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Is it predictable the nominal exchange rate in the long term through its monetary fundamental? The evidence for Mexico 1995-2008

TELLEZ-Elizabeth*†

Centro de Investigacion y Docencia Economica. Mexico Toluca 3655, Lomas De santa Fe, Alvaro Obregon, 01210 Ciudad de Mexico, Distrito Federal, Mexico

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In this work the relation of long existing term between the fundamental type of nominal change and its monetary ones is analyzed, within the framework of the present exchange regime of flotation (1995-2008). Specifically the predictability of the movements in the fundamental type of change from its monetary ones is investigated. The analysis of the predictability of the type of change is motivated because a) exists few studies on the subject in Literature for Mexico, since most of the studies on the type of change in Mexico they have been elaborated to establish his determinants, and b) at the present time does not exist a consensus on the subject and it is tried to contribute to the debate demonstrates empiricist for the case of Mexico.

RCF, Nominal Exchange rate, Predictability.

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*Correspondence to Author (email: jafonsor@ull.es)
† Researcher contributing as first author.

Introduction

The origin of the current debate is about the work of Nelson Mark (1995), since this approach caused controversy among researchers such as Kilian (1997), Berkowitz and Giorgianni (1997), Groen (1997) and Berben and Van Dijk (1998) who question the statistical robustness of the results. On the other hand, there is favorable evidence for the exchange rate predictability in MacDonald and Taylor (1993), Chinn and Meese (1995), Chen and Mark (1996), MacDonald and Marsh (1997) and in the present paper for Mexico (1995-2008).

This research aims to contribute to the empirical debate showing evidence for the Mexico case on the predictability of the exchange rate movement based on the basic variables derivated from the monetary model.

The research hypothesis focuses on two main objectives: the first one is to prove that the the nominal exchange rate is cointegrated in the long-term with predicted determinants by the monetary model, and the second is to examine the ability of monetary fundamental to predict changes in the nominal exchange rate in regard to its fundamental value. This latter aspect is analyzed estimating error correction models for the unrestricted case.

Econometric model

In this section the econometric model that examines the hypothesis if the research is specified:

- If the fundamental value (f_t) and the nominal exchange rate (S_t) are cointegrated.

- If the deviations of the nominal Exchange rate of its fundamental value (x_t) help to foresee S_{t+k},, through the Engle and Granger cointegration approach, and if there is evidence of cointegration, an error correction model (ECM) will be estimated to incorporate short-term relations.

The use of the cointegration approach can be restricted or irrestricted; in this research the irrestricted model is used. Even if a great amount of empriricla research have studied the restrict monetary model, [24] other authors [25] are against imposing restrictions a priori to the coefficients of the econometric model of the exchange rate's monetary approach, when we want to prove that it returns to its fundamental value in the long term. Therefore, to give more robustness to the model, all the parameters are considered.

[24] Messe y Rose (1990), Chinn y Meese (1995), Mark (1995), Blomberg y Hess (1997) y Mark y Choi (1997).

[25] Cheung y Lai (1995), quienes observaron que las restricciones sesgan el resultado para no alcanzar el equilibrio a largo plazo. Además la evidencia en García y González (2000) señala que el poder explicativo de modelo monetario del tipo de cambio sin imponer restricciones a los coeficientes permite obtener el equilibrio de largo plazo del tipo de cambio spot.

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

The first step in the construction of the econometric model is specify on what S_t is based, in the presence of "rational bubbles" the function is specified next:

$$S_t = \gamma [m_t^s - m_t^{s*} - \lambda (y_t - y_t^*)] \quad (1)$$

Where *St* is the logarith of the spot exchange rate, m_t^s is the logarithm of the domestic money supply, m_t^{s*} is the logarithm of the foreign money supply, y_t is the logarithm of the domesctic country product, and y_t^* is the logarithm of the foreign product.

Now X_t is defined as follows:

$$X_t = f_t - s_t \quad (2)$$

Where x_t is the deviation of the spot Exchange rate regarding its fundamental, f_t is the monetary fundamental and s_t is the spot exchange rate.

Irrestrict cointegration model.

Since for the econometrician is important to estime coefficients for each of the fundamentals, the irrestrict equation of (1) is:

$$S_t = \beta_1 m_t - \beta_2 m_t^* - \beta_3 y_t + \beta_4 y^* + u_t \quad (3)$$

And is defined: X_t^m as follows:

$$X_t^m = s_t - \beta_1 m_t + \beta_2 m_t^* + \beta_3 y_t - \beta_4 y_{t^*} = u_t \quad (4)$$

The irrestrict model can be estimated with Ordinary Least Square (OLS), since Engle and Granges (1987) demonstrated that if there is conintegration, the OLS estimator is consistent.

This result is given even though f_t is correlated with the error term. More surprisingly, authors show that the difference ($\square_{\square OLS}$ - $\square\square\square$ tends to zero at about the same rate as T^{-1} tends to zero as T.

This has more speed than the standard convergence of $T^{-1/2}$ of the OLS estimator of the classic regression, this is the reason why it is called superconsistent and can be used to estimate the parameters of the long term relationship. But the estimators resulting from the OLS for a small sample are inefficient and biased.

Therefore, to avoid debate on the simple size, the model will be etimated with Dynamic Ordinary Least Square (DOLS).

The estimator obtained through dynamic ordinary least square was proposed by Saikkonen (*Econometric Theory*, 1991) and includes *p* lags and advances of the *ft* differences in the cointegrating regression: model with Dynamic Ordinary Least Square (DOLS).

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

The estimator obtained through dynamic ordinary least square was proposed by Saikkonen (*Econometric Theory*, 1991) and includes *p* remnants and advances of the *ft* differences in the cointegrating regression:

$$S_t = f_t \beta + \quad \Delta f_t + {}_j\delta_j + v_t \qquad (5)$$

The motivation is suppres the serial correlation of the error term adding sufficient conductors and remnants to the regression. This estimator is asyntotically efficient.

For the short term the adjustment model is specified in the next section.

Error correction model

From the long term relationship we have:

$$S_t = \beta_{OLSD} f_t^m + u_t \qquad (6)$$

Then, the short term relationship will be:

$$\Delta s = \varphi_1 \Delta s_{t-1} + \varphi_2 \Delta f_t^m + \varphi_3 (s_{t-1} - \beta\ OLSD\ f_{t-}{}^m{}_1) + u_t \qquad (7)$$

Remanents of $\Delta s + \Delta f.$ can be included. And if $\varphi_3 < 0$ and significative, then the deviations of the exchange rate in regard to its fundamentals help to predict the deviations in the exchange rate.

Econometric methodology and estimation analysis

The first step of the econometric methodology consists on determining the order of the series integration through correlograms[26] and the augmented unit root Dickey-Fuller test for the information criteria of Akaike, Schwarz, modified Akaike and modified Schwarz.

The Dickey-Fuller-GLS test is also obtained in order to have a test range that validate the results.

If in the first step it is found that the logarithms of the series have a unit root, the order of integration of the series can be identified, and if all have the same integration order, the second stpe will proceed.

Then, the results for the long-term model that was specified in (3) by OLS and DOLS estimation methods are obtained.

It should be noted that for the DOLS Estimator, it is possible to do inferences as follows: Frist, (5) is estimated "augmented cointegration model", where the long term relation is augmented in order to include □ which will "absorb" the endogeneity of f_t , plus *p* leads and lags of □ □ f_t which will control by residual autocorrelation

Then, the hypothesis H_0:=0 can be assesed using the ratio-t rescaling as follows:

$$* = \left(\sigma_v^2 / \lambda^2_v \right)(t) \rightarrow t - distribución\ \ t -$$

[26] Éstos no se repotan en los resultados, puesto que son varias series y por cuestión de espacio sólo se menciona su comportamiento en los resultados.

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

The term σv^2 is the error variance in the regression (5), the parameter $\sigma^2 v$ is the long term variance and can be obtained from an auxiliary regression AR(s), using the (*) residuals, so σv is obtained from the relation:

$$\lambda^2_v = \frac{\sigma_w^2}{\varphi_{1-\ldots-\varphi s})^2} \quad \text{con} \quad \sigma_w^2 = (T-s)^{-1} \quad w_t^2$$

In the second step a cointegration analysis with the Engel and Granger approach is performed. For the specific case of I variables (1) thatwe have, it ios established that if $f_t \sim I$ (1) and $s_t \sim I$ (1), then f_t and s_t are conintegrated if there is a value α, as that the linear combination $(s_t - \alpha f_t) \sim I(0)$.

This case is detonated f_t , $s_t \sim CI(1,1)$. This means, simply, that f_t and s_t do not tend to separate (diverge) through time or that will keep the same distance and, then, the equation $s_t = \alpha f_t + u_t$ will have sense and will capture the long term relationship between f_t and s_t.

When considering cointegration existence, we have an equilibrium relationship to which f_t and s_t converge over time. In this case, the error term u_t can be interpreted as a desequilibruim error I the *t* moment.

So after getting the long term relationship, the (1) estimated remainders by OLS are obtained to prove the cointegrating hypothesis with unit root tests.

The test consists of the following explanation: if $X_t^m = u_t \sim I(1)$ there would be a unit root, which indicates that the series is not stationary and there will not be cointegration; but if $X_t^m = u_t \sim I(0)$ there is not unit root so the series is stationary and there is cointegration.

Step three is performed if there is evidence of cointegration, since the short-term relationship can be estimated with an error correction model specified in (7), which is estimated with DOLS estimator for being more efficient than the OLS.

Although the latter has the property of super-consistency for a large number of data, it may be subject to bias due to endogeneity and autocorrelation problems. And even when there are 163 data in our study which is considered "a large enough sample", it is estimated with DOLS.

In the next section, the econometric analysis results for Mexico during its flexible exchange rate regime are shown.

Statistical Analysis of Series

In this section, the econometric results of the studied period, 1995:06-2008:12, are displayed to analyze the empirical evidence derived from the data of Mexico to the discussion of the predictability of the exchange rate based on their monetary fundamentals. It begins by showing the series used in this study and then presents empirical results based on the sample for Mexico

Series description

The period of study of this research includes a period from June 1995 to December 2008, on a monthly basis; the variables used in the study are:

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

- The spot exchange rate (ER) obtained from the IMF database, to the closure of the national markets and in the end of the period, the units are given in pesos for U.S dollar and for this variable, the stationarity adjustment is not applied.

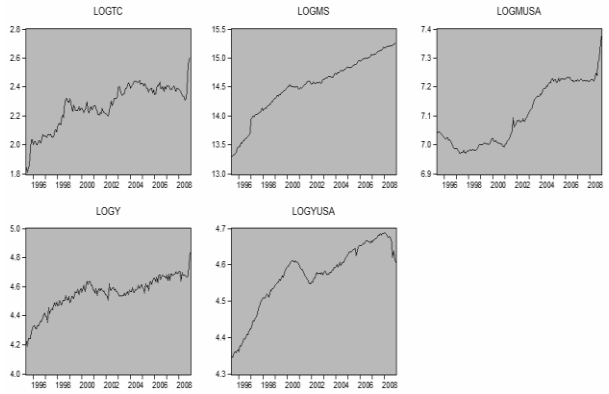
- The series used to represent the moneatry supply (ms) is obtained from the IFM as the sum of money plus near money, both reflect the current state of the economic activity levels. The unit is million pesos and is presented seasonally adjusted.

- The series used to measure the product of Mexico is the industrial production rate which refers to the volume of output generated by production units[27] according to the data

- The series for the U.S. monetary supply (yusa) was obtained from the IFM with entry M1, which reflects the economic activity level. The unit is million pesos and is seasonally adjusted.

- The series for industrial production rate (yusa) is obtained from the IMF and is seasonally adjusted.

The research was done with 163 observations and all series were he obtained the April 10, 2009. The chart each of the series at levels (applying the logarithm to each series) presented below.



Graphic 1

It is observed that all the series have a tendency in the same direction, which gives a first encounter to the presence of a long term equilibrium to which the economic system convegreges through time, even when each series has a stochastic tendency. For that, the statistics for each series are presented in the next section.

Statistical analysis of the series

Covarianza	LOGTC	LOGMS	LOGMUSA	LOGY	LOGYUSA
LOGTC	0.022510				
LOGMS	0.067762	0.245483			
LOGMUSA	0.012097	0.041359	0.011033		
LOGY	0.015026	0.054209	0.007982	0.013153	
LOGYUSA	0.011875	0.043019	0.006593	0.009788	0.007986
Correlación	LOGTC	LOGMS	LOGMUSA	LOGY	LOGYUSA
LOGTC	1.000000				
LOGMS	0.911563	1.000000			
LOGMUSA	0.767637	0.794713	1.000000		
LOGY	0.873288	0.954011	0.662617	1.000000	
LOGYU	0.8856	0.9715	0.7023	0.9550	1.0000

[27] Las unidades de producción están clasificadas en sectores industriales: C (minería), D (Industria manufacturera) y E (energía eléctrica, gas y agua) conforme a la Clasificación Industrial Internacional Uniforme de todas las Actividades Económicas (CIIU Rev. .3).

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

Chart 1 shows that the logtc, the log, musa, the logy and the logyusa have a similar standard deviation in their data around 0.1, while logms has a standard deviation of 0.5 and suggest that the series do not distance from their mean and that reflects the presence of a long term equilibrium, analized formally in the long term model section.

Covariance and correlation of the series in levels.

$\alpha_p + \mathbf{A}\not{\xi}_{k,p}\beta_k$ diverge at the rate $n^{1/2}$.

	LOG	LOG	LOGM	LOG	LOGY
Media	2.269	14.52	7.10408	4.552	4.56834
Mediana	2.297	14.56	7.08179	4.570	4.58394
Máximo	2.605	15.25	7.37763	4.837	4.68757
Mínimo	1.806	13.29	6.96941	4.187	4.34419
Dev. Std.	0.150	0.496	0.10536	0.115	0.08964
Observaci	163				

Chart 2

Chart 2 shows that the Exchange rate has a higher covariance with the monetary supply of Mexico; moreover, in the correlation analysis, it can be seen that all are positive and relatively high, which suggest a coomon direction in the series. specifically, that the correlation between logtc and logms is 0.91 suugests that the exchange rate will answer mucho more to its monetary fundamental ms.

This gives the monetary policy a wide scope for action to establish the exchange rate when when a rigid exchange rate stability is required. IV.

Results of the econometric analysis

Correlograms of the series with the logarithm transformation were observed to determine the integration oreder of the series by levels, and a slow decay was identified, therefore it is concluded that the series have a unit root.

Analysis of series and unit root

To be certain of the presence of unit root, augmented Dickey-Fuller unit root tests were run: the logarithm and the difference of the logarithm of the series with 13 lags, intercept and slope.

Order of integration of the series

Stationarity analysis with 13 lags Monthly dates 06:1995-12:2008					
Variables	ADF statistic Schwarz Information criteria		DF-GLS statistic Schwarz information criteria		integration order
at levels with intercept and tendency					
Log: is the logarithm of the variable	test value	p-value	test value	critical value: 1% 5% 10%	I(d)
LogTC	-3.092272	0.1117	-1.710264	-3.505600 -2.968000 -2.678000	I(1)
LogMs	-3.112727	0.1069	-0.496945	-3.505600 -2.968000 -2.678000	I(1)
LogMusa	-1.572504	0.7996	-0.690928	-3.509200 -2.971000 -2.681000	I(1)
LogY	-3.090000	0.1123	-1.161720	-3.508000 -2.970000 -2.680000	I(1)
LogYusa	-0.954016	0.9462	-0.407077	-3.509200 -2.971000 -2.681000	I(1)

Chart 3

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

At Firtst differences with intercept

DLog: it is the first difference of the variable logarithm	test value	p-value	test value	Critical Value : 1% 5% 10%	I(d)
DLogTC	-11.32073	0.0000	-9.788603	-2.579315 -1.942805 -1.615400	I(0)
DlogMs	-11.14273	0.0000	-9.639493	-2.579315 -1.942805 -1.615400	I(0)
DLogMusa	-1.854313	0.3532	-1.780658	-2.579495 -1.942830 -1.615384	I(0)*
DLogY	-12.09620	0.0000	-12.06353	-2.579404 -1.942818 -1.615392	I(0)
DLogYusa	-4.139053	0.0011	-4.153127	-2.579495 -1.942830 -1.615384	I(0)

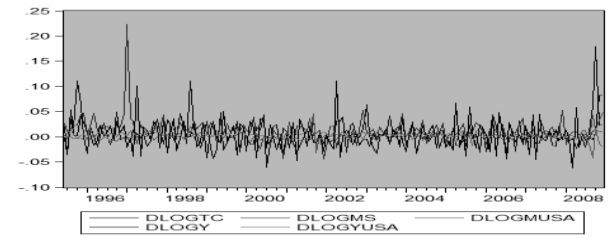
Mackinnon critical value to reject the hypothesis of unit root
* it is (0) to the 10% of significance according to DF-GLS test.

Thus, in the chart 3, the stationarity analysis of each one of the series is shown at levels and in differences of logarithms, with ADF and DF-GLS tests and Schwarz information criteria [28] with 13 lags. The results of the unit root analysis show that in the series at levels have unit root, as the *p*-vablue is greater than 0.05, making it impossible to reject the null hypothesis and meaning that the series at levels are not stationary; in contrast to this result, the difference of the logarithm for all series are stationary for not having unit root under the DF-GLS test with 90 % of reliability.

The result reached with the unit root analysis is that series at level are integrated of order 1, I(1).[29] The logarithms series in differences are integrated of order 0, I(0) and, therefore, stationaries.

In order to visualize the stationarity of the series in differences of logarithms, the graphic 2 is presented below.

Stationeries Series



Graphic 2

Once determined the integration order, step 1 result, which characterize ARIMA processes (p,1,q) given the unit root tests before shown, the second step of the econometric methodology proposed in the previous chapter proceeds in order to do an cointegration analysis with the Engwl and Granger approach.

Results of cointegration analysis

In this section, the results of the econometric estimation of the long-term model and the cointegration test with the Engel and Granger approach are presented. Remember that to describe the long term relationship we specified the irrestric model in (3) in the section I. So the estimation of the irrestrict cointegration model by OLS and DOLS are shown below:

Irrestrict cointegration model:
OLS estimator

[28] For reasons of space the Augmented Dickey-Fuller tests are not presented with other information criteria, but were run in order to give greater strength to the inferences obtained and it is observed that reaches similar conclusions.

[29] Las series I(1) presentan principalmente las siguientes propiedades: el efecto de un choque es permanente, la varianza es creciente y la autocorrelación teórica es h 1 para todo h cuando t.

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

DOLS Estimator

$$S_t = 0.399822m_t - 0.123892m_t^* \_ 0.324041y_t - 0.259361y_t^* + 0.231641\Delta m_{t+1} + 0.480326\Delta m_{t+1}^* - 0.070536\Delta y_{t+1} - 0.517340\Delta y_{t+1}^* - .260073\Delta m_{t-1} + 0.912685\Delta m_{t-1}^* + 0.034993\Delta y_{t-1} + 0.867047\Delta y_{t-1}^*$$

Since the DOLS estimator is used to obtain reliable estimates of the cointegration relationship, is only necessary to adjust the classic ratio-t and contrast it with the classical t-distribution, as noted in the econometric methodology, in order to make statistical inference.

In both cases, estimating with OLS or DOLS, the estimated coefficents for logms are significative in 95% reliability, which shows the power of manipulating the money supply in determining the nominal exchange rate in the long term. In the irrestrict model estimated by DOLS it is obtained that logms, logmusa, logy and logyusa explain the logtc; besides, the expected and future growth rate of the national money supply, as well as the national income explains the logtc, with a reliability of 90%

The interpretation [30] of the long term relationship will be made over the coefficients estimated by DOLS that is asintotically efficient.

Results of the cointegration test.

Conintegration test ´ Schwarz criteria 0 lags		Interpretation of the cointegration test	
Test value	p-value	Test value	p-value
-3.171462	0.0017	It is rejected H_0: unit root $u_t \sim I(0)$	There is cointegra-tion to the 99 % of reliability

Chart 4[31]

Therefore, when the money supply increases by 1% the exchange rate depreciates by 0.39%, a 1% increase in the U. S money supply, will appreciate the exchange rate in 0.12%, a 1% increase in the production rate of Mexico will appreciate in 0.32% the exchange rate and a 1%in the production rate of U.S. will appreciate the exchange rate in 0.25%. Note that the signs expected by the theory were similar to those for logms, logmusa and logyusa.

[30] La interpretación de cada coeficiente se realiza ceteris paribus.

[31] Se observó, uno de los resultados más importantes de Engle y Granger (1987), que el estimador OLS dela relación de largo plazo (de cointegración) es "superconsistente" a pesar del problema de endogeneidad y posible autocorrelación de errores. Desde un punto de vista práctico se utiliza el estimador de OLS porque: (i) se cuenta con un número relativamente grande de observaciones (ii) los problemas de endogeneidad y autocorrelación no son importantes. Además se podría decir que las variables del lado derecho son, de hecho, exógenas y no existe autocorrelación, entonces el estimador de OLS es válido. Sin embargo, con el fin de obtener estimaciones confiables de la relación de cointegración se estima con DOLS.

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

Chart 4 shows the results of the cointegration test about the estimated remainder. It is found that the null hypothesis of the unit root is rejected with 99% of reliability, which implies that there is not unit root and thus the remainder are stationaries; this proves that there is cointegration between the exchange rate and monetary fundamental. This verifies one of the two hypotheses posed at the beginning of this research; it is now possible to estimate the step three of the econometric methodology.

Results of the error corection model

Chart 5 shows the estimated coefficients of the equation (7) and the results of the test are presented over the remainders to verify if they are white noise with 95% reliability.

Error correction model (ECM)

Error correction model	Values of short term parameters	RB test over the remainders of the model Schwarz critera 0 lag	
Model	Error Correction Model	test value	p-value
(7) 1995:06-2008:12	$\Delta s_t = 0.241046\Delta s_{t-1} + 0.793503\Delta \log musa + 0.158203\Delta \log y + 1.057268\Delta \log yus$ (0.0044) (0.0045) (0.0934) (0.0029) $-1.275956\Delta \log yusa_{t-1} - 0.124606\left(s_{t-1} - \beta_{(a,s,p)} f^{*}_{t-1}\right)$ (0.0004) (0.0016)	-12.86429	Remainders RB 0.0000

Chart 5

In chart 5, it is observed that from the equation (7) is obtained the adjustment term that allows the nominal exchange rate to return to its fundamental value, this is -0.124606 and is significative to 99% of reliability. Precisely this term links the short term behavior with its long term value, moreover, it is noted that the sign hold is correct (negative) and close to zero, which implies that long term equilibrium will be slow, and indicates higher adjustment costs. The previous demonstrates the empirical evidence of the exchange rate through deviations of the nominal exhchange rate of its fundamental value.

Therefore, we conclude that favorable evidence in Mexico for the exchange rate predictability through their fundamental monetaries with an irestrict model had been found and more reliability is given to the resulst found by letting the parameters being freely estimated.

Conclusions

En este trabajo se utilizó un modelo monetario del tipo de cambio basado en la relación del tipo de cambio nominal y los fundamentales monetarios.

The empirical results show favorable evidence, for the Mexico case, about predictability of exchange rate movement during the 1995-2008 period. It was shown that the hypothesis of this research is satisfied, because: a) the nominal exchange rate is cointegrated with its fundamental monetary value, and b) deviations of the exchange rate from its fundamental value allow to predict movements in the nominal exchange rate, for the used sample.

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

Although evidence suggests that in the case of Mexico between 1995-2008 the money supply is significantly associated with the nominal exchange rate in the long term and predicts the direction of their changes properly in the short term, it is important to note that the estimates of the error correction models indicate that the correction process towards long term equilibrium is slow.

A possible extension of this research would be to consider nonlinear adjustment process of the exchange rate to its fundamental value.

References

Berben, R.B. y van Dijk, D.J. Does the absence of cointegration explain the typical findings in long horizon regressions?. Econometrics Institute: Erasmus University Rotterdam, 1998.

Berkowitz, J., Giorgianni, L. Long-horizon exchange rate predictability?. IMF: International Monetary Fund, 1997.

Chen, J. y Mark, N.C. "Alternative long-horizon exchange rate predictors". IMF: International Journal of Finance and Economics 1 (1996): 229–50.

Cheung, Y., Fung, H., Lai, K. y Lo, W. "Purchasing Power Parity under the European Monetary System". Journal of International Money and Finance 14 (1995): 179- 89.

Chinn, M.D. y Meese, R.A. "Banking on currency forecasts: how predictable is change in money?". Journal of International Economics 38 (1995):161–178.

Edison, Hali J. "Purchasing Power Parity in the Long Run: A Test of the Dollar/ Pound Exchange Rate (1890-1978)". Journal of Money, Credit, and Banking 19(3) (1987): 376-87.

Engel, Charles y Hamilton, James D. "Long Swings in the Dollar: Are They in the Data and Do Markets Know It?". American Economic Review 80(4) (1990): 689-713.

Engel, Robert y C. W. J. Granger. "Co-integration and error correction: represetation, estimation, and testing". Econométrica 55 (1987): 251-276.

Esquivel, Gerardo y Felipe Larrain. "Determinantes de las crisis cambiarias". El Trimestre Económico 266, (2000): 191-237.

Fama, E.F., French, K.R. "Dividend Yields and Expected Stock Returns". Journal of Financial Economics 22(1), (1988): 3–25.

Fisher, Eric 0. y Park, Joon Y. "Testing Purchasing Power Parity Under the Null Hypothesis of Co-integration". Economic Journal 101(409) (1991): 1476-84.

García S. Jose y Ma. Isabel Gonzalez. "Los fundamentos monetarios del tipo de cambio peseta/marco aleman a corto y a largo plazo". Moneda y Credito 211 (2000): 191-18, España.

Groen, J.J. "Long horizon predictability of exchange rates". Tinbergen Institute Discussion TI 97-095/2 (1997)

Hamilton, J. D. "Time Series Anaysis". Princenton University Press, (1994).

ISSN-Print: 2007-1582- ISSN-On line: 2007-3682

Kilian, L. "Exchange rates and monetary fundamentals: what do we learn from long-horizon regressions?". Journal of Applied Econometrics, forthcoming (1997).

MacDonald, R. y Taylor, M.P. "The monetary approach to the exchange rate: rational expectations, long-run equilibrium and forecasting". IMF 40 (1) (1993).

Maddala, G. y Kim, I-M. Unit Roots, Cointegration, and Structural Change. Cambridge: Cambridge University Press, 1998.

Mark, Nelson. "Exchange and Fundamentals: Evidence on Long-Horizon Predictability". The American Economic Review, (1995): 201-218.

Mark, Nelson y Donggyu Sul. "Nominal exchange rates and monetary fundamental Evidence from a small post-Bretton woods panel". Journal of International Economics, (2001): 29-52.

Meese, Richard y Rogoff, Kenneth. "Empirical Exchange Rate Models of the 1970's: Do They Fit Out of Sample?". Journal of International Economics, (1983a): 3-24.

Obstfeld, Maurice. "International Currency Experience: New Lessons and Lessons Relearned". Brookings Papers on Economic Activity 1 (1995): 119-220.

Fondo Monetario Internacional (FMI): http://www.imf.org.

Banco de Mexico (Banxico): http://www.Banxico.org.mx/.

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