2000

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A PERSPECTIVE ON REAL EXCHANGE RATE DETERMINATION IN ITALY DURING THE CONVERGENCE PROCESS TOWARDS THE EMU: THE "TRADED NON-TRADED" MODEL

di Roberta De Santis[*]

1. **Introduction**

This paper attempts to provide a perspective on real exchange rate determination in Italy during the convergence process towards the EMU. It focuses on some structural determinants of real exchange rates such as the behaviour of traded non traded prices, Government expenditure and interest rates differentials.

Though inflation rates in EMS countries have significantly converged over the past decade, exchange-rate adjusted price levels have sharply diverged and continue to do so, albeit at a decreasing rate. This violation of purchasing power parity (PPP) may be viewed as a stylised fact in international finance.

The failure of PPP to hold continuously is well documented empirically. However, there is growing evidence that it does hold as a long run phenomenon. A broad body of evidence suggests that real exchange rate is not a random walk, and that shocks to real exchange rate damp out over time albeit very slowly.

Consensus estimates and studies of purchasing power parity, surveyed in Froot and Rogoff (1995), put the half-life of deviations from PPP at about four years for exchange rates among major industrialised countries. Recent attempts to formulate and test the structural models of deviations from PPP, [Asea and Mendoza (1994), Marston (1987), De Gregorio, Giovannini and Wolf (1994)] stress the different behaviour across countries of the prices of manufactured goods relative to that of service. In fact, several recent studies [for example Engel (1996)] that employ unbundled data, have investigated the extent to which departures from PPP are caused mainly by the presence of non traded goods versus deviations from the law of one price in traded goods.

In particular in the EMS area, a sizeable fraction of changes in Intra-European real exchange rates may have been driven by changes in domestic relative prices between traded and non traded goods, rather than

[*] This paper is the revised version of the one presented at the Kiel Institute of World Economics "1998 ASP conference", May 10-15, 1998.

by changes in the prices of tradable goods across countries[1]. In fact a marked divergence in inflation rates between the tradables and non tradables sectors has been a feature of some EC economies, especially those of Italy, Spain and UK, since the early 1980s. Sectoral productivity differences, international competitive pressure and Government demand for non tradables are possible reasons.

This paper investigates whether, the traded non traded model can be used to provide a measure of the deviation from equilibrium of the Italian Lira ECU real exchange rate.

The paper is organised as follows: section 2 reviews the relevant literature on exchange rates and sketches the model and section 3 presents the data set. Section 4 examines the empirical results of the cointegration analysis. Concluding remarks are offered in section 5.

2. **Review of the literature and model**

There is a large literature concerning real exchange rates. This includes studies on purchasing power parity (PPP) surveyed in Froot Rogoff (1995). The main purpose of this literature is to explain nominal exchange rate determination across countries. There is also a large literature attempting to formulate and test structural models of deviation from PPP, for example Asea and Mendoza (1994), Marston (1987), De Gregorio, Giovannini and Wolf (1994).

Among the most famous models that attempt to explain deviations from PPP in terms of fundamental factors (for example productivity, government spending and strategic pricing decisions by firms), there are those based on the distinction between traded and non traded goods[2].

This kind of models[3] originates from the seminal papers of Balassa (1964) and Samuelson (1964)[4] and Baumol-Bowen (1966)[5].

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[1] In a world with traded and non traded goods and services, demand and supply for tradables are brought into equilibrium on a worldwide basis while demand and supply for non tradables are equated in each country domestic market.

[2]In this paper we will use as synonymous terms traded and exposed to international competition on one side, and on the other side non traded, sheltered and service intensive.

[3]The limitation of this kind of model is that it accounts only for the supply side of the economy: since the demand side is not explicitly taken into consideration, this means we are assuming an "accomodating" demand. However, in a fixed exchange rate regime, the traditional adjustment mechanism can operate through the external channel of creation of monetary base.

[4]The author argue that technological change has been traditionally higher in the traded goods sector and this productivity bias is more pronounced in high-income countries.

[5]Baumol-Bowen (BB) note that there is a tendency for the prices of service intensive goods to rise over time. It is important to stress the fact that the presence of a BB effect does not imply the existence of a Balassa-Samuelson effect.

The traded - non traded model is a Ricardian neoclassical[6] type of model of a country that produces two goods. The first is a traded[7] good, the demand of which is perfectly elastic, while the second is a domestic good, the demand of which is inelastic.

Assume the price level can be expressed as a geometric average of the traded and non traded goods in price indices, where all variables are expressed in logs (eq.1):

$$p^t = \Omega p_t^N + (1-\Omega)\, p_t^T$$

Then defining the real exchange rate as the aggregate price index deflated exchange rate yields the following expression, assuming purchasing power parity (PPP) holds for tradable goods (eq. 2).
where *s* is the nominal exchange rate, and an asterisk denotes the foreign country.

$$q_t \equiv (s_t + p_t^* - p_t) = \Omega(s_t + p_t^{N*} - p_t^N)$$

Equation (2) states that the real exchange rate is a function of the relative price of non traded. This point has been incorporated in various models of the nominal exchange rate where the long run real exchange rate is allowed to vary over time.

Following Warner (1997), the basic idea of this paper is that the crucial equilibrium relationship concerns the ratio of non traded goods prices to traded goods prices within a country.

The model in this paper yields is a reduced-form where in equilibrium, the relative price of non traded goods is a function of exogeneous variables.

We may assume two basic hypothesis.

The first is the existence of an equilibrium relationship as:

$$p^N / e * p^T = g(Z)$$

[6] For the sake of simplicity we will not explicitly take into account the role of technology.

[7] *Sectors exposed to international competition:* manufacturing; mining and quarrying; chemicals and pharmaceuticals; fabricated metal products, machinery and equipment; electrical, data processing and electronical machinery; food, beverages and tobacco; textile, wearing apparel and leather industries; wood and wood products; paper and paper products; other manufacturing industries.
Sheltered sectors: electricity, gas and water; construction; wholesale and retail trade; transport, storage and communication; other services; producers of government services.

where the *T* and *N* superscripts denote traded and non traded variables[8], *e* is the nominal exchange rate, and *Z* is a vector of exogeneous variables.

To provide a contrast, the analogous equilibrium condition in the purchasing power parity approach would be $P=eP^*$, where *P* and *P** are domestic and foreign price indexes. We may also write the PPP equation as $P/eP^*=K$ (constant), to emphasise the fact that the price ratio is assumed to be constant in equilibrium, rather than depend on variables in *Z*.

The second hypothesis is quite standard. Either *e* or p^N, or both can change to establish equilibrium, on the contrary p^T can not change to restore equilibrium because is exogeneously determined by international competition. With flexible exchange rates *e* can jump quickly to restore equilibrium. But when *e* is fixed[9], p^N must adjust and does so with a finite adjustment speed, so that the observed value of p^N/e can deviate from equilibrium for a while. Therefore under fixed exchange rates it is possible to think of the shadow or equilibrium exchange rate as being potentially different from the actual observed exchange rate.

Purpose of the paper that p^N/e and the variables in *Z* are cointegrated which would support the idea that they are linked by a long run equilibrium. In particular become crucial the choice of the variables in Z.

We assume that the variables in *Z* the ratio of nominal expenditure by the Government to nominal GDP and the difference Italian Government bond yield long term minus Germany government and public authorities weighted average bond yield life over 3 years.

The ratio of nominal expenditure by the Government to nominal GDP is included in the model because the retreat of the public sector that can be seen in the budget cutting of the Government is one of the main feature of the Italian lira convergence process towards the euro.

It has to be underlined the fact that the public sector has higher propensity to spend on non traded goods. Government expenditure is assumed to fall entirely on non traded goods. Public budget cutting causes a net reduction in demand for non traded goods which reduces both output and prices of non traded goods. The effect of convergence process, in the framework of the traded non traded model, is to depreciate the equilibrium real exchange rate.

The difference between Italian government bond yield long term and German government and public authorities weighted average bond yield life over 3 years is included. There is in fact evidence [Mac Donald (1997),

[8] Traded prices are measured in foreign currency.

[9] In Italy during the period 1980 1998, the convergence period towards EMU, it is possible to assume nominal exchange rate pegged.

Mac Donald, Nagayasu (1999)] of long run relationship between real exchange rate and interest rate differential (RERI model).

3. **Data**

The source of the data is O.E.C.D., *Main Economic Indicators* and *Quarterly National Accounts* and International Monetary Fund, *International Financial Statistics*, taken from Datastream. The periodicity of the data is quarterly and the period under investigation is 1980Q1-1998Q2[10].

The variables used in the model are defined as follows:

$p^N - e$ = (*lrealecu*) proxy for ratio of prices of non traded goods to price of traded goods in logs. p^N is the log of prices of non traded goods; *e* is the nominal effective exchange rate Italian lira/ECU. The producer price index (PPI) of textile sector (traded) and transport sector (non traded)) is the price measure to calculate inflation.

g =(*lgov/gdp*) log of the ratio of nominal expenditure by the Italian Public sector, including public enterprises, to nominal GDP.

$i - i^*$ = (*ldiffl*) Italian government bond yield long term minus German government and public authorities weighted average bond yield life over 3 years.

4. **Testing for cointegration using Johansen approach: the long run relations**

The first step of the analysis is the test for the order of integration of the single series. We analyse the order of integration using a standard unit root test, namely the Augmented Dickey Fueller test (ADF). The ADF statistics are calculated with a constant plus a time trend.

Using the strategy suggested by Hendry and Doornik (1994, pg.94), we have selected the highest lag with a significant coefficient γ_S (following γ_S the conventional t-distribution) and then checked if the series, according to ADF test statistic, was stationary.

Table 1 reports a summary of the results of the Augmented Dickey Fueller.

The performed ADF test shows that the series are integrated of order one, I(1) then first differencing to avoid the problem of spurious correlation is indeed the correct procedure.

This suggests to build our model with these variables: real exchange rate Italian lira ECU, Italian government bond yield long term[11] minus

[10] Datastream forecast
[11] (9-10 year treasury bonds).

German government and public authorities weighted average bond yield life over 3 years, and the ratio of nominal expenditure by the Italian Public sector, including public enterprises, to nominal GDP.

Table 1

variable[12]	lag	ADF*
De	5	-3.753
Dp^N	5	-4.708
Di	2	-3.868
Di*	2	-3.967
Dlog GDP	2	-3.475
Dlog Gov exp	2	-3.851

*Critical values: 5%=-3.474, 1%-4.093; constant and trend are included

To show that there is evidence for cointegration between the three variables considered in the non traded model (p^N*-e, g, i-i*)* table 2 presents the results of both max and trace Johansen cointegration test.

Table 2*

H_0:rank=p	-Tlog(1-μ)		using T-nm		95%	-Talg(1-μ)		usingT-nm		95%
p=0	38.42	**	35.26	**	22.0	72.94	**	66.95	**	34.9
p<=1	28.35	**	26.02	**	15.7	34.52	**	31.69	**	20.0
p<=2	6.172		5.665		9.2	6.172		5.665		9.2

* the null hypothesis is of non- stationarity

The results show evidence, at five percent level, of two cointegrating vector[13]. It has to be underlined that cointegration is a rather strong result that other exchange rate models often do not satisfy. A finding of cointegration provides statistical support to claims that the variables in the model determine long run equilibria.

[12] *Note*: The letter D before a variable denote the first difference.

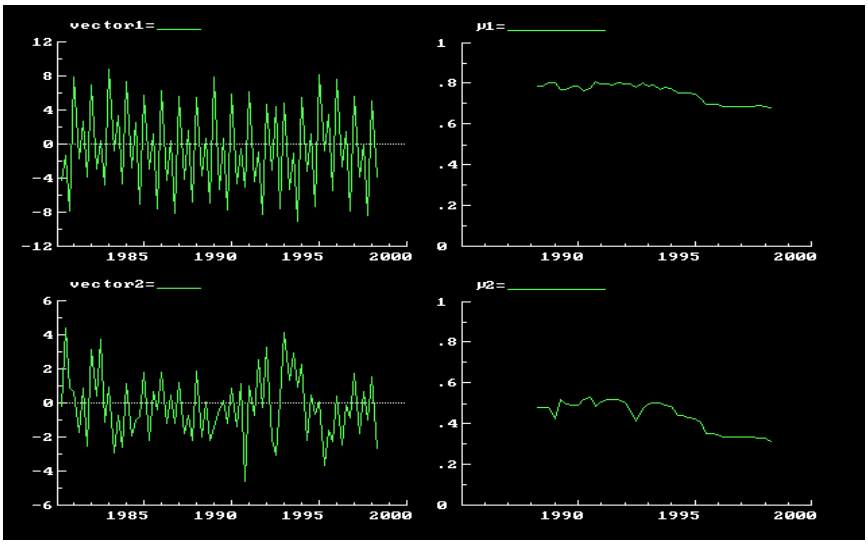
[13] The identification procedure will be object of further investigation on the present subject. In this paper it is considered sufficient to test the existence of a cointegration relationship among the variables of the model. Moreover the Johansen procedure yields implicitly a normalization which imposes that the cointegration relationships have the orthogonality condition. Phillips P.C.B., "Optimal Inference in Cointegrated System" in Econometrica, 59, pap 283-306.

This result is partially confirmed by the graph of the cointegrating vectors which are quite stationary and by the graph of the values of the recursive eigenvalues that are relatively constant.

For what concerns single equation Chow tests, the following graph shows that they all have the desired statistical properties (only the exchange rate equation has a slight volatility). Chow test for the system as a whole seems to confirm that constancy is not rejected. Thus, our model seems to be consistent with the data.

Finally, the normality properties of the single equations do not create any problem reinforcing the idea of a well specified model.

Fig. 1 - Time series of cointegration vectors and recursive eigenvalues

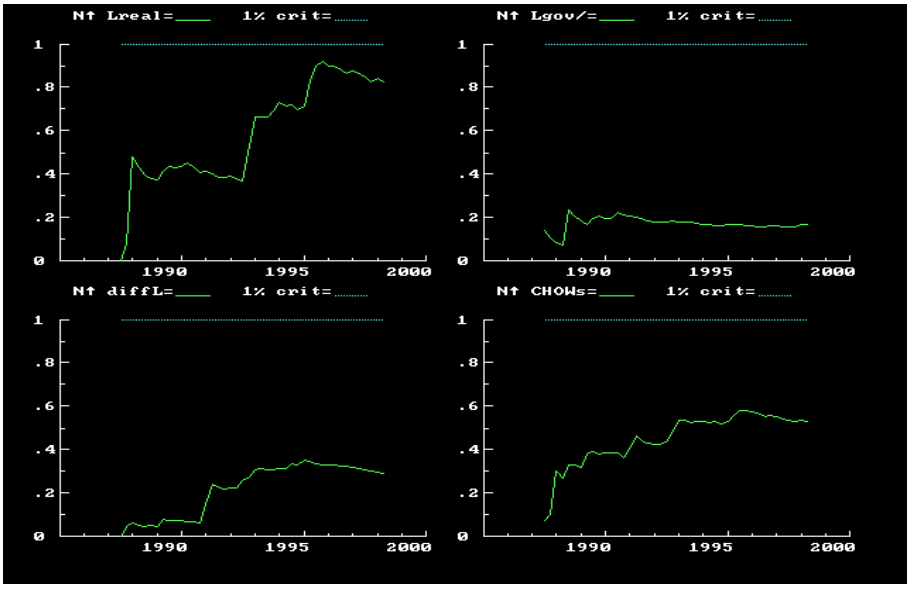


With the evidence that the variables are cointegrated, the next step, after having identified the estimated long run parameters is to derive a time series that represents the long run equilibrium exchange rate according to the non traded-model. This “shadow” equilibrium exchange rate can then be compared with the actual real exchange rate to draw conclusion about Italian exchange rate overvaluation (undervaluation) in the period of the convergence process towards the EMU (fig.4).

The evidence of exchange rate misalignment is summarised by the data in figure 4. The solid line is the log of the actual real exchange rate series. The dotted line represents the simulated equilibrium exchange rate built on the basis of the non traded model.

The model shows real exchange rate misalignments over the sample period before all the major "realignments" (1987[14], 1992[15], 1995). The graph shows 1987 misalignment as well as the significant overvaluation of the real exchange rate of the late 80ies and early 90ies when compared to its equilibrium model. Finally, we can notice the depreciation of the 1995 real exchange rate, mainly due to a "credibility effect". The perspective of a major stability and the expectation of a return of Italian Lira into the EMS as well as deflationary pressures due to weak internal demand have led the exchange rate to revert quickly to its long-run level.

Fig. 2 - Recursive estimate statistic



According to 1998 data, there appears to be a slight amount of misalignment showing under-valuation of Italian exchange rate versus ECU shortly before the decision of the irrevocably fix exchange rate with respect to the euro.

[14] 8 of January 1987, Italian lira devaluation of 3.4%.

[15] In September 1992 Italy and United Kingdom abandoned the Exchange Rate Mechanism and this was followed by the devaluation of the Spanish peseta later in September , of the peseta and the Portoguese escudo in November, of the Irish pound in January 1993, and the peseta and the escudo again in May 1993.

Fig. 3 - Residual histogram and density

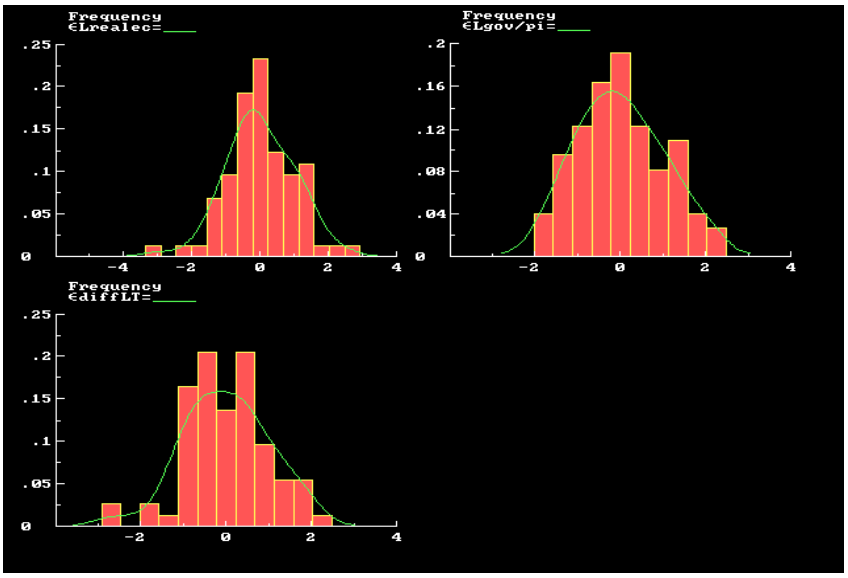
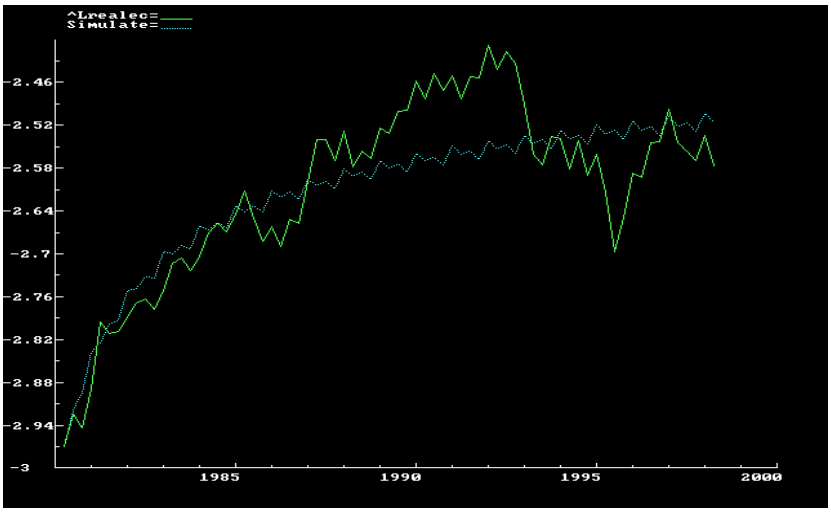


Fig. 4



4. **Conclusions**

In this research the author attempts to provide a perspective on real exchange rate development following the inception of the EMS by focusing on some structural determinants of real exchange rate (i.e. the behaviour of tradables and non tradables prices).

The basic assumption of this paper is that deviation from PPP in Italy is due to the behaviour of non tradables prices influenced by changes in public expenditure and in long term interest rate differentials.

Following Warner (1997), the author estimates and tests the non traded model for Italy in the sample period from 1980 to1998 using Johansen cointegration technique. The model offers a reasonably successful empirical account and provides a way to define and measure disequilibrium in real exchange rate Italian lira ECU.

To summarise, the main evidence in favour of the traded non traded model to explain deviation from PPP in Italy, is the following. Consistently with the model non traded presented in this paper, it is possible to find the existence of cointegration between the real exchange rate, public expenditure and interest rate differentials.

The comparison between the “shadow”, equilibrium real exchange rate, implied by the cointegration relation, and the effective one is striking. Before any major realignment episodes, the misalignment was significant but there was always a reversal towards the shadow real exchange rate.

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