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Exchange rate unbalances within the Eurozone

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The current economic unbalances within the Eurozone are being analyzed in this paper. By estimating an exchange rate model, based on fundamental variables in a panel data set from 1988 to 2011, an equilibrium exchange is being calculated. By comparing this with the market exchange rate it is possible to conclude that the southern Europe has overvalued currencies compared to the northern Europe. This confirms previous studies on the subject.

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1. Introduction

Ever since the euro crises started great unbalances among the euro members, especially in terms of trade balance and productivity, have been observed. It is common to divide the Eurozone into two groups: the financially stronger and more productive northern countries (excluding Ireland), and the financially weaker and less productive southern countries (including Ireland). These large economic differences among the countries in the Eurozone have created enormous problems, especially for the south, as the common exchange rate may not reflect their current economic situation. The results of the economic unbalances between the two groups are especially great differences in trade balance, but also economic growth and unemployment, that threatens the entire euro project since major economies like Italy and Spain also looks troublesome, and not only peripheral countries like Cyprus, Greece and Portugal. The Eurozone is, next to the US, the largest economy in the world and with not only economic but also political unbalances this is the single greatest danger to the ongoing recovery after the financial crisis.

One of the most important problems within the Eurozone right now is the currency in itself. The fact that two very different economies like Germany and Greece have the same exchange rate has created lot of debates. As the great economic unbalances are known it is possible to assume that the common exchange rate is incorrectly valued in some countries, this problem is highlighted in the thesis. By creating a model that is based on fundamental variables it is possible to estimate an equilibrium exchange rate for every individual country in the Eurozone that reflects their actual economic situation right now. The individually estimated exchange rates are compared with the actual exchange rates and it is possible to conclude whether a country has an over- or undervalued currency.

The economic differences among the euro countries were discussed already before the implementation. Except productivity and trade balance, differences in public finance and monetary history were mentioned as important dangers for the euro. The defenders of the euro could not deny these differences but argued that the monetary union would make the countries converge and become more similar. When the euro was implemented in 1999, the southern countries experienced a very low nominal interest rate and the risk premium of lending to these countries dropped significantly since they now shared the same currency with the historically more stable north. From 1999 until 2007 the maximum spread of the 10-year bond rate between Germany and the peripheral south was 40 basis points (Cline and Williamsson,

2011). The low interest rates led to an increase in capital inflow in the south. However, it was not accumulated in an efficient way according to Coudert et al (2012), as it mainly financed the construction sector in Spain and Ireland, high government deficit in Greece and private consumption in Portugal. After the collapse of Lehmann Brothers and the financial crisis, these problems were highlighted. The peripheral countries had fallen far behind some of their European neighbors, suffering from high unemployment and an uncontrolled increasing government debt. The belief and hope that the euro would make the different economies converge has not been a reality as the current economic situation is widely different among the countries.

In order to see whether a currency is valued at a correct level an estimated exchange rate has to be compared with the market exchange rate. There are several approaches to this and no general consensus exists among academics and researchers about which one to use. The oldest and most famous is the Purchasing Power Parity (PPP) model. It builds on the assumption that all goods should have the same real price all over the world and by comparing the price level between two countries the exchange rate can be calculated. However, this rarely holds and Rogoff (1996) argues that it can only work as "an anchor for long-run exchange rate" and that more macroeconomic variables are needed to estimate exchange rates. In Driver and Westweys (2004) discussion about the on-going exchange rate research they argue that the PPP is too simple and that fundamental factors must be considered. They argue that macroeconomic factors can bring the exchange rate away from its original long-run equilibrium. A similar discussion takes place in Dunaway and Li's (2005) IMF working paper, concerning the Chinese RMB. According to Dunaway and Li an extended PPP model is necessary to describe and explain the short-run deviations from the long-run equilibrium exchange rate that follows the PPP. Stein (2002) has made a review of several research papers on the euro exchange rate and concludes that there are fundamental determinants that can estimate the euro, while the PPP model fails.

During the euro crisis the fundamental differences among the countries have been highlighted and lead to an increasing number of papers on this topic. Jeong et al (2010) used the fundamental equilibrium exchange rate (FEER) approach to calculate the misalignment of each "national euro". The FEER defines the exchange rate when the economy reaches both internal and external equilibrium at the same time. The internal equilibrium corresponds to a situation with full utilization of productive resources of one country without inflation pressure (non-accelerating inflation rate of unemployment, NAIRU), while the external is reached

when the current account is at a sustainable level. This model mainly takes into consideration foreign trade relations and was developed by Williamson (1983). In Jeong el al's (2010) study, Greece was unfortunately excluded. However, countries such as Spain and Portugal were not and according to this study their currencies have been overvalued since the start of the euro while the German euro was the most undervalued. The explanation for the overvaluation among the southern countries by Jeong at al (2010) was the low relative productivity.

Previous studies on the exchange rate unbalances

Table 1.1	Aus	Bel	Fin	Fra	Ger	Gre	Ire	Ita	Ned	Por	Spa
Jeong*	-8,2	-	-3,6	2,0	-10,3	-	8,0	3,7	-1,0	24,4	23,4
Courdet**	3,2	4,2	-7,3	-0,4	-0,5	20,0	5,3	6,6	3,0	13,8	10,0

*Jeong et al (2010), over- (+) and undervaluation (-) in 2009 (%).
**Courdet et al (2012), over- (+) and undervaluation (-) in 2010 (%).

A similar study has been made by Coudert et al (2012), using the Behavior Equilibrium Exchange Rate (BEER) approach with productivity and net foreign assets as dependent variables. Coudert et al's results mainly concluded what Jeong et al's results had already showed in regard to Greece, Portugal and Spain's currencies being significantly overvalued. Coudert et al also explains the overvaluation of the peripheral southern countries exchange rates by the relatively low productivity, but also the higher inflation in these countries and the appreciation of the euro against third currencies that further deteriorated the relative productivity (against third countries). Furthermore, according to Coudert et al's study all countries except Greece and Portugal had undervalued currencies in the early 2000's. During this period the euro depreciated significantly which explains the short period of increased competitiveness. However, in 2010 all currencies were overvalued except the Finish, German and French currencies.

By creating an extended PPP model with interest rate, price level, productivity, risk, terms of trade and trade balance as the fundamental dependent variables it will be possible to estimate an equilibrium exchange rate for the eleven largest economies in the Eurozone that can be compared against the market exchange rate. The model will be based on panel data from 1980 until 1998, the year before the euro was implemented. In addition to data from the Eurozone the model will also be complemented by data from Australia, Canada, Japan, UK and US. By

using the coefficients from the model an equilibrium exchange rate will be estimated until 2011.

The results from the model corresponds to a high degree with those from Coudert el al (2012) and Jeong et al (2010) with the Greek euro as the most overvalued currency, followed by its southern neighbors Italy, Portugal and Spain. On the other side the Dutch and the German euro are the strongest. However, even if the order of the countries is rather similar the percentage over- or undervaluation is significantly lower than in the two studies presented above.

This paper is structured as follows. Section 2 describes the general economic theory behind the exchange rate research. Section 3 present the final empirical model that is used to estimate the equilibrium exchange rate, based on the economic theory from the previous section. A short description of the data is also included. The results of the econometric study is presented and analyzed in section 4. Section 5 concludes the paper.

2. Theory

The basic concept of the PPP model assumes that the law of one price holds, which says that the same goods should have the same price all over the world if transport costs are absent (Rogoff, 1996). If this holds, it is possible to calculate the exchange rate by comparing the price of goods in two countries. The law of one price only applies for one individual good while the PPP applies for a bundle of several goods. However, as already mentioned above, this model has constantly been empirically rejected. Firstly, Taylor and Taylor (2004) explain this by the failure of the law of one price. Because of transaction costs (such as transport, tariffs, taxes and barriers) it cannot hold.

Secondly, there is a price difference between rich and poor countries, created by the productivity differentials and related to the Balassa-Samuelson effect. By presenting a more generalized version of the PPP (Pilbeam, 2004), a version distinguishing between tradable goods and non-tradable goods, the importance of the Balassa-Samuelson effect can be proved. The reason for separating tradable and non-tradable goods is that non-tradable goods do not comply with the law of one price and therefore not the PPP. For example, if a house or a haircut is cheaper abroad, this will not affect the exchange rate because there is minimal room for arbitrage forces since these goods are non-tradable. Therefore, if we only consider tradable

goods the PPP will follow the exchange rate to a much higher degree than the overall PPP (Balassa, 1964). If only tradable goods are considered we can assume that PPP holds.

Rogoff (1996) argues that there is a constant undervaluation of developing countries currencies because of the lower price level. According to the Balassa-Samuelson effect this is explained by the fact that developed countries have higher prices on non-tradable goods, and therefore a higher general price level. According to Balassa (1964) this is explained by the lower productivity in the tradable sector in developing countries that leads to lower wages in this sector, and since wages are assumed to be equalized within one country the wages are also lower in the non-tradable sector. Even if the productivity between rich and poor countries in the non-tradable sector is the same, the prices for non-tradable goods in poor countries will be lower. This also explains why the original PPP cannot hold. Therefore, by adding a productivity variable $(y-y^*)$ the shortcomings of the original PPP model is considered. Although this thesis only studies developed countries, there are differences in productivity that will affect the price level and therefore the exchange rate.

Rogoff (1996) argues that, in addition to the productivity, more macroeconomic variables are needed to explain the short run deviations that the PPP cannot. Models trying to observe the exchange rate volatility in the short run are usually built on the uncovered interest parity condition (UIP). This theory is considering the arbitrage situation that appears if the interest rate is different between two countries, so that a higher interest rate in the home country will lead to an appreciation because foreign capital will be invested in the home country which has an appreciating effect on the exchange rate. Some assumptions are required for this to hold, capital needs to be completely mobile and both domestic and foreign bonds must be considered equally risky.

However, the assumption that government bonds are equally risky rarely holds. Therefore a risk premium (of investing in domestic bonds) must be included. The risk premium indicates the included risk when investing in a certain asset. For this purpose, a variable that describes the countries' public finances is a relevant measure according to Driver and Westway (2004). The risk of a national default is the general risk when investing in a country and its currency. A positive risk premium indicates that domestic bonds are more risky and will have a depreciating effect. However, Driver and Westway (2004) argues that the UIP model only explains the exchange rate adjustments back to its equilibrium and that the long run

movements must be explained by other factors. This is confirmed by Stein (2002) who argues that the UIP can explain deviations from the long term equilibrium.

In theory, with PPP describing the long run and UIP the short run exchange rate, these two models can be combined into the Capital Equilibrium Exchange Rate (CHEER) model. According to Macdonald (2000) it builds on the basic PPP model but takes into account that it may be away from its long run equilibrium because of interest rate differentials. The model is therefore supported by the UIP. A long run cointegration relationship between exchange rate, interest rate and price is then estimated. Other models based on the UIP include the Behavior Equilibrium Exchange Rate (BEER) model, first introduced by Clark and MacDonald (1999). In this model the researcher tries to observe the long run relationship between the exchange rate and several economic variables based on economic theory. The exact variables, except the risk free interest rate, vary between models but usually include terms of trade, productivity and net foreign assets.

Except for fundamental factors related to the PPP and the UIP models, factors related to a country's trade is widely recognized as important variables for the exchange rate as it effects the capital in- and outflow. Trade balance, the relationship between export and import, is advocated by Rogoff (1996) as one of the macroeconomic factors that can describe the short run movements by the exchange rate and thereby improve the PPP model. Dunaway and Lee (2005) also argue for and extended PPP model with variables that can observe the capital inflow. According to theory a decline in inflow has a depreciating effect (Dunaway and Lee, 2005).

Terms of trade is often used in BEER models and is the price of exportable goods in relation to price of importable goods. It means the quantity of imported goods that a country can buy through the sale of a fixed quantity of exported goods. According to Hinnossar (2005) it has a positive effect for two reasons. Firstly it has an adjusting effect on the trade balance. Secondly, an increasing terms of trade shifts production from non-tradables to tradables. This leads to an excess demand for non-tradables and an increase in their price.

To sum up the theoretical discussion it started with the original PPP model that only considers countries price level. Because of the price difference between tradables and non-tradables a productivity variable was included, i.e. the Balassa-Samuelson effect. However, constant macroeconomic shocks bring the exchange rate out of its long run equilibrium and therefore a couple of short run economic variables are needed in order to observe these. The UIP model

describes the arbitrage situation that affects the exchange rate market while the trade variables are important to observe the exchange of goods and services that affects the exchange rates. This concludes that the exchange rate is a function of the following variables:

$$s = q[p - p^*, rp, r - r^*, tb, tot, y - y^*] \quad (1)$$

Where s indicates exchange rate, p price level, rp risk premium, tb trade balance, tot terms of trade and y productivity.

3. Model and data

Based on the theory above it is possible to make a model that will be able to estimate an equilibrium exchange rate. The model is built on the PPP model with an added productivity variable in order to observe the Balassa-Samuelson effect. As the PPP model tends to miss the short run deviations when it moves out of its long run equilibrium a few macroeconomic variables presented in the theory are included as well. The data is estimated in a panel cointegration model.

$$s_t = \beta_1(p_t - p_t^*) + \beta_2\, rp_t + \beta_3\,(r_t - r_t^*) + \beta_4\, tb_t + \beta_5\, tot_t + \beta_6(y_t - y_t^*) + u_t \quad (2)$$

Where r is interest rate, rp is risk premium, tot is terms of trade and tb is trade balance. The model will be estimated with a panel cointegration model in order to find the long-run relationship between the economic variables.

The data is collected from 16 developed countries from 1980 to 2011. In addition to the eleven largest countries within the Eurozone (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain), five major developed economies outside the Eurozone are included as their impact on the foreign exchange market is vital (Australia, Canada, Japan, United Kingdom and United States).

> S (nominal effective exchange rate): This is a weighted average of a country's currency relative to other currencies, expressed as an index. The weights depend on the size of the trading relationship between countries, measured by the balance of trade. The weight consists of 27 countries. A higher s indicates an appreciation and the data is in log form.
> *Source: Bank of international settlement*
>
> P (price level): The price is a consumer price index (CPI) and in log form.
> *Source: OECD*
>
> R (interest rate differentials): This is the difference between the domestic interest rate and an

average of all interest rates for that year. The data that has been used here is the 10 year government bond yield and is in log form.
Source: Oxford Economics

Rp (risk premium): Government debt as a percentage of the gross domestic product.
Source: Oxford Economics

Tot (terms-of-trade): The terms of trade is the export price divided by the import price, in log form.
Source: Oxford Economics

TB (Trade balance): The trade balance as percentage of the gross domestic product.
Source: Oxford Economics

Y (Productivity): Labor productivity differential per hours in USD, in log form.
Source: The Conference Board Total Economy Database

4. Results and analysis

The following model is estimated:

$$s_{ti} = \beta_1(p_{ti} - p^*_{ti}) + \beta_2\, rp_{ti} + \beta_3\,(r_{ti} - r^*_{ti}) + \beta_4\, tb_{ti} + \beta_5\, tot_{ti} + \beta_6(y_{ti} - y^*_{ti}) + u_{ti} \quad (3)$$

The data is described above. The data used in our regression analysis comes from 1980 until the year before the euro was implemented, 1998. The model will be estimated with a panel cointegration test in order to get the long run relationship between the variables. The cointegration vectors will be used to estimate the equilibrium exchange rate between the years 1999 and 2011.

When working with this type of data in a panel data set it is very likely that we will have cross-sectional dependence between our variables. In order to test for a cointegrational relationship between our variables this has to be removed. By subtracting each variable with its average a fixed effect estimator is included in the model that will solve for this. The Fisher Phillips-Perron panel unit roots test is used to test for stationarity in our variables. The results are summarized in table (3.1). For price and trade balance the null hypothesis of a unit root can be rejected. For the remaining variables the unit root can be rejected when taking the first difference. That is, price and trade balance is I(0) while price, interest rate, terms of trade and productivity is I(1).

Table 3.1	Fisher Phillips-Perron panel unit root test	
	Level	First difference
S	39,6806	107,146
	(0,1649)	(0,00)
P	272,6	
	(0,00)	
R	29,1352	245,197
	(0,6123)	(0,00)
Rp	20,5901	83,4594
	(0,9402)	(0,00)
Tb	47,2659	197,448
	(0,0401)	(0,00)
Tot	27,1326	152,098
	(0,7115)	(0,00)
y	34,4278	141,329
	(0,3523)	(0,00)

With these results it is not unreasonable to assume a cointegration relationship and therefore a Pedroni cointegration test is performed and presented in table (3.2). The null hypothesis of no cointegration cannot be rejected at a satisfying level when no deterministic trend is included. However, if a cointegration test is performed with a deterministic trend the hypothesis of no cointegration can be rejected. The need for a deterministic trend is explained by the appreciating trend among most of the nominal effective exchange rates in the data set.

Table 3.2	Panel Phillips-Perron cointegration test
No deterministic trend	-1,212272
	(0,1127)
Deterministic trend	-2,202251
	(0,0138)

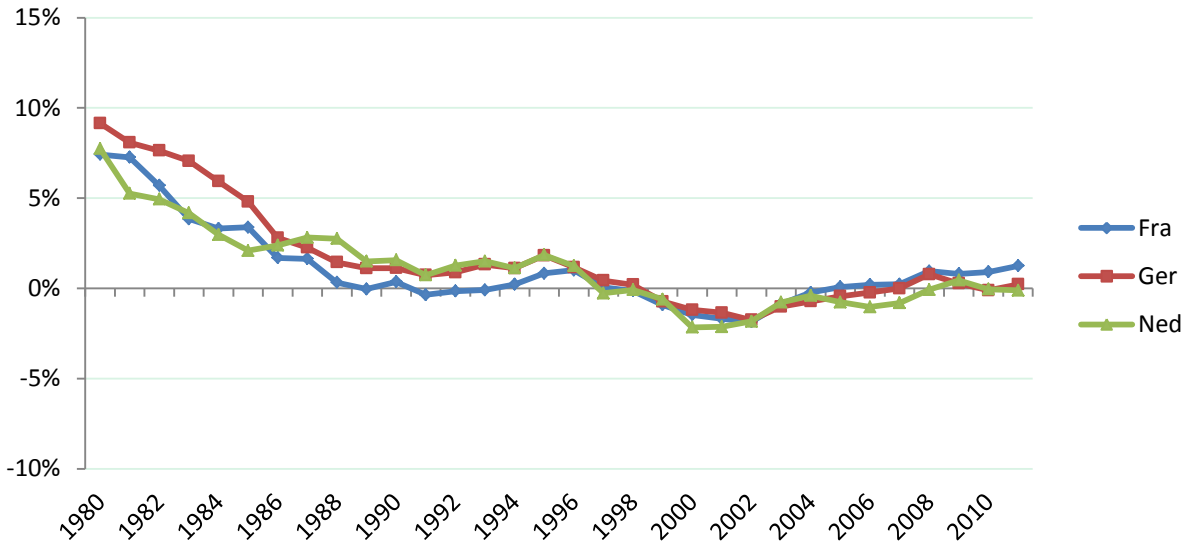
As cointegration relationship can be assumed the cointegration vector is estimated with a fixed effect.

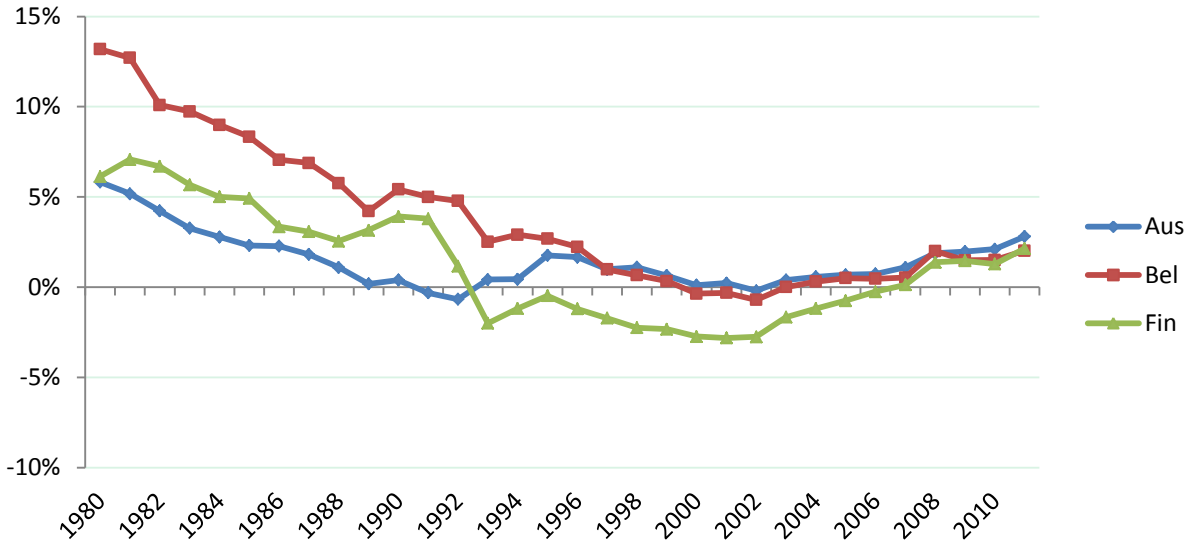
Table 3.3	Cointegration vector					
Constant	P	R	RP	TB	TOT	Y
-1,21E-16	-1,0135	0,0017	-0,0012	0,0030	1,0130	0,0709
(0,0040)	(0,0355)***	(0,0026)	(0,0005)***	(0,0014)***	(0,0740)***	(0,1204)

Standard error within parenthesis.
*** indicates significance at 1 %-level

The cointegration vector gives the expected signs that correspond with theory and it is not surprising that price, together with terms of trade, has the largest impact in our model. The productivity variable may look surprisingly small but compared to some of the other variables the effect is not unimportant. Since it is an important part of the modified PPP model that is also expected.

These coefficients are used to model the equilibrium exchange rate from 1980 until 2011, focusing on the last decade as the euro was implemented in January 1999. By comparing the model equilibrium exchange rate with the nominal effective exchange rate it is possible to conclude whether the currency is under- or overvalued. The diagrams below present the percentage deviation from the nominal effective exchange rates, a positive (negative) equilibrium exchange rate indicates an overvaluation (undervaluation). The eleven euro countries are divided into four different groups.

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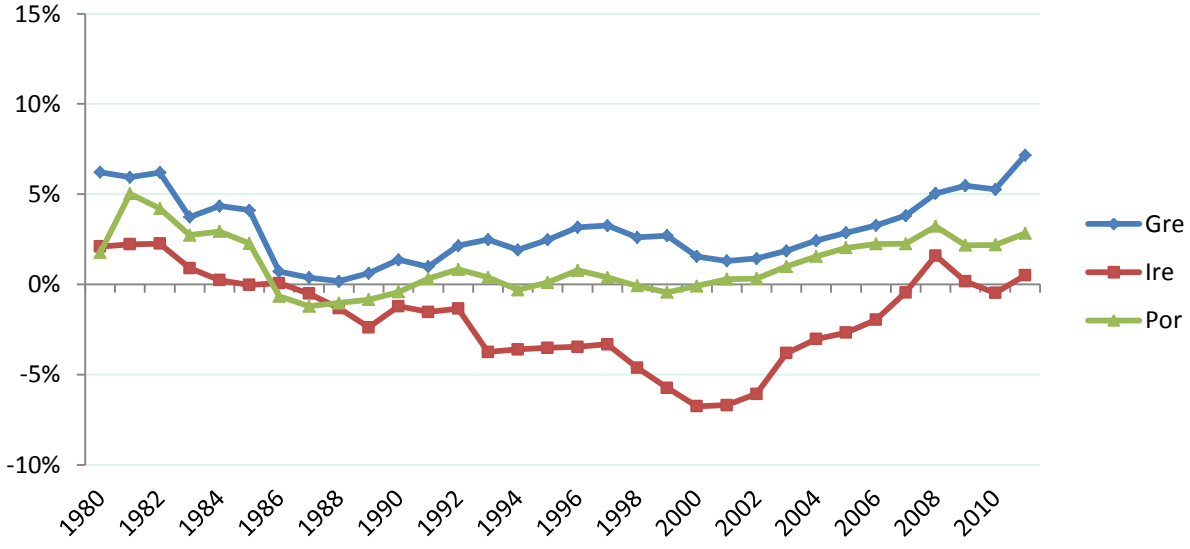
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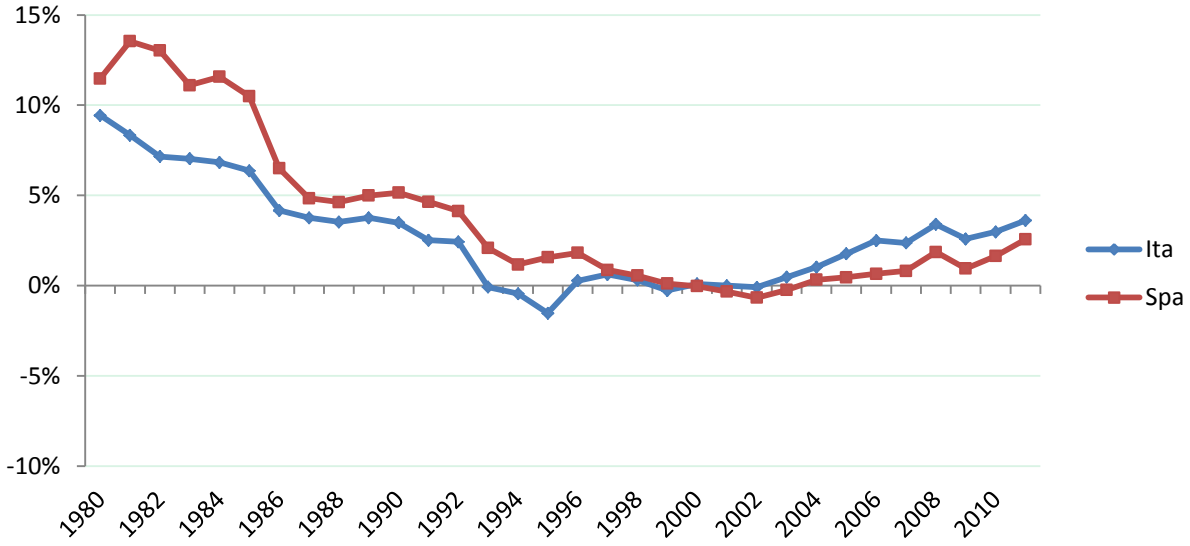
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As the diagrams illustrate the southern countries are overvalued to a larger degree than the northern countries. Considering the clear distinction in economic fundamentals between the two groups, especially in terms of productivity and trade, it is not surprising and confirms results from previous studies. Neither is it surprising that Ireland seems to be in the wrong group, even considering its difficulties during the financial crisis and the support from IMF. The Irish productivity is more in line with its northern neighbors and has a modest increase in price level compared to Greece, Portugal and Spain. The Irish crisis was created by an uncontrolled economic boom followed by a real estate bubble, rather than by fundamental economic factors (Courdet et al, 2012). The boom in the building and real estate sector is known from Spain as well, but there are more underlying fundamental reasons behind their problems, such as productivity. Therefore the Spanish euro has been, and still is, significantly overvalued compared to the Irish euro.

Another notation on the national level is the German overvaluation in the mid 90's, which is the highest since the mid 80's. According to Jeong et al (2010) this was created by the German reunification 1990 that lead to large transfer of resources from West Germany to East Germany. This had a negative effect on the external surplus in Germany. Jeong et al continues to argue that since the 90's the German economy has gone through a painful adjustment process with lower costs and higher productivity as a result, which is reflected in the deviation of the German euro from the market exchange rate. Since the late 90's the German Euro has been undervalued almost the entire period, as a result of the great adjustment. The French currency has developed in an opposite way. It was less overvalued (or more undervalued) than the German euro for most of the observed period and according to Jeong et al (2010) it benefited from the German adjustment period in the 90's. But, as the graph illustrates, the French euro is now more overvalued than the German euro.

It is noticeable that many of the currencies were undervalued (or less overvalued) in the beginning of the 21'st century. This is also observed in both Coudert et al's (2012) and Jeong et al's (2010) studies, although less obvious in the later. During this period the euro was at a record low level against both the US dollar and the Japanese yen. The reason can be found in the lower global growth during this period, and in years of turmoil money are often being relocated to a few safe havens around the world. Since then the euro appreciated significantly for several years which explains the general overvaluation among the majority of the studied currencies.

As the graphs shows there was a fast decline in overvaluation during the 80's and 90's until the countries were relatively balanced against each other when the euro was implemented in 1999. This is explained by the constant devaluations that were made during this period (Courdet et al, 2012), especially in the south, in order for the countries to reach a common economic level before 1999. According to Beeby et al (2002) the devaluations in the early 90's were also a result of the ERM-crisis (European Exchange Rate Mechanism) which forced Italy and Spain to devaluate. This is observable in the graphs as the overvaluation dropped significantly during this period and the Italian currency even reached a level of undervaluation for a couple of years. This drop is also noted in previous studies. However, this situation did not last very long as the overvaluation increased again. According to Jeong et al (2010) this is explained by the lower productivity and reflects the unequal competitive situation within the entire Eurozone.

By looking at the graphs it is possible to observe the devaluations during the 80's and early 90's, and it is also possible to conclude that the development towards an economic stable Eurozone and a common exchange rate by the devaluations was successful. But, since then the countries have not managed to stay in balance as economic factors have developed differently. For example, until the middle of the 90's the southern countries had a productivity growth that was comparable with the north even if it was slower. Since the end of the 90's the growth has completely stagnated while the growth in the north, including Ireland, has continued with the same pace as before. This has increased the unbalance significantly and made it hard for the south to compete with the north. During the same period the inflation has been at a higher level in the south compared to the north.

As the unbalances no longer can be adjusted by devaluations (or revaluation) and the north still show a significantly higher productivity the increasing overvaluations in many countries the last decade is not surprising. Therefore it is easier to notice the difference between the south and the north in the second half of the period than in the first half, when it still was possible to adjust the currency by devaluation.

Further comparison with previous studies shows a similar pattern as the results from the model in this paper. Greece, Portugal, Spain and Italy are among the countries with the most overvalued currencies while Germany is among the countries with the most undervalued currencies. The country with the most differing results is Finland. As the graph illustrates the Finish euro is one of the most overvalued among the northern countries, while previous

studies shows that it is one of the most undervalued currencies in the Eurozone. As completely different models are used, differing estimates are not surprising. The model used in this paper is based on the PPP model and therefore the price variable is of significant importance, and compared with its northern neighbors Finland has the highest inflation growth since the 80's. Furthermore, the productivity is the second lowest in northern Europe after Austria, in terms of labor productivity per hour.

The level of deviation from the market exchange rate is in general smaller in this model than in previous studies. The order and distribution of the countries are, however, similar which confirms the economic unbalances within the Eurozone. Coudert et al (2012) and Jeong et al's (2010) studies use different models, BEER and FEER respectively, but in both models the current account has a significant impact. Since the early 90's the current account differences among the euro countries have increased, the southern countries have large deficits while many northern countries have surplus, especially Germany. This is reflected in the large deviations from the market exchange rate. The balance of trade in this papers model is concerning this effect as well but to a much smaller degree than the models in previous studies. This further explains the different results of the Finish euro, as Finland has one of the Eurozone's strongest current accounts.

Lastly, Coudert et al (2012) argues that the currency misalignment in general has increased since the euro was implemented in 1999. This is not illustrated in the graphs above, except for Greece and Portugal. However, Coudert et al's study started in 1988 which should be noted. Together with Ireland, Greece and Portugal had the largest misalignment after 1999 compared with the previous period in Coudert et al's study. It is argued that this is an indication of that the debt crisis in these countries was mainly created by the lack of competitiveness after the euro was implemented rather than a result of a bank crisis or deteriorated public finances. By comparing the ten years before and after the euro was implemented it is possible to agree that the misalignment has not decreased after 1999.

5. Conclusion

The current euro crisis has highlighted the economic unbalances in productivity, trade and public finances among the counties within the Eurozone. Since the crisis started the countries have often been divided into two groups: the stronger north and the weaker south. A debate about the exchange rate has taken place as the southern countries are falling behind in terms

of economic growth, public finances and unemployment. The question whether the exchange rate was incorrectly valued in some part of Europe was the purpose for this paper.

An exchange rate model, including several economic variables based on relevant economic theory, was estimated in order to calculate an equilibrium exchange rate that could be compared with the market exchange rate. The data was estimated in a panel cointegration model and based on an extended PPP model including interest rate, government debt, productivity, terms of trade and trade balance. This created a model that could observe the exchange rates movements in both the short and the long run. The result corresponded in general with previous studies and was highly expected. The southern countries weaker productivity and higher inflation is reflected in their overvalued currencies while northern countries such as Germany and Netherlands equilibrium exchange rates are more in line with the actual market exchange rate. The results also illustrates that the equilibrium exchange rate deviation between the south and the north has increased lately which further points out the difficult situation for the south as the euro is making it very hard for them to compete at an international level.

For further studies it would have been interesting to use other exchange rate models and compare the results, but also to use other fundamental economic variables. The use of fundamental variables in exchange rate models has been questioned as the qualities of the results are varying. However, as more data is becoming available the research should proceed.

The results of this paper clearly points out the core of the problems within the Eurozone and the currency in itself. Without a great economic change in the southern countries the unbalance will continue to grow with even more overvalued currencies as there is no adjustment tool such as devaluation in a monetary union.

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