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Financial Assets, Expected Return and Risk, Speculation, Uncertainty, and Exchange Rate Determination

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Abstract:

Purpose: *The objective of this paper is to determine the movements (long-term trend) of the exchange rate by forecasting the rate of return and risk (return to variability ratio, RVR) that financial assets have in two economies and for four different investments.*
Design/Methodology/Approach: *Risk averse speculators will try to maximize their return and minimize their risk by investing domestically or abroad, but these capital flows will affect the value of the two currencies (their exchange rate).*
Findings: *The empirical results show that before 2001 the return in the U.S. was high and the dollar was appreciated; after 2001, the same return became negative and the dollar was depreciated, but after 2004 the returns have growing positively for the U.S., and the returns for the Euro-zone are falling.*
Practical Implications: *We can say that the dollar may appreciate with respect to euro, except if we will have any other domestic or external shocks on the two economies. Still the results of this analysis are not very conclusive.*
Originality/value: *International investors are investing in countries with higher return and lower risk. This increase in demand for these assets, increases the demand for currency in that country and its currency is appreciated.*

Keywords: *Estimation, time-series models, foreign exchange, portfolio choice.*

JEL classification: *C13, C22, C53, F31, G11.*

Paper Type: *Research study.*
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1. Introduction, Speculation, and the "News"

The Cold War seems to be over since 1990, but the economic war has become more severe and the global uncertainty is distressing. Speculators are shifting their funds from one economy to the other, seeking higher return, lower risk, or to affect a specific economy for political purposes. Years of large current account deficits,[1] enormous national debt,[2] high real return on U.S. assets, the investment opportunities, the low saving, and relatively low risk have left the United States with the world's largest stock of international liabilities. By the end of 2019, foreign net claims on the U.S. amounted to approximately $10 trillion, equivalent to 50% of U.S. GDP.[3] This tremendous demand for U.S. assets were expected to appreciate the U.S. dollar relative to euro and the other foreign currencies, but data show exactly the opposite. Over the past several years, Americans and their government enjoyed one of the best deals in international finance. They borrowed trillions of dollars from abroad, but as those borrowings mounted, the nation's payments on its foreign debt have become a clear burden, and it will negatively affect the nation's creditworthiness, living standards, and the value of the dollar.[4]

Thus, this enormous debt and other factors might have affected the exchange rate between the dollar and the other major currencies, like speculation[5] and uncertainty for the future, due to the Middle East crises It is well established that the volatility of exchange rates[6] displays considerable persistence. That is, large movements in spot rates tend to be followed by more large movements later, which increasing risk and producing serial correlation in real returns. Thus, past volatility and current one can be used to predict future volatility and the forward discount or premium of the different currencies. Investors in foreign assets must pay attention not only to the expected return from their investment activity but also to the risk that they incur.[7] Risk averse investors try to reduce their exposure during periods of high volatility by predicting the rate of return (i_{t+1}^{e}) of their investment and the volatility (variance, σ_i^2) of this return.

This volatility can be forecasted with a GARCH (p, q) model[8] or a genetic program,[9] which give broadly similar results. Investors will invest in assets denominated in a currency that its return will be higher than the others, and its risk to be the smallest one. They will try to maximize their return to variability ratio (RVR). Determining these assets with the highest RVR, we can determine the trend of the exchange rate of this specific country. Because a high RVR will create an excess demand for the country's assets, this demand for the specific country's currency will cause its appreciation (Thalassinos and Kiriazidis, 2003).

We shall give examples which reveal the effect of speculation on the different exchange rates. On Tuesday, February 22, 2005, South Korea's Central Bank announced that plans to diversify its foreign exchange reserves, which traders took to mean a slowdown in purchases of dollar-denominated securities. The U.S. dollar

fell to \$1.3259 per euro and lost value with respect to the other major currencies, too. The DJIA slid 174.02 points (1.6%) as concerns about the weak dollar sparked a sell-off of the U.S. currency. Also, gold surged \$7.40 to \$434.50 and oil climbed to \$51.42 per barrel.[10] In addition, terrorist attacks globally rose in 2004 to about 650 from 175 in 2003, said congressional aides briefed by State Department and intelligence officials.[11] A terrorist attack in London on July 7, 2005, caused stocks worldwide to fall; the London stocks (FTSE 100 index) fell by 200 points, the DJIA fell by 250 points, U.K. pound slumped to \$1.7403 from \$1.7556, bonds gained (10-year AAA=4.80%), oil in N.Y. fell by \$5 to \$57, and gold price increased by \$4 to \$430 per troy ounce; but after this shudder in the markets, they rebounded quickly.[12]

The plan of this study is as follows. We start, in section 2, with the development of the assets expected return and risk under uncertainty. In section 3, the empirical results of this ex ante analysis are given for the two economies. In section 4, policy implications are discussed for currencies, which deviate from their fundamentals. Lastly, we conclude with a few comments on this work.

2. Assets Risk and Expected Return under Uncertainty

The current ex ante analysis includes an international portfolio balance theory and its implications will be used for exchange rate determination. A starting point is the hypothesis that real money demand depends not only on income, the conventional transactions variable, but also on interest rate and on exchange rate, the speculative demand.[13] The internationalization of business and investment opportunities induce speculators to diversify their portfolios of assets denominated in a variety of currencies so that they can maximize their expected return (i_t^e) and minimize its risk (σ_i^2). Many times, we have experienced drastic effects on the value of currencies because these speculators decided to change overnight the content of their portfolia.[14]

These shifts in investments induced by current account imbalances or portfolio diversification create monetary imbalances leading to adjustments in long-run price level expectations and thus to exchange rate movements. With perfect mobility of capital, these specifications of money demand imply that the real money demand of a country with a surplus or acquiring its assets rises while it falls abroad. The relative price level of the country with a surplus or with a high demand of its assets declines and, therefore, exchange rates for given terms of trade tend to appreciate. The demand for monies is affected by an international redistribution of wealth, due to different returns and exchange rate fluctuations. Portfolio effects can arise in the context of imperfect asset substitutability. With uncertain returns, portfolio diversification makes assets imperfect substitutes and gives rise to determinate demands for the respective securities and to yield differentials, or a higher risk premium that one currency offers relative to the others (Thalassinos *et al.,* 2015).

A portfolio model could provide an explanation of the unanticipated euro appreciation that is only poorly accounted for by speculation, high risk of holding U.S. dollar assets,[15] huge deficits and debts, future uncertainty, and global instability. The system of flexible exchange rates, the macroeconomic policies, and the lately disturbances[16] have created an incentive for portfolio diversification. We would like to measure the returns and risks of investors (American, European, and foreign) on assets denominated in dollars and euros. The nominal interest rate for a foreign investor must be as follows (with ex ante calculation), depending whether the currency is at a forward discount or at a forward premium:

$$i^{e}_{At+1} = i^{*e}_{t+1} + fp^{e}_{t+1} \tag{1}$$

or

$$i^{e}_{At+1} = i^{*e}_{t+1} - fd^{e}_{t+1} \tag{2}$$

and

$$fd^{e}_{t+1} \; or \; fp^{e}_{t+1} = f_t - s_t \cong s^{e}_{t+1} - s_t \tag{3}$$

For a domestic investor, the rate of interest is decomposed:

$$i^{e}_{Dt+1} = r^{e}_{t+1} + \pi^{e}_{t+1} \tag{4}$$

where, i_D=the nominal interest rate (return) for investing domestically, i_A=the interest rate (rate of return) for investing abroad, r=the real rate of interest, =the inflation rate, fd=the forward discount of the currency, fp=the forward premium, s=the ln of spot exchange rate, f=the ln of forward exchange rate, "e" the expected value of the variable, and an asterisk denotes the foreign country.

These ex ante interest rates can be measured by using a combined regression-time series model as a function of lagged values of interest differential, lagged values of exchange rate,[17] lagged values of inflation differential, and an autoregressive-moving average model (lagged values of the dependent variable and lagged values of the error term).[18]

$$i^{e}_{t+1} = E(i_{t+1} \mid I_t) \cong i_t = k + \sum_{j=1}^{m} \alpha_j (i_{t-j} - i^{*}_{t-j}) + \sum_{j=1}^{n} \beta_j (\pi_{t-j} - \pi^{*}_{t-j}) + \sum_{j=1}^{T} \gamma_j s_{t-j} + \sum_{j=1}^{\Phi} \delta_j i_{t-j} + \sum_{j=1}^{\Psi} \theta_j \varepsilon_{t-j} \tag{5}$$

where, $i^{e}_{t+1} = i^{e}_{Dt+1} \; or \; i^{*e}_{t+1}$

In order to measure the interest rate risk (σ_i^2), we use Bollerslev's (1986) model, which is an extension of Engle's (1982) original work by developing a technique that allows the conditional heteroscedastic variance to be an ARMA process. This

process is the Generalized ARCH (p, q), called the GARCH (p, q), in which the variance is given by

$$\sigma_{it}^2 = \omega + \sum_{j=1}^{q} \alpha_j \, \varepsilon_{t-j}^2 + \sum_{j=1}^{p} \beta_j \, \sigma_{t-j}^2 \tag{6}$$

where, ε_t = the disturbances or estimated residuals and σ_t^2 = the variance of $\{\varepsilon_t\}$.

The GARCH model has been used extensively by many researchers to characterize patterns of volatility in U.S. dollar foreign exchange markets,[19] in the European Monetary System,[20] and interest rate risk.[21]

Now, we take the utility function of an investor who wants to maximize his next-period return (i_{t+1}) by investing on home (i_D^A *or* i_D^E)[52] and foreign (i_A^A *or* i_A^E)[23] securities and minimize its interest rate risk (σ_i^2).

$$\text{Max } U = u\left[E(i_{t+1}),\ \sigma_i^2\right] \tag{7}$$

where, U=the utility function, $E(i_{t+1})$ =the next-period expected return, and σ_i^2 =the variance of return, i_D^A or i_D^E =return of an American or European investor investing domestically, and i_A^A or i_A^E =the return of an American and a European investing abroad.

The solution of eq. (5) will be to construct four different portfolia of four different assets (i_D^A, i_D^E, i_A^A, i_A^E) for four different types of investors (American investing in U.S., European investing in EU, American investing abroad, and European investing abroad), which will maximize their returns, $E(i_{t+1})$, and minimize their risks, σ_i^2. If investors would choose to invest in the U.S. or in EU, due to high return and low risk, the high demand for this country's assets would increase the demand for its currency and the currency will appreciate.

$$E(i_{Dt+1}^A) = i_{Dt+1}^e \tag{8}$$

$$E(i_{Dt+1}^E) = i_{Dt+1}^{*e} \tag{9}$$

$$E(i_{At+1}^A) = i_{t+1}^{*e} + fp_{t+1}^e \tag{10}$$

$$E(i_{At+1}^E) = i_{t+1}^e - fd_{t+1}^e \tag{11}$$

where, $fp^{e}_{t+1} \equiv hfp_{t+1}$ (historic forward premium), $fd^{e}_{t+1} \equiv hfd_{t+1}$ (historic forward discount), and $hfd \; or \; hfp = \sum_{t=1}^{n} \frac{(s_t - s_{t-1})}{n} x\,1200$ (for monthly data).

Also, we can calculate the expected return to variability ratios of these four investment opportunities and maximize them.

$$\text{Max } E(RVR) = \frac{E(i_{t+1})}{\sigma_i} \tag{12}$$

where, $E(RVR)$ =expected return to variability ratio, $E(i_{t+1})$ =expected nominal return of asset j (in U.S. or EU) for an American or a European investor, and $\sigma_i = \sqrt{\sigma_i^2}$ (the standard deviation of the nominal return of this asset j).

Meese and Rogoff (1983) conclude that exchange rate models do a poor job of tracking movements over short horizons. Then, the macroeconomic variables (money supply, income, interest rate, price level, debt, etc.) can explain changes in exchange rate over medium and long horizons. Currency traders, speculators, and other market participants who focus on the short-term horizon look beyond macroeconomic models. They, search for signs (like risk and return) of short-term changes in the demand for currencies (assets denominated in specific currency), using any available measures of market transactions, behavior, and news. It is important for economists to model short-term exchange rate dynamics and determine (forecast) the future value of the different currencies (Thalassinos, 2007). Speculators in the future market are constantly interpreting public and private information about ongoing shifts in foreign currency demand as they develop their directional views.[24]

The first step in evaluating the strength of any relationship between rate of return and exchange rates is to look for visual evidence. Plotting the levels of the rate of return against exchange rate levels reveals no obvious patterns. However, a fairly clear relationship emerges when looking at changes in the two variables. Knowing the change of the rate of return of a country would have allowed someone to guess correctly only the L-T direction of the U.S. dollar and the euro. Furthermore, tests show that movements of rate of return and its risk in one country anticipate how speculators change their demand and supply of assets denominated in this specific currency. The nature of exchange rate dynamics could argue about the contemporaneous relationship between return/risk and exchange rates and their future trends.

Currency market participants are heterogeneous and act on their own bits of private information, as well as on public information.[25] Examples of private information

include participants' expectations of future economic variables, perceptions of official and private sector demand, and perceptions of developing shifts in global liquidity and risk taking. Speculators act immediately in advance of exchange rate movements in a way that anticipates the direction of exchange rates and the rate of return.

From International Finance, we know, "The currency with the higher interest rate will sell forward at a discount, and the currency with the lower interest rate will sell forward at a premium".[26] There is a Rule of Thumb, here. If the currency is at a premium ($S\downarrow$ and $\$\uparrow$), the interest rate will decline ($i\downarrow$). Then, a correlation exists between S_{t+1} and i_{t+1}. We want to test the causality between i_t and S_t ($i \Rightarrow S$). If the interest rate causes the exchange rate to change, we can determine the trend of the exchange rate by predicting the future interest rate in the countries of question.

Our objective is to seek data to help us understand what is driving the exchange rate at any given time. Variables that are viewed as fundamental to dictating currency values (relative money supply, output, inflation rates, interest rate differentials, risk premia, current accounts and budget deficits, unemployment rates, growth in financial markets, etc.) are constantly analyzed and forecast. Various transaction data are also examined to determine demand changes in different currencies. The results suggest that expected rate of return and risk in different countries merit inclusion in policy analysis and in ongoing research on exchange rate trend, its dynamics, and its determination. Here, the goal is to forecast the rate of return in different financial assets and their risk and to derive the long-term trend of these interest rates by using the Hodrick-Prescott (HP) filter.[27] The country where the interest rate will increase and the risk will fall (increase in RVR), its currency will appreciate.

This filter is a two sided linear filter that computes the smoothed series I (HPTREND) of i ($i_D^A, i_D^E, i_A^A, i_A^E$) by minimizing the variance of i around I, subject to a penalty that constrains the second difference of I. Then, the HP filter chooses I to minimize the following function,[28]

$$\sum_{t=1}^{T}(i_t - I_t)^2 + \lambda \sum_{t=2}^{T-1}[(I_{t+1} - I_t) - (I_t - I_{t-1})]^2 \tag{13}$$

where, λ =the penalty parameter that controls the smoothness of the series (the larger the λ, the smoother the series, as $\lambda \to \infty$, I approaches a linear trend). Here, λ =14,400 (because data are monthly).

3. Empirical Results

In the previous section, we discussed the theoretical part of the expected rate of return and risk ($\sigma^2_{i_t}$) for a domestic ($i^e_{D_{t+1}}$) and a foreign or an abroad ($i^e_{A_{t+1}}$) investment. By forecasting the interest rate and risk (domestically in the U.S. and abroad in the EMU), we can predict the exchange rate trend (between the U.S. dollar and the euro). The data, taken from economagic.com and imfstatistics.org, are monthly from 1999:01 to 2006:12. They comprise spot exchange rate, money supply (M2), consumer price index (CPI), federal funds rate, 3-month T-bill rate, prime rate, government bonds rate, ECB overnight deposit rate, EU 3-month LIBOR, EU 10-year government bond rate, real GDP, real risk-free rate of interest, risk premium (i_{GB}-i_{3MTB}), current account, unemployment rate, budget deficit, national debt, personal saving rate, price of gold, price of oil, and stock market index (DJIA) for these two countries (U.S. and Euro-zone).

Table 1 presents the exchange rate [USEUS ($/euro)]. The sample is divided into two sub-periods, from 1999:01-2001:12 (before the introduction of the euro-notes) and from 2002:01-2006:12 (after the circulation of the euro-notes). Also, the four rate of returns are calculated by taking into consideration the forward discount (fd) or premium (fp) of the currencies. The return for an American investor investing in EU was -3.76% and for a European investing in U.S. was 13.67%. The highest return was in the U.S., following by the Euro-zone. During this period the dollar was at a premium and the euro at a discount. After 2002, the highest return was in Euro-zone, following by U.S. (-6.12% return for a European investing in the U.S.). The dollar was at a discount with respect the euro and the euro was at a premium. This table shows ex post that the high return in the U.S. assets before 2002 has attracted speculators and this excess demand for financial assets in the U.S. has appreciated the U.S. dollar ($S\downarrow$). After 2002, the rate of return was higher in the Euro-zone and this demand for European assets has appreciated the euro ($S\uparrow$). A question still remains, here. Was the currency at a premium (before 2002) and then, the interest rate was expected to decline and investment went abroad (after 2002) or the interest rate was higher than abroad and this has caused an appreciation of the dollar. This causality is examined bellow.

Table 2 gives the correlation between the interest rates and the growth of the exchange rate. The highest correlation coefficients are between: U.S. and EU ($\rho = +0.99$). Tables 2a, b, and c show an increase in the spot rate ($GUSEUS\uparrow, \$\downarrow and\ euro\uparrow$) reduces the rate of return in the U.S. for a European investor and increases the rate of return in Euro-zone for an American investor.

Table 1. *Spot Exchange Rates, Rates of Return, Natural Logarithms, and Forward Discounts or Premiums (horizontal)*

(1999:01-2005:12)							(1999:01-2001:12)						(2002:01-2005:12)					
	$\bar{S}$	σ_S	$\bar{s}$	σ_s	fd (+)	σ_{fd}	$\bar{S}$	σ_S	$\bar{s}$	σ_s	fp (-)	σ_{fp}	$\bar{S}$	σ_S	$\bar{s}$	σ_s	fd (+)	σ_{fd}
USEUS	1.069	0.15	0.06	0.14	0.52	30.00	0.956	0.08	-0.05	0.08	-9.01	30.34	1.146	0.13	0.13	0.12	7.06	28.22
(1999:01-2005:12)							(1999:01-2001:12)						(2002:01-2005:12)					
	$\bar{i}_j^I$	$\sigma_{i_j^I}$	$\bar{fd}$ *or* $\bar{fp}$		$\sigma_{fd\ or\ fp}$		$\bar{i}_j^I$	$\sigma_{i_j^I}$	$\bar{fd}$ *or* $\bar{fp}$		$\sigma_{fd\ or\ fp}$		$\bar{i}_j^I$	$\sigma_{i_j^I}$	$\bar{fd}$ *or* $\bar{fp}$		$\sigma_{fd\ or\ fp}$	
i_{US}^A	3.05	1.76					4.67	1.23					1.69	0.80				
i_{US}^E	2.53	30.59	0.52		30.00		13.67	30.50	-9.01		30.34		-6.12	29.21	7.81		28.99	
i_{EU}^E	3.37	1.99					5.25	1.40					1.94	0.87				
i_{EU}^A	3.91	30.00	-0.52		30.00		-3.76	30.24	9.01		30.34		9.75	28.77	-7.81		28.99	

Note: USEUS=dollar/euro spot exchange rate ($/euro), $\bar{S}$ =the mean spot rate, $\bar{s}$=the mean of the ln S, σ_S=the standard deviation, fd=the forward discount, fp=the forward premium, i_{US}^A=US interest rate for an American investor, i_{US}^E=US interest rate for a European investor, i_{EU}^E=EU interest for a European investor, and i_{EU}^A=EU interest for an American investor (investments in T-bills).

Source: Economic Time Series Page by Eveline Tainer at http://www.economagic.com and hhtp://www.imfstatistics.org.

Table 2a. *Correlation Matrix (1999:01-2005:12)*

	i_{US}^{A}	i_{US}^{E}	i_{EU}^{E}	i_{EU}^{A}	GUSEUS
i_{US}^{A}	1.00				
i_{US}^{E}	0.37	1.00			
i_{EU}^{E}	0.99	0.37	1.00		
i_{EU}^{A}	-0.26	-0.99	-0.25	1.00	
GUSEUS	-0.32	-0.99	-0.32	0.99	1.00

Note: *GUSEUS=growth of the U.S. dollar per euro spot exchange rate ($/euro).*
Source: *See, Table 1.*

Table 2b. *Correlation Matrix (1999:01-2001:12)*

	i_{US}^{A}	i_{US}^{E}	i_{EU}^{E}	i_{EU}^{A}	GUSEUS
i_{US}^{A}	1.00				
i_{US}^{E}	0.15	1.00			
i_{EU}^{E}	0.99	0.13	1.00		
i_{EU}^{A}	-0.06	-0.99	-0.04	1.00	
GUSEUS	-0.11	-0.99	-0.09	0.99	1.00

Note: *GUSEUS=growth of the U.S. dollar per euro spot exchange rate ($/euro).*
Source: *See, Table 1.*

Table 2c. *Correlation Matrix (2002:01-2005:12)*

	i_{US}^{A}	i_{US}^{E}	i_{EU}^{E}	i_{EU}^{A}	GUSEUS
i_{US}^{A}	1.00				
i_{US}^{E}	0.28	1.00			
i_{EU}^{E}	0.99	0.29	1.00		
i_{EU}^{A}	-0.23	-0.99	-0.24	1.00	
GUSEUS	-0.26	-0.99	-0.27	0.99	1.00

Note: *See, Table 1 and 2a.*
Source: *See, Table 1.*

Table 3 provides the mean values and the standard deviations of the growth of different macro-variables. The U.S. had high return from1999 to 2001 and the dollar was appreciated. After 2002, the interest rates declined and the currency was

depreciated. Before 2002, the $\dot{m} > \dot{m}^*$, the $\pi > \pi^*$, the $i_{RF} < i_{RF}^*$, the $\dot{q} < \dot{q}^*$, and the $r_{US}^* < r_{EU}^*$, which mean that the dollar should have been depreciated, but we know that it was appreciated. The $i_{FF} > i_{FF}^*$, $i_{GB} > i_{GB}^*$, $RP < RP^*$, and $u < u^*$, which might have contributed to the appreciation of the dollar. After 2002, $\dot{m} < \dot{m}^*$, $i_{GB} > i_{GB}^*$, $\dot{q} > \dot{q}^*$, $u < u^*$ and the dollar should have been appreciated, but the opposite is going on. Consequently, the fundamentals do not affect the exchange rate. Of course, $\pi > \pi^*$, $i_{FF} < i_{FF}^*$, $i_{RF} < i_{RF}^*$, $r_{US}^* < r_{EU}^*$, $RP > RP^*$, which have contributed to this tremendous depreciation of the dollar.

Table 4 reports the correlation coefficients between different macro-variables and the exchange rates. All are very small. Then, it is difficult to derive any inference from these statistics.

Table 5 supplies a Granger causality test between the macro-variables (fundamentals) and the exchange rates. Between 1999 and 2001, the variables that caused changes in exchange rate in the U.S. were, inflation, and real risk free rate of interest. In the EU, there were no variables causing the $/euro exchange rates to change. After 2002, in the U.S. and the EU there were no variables causing the $/euro exchange rate. The conclusion is, here, that economic fundamentals do not cause exchange rate to move, during 2002-2006. It might be only speculation that affects that exchange rate.[29]

Tables 6a, 6b, and 6c give the average return, standard deviation (risk) of the return, and the return to variability ratio. The highest return before 2002 was for $i_{US}^E = 13.683\%$ and the lowest for $i_{EU}^A = -3.764\%$. The lowest risk is for an American investor investing in U.S. T-bills ($\sigma_{i_{US}^A} = \pm 1.231\%$), the highest risk was for the European investor investing in the U.S. ($\sigma_{i_{US}^E} = \pm 30.495\%$). The return to variability ratio ranks, first $i_{US}^A = 3.795$, second $i_{EU}^E = 3.754$, third $i_{US}^E = 0.449$, and lastly $i_{EU}^A = -0.124$. The high RVR in the U.S. has appreciated the U.S. dollar and depreciated the euro. The highest return after 2002 was in the EU by an American investor ($i_{EU}^A = 9.752\%$) and the lowest in the U.S. for a European investor ($i_{US}^E = -6.117\%$). The risk was smaller in the U.S. for an American investor ($\sigma_{i_{US}^A} = 0.797\%$) and worst in the U.S. for a European investor ($\sigma_{i_{US}^E} = 29.211\%$). The return to variability ratio ranks first in EU for a European investor (2.236%), second in U.S. for American investors (2.123%), third in EU for American investors (0.339%), and lastly in U.S. for European investors (-0.209%). The best country for investors is the EU. This might be the reason that the U.S. dollar was depreciated during that period and the euro was gaining value.

***Table 3**: Currencies and Macro-variables Statistics*

1999:01-2005:12

Country	$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S.																	
$\overline{X}$	-	6.13	2.63	3.16	2.96	6.16	5.43	2.15	0.33	2.47	-0.27	5.07	8.74	1.74	5.77	3.36	9.21
$\sigma_{\overline{X}}$	-	7.73	3.39	2.02	1.87	2.03	0.49	8.95	3.69	1.55	0.05	0.79	0.10	0.94	0.17	0.28	0.09
EMU																	
$\overline{X}$	-0.61	5.61	2.16	3.45	3.86	-	4.88	1.67	1.70	1.44	0.05	8.54	-	-	5.69	3.26	-
$\sigma_{\overline{X}}$	30.95	9.03	2.69	0.86	2.12		0.52	7.47	3.39	0.71	0.02	0.49			0.11	0.22	

1999:01-2001:12

Country	$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S.																	
$\overline{X}$	-	7.27	2.49	5.04	4.67	8.05	5.78	1.36	2.18	1.11	-0.23	4.34	8.65	1.63	5.62	3.21	9.25
$\sigma_{\overline{X}}$	-	9.32	3.39	1.28	1.23	1.26	0.34	8.37	3.11	1.07	0.02	0.47	0.02	1.05	0.04	0.24	0.06
EMU																	
$\overline{X}$	-9.01	5.82	2.16	3.77	5.25	-	5.08	2.02	3.08	1.31	0.04	8.55	-	-	5.62	3.21	-
$\sigma_{\overline{X}}$	30.34	9.27	2.71	0.88	1.40		0.44	8.03	3.01	0.85	0.01	0.59			0.04	0.24	

2002:01-2005:12

Country	$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S.																	
$\overline{X}$	-	5.11	2.75	1.46	1.42	4.46	5.10	2.86	-1.33	3.68	-0.31	5.73	8.82	1.84	5.90	3.50	9.16
$\sigma_{\overline{X}}$		5.89	3.43	0.45	0.49	0.44	0.36	9.50	3.41	0.59	0.02	0.27	0.08	0.84	0.13	0.24	0.10
EMU																	
$\overline{X}$	13.40	5.27	2.15	2.92	1.56	5.87	4.57	1.09	-0.60	1.65	0.07	8.52	-	-	5.80	3.33	-
$\sigma_{\overline{X}}$	27.20	8.82	2.74	0.48	0.32	0.36	0.50	6.57	2.72	0.32	0.01	0.29			0.08	0.14	

Note: See, Table 1 and 2; $\dot{S}$ ($/euro)=the rate of growth of the spot rate, $\dot{m}$ =the rate of growth of money supply, π =the inflation rate, i_{FF}=the federal funds rate, i_{RF}=the risk-free rate of interest, i_P =the prime rate, i_{GB}=the government bond rate, $\dot{q}$=the growth of the real GDP, r^*=the real risk-free rate of interest, RP=the risk premium (US20YTB-US3MTB), CA= current account, u=unemployment rate, BD=budget deficit, ND=national debt, psr=personal saving rate, P_{Gold}=price of gold, P_{oil}=price of oil, and DJIA=Dow Jones Industrial Index.

Table 4. *Pairwise Correlation Matrix (1999:01-2005:12) (horizontal)*

	$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	P_{Gold}	P_{oil}	LDJIA
U.S.																	
$\dot{S}$ ($/euro)	1.00	-0.07	-0.12	-0.32	-0.33	-0.32	-0.26	0.07	-0.06	0.32	-0.32	0.36	0.26	0.17	0.30	0.22	-0.24
EU																	
$\dot{S}$ ($/euro)	1.00	0.15	-0.23	-0.05	-0.33	-0.01	-0.12	0.13	-0.02	-0.03	0.20	-0.16	-	-	0.33	0.22	-

1999:01-2001:12

$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA	
U.S.																	
$\dot{S}$ ($/euro)	1.00	0.21	-0.03	-0.06	-0.11	-0.05	-0.12	0.11	-0.01	0.09	-0.13	0.10	0.25	0.23	-0.02	0.15	-0.05
EU																	
$\dot{S}$ ($/euro)	1.00	0.15	-0.25	0.14	-0.09	0.17	0.06	0.26	0.19	-0.11	-0.02	-0.21	-	-	-0.02	0.15	-

2002:01-2005:12

$\dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA	
U.S.																	
$\dot{S}$ ($/euro)	1.00	-0.37	-0.25	0.01	0.01	0.01	0.05	-0.01	0.25	0.03	0.05	0.16	-0.11	0.03	0.04	-0.03	-0.12
EU																	
$\dot{S}$ ($/euro)	1.00	0.23	-0.24	0.18	0.08	0.18	0.05	-0.05	0.25	-0.21	-0.41	-0.02	-	-	0.15	0.10	-

Note: See, Tables 1 and 2.
Source: See, Table 1.

Table 5. *Pairwise Granger Causality Tests (1999:01-2005:12) (horizontal)*

$X \Rightarrow \dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S. $\dot{S}$ (\$/euro)	0.276	1.659	3.181**	2.966*	3.416**	0.686	0.902	0.153	3.345**	2.643*	4.568**	1.310	0.334	0.631	0.087	2.531*
EU $\dot{S}$ (\$/euro)	0.360	0.274	0.169	3.106*	0.747	0.083	1.675	0.629	0.128	1.225	0.239	-	-	0.360	0.088	-

1999:01-2001:12

$X \Rightarrow \dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S. $\dot{S}$ (\$/euro)	0.207	3.460**	0.243	0.093	0.529	0.260	1.364	3.313**	0.033	0.610	0.824	1.659	0.403	2.135	0.113	0.506
EU $\dot{S}$ (\$/euro)	0.097	2.057	0.314	0.538	0.868	0.101	0.963	0.894	0.334	0.627	0.728	-	-	2.135	0.113	-

2002:01-2005:12

$X \Rightarrow \dot{S}$	$\dot{m}$	π	i_{FF}	i_{RF}	i_P	i_{GB}	$\dot{q}$	r^*	RP	LCA	u	LND	psr	L P_{Gold}	L P_{oil}	LDJIA
U.S. $\dot{S}$ (\$/euro)	0.133	0.545	0.483	1.576	0.486	1.098	0.003	0.472	1.403	0.017	1.377	1.165	0.481	1.682	0.466	1.061
EU $\dot{S}$ (\$/euro)	0.126	0.016	0.492	0.817	0.211	1.439	0.793	0.179	0.579	0.231	0.398	-	-	0.843	0.467	-

Note: See, Tables 1 and 2; $X \Rightarrow \dot{S}$ = X causes $\dot{S}$, $\dot{S}$=the growth of the spot exchange rate, Numbers are F-Statistics, *** =significant at the 1% level, **= significant at the 5% level, and *= significant at the 10% level.

Table 6a. *Investments in U.S. and Euro-zone Assets: Return, Risk, and Return to Variability Ratio (1999:01-2005:12)*

	3.050	2.534	3.371	3.912
	1.762	30.591	1.992	29.997
	1.731	0.083	1.692	0.130

Note: *See, Tables 1 and 2; = growth of the U.S $/euro exchange rate ( ), and = the return to variability ratio.*
Source: *See, Table 1.*

Table 6b. *Investments in U.S. and Euro-zone Assets: Return, Risk, and Return to Variability Ratio (1999:01-2001:12)*

	4.672	13.683	5.248	-3.764
	1.231	30.495	1.398	30.244
	3.795	0.449	3.754	-0.124

Note: *See, Tables 1 and 2; = growth of the U.S $/euro exchange rate ( ), and = the return to variability ratio.*
Source: *See, Table 1.*

Table 6c. *Investments in U.S. and Euro-zone Assets: Return, Risk, and Return to Variability Ratio (2002:01-2005:12)*

	1.692	-6.117	1.943	9.752
	0.797	29.211	0.869	28.774
	2.123	-0.209	2.236	0.339

Note: *See, Tables 1 and 2; = growth of the U.S $/euro exchange rate ( ), and = the return to variability ratio.*
Source: *See, Table 1.*

Tables 7a, 7b, and 7c present the average expected values [eq. (5)] and standard deviations [eq. (6)] of interest rates and exchange rate from 1999:01 to 2006:12, their correlation coefficients and the causality between interest rate and exchange rate. The U.S. has higher returns relative to the Euro-zone. The highest correlation of the exchange rate is with the European overnight rate ($\rho = -0.873$) and the European government bonds ($\rho = -0.768$). Euro is appreciated and the European interest rate is falling (but, when the dollar is appreciated the U.S. interest rate is increasing, which is a paradox for the U. S. economy). The causality is stronger between exchange rate and interest rates ($S \Rightarrow i$). [$S \uparrow (\$\downarrow) \Rightarrow i_{US} \downarrow$ *and* $S \uparrow (euro \uparrow) \Rightarrow i_{EU} \downarrow$].

Table 7a. *Statistics of the Expected Interest Rates in Financial Assets (1999:01-2006:12)*

Variables	S	s						
	1.009	0.002	3.304	3.090	6.307	5.483		3.249
3.489	4.828							
	0.119	0.115	2.092	1.971	1.971	0.448		0.920
2.201	0.517							

Table 7b. *Correlation Matrix of the Expected Returns and Exchange Rate*

Variables	S	s						
S	1.000							
s	0.999	1.000						
	-0.541	-0.532	1.000					
	-0.535	-0.526	0.994	1.000				
	-0.545	-0.536	0.999	0.994	1.000			
	-0.526	-0.516	0.748	0.781	0.749	1.000		
	-0.873	-0.880	0.618	0.588	0.621	0.372	1.000	
	-0.517	-0.508	0.994	0.997	0.994	0.782	0.573	1.000
	-0.768	-0.766	0.760	0.774	0.762	0.855	0.686	0.772	1.000

Table 7c. *Pairwise Granger Causality Tests (1999:01-2006:12)*

S ($/euro)

	4.184**	1.431	3.709**	1.099	2.568*	4.158**	2.168
	5.118***		8.819***		5.420***		5.555***
3.996**	9.477***		9.901***				
	4.639**	1.834	4.078**	1.113	2.805*	4.416**	2.062
	5.291***		9.775***		5.505***		6.127***
4.364**	10.793***		9.707*				

Note: *S=Spot exchange rate, s=ln of S, =expected federal funds rate, =expected risk-free rate of interest, =expected prime rate, =expected government bonds rate, =expected EU overnight rate, =expected EU 3-month deposit rate, =expected EU government bonds rate, =the mean value of the variable, =the standard deviation of the variable, =X causes S, *** =significant at the 1% level, **= significant at the 5% level, and *= significant at the 10% level.*

Source: *See, Table 1.*

Table 8 is forecasting the interest rates, their risk and the expected return to variability ratios. The results show that Americans will invest abroad (in EU) because the return is higher, there (i.e., 4.251%<4.988%). Also, Europeans will invest domestically because the return is expected to be higher in Euro-zone (i.e., 2.543%<3.280%).By considering the risk (interest rate and exchange rate ones), Americans will invest domestically and Europeans the same [$E(RVR)_{US} = 3.026\%$ *and* $E(RVR)_{EU} = 2.262\%$], but Europeans will never invest in the U.S. because [$E(RVR)_{US} = 0.448\% < E(RVR)_{EU} = 0.878\%$]. Then, it will be difficult for the dollar to appreciate.

Table 8. *Expected (Forecasting) Interest Rates [eq. (5)], their Risk [eq. (6)], and Expected Return to Variability Ratio [eq. (12)]*

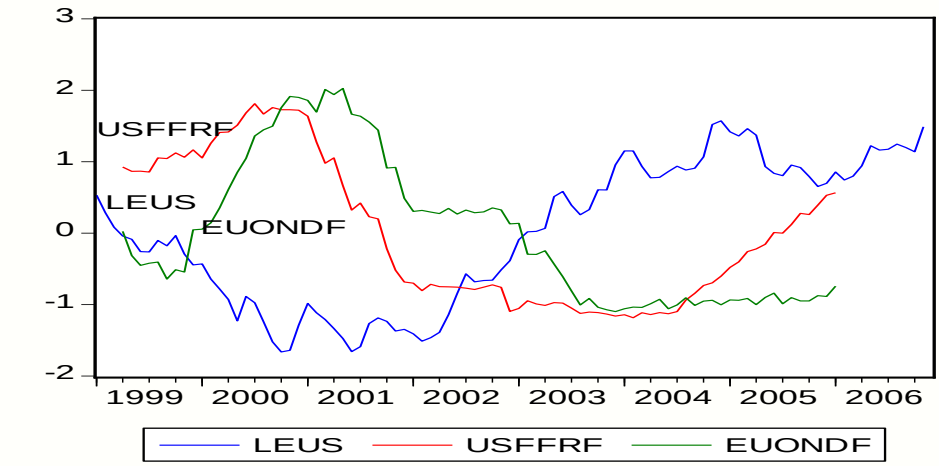
U.S. Financial Assets			EU Financial Assets	
Variables	i_D^A	i_A^E	Variables	i_D^E
	i_A^A			
$E(i_{FF})$	4.251%	2.543%	$E(i^*_{OND})$	
	3.280%	4.988%		
$E(\sigma_{i_{FF}})$	1.975%	32.166%	$E(\sigma_{i^*_{OND}})$	
	2.102%	32.293%		
hfd or hfp	-1.708%	-1.708%	*hfd or hfp*	
	+1.708%	+1.708%		
$E(RVR)$	3.026%	0.448%	$E(RVR)$	
	2.262%	0.878%		
$E(i_{TB})$	5.005%	3.297%	$E(i^*_{3MDL})$	
	4.336%	6.044%		
$E(\sigma_{i_{TB}})$	3.209%	33.400%	$E(\sigma_{i^*_{3MDL}})$	
	2.732%	32.923%		
hfd or hfp	-1.708%	-1.708%	*hfd or hfp*	
	+1.708%	+1.708%		
$E(RVR)$	2.794%	0.570%	$E(RVR)$	
	2.623%	1.053%		
$E(i_P)$	7.219%	5.511%		
$E(\sigma_{i_P})$	2.707%	32.898%		
hfd or hfp	-1.708%	-1.708%		
$E(RVR)$	4.388%	0.961%		
$E(i_{GB})$	4.844%	3.136%	$E(i^*_{GB})$	
	4.307%	6.015%		
$E(\sigma_{i_{GB}})$	3.300%	33.491%	$E(\sigma_{i^*_{GB}})$	
	2.094%	32.285%		
hfd or hfp	-1.708%	-1.708%	*hfd or hfp*	
	+1.708%	+1.708%		
$E(RVR)$	2.665%	0.542%	$E(RVR)$	
	2.977%	1.059%		

Note: *See, Table 7 and* $\sigma_{hfd} = \pm 30.191\%$, $\sigma_{i_A^E}$ *or* $\sigma_{i_A^A} \equiv \sigma_{i^*} = \sigma_i + \sigma_{hfd}$

Source: *See, Table 1.*

Figure 1 shows the natural logarithm of the spot exchange rate and the two monetary policy variables (interest rates) in the U.S., the federal funds rate (USFFRF) and in the EMU, the overnight rate (EUONDF) forecasting with eq. (5). The correlations are here: $\rho_{s,i_{FF}} = -0.470$, $\rho_{s,i_{FFF}} = -0.484$, $\rho_{s,i^*_{OND}} = -0.891$, $\rho_{s,i^*_{ONDF}} = -0.895$. Our forecasting gives a higher correlation with the exchange rate. The correlations between the actual and the forecasting interest rates are: $\rho_{i_{FF},i_{FFF}} = 0.997$, $\rho_{i^*_{OND},i^*_{ONDF}} = 0.990$, which means that the forecasting is very good. Finally, $\rho_{i_{FF},i^*_{OND}} = 0.599$ *and* $\rho_{i_{FFF},i^*_{ONDF}} = 0.587$. The causality between spot rate and these two policy rates goes both ways, but it is stronger from spot rate to interest rate ($S \Rightarrow i$). Both interest rates are going up now, and this increase in interest rates cause the spot exchange rate to fall [$i\uparrow \Rightarrow S\downarrow (\$\uparrow, euro\downarrow)$]. Any time that there is an increase of $\Delta i = 0.25\%$ the dollar will appreciate by $+ = 0.12\%$ and when there will be a change of $\Delta i^* = 0.25\%$, the euro will depreciate by $- = 0.22\%$.

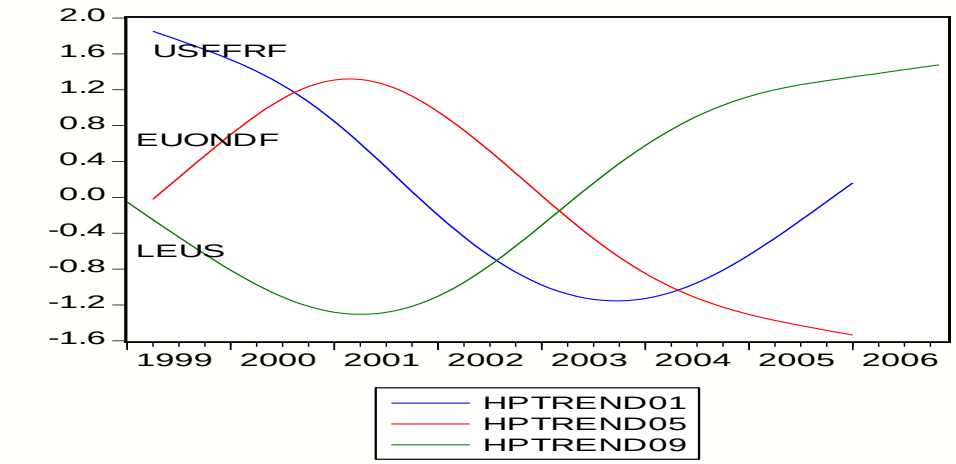
Figure 1. *Exchange Rate and Policy Rates*



Note: *LEUS=ln of S ($/euro), USFFRF=forecasting U.S. federal funds rate, and EUONDF= forecasting ECB overnight rate. Also, and , and depreciation of the U.S. dollar causes the U.S. interest rate to fall and an appreciation of the euro causes the Euro-zone rate to fall.*
Source: *See, Table 1.*

Next, we did a smooth estimate of the long-term trend of the rate of return in the two different countries (U.S. and EMU) and the spot exchange rate by using a Hodrick-Prescott filter, eq. (13). Figure 2 shows that the trend for the U.S. interest rate is positive and this increase in interest rate will reduce the exchange rate (dollar will appreciate). The trend of the interest rate in the Euro-zone is negative and going to become flat, which means that the euro might appreciate a little or will stay as it is now. Lastly, the exchange rate trend is flattening out, which means that the exchange rate will stay as it is.

Figure 2. *Smooth Estimate of the L-T Trend of the Policy Rates and Exchange Rate (Hodrick-Prescott Filter)*



Note: *HPTREND01=USFFRF (U.S. federal funds rate forecasting), HPTREND05=EUONDF (ECB overnight deposit rate forecasting), and HPTREND09=LEUS (ln of the spot exchange rate).*
As , the trend is now: , one effect is going against the other, but because the has a higher correlation (stronger effect) will prevail; then, the euro will continue to appreciate a little with respect to the U.S. dollar.
Source: *See, Table 1.*

Further, we did the smoothing of seven interest rates and the exchange rate (Figure available from the authors upon request) and we see that the i_{FFF} is increasing ($i_{FFF} \uparrow \Rightarrow S \downarrow \Rightarrow \$ \uparrow$), the i_{3MTB} is increasing ($i_{3MTB} \uparrow \Rightarrow S \downarrow \Rightarrow \$ \uparrow$), the prime rate is increasing ($i_P \uparrow \Rightarrow S \downarrow \Rightarrow \$ \uparrow$). The U.S. 20-year Treasury bond rate is flat, then, no effect on the dollar. The European overnight rate is flattening ($\bar{i}^*_{OND} \Rightarrow \bar{S} \Rightarrow euro\bar{o}$), the European 3-month deposit rate is increasing ($i^*_{3MDL} \uparrow \Rightarrow S \downarrow \Rightarrow euro \downarrow$), the Euro-bond rate is declining and flattening, then no effect on the exchange rate. The spot rate is flattening out, too, which means that we do not expect depreciation of the dollar.

Furthermore, we run a vector autoregression (VAR) estimate to forecast the system of the three most interrelated time series (S, i_{FFF}, i^*_{ONDF}) and to analyze the dynamic impact of random disturbances on the system of our variables. Table 9 gives the VAR results and we see that the spot rate depends only on its lagged values. The forecasting U.S. federal funds rate depends on its one period lagged value and on the European overnight rate two lagged periods. The European overnight rate depends on the one period lagged exchange rate and on its own value one period lagged. The impulse responses appeared in Figure 3. A shock to the j-th variable not only directly affects the j-th variable, but is also transmitted to all the other endogenous variables

through the dynamic (lag) structure of the VAR. The impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. An increase in the i_{FFF} reduces the spot rate ($\$\uparrow$) and after 3 months flatten out. An increase in the i^*_{ONDF} is reducing the spot rate ($euro\downarrow$) and after 3 months it stops.

Lastly, we did a VAR for the other interest rates and the spot rate by taking five variables as endogenous ($S, s, i_{STT3M}, i_P, i^*_{3MDL}$), and two exogenous ones (i_{FFF} *and* i^*_{ONDF}). The results appeared in Table 10. The spot exchange rate does not depend on any one of these variables. The T-bill rate depends on the lagged exchange rate, on its lagged values, and the second lagged value of the European 3-month deposit rate. The prime rate depends on the second lagged of the exchange rate, on the lagged T-bill rate, on the first lagged of the European 3-month deposit rate, and on the exogenous forecasting federal funds rate (as long as the FOMC raises the Fed funds rate, the prime follows). At the end, the European 3-month deposit rate depends on lagged values of exchange rate, its own one period lagged rate, and on the exogenous forecasting Federal funds and overnight rates. Their impulse responses appeared in Figure 4. An increase of the T-bill rate reduces the spot rate for 3 months and then, slowly goes back to its previous level after 10 months. An increase in the prime rate reduces the exchange rate for 3 months and then, goes back to its previous level. Finally, an increase in the European 3-month deposit rate causes the exchange rate to decline for 3-4 months and then, goes up to its previous level. The figure shows also the response of these variables to all the other ones.

4. Policy Implications of Currencies deviated from their Fundamentals

Even though that the U.S. dollar has depreciated drastically since 2001 (i.e., -52.66% with respect to euro),[30] the current account deficits have assumed extraordinary proportions.[31] A current account deficit is matched by a capital account surplus. In other words, a country with a current account deficit surrenders claims on future income (physical assets, stocks, and bonds) to foreigners. The ongoing U.S. current account deficit translates into an average of billions dollars in net capital imports per business day. That is, foreign investors have been accumulating U.S. assets at an unusually high rate. Foreign investors might become wary of holding increasingly larger portions of their wealth in U.S. assets. In order to promote continued investment in the United States, U.S. assets would then have to become more attractive. One way of attracting foreign investments is to lower the price of the asset in foreign currency terms. A decline in the foreign exchange value (depreciation) of the dollar would do just that. Therefore, a large current account deficit might be expected to depress the value of the dollar over time.

Also, at the end of 2002, the exchange rate of the U.S. dollar with respect the euro

was about one (1),[32] but the interest rate was falling in the U.S. and preparations for the Iraqi war have been started. Many investors begun to invest in the Euro-zone, taking their funds out of the U.S. Arabs and other Muslim investors shocked by the war and been afraid that U.S. government might freeze their funds transfer them to Europe. For a Middle-East investor to invest in U.S. assets, he required a return, which will compensate him for the expected depreciation of the dollar plus a risk premium for the possibility of freezing his funds. Then, the interest rate in the U.S. must be:

$$i_{US_t} > i^*_{EU_t} + fd_{\$_t} + FFRP_t \tag{14}$$

where, i_{US} =U.S. interest rate on financial assets, i^*_{EU} =Euro-zone interest rate, $fd_{\$}$ =forward discount of the dollar, and $FFRP$ =freezing funds risk premium.

For example, by looking at the average policy rates in the U.S. and Euro-zone from 1999:01 to 2006:12, we have: $\bar{i}_{FF} = 3.43\%, \sigma_{i_{FF}} = \pm 1.88\%$; $\bar{i}^*_{OND} = 2.98\%, \sigma_{i^*_{OND}} = \pm 0.91$; $\bar{fd}_{\$} = 0.0014, \sigma_{fd_{\$}} = 0.025$; and $\overline{FFRP} = 0.434\%, \sigma_{FFRP} = \pm 1.594\%$. During 2003-2004, the interest rate in the U.S. was 1% and the interest rate in EMU 1.97% plus 0.17% the $fd_{\$}$ and 0.434% the average FFRP, which give a total return for investing in the Euro-zone of 2.574%. Consequently, no one could have invested in U.S. assets.

A reasonable question arises now; but, what about the persistent current account deficit? Indispensably, trade policies must improve it and citizens must make their demands for imports more elastic ($|\varepsilon_M| > 1$) for their own good (personal interest) and their country's benefits. But the problem is production; U.S. does not produce any manufacturing products anymore, everything is imported. The following identity holds for an economy,

$$Y - E = T - G + S - I = X - M \tag{15}$$

where, Y=income (GDP), E=expenditures, T=taxes, G=government spending, S=saving, I=investment, X=exports, and M=imports.

If (X-M<0) in the above eq. (15), a devaluation might improve this current account deficit. But, a necessary and sufficient condition (Marshall-Lerner) must hold,

$$|\varepsilon_M| + |\varepsilon_{M^*}| > 1 \tag{16}$$

where, ε_M =the domestic price elasticity of the demand for imports and ε_{M^*} =the foreign price elasticity of demand for their imports.

Lately, our demand for imports has become completely inelastic, due to lack of production domestically, abandonment of any trade policy, and easements of borrowing (credit cards). Then, the process could be as follows (if Marshall-Lerner condition holds):

$$CAD \uparrow \Rightarrow (KAS) \uparrow \Rightarrow EX\ S_{assets} \Rightarrow P_{assets} \downarrow and\ (i_{assets} \uparrow) \Rightarrow to\ promote\ sales\ (S) \uparrow (\$ \downarrow) \Rightarrow CAD \downarrow$$

where, CAD=current account deficit and KAS=capital account surplus.

After 2001, even though that the dollar is depreciated, the current account deficit is increasing; it became 7% of the GDP by the end of 2005.[33] In 2006, it seems to be $100 billion more than the previous year. The current account and capital account are two sides of the same coin. A country that is running a current account deficit $(M_{Goods\ and\ Services} > X_{Goods\ and\ Services})$ is necessarily also running a capital account surplus $(X_{Financial\ Assets} > M_{Financial\ Assets})$. Foreign-owned assets in the United States increased from less than $2.5 trillion in 1990 to over $10 trillion by the end of 2003. Today, they are in the area of $ trillion, due to widened trade deficits.[34] Over the same period, U.S.-owned assets abroad increased from $2.3 trillion to nearly $29 trillion.[35] U.S. has to adjust its spending (actually, its production and trade policies) and reduce its debt; otherwise it will be a big impact on its consumption, employment, national wealth, and living standards in the future.36

Even though that the return is lower in the U.S. [inequality (14) is not satisfied], investors invest here, because of the unparalleled efficiency, stability, transparency, certainty, and liquidity of the U.S. financial markets. Investors find that dollar-denominated claims are an attractive element of any international portfolio. This process of investors seeking the most beneficial combination of risk and return, rebalancing portfolio when opportunities arise, gives rise to a source of capital account dynamics that is unrelated in any direct way to the pattern of trade in goods and services. Of course, this underproduction, under-saving, and over-consumption cannot continue for ever. The country needs to revise its public and foreign policies for the benefits of its citizens.

5. Summary and Concluding Comments

The objective of this analysis is to determine the exchange rate (its L-T trend) between the U.S. dollar and the euro. Lately, the U.S. dollar is losing value with respect the euro and other major currencies of the world and we want to see if this depreciation depends on economic fundamentals (lower return in the U.S. and higher risk) or it is just speculation from individuals and countries, which hold large amounts of foreign assets denominated in different currencies or due to the current global instability and the risk that the U.S. might freeze the foreign funds invested in its assts. The preliminary conclusion from this ex ante analysis is, here, that, international investors are investing in countries with higher return and lower risk.

This increase in demand for these assets, increases the demand for currency in that country and its currency is appreciated. Before 2001, people were invested in the U.S. and Japan, so the U.S. dollar and the Japanese yen were appreciated. After 2001, they invested in Euro-zone and the U.K. and the dollar and yen lost their value. Of course, due to high risk (wars and creeping ones and political conflicts) and low returns many speculators have invested in euros and other currencies, instead in dollars denominated assets.

Historically, the American governments have frozen the foreign assets inside the U.S. when a conflict arises. The L-T smoothing of these returns shows that they are growing in the U.S and are declining in the Euro-zone, so the demand for U.S. investment will increase and the U.S. dollar is expected to appreciate in the future. Investors know what is going on globally and act accordingly, so speculators take advantage of this knowledge. Already, the current data show this trend; the dollar from S = 1.3646 $/euro (12/30/2004) had reached S = 1.1877 $/euro (2/16/2006).[36] Now, The results show that before 2001, the return for investment in U.S. assets was higher than in European ones ($i > i^*$) and the dollar was appreciated by +26.45% (from 1999:01-2001:06). After 2001, the interest rate in the U.S. fell ($i < i^*$) and the dollar lost -57.186% (from 2001:06-2004:12). Then, the interest rate started increasing ($i > i^*$) and the dollar appreciated by +12.075% (from 2004:12-2005:11). The stranger period was from 2005:11 to 2006:12; the interest rate in U.S. was higher than in Euro-zone ($i > i^*$) and the dollar lost -12.01%. A causality test between the economic fundamentals in the U.S. and Europe shows that only U.S. inflation and real risk-free rate of interest in the U.S. caused the dollar to appreciate before 2001; after 2001, there were no variables in the U.S. or in Europe that caused this tremendous depreciation of the dollar.37

The RVR shows that before 2002, investors were better off investing in the U.S. and after 2002, they were better off investing in Europe. A correlation between the interest rates and the exchange rate reveal that the European interest rates have a higher correlation with the exchange rate ($\rho_{s,i^{*e}_{OND}} = -0.880$ *and* $\rho_{s,i^{e}_{FF}} = -0.532$). An increase in i^{e}_{FF} causes the spot rate to decline ($\$\uparrow$), but an increase in i^{*e}_{OND} causes the spot rate to decline ($euro\downarrow$), which is wrong according to economic theory. The causality is stronger from spot rate to interest rate ($S \Rightarrow i$) and not the opposite. Then, an increase in the spot rate (dollar is depreciated), the U.S. interest rate is falling, which means that the U.S. cannot attract investments. With, Europe the increase in the spot rate (euro appreciated) and the European interest rate is falling.

The one-period forecasting of the interest rates and the RVR show that the return on EU financial assets exceeds the one on the U.S. assets. A smooth estimate of the L-T trend of the policy rates (i_{FFF} *and* i^{*}_{ONDF}) shows that the U.S. rate is increasing, the ECB's one is falling. Then, we might see the dollar to gain some value (the euro will not depreciate drastically). The smooth estimate of the exchange rate shows that it

leveled off (no growth or appreciation of the dollar).

Finally, the response of the two policy rates (i_{FFF} *and* i^{*}_{ONDF}) on the exchange rate is a negative one for three months and then, it stays constant, which means [$i\uparrow (M^{s}\downarrow)\Rightarrow S\downarrow (\$\uparrow$ *and euro* $\downarrow)$] a lot for 3 months (overshoots)[67] and then, it stabilized at a lower level. Testing the effectiveness of monetary policy on the exchange rate, we found it non-effective. [$i_{FF}\uparrow\Rightarrow S\uparrow (\$\downarrow)$ *and* $i^{*}_{OND}\uparrow\Rightarrow S\downarrow (euro\downarrow)$].[38] Taking into consideration the effect of the FFRP on the exchange rate, we found that: [$FFRP\uparrow\Rightarrow S\uparrow (\$\downarrow$ *and euro* $\uparrow)$],[39] which is reasonable for our state of the economy, due to the Middle-East crises. A Granger causality test shows that the USFFR causes EUOND, FFRP, and LEUS. Also, the EUOND causes USFFR and FFRP. After all this analysis, we can say that the dollar may appreciate with respect to euro, except if we will have any other domestic (like, increase of the ECB rate) or external shocks on the two economies.[40] Still the results of this analysis are not very conclusive; the forecasting of the exchange rate remains as a problem.

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Notes:

1 This deficit, from $25 billion in 1990 has reached to around $ 500 billion in 2019. (www.economagic.com).

2 The outstanding national debt was approximately $ 20trillion at, 2019 (www.brillig.com).
3 See, Higgins, Klitgaard, and Tille (2005, p. 1).
4 The net investment income of the U.S. (payments minus receipts) has reached $2.5 billion in the second quarter of 2006.
5 Speculators (actually, sordid gainers and profiteers) in the oil industry have cause uncertainty in the global economy, too. Some call them "white collar terrorists". Exxon Mobil Corp., the world's biggest oil company, said fourth-quarter profit rose 27% to a record $10.7 billion on surging energy prices, capping the most profitable year for any company in U.S. history. (Bloomberg.com, 1/30/2006 and The Wall Street Journal, January 31, 2005, pp. A1 and A3).
6 Their standard deviations of their fd or fp are: $\sigma_{\$/euro} = \pm 30.00\%$, $\sigma_{\$/pound} = \pm 33.05\%$, $\sigma_{\$/yen} = \pm 27.27\%$, $\sigma_{pound/euro} = \pm 18.58\%$, $\sigma_{yen/euro} = \pm 30.94\%$, $\sigma_{pound/yen} = \pm 26.89\%$. *See, Kallianiotis and Frear (2007).*
7 Muslim countries avoid to invest in U.S. assets after 2003 (invasion in Iraq) because they are afraid that the American government might freeze their funds. They require a freezing fund risk premium (FFRP) as Kallianiotis and Petsas (2006) have mentioned.
8 See, Kallianiotis (2004a and b).
9 See, Neely and Weller (2002).
10 See, The Wall Street Journal, February 23, 2005, pp. A1, C1, C2, and C3; and "Dollar Declines as Bank of Korea Plans to Diversify Currency Reserves", Bloomberg.com, 2/22/2005.
11 See, The Wall Street Journal, April 27, 2005, p. A1.
12 A group purporting to be the terrorist organization al-Qaeda claimed responsibility for explosions during morning rush hour across London. The public transportation system was shutting down. Bloomberg.com, July 7, 2005 and The Wall Street Journal, July 8, 2005, p. C1.
13 As follows: $\frac{M_t^d}{P_t} = \alpha_0 + \alpha_1 Y_t - \alpha_2 i_t - \alpha_3 S_t + \varepsilon_t$. *Where,* $S_t \uparrow (\$\downarrow)$, *the demand for dollars is falling. See, Kallianiotis and Petsas (2006).*
14 In June 1997, the Asian currency crises started. The Thai baht devaluated in July, followed soon after by the Indonesian rupiah, Korean won, Malaysian ringgit, and Philippine peso. Following these initial exchange rate devaluations, Asian economies plummeted into recessions. The Indonesian president went public and blamed speculators (he named even one, George Soros) who shifted their short-term investments out of the country. Next day this poor president was forced to resign. See, Eiteman, Stonehill, and Moffett (2004, p. 30), Rajan and Zingales (1998), and Singal (1999). The world is controlled by businessmen and not anymore by politicians.
15 Some "news" were: "Syrians' funds will freeze in the U.S. banks". (TV News, March 6, 2005). "Dollar declined as Bank of Korea plans to diversify currency reserves." (Bloomberg.com, February 22, 2005).
16 The U.S. Treasury reported the federal deficit hit a monthly record of $113.94 billion in February of 2005. Greenspan told the Council on Foreign Relations deficits pose a bigger risk to the U.S. than trade imbalances or low savings. (The Wall Street Journal, March 11, 2005, p. A1).
17 See, Frenkel (1984, p. 19) for a similar equation for the $(i_t - i_t^*)$.
18 This equation is an example of a Transfer Function Model or a Multivariate Autoregressive-Moving Average (MARMA) Model. See, Pindyck and Rubinfeld (1981, pp.

593-595) and Kallianiotis and Boutchev (1995a and b).
19 See, Baillie and Bollerslev (1989 and 1991).
20 See, Neely (1999).
21 See, Kallianiotis (2004a and b).
22 The variables i_D^A and i_D^E can be estimated (forecasted) by using eqs. (3) and (4).
23 The variables i_A^A and i_A^E are calculated from eqs. (1), (2), and (4).
24 "The empirical failure of macroeconomic models to explain exchange rate movements over daily, weekly, or monthly intervals has spurred efforts by economists to find new data that might offer insight into how currency markets st prices in the short term." Klitgaard and Weir (2004, p. 18).
25 See, Evans and Lyons (2002).
26 See, Eiteman, Stonehill, and Moffet (2007, p. 113).
27 See, Hodrick-Prescott (1997).
28 See, Kallianiotis and Frear (2007).
29 The corruption lately is so high that traditional economic theories cannot apply in our global economy (another serious problem of the destructive globalization. "Currency-trading fraud has been proliferating, as scam artists exploit a growing awareness of the foreign-exchange market and the regulatory loophole." (Wall Street Journal, January 6-7, 2007, pp. A1 and B1.
30 See, Kallianiotis (2005b, Table 1).
31 Trade deficit in U.S. widened to a record in 2005 reaching $726 billion, even though that the U.S. dollar was depreciated. (Bloomberg.com, 2/10/2006).
32 On December 31, 2002, it was 1.0194$/euro. (Economagic.com).
33 See, www.epi.org, 3/11/2020.
34 See, www.bloomberg.com, 2/10/2020.
35 See, Pakko (2004) and The Wall Street Journal, September 25, 2006, p. A9.
36 See, bloomber.com.
37 See, Dornbusch (1976).
38 The regression is:

$$s_t = 0.448^{***} + 0.020^{***} i_{FF_t} - 0.148^{***} i^*_{ond_t}$$
$$(0.027) \quad (0.005) \quad (0.010)$$

$$R^2 = 0.703, \quad SSR = 0.556, \; F = 110.204$$

39 These results are as following:

$$s_t = 0.450^{***} - 0.130^{***} i^*_{OND_t} + 0.018^{***} FFRP_t - 0.079\, fd_{\$_t}$$
$$(0.026) \quad (0.008) \quad (0.005) \quad (0.320)$$

$$R^2 = 0.730, \quad SSR = 0.494, \quad F = 82.033$$

40 On January 12, 2007 (6:00 a.m.), a provocative rocket attack against the American Embassy took place in Athens, Greece and the dollar lost 0.0035 points (from 1.2892$/euro fell to 1.2927$/euro). (TV News ALTER, 1/12/2007 and Bloomberg.com).