

ESTUDIOS SOBRE LA ECONOMIA ESPAÑOLA

Testing Uncovered Interest Rate Parity: The Spanish case

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EEE 128

April 2002



<http://www.fedea.es/hojas/publicado.html>

Testing Uncovered Interest Rate Parity: The Spanish case^{*}

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^{*} The author is very grateful to Professor R. Baillie for comments and suggestions.

1. INTRODUCTION

“The one person in your family who ever asks you advice about economics is your uncle, who is in the import-export business. A while back he called you about a foreign exchange issue. ‘Let’s suppose I owe a million German marks, payable in one month.’ He said. ‘We have the money to pay in dollars, so the issue is whether to put the money into marks now or later. I figure we should put the money wherever it would earn the highest interest rate, but my treasurer, one of those MBA hot shots, tells me that this is irrelevant because if the interest is high in Germany that means that the market is expected to go down. When I ask her what we should do, she says that it does not matter. Flip a coin, she says! Is this what I am paying her so much money for? To flip coins?’” (Froot and Thaler, 1990, p.179).

One of the most active markets among all the financial markets is the foreign exchange market. The foreign exchange trading is so much greater than trading in real goods and services, what could seem to be a highly liquid and efficient market. As a result of this volume of trading, many researchers have focused on the foreign exchange market to examine different questions. Among them, it is possible to find an extensive literature about Uncovered Interest Rate Parity, starting from analysing the relationship between forward and spot exchange rates, testing the UIP condition, establishing the “anomaly”, and trying to find an explanation.

UIP is the condition that relates domestic and foreign interest rate and the current and expected future exchange rate. It means:

$(1 - i_t) = (1 - i_t^*) E_t (S_{t+1} / S_t)$; where S_t is the spot exchange rate domestic currency/foreign currency at time t and i_t and i_t^* , domestic and foreign interest rates.

Taking logarithms on both sides of the UIP equation, applying Taylor series in $\ln(1 + i_t)$ and allowing inflation economy that situate the interest rate between 0 and 0.5, the UIP condition can be expressed as $i_t - i_t^* = E_t \Delta S_{t+1}$. This expression leads to the statement that the country with the higher rate of interest is expected to have the currency depreciation.

The interest in the UIP test comes from the fact that many macroeconomic models are constructed under the assumption that UIP condition holds. Therefore, if UIP does not hold, the assumptions made in these models become doubtful and also the models themselves.

Since 1979, the UIP literature has been focused in different aspects. First of all, and trying to forecast the expected rate of appreciation/depreciation, the UIP literature focused in the relationship between forward and spot exchange rates. Forward prices are usually presented as the best-unbiased forecast of future spot prices. In the exchange rates literature, it is possible to find very many empirical works on forward exchange rates as predictor of future spot rates. Under the assumptions of rational expectations, risk neutrality, free capital mobility and no taxes on capital transfers, the relationship between forward and spot rates is expressed as forward rates being an unbiased predictor of future exchange rates. This was the approach of Frenkel (1979) who established a simple test and the base of more sophisticated tests that used different estimation methods as IV, and system of SURE. However, the accumulated evidence was that unbiasedness hypothesis could not be rejected. Those tests can be also interpreted as cointegration test between spot and forward rates. All the studies found overwhelming evidence that spot and forward rates are cointegrated with a cointegration factor approximately unity. Therefore, the forward premium should be stationary.

Another derivation of the relationship between spot and forward rates, which is also related with the unbiasedness hypothesis, is that expected future real returns from going either short or long in the forward market have to be on average zero. The idea can be expressed from the Euler equation as: $E_t[(S_{t+1}-F_t)/P_{t+1}]=0$; what is also saying that going either short or long in the forward market has to be a fair game.

Second of all, the literature has been centred on the UIP test. The statistical features of the spot and forward rates have led to the conclusion that both spot and forward rates are well approximated as martingales, so that Δs_t is white noise. Hence, the appropriated UIP regression seems to be: $\Delta s_{t+1}=\beta(f_{t,1}-s_t)+\varepsilon_{t+1}$. Bilson (1981) and Fama (1984) tested UIP based on that expression. The widespread empirical finding is that the returns on most freely floating nominal exchange rates up until early

1990's appear to be negatively correlated with the lagged forward premium, or that the estimated slope coefficients are found to be negative. This is known as forward premium anomaly. Froot and Thaler (1990) have noted that the mean value of the estimated slope in seventy-five published studies is -0.88 .

Finally, numerous interpretations and explanations of the anomaly have been proposed. Among them, the idea of forward premium as a biased predictor of the future spot rate and/or evidence of time varying risk premium. Lewis (1988), Kaminsky (1993) and Evans and Lewis (1995) explain the anomaly from "peso problem", i.e, from the problem of sample statistics that are not representative of the population. Frankel and Froot (1987), Lewis (1989) and Elliott and Ito (1995) argue for the importance of learning and heterogeneous beliefs. Meese and Singleton (1983) and Baillie and Bollerslev (1989) found strong evidence for unit root in the log of spot and forward rates. They also observed that forward premium generally presents very persistent, slowly decaying autocorrelation that has persuaded some authors that forward premium may contain some non-stationary component. This contradicts the previous statement of forward premium as stationary process that arises from the cointegration results. Finally, Baillie and Bollerslev (2000) see the anomaly as an econometric problem that comes from the specification of the regression. Between these problems they point to the very persistent autocorrelation in the forward premium and peso problems.

While these models have been centred on exchange rates of different currencies against US dollar, they have not analysed the exchange rate peseta/dollar. Therefore, the aim of this work is to review the conventional literature of UIP condition for the exchange rate peseta/dollar from 1979 to 1989. We will follow the traditional test for the exchange rate peseta/dollar, in order to know more about the Spanish case from a UIP point of view and see if there is something to add different from what is already known for other currencies. The research will focus in three aspects. First, we will analyse the statistical features of the series in order to present the right regression and estimation method. Second, we will test the UIP condition and analyse the consequences of its results. Third, by following the literature, we will try to find and explanations to the results. For that, we will replace the Spanish data in models developed by Fama, Bilson and Engel, which

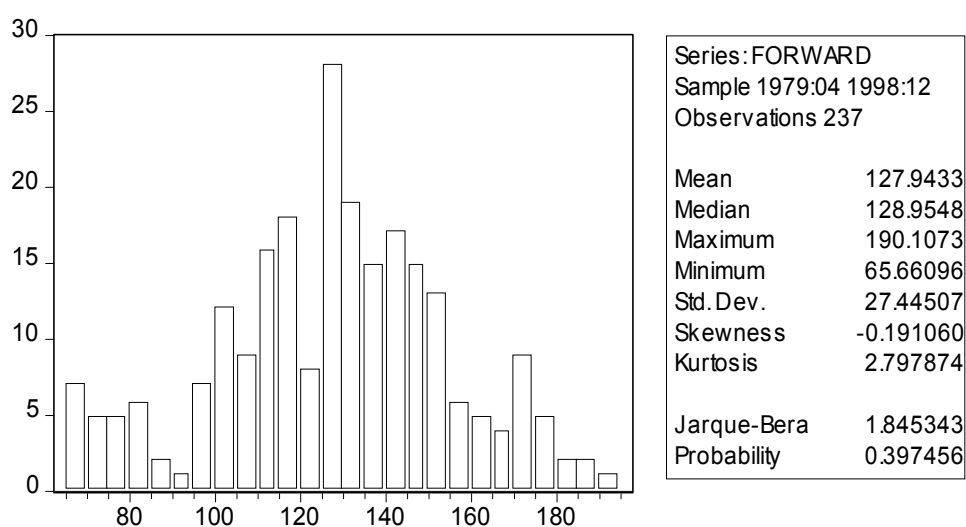
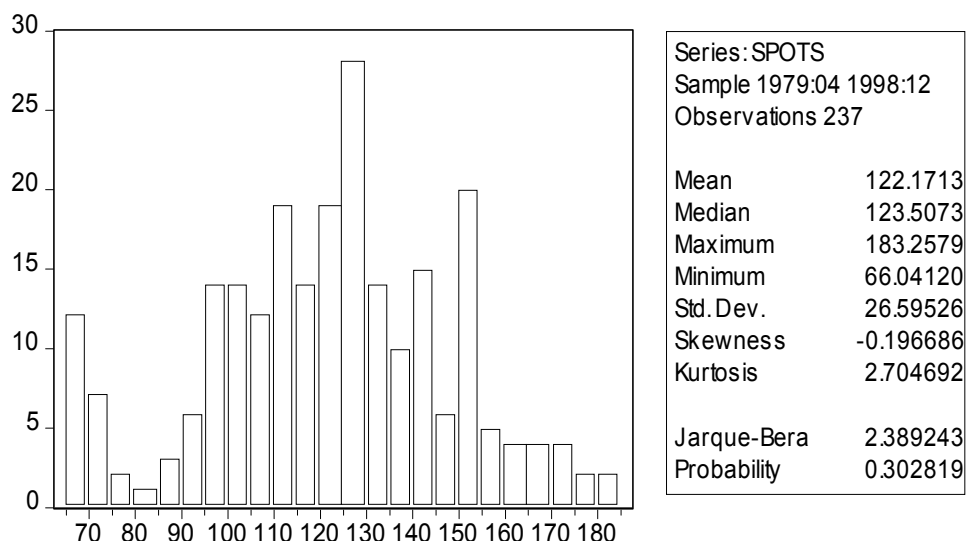
point out the efficiency of the exchange rate market, and/or the biasedness/unbiasedness of the forward rate. Other explanations, like time varying risk premium and expectation problems, will be just commented. Statistical errors explanation will be also analysed for Spanish data. Finally, we will divide the sample in different periods according to the Spanish monetary policy and exchange rate events, in order to infer some conclusion exclusively from the Spanish reality.

To attend these issues, the paper is organised in the following sections. Section 2 presents the statistical features of the series. In section 3, we estimate the UIP condition and explain the main results. In section 4, we try to find an explanation to the results of the tests, and finally, section 5 presents the main conclusions.

2. DATA AND SUMMARY STATISTIC

The data used in this study are monthly observations on spot and forward exchange rates of the peseta against the US dollar. One data per month of the spot exchange rate as the overage of 30 days and also of forward premium (as the percentage of deviation of forward exchange rate (30 days) over monthly spot rates), were taken from the database of the Bank of Spain. With these two series it was possible to calculate the 30 days forward premium and the rest of the series for the regressions, having one data per month in each series. The sample has a size of 237 monthly observations, from April of 1979 to December of 1998, the last month in which the peseta plays, officially, its own role against dollar.

The statistical features of the spots and forward exchange rate series and also the logarithms for the exchange peseta/dollar, are very similar to the traditional statistical features observed in the case of other currencies, what is accepted as stylised facts for spot and forward exchange rates. The following histograms and tables show some of these features observed for the Spanish case:



As it can be observed, the kurtosis coefficient is just slightly smaller than 3 for the spot rate and forward rate. On the other hand, the Jarque-Bera test is rejecting the null hypothesis of normal distribution as the process that generates the series. Therefore, the series behave as expected from previous studies. Both unit root tests, Augmented Dickey-Fuller and Phillips-Perron for the variables in levels, cannot reject the presence of unit roots or in other words, recognise that the process generating the series is a $I(1)$ process or non-stationary. These are some results:

Phillips-Perron Unit Root test: series spots exchange rate peseta/dollar

PP Test -1.960012 1% Critical Value -3.4595
Stat

5% Critical Value -2.8739

10% Critical Value -2.5733

Phillip-Perron Unit Root test: series forward exchange rate peseta/dollar

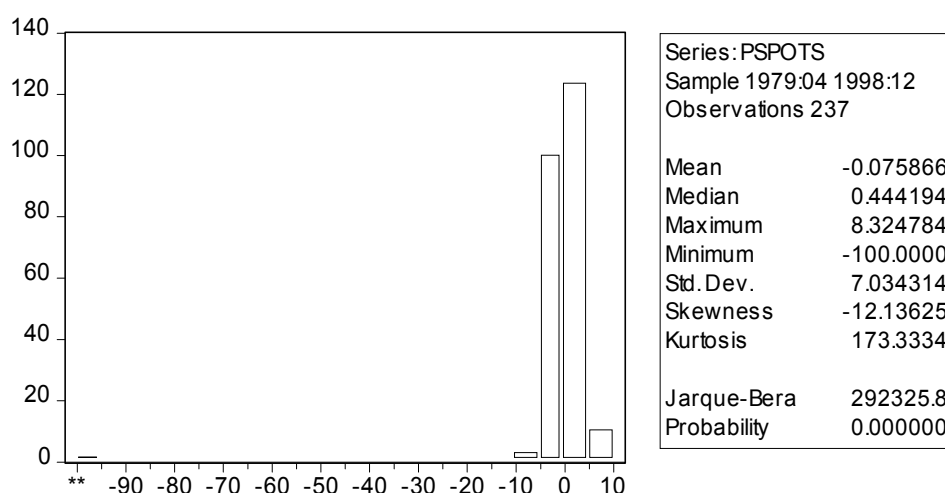
PP Test -2.100214 1% Critical Value -3.4595
Stat

5% Critical Value -2.8739

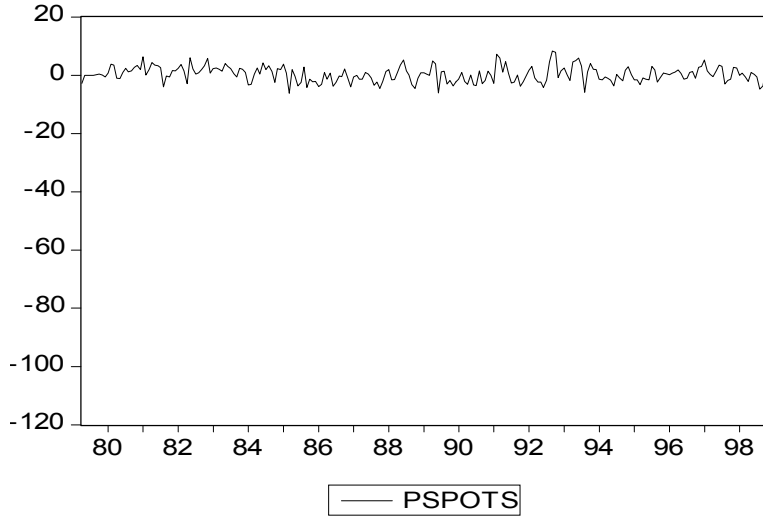
10% Critical Value -2.5733

This means that the process in first differences should be a stationary or $I(0)$, what is know as another stylised facts in the exchange rate literature.

For the case of the logarithms of the forward and spot exchange rates, the statistic features of the series are almost the same than the characteristics commented for the previous series. The exception is a kurtosis coefficient slightly greater than 3 for the log of the spot exchange rate and for the log of forward. The exchange rate literature has accepted the spot and forward exchange rates processes as well-approximated martingales process, and that seems to be the case for the exchange rate peseta/dollar.



The following histogram, table and graph (under the name of “pspots”) show some of the statistical features of the series $100\left(\frac{S_{t+1} - S_t}{S_t}\right)$. The series presents excess kurtosis what means presence of more extreme values than in the normal distribution, and also nonnormality. The graph illustrates the behaviour of the series.



3. THE REGRESSION

In order to test Uncovered Interest Rate Parity for the Spanish data, OLS estimation is applied to two different possible regressions that are equivalents in their meanings:

The first regression is:

$$100 \left(\frac{S_{t+1} - S_t}{S_t} \right) = \alpha + \beta \left(\frac{F_t - S_t}{S_t} \right) + \epsilon_{t+1} \quad (1);$$

where S_{t+1} and S_t are the levels of the exchange rate peseta against dollar at time $t+1$ and t ; F_t is the 30 days forward rate; and ϵ_{t+1} is the disturbance at $t+1$. As it was said in the previous section, the data are monthly data with a gap of 30 days between t and $t+1$.

The second regression is expressing the same condition with the variables taken in logarithms:

$$s_{t+1} - s_t = \alpha + \beta (f_t - s_t) + \epsilon_{t+1} \quad (2);$$

where $s_t = \ln S_t$, $s_{t+1} = \ln S_{t+1}$, $f_t = \ln F_t$, and ϵ_{t+1} the disturbance at $t+1$.

By taking logs, it is possible to avoid what is known as Siegel's paradox. The paradox states that the choice of numeraire currency matters, given that $F_t = E_t S_{t+1}$ is not the same as $1/F_t = E_t (1/S_{t+1})$. Also, as it is well-known, it is possible to calculate the rate of change of any variable by taking the difference of the logs in different points of time.

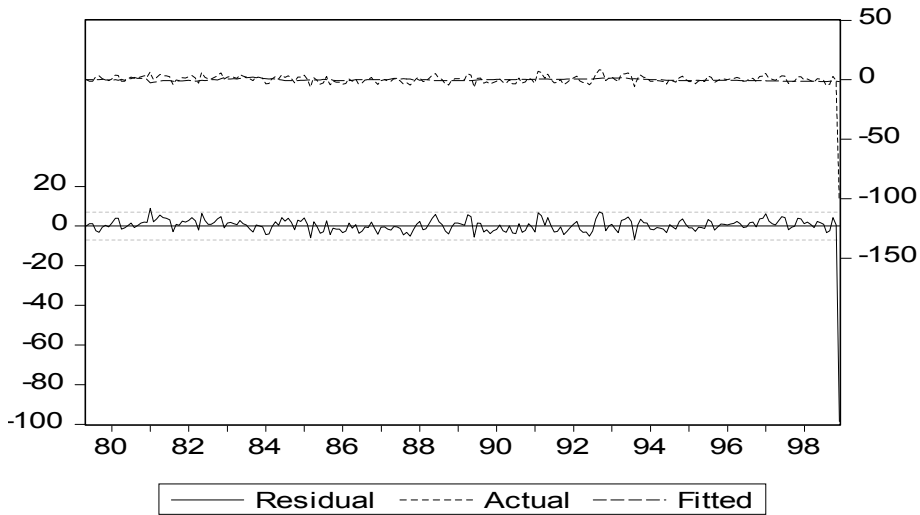
OLS will be the method to estimate the values of α and β . The results of the estimation of the parameters will not be very different between both regressions. The choice of the OLS as the right estimation method comes from the fact that:

1. Working under the assumption of market participants operating under rational expectations hypothesis and risk neutrality, it should be expected a conditional expectation of the disturbance equal to zero. In other words: $E_t(\epsilon_{t+1})=0$. This expectation is conditional to all the available information up to time t . The assumption implies that the forward rate will be an unbiased predictor of the future spot rate. But rationality also means the best possible prediction by the agents given the available information, what in econometric terms implies serially uncorrelation between the innovations.
2. Working with a forecast horizon that is equal to the sampling interval, we should expect serially uncorrelated forecast errors (See Baillie, R.T. and T. Bollerslev(1989)).
3. Very many studies (See Baillie and Bollerslev (1990), Boothe and Glassman, (1987), Domowitz and Hakkio (1985) and Hodrick (1989)) have ended up with the same conclusion about the monthly data: the possible ARCH effects with monthly observations decline, and there is a tendency to normality when the observation period become bigger. Boothe and Glassman (1987) have concluded with the observation of only minimal ARCH effects and almost normality with monthly spot exchange rate. However, we will analyse the ARCH model of Engle (1982) in section 4, in order to find some opportunity of profits in the exchange market peseta/dollar during the observed period.
4. Also, researchers of the topic have accepted that by using monthly data, the conditional heteroskedasticity or time dependence between the conditional covariance of the fundamental variables and the exchange rate is very often of a small magnitude.

For these reasons, we can accept Ordinary Least Square estimation as a suitable for consistent estimation.

Once the right method of estimation has been identified, it is possible to present the results of the estimated regression that, in some way, will follow the results obtained by the literature for other currencies. The test of UIP analysed in this work is the traditional joint test $\alpha=0$, $\beta=1$ and ϵ_{t+1} serially uncorrelated. For the case of regression (1), the values obtained by OLS are: $\alpha=-1.179$, $\beta=0.227$, Std.error (α)= 0.73, Std.error (β)= 0.116, $R^2=0.016$, adjusted $R^2=0.011$ and rejection of no serial correlation of the innovations, as null hypothesis by Breusch-Godfrey serial Correlation LM test. With these values we can write the first regression as:

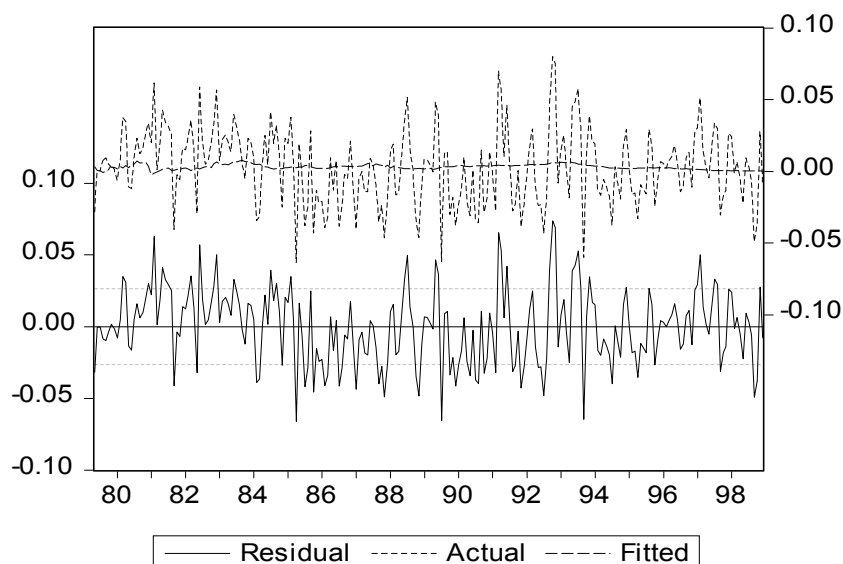
$$100\left(\frac{S_{t+1}-S_t}{S_t}\right) = -1.179 + 0.227\left(\frac{F_t - S_t}{S_t}\right)100 + \epsilon_{t+1}, \quad \text{and see graphically the significance of the regression:}$$



The low value of the determination coefficient indicates that the right-hand side of the equation explains very little of the left-hand side. In other words, the forward premium or discount premium explains very little of the rate of appreciation/depreciation of the spot exchange rate.

The joint null hypothesis of the coefficient equal to zero and slope equal to one is tested following the Wald test method (that is asymptotically equivalent to the likelihood ratio test). The test rejects the null hypothesis with a probability of acceptance of 0.0000. These are the results of the test in terms of F-statistic and Chi-Square:

F-statistic	81.61783	Probability	0.000000
Chi-square	163.2357	Probability	0.000000



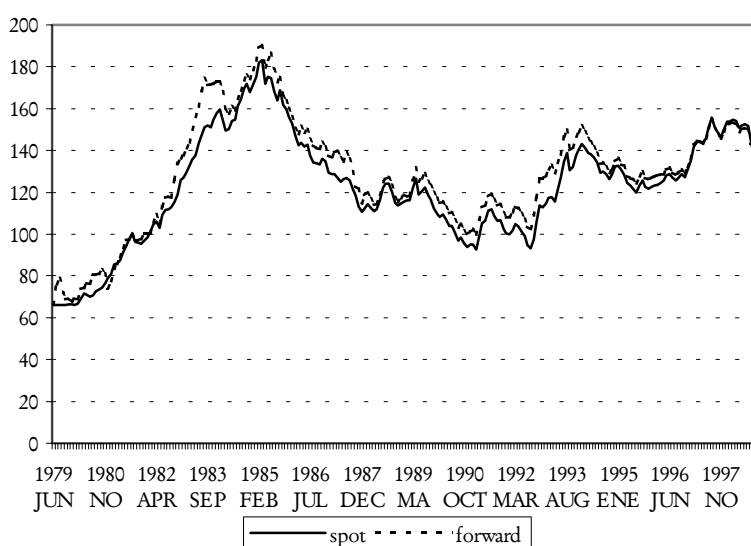
The results for the regression equation (2) are: $\alpha=0.0008$, $\beta=0.0488$, $\text{Std.error}(\alpha)=0.0027$, $\text{Std.error}(\beta)=0.0462$, $R^2=0.0047$, adjusted $R^2=0.0005$ and rejection of no serial correlation for innovations by Breusch-Godfrey test. The Wald test for the same null hypothesis gives a F-statistic equal to 542.3140 and Probability of 0.000000 and Chi-square with a value of 1084.628 and probability of 0.000000. We can also observe the graph with the residual, actual and fitted values:

The rejection of the null hypothesis is not a strange result if we follow the test of Uncovered Interest Parity for other currencies against dollar. There are some different interpretations of these results such as forward rate as a biased predictor of the future spot rate, the existence of a time varying risk premium, peso problem, statistical problem, and the expectation errors. But the most serious problem appears when the efficiency of the exchange rate market is doubtful. All these explanations will be review in section 4.

These theories try to explain what is known in the literature as the “forward premium anomaly” that refers to the empirical finding of negative slope coefficients for the regression equations until early 1990’s. The interpretation of the negative

coefficient is the negative correlation between the lagged forward premium or forward discount and the returns of nominal exchange rates in most of freely floating exchange rate systems. According to the results for the Spanish case, the importance of the empirical finding does not rest on the negative value of the beta coefficient, but on a value of beta no significantly different from zero.

Finally, there is another implication that is worth mentioning: the meaning of the results in terms of cointegration. As it was explained in the summary statistic, the spot and forward series, and also their logarithms are $I(1)$. This means that both right hand side and left hand side of the regressions (1) and (2) should be a $I(0)$ or stationary processes. The requirement of $I(0)$ in both sides of the regressions is restricting the relationship between spot and forward rates. One of the restrictions is that spots and forward rates should be cointegrated. To test cointegration, it is possible to use the traditional tests of Unbiasedness Hypothesis that have been interpreted as cointegration test between spot and forward rates. Frankel (1979) presented the original test and estimated the regression: $s_{t+1} = \alpha + \beta f_{t,1} + \epsilon_{t+1}$. A beta coefficient equal to one would lead to the conclusion that spot and forward rates are cointegrated one by one, while a value for beta coefficient no significantly different from zero would makes it difficult to believe in some kind of long-run relationship between the variables. The following graph illustrates the relationship for the Spanish case.



The estimation of β for the Spanish case by OLS method gives a value equal to 0.985982, suggesting that forward premium is stationary (issue developed in section 4.1). Through the literature, it is possible to find other interesting and more sophisticated cointegration tests for the case of switches of the exchange rate processes of appreciation and depreciation (See Evans M. D.D. and Karen K. Lewis (1995)).

4. LOOKING FOR AN EXPLANATION

In this section, we review the main explanations about the “forward premium anomaly” by following the R.J. Hodrick’s survey, *The empirical Evidence on the efficiency of the forward and futures foreign exchange markets* (1987). Some of the models (like the explanations presented by Fama, Bilson, Engel and Baillie and Bollerslev), are studied for the exchange market peseta/dollar by replacing the original data for our data, while other models are just commented. More recent explanations are included and also a review of the Spanish situation is presented in section 4.2.

4.1. THE LITERATURE

The interpretations of the anomaly can be summarised in rejection of the unbiasedness hypothesis, presence of risk premium, peso problem and/or expectational errors and statistical problems.

- Rejection of the unbiasedness hypothesis.

We will discuss three models in this subsection: First, Fama Decomposition model (1984); second, Bilson’s Speculative Efficiency Hypothesis (1981); and finally, Engel’s Analysis of Unbiasedness in real terms (1984).

FAMA’S DECOMPOSITION:

Under the assumption of market efficiency and rational expectations, Fama proposes a simple model in which the forward exchange rate can be explained as the sum of two variables: expected future spot rate and risk premium. His analysis considers two different but complementary regressions, using nonoverlapping monthly data. Taking the variables in logarithms, Fama regresses $f_t - s_{t+1}$ and $s_{t+1} - s_t$ on $f_t - s_t$,

$$f_{t-s_{t+1}} = \alpha + \beta(f_{t-s_t}) + \epsilon_{t+1} \quad (3);$$

$$s_{t+1}-s_t = \alpha + \beta(f_{t-s_t}) + \epsilon_{t+1} \quad (4);$$

A coefficient beta reliably different from zero in the equation (3) means that the premium component of f_{t-s_t} has variations that affect reliably in $f_{t-s_{t+1}}$, given that $f_{t-s_{t+1}} = p_t + E_t(s_{t+1}-s_t)$, with the last term of the right hand side as the random error of the rational forecast, and p as the risk premium observed at t .

A coefficient reliably different from zero in the equation (4) means that the current forward-spot differential has power to be able to predict future returns of the exchange rate. In other words, if beta is different from zero in (4), it is correct to conclude that the forward rate observed at t has information about the spot rate to be observed at $t+1$.

In the Spanish case, we obtained (by OLS) a beta equal to 0.9512 in equation (3), significantly close to one. According to Fama, this indicates that the equation can be written as; $f_t - s_{t+1} = (f_t - s_t) - (s_{t+1} - s_t)$, as long as $\Delta s_{t+1} = \epsilon_{t+1}$ is white noise, $\beta = 1$ and $\alpha = 0$. For the equation (4), the value of beta is 0.048 or significantly different from one and close to zero, what means that forward-spot differential has no explanatory power predicting the future rate of returns in the spot rates.

Other interesting finding in the Spanish case is the null covariation between the current forward-spot differential and the future rate of appreciation/depreciation of the spots rate peseta/dollar, or $\text{cov}(s_{t+1}-s_t, f_t-s_t) = 0$.

This result is important since Fama also interprets β , in the second regression,

$$\text{as } \beta = \frac{\text{cov}(s_{t+1} - s_t, f_t - s_t)}{\sigma^2(f_t - s_t)}.$$

Therefore, the value of beta for the Spanish case

will be zero. It has been widely recognised that deviation of β from 1 could be due to a time varying premium in the forward rate.

The results obtained with the original Fama's data end up with a negative beta coefficient in the last regression, what he interprets as a negative covariance between the expected rate of depreciation and the risk premium.

Fama believes that his results can be explained by inefficient foreign exchange market, government intervention in the spot exchange market, and stochastic

deviations from purchasing power parity. To explain the negative covariation, Fama suggests the construction of a model from the Lucas' model (1982). His main conclusion is the statement that any forward rate can be interpreted as the sum of the premium and expected future exchange rate, what is known as the Fama's Decomposition. Trying to find a consistency between the negative covariation and the theory from the Fama's results, the Uncovered Interest Rate Parity literature presents models such as Hodrick and Srivastava's model (1984), that analyses whether the negative covariation is reliable outcome of the Lucas model mentioned before. Hodrick and Srivastava assume stationarity and ergodicity as statistical time series properties of the data. They state that the variability of the risk premium is big enough to make the forward premium predict the expected rate of exchange rate in the wrong direction.

ENGEL'S ANALYSIS OF UNBIASEDNESS IN REAL TERMS:

To test the existence/absence of expected real profits from forward market speculation, Engel develops his model under the additional and new assumption of no monetary illusion on the representative agents operating in the market. The empirical results fail to find evidence of unexploited real profits opportunities, even though UIP does not hold under the traditional test. The non-expected profits condition, expressed in domestic currency, is $F_t = E_t S_{t+1}$. From this condition, Engel derives the variable " e_{t+1} " that is defined as:

$e_{t+1} = (F_t/P_{t+1}) - (S_{t+1}/P_{t+1})$, where F and S are the forward and spot rates expressed in two different periods (t , $t+1$), and P is the monthly CPI denominated in the domestic currency. The requirement, in order to state that real anticipated profits (obtained by forward market speculation) disappear, is $E_t e_{t+1} = 0$.

By contrast, the most frequent test is $E_t u_{t+1} = 0$ with $u_{t+1} = \log F_t - \log S_{t+1}$, that assumes monetary illusion by the agents.

Both " e " and " u " variables can be interpreted as the forecast errors in real terms and nominal terms respectively. Engel regresses (by OLS method) each of these variables on a constant and on four of their own lags. The null hypothesis of no expected profits comes from the joint test of the constant term and all coefficients equal to zero for both regressions (e , u). The chi-square statistics for

the joint hypothesis fail to reject the null hypothesis of no expected profits for both regressions.

However, the results obtained for the exchange rate peseta/dollar are different. Using as a deflator the monthly general CPI for Spain, the results show the rejection of the null hypothesis of no expected profits. The estimated values for “e” regression in Spanish case are:

$$\alpha=0.0135, \beta(e_{t-1})=0.7252, \beta(e_{t-2})=-0.1398, \beta(e_{t-3})=0.2057, \beta(e_{t-4})=0.0162$$

Wald test for the null hypothesis of coefficients equal to zero:

$$F\text{-statistic}=147.1019 \quad \text{Probability}=0.000000$$

$$\text{Chi-square}=735.5096 \quad \text{Probab.}=0.000000$$

The estimated values for “u” regression in the Spanish case are:

$$\alpha=0.0093, \beta(u_{t-1})=0.7095, \beta(u_{t-2})=-0.1754, \beta(u_{t-3})=0.2283, \beta(u_{t-4})=0.0145$$

Wald test for the null hypothesis of coefficients equal to zero:

$$F\text{-statistic}=149.3208 \quad \text{Probability}=0.000000$$

$$\text{Chi-square}=746.6040 \quad \text{Probab.}=0.000000$$

According to our empirical results and following the Engel’s interpretation, it was possible to find opportunities for expected profit from forward market speculation in the exchange market peseta/dollar between 1979 and 1998.

BILSON’S SPECULATIVE EFFICIENCY HYPOTHESIS:

Bilson is considered the Fama’s precursor. His model is basically an investigation of the unbiasedness hypothesis. He goes one step further than other studies of unbiasedness as he analyses whether the risk and return trade-offs between risk and return on a trading strategy (implied by the estimated parameters) and the rejection of the unbiasedness hypothesis, is consistent with the trade-offs in other asset markets.

There is another novel aspect: the idea of Speculative Efficiency that appears as a way of considering the unbiasedness hypothesis independently of its implications for rational expectation or market efficiency, on which are based the most frequently studies. To explain the rejection of Speculative Efficiency, Bilson develops a very interesting analysis based on the possibility that a small number of extreme observations are dominating the results, given the high skewness in the distribution of the forward premium. To see if the results can

be attributed to the effect of these extreme observations, he divides the observation in two groups (the small group that gathers observations with extreme values, and the big group that contains the rest of the observations). With this analysis he partially rehabilitates the hypothesis of speculative efficiency, showing a destabilizing speculation that occurs in time of extreme stress in which the forward rate is not any more an unbiased forecast for the future spot exchange rate. This is the case when a risk averse speculator could be justified in intervening in the market.

The test of speculative efficiency hypothesis presented by Bilson, is rewritten for expositional purpose as: $\Delta s_t - x_{t-1} = \alpha + \beta x_{t-1} + \epsilon_t$, where Δs_t is the actual rate of depreciation, x_{t-1} is the forward premium ($f_{t-1} - s_{t-1}$), and ϵ_t is an error term that can be serially correlated. The null hypothesis consists in the joint hypothesis of both coefficients equals to zero. We should expect a value for beta equal to the value obtained in the Fama's regression (3), but with opposite sign since the Bilson's regression one period forward can be written as $s_{t+1} - f_t = \alpha + \beta(f_t - s_t) + \epsilon_{t+1}$, which is, basically, the first Fama's regression. The regression has been recalculated for the case of Spanish data and the estimated values of alpha and beta are, 0.0008 and -0.9512 respectively, as expected. Wald test method rejects the null hypothesis with probabilities of 0.000000 for both F-statistic and Chi-square. Under the Bilson's interpretation, we can say that there were predictable profits to be made from foreign exchange speculation in the Spanish case.

In order to go a step further and see the existence or non-existence of excess profits from foreign exchange speculation, Bilson calculates the "profit/risk ratio" that appears to be too large to be accounted for in terms of risk aversion, and precludes the possible explanation in terms of transaction cost, theories with a risk premium as a function of the level of the forward premium on a currency, and the monetary policies effects in terms of inflation and interest rate.

Finally, the literature presents the trading strategies known as filter rules. They are based on the past history of changes in the exchange rates and have been developed by Alexander (1961), Dooley and Shafer (1976) and Sweeney (1986). The design of the filter rules methodology takes place in order to analyse the overshooting reaction as a result of what is known as “the jump on the bandwagon” after a shift in prices by some of the market participants. The idea of the overshooting starts with a definition of a market with participants that are thought or known to have more accurate information. Then, after buys or sells, they generate changes in prices. The rest of the participants jump on the bandwagon overshooting the new equilibrium price level.

Econometric Models of Risk Premiums:

Following Hodrick (1989) and Baillie’s notes for UIP (1999), the econometric models of risk premiums can be summarised in two different groups: Models with no market fundamentals and models with market fundamentals.

MODELS WITH NO MARKET FUNDAMENTALS:

This group can be defined as the models that develop test of asset pricing models by utilising the measured returns on assets. They ignore other data, traditionally used as fundamentals in an economic perspective. This section reviews some of the test of asset pricing models:

1. The pioneer empirical approach comes from Roll and Solnik (1977). The analysis was built on the theoretical work of Solnik (1973), who develops one of the first models of international asset pricing. The weakness of their analysis is that the estimation techniques applied in these models seem just to tell us that there is a correlation in unanticipated changes in exchange rate measured in a common currency. Because of its poor results, this analysis was not discussed further and it is introduced in this work just as an approach to this area.
2. Robichek and Eaker's model (1978) is another of the early empirical studies of the risk premium in the foreign exchange market. They employed static asset-pricing model, or what is known as Static CAMP, to price the foreign exchange risk. The rational expectation assumption is given empirical content to the static CAMP model. Its basic requirement is that the expected value of a future cash flow has to be discounted by one plus an appropriate risk adjusted

rate of return. The work concludes with the need of having in the structural equations a larger number of variables that specify different characteristic of countries, which lead to different risk premiums. These variables are market fundamentals. Therefore, asset returns are not enough to model the risk premium in a consistent way.

3. The next remarkable contributions come from Hansen and Hodrick (1983) and Hodrick and Srivastava (1984). Hansen and Hodrick examine the implications for the representation of the expected normalized profit in a long position in the forward market, when a stand of the measurement of the appropriate benchmark portfolio is not taken or is taken as a constant. Their estimation proceed under the rational expectation assumption and, since the expected excess returns on the benchmark portfolio (denoted by X_t) are not observable, they consider the best linear prediction of X_t on a subset of information available at time t . The choice of the explanatory variables for X_t is the set of past forecast errors. The strategies for estimation in their model go from maximum likelihood to GMM estimation. Using a sample period with 512 monthly observations beginning on 5 of February of 1976 and ending on 29 of December of 1980, they present a result that concludes with the idea of a significant rejection unbiasedness hypothesis and substantial evidence against the hypothesis of no risk premium and constant risk premium. Hodrick and Srivastava's model follows the performance of Hensen and Hodrick after including 21 additional monthly observations and the forward current premiums as instrumental variables. These changes lead to the conclusion that if the unbiasedness hypothesis is associated with a time varying risk premium, either the assumption of constant measurement of the benchmark portfolio is too strong, or some other models of risk and return have to be developed in order to describe the forward market.

4. The next alternative model of risk premium comes from Domowitz and Hakkio (1985). The novel aspect of their analysis is the use of the ARCH framework to model the risk premium, without any alternative data other than exchange rates. The conditional variance of the foreign exchange forecast error becomes an important sole determinant of the risk premium. The weakness of

the Domowitz and Hakkio's model comes with the conclusion that, even though their results are consistent with the rejection of the unbiasedness hypothesis, there is a little support for the conditional variance.

5. The last approach in developing a model of the risk premium by using asset returns is the Korajczyk's study (1985). His empirical model relates the risk premium in the forward exchange market to the deviation between the expected real interest rates of two countries. Imposing the assumption of serially uncorrelation innovations, he examines three alternative ways in generating distribution in order to conduct the tests: the asymptotic distribution from 3SLS, a bootstrap distribution and Monte Carlo simulation. One of his findings after a complicated and difficultly understandable analysis is that the highly significant correlation of the forward rate forecast error seems to be the result of a time variation in the expected real interest rate differentials. Up to this moment, none of these studies have given a satisfactory and consistent explanation of the anomaly.

MODELS WITH MARKET'S FUNDAMENTALS:

In this subsection, the models incorporate some other variables different from just exchange rates and asset returns in order to explain the risk premium. Among them, it is possible to find models based on a mean variance optimisation, models that incorporate stochastic inflation rates, consumption data, money supply, etc.

It is also possible to make a differentiation between those models that treat the risk premium as a constant, and others with time varying risk premiums.

1. Constant risk premium: Here we can find the analysis of Frankel (1982), Frankel and Engel (1984), Lewis (1986), Mark (1985).

The representation of the risk premium that Frankel investigates is; $E_t(\Delta S_{t+1}) + (i_t - i_t^s) = \rho \Omega (X_t - \alpha)$; where X_t is the optimal portfolio shares, Ω is the conditional covariance matrix of the relative rates of currency depreciation, α is a constant and ρ is the coefficient of relative risk aversion.

His estimation proceeds under the assumption of rational expectations. The empirical results of his specification are not supportive of the model.

Frenkel and Engel define the real rate of return on the nominal asset of a currency and relax the assumption of the rate of inflation as predetermined variable. They define the variable z_{t+1} as: $z_{t+1} = (r_{t+1} - r_{t+1}^s)$ or the vector of real returns. Hence, under the assumption of rational expectations, the estimating system is written as: $z_{t+1} = \alpha + \rho\Omega x_t + \epsilon_t$, where ρ is the coefficient of relative risk aversion and $\Omega = E(\epsilon_{t+1}\epsilon_t')$. Their findings constitute a clear rejection of the model. They recognize that the assumptions are making the model too restrictive to explain the data. It is also difficult to know which of the assumptions is the most troublesome.

Other studies have modelled the risk premium as a constant term incorporating other variables such as consumption and utility functions. But their conclusions are difficult to be sustained as possible explanations of the Forward Premium Anomaly.

2. Other parametric formulations of risk premium are:

- Domowitz and Hakkio (1985): $\rho_t = -(1/2)[Var_t m_{t+1} - Var_t m_{t+1}^*]$ with m_{t+1} and m_{t+1}^* as the domestic and foreign money supply respectively at time $t+1$.
- Hodrick and Srivastava (1986):

$$\rho_t = [m_{t+1}^* - E_t m_{t+1}^*] - [m_{t+1} - E_t m_{t+1}] + (1/2)[Var_t m_{t+1} + Var_t m_{t+1}^*] + \ln[1 - \exp(Var_t m_{t+1})]$$
- Hodrick (1989):

$$\rho_t = -\alpha_1 Var_t y_{t+1} + \alpha_2 Var_t y_{t+1}^* - \alpha_3 Var_t m_{t+1} + \alpha_3 Var_t m_{t+1}^* + g$$

Where y and y^* represent the domestic and foreign output respectively and g is a government expenditures' function.
- Engel (1996):

$$\rho_t = -\alpha_1 \lambda Cov_t(m_{t+1} - m_{t+1}^*, y_{t+1}) - (1 - \alpha) \gamma Cov_t(m_{t+1} - m_{t+1}^*, y_{t+1}^*)$$

where γ is the coefficient of relative risk aversion and α is the share of consumption spent in domestic goods.
- Baillie and Osterberg (1997):

$$\rho_t = -\alpha_1 Var_t y_{t+1} + \alpha_2 Var_t y_{t+1}^* - \alpha_3 Var_t m_{t+1} + \alpha_4 Var_t m_{t+1}^* + g_t + \alpha_5 \psi_t + \alpha_6 \psi_t'';$$

where ψ, ψ'' are the share of domestic and foreign money stock held with the purpose of intervention.

- Measurement errors, the peso problem and/or the expectation errors:

Other important explanation of the forward premium anomaly is the expectation errors:

Hansen and Hodrick (1980) conclude with the idea that other explanations different from the risk premium have to be found. They propose the measurement error due to the large sample approximations used to compute probabilities. These probabilities are associated with their test statistic, although it is not explicit the knowledge of how large the sample size has to be before the approximations become good. This is a very usual problem that plagues much of the time series analysis, and that has been used as a possible explanation for the biasedness in the forward discount and the interest differential. Another possibility comes from the necessity of specifying what the economic agents know about stochastic properties under policy decisions. Hence, the explanation of the anomaly could be the combination of incorrect assumptions made by the agents in determining the asymptotic covariance matrix of their estimations, plus a small sample size relative to the movements in government policy variables, plus inappropriateness of an ergodicity assumption. As a consequence, the agents can assign positive probabilities to events that may ultimate never occur. The latter explanation is known as expectation errors.

The second paper to mention is the Jeffrey A. Frankel and Kenneth A. Froot's paper (1987). In this study, different expectation assumptions are presented and included in the decomposition of forward premium. The paper begins with the statement that the general interpretation of the risk premium for the gap between forward discount and expected depreciation is wrong. They develop a model of investors expectations that try to see whether those expectations are unbiased forecast for the spot exchange rate process. The decomposition of forward discount is: $f_t - s_t = \Delta s_{t+1}^e + p_t$, where the last term of the right hand side is the risk

premium and the first term is the expected depreciation for the spot exchange rate. They analyze different expectation processes like static and extrapolative expectations, distributed lags expectations, adaptative expectations, and regressive. But all of them have a common factor. They are homogeneous expectations. The main conclusions of the paper are: exchange rate expectations are neither static nor extrapolative; expectations are less elastic than it is rational; the rejection of rationality depends on the sample period; and finally, maybe the best explanation comes from the assumption of heterogeneous expectations instead homogeneous.

Karen K. Lewis (1987) presents the peso problem as explanation of the anomaly from the effects of the policy process. She defines peso problem as the “belief of the market that a discrete event may occur”, such as foreign exchange market intervention, when the event does not materialize for some time. Even under the assumption of rational expectations, the agents require repeated observations to be able to learn about the reality. Then, it is the learning period the phenomena typically associated with the peso problem persistence. This is the theory defended by Lewis that provides an example of how a policy process switch may cause persistence in empirical phenomena, in contrast with the view that the peso problem disappears almost instantaneously after the discrete policy change.

Graciela Kaminsky and Rodrigo Peruga (1990) start reviewing the risk premium explanation and continue with their own interpretation by using the intertemporal asset-pricing model developed by Lucas (1982), where the risk premium is due to consumption risk. To estimate the conditional covariance matrix, the model uses the GARCH-I-mean model developed by Engel (1982). Their estimates provide enough evidence of a non-zero risk premium, but reject the restrictions imposed by the Intertemporal Asset Pricing Model. They argue a possible explanation of such result based on the peso problem. The risk associated to a possible change in the exchange rate regime, will also influence the risk premium.

Silbert (1989) finds the explanation in the misspecification errors because of the omission of the variance of spots returns and the covariance between spot rates and prices in the regression equation.

However, none of these explanations have been fully satisfactory.

- Possibility of Statistical problems:

The last explanation considered in this work is presented by Baillie and Bollerslev (2000). They explain the forward premium anomaly from a stochastic point of view. The possible reason of the anomaly is an econometric problem that arises from the specification of the regression. Specifically, it is the very persistent autocorrelation in the forward premium the main statistical problem. The model presented by Baillie and Bollerslev is designed to hold the known stylized facts about the time series properties of forward and spot exchange rate and it is calibrated to a monthly observation frequency for the forward premium but daily frequency for the spot rate. Under these conditions, the model imposes UIP and allows the daily spot rate to have very persistent volatility with periods of relative tranquility and turbulence or, in other words, ARCH effects. To provide a good representation of the daily DM-\$ spot exchange rate conditional variance process, they choose the Fractional Integrated GARCH model that they previously argued in 1996. The advantages of FIGARCH model comes from the slow hyperbolic rate of decay for the lagged square innovations and persistent impulse response weights that the process implies.

Hence, the model generates an unusual and complicated non-linear process for the monthly forward premium with long memory characteristics in which it is not clear how this dependence will affect the value of the estimated beta coefficient in the traditional anomalous regression as equation (1) or (2) presented in the section 3.

One of the evidences obtained by the Baillie and Bollerslev is the fact that with shorter samples, the anomalous regressions generate estimated slope coefficient that are very widely dispersed, even positive, and significantly greater than one for some of the 5 periods in which they divide the sample. The main conclusion is that there are two statistical facts that give an anomalous result in the UIP regressions and test. These two facts are: small sample size and persistent autocorrelation in the forward premium. This is the reason why Baillie and Bollerslev cannot see convincing statistical evidence to reject the unbiasedness hypothesis. After this results, they answer the time varying risk premium theory with the statement that if a time varying risk premium exists, it is extremely small at the monthly level.

The corelogram for the discount premium for the Spanish case including 12 lags shows the persistent autocorrelation of the series or the possible presence of nonstationarity;

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. *****	. *****	1	0.859	0.859	177.00	0.000
. *****	* .	2	0.705	-0.125	296.68	0.000
. *****	. *	3	0.622	0.186	390.20	0.000
. *****	. .	4	0.569	0.037	468.99	0.000
. *****	* .	5	0.497	-0.067	529.41	0.000
. *****	. *	6	0.469	0.179	583.32	0.000
. ****	* .	7	0.432	-0.098	629.34	0.000
. ****	. .	8	0.386	0.021	666.20	0.000
. ****	. .	9	0.343	0.004	695.46	0.000
. ***	. .	10	0.326	0.038	722.03	0.000
. ***	. .	11	0.297	-0.026	744.17	0.000
. ***	. .	12	0.255	-0.048	760.56	0.000

where AC indicates autocorrelations and PAC partial autocorrelations. Hence, the autocorrelation are also very persistent in the Spanish case. Following their interpretation, it is possible to say that the widely accepted unbiasedness regression does not seem to provide as much evidence as was thought concerning the possible bias of the forward rate.

THE SPANISH SITUATION

In order to find more information about UIP condition for the exchange rate peseta/dollar, we examine the exchange rate evolution and monetary policy in Spain from 1979 to 1998. That will be the objective of this section for what a briefly explanation of the Spanish situation will be presented.

THE ANTECEDENTS:

The modern monetary policy gave its first steps in Spain around 1973. From the end of the civil Spanish war up to 1958, the country did not have any institutional base capable to control the money. Spain did not belong to the fix exchange rate system and the country was living the autarky years in which the basic monetary equilibriums were not very important. This period end up in 1959 with what is known the “Stabilization Plan”, that implied a stronger financial discipline but did not bring any consistent monetary policy. Between 1959 and 1973, the money

creation process was submitted to the general develop policy but did not play its own role in the economy. In the sixties, the Government's targets were to achieve the right interest rate and volumes of credit rather than smooth and stable management of monetary policy. In the early seventies, Spain received the effects of the inflation rates arising from the first petrol crisis and exchange rate turbulences as a result of three effects: dollar depreciation, DM appreciation and strong capital movements. The volume of foreign exchange reserves in Spain rose from 1,792 millions of dollars in December of 1970 to 6,780 millions in December of 1973. During those years, money supply increased in a 28 per cent and the interior prices in a 14 per cent.

The problems in the Spanish economy demanded a solution for what monetary policy seemed to be the best instrument. The next step was the design of this active monetary control and its mechanism. That took place in 1974, 1975, and 1976, coinciding with the political transition in Spain from the dictatorship regime to democracy. Under this environment, the Government had to define the monetary policy objectives, the economy Minister had to control the financial institutions and finally, the Bank of Spain had to choose the way of executing the government's decisions.

THE PERIODS:

Hence, the sample period chose for this work (1979-1998) can be divided in three different subperiods according with the Spanish events that took place (See Aríztegui J. (1993)):

1. (1979-1982) The first period corresponds with what is called "the maturity of the monetary policy". Restrictive monetary policy from 1977 and new income policy adopted by the new "democratic" government reduced the inflationary pressures. The period closed with lower inflation rate plus the depreciation of peseta. These years coincided with the second petrol crisis and after the failure of the Keynesian policies, monetary control became, again, the right adjustment tool.
2. (1983-1988) The second period is called "the new adjustment period". Since December of 1982 the peseta starts to depreciate, while other European currencies remained more stable. The period presents another interesting

characteristic: the innovation process in the financial Spanish market. New financial instruments and products start to plague the market. Monetary policy became more restrictive than in previous periods and income policy even more adjusted, what allowed reducing the inflation rate and balancing the exterior deficit. In 1985 Spanish's economy began a new expansive cycle that coincides with its entrance in the European Economic Community. The cycle lasted 6 years. In June of 1986 the peseta incorporate in the exchange mechanism of the European Monetary System.

3. (1989-1998) The third period is called "Monetary Policy in the EMS". Against the stability that one may think for taking part in the European project, Spain lived a years of economic instability. First of all, because belonging to the EMS was a hard challenge in order to hold the exchange rate agreement, and second because neither the interior markets, nor the prices of the resources, nor revenue policy, nor public expenditures adjusted to the new discipline environment. Once again, monetary policy appears as the best policy adopting restrictive objectives to offset the strong inflationist pressure and to ensure the performance of the currency between the fluctuations bands. From 1988 to 1992, monetary policy has to deal with high interest rates as the combination of expansive fiscal policy and restrictive monetary policy, what is a dangerous cocktail in the long-run term. High interest rate led to strong appreciation of the currency situating it in the upper band of the system. The situation was solved by government intervention in the exchange rate market and important accumulation of foreign exchange reserves. During 1992-1993, all European economies fell into crisis. . However, it is well known that all the currencies belonging to the European exchange rates system enjoyed neither the same stability nor the same credibility. The Spanish peseta showed a different behavior depending on the band width that it was subject to. From June of 1989 to July of 1993, it was subject to the narrow band of 6% (See Campos M. I. And Jiménez-Ridruejo Z. (2000)). The Spanish currency started the period overvalued, followed by a phase of turbulence in 1992/1993, where it suffered three devaluations. The end of the crisis also meant the end of the explosive combination of restrictive monetary policy and expansive fiscal policy for

Spain. After that, the Spanish economy focused in the European integration programmes that went from: independence of the Bank of Spain in 1994 to submission to the direction of European System of Central Banks. From 1993 to 1998, the currency enjoyed the wide band, showing a relative trend to depreciation that accentuated in 1995, when it was realigned. From 1996, its evolution was more stable with a deviation from central parity close to zero.

The analysis of the Spanish history and the finding of different periods because of different characteristic or events, suggest the possibility of dividing the sample and repeat the regression for each one. The first idea to develop in this dissertation was to make the regression for the three periods that have been explained before. The results in terms of equation (1) can be summarised in table 1:

<u>First period: April of 1979 to November 1982, 43 observations</u>	<u>Second period: December 1982 to June 1989, 78 observations</u>	<u>Third period: July 1989 to December 1998, 115 observations</u>
$\alpha = 1.594$	$\alpha = -0.2706$	$\alpha = -3.1094$
$\beta = -0.0139$	$\beta = 0.0539$	$\beta = 0.5217$
stad.error (α) = 0.4388	stad.error (α) = 0.5683	stad.error (α) = 1.4301
stad.error (β) = 0.0659	stad.error (β) = 0.0848	stad.error (β) = 0.2449
$R^2 = 0.0011$	$R^2 = 0.0052$	$R^2 = 0.0385$
adjusted $R^2 = -0.0232$	adjusted $R^2 = -0.0078$	adjusted $R^2 = 0.0300$
<u>Wald test, null hypothesis</u> <u>UIP;</u>	<u>Wald test, null hypothesis</u> <u>UIP;</u>	<u>Wald test, null hypothesis</u> <u>UIP;</u>
F-statistic 152.3971	F-statistic 258.5367	F-statistic 19.3841
Probability 0.000000	Probability 0.000000	Probability 0.000000
Chi-square 304.7943	Chi-square 517.0735	Chi-square 38.7682
Probability 0.000000	Probability 0.000000	Probability 0.000000

As it is possible to see, the behavior of the beta coefficient becomes better in the last subperiod, when the peseta belong to EMS, although it is not possible to accept the joint null hypothesis of UIP.

These results also suggest dividing the sample in just two periods given the slight difference between periods 1 and 2. Hence, the analysis is done for the period in which the peseta was not a member of EMS and the period as member of EMS.

The results are summarized in table 2:

First period: April of 1979 to June of 1989, 122 observations		Second period: July of 1989 to December of 1998	
$\alpha=0.5494$		$\alpha=-3.1094$	
$\beta=-0.0062$		$\beta=0.5217$	
stad.error (α)=0.3776		stad.error (α)=1.4301	
stad.error (β)=0.0567		stad.error (β)=0.2449	
$R^2=0.0001$		$R^2=0.0385$	
adjusted $R^2=-0.0082$		adjusted $R^2=0.0300$	
<u>Wald test, null hypothesis UIP;</u>		<u>Wald test, null hypothesis UIP;</u>	
F-statistic	360.4187	F-statistic	19.3841
Probability	0.000000	Probability	0.000000
Chi-square	720.8373	Chi-square	38.7682
Probability	0.000000	Probability	0.000000

Again, It is obvious that we cannot accept the joint null hypothesis of UIP in any case. However, there is a significant change in the value of beta coefficient between the first and the last period, what could suggest that the value of beta could be closer to one in case of having a larger sample.

Evan Tanner (1998) has analyzed the UIP for Spain and others industrialized and not industrialized countries for the period in which the currencies belong to the EMS. He tests the condition from a different point of view calculating the deviation of the UIP denoted by ω . His conclusions lead to an acceptance of the UIP since: The mean of the deviation is not statistically different from zero for any country and is stationary, assuming an autoregressive process for UIP deviations. With a sample of monthly data going from January of 1986 to April of 1997, he also concludes with the unanticipated changes on the real exchange rate growth as an

explanation for the deviation from UIP in industrialized countries. Our regressions (1) and (2) were estimated for the sample period 1986:01-1997:04 and our results lead to reject again the joint hypothesis of UIP ($\alpha = -0.6656$, $\beta = 0.1225$). Hence, what seems to be accepted by Tanner's methodology, it is rejected by the traditional UIP test.

5. CONCLUSION

The purpose of this study was to examine the Uncovered Interest Rate Parity condition for the exchange rate peseta/dollar from April of 1979 to December of 1998.

Following the literature, the research has been focused in three main aspects that lead to the three main conclusions of this analysis:

1. From the statistical properties of the spot and forward exchange rates series, it is possible to say that, also in this case, the series behave following the stylised facts that have been obtained through the exchange rates literature. It is correct to conclude that they are well approximated by a martingale process and the series present as non stationary process or I(1) process.
2. The traditional regressions of UIP showed have been tested by a well-justified OLS estimation method and lead to reject the joint null hypothesis of UIP by Wald test. However, the anomaly in the forward premium, traditionally described as the negative beta coefficient in the regression, presented for the case of Spain a beta coefficient significantly close to 0.
3. Next step was to find out an explanation to the anomalous results of the regression.

Fama's Decomposition said that the presence of risk premium is very strong for the Spanish case and that the forward premium is explaining almost nothing about the future rate of appreciation/depreciation of the exchange rate peseta/dollar. Also, the Engel and Bilson's models applied for the Spanish data showed that there was something wrong with the market, as long as the expected opportunity profits were not different from zero, what makes difficult to defend the idea of Efficiency for the exchange rate market.

Other possible explanations as risk premium, expectation errors and/or peso problem have not been checked for the Spanish case because of the availability of the data and the unsatisfactory explanations that they have offered up to this moment.

The statistical error explanation seems also to be acceptable, given the high persistent autocorrelation in the forward premium. This became a consistent reason of the anomaly without questioning the unbiasedness of the forward rate and/or the efficiency of the market.

Finally, the analysis of the Spanish situation by dividing the sample in different periods does not help to find any significant result in order to accept the UIP condition. Then, if one was expecting to get something new or different about the history of the exchange rate peseta/dollar from a UIP condition point of view, one could feel disappointed after this analysis. The reason is that there are not very many new results that can be added to the Spanish case, apart from what is already known for other currencies. Now, the question to address is whether the market was inefficient for exchange rate peseta/dollar or the traditional UIP test is not strong enough to release the right results, results that support the idea of efficiency of the exchange rate market peseta/dollar.

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