

**REAL EXCHANGE RATE, FOREIGN TRADE AND REAL OUTPUT GROWTH:
THE CASE OF SPAIN, 1970-2009**

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Abstract

We analyze the evolution of the exchange rate with Dollar, real output and foreign trade balance in Spain, during the period 1970-2009. We present the estimation of an econometric model that related output growth and real exchange rate with other variables. Applying the monetary policy reaction function and employing the dummy variable technique, this paper finds that real GDP and the *expected real effective exchange rate* (REER) exhibit a J-shaped relationship. Thus, recent appreciation of the euro, for the period 2001-2007, would work in favor of Spain, provided that economic policies support a positive evolution of industrial production, exports and other main variables. Other findings of this model are that a higher real stock price, a higher real euro interest rate, and a lower expected inflation rate would raise real output for Spain whereas deficit-financed government spending has a little negative impact on real output. We also analyze the effect of foreign trade balance of Spain on the evolution of the exchange rate and economic growth, having into account the important positive role of industrial production to guarantee economic development in this country. Finally we present some recommendations in order to get a fast recovery of Spain after the economic crisis of the period 2008-2010.

Keywords: Monetary Policy Reaction Function, MPRF, Uncovered Interest Parity, UIP, expected real depreciation or appreciation, government deficit, world interest rate, expected inflation, Spanish output growth 1970-2009, Foreign Trade and Development, Real exchange rate Euro/Dollar, REER,

JEL Classification: E52, F31, F41

1. Introduction

Recent appreciation of the Euro, for the period 2001-2007, has led to renewed interest in its impact on output in the EU member countries including Spain. Real appreciation of the euro would reduce exports, increase imports, and cause net exports and aggregate expenditures to decline. On the other hand, real appreciation of the euro would reduce import prices, lower inflation, may cause the **central bank** to reduce the real interest rate, and stimulate household consumption and business investments. Hence, whether the recent real appreciation of the euro or possible real depreciation of the euro in the future would reduce or increase real output for Spain needs to be addressed further.

The recent global financial crisis has hurt Spain's economic and business activities. According to the forecast of Spain's economy in 2009 made by the

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International Monetary Fund, real GDP, final domestic demand, private consumer expenditure, and the current account are expected to decline 3.5%, 6.3%, 5.1%, and 6.0%, respectively. It is significant to examine the roles of the expected real effective exchange rate and other major macroeconomic variables in determining output fluctuations for Spain. The paper has several focuses. First, the paper incorporates the monetary policy reaction function in the formulation of the model. It is appropriate as the central bank determines its short-term interest rate based on an inflation targeting of less than 2%. Second, the paper tests whether the expected real effective exchange rate and real output may exhibit different relationships during different time periods. If the relationship changes, the dummy variable technique will be employed to test if the intercept and/or the slope coefficient of the expected real effective exchange rate may have changed. Third, comparative static analysis will be applied in order to determine the possible response of equilibrium real GDP to a change in one of the exogenous variables including the expected real effective exchange rate.

Camarero and Tamarit (2001) analyze the real exchange rate of the Spanish currency during the period 1973-1992 (Peseta) in relation to 9 of its European partners, using panel cointegration tests and comparing several structural models tested in the literature. They conclude:

“To summarize the main empirical results, from models 1, 4 and 5, we can derive that both supply and demand variables have been important in the evolution of the peseta during the period studied. However, when combined, the specification including the real interest rate differential seems to be more supported by the data than the one containing the difference in public expenditure. Moreover, in the case of Spain, the two demand factors (contractionary monetary policy and expansionary fiscal policy) appear to lead to an increase of real interest rates and to an appreciation of the currency.”

There are several major studies examining the impact of currency depreciation or devaluation on output. Krugman and Taylor (1978) state that one of the conditions for currency devaluation to have a contractionary impact is if exports are initially less than imports. Edwards (1986), Upadhyaya (1999), Bahmani-Oskooee, Chomsisengphet, and Kandil (2002) and Christopoulos (2004) find that currency devaluation or depreciation could have a contractionary, an expansionary, or no effect depending upon the countries or time periods in empirical work. Chou and Chao (2001) and Bahmani-Oskooee and Kutun (2008) indicate that depreciation or devaluation is ineffective or has little impact in the long run.

Studies reporting depreciation or devaluation is expansionary include Gylfason and Schmid (1983) except for the U.K. and Brazil, Gylfason and Risager (1984) for developed countries, and Bahmani-Oskooee and Rhee (1997). On the other hand, studies showing that depreciation or devaluation is contractionary include Gylfason and Risager (1984) for LDCs, Rogers and Wang (1995), Moreno (1999), Kamin and Rogers (2000), Chou and Chao (2001) in the short run, and Bahmani-Oskooee and Miteza (2006) for 24 non-OECD countries.

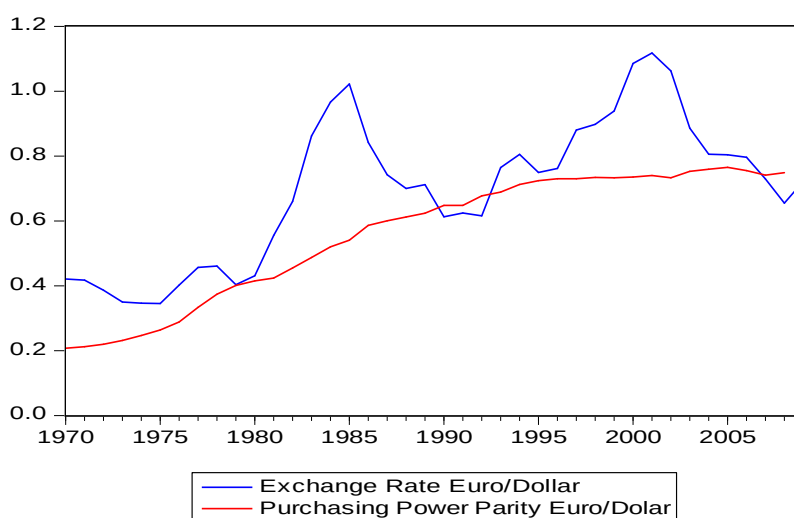
These previous studies have made significant contributions to the understanding of the subject. These findings suggest that the impact of real depreciation could be expansionary, contractionary or neutral and depends on the country, time period, the formulation of a model, and the methodology employed in empirical work. To the author's best knowledge, few of the previous studies have focused on the hypothesis that

the impact of the real exchange rate on real output may be nonlinear and vary with the output level or the stage of economic development.

2. Exchange Rate, Foreign Trade Balance and real GDP in Spain 1970-2009

Graph 1 shows the evolution of the exchange rate (ER) and Purchasing Power Parity (PPP) in Spain for the period 1970-2009. As Guisan (2009 b) indicates, there is usually a trend of ER in Spain and other OECD countries to regress to the corresponding PPP, although with important departures from that trend in some years. In the case of Spain, the largest differences of ER respect to PPP are found during years 1985 and 2001.

Graph 1. Exchange rate and PPP Euro/Dollar in Spain, 1970-2009



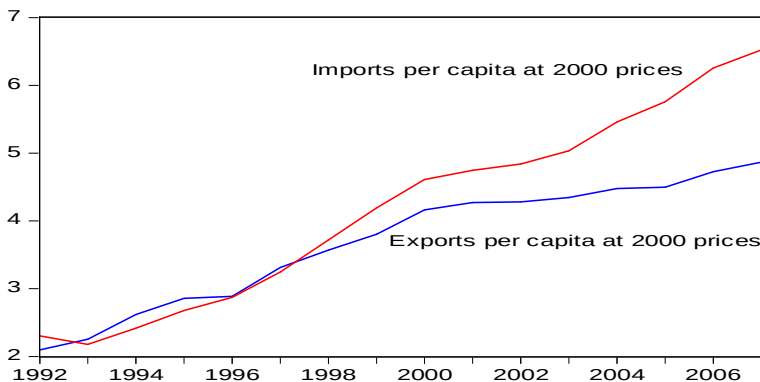
Source: Elaborated from OECD National Accounts Statistics, converting the old local currency of Pesetas into Euros for years before the official change of currency.

Graph 2 shows the increasing deficit of foreign trade in Spain for the period 2000-2007, which has weakened the international position of Spain at the cost of financing economic growth of that period with increasing dependence on foreign lending.

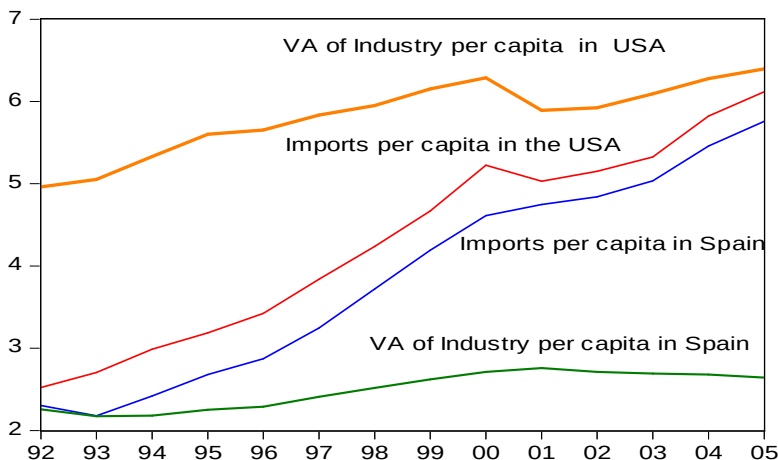
In comparison with the USA, the evolution of Imports per capita in Spain has very alike, what should not be a problem in Spanish Exports would show a more balanced evolution with Imports, but it has not been the case as seen in Graph 3.

An important question to explain the differences between the better economic performance of the USA in comparison with Spain is that real Value-Added of Industry per capita is much higher in the United States and has not increased in Spain for the period 2001-2010 due to wrong economic policies. The main problem of economic policies in Spain is not the lack of good economic advisers but the lack of bridges among economic researchers, economic advisers and policy makers.

Graph 2. Real Imports and Exports per capita in Spain 1992-2007



Graph 3. Evolution of real Value-Added of Industry and Imports in Spain and the USA (thousand Dollars at 2000 prices and exchange rates)



2. A Model of Gross Domestic Product and Real Effective Exchange Rate (REER)

Suppose that aggregate spending is determined by real output, the domestic real interest rate, government spending, government tax revenues, the real financial stock price, and the real effective exchange rate, that the real policy interest rate is affected by the inflation rate, real output, the real exchange rate, and the world real interest rate, that the real effective exchange rate is influenced by the domestic real interest rate, the world real interest rate, and the expected real effective exchange rate, and that the inflation rate is affected by the expected inflation rate, the output gap, and the real effective exchange rate. Applying and extending Taylor (1993, 1995), Romer (2000, 2006), Svensson (2000), and other previous studies, we can express the open-economy IS function, the monetary policy reaction function, uncovered interest parity, and the augmented aggregate supply function as:

$$Y = F(Y, R, G, T, A, \varepsilon) \quad (1)$$

$$R = G(\pi, Y, \varepsilon, R') \quad (2)$$

$$\varepsilon = H(R, R', \varepsilon^e) \quad (3)$$

$$\pi = \pi^e + \lambda_1(Y - Y^*) - \lambda_2\varepsilon \quad (4)$$

where

- Y = real GDP in Spain,
- R = the domestic real interest rate,
- G = government spending,
- T = government tax revenues,
- A = the real stock price,
- ε = the real effective exchange rate,
(An increase means real appreciation of own currency.)
- π = the inflation rate,
- R' = the world real interest rate,
- ε^e = the expected real effective exchange rate,
- π^e = the expected inflation rate,
- Y^* = potential output for Spain, and
- λ_1, λ_2 = parameters.

Solving for four endogenous variables Y, R, ε , and π simultaneously, we can express equilibrium real GDP as:

$$\bar{Y} = \bar{Y}(\varepsilon^e, G, T, A, R', \pi^e; \lambda_1, \lambda_2, Y^*). \quad (5)$$

The Jacobian for the endogenous variables is given by:

$$\begin{aligned} |J| = & (1 - F_Y) - H_R F_\varepsilon G_Y - F_R G_Y - H_R G_\varepsilon (1 - F_Y) \\ & - G_\pi [-\lambda_2 H_R (1 - F_Y) + \lambda_1 F_R + \lambda_1 H_R F_\varepsilon] > 0. \end{aligned} \quad (6)$$

We expect that the sign of $(\partial \bar{Y} / \partial G - \partial \bar{Y} / \partial T)$ or $\partial \bar{Y} / \partial A$ is positive. The effect of appreciation of the expected real effective exchange rate on equilibrium real GDP is uncertain because the negative impact of decreased net exports may be less or greater than the positive impacts of a lower inflation rate and a lower real interest rate due to monetary easing:

$$\partial \bar{Y} / \partial \varepsilon^e = H_{\varepsilon^e} (F_\varepsilon + F_R G_\varepsilon - \lambda_2 F_R G_\pi) / |J| > \text{or} < 0. \quad (7)$$

The effect of a higher world real interest rate on equilibrium real GDP is uncertain as the first term in the parenthesis in (8) is positive whereas the remaining terms in the parenthesis in (8) are negative:

$$\begin{aligned} \partial \bar{Y} / \partial R' = & (H_{R'} F_\varepsilon + H_{R'} F_R G_\varepsilon + H_R F_\varepsilon G_{R'} \\ & + F_R G_{R'} - \lambda_2 H_{R'} F_R G_\pi) / |J| > \text{or} < 0. \end{aligned} \quad (8)$$

A higher expected inflation rate would cause equilibrium real GDP to decline partly because the central bank would raise the real interest rate to contain inflation and partly because a higher real interest rate would cause real appreciation and reduce net exports:

$$\partial \bar{Y} / \partial \pi^e = (H_R F_\varepsilon G_\pi + F_R G_\pi) / |J| < 0. \quad (9)$$

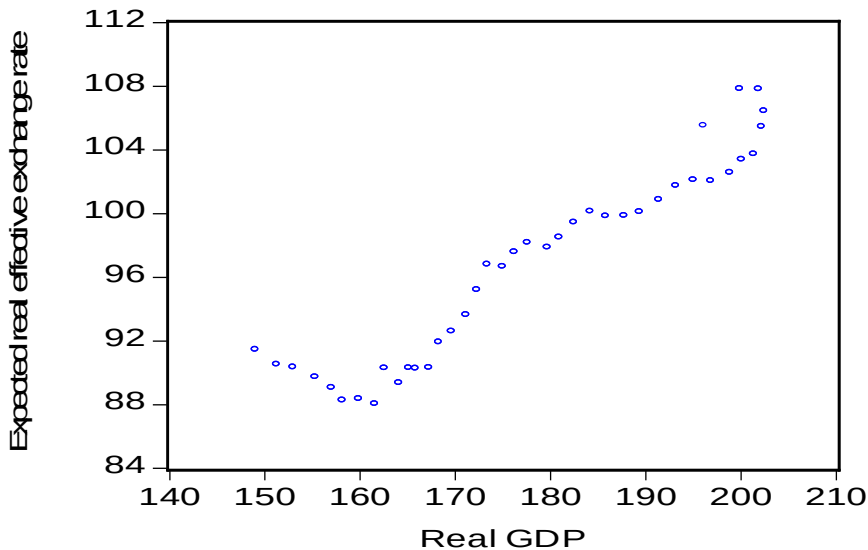
3. Empirical Results

The source of the data came from the *International Financial Statistics* (IFS), which is published by the International Monetary Fund. Real GDP is measured in billion euros. The real effective exchange rate is the weighted real exchange rate with major trading partners based on the relative consumer price index. The expected real effective exchange rate is the lagged real effective exchange rate. The ratio of government deficit to GDP is selected to represent fiscal policy. The share price index is divided by the consumer price index to derive the real stock price index. The world real interest rate is represented by the refinancing interest rate of the European Central Bank (ECB) minus the inflation rate in the EU. The inflation rate is the percent change in the consumer price index in Spain. The expected inflation rate is the lagged inflation rate. Except for the dummy variable, the ratio of government deficit to GDP, and the expected inflation rate with zero and negative values, all other variables are measured in the log scale. After calculating the inflation rate and taking lags, the sample ranges from 1999.Q3-2008.Q3. The data for government deficit after 2008.Q3 are not available at the time of writing the paper.

The ADF test shows that variables have unit roots in the level form and are stationary in the first-difference form. According to the Johansen test, the maximum eigenvalue statistic is greater than the critical value, suggesting that these variables have a long-term stable relationship. The vector-error correction model is not applied due to a relatively small sample size in the study.

The relationship between ε^e and real GDP is presented in Graph 4.

Graph 4. Scatter diagram between the expected real effective exchange rate and real GDP for Spain, 1999.3 to 2002.3



It seems that the relationship is nonlinear and exhibits a J-shape. In other words, they have a negative relationship during 1999.Q3-2001.Q1 and a positive relationship during 2001.Q2-2008.Q3. The threshold real GDP in 2002.Q3 is 162.56 billion euros. Therefore, a dummy variable is generated with a value of 0 during 1999.Q3-2001.Q1 and 1 otherwise. An interactive dummy variable is also generated to test whether the slope coefficient of the real effective exchange rate may have changed.

Estimated parameters, standard errors, t-statistics, and other related information are presented in Table 1.

Table 1. Estimated regression of real GDP for Spain: The dependent variable is $\log(Y)$

Variable	Coefficient	Std. Error	t-Statistic	Prob.	
C	12.40177	1.044009	11.87899	0.0000	
DUM	-12.59688	1.194763	-10.54342	0.0000	
$\log(\varepsilon^e)$	-1.699396	0.231097	-7.353619	0.0000	
DUM x $\log(\varepsilon^e)$	2.817387	0.264331	10.65856	0.0000	
DY	-0.000970	0.000737	-1.316286	0.1984	
$\log(A)$	0.057817	0.017526	3.299031	0.0026	
$\log(R')$	0.014267	0.004992	2.857813	0.0078	
π^e	-0.002290	0.001110	-2.062697	0.0482	
Adj. R-squared	0.989475	Akaike info criterion	-6.1425	Schwarz criterion	-5.7942
F-statistic	389.4726	Sample 1999.Q3-2008.Q3	MAPE	0.663186	

Notes: DY is the ratio of government deficit to GDP. MAPE is the mean absolute percent error.

Because a reduced form equation is estimated, endogeneity would not pose a concern. The Newey-West method is applied in order to correct for autocorrelation and heteroskedasticity simultaneously when their forms are unknown. As shown, 98.7% of the behavior of real GDP can be explained by the seven right-hand side variables. Except for the coefficient of government deficit ratio, all other coefficients are significant at the 1% or 5% level. Real GDP is positively associated with the interactive dummy variable DUM x $\log(\varepsilon^e)$, the real stock price, and the real refinance rate set by the European Central Bank and negatively influenced by the intercept dummy variable, the expected real effective exchange rate, and the expected inflation rate. The coefficient of ε^e is estimated to be -1.699 during 1999.Q3-2001.Q1 and 1.118 (= -1.699 + 2.817) during 2001.Q2-2008.Q3.

Several different versions are tested. When the intercept and interactive dummy variables are not included in the estimated regression, the adjusted R^2 is estimated to be 0.938, and the coefficient of the expected real exchange rate is positive and significant at the 1% level. However, the coefficient of the real stock price becomes negative and insignificant at the 10% level. This result may be misleading as possible different intercepts and/or slopes are not tested. If the ratio of government deficit to GDP is replaced by real government deficit, its coefficient is negative and insignificant at the 10% level. When the ECB's real refinancing rate is replaced by the U.S. real federal

funds rate, its coefficient is positive but insignificant at the 10% level. When the expected inflation rate is represented by the average inflation rate of past four quarters, its coefficient is negative but insignificant at the 10% level. To save space, these results are not printed here and will be made available upon request.

4. Foreign trade balance and REER in Spain and other Euro Countries

Accordingly to Guisan (2009 b), we find that there are important relationships between the foreign trade balance and the real effective exchange rate of Spain. The following econometric model relating REER to the evolution of foreign trade shows a significant and positive effect of the explanatory variable and a high goodness of fit in the three Euro countries where it was estimated, for 1961-2007 in Spain, Germany and France:

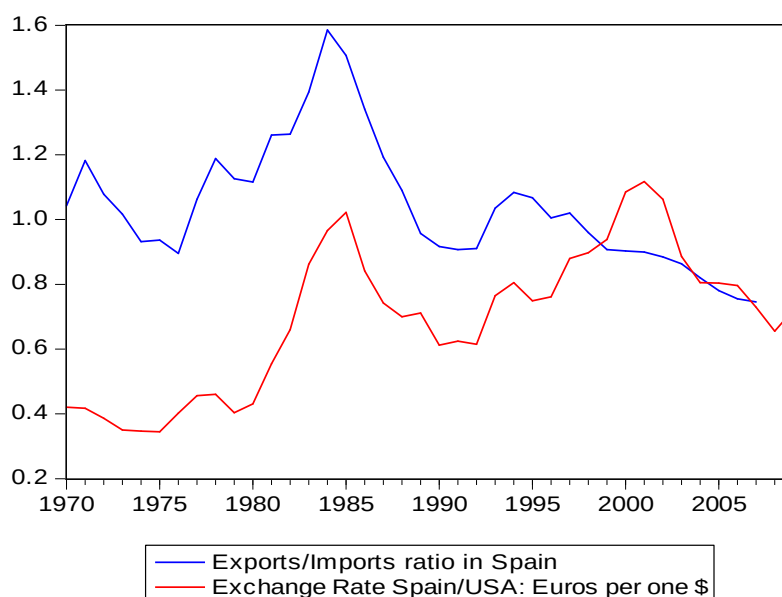
$$REER_t = f(REER_{t-1}, D(Z_t), D(ZU_t))$$

Where Z is the ratio of Exports/Imports for the Euro country and ZU is the same ratio for the United States.

The estimated coefficients are positive for D(Z) and negative for D(ZU), and the goodness of fit is very high. The model indicates that financial movements related to the foreign trade balance contribute to the evolution of real exchange rates.

Graph 5 shows the evolution of the Exchange Rate Euro/Dollar in Spain for the period 1970-2009, together with the ratio Exports/Imports in Spain.

Graph 5. Foreign trade and Exchange Rate in Spain 1970-2009



The consequences of appreciation of the Euro-Dollar real exchange rate in Spain implies increase of Imports and decrease of Exports in the next year what has contributed to increasing foreign trade deficit for the period 2001 to 2007. Economic policies of Spain in that period were expansionary, based on the growing building and services sectors without enough development of industrial production, which led to aggravating foreign trade deficits and to a high degree of dependence on foreign credit.

The new circumstances of year 2008, with increasing oil prices and with restrictions on foreign credit, have led to the Spanish economic crisis of years 2008-2010. Economic policies of years 2008 to 2010 have focused on diminishing foreign trade deficit, but unfortunately were not addressed to a higher increase in exports in comparison with imports (which would be the right policy to favour at the same time economic development and equilibrium in trade balance) but instead they led to a higher diminution in imports in comparison with exports (which only contributed to diminish disequilibrium in trade balance but did not favour economic development). This has happened because economic policies did not take into account the positive effect of imports on economic growth (increase in real GDP) and development (increase in real output and income per capita) from the supply side, provided that the trade deficit is under control, and it is not too large, as seen in Guisan (2006) and other studies.

5. Summary and Conclusions

This paper has examined the impacts of expected real depreciation or appreciation and changes in other related variables on output fluctuations in Spain based on a simultaneous equation model incorporating the open-economy IS function, the monetary policy reaction function, uncovered interest parity, and an augmented aggregate supply. Real GDP is postulated to be a function of the dummy variable, the expected real effective exchange rate, the interactive dummy variable with the expected real effective exchange rate, the ratio of government deficit to GDP, the real stock price, the real refinancing rate, and the expected inflation rate. A generalized least squares method is employed in empirical work to yield consistent estimates for the covariance and standard errors.

There is evidence of a J-shaped relationship between the expected real effective exchange rate and real output, suggesting that expected real depreciation would increase real output up to 2001.Q1 whereas expected real appreciation would raise real output after 2001.Q1. Besides, a higher real stock price, a higher refinancing rate, or a lower expected inflation rate would help raise real output.

There are several implications. The J-shaped relationship between the expected real effective exchange rate and real GDP suggests that the recent trend of real appreciation of the euro against the U.S. dollar would work in favour of Spain due to its positive impact on real output. Expansionary fiscal policy may need to be pursued with caution as deficit-financed government spending has little negative impact on real output. As the stock market is reversing its downward trend, the wealth effect and the balance-sheet effect of a higher stock price would increase household consumption and business investments. It would be desirable for the central bank to maintain transparency and effective communications in order to reduce inflationary expectations.

There may be areas for future study. A quadratic function may be applied to determine the turning point of real GDP when the relationship between the expected real effective exchange rate and real GDP changes from being negative to being positive. If the data are available, the ratio of government debt to GDP may be selected to represent fiscal policy. The model developed in this paper may be considered for other countries to determine whether it may apply. The expected inflation rate may be constructed in different manners.

We have also examined some relationships between foreign trade, exchange rates and development. In this regard, the main conclusion is that economic policies in Spain should be addressed to diminish foreign trade deficits through the increase in exports but not through the diminution in imports.

Accordingly with Guisan(2008) and other studies, we find that the increase in industrial production per inhabitant is of vital importance in this regard as Spain has a very low value of this variable in comparison with the United States and other advanced economies. European Economic policies should be addressed to make compatible a positive international cooperation with development countries and to avoid unfair competition and discrimination against European manufacturers which have to compete in European markets with productions not subjected to the same taxes and social welfare contributions.

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