history, borders ect.

IV. Data and methodology

Quarterly series of GDP and export unit prices are taken from International Financial Statistics database. Quarterly Export Unit price for Albania was proxied by export unit price series for developing countries (IFS), while bilateral export/import data in USD were drawn from ACIT database. Considering the ambiguity of the questioned subject in both theoretical and empirical arena, the analysis tries to examine

[2] *Export Function*

$$Log(X_{ijt}) = \alpha_0 + \alpha_1 \log(Y_{it} Y_{jt}) + \alpha_2 SIM_{ijt} + \alpha_3 \log D_{ij} + \alpha_4 \log N_{ijt} + \alpha_5 P_t + \alpha_6 V_t + \alpha_7 CMBR + \alpha_8 Dummy + u_{ijt}$$

Import Function

$$Log(M_{ijt}) = \alpha_0 + \alpha_1 \log(Y_{it} Y_{jt}) + \alpha_2 SIM_{ijt} + \alpha_3 \log D_{ij} + \alpha_4 \log N_{ijt} + \alpha_5 P_t + \alpha_6 V_t + \alpha_7 CMBR + \alpha_8 Dummy + u_{ijt}$$

evidences through different steps. Firstly a simple error correction method is applied on the total volume of trade and two main exchange rates - LEKE/USD, EURO/USD).
This estimation is a lit bit bared, considering only exchange rate as an explanatory variable of the trade variation, but it simply tries to evidence the direction of the relation between trade and the two main currencies. This overall indication will be confronted with results from estimating export/import demand function where a set of determinants of exports and imports are considered (derived from partial/general equilibrium international trade models). Effect of exchange rate on trade volume will be tested separately for the three main trading partners, which is Italy, Greece, Germany, using co integration techniques, while panel data estimations will try to estimate the resultant effect variability of different currencies had on Albania's trade volume.

V. Some empirical evidences on exchange rate volatility relation with trade

V.1 Trade volume and USD/EURO nominal exchange rate

Trade volume seems to have been negatively correlated with USD nominal exchange rate movements (in long run prospective), while not significantly related with LEKE/EURO nominal exchange rate (Table 6. – Appendixes, coefficient statistical significance). Exports and imports display different sensitivity with respect to both currencies; imports are almost three times more sensitive to dollar movement, than to EURO. This is because of a more stable EURO compared to USD (table 1. Std. deviation measure comparison) as well as increased invoicing in Euro (75% of Albania's trade volume originates from EU countries). Exports reaction to currency movement doesn't reflect firmness, the estimated coefficient are not highly significant (USD estimated coefficient is significant at 10% level of confidence while reaction coefficient to Euro movement doesn't appear significant, Table 6-appendixes). Coefficient magnitude gives signs of a higher sensitivity when invoicing in Euro, and this mainly to pegged nature of our currency to USD, which doubles the risk exporters have to bear when trading. Exports and imports vary largely due to short run adjustment toward equilibrium, (ERC-term significance); the relation of trade with EURO seems to be more resistant to sudden short run changes, while dollar movement has been mirrored in a deteriorating trade volume.

What is the importance currency risk has in a general environment where trade take place where other very important factor simultaneously play the game, what is the role each trading partner currency behavior has on trade allocation, does the effect of exchange rate risky behavior remains solid or it is spread among other variables, especially on prices? The following part of the paper focuses on these questions, with the aim of amplifying the analyses dimension.

V.II Country evidences – long run co integration vector

Vector Error Correction (VEC) method is being used to point out the effect currency behavior for the Albania's three main trading partners has had on trade variation and trade distribution among countries. The VEC method is based on the Engle and Granger (1987) statement that a linear combination of two or more non-stationary series may be, and the co integration equation stationary and if such a linear combination exists. The VEC specification restricts the long run behavior of the endogenous variables, to converge to their co integration relationship, while allowing a wide range of short run dynamics. The reasons behind adopting this econometric method of estimation, was to observe short run behavior, which in case of an transitory economy is characterized by dynamic high economic structural adjustments , which makes infirmness long run tendencies. Prior applying VEC estimation method, time series stationary is tested through Augmented Dickey-Fuller test, and the order of integration is defined. The summary table of ADF the appendixes, show that variables are non-stationary, until being differentiated with the first order.

Table 2. Unit Root test - summary table

	Italy	Greece	Germany
$\log(Y_t^{Albania})$	I(1)*	I(1)	I(1)*
$\log(Y_t)$	I(1)*	I(1)	I(1)
$\log(p_t)$	I(1)*	I(1)	I(1)**
V_t (MSDA)	I(1)	I(1)	I(1)
V_t (ARCH_GARCH)	I(1)	I(1)	I(1)
Log(Exports)	I(1)	I(1)	I(1)
Log(Imports)	I(1)	I(1)	I(1)

*Significant at 5% - 3 and 5 lags
** Significant at 1% 2-lags

To establish weather there is a long run relationship among the variables Johansen method was used, (Johansen, 1991 and Johansen and Juselius, 1990). For each country, employing and ARCH/GARCH volatility measures, Johansen Likelihood Ratio test (trace statistics) and maximum eigenvalue[3] statistics were used to identify the presence of common stochastic trends. For all countries the null hypothesis of r=0 is rejected in favor of the alternative hypothesis $r \geq 1$, indicating the presence of long run co integrating relation between among exports/imports and economic activity, relative prices and exchange rate volatility.

Table 3 Co-integration test

		TRACE STATISTICS				MAXIMUM EIGENVALUES			
Country	Function	H_0: r=0 H_1: r=1	$r \leq 1$ r=2	$r \leq 2$ r=3	$r \leq 3$ r=4	r=0 $r \geq 1$	$r \leq 1$ $r \geq 2$	$r \leq 2$ $r \geq 3$	$r \leq 3$ $r \geq 4$
Germany	Exports	115.67	43.61	10.47	2.85	72.06	33.14	7.62	2.85
	Imports	71.77	33.79	4.24	0.083	37.98	29.55	4.157	0.083
Italy	Exports	104.45	41.302	13.977	0.706	63.15	27.325	13.271	0.706
	Imports	105.59	51.16	25.19	15.41	54.43	25.97	9.78	15.41
Greece	Exports	97.41	47.13	16.81	0.099	50.28	30.32	16.711	0.099
	Imports	65.77	34.66	15.41	3.76	31.11**	19.25	11.65	3.76

- Co integrated at 5% level of significance is being tested using critical value, which are 35.65 for maximum eigenvalues, and 54.46 for trace statistics at r=0, $r \geq 1$ hypothesis
** Greek Import function , manifests a weaker co-integration vector at 10% level of significance – critical value is 26,98
r-denotes the number of co integration vectors

Normalized co integrating vectors (Table 4), corresponding to the maximal eigenvalues, the dominant long-run relationship showed that the long run effect exchange rate volatility has played on trade differs among the set of countries. Long run perceived currency risk increase, will significantly shrink trade initiatives for exporters to Germany and Greece (refers to estimated coefficient, of volatility index, table-4), and while exports to Italy result to be insignificantly related to exchange uncertainties. The negative effect of exchange rate risk on exports is in line with theory and other empirical findings (IMF country report, 2000), while the sensitivity manifested is characteristics of exports responsiveness founded in small developing countries. (Das, 2003 Rahmatsyah et al, 2002).

[3] The maximum eigenvalues can be computed from the trace statistic by the following relations
$Q_{\max} = -T\log(1-\lambda_{t+1}) = Q_r - Q_{r+1}$

The reaction of exports to exchange rate variations is also induced by specific characteristics export demand manifests, demand for Albania's exports is elastic to price changes in case of Greece and Germany (the estimated coefficient varies from -1.45 and -2.13), and this elasticity was a reason that makes trade volumes more sensitive to exchange rate volatility in long term.

Exports to Italy characterized by contracted re-exports reflect insensitiveness to currency and prices behavior (variables are not significant) due to the fact that in large part they are denominated by-exports and therefore there is no mismatch to affect transactions. Imports volumes seem to have benefited from currency behavior (all the coefficient are positive, and significant, while relative price coefficient is either not significant, Greece or Italy, or less than unity – Germany, table 4) in long run, and mainly due to the inelasticity nature of imports' demand.

Table 4. Co integration Equations

Country		Normalized Co integration Vectors	Test H_0 $\beta_3=0$
Germany	Export	$LogX_t = 0.31*\log(Y_t^{Albania}) - 1.45*\log(p_t) - 9.24*V_t$	t = - 2.81*
	Imports	$LogM_t = 1.06*\log(Y_t^i) - 0.74*\log(p_t) + 5.97*V_t$	t = 3.39*
Greece	Export	$LogX_t = 14.77*\log(Y_t^{Albania}) - 2.13*\log(p_t) - 8.05*V_t$	t = -5.14*
	Imports[1]	$LogM_t = -2.5*\log(Y_t^i) + 6.62*V_t$	t = 3.56*
Italy	Export	$LogX_t = 6.81*\log(Y_t^{Albania}) + 1.95*\log(p_t) - 1.902*V_t$	t = -1.44
	Imports	$LogX_t = -2.11*\log(Y_t^i) + 1.96*\log(p_t) + 4.88*V_t$	t = 2.99*

*Significant at 1% level of confidence

[1]Relative prices for Greece was not significant and they caused

V.ii Country Short Run dynamic adjustments

Based on the representation theorem developed in Eager and Granger (1987) it can be shown that for the error correction model exists for a co integrating vector shown below:

Exports:

$$\Delta LogM_t = \alpha_0 + \alpha_1 R_{t-1} + \sum \beta_i * \Delta LogM_{t-i} + \sum \gamma_i \Delta \log(Y_{t-i}^i) + \sum \delta_i \Delta \log(p_{t-i}) + \sum \tau_i \Delta V_{t-i} + \alpha_2 Dummy + \varepsilon_t$$

Imports:

$$\Delta LogX_t = \alpha_0 + \alpha_1 R_{t-1} + \sum \beta_i * \Delta LogX_{t-i} + \sum \gamma_i \Delta \log(Y_{t-i}^{Albania}) + \sum \delta_i \Delta \log(p_{t-i}) + \sum \tau_i \Delta V_{t-i} + \alpha_2 Dummy + \varepsilon_t$$

Where R_t term is the lagged error correction term, generated from the residuals of co integration vector, standing for partial short run adjustments that corrects deviation from long run equilibrium. In the applied analyses ECT accounts for the fact that actual exports/imports do not adjust instantaneously to their long term determinants and shows how the system converges to long run equilibrium implied by co integrating regression.

As a general view there are dynamic short run adjustments, statistically significant, and of different speeds among the set of countries (refers to coefficient magnitude, of error correction term, Table -5), that have played role on trade variations. While no statistically significant trace of short run pressure on exports volume was found for Greece, Albanian exports to Italy and Germany do manifest significant variation due to short run adjustment pressure toward equilibrium level, almost 40% of short run variation in exports volume towards Italy and Germany is result of such distorted equilibrium situations. Exchange rate risk measure results significantly related to exports volume, while manifesting differences in behavior in both magnitude and directions comparing individual countries.

Exports to Germany are shrunk due to currency behavior (refers to coefficient sign, table 5) and it is interesting the long standing impact of exchange uncertainty on exports. Italian exports in short run are a positive function of the risky behavior of the currency term; theoretically and empirical evidences support such behavior, under the assumption that firm utility function is an increasing function on risk But instead of going back to theoretical hypothesis the contests of exports with Italy where a considerable part of exports' volume is just re-exporting, gives the relation exchange uncertainty – exports , behavioral characteristics of imports, rather than exports, and the result is increasing exports despite experienced currency appreciation and increased risk faced due to exchange uncertainty.

Table 5 Error Correction Results[1]

EXPORT FUNCTION				**IMPORT FUNCTION**			
Variables	**Germany**	**Italy**	**Greece**	**Variables**	**Germany**	**Italy**	**Greece**
ECT	-0.49 (-4.17)	-0.43 (-2.449)		**ECT**	-0.82 (-2.21)	-0.469 (-3.627)	0.54 (1.75)
Δ X(-1)	-0.43 (-3.04)		-0.61 (-2.86)	**Δ M(-1)**			-1.114 (-2.504)
Δ X(-2)				**Δ M(-2)**		-0.46 (2.228)	
Δ X(-3)				**Δ M(-3)**			
Δ $Y_{Albania}$(-1)	-12.74 (-4.48)			**Δ Y(-1)**			6.38 (2.083)
Δ $Y_{Albania}$(-2)	8.82 (-4.79)			**Δ Y(-2)**			
Δ $Y_{Albania}$(-3)		2.57 (1.757)		**Δ Y(-2)**			
Δ P(-1)				**Δ P(-1)**			
Δ P(-2)		2.019 (1.745)	-1.34 (-1.76)	**Δ P(-2)**		-2.903 (-2.012)	
Δ P(-3)			-1.72 (-2.35)	**Δ P(-3)**			
Δ V(-1)	-3.85 (-1.88)	5.22 (2.449)		**Δ V(-1)**	6.94 (2.28)		10.85 (2.635)
Δ V(-2)	-10.05 (-4.36)		-3.8 (-1.88)	**Δ V(-2)**			
Δ V(-3)		5.39 (2.127)					
Dummy				**Dummy**	0.58 (2.11)	-0.66 (-2.35)	
Adjusted – R^2	0.57	0.63	0.64	**Adjusted – R^2**	0.33	0.38	0.38

[1] – Insignificant variables are excluded from the table of results

Exports to Greece reflect sensitivity to short run relative prices movements, sensitivity that has affected the negative pressure exchange volatility has exerted on exports (Table, 5). EURO introduction in the set of countries observed doesn't result of help for Albanian exports, and it hasn't induced so far any reaction in the exports allocation, or on the volumes. This mainly because of the short period of the effective EURO introduction, as well as of its appreciation compare to USD.

There is a different behavior of imports variability in short term; there are a few variables being statistically important, and a small explanation power of the model (Table 5, Adjusted R^2). The main reason of such results may be excluding the leading factor of imports' demand, which is the gap between the domestic demand and supply.

The significant Error Correction term shows that imports variation, is rather result of short run structural changes and adjustment process, as a whole, than result of significant influence from individual variable behavior (number of variables significance in short run reduces). The differences among countries in the way imports have interacted with exchange volatility are present, there is an increased import function for Germany and Greece imports to Albania, that goes in line with EURO introduction effect and an observed decreasing Italian imports due to relative prices disadvantage (German and Greek imports are correlated positively with exchange rate volatility while there is a negative coefficient of correlation between Italian Imports and relative prices, table 5). Relative prices insignificance in the overall picture of the results enforces the idea of an inelastic import demand to prices (Mancellari et al, 1999).

V.4 Aggregated evidences on trade – exchange volatility index

Country evidences showed behavioral differences, among the set of selected countries, where depending on the observed country specific elasticity of import/exports demand we had different magnitude and direction of the exchange rate volatility index on trade volume. A pooled method of estimation is the following step the empirical analysis goes through in order to observe the resultant effect of countries' specifics. Two set of estimations were run an augmented gravity equation, with exchange rate volatility measure explicitly incorporated and an estimable export/import demand function (see equation 3.1 and 3.2). A proxy[4] for real exchange rate was introduced, in order to weight the effect fluctuations of nominal exchange rate by wholesales price indexes.

Table 6. Exports/imports demand - Panel Data Estimation – Fixed effect

	EXPORT FUNCTION		**IMPORT FUNCTION**	
	RER	**NER**	**RER**	**NER**
$\log(Y_t^i)$			-0.65 (-1.02)	-0.026 (-1.19)
$\log(Y_t^{Albania})$	0.87 (9.84)**	0.91 (10.446)**		
$\log(p_t)$	-0.77 (-2.902)**	-0.64 (-2.364)**	-0.52 (-0.98)	-0.15 (-0.34)
V_t	**-1.753** **(-2.141)****	**-1.259** **(-1.37)***	**-2.51** **(-1.67)**	**-2.9** **(-1.74)**
Dummy	-0.064 (-0.67)	-0.044 (-0.47)	0.29 (1.67)*	0.45 (3.22)**
AR-term -1			0.35 (3.99)	0.38 (4.5301)
R^2	0.944	0.942	0.85	0.859
Adjusted R^2	0.940	0.939	0.84	0.851
Chow-Test[3]	23.92	22.698	15.56	15.425
DW - test	2.016	2.014	1.96	1.83
Observations	117	119	117	128

[4] $RER_T = NER * \frac{WPI_{ALBANIA}}{WPI_{COUNTRY-i}}$, where WPI – whole sales price index

Aggregated Exports showed to be a positive function of the Albania's gross domestic product, with almost a unitary elasticity (estimated coefficient vary from 0.84 to 0.89, Table 6). The relative prices and exchange uncertainty risk (NER and RER) have the expected signs; they both have negatively affected exports volume. Trade sensitivity magnitude to currency fluctuations appears vulnerable to the measures applied (MSDA/Arch-Garch approach), but they results to be consistent in terms of direction. Country specifics effect appears strong; consider the fact that fixed effect method of panel estimation resulted superior. Exports appear to have suffered significantly from real exchange rate volatility index, while imports at the end despite the fact that who won more or less among the partners, they have suffered little from nominal exchange rate movements as well as from increased prices. (Refers to not so high significant estimated coefficient of real exchange rate volatility measure and relative price variable, Import Function, Table 6).

Table 7 Gravity approach panel estimation results

	EXPORT FUNCTION		**IMPORT FUNCTION**	
	RER	**NER**	**RER**	**NER**
Constant term	17.87 (15.)**	17.34 (14.1928)**	16.01 (11.016)**	16.09 (13.1801)**
$\log(Y_t^i * Y_t^{Albania})$	0.0034 (0.269)	0.012 (0.84)	0.039 (2.3818)	0.034 (2.539)**
SIM	1.67 (7.352)**	1.41 (3.8508)**	1.206 (4.1203)**	1.33 (5.3303)**
$\log(p_t)$	**-0.95** **(-3.468)****	**-0.68** **(-2.286)****	**-0.0577** **(-0.1629)**	**-0.082** **(-0.225)**
Log(POP)	1.63 (2.89)**	2.02 (3.215)**	2.55 (-3.499)**	2.36 (3.879)**
Log(Dist)	-2.69 (-7.899)**	-3.13 (-8.35)**	-3.24 (-7.3401)**	-3.08 (-8.2569)**
V_t	**-3.34** **(-1.059)**	**-0.15** **(-0.17)**	**0.709** **(0.1717)**	**-0.27** **(-0.27)**
Dummy	-0.0039 (-0.41)	0.12 (1.0035)*	0.13 (1.103)	0.18 (1.739)**
AR-term		0.21 (2.33)		
R^2	0.939	0.936	0.88	0.89
Adjusted R^2	0.934	0.931	0.87	0.88
Chow – test[2]	0.39	0.78	1.507*	1.06
DW - test	1.92	1.9	1.9	1.88
Observations	117	117	117	123

2 - Critical values for chow test run is $F_{(2,105)}=1.87$

Previous experiences or observed changes seem to be significant in imports' behavior considering the autoregressive term significance, but this is not exclusively related to currency variations. It is part of the overall imports adjustments, to the economic structural changes, in-country overall risk and stability in both economic and political terms. Real exchange rate proxy, which increases compare to the magnitude of the nominal exchange rate (refers to estimated coefficient, Table 6 and 7) negative effect on trade showing, due to the inflationary effect embodied, which increases uncertainty and risks . Albania's exports haven't yet reacted positively to EURO introduction, while imports are significantly being an increased function of the facility of a unified stable currency. Actually EURO appreciation against USD could have had the contrary effect on imports if facing an elastic import demand to prices, which is not the case (magnitude of the estimated coefficient is less than unitary), and the pooled estimations does confirm it again. Other factors drawn from the augmented gravity equations play an important role in the variability of

exports/imports factors such as distance and transportation costs, differences in economic mass and structure, which in cases of inelastic export/imports demands do put some shade on price variable and exchange rate volatility has on trade, which remain deteriorating for exports and in relation to country import demand specifics, a benefiting tool for importers.

Some concluding remarks:

Some concluding remarks:

Exchange rate volatility effect on trade volume, does exists, but its magnitude, significance and the direction are a function of the disagregation level that the analyses consider. Effect exchange rate volatility has played resulted highly related to countries' specifics, and these specifics mainly meant demand/supply elasticities to relative prices. Relative prices become the transitory factor of the volatility effect on trade and the determining factor of the relation firmness and direction. Non-uniformity of the exchange rate volatility effect on trade volumes when considering different trade partners is a fact that draws some attention on the role this factor may play in making comfortable trade advantages regionally or in EU markets. Exchange rate volatility effect on imports have been firmer in long term, while exports become vulnerable to the currency behavior in short term step as well as when the analyses are disaggregated in country terms. Trade sensitivity to the two important currencies (USD and EURO) appears different, yet not too sensitive to EURO movements, in both long and short run.

References:

Asseery, A. and D.A. Peel (1991) "The Effects of Exchange Rate Volatility on Exports" Economic *Letters*, 37, 173-177.

Bailey, M.J., G.S. Tavlas, and Ulan, M. (1987) "The Impact of Exchange-Rate Volatility on Export Growth: Some Theoretical Considerations and Empirical Results" *Journal of Policy Modeling*, 9, 225-243.

Bini-Smaghi, L. (1991) "Exchange Rate Variability and Trade: Why is it so Difficult to Find Any Relationship" *Applied Economics*, 23, 927-936.

Bank of Albania – Monthly exchange rate Statistics (1993-2003)

Broda C. and Romalis J. (2004) "Identifying the relationship between trade and exchange rate volatility" NBER working paper.

Barkoulas, T. John, Baum,F. Christopher, and Caglayan, Mustafa (2002) "Exchange rate Effects on the Volume and Variability of Trade Flows". *Journal of International Money and Finance,* Vol. 21, 481-496.

Calvo, G. A. and C.M. Reinhart (2000a) "Fear of Floating" *NBER Working Paper* No. 7993.

Cote' A. (1994) "Exchange rate volatility and trade, a Survey", International Department, Bank of Canada- Working paper 94-5.

Caporale, T. and K. Doroodian (1994) "Exchange Rate Variability and the Flow of International Trade" *Economics Letter* 46, 49-54.

Chowdhury, Abdul R. (1993) "Does Exchange Rate Volatility Depress Trade Flows? Evidence from Error Correction Models" *The Review of Economics and Statistics*, 75, 700-706.

DeGrauwe, P. (1988) "Exchange Rate Variability and the Slowdown in Growth of International Trade." International Monetary Fund Staff Papers, 35, 63-84.

Durbin, J. (1970) "Testing for Serial Correlation in Least Square Regression when some of the Regressors are Lagged Dependent Variables" *Econometrica*, 38, 410–421.

DeNardis S. and Vicarelli C (2003) "The impact of the Euro on Trade, The (early) effect is not so large" ENEPRI Working Paper Nr. 17

Dell'Ariccia G. (1999) "Exchange rate fluctuations and trade flows, evidences from the European Union", IMF Staff Papers, Vol. 46, Nr.3

Engle, R. F. and C.W.J. Granger (2000) "*Long-Run Economic Relationships*" Oxford University Press.

Engle, R, and C.W.J. Granger (1987) "Cointeration and Error Correction: Representation, Estimation and Testing" *Econometrica,* Vol. 55, 251-276.

Franke, G. (1991)."Exchange Rate Volatility and International Trade" *Journal of International Money and Finance,* Vol. 10 (June), 292-305.

Feensta C. R and Kendall D.J (1991) "Exchange Rate Volatility and International Prices" NBER Working Series No. 3644

Hooper, P. and S. Kohlhagen (1978) "The Effect of Exchange Rate Uncertainty on The Prices and Volumes of International Trade" *Journal of International Trade*, 8, 483-511.

International Monetary Fund. (1984) "Exchange Rate Volatility and World Trade" Washington D.C.

International Monetary Fund - International Financial Statistics (1993-2003)

International Monetary Fund – Country Report – Albania 2003

Josef C. Pickard (2003) "Exchange rate volatility and bilateral trade flows: an analysis of U.S demand for certain steel products from Canada and Mexico" Virginia Polytechnic Institute and State University, Economics

Mckenzie, M. D. (1999) "The Impact of Exchange Rate Volatility on International Trade Flows" *Journal of Economic Surveys*, Vol. 13, pp. 71-106.

Mançellari A. et al (1999) "Kurset e këmbimit dhe tranzicioni ekonomik"

Rose, A and Engle, CH. (2000) "Currency Unions and International integration" National Bureau of Economic Research, Inc. working paper nr. 7872

Rose, A. (1990) "Exchange Rates and Trade Balance: An Empirical Evidence from Developing Countries" *Economics Letters,* Vol. 34, (3), 271-275.

Rose K. A and Flood P. R (1999) "Understanding Exchange rate volatility without the contrivance of Macroeconomics" Haas School of Business, University of California

Rahmatsyah, T et al, (2002) "Exchange rate volatility, Trade and "Fixing for Life" in Thailand" CIES Discussion paper No. 0212

Sujit K. Das (2003) "Effect of exchange rate volatility on international trade, an empirical analysis" Vanderbilt University, Department of Economics, TN 37235

Taglioni D.(2002) "Exchange rate volatility as a barrier to Trade, New Methodologies and Recent Evidence" *Economie Internationale 89-90(2002) p. 227-259*

Wang , K. and Barret, C.(2002) " A new look at the trade Volume effect of Real Exchange rate Risk" Department of Applied Economics and Management, Cornell University, Ithaca, New York – Working Paper 2002-41

APPENDIXES:

Table 1. Country OLS Estimations - EXPORTS

Variables	Italy		Greece		Germany	
	MSDA	ARCH/GARCH	MSDA	ARCH/GARCH	MSDA	ARCH/GARCH
Constant	-4.548 (-3.165)	-3.97 (-2.708)	-5.43 (-6.65)	-4.7 (-3.477)	-7.19 (-6.976)**	-7.25 (-8.14)**
$\log(Y_t^{Albania})$	1.035 (5.446)	0.94 (4.795)	0.927 (9.212)	0.83 (4.879)	1.06 (8.04)**	1.0706 (9.3215)**
$\log(p_t)$	-0.0082 (-0.016)	-0.42 (-0.7438)	-1.22 (-3.37)	-0.57 (-0.9027)	-0.54 (-0.966)	-0.566 (-1.067)
V_t	-3.87 (-3.399)	-2.132 (-1.2409)	0.56 (0.482)	1.529 (1.436)	-0.39 (-0.2764)	-0.55 (-0.356)
Dummy	0.097 (0.809)	0.1008 (0.7365)	-0.084 (-0.77)	0.030 (0.177)	-0.316 (-2.288)	-0.32 (-2.432)
AR-term			-0.48 (-3.9036)			
R^2	**0.85**	**0.82**	**0.78**	**0.63**	**0.68**	**0.73**
Adjusted R^2	**0.83**	**0.80**	**0.75**	**0.58**	**0.65**	**0.706**
F-statistic	50.385	42.122	20.051	12.0848	20.325	26.808
Durbin-Watson	2.1	1.73	2.02	1.967	2.012	2.09

Table 2. Country OLS Estimations – Import Function

Variables	Italy		Greece		Germany	
	MSDA	ARCH/GARCH	MSDA	ARCH/GARCH	MSDA	ARCH/GARCH
Constant	-14.425 (-1.67)*	-13.9504 (2.088)**			2.89 (6.058)**	2.34 (4.546)**
$\log(Y)$	1.47 (2.133)**	1.43 (2.0885)**	2.84 (2.744)**	3.14 (2.207)**	-0.044 (-1.24)	-0.046 (-1.38)
$\log(p_t)$	-2.735 (-6.8216)**	-2.65 (-7.0002)**	1.91 (1.64)*	1.808 (1.265)	1.72 (2.138)**	1.81 (2.248)**
V_t	0.19 (0.138)	0.061 (0.03238)	-5.99 (-2.18)**	2.53 (0.8427)	-4.34 (-1.937)*	-2.88 (-1.1087)
Dummy	0.033 (0.2289)	0.042 (0.2904)	0.067 (0.255)	0.022 (0.0607)	0.604 (3.276)**	0.58 (3.24)**
AR-term			0.305 (1.897)	0.61 (2.568)		
R^2	**0.68**	**0.69**	**0.59**	**0.60**	**0.416**	**0.47**
Adjusted R^2	**0.65**	**0.65**	**0.54**	**0.54**	**0.354**	**0.41**
F-statistic	19.066	20.382	10.128	10.594	6.773	6.921
Durbin-Watson	1.92	2.043	1.85	2.044	2.19	2.204

* Significance at 5% level of significance, ** Significance at 1% level of significance

Table 3. ADF-Tests results

Italy	I(0)	I(1)	Number of Lags - variable	MacKinnon Critical values	Difference Order
Log(Exports)	-1.19	-4.345	3	-3.6067	I(1)
Log(Imports)	-1.799	-4.202	3	-3.6067	I(1)
$\log(Y_t^{Albania})$	-2.027	-2.635	3	-2.6118**	I(1)
$\log(Y_t)$	-1.411	-2.801	5	-2.6092*	I(1)
$\log(p_t)$	-1.747	-3.126	2	-5.5973	I(1)
V_t (MSDA)	-1.616	-2.963	3	-2.6242	I(1)
V_t (ARCH_GARCH)	-1.537	-3.095	3	-2.6472	I(1)
RER(MSDA)	-2.15	-2.704	3	2.6290	I(1)
Greece					
Log(Exports)	-0.266	-5.839	3	-3.6289	I(1)
Log(Imports)	-2.55	-3.452	3	-2.9472	I(1)
$\log(Y_t^{Albania})$	-2.027	-2.635	3	-2.6118**	I(1)
$\log(Y_t)$	-1.486	-3.762	3	-3.6289	I(1)
$\log(p_t)$	-2.987		3	-2.9446	I(0)
V_t (MSDA)	-2.09	-3.275	3	-2.9705	I(1)
V_t (ARCH_GARCH)	-2.7048	-5.234	3	-3.6067	I(1)
RER(MSDA)	-1.403	-3.11	3	-2.9798	I(1)
Germany					
Log(Exports)	-2.36	-3.78	3	-3.6289	I(1)
Log(Imports)	-0.67	-4.22	3	-3.6289	I(1)
$\log(Y_t^{Albania})$	-2.027	-2.635	3	-2.6118**	I(1)
$\log(Y_t)$			3		I(1)
$\log(p_t)$	-1.22	-2.54	2	-1.9504	I(1)
V_t (MSDA)	-1.902	-3.317	3	-2.9705	I(1)
V_t (ARCH_GARCH)	-2.732	-4.534	3	-3.6353	I(1)
RER(MSDA)	-2.25	-3.18	3	-2.9705	I(1)

* Significance at 10 % level of confidence

** Shows significance at 5% level of confidence

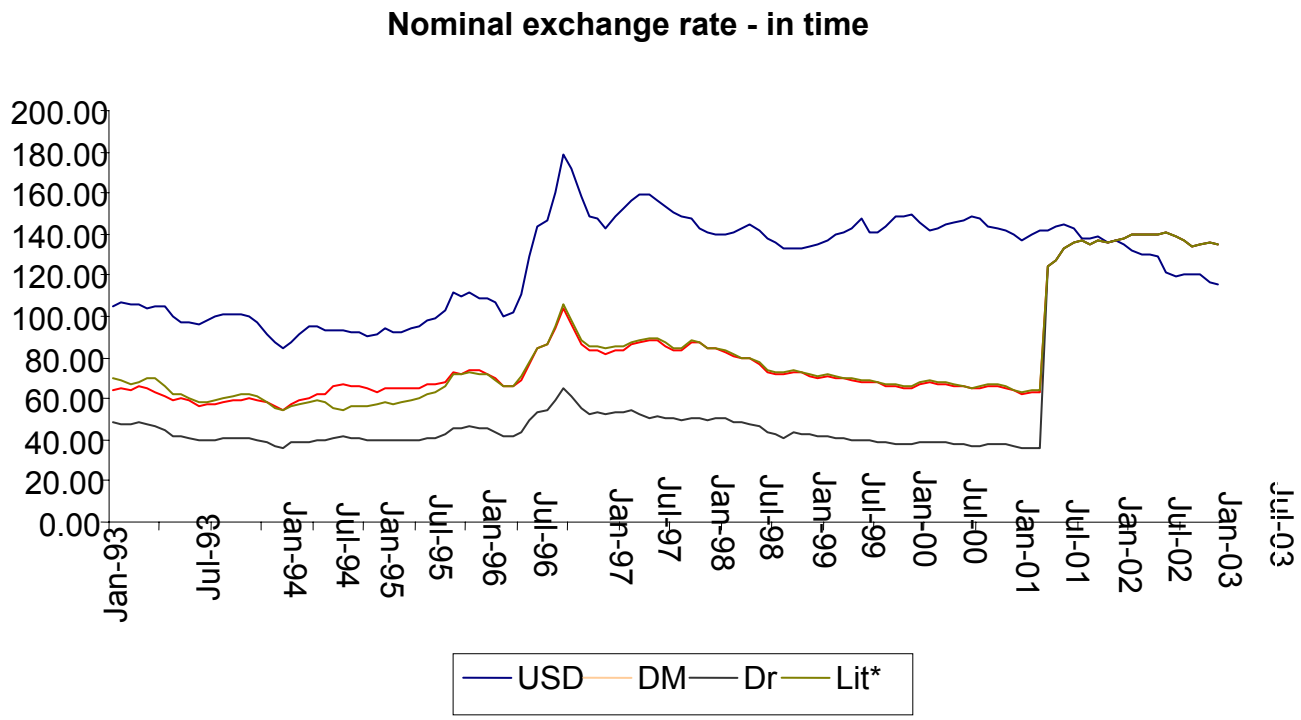


Table 4. Exports- Imports reaction toward USD/EURO

Nominal exchange rate – EURO/LEKE			**Nominal exchange rate – USD/LEKE**	
Variables	**Imports**	**Exports**	**Imports**	**Exports**
Log(NER)$_{t-1}$	-0.84 (-0.68)	-6.91 (-1.315)	-2.52 (-2.9202)**	-0.85 (-1.66)*
C	-0.26	13.28	3.504	0.53
ECT	-0.34 (-4.4269)	-0.108 (-1.49)	-0.208 (-3.699)**	-0.35 (-3.885)**
Δ log(X_{t-1})		-0.609 (-4.123)		-0.31 (-3.152)**
Δ log(X_{t-2})		-0.478 (-2.768)		-0.14 (-1.62)
Δ log(M_{t-1})	0.21 (-1.721)		-0.25 (-2.798)**	
Δ log(M_{t-1})			-0.026 (-0.294)	
Δ log(NER_{T-1})	1.92 (1.51)	-0.55 (-0.24)	-2.49 (-2.042)**	-4.13 (-3.362)**
Δ log(NER_{T-2})		5.01 (1.8547)	1.24 (0.90)	1.24 (0.90)
Adjusted – R^2	**0.24**	**0.34**	**0.33**	**0.33**

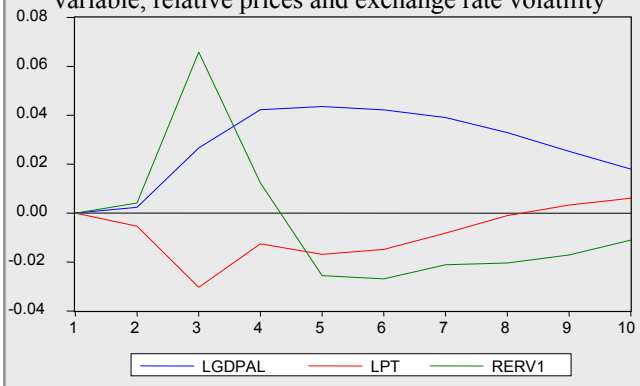
[1] – Variables are monthly time series starting from January 1993, until November 2003

* - Denotes statistical significance at 10% level of confidence, ** - Denotes statistical significance at 5% level of confidence

Table 1. Descriptive on nominal exchange rate

Currency data	**USD**	**DM**	**DR**	**LIT**	**EURO**
Std. Deviation	22.85	9.94	6.008	11.01	8.167
Average	125.58	70.34	43.735	70.257	135.61
Ratio Std.deviation/Averarage NER (%)	18%	14%	14%	16%	6%
Std. Deviation – without year 1997	23.65	8.37	4.64	9.35	8.17
Average	123.11	73.15	43.01	73.95	135.57
Ratio Std.deviation/Averarage NER (%)	19%	11%	11%	13%	6%
Std. Deviation – from 1998 until 2003	10.17	8.39	5.66	8.57	8.17
Average	139.52	68.46	42.42	68.16	135.57
Ratio Std.deviation/Averarage NER (%)	7%	12%	13%	13%	6%
Volatility index					
Nominal exchange rate - Average	0.0027	0.0028	0.00259	0.006472	0.00045
Nominal exchange rate – S.D	0.00469	0.00428	0.00253	0.0134	0.000195

Response of exports to One S.D. Innovations in income variable, relative prices and exchange rate volatility



Response of imports to one S.D innovation in country GDP, relative prices and exchange volatility