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An estimation of the nominal exchange rate level that would eliminate the mexican currency misalignment: is it moving in the right direction in 2025?

Una estimación del tipo de cambio nominal que eliminaría del desalineamiento cambiario del peso mexicano: ¿se está moviendo en la dirección correcta en 2025?

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Abstract

We estimate an approximation of the equilibrium real exchange rate to measure the Mexican currency overvaluation, which is approximately of 25.3% in the first quarter of 2024. The nominal exchange rate level that would return the real exchange rate to its equilibrium level would be $22.77 Mexican pesos per US dollar, in contrast to an average nominal exchange rate of $17.00 observed in first quarter of 2024 and an average nominal exchange rate of $19.51 in the second quarter of 2025. The National Institute of Statistics and Geography (INEGI) changed in 2023 the base year to measure real variables as GDP, private consumption, public consumption and exports from 2013 to 2018 chained pesos. It is essential to estimate the VAR and a VEC models for period 1995Q1-2024Q1 using the new time series provided by INEGI to obtain updated and subsequent estimates of the magnitude and how it changes the Mexican peso overvaluation. The fitted values of the cointegration equation provide us with the approximation of the equilibrium real exchange rate. Although the observed real exchange rate has risen from the local minimum reached in the first quarter of 2024, it is appreciating again starting in the second quarter of 2025. If this appreciation continues, there is a risk of a return to significant exchange rate overvaluation.

Keywords: nominal exchange rate, real exchange rate, VAR-cointegration, Mexican currency misalignment, Mexican peso overvaluation

Resumen

Estimamos una aproximación del tipo de cambio real de equilibrio para medir la sobrevaluación de la moneda mexicana, la cual es de aproximadamente 25.3% en el primer trimestre de 2024. El nivel de tipo de cambio nominal que regresaría al tipo de cambio real a su nivel de equilibrio sería de $22.77 mexicanos pesos por dólar estadounidense, en contraste con un tipo de cambio nominal promedio de $17.00 observado en el primer trimestre de 2024 y con un tipo de cambio promedio de $19.51 en el segundo trimestre de 2025. El Instituto Nacional de Estadística y Geografía (INEGI) cambió en 2023 el año base para medir variables reales como el PIB, el consumo privado, el consumo público y las exportaciones de precios constantes de 2013 a precios constantes de 2018. Es esencial estimar los modelos VAR y VEC para el periodo 1995T1-2024T1 utilizando las nuevas series de tiempo publicadas por el INEGI para obtener estimaciones actualizadas y posteriores de la magnitud y de cómo cambia la sobrevaluación del peso mexicano. Los pronósticos por la ecuación de cointegración proporcionan la aproximación del tipo de cambio real de equilibrio. Aunque el tipo de cambio real observado ha subido desde el mínimo local alcanzado en el primer trimestre de 20024, a partir del segundo trimestre de 2025 se está apreciando nuevamente. De mantenerse dicha apreciación se corre el riesgo de regresar a una sobrevaluación cambiaria considerable.

Palabras clave: tipo de cambio nominal, tipo de cambio real, VAR-cointegración, desalineamiento de la moneda mexicana, sobrevaluación del peso mexicano

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INTRODUCTION

The Mexican GDP fell 8.4% in 2020 with respect the previous year, while the inflation rate remained low, reaching a minimum of 2.1% (annual rate) in April in that year. At the beginning of 2021, Banco de México reacted decreasing its objective nominal interest rate to 4.0% and kept it in that level from the 12 of February till the 24 of June of 2021. However, inflation picked up in Mexico -as in many other countries- in the second half of 2021[1]. Banco de México started increasing its objective nominal interest rate to curb inflation by the end of June 2021, around three quarters earlier than the FED did. The lack of synchronization between the monetary policies between those two central banks provoked by the delay of the FED in recognizing that inflation was becoming a serious problem caused that the interest rates differential widens. The lowest interest rate differential was around 3.9 percentage points, from February 18 to June 22, 2021. Since this last date, only the Bank of Mexico had uniquely increased its objective nominal interest rate until the 24 of February 2022. The interest rate differential had reached 5.9 percent at this date. Starting on March 19, 2022, the FED tightened its monetary policy and then both central banks alternated increases in their respective interest rates until May 10, 2023, when the Bank of Mexico increased its objective interest rate for the last time that year. In this period of alternating increases, the interest rate differential reached a maximum of 6.4 percentage points. In the second half of 2023, inflation rates began to slow in both countries: in July and October for the United States and Mexico, respectively. The increased in the interest rate differential from 3.9 to 6.4 per cent points caused an accelerated appreciation of the Mexican peso: from around MXN $20.0 per dollar when Banco de México began to tighten its monetary policy, to below MXN $17.0 by mid-April 2024. This caused the appreciation of the real exchange rate (RER). However, appreciation of the RER does not necessarily mean overvaluation because the latter is determined by the difference between the observed RER and the equilibrium real exchange rate (ERER). The problem with the ERER is that it is a "moving target", as it recognized by Gil Díaz y Carstens (1996: 11). Another reference that the ERER is a moving target is provided by Harberger (1996: 44-45), who pointed out that the ERER for Mexico changed from its previous level in September to a new level in November 1993, when the U. S. Congress approved NAFTA. Again, the ERER changed twice because of the capital outflow registered in April and in December 1994. This exemplifies how the ERER can change quickly. Both the ERER and RER are moving in time, and the overvaluation (or undervaluation) estimates result from the comparison between them. For this reason, we must support how the ERER is obtained. We decided to choose the cointegration approach to identify the ERER through the cointegration equation, as it will be discussed in the review of the literature.

As both the nominal and the real exchange rates appreciates over time, the latter diverts from its long-run equilibrium value. In addition, INEGI change the base year and now it measures Mexican real variables in 2018 chained pesos instead of 2013 chained pesos, as it will be discussed later. The hypothesis of this research is that there is one cointegration equation for the new sample 1995Q1-2024Q1, despite the change of the base year for the Mexican variables.

We consider this estimate very valuable to achieve a triple objective: i) it will allow us to estimate an updated Mexican peso overvaluation; ii) it will allow us to carry out a sensitivity analysis to find out how the base change from 2013 to 2018 chained pesos affected the overvaluation estimates, and iii) it will allow us to identify which is the level of nominal exchange rate consistent with the elimination of the Mexican currency misalignment in the first quarter of 2024. The justification of this new estimate is that Mexico faces a currency overvaluation problem, and it is very valuable to get results that shed light about its current magnitude and if it is getting bigger or smaller. We organize the rest

[1] It was mainly caused by a second quantitative easing program instrumented by the U. S. Federal Reserve Bank (FED). See Figure 1 in Jimenez-Gomez et al. (2023:4898) for more details.

of the paper as follows: a survey is presented in section 2. In section 3, we re-estimate the model of Jiménez-Gómez (2023) with the most recent information available by the time we write this paper. In section 4, we present the currency overvaluation estimations and discuss which would be the nominal exchange level necessary to correct the Mexican peso misalignment. In addition, we discussed the effect of the U. S. dollar weakness that arose since the announcement of the tariffs impositions to many countries on "liberation day". Some concluding remarks are discussed at the end of this chapter.

DEVELOPMENT

Review of the Literature on How Currency Overvaluation Has Been Estimated

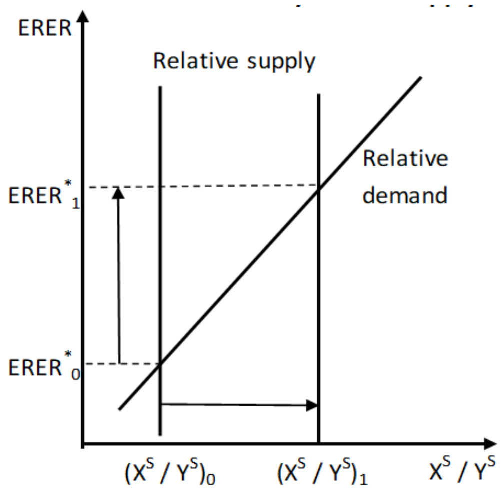
Theoretical Model

The difference between the ERER and the observed RER can be considered as a measure of currency overvaluation or undervaluation. First, we must select a theoretical approach that allows us to identify the ERER. Then we must estimate this "moving target" using statistical techniques. There are already two very good surveys on the determination of the ERER: Hinkle and Montiel (1999) and Lee et al. (2008). These authors propose a classification of the different approaches. For example, Montiel and Hinkle (1999: 4) classify the models according to the methodologies that are used to obtain an estimation of the ERER: i) models of trade, ii) computable general equilibrium models, iii) Purchasing Parity Power (PPP), and iv) econometric estimates, that commonly use time series with unit roots and try to estimate cointegration vectors. In this chapter, we follow the time series approach to estimate the ERER according to the theoretical model of Stockman (1987) and Krugman et al. (2012)[2]. According to these authors, the ERER is identified where the relative supplies and demands of two countries intersect. In present case, the first curve is defined as the supply of Mexico relative to the supply of the U. S., while the second curve is the demand of Mexico relative to the demand of the U. S.

[2] Stockman expresses his original model in terms of indifference curves, while Krugman et al. (2012) expresses the Stockman original model in terms of relative supplies and demands.

Graphic 1

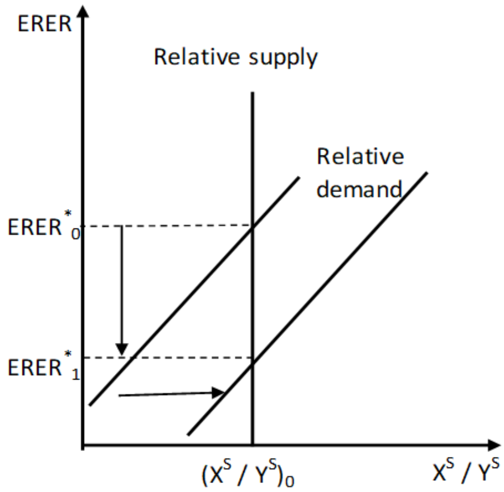
Equilibrium real Exchange rate: An increase of the domestic country relative supply



Source: Krugman et al. (2012, 420)

Graphic 2

Equilibrium real exchange rate: An increase of the domestic country relative demand



Source: Krugman et al. (2012, 420)

In Figure 1, we represent the case of an increase in the ratio Mexican supply / U. S. supply. The economy is initially at ERER0 and that the supply of Mexico grows more than the supply of the U. S. keeping the relative demand without change, then the relative supply shifts to the right and the new equilibrium level will be ERER1. The ERER depreciates because the price level in Mexico increases less than the corresponding variable in the U. S. because of a larger supply expansion in the former country´s supply than of the latter. In figure 2, we represent an increase in the ratio Mexican demand / U. S. demand. Initially, the economy is at ERER0 and if the demand in Mexico increases more than the demand in the U. S., keeping the relative supply constant, then the relative demand moves to the right, being ERER1 the new equilibrium level. As the Mexico´s price level increases more than the one in the U. S. because of a larger expansion in the demand of the domestic country than of the foreign country.

Estimates of Currency Misalignment for Mexico

These estimates can be classified if the prevailing exchange rate regime was fixed and currency band or flexible. In the first group we find a lot of currency misalignment estimations for several years: Zedillo (1992: 36), Solís (1996: 87), Elbadawi and Soto (1997, 102), Dornbusch and Werner (1994: 286) and Montiel (1999: 259). For 1982 and 1994, some authors estimated the largest currency overvaluations. In the second group there are few currency misalignment estimations: Carrera et al. (2021: 71), Galindo and Guerrero de Lizardi (2001: 8), González-García et al. (2022, 148), Jiménez-Gómez (2023: 187), and Jiménez-Gómez et al. (2023, 4914).

For this period the largest currency undervaluation was estimated for 1995 and no serious persistent overvaluation was detected. We must emphasize that the 2023 information was the latest for the most recent studies.

Estimates for Other Countries

As we will review, the concern of estimating currency misalignments is widespread among researchers, mainly in developing countries. Nassif, et al. (2011, 8-11) consider the RER as a function of long-term variables. These authors find statistically significant the estimated coefficients associated to the level of international assets, the Brazil´s risk premium, the difference between domestic and foreign interest rates, the current account and the gross domestic product per capita. The authors identify a currency overvaluation around 80% in April 2011. García-Solanes and Torrejón-Flores (2013, 10) consider a non-tradable and tradable goods model, highlighting total factor productivity. According to the Balassa-Samuelson approach, countries that register more accelerated productivity growth rates in the tradable sector will have an appreciating real exchange rate over time.

García-Solanes and Torrejón-Flores (2013, 14) estimate using a panel data model that real exchange rate for Spain was overvalued around 28% in 2008. Villegas et al. (2013) estimate a cointegration vector and an error correction model for Venezuela for the period 1999-2010 and they find a stable relationship between the RER, and the degree of openness, terms of trade, aggregate productivity, government expenditure and capital flows in the long run. Based on their work, these authors find periods of overvaluation and undervaluation in Venezuela. Such exchange rate misalignment tends to persist. Cheung and Fujii (2014, 94) regress the real exchange rate in terms of the real per capita income of a country relative to the corresponding U. S. variable and a stochastic error. The estimated residual ($\hat{\mu}_t$) indicated overvaluation if it is positive or undervaluation if it was negative. They find the currencies of BRIC countries were undervalued in 2005 with respect to the U. S. dollar. On the other hand, Tashu (2018) studies the ERER in Peru following the cointegration approach. Based on his results, this author argues that the ERER of Peru is mainly driven by government expenditure and productivity. He concludes that the Peru´s currency -the sol- is not a commodity currency because the prices of the raw materials for export do not have a statistically significant impact on its real effective exchange rate. González-Sánchez (2020) estimate an ARDL model following the Behavioral Equilibrium Exchange Rate (BEER) methodology for Dominican Republic for the period 1996-2020. The author uses the gross capital formation, terms of trade and public consumption.

The author concludes that: “For 2019 the average total misalignment was 0.8%, maintaining the same trend during the first quarter of 2020, this suggests the need for a slight real appreciation and is indicative that the RER is practically in equilibrium”, González-Sánchez (2020: 14). These references represent examples of how the ERER can be estimated as a previous step to identify a currency misalignment and using time series with unit roots is a very popular method among researchers.

Estimating of the Equilibrium Real Exchange Rate (ERER) with Updated Information: Mexican Variables in 2018 Chained pesos

Jiménez-Gómez (2023) estimated the theoretical model of Stockman (1987) and Krugman et al. (2012) for the period between the first quarter of 1995 and the first quarter of 2021 and no currency misalignment problem was detected. Jiménez-Gómez et al. (2023) re-estimated the previous model using updated information till the first quarter of 2023 and a currency overvaluation of 9.8% was estimated. In both cases, the series for the Mexican variables were in 2013 chained pesos. But the National Institute of Statistics and Geography (INEGI) decided to change the base year used to measure the GDP and the aggregate demand variables. The base years used previously were: 1993, 2003 and 2013, which suggests that the base year is changed every ten years. This indicates that INEGI would have changed the base year when they had all the necessary information for 2023. However, the INEGI went ahead to change the base year, choosing 2018 instead of 2023, which is inconsistent with what has been done in the last 30 years. For this reason, the models and estimates quoted at the beginning of this section became obsolete. Therefore, any update to the model and its estimates from the second quarter of 2023 onwards must be done using a completely new series for the Mexican GDP and for the sum of private and public consumptions, and exports, in chained pesos of 2018.

The approximate variables for Mexico and the U. S. supplies are GDP (Y: chained pesos of 2018) and the Industrial Production Index (IPI: 2017=100), respectively. The approximate variables for Mexico and the U. S. demands are private consumption, public consumption and exports for the first country (CGX: chained pesos of 2018) and real fixed private investment (RFPI) for the second one. The RER is calculated multiplying the nominal exchange rate (Mexican pesos for one U.S. Dollar) times the U. S. Consumer Price Index divided by the Mexican National Consumer Price Index. We use the natural logs of these variables to estimate the new model. The data was obtained from the Banco de México, INEGI and St. Louis FED[3]. E-views is the statistical software we use to estimate the VAR and the VEC models and to perform the statistical tests.

[3] www.banxico.org.mx, www.inegi.org.mx and www.stlouisfed.org are the web pages, respectively.

Unit Root Tests

Table 2

Unit root test for RER, Y, IPI, CGX and RFPI. Sample: 1995 1st quarter – 2024 1st quarter

Variables in levels	Specification 1	Augmented Dickey-Fuller			Phillips-Perron		
		Lags	Statistic	p-value	Bandwidth	Statistic	p-value
RER	I	0	-2.51	0.12	2	-2.56	0.10
Y	I	3	-2.51	0.12	5	-1.80	0.38
IPI	I and T	0	-2.96	0.15	5	-3.00	0.14
CGX	I	4	-2.12	0.24	9	-1.91	0.33
FPI	I and T	1	-1.53	0.51	7	-1.44	0.56
Variables in differences	Specification 1	Augmented Dickey-Fuller			Phillips-Perron		
		Lags	Statistic	p-value	Bandwidth	Statistic	p-value
RER	N	0	-9.98	0.00	4	-9.98	0.00
Y	I	2	-9.51	0.00	3	-17.15	0.00
IPI	I	0	-11.30	0.00	5	-11.30	0.00
CGX	N	3	-4.65	0.00	8	-16.10	0.00
FPI	I	0	-5.88	0.00	3	-5.89	0.00

1 I means intercept, T linear trend and N nothing.
2 Significative 5%.

Source: own elaboration.

The augmented Dickey-Fuller and the Phillips-Perron tests have as a null hypothesis that the variable has a unit root. If a variable is tested in levels and the null hypothesis is not rejected, and subsequently the test is repeated on the same variable but now in differences and the null hypothesis is rejected, then we can say that the variable is integrated of order one [I (1)]. The obtained results allow us to identify the five variables as integrated of order one, therefore, we can continue with the VAR model estimation. The VAR is estimated with 6 lags as in Jiménez Gómez et al. (2023). We also incorporate three dummy variables in 2008Q4, 2009Q1 and 2020Q2 because of the Great Recession and the SAR-COV-2 pandemic seriously affected macroeconomic variables of both countries. The statistical results are reported in Table 3.

Johansen Cointegraton Test

According to Juselius (2006: 132), Johansen (1991, 1995) cointegration test discriminates between those eigenvalues which correspond to stationary relations and those which correspond to non-stationary relations.

Table 3

Johansen integration test. Sample: 1995 1st quarter – 2024 1st quarter

Table 2
Johansen cointegration test
Sample: 1995 1st quarter - 2024 1st quarter

i) Cointegration test					
Eigenvalues	0.35	0.18	0.15	0.03	0.01
Null hypothesis	rank = 0	rank ≤ 1	rank ≤ 2	rank ≤ 3	rank ≤ 4
λ trace statistic	92.95	**46.11***	23.66	5.23	1.52
Critical values (95%)	69.82	47.86	29.80	15.49	3.84
P-value	0.00	0.07	0.22	0.78	0.22
λ maximun eigenvalue statistic	46.84	**22.45***	18.44	3.70	1.52
Critical values (95%)	33.88	27.58	21.13	14.26	3.84
P-value	0.00	0.20	0.11	0.89	0.22
ii) Cointegration vector and adjustment coefficients (Johansen)					
Variables	RER	Y	IPI	CGX	FPI
Normalized cointegration coefficient:	1.00	55.20	-114.81	-16.62	9.48
(standard error)		52.89	23.22	34.42	8.68
Adjustment coefficients	0.00	0.00	0.00	0.00	0.00
(standard error)	0.00	0.00	0.00	0.00	0.00
iii) Specification tests					
Trace correlation		Test statistic			
		0.58			
Normality		Test statistic			p-value
Jarque-Bera		2.71			0.99
Skewness (Chi-sq)		2.26			0.81
Kurtosis (Chi-sq)		0.45			0.99
Heteroscedasticity		Test statistic			p-value
White (no crossed terms, 945 d. of f.)		999.19			0.11
Serial correlación LM		Test statistic			p-value
Null hypothesis: no serial correlation from lags 1 to h					
lag "h"	3	4	5	6	7	8
Rao F Statistic (p-value)	1.2 (0.186)	1.1 (0.270)	1.0 (0.475)	1.1 (0.220)	1.1 (0.182)	1.3 (0.066)

* Trace and Max-eigenvalue test indicate 1 cointegration equation at the 0.05 level.
Source: Own elaboration.

Source: own elaboration.

The first null hypothesis is that there is not a cointegration vector and in this case, it is rejected because both the trace and the maximum eigenvalue statistics are larger than their critical values. Then the subsequent null hypothesis is that there is just one cointegration vector which is not rejected at the 95% confidence because both the trace and the maximum eigenvalue statistics are smaller than their critical values. The estimated coefficients of the cointegration vector have the signs predicted by Stockman (1987) and Krugman et al. (2012). The sign of the adjustment coefficient corresponding to the RER is negative, which means that if this variable is out of its long run equilibrium, then the RER will tend to return to it. We use the trace correlation as a measure of goodness of fit, which is 0.58 in this case. Finally, the diagnostic tests reveal that the assumptions about errors are fulfilled.

Estimated Parameters Constancy Tests

We use the likelihood ratio logarithm calculated recursively to test the constancy of the estimated parameters following a bias-corrected test statistic (Juselius, 2006: 152). The test statistic formula is:

$$Q_T^{Corr}(t_1) = \frac{t_1}{T}\sqrt{\frac{T}{2p}}\left[\left\{log\left|\hat{\Omega}_{t1}\right| - log\left|\hat{\Omega}_T\right|\right\} + \frac{1}{T}\left\{\left(\frac{1}{2}p(1-p) + r + p(k-1) + 1\right)\left(1 - \frac{t_1}{T}\right)\right\}\right]$$

Where:

$\hat{\Omega}_T$ is the covariance matrix of the errors obtained by the estimation using the complete subsample, in this case from 1995q1 to 2023q3.

$\hat{\Omega}_{t1}$ is the covariance matrix of the errors obtained by the estimation using a just a part of the subsample, which changes as t_1 runs.

t_1 is the time index that runs to enlarge the part of the subsample.

T is the full subsample size.

p is the number of variables.

r is the number of cointegration vectors.

k is the number of lags in the variables in levels.

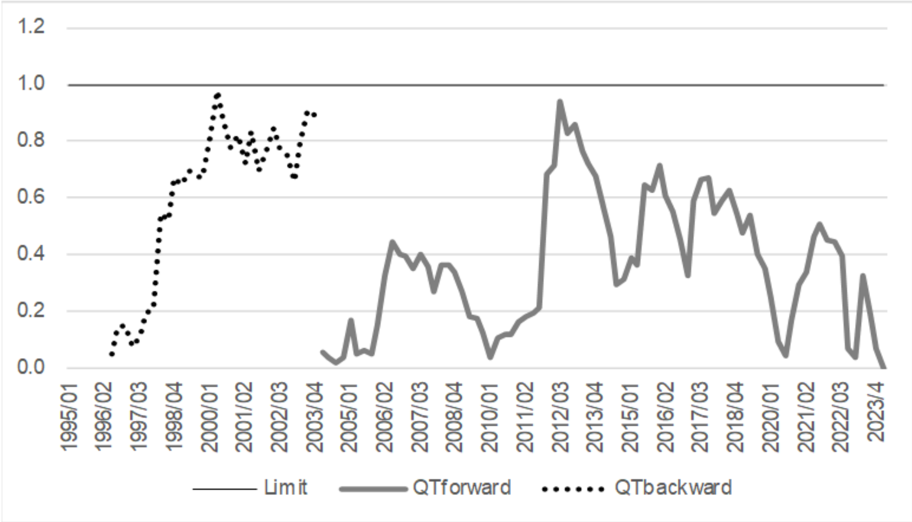
If the sample increases forward, we get the statistic estimating the R-model for the periods 1996q3 – 2004q1, then 1996q3 – 2004q2, and so on until we use the full sample: 1996q3-2024q1. If the sample increases backwards, we get the test statistic estimating the R-model for the periods 2004q1-2024q1, 2003q4-2024q1, 2003q3-2024q1 and so on until we use the full sample: 1996q3-2023q3. We can plot the test statistic as the size of the sample increases forward (or backward) in Figure 3. The values of this test statistic are lower than 1.0, which provides some evidence that there was no structural change within the sample[4]. The next step is to estimate the vector error correction model (VEC), whose results are in Table 3[5].

[4] See Juselius (2006: 152) for details

[5] The dummy variables already incorporated in the VAR model are also in the VEC model but in differences. In addition, we incorporate dummy variables in differences for 2009Q3, 2023Q3 and 2023Q4. We also include a dummy variable 2024Q1

Graphic 3

Recursive tests of constancy of the estimated coefficients in the Co-integration vector Q_T^{Corr} (t^1), forward and backward. 1995Q1 – 2024Q1



Source: own elaboration.

The cointegration equation is identified in the first row. We use this equation to obtain $ERER = \widehat{RER}$. From the tests in the second section of Table 3, we can see that all the estimated coefficients in the cointegration equation are statistically significant. From the tests reported in the third section, the RER can be considered as a "reaction" variable because its estimated adjustment coefficient is statistically significant. On the other hand, Y, IPI, CGX and FPI are "push" variables because their adjustment coefficients are not statistically significant. The VEC model fulfills the assumptions of normality, homoscedasticity and no serial correlation of errors as we can see in the last section of Table 4.

Vector Error Correction Model and Diagnostic Tests

We can estimate ΔRERt as a function of the differences of RER, Y, IPI, CGX and RFPI including 1 to 5 lags and the error correction term using Ordinary Least Squares because all the variables are stationary. The results are presented in Table 4. We start with the same dummy variables in differences incorporated in the VEC model. We follow "from the general to particular approach" to estimate the specific VEC model for our variable of interest. We perform the redundant variable test to find out if a group of coefficients are not statistically significant. If the null hypothesis that the group of coefficients are statistically equal to zero is not rejected, the group of variables can be removed from the model. We repeat this procedure until no further group of variables can be removed. The results are presented in Table 4.

Table 4

Vector error correction model, cointegration equation, and weak exogeneity and diagnostic tests. Sample: 1995 1st quarter – 2024 1st quarter

i) Cointegration equation and adjustment coefficients						
Variables	RER	Y	IPI	CGX	FPI	Constant
Normalized Coint. Coef.	1.00	-3.94	3.98	1.70	-0.97	23.49
Stardard error		0.49	0.22	0.32	0.08	
t statistic		-8.05	18.24	5.37	-11.77	
Adjustment coefficients	-0.35	0.08	-0.06	-0.02	0.00	
Stardard error	0.13	0.05	0.03	0.06	0.04	
t statistic	-2.63	1.63	-1.82	-0.33	0.07	
ii) Cointegration equation coefficients significance tests						
Variables	RER	Y	IPI	CGX	FPI	
$\chi 2_{(1)}$	**6.75**	**6.73**	**6.55**	**5.73**	**6.70**	
p-value	0.01	0.01	0.01	0.02	0.01	
iii) Weak exogeneity tests						
Variables	RER	Y	IPI	CGX	FPI	
$\chi 2_{(1)}$	**5.03**	3.05	2.28	0.13	0.00	
p-value	0.02	0.08	0.13	0.72	0.96	
iv) Specification tests						
Normality			Test statistic			p-value
Jarque-Bera			11.39			0.33
Skewness			7.96			0.16
Kurtosis			3.43			0.63
Heteroscedasticity			Test statistic			p-value
White (no crossed terms, 930 d. of f.)			818.66			0.99
Serial correlación LM			Test statistic			
Null hypothesis: no serial correlation from lag 1 to lag "h"						
lag "h"	3	4	5	6	7	8
Rao F statistic (p-value)	1.2 (0.116)	1.0 (0.492)	1.0 (0.440)	1.0 (0.392)	1.2 (0.143)	1.1 (0.183)

Source: own elaboration.

Vector Error Correction Model Specific to ΔRER and Diagnostic Tests

The ECM specific to the RER has few variables. Only ΔRERt-1, ΔYt-1 and ECTt-1 remain in the final model. This implies that the influence of the other three variables (IPI, CGX and RFPI) on ΔRERt is through the error correction term. The number of dummy variables is reduced from seven to five. The dummy variables in differences for 2008Q4, 2009q1 and 2002q2 remain from the VAR model. We add a dummy variable in differences for 1995Q4 and a dummy variable for 2024Q1. The specification tests reveal that the classical assumptions about errors are fulfilled.

Table 5

Error correction model specific for ΔRER_t, 1995 1st quarter – 2023 3rd quarter

Variable	Estimated coefficient	Standard error	t or F statistic	p-value
ECT_{t-1}	-0.12	0.04	-2.84	0.01
ΔRER_{t-1}	0.34	0.08	4.20	0.00
ΔY_{t-1}	-0.23	0.10	-2.32	0.02
C	0.00	0.00	0.74	0.46
DDV 1995Q4	0.10	0.02	4.10	0.00
DDV 2008Q4	0.14	0.03	4.83	0.00
DDV 2009Q1	0.15	0.03	5.91	0.00
DDV 2020Q2	0.15	0.03	5.91	0.00
DV 2024Q1	-0.08	0.04	-2.28	0.02
R^2			0.46	
R^2 ajusted			0.42	
Standard error			0.03	
Jarque-Bera			0.13	0.94
Skewness			0.08	
Kurtosis			3.02	
Breusch-Godfrey LM F(5, 101)			1.53	0.19
White Heteroscedasticity F(8, 106)			0.40	0.92

Source: own elaboration.

Estimate of the Overvaluation of the Mexican Peso

We use the estimated cointegration equation reported in Table 3 to obtain the fitted value of the RER that we consider as the ERER and it is represented in equation (1).

$$ERER_t = \widehat{RER}_t = 3.94Y_t - 3.98IPI_t - 1.70CGX_t + 0.97RFPI_t - 23.49 \qquad (1)$$

Mexican Peso Overvaluation Estimation and the Level on the Nominal Exchange Rate that eliminates the Currency Misalignment

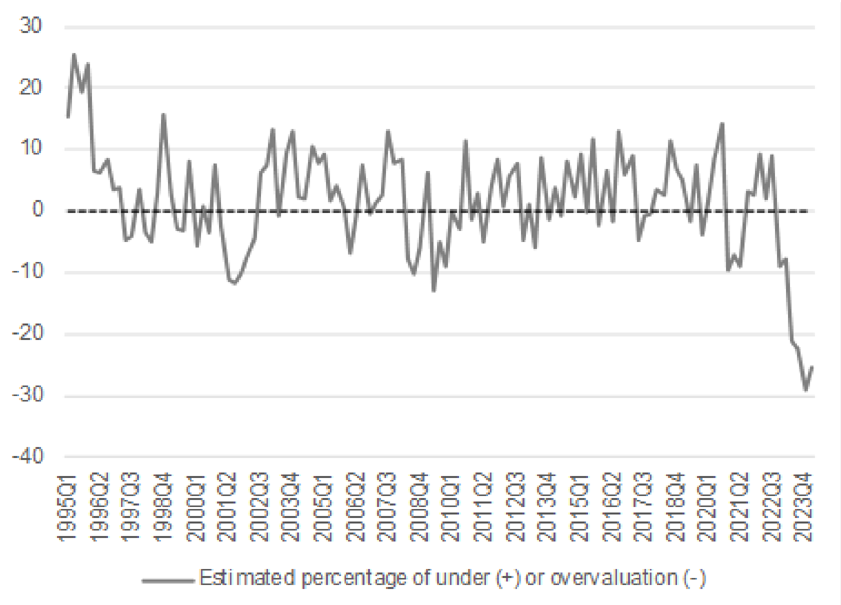
The percentage deviation of the RER with respect to ERER[6] is our calculation of the overvaluation of the Mexican peso. In this way, we use equation (1) to calculate an overvaluation of the Mexican currency of 25.3% in first quarter of 2024 (see Figure 4). The current Mexican peso misalignment started in the last quarter of 2022 (-8.9%) and the first quarter of 2023 (-7.8%), however the overvaluation more than doubled in the next two quarters: second and third quarters of 2023 with -

[6] Already in levels and not in natural logarithms.

21.3 and -22.4%, respectively. In the last quarter of 2023, the currency misalignment reached a maximum estimated overvaluation (-29.1%) since the flexible exchange rate regime was adopted in 1995, according to this estimation. The Mexican currency misalignment observed in the first quarter of 2024 is very similar in magnitude (but with an opposite sign) to the one observed in the second quarter of 1995, when the RER reached its maximum level because of the "overshooting", after the abandonment of the currency band for the Mexican peso in December 1994.

Graphic 4

Estimated percentage of undervaluation (+)/overvaluation (-) of the Mexican currency. Sample 1995Q1 – 2024 Q1



Source: own elaboration.

According to Nassif, et al. (2011, 5), the increase in the interest rates differential between Mexico and the U. S. and the expectations of the nominal exchange rate appreciation caused flows of foreign short-term capital. However, these capital flows can stop and even begin to leave Mexico suddenly. Sooner or later, the nominal exchange rate will depreciate to undo the overvaluation. Under the assumption that the nominal exchange rate is the only variable that adjusts so that the RER returns to its equilibrium level, we calculate that the exchange rate would depreciate to MXN $22.77 per dollar. In addition to this depreciation, we must add the "overshooting" as well. Capistrán et al. (2017, 22) found evidence of "… the existence of an overshooting in the Mexican exchange market...". In this way, when the nominal exchange rate adjusts, we expect it will situate temporarily above our estimation. An adjustment of such magnitude will represent an important shock to the Mexican economy.

Comparison to other authors´ estimations

This overvaluation estimation is not directly comparable with those in Jiménez-Gómez (2023, 187) and Jiménez-Gómez et al. (2023, 4914) mentioned in the survey. The reason is that the supply and demand variables for Mexico are in 2013 chained pesos in the former studies, while in the present research those series are in 2018 chained pesos. For this reason, it is important to identify to what extent the estimates for the overvaluation differ between each other depending on if the Mexican real variables in the model are in 2013 or in 2018 chained pesos.

The last four observations of the model estimated in Jiménez-Gómez et al. (2023) (from the 2nd quarter of 2022 to the 1st quarter of 2023) are compared with the same observations of the present model. This comparison is reported in Table 5.

Both models point out that the overvaluation problem began in the fourth quarter of 2022. The estimates of the ERER and those of the nominal exchange rate of the two models do not differ much. The difference in the nominal exchange rate which is consistent with the ERER is no larger than 40 Mexican cents. This comparison suggests that the Mexican peso misalignment estimation is not seriously affected by using series for Mexican variables in 2013 or in 2018 chained pesos. The estimates of the latter model are more conservative, calculating lower nominal exchange rates.

Table 6

Estimated equilibrium exchange rates using Mexican real series in 2013 and 2018 chained pesos

Estimated equilibrium real exchange rates using Mexican real series in 2013 and 2018 chained pesos

	Model estimated with Mexican real series in 2013 chained pesos.			Model estimated with Mexican real series in 2018 chained pesos.			
	Equilibrium real exchange rate	Currency misalignment overvaluation (-) undervaluation (+)	Nominal exchange rate consistent with the ERER	Equilibrium real exchange rate	Currency misalignment overvaluation (-) undervaluation (+)	Nominal exchange rate consistent with the ERER	Difference in the nominal exchange rate consistent with the ERER
			(a)			(b)	(a)-(b)
2022Q2	48.2	0.4	20.0	47.4	2.0	19.7	0.3
2022Q3	45.4	6.8	19.0	44.5	9.0	18.6	0.4
2022q4	52.0	-10.4	22.0	51.1	-8.9	21.6	0.4
2023Q1	48.7	-9.8	20.7	47.6	-7.8	20.3	0.4

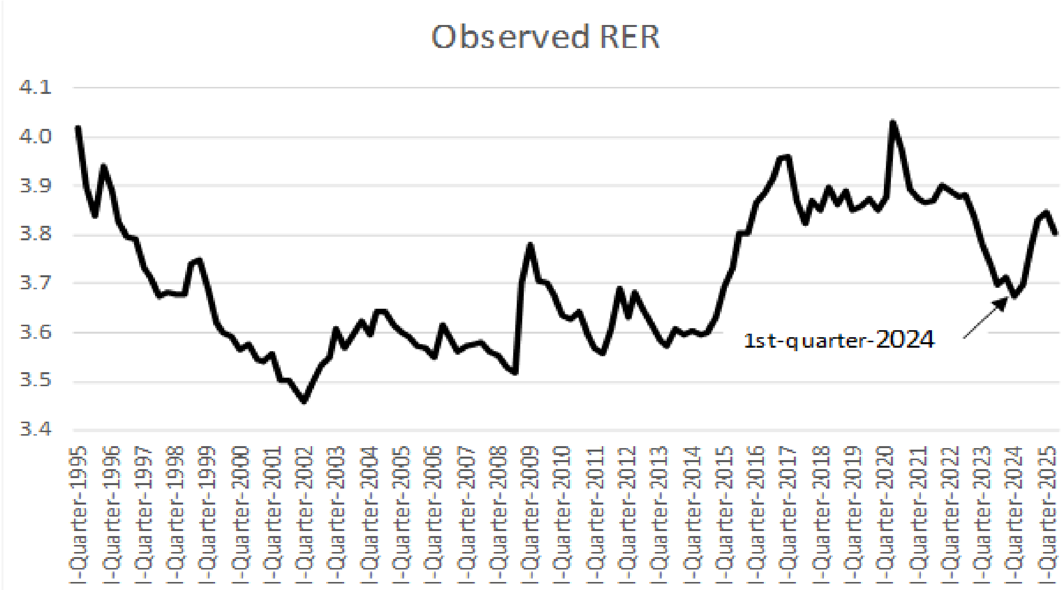
Source: own elaboration.

Evolution of the Observed Real Exchange Rate and Recent Events

In December 2024, Banco de México´s objective interest rate was 10.0% and since then it has decreased to 7.75% by the end of August 2025, despite the FED stop decreasing its interest rate because of the inflation risks that emerge as a result of the tariffs impositions by the Trump administration. One possible explanation is that the annual inflation reached 3.5% in July 2025, hence Bank of Mexico decreased its interest rate. An alternative explanation is that Banco de Mexico made this decision to reduce the interest payments of the internal debt, which grew considerably to finance the public deficit mentioned above. The reduction in the interest rate differential is not risky because the dollar has weakened as a result of the U. S. government´s tariff policy. The U. S. dollar depreciation has made possible to decrease the Mexican interest rate and the interest rate differential, however, this depreciation has provoked that the observed RER started appreciating again in the second quarter of 2005, which makes it even more difficult to eliminate the Mexican peso´s overvaluation.

Graphic 5

Observed real exchange rate



Source: own elaboration with data of Banxico, INEGI and FED Saint Louis.

CONCLUSION

We have estimated a new empirical model with updated information until the first quarter of 2024 and incorporated the series for the Mexican GDP, private consumption, government consumption an exports expressed in 2018 chained prices. We estimated that the Mexican real exchange rate is overvalued 25.3% in the first quarter of 2024. We also estimate that the nominal exchange rate consistent with the equilibrium real exchange rate in the first quarter of 2024 is approximately MXN $22.77 per dollar. The Mexican peso overvaluation reached a local maximum at the first quarter of 2024, and since then the observed RER has been depreciating which is consistent with the elimination of the currency misalignment, but the U. S. dollar weakness has made that the observed RER started appreciating again in the second quarter of 2025. If the U. S. dollar weakness persists, then the Mexican peso´s overvaluation will tend to persist too, becoming another obstacle to Mexican exports that are sent to the U. S. economy.

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