IS THERE EVIDENCE OF A J-CURVE FOR THE SUDANESE TRADE DATA?

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ABSTRACT

This paper investigates the existence of J–curve phenomenon for the Sudanese trade data during the period 1979-2006 via Vector Error Correction. The Marshal-Lerner condition has been met for the elasticity of real exchange rate while that of demand for imports and exports have not been achieved. Empirical results do not support existence of J-curve. The real exchange rate is influential only in the short-run. The real income of the Euro-zone has positive impact on trade balance in the short-run and the long-run. The real income of Sudan and Arab countries has negative impact on the trade balance.

Key Words: *elasticity, demand, depreciation, export, import, trade balance*

Introduction

Since the collapse of the Bretton Woods agreement of fixed exchange rates among major industrial countries in 1973, assessing of currency depreciation effect on trade volume has become an important issue of macroeconomic analysis that has received a great deal of interest from academics, financial economists and policy makers both in the context of developed and developing countries. A precise investigation and understanding of the issue is the key to a successful trade policy.

In international trade literature, it is widely accepted that the real devaluation of the fixed exchange rate and depreciation of the floating exchange rate aims to improve the trade balance of a country in the long–run by positive response of producers and consumers to offset the adverse effect encountered in the short-run which is due to the obligations concerning export and import contracts made several months in advance. The response of the trade balance through time then forms the famous J-shape. The Marshal–Lerner (also known Marshal–Lerner–Robinson) is an essential prerequisite to devaluation and depreciation of the exchange rate. MLR states that "following a fall in the value of a country's currency or depreciation there will be an improvement in the economy's current account position if the sum of elesticities of exports and

imports is greater than one." The J-Curve effect was first observed in 1973 by Stephen Magee when the U.S. trade balance deteriorated in 1972 despite devaluation of the dollar in 1971. He stressed that the initial decline in the trade balance following devaluation the J-curve is not a theoretical inevitability.

Of course, the significant impact of exchange rate depreciation on trade balance may be country specific in the sense that different countries may show different examinations. Sudan followed fixed exchange regime since independence in 1956 up September 1978, whereas one Sudanese pound worth 2.83$. Sep 1978 witnessed the first devaluation of the Sudanese currency by 12% to become 2.5$. Then a series of devaluations has been taking place. The justification behind these devaluations were the echo of the J-curve hypothesis i.e. the trade balance will be affected adversely by the devaluation in the short run, and will improve in the long-run. Basically the trade balance was running a deficit during 57 years i.e. the independence period except four years. The main trade partners of Sudan are European Union EU, East Europe EE, Japan, USA, China, India, Egypt, Arab and Asian countries.

This paper seeks to test the formation of the J-curve for the Sudanese foreign trade through time of the real exchange rate, to estimate the short-run and long-run effects. The remaining of this paper is organized as follows: Section 2 provides literature review on the J-curve phenomenon. Section 3 describes the data and provides a summary of econometric methodology. Empirical results of the paper will be presented in section 4, while the discussion is provided in Section 5. Finally, Section 6 concludes the paper.

Literature Review

There has been a large amount of empirical literature on modeling the existence of the J-curve effect in both developed and developing countries around the globe. Different econometric models have been used to investigate this phenomenon. Empirical examinations on the J-curve effect have come up with mixed results. Some results are consistent with the J-curve phenomenon while others depict non existence or new evolution of the J-curve effect.

By investigating the effect of currency depreciation on the trade balances of South Asian Countries, Raza, Larik, and Tariq (2013) confirmed the Marshal-Lerner Model highlighting that devaluation of currency does not always help improving balance of trade. Akpansung and Babalola (2013) examined the effects of real exchange rate on trade balance in Nigeria. The results of causality test indicate weak evidence of causality between real exchange rate and trade balance. The error-correction model estimates provide evidence in support of restoration of long-run equilibrium after short-run distortion. However, the impulse response function does not establish the existence of J-Curve effect in Nigeria. Umoru and Eboreime (2013) shed empirical evidence on the J-curve trade effect of real exchange rate depreciation with special focus on the Nigerian oil sector using the Bounds testing approach on time series data that spans over a 40-year period. The empirical evidence concluded that the standard J-curve hypothesis cannot be

validated for the Nigerian oil sector. Atiqurrehman, Ifitikhar, & Anis (2012) believe that the J-curve theory will work only if the imports and exports are elastic enough to the movement of exchange rate. Major portion of Pakistani imports consists of necessities and shows no response to exchange rate movements. Therefore, the currency depreciation will cause a rise in the value of imports as well as increase the amount of external debt measured in local currency. Given the heavy amount of external debt payable, the currency depreciation will put heavy burden on economy of the country. Therefore, the net result of currency depreciation is simultaneous increase in import bill and the debt burden. Petrović (2010) showed that exchange rate depreciation in Serbia improved trade balance in the long run, giving rise to a J-curve effect in the short run. Corresponding error correction models as well as impulse response functions indicated that, following currency depreciation, trade balance first deteriorates before it later improves, i.e. exhibiting the J-curve pattern. Nadenichek (2010) used a structural vector autoregression to examine whether the interactions between the trade balance, terms of trade and output support the predictions generated by international real business cycle models. The results are found to be generally inconsistent with the theory. Permanent productivity shocks have little impact on either the terms or balance of trade. Terms of trade innovations and temporary demand shocks are found account for the majority of trade balance movements. Examination of the data also reveals only a partial J-curve pattern in the response of the trade balance to terms of trade shock. Ling et al (2008) identified the relationship between the real exchange rate and trade balance in Malaysia. The main findings are: (i) long run relationship exists between trade balance and exchange rate. Other important variables that determine trade balance such as domestic income shows a long run positive relationship between trade balances, and foreign income shows a long run negative relationship (ii) the real exchange rate is an important variable to the trade balance, and devaluation will improve trade balance in the long run, thus consistent with Marshall-Lerner condition (iii) the results indicate no J-curve effect in Malaysia case. Aftab and Khan (2008) tested the effects of real exchange rate depreciation in the Pakistani Rupee on the bilateral trade balance between Pakistan and her 12 respective trade partners. These countries, together, account for almost half of Pakistan's total trade. In order to differentiate between the long-run equilibrium and short-run disequilibrium dynamics, and also to deal with non-stationary data, the ARDL approach is used. The results do not provide any support for the standard J-curve phenomenon. Yazici (2006) used data covering the period from 1986:I to 1998:III, to show that following devaluation, agricultural trade balance initially improves, then worsens, and then improves again. This pattern shows that J-curve effect does not exist in Turkish agricultural sector. Another important finding is that devaluation worsens the trade balance of the sector in the long run, a result contradicting with the earlier findings for the Turkish economy as a whole. The studies reviewed above have one thing in common i.e. estimation technique where they relied on cointegration and error-correction to estimate the short-run a long-run effects of real exchange rate on trade balance. The evidence that emerged from the literature is rather mixed. Some studies have found the evidence of the J-curve while others have found no evidence.

Methodology and Data Issues

Integration

In the first step, the variables included in the model are tested for stationarity by using the Augmented Dickey-Fuller (ADF) unit root test (Nelson and Plosser (1982), Stock and Watson (1988) and Campbell and Perron (1991) among others approved that most of the economic time series are non-stationary, that is, have unit root1). The test is being done at various levels of stationarity; at first and second difference levels.

A series X_t is said to be "integrated of order d" if one can obtain a stationary series by "differencing" the series d times $X_t \sim I(d)$ (Charemza 1992). To test the order of integration Augmented Dickey-Fuller (ADF) is the most commonly used to test the significance of the coefficient δ in the equation $\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{n} \theta_i Y_{t-1} + \varepsilon_t$ under the null hypothesis $\delta = 1$

The stationarity of the parameters is being determined if the ADF statistics is greater than the Mackinnon critical value at specified significant level.

Cointegration

The second step involves testing for the long-run relationship among the integrated variables by using the Johansen co-integration test2. The long-run relationship is being determined if the trace statistics is greater than 5% critical value at the non hypothesized stage. The procedure is based on likelihood ratio (LR) test to determine the number of Cointegrating vectors in the regression. The long-run function, when log transformed, reads as follows:

If there exists a vector β such that the disturbance term from the regression $(\hat{\mu}_t = y_t - \hat{\beta} x_t)$ is of lower order of integration $I(d-b); b > 0$ the Engle –Granger defined y_t and x_t as cointegrated of order(d, b).

Error Correction

Provided that one or more cointegrating relationships exist, the third step of the standard procedure involves the estimation of an Error Correction Model (ECM)3 containing the cointegrating relationship, lagged first differences of the variables in the cointegrating relationship, and any stationary variables thought to influence the dependent variable. In addition, the causality relationship in the short run and the long run between the included variables would be investigated. The error-correction is a way of capturing adjustments in the

[1] The presence of a unit root in any time series means that the mean and variance are not independent of time. Conventional regression techniques based on non-stationary time series produce spurious regression and statistics may simply indicate only correlated trends rather than a true relationship (Granger and Newbold, 1974).

[2] The most important application on cointegration in economic estimations is that it shows there is a long run relationship between variables which are cointegrated.

3 The error correction modeling philosophy by Granger (1986) was used to provide the short run dynamics necessary to obtain the long-run equilibrium.

dependent variable which depended not only on the level of some explanatory variable, but on the extent to which an explanatory variable deviated from an equilibrium relationship with the dependent variable (Banerjee et al 1993).

Vector Error Correction Models:

The vector autoregressive (VAR) model is a general framework used to describe the dynamic interrelationship among stationary variables. So, the first step in time-series analysis should be to determine whether the levels of the data are stationary. If not, take the first differences of the series and try again.

Data Description and Sources

The data used in this paper for investigating the existence of the J-curve phenomenon for the Sudanese trade data were collected on a yearly basis for the period 1979-2006. The start of this period witnessed the first episode of the devaluation series. The end period is chosen because it was the start on new political era that is the signing of comprehensive peace accord with People Liberation Army ending the civil war. The real GDP of European countries has been aggregated in Euro-zone countries RGDP_Euro. Real GDP of Egypt has been added to the real GDP of Arab countries to become RGDP_Arab. Table 1 presents the list of included variables.

Table1: List of Variables and Sources

Variable	Description	Source
XG	Exports of Goods	Central Bureau of Statistics
MG	Imports of Goods	Central Bureau of Statistics
RGDP	Real Gross Domestic Product	Central Bureau of Statistics
EURO	GDP of Euro Zone	World Bank
Arab	GDP of Arab Countries	World Bank
XP	Export Price Index	Central Bureau of Statistics
CPI	Consumer Price Index	Central Bureau of Statistics
WCPI	World Consumer Price Index	International Financial Statistics
TB	Trade Balance	Constructed Variable

Structure of the Model

The classical model for the J-curve theory explains the trade balance as a function of exchange rate, domestic income and foreign income. Theoretically, the J-Curve hypothesis suggests that the partial derivative $\partial TB^{\beta}_{j,t}/\partial RER^{R}_{j,t}$ will be negative in the short-run and positive in the long-run (Goldstein and Khan 1985). This paper follows similar equations estimated for African and Asian countries (Akpansung and Babalola; Umoru and Eboreime 2013; Atiqurrehman, Ifitikhar, & Anis 2012; and Aftab and Khan 2008). The trade balance TB is calculated in logarithmic terms as the natural logarithm of dividing export of goods over import of goods. It is a function of home income Y, foreign income Y*, and real exchange rate RER. The real exchange rate is

the nominal exchange rate X multiplied by consumer price index of the trade partners divided by consumer price index of the home country:

$$TB = \ln\left(\frac{XG}{MG}\right) = \ln(XG) - \ln(MG) \quad (1)$$

$$\ln(RER) = \ln\left(X * \frac{WCPI}{CPI}\right) \quad (2)$$

$$TB = \beta_0 + \beta_1 \ln(RER_T) + \ln\beta_1(Y_t) + \beta_3 \ln(Y_t^*) + \varepsilon_t (3)$$

Where; β_1, β_2 and β_3 are the coefficients of explanatory variables; β_0 is the constant parameter and ε_t is the disturbance term which assumed to be a white noise process.

In the analysis, the variables of the model are transformed using natural logarithm in order to ease coefficients interpretation.

The ECM to investigate the short run dynamics of the existence of J–curve for Sudanese trade data is based on the following equation:

$$TB_t = \alpha_0 + \sum_{j=1}^{n} \alpha_{1i}\, \Delta(TB)_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta \ln(RER)_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta \ln(Y)_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta \ln(Y^*)_{t-i} + \lambda(EC)_{t-i}$$

Where EC_{t-1} represents the error-correction term, lagged residuals from the cointegration relations that will capture the speed of the short run adjustments toward the long run equilibrium.

Empirical Results

Graphical representation of the included variables

Figure1. Trade Balance, Real GDP and real EX of Sudan

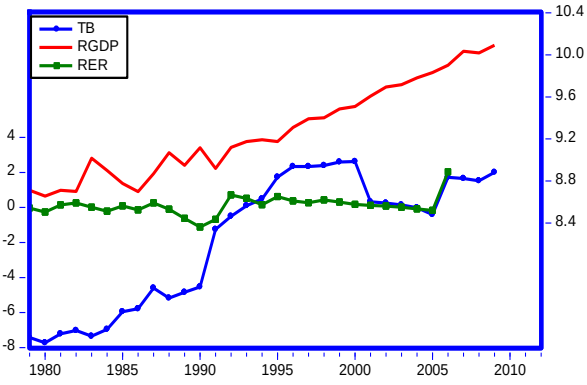

Figure2. Real GDP for Euro-zone and Arab countries

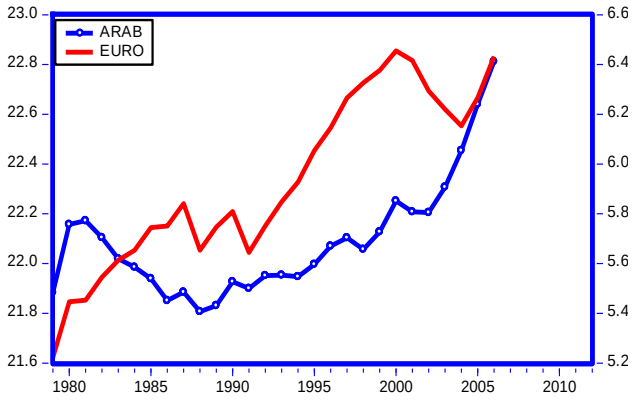

Table 2 reports results of the Augmented Dickey –Fuller (ADF) test which is conducted by including both trend and intercept in the test equation.

Table 2: Augmented Dickey-Fuller (ADF) unit root test

Variable	ADF		Order of Integration
	Level	First Difference	
XG	- 4.082*	-	I(0)
MG	-1.80	-5.29**	I(1)
RGDP	-1.68	-6.12**	I(1)
EURO	-4.25*	-	I(0)
Arab	-2.56	-5.17***	I(1)
CPI	1.71*		I(0)
WCPI	0.23	-3.39*	I(1)

*, ** and *** indicate test statistic is significant at the 10%, 5%and, 1% levels respectively.

Table 3: The Results of the Estimated Model

Variable/Equation	Export	Import	Trade Balance	
			Short-run	Long-run
LOG(XG(-1)/MG(-1))			1.00	0.50**
LOG(XG(-2)/MG(-2))				0.42*
Constant	51.77*	-6.25***		
LOG(RGDP_SUDAN)		0.94***		-1.48*
LOG(RGP_SUDAN(-1))			-40.48***	1.71*
LOG(RGDP_SUDAN(-2))				
LOG(RER)	0.63***	0.62***		
LOG(RER(-1))			7.86***	-0.002
LOG(RER(-2))				-0.22
LOG(RGDP_EUROPE)	-0.96***			
LOG(RGDP_EUROPE(-1))			16.42***	8.53***
LOG(RGDP_EUROPE(-2))				5.26*
LOG(RGDP_ARAB)	-2.31***			
LOG(RGDP_ARAB(-1))		12.56***		-6.57**
LOG(RGDP_ARAB(-2))				1.04
Error-Correction Term				-0.17***
R-Squared	0.85	0.80	0.56	

(*)(**) (***) denotes rejection of the hypothesis at 10%; 5%; and 1% significance level respectively.

As observed from Table (3), the sum of coefficients of elasticity of demand for exports and imports is negative (–2.33). This connotes that devaluation worsens the Sudanese trade balance. Consequent upon this, it can also be expressed unequivocally that the Marshall-Lerner condition is not absolutely established. Whereas the sum of coefficients of the exchange rate variables is positive and greater than one (1.25) establishing ML condition. The error correction term is

highly significant and holds the right sign. However the number of years needed to the trade balance reverts to the equilibrium is approximately six years.

Discussion

Results not only reject the J-curve hypothesis, but also there is no significant effect of the real exchange rate on the trade balance for Sudan in the long-run as has been hypothesized. Depreciation ought to be in fever of controlling the trade balance by increasing the cost of imports and renders exports more cheaply for foreign demand but due to the rigid structure of both imports and exports this is out of reach. Agricultural products (primary products that are cotton, sesame, groundnuts, gum Arabic and animal wealth) constitute 81 per cent of exports of goods before commencing of oil export in Sep 1999. After that exports of crude oil and its products dominated Sudanese exports. It is well known that primary products may have no direct relationship with exchange rate. They depend mainly on the foreign demand, the political factors i.e. economic sanctions and restrict rules of the major trade partners which are Euro-zone and Arab countries concerning their imports from Sudan. On the hand major portion of imports consists of necessities, agricultural, and industrial raw-materials which show no response to exchange rate movements. The effect of the Euro-zone demand is envisaged to be positive in both in the short run and the long run. The negative effect of the demand of Arab countries on the Sudanese trade balance can attributed to the competitiveness between Sudan and Arab counties. The Heckscher-Ohlin theory explains inter-industry, instead of intra-industry, highlighting competitiveness rather than complementarity between Sudan and Arab countries (Arabi and Ibrahim 2012).

The manufacturing sector depends to a greater extent on imported inputs; the same is true concerning agricultural inputs. Therefore; the currency depreciation will cause a rise in the value of imports raising cost of export goods. Thus currency depreciation will worsen the will worsen the balance of trade. Prices are rising and inflation has a continuous upward trend. 'The exchange rate responds to news about the general price level, money supply, current account and its simultaneous relationship with its volatility. The devaluation triggers much higher volatility" (Arabi 2012). Control of foreign currency and tariff policy are common in the whole period. Free trade system has been followed for the first 15 years of the independence period. Then there was inclination to the protection system during the period 1970-1992 concentrating first on self sufficiency from imported good, quota system, and administrative measures to ensure enforcement of custom law, and government purchases (Arabi 2011). Since Feb 1992 the economic liberation policy has been announced and free trade system has been followed.

Conclusions and Recommendations

This paper has empirically examined the existence of the J-curve phenomenon of the bilateral trade between the Sudan and his main trade partners including Euro-zone, and Arab countries. Although the study did not find a long-run relationship between the trade balance and real

exchange rate, the empirical results did not exhibit J-curve formation. The implication of the study is that real exchange rate movement alone may not ensure favorable balance of trade in Sudan. Since results do not support the traditional view of the link between devaluation and depreciation and J-curve, the study recommends revising macroeconomic policies in general and exchange rate adjustment policies in particular.

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Annex

Date: 11/02/13 Time: 05:18				
Sample: 1979 2012				
Included observations: 26				
Test assumption: Linear deterministic trend in the data				
Series: TB EURO ARAB RER				
Lags interval: 1 to 1				
Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.605875	65.62391	47.21	54.46	None **
0.529763	41.41561	29.68	35.65	At most 1 **
0.509332	21.79811	15.41	20.04	At most 2 **
0.118738	3.286411	3.76	6.65	At most 3
*(**) denotes rejection of the hypothesis at 5%(1%) significance level L.R. test indicates 3 cointegrating equation(s) at 5% significance level				

Dependent Variable: LOG(MG/CPI)
Method: Least Squares
Date: 11/02/13 Time: 07:00
Sample(adjusted): 1979 2005
Included observations: 27 after adjusting endpoints
Convergence achieved after 33 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RGDP)	0.937258	0.363295	2.579882	0.0167
LOG(RER)	0.622726	0.141801	4.391548	0.0002
C	-6.260470	3.362004	-1.862124	0.0754
AR(1)	0.773186	0.174374	4.434061	0.0002
R-squared	0.804437	Mean dependent var		2.274249
Adjusted R-squared	0.778929	S.D. dependent var		0.545147
S.E. of regression	0.256319	Akaike info criterion		0.251163
Sum squared resid	1.511082	Schwarz criterion		0.443139
Log likelihood	0.609303	F-statistic		31.53634
Durbin-Watson stat	1.311089	Prob(F-statistic)		0.000000
Inverted AR Roots	.77			

Date: 11/02/13 Time: 05:11
Sample: 1979 2012
Included observations: 31
Test assumption: Linear deterministic trend in the data
Series: LOG(TB) LOG(RGDP_SUDAN) LOG(RGDP_EURO) LOG(RER) LOG(RGDP_ARAB)
Lags interval: 1 to 1

	Likelihood	5 Percent	1 Percent	Hypothesized
Eigen value	Ratio	Critical Value	Critical Value	No. of CE(s)
0.839828	136.5993	94.15	103.18	None **
0.749786	79.82251	68.52	76.07	At most 1 **
0.503309	36.87395	47.21	54.46	At most 2
0.297202	15.18054	29.68	35.65	At most 3
0.126732	4.247275	15.41	20.04	At most 4
0.001495	0.046375	3.76	6.65	At most 5

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level

Dependent Variable: LOG(X/XP)
Method: Least Squares
Date: 11/01/13 Time: 08:28
Sample (adjusted): 1979 2006
Included observations: 28 after adjustments
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RGDP_EURO)	-0.955329	0.507159	-1.883689	0.0723
LOG(RGDP_ARAB)	-2.305641	0.539884	-4.270620	0.0003
LOG(RER)	0.625425	0.135280	4.623175	0.0001
C	51.76998	10.51405	4.923887	0.0001
AR(1)	0.499773	0.162647	3.072753	0.0054

R-squared	0.847312	Mean dependent var	-4.803218
Adjusted R-squared	0.820758	S.D. dependent var	0.738841
S.E. of regression	0.312803	Akaike info criterion	0.673947
Sum squared resid	2.250453	Schwarz criterion	0.911841
Log likelihood	-4.435257	Hannan-Quinn criter.	0.746673
F-statistic	31.90853	Durbin-Watson stat	1.645427
Prob(F-statistic)	0.000000		
Inverted AR Roots	.50		

Vector Error Correction Estimates					
Date: 11/03/13 Time: 17:48					
Sample (adjusted): 1979 2006					
Included observations: 28 after adjustments					
Standard errors in ( ) & t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
LOG(TB(-1))	1.000000				
LOG(RER(-1))	7.859911				
	(2.05760)				
	[3.81994]				
LOG(RGD_EURO(-1))	16.41852				
	(3.25391)				
	[5.04578]				
LOG(RGDP(-1))	-40.38296				
	(4.30991)				
	[-9.36978]				
LOGRGD_(ARAB(-1))	12.56237				
	(1.06876)				
	[11.7542]				
Error Correction:	D(LOG(X/M))	D(LOG(RER))	D(LOG(EURO/WCPI))	D(LOG(RGDP))	D(LOG(ARAB/WCPI))
CointEq1	-0.172418	-0.057479	-0.002619	0.021957	-0.003902
	(0.04369)	(0.02986)	(0.00533)	(0.00529)	(0.00468)
	[-3.94618]	[-1.92495]	[-0.49154]	[4.15111]	[-0.83293]
D(LOG(TB(-1))	0.496001	0.251337	0.025830	0.037100	-0.002263
	(0.23838)	(0.16291)	(0.02907)	(0.02886)	(0.02556)
	[2.08073]	[1.54278]	[0.88856]	[1.28558]	[-0.08855]
D(LOG(TB(-2))	0.416224	0.064316	0.040271	-0.021505	0.007322
	(0.23191)	(0.15849)	(0.02828)	(0.02808)	(0.02487)
	[1.79476]	[0.40580]	[1.42401]	[-0.76598]	[0.29446]

D(LOG(RER(-1)))	-0.001906	-0.016786	0.001251	-0.162520	0.041846
	(0.65179)	(0.44545)	(0.07948)	(0.07891)	(0.06989)
	[-0.00292]	[-0.03768]	[0.01574]	[-2.05963]	[0.59875]
D(LOG(RER(-2)))	-0.219370	-0.177216	0.060024	-0.036442	0.027922
	(0.48364)	(0.33053)	(0.05898)	(0.05855)	(0.05186)
	[-0.45358]	[-0.53616]	[1.01775]	[-0.62240]	[0.53843]
D(LOG(RGDP_EUR O(-1))	8.530183	2.360708	0.263060	-0.427321	-0.155475
	(2.76243)	(1.88789)	(0.33687)	(0.33442)	(0.29620)
	[3.08793]	[1.25045]	[0.78091]	[-1.27778]	[-0.52490]
D(LOG(RGDP_EUR O(-2))	5.267046	0.596755	0.016399	-1.428559	0.128652
	(3.05046)	(2.08473)	(0.37199)	(0.36929)	(0.32709)
	[1.72664]	[0.28625]	[0.04409]	[-3.86835]	[0.39333]
D(LOG(RGDP(-1)))	-1.484772	-1.159927	-0.217536	0.427391	-0.122621
	(1.72025)	(1.17565)	(0.20978)	(0.20826)	(0.18445)
	[-0.86311]	[-0.98663]	[-1.03699]	[2.05223]	[-0.66478]
D(LOG(RGDP(-2)))	-1.708086	-0.887183	0.260123	0.165000	0.252601
	(1.19297)	(0.81530)	(0.14548)	(0.14442)	(0.12792)
	[-1.43179]	[-1.08817]	[1.78807]	[1.14248]	[1.97474]
D(LOG(RGDP_ARA B(-1))	-6.569690	-2.237463	-0.011239	-0.017024	0.808458
	(2.99032)	(2.04364)	(0.36466)	(0.36201)	(0.32064)
	[-2.19698]	[-1.09484]	[-0.03082]	[-0.04703]	[2.52141]
D(LOG(RGDP_ARA B(-2))	1.037988	2.993110	0.264276	0.895518	-0.252115
	(2.97505)	(2.03320)	(0.36279)	(0.36016)	(0.31900)
	[0.34890]	[1.47212]	[0.72845]	[2.48641]	[-0.79033]
R-squared	0.567015	0.432310	0.400587	0.587250	0.540500
Adj. R-squared	0.312318	0.098374	0.047992	0.344455	0.270207
Sum sq. resids	10.54759	4.926332	0.156849	0.154585	0.121268
S.E. equation	0.787684	0.538316	0.096054	0.095358	0.084459
F-statistic	2.226236	1.294590	1.136110	2.418713	1.999677
Log likelihood	-26.06198	-15.40374	32.85516	33.05875	36.45716
Akaike AIC	2.647284	1.885982	-1.561083	-1.575625	-1.818368
Schwarz SC	3.170650	2.409348	-1.037717	-1.052259	-1.295002
Mean dependent	0.344437	0.072861	0.049225	0.037960	0.042315
S.D. dependent	0.949858	0.566923	0.098446	0.117776	0.098866
Determinant resid covariance (dof adj.)		1.50E-08			
Determinant resid covariance		1.24E-09			
Log likelihood		88.48582			
Akaike information criterion		-2.034702			
Schwarz criterion		0.820022			