Exchange Rate and Purchasing Power Parity in Mexico

ALEJANDRO MACÍAS MACÍAS*

In 1989, Mexico intensified the structural reforms initiated seven years earlier. This move represented an attempt to cope with changed economical conditions and to recover from the economic crisis suffered by the country since 1982. The Mexican economy began to turn abroad for its main source of funds to finance development. Foreign markets were, to a large degree, substituted for domestic markets. A number of legal reforms and political decisions were instituted to increase Mexico’s economic contacts abroad.

These changes increased the importance of the statistical variables used to understand international economic relations. One of these is exchange rate, which has always been a key element in assessing economic stability or instability. In 1994 the new Mexican economic model fell into what was considered the first major crisis of the new international financing economy. Much has been written regarding the supposed importance of overvaluation of the peso with respect to the dollar as one of the causes of the major imbalance in the current account balance and consequence of the 1994–1995 crisis.

It has been calculated that the peso was overvalued by some 30%, using 1989 as the base year and applying differentials based on Mexican and U.S. inflation (purchasing power parity technique). This was the calculated overvaluation rate, even though the band of flotation had increased by about 15% from January to November 1994, according to then President Carlos Salinas.¹ The current account balance deficit was also showing worrisome figures for the third year in a row. By 1994 it had risen to $29.662 billion, 6.5% of the gross domestic product (GDP) for the year (at an average exchange rate of 3.137 pesos to the dollar). From the point of view of the Salinas government, however, this overstated the overvaluation of the peso. Moreover, overvaluation did not exercise a controlling influence on the balance of payments, for exports continued to grow at an annual rate of 30%.² Former president Salinas argued:

A narrow view of consumer price differences between Mexico and the United States [in 1994] might have led an uninformed observer to conclude that the peso was overvalued. Nevertheless, taking the costs of "all materials and

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² Ibid.

Ibid.
productivity” into account, in particular labor costs, the results were different [...] it would be hard to claim that the peso suffered from overvaluation.\footnote{Ibid.}

In fact, according to Salinas, overvaluation was still calculated at only 15% at the beginning of Ernesto Zedillo's term of office. This was why the Zedillo government made an initial proposal to widen the margin of exchange.\footnote{Ibid.} In December 1994, however, in response to the troubled economic situation, Zedillo made the decision to devalue the peso by some 35% against the dollar, from 3.55 to 4.80. The obvious consequence of this devaluation, which reached 7.50 pesos per dollar by March 1995, was Mexico's most severe economic crisis in the country's recent economic history.

In 2002, another difficult time for the Mexican economy (although for different reasons), there were also cries that the Mexican peso was severely overvalued against the dollar and that this was hurting the trade balance. An article published in the July 12, 2002 El Financiero said,

> The National Chamber of the Manufacturing Industry (Canacintra) Center for Economic Studies deemed it necessary for the exchange rate to continue depreciating to prevent imported products from becoming cheaper than domestic products and to stop foreign manufacturing from continuing to displace our industry in the domestic market. If the peso falls against the dollar, it will help increase exports, which would stimulate the economy.

The Vicente Fox government has indicated that Mexico's exchange rate is wholly flexible and set entirely by market forces. It would therefore seem somewhat superfluous to speak of overvaluation, because if it existed, these same market forces would push down an overvalued peso. The debate raises some important questions. What does overvaluation of the exchange rate mean, and what forces does it involve? How can overvaluation of one currency with respect to another be measured? Why is there disagreement about whether the peso is currently overvalued? Is an overvalued peso currently disturbing Mexican foreign trade as the Canacintra claims?

These are the questions which we attempt to answer. We begin with a theoretical analysis of the parity purchasing power (PPP) model. This is the most commonly used model for determining the real exchange rate of a currency, and hence for defining whether it is over or undervalued. The strengths and weaknesses of the method are identified, showing why it is nevertheless a valid method for analyzing changes and patterns in the exchange rate.

In the following section, the real exchange rate in Mexico is defined, as a first step to determining the extent of overvaluation. We assess whether the current nominal exchange rate has an influence on Mexican foreign trade.

\footnote{Ibid.}
PURCHASING POWER PARITY MODEL

In an environment as globalized as Mexico's, defining the relationship between the nominal and real exchange rates is a basic aspect of analyzing exchange rate fluctuations and their repercussions on economic variables.

The nominal exchange rate (E) is defined as the ratio at which two currencies are traded at a particular time. A country can adopt an exchange rate regimen ranging from flexible, where the market sets the rate, to fixed, in which the official monetary body (in this case the Bank of Mexico) sets the rate and manipulates the currency supply to maintain parity at the level which has been set. Between these two extremes are other regimens requiring more involvement or less on the part of the official monetary body. Table 1 shows the monetary regimes in effect in Mexico since 1957.

The real exchange rate is the rate which should prevail if trade relations between the two countries are to be maintained in equilibrium, given the price movements of the countries involved. Foreign trade is determined by competitive differences in goods and services.

One of the methods most frequently used to define the real exchange rate is called the PPP method. A function of differentials between the two countries in price changes (inflation) is defined. A key element of the model is arbitrage, which may be effected by market participants. When there are price differentials between the same product in two different countries (adjusted for costs such as transportation and taxes), economic actors might buy in the country where the product is cheaper and resell it where it is more expensive. The arbitrage process itself depreciates the currency where the product is expensive and appreciates it in the other country until PPP is again reached.

|---------------------|-------------------------------|------------------------------|-------------------------------|--------------------------|----------------------|-------------------------------|
The method is based on the law of one price. This means that identical goods are sold at the same price without regard to which market they are in, excluding other costs such as transportation and duties, such that arbitrage does not apply.\(^5\) The law follows the equation:

\[ P = E (P_m^*) \]  \[ \text{[1]} \]

where \( P \) = price of the product in local currency, \( P_m^* \) = price of the product in foreign currency, \( E \) = nominal exchange rate (price of a unit of foreign currency in local currency).

Equivalently,

\[ E = \frac{P}{P_m^*} \]  \[ \text{[2]} \]

For example, if a particular product costs one dollar in the United States and 10 pesos in Mexico, and the exchange rate (\( E \)) is 10 pesos per dollar, then the formula shows that the product has the same cost in both countries. This ratio is called the "absolute form of the PPP", and one of its most widely used applications has been the Big Mac index. This index defines a country's real exchange rate in terms of the price of a McDonald's Big Mac hamburger. McDonald's operates in 120 countries.\(^6\)

In the real economy, however, many different goods and services should be considered in defining the real exchange rate. The absolute form of the PPP does not apply at all, for the weighting of each product is a function of the tastes and preferences of each country. That is, although the proportional price increase of a product may be the same in both countries, its effect on prices will be greater in the country where its weight is greater.

In this instance, the relative form of the PPP is used:

\[ \Delta E = \frac{\Delta P - \Delta P_m^*}{1 + \Delta P_m^*} \]  \[ \text{[3]} \]

The relative form of the PPP uses price changes—inflation—rather than absolute prices. For example, if during a given period, inflation in Mexico (\( \Delta P \)) were 5\% and in the United States (\( \Delta P_m^* \)) 2\%, then according to Equation 3, the exchange rate of the peso against the dollar (\( E \)) should have fallen by 2.94\% during that period.

\[ \Delta E = \frac{0.05 - 0.02}{1 + 0.02} = 0.0294 = 2.94\% \]


\(^7\) For a derivation of the equation, see Maurice Levi, *op cit*, pp. 264–265.
VALIDITY OF PURCHASING POWER PARITY

A variety of empirical studies\(^8\) have demonstrated that it is unlikely that the PPP will hold in the short term, since there are strong economic forces causing extensive currency fluctuations, such as speculation or external events. These same studies do tend to show, however, that the PPP generally holds in the long term. The validity of the PPP method is confirmed using a regression based on Equation 3:

\[
\Delta E = \beta_0 + \beta_1 \left[ (\Delta P - \Delta P_M^*)/(1 + \Delta P_M^*) \right] + \mu \tag{4}
\]

where \( \mu \) is the error regression term. According to Levi,\(^9\) the PPP method is valid if \( \beta_0 \) approaches zero, \( \beta_1 \) approaches one (since a percentage change in price differences would be similar to a percentage change in exchange rate), and the regression error term (\( \mu \)) is small, or, equivalently, the \( R^2 \) parameter measuring the goodness of fit of the regression is greater than 0.70.


Finally, the regression was performed from 1982 to 2001 using the annual consumer price index; a long-term estimation of the PPP. The results are shown in Table 2.

It can be seen that the PPP does not meet the above conditions for validity in the short term, but does do so in the long term. In the short term, when monthly price indexes are used, although the parameter \( \beta_0 \) does approach zero in the four regressions and the parameter \( \beta_1 \) approaches one in three of the four, the \( R^2 \) values are too low to validate the PPP. The fit is even worse when GDP deflators are used because even the value of the parameter \( \beta_1 \) is far from one.

Nevertheless, when the regression is performed annually for the study period (1982-2001), the validity criteria for the PPP are met satisfactorily. If the years


\(^10\) Up to April.

\(^11\) Up to the first quarter.
with high depreciation are eliminated (1982, 1983, 1986 and 1995), namely the years corresponding to the most recent economic crises in Mexico, and therefore atypical, the estimates are greatly improved, in particular $R^2$ and the margin of error.

One interesting feature is that the exchange rate and inflation variables influence each other, as price differentials should modify the exchange rate, according to the PPP. Changes in exchange rate also affect inflation in a country. It is therefore important to consider the correlation coefficient, which is quite high and demonstrates the close relationship between changes in these two variables, even more than that indicated by the long-term PPP.

### Table 2

**MEXICO: SHORT AND LONG TERM VALIDITY OF PURCHASING POWER PARITY, 1982–2002**

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<tr>
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<tr>
<td>$\mu$</td>
<td>0.1034</td>
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<th>NCPI (annual)</th>
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<tr>
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<td>$R^2$</td>
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<td>Correlation coefficient</td>
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<tr>
<td>$\mu$</td>
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Regression equation: $\Delta E = \beta_0 + \beta_1 \left[ (\Delta P - \Delta P_{*})/(1 + \Delta P_{*}) \right] + \mu$. The nominal exchange rate was used to convert foreign currency.


Figure 1 shows changes in the nominal exchange rate and inflation differentials between Mexico and the United States. Although the curves are not identical, they follow the same trend except in 1982, 1983, 1986 and 1995. It is interesting to note that a substantial depression of the peso is followed by periods in which inflation differentials (basically influenced by Mexico, as the
United States has minimal inflation) overcome depreciation. Besides illustrating the mutual effect the variables have on one other, these represent a period of adjustment for the PPP.

Although these calculations confirm that the PPP has a certain validity in the long term, the validity is not total. Considering the case of Mexico from 1982 to 2001, the exchange rate decreased by 9.96% more than price differentials (although if the data are taken from 1983 on, it decreased 25.88% less). According to the PPP the difference should tend to zero.

One might thus ask what deficiencies in the purchasing power parity model cause it to be less than valid even in the long term. To begin, it should be mentioned that according to Isard,\textsuperscript{12} for the PPP to be entirely correct, at least these three conditions must be met:

1) that every tradable good follows the law of one price;

2) that factors of production have equal prices and that functions of production be the same between countries, so that non-tradable goods (those which do not participate in foreign trade) have the same prices in both countries;

3) that every good receives the same weight in the consumer basket in both countries.

\textsuperscript{12} Peter Isard, \textit{Exchange Rate Economics}, Cambridge University Press, New York, 1995, p.58
These conditions are not, however, met in practice. The first condition would require the economies of both countries to operate in full perfect competition. It is well known that in reality almost all industries operate according to oligopolistic models and manipulate domestic prices, diverging from the law of one price.

Considering the second condition, neither functions of production nor income levels are the same between countries. This causes non-tradable goods not to conform to the law of one price. It has, in fact, been shown that non-tradable goods are more expensive in countries with higher income levels.13

It is also evident that the third condition is not met, because in respect to consumer price indexes, consumer preferences differ between countries, in some cases considerably. The condition is not met with respect to GDP deflators either, as production and volumes of goods and services are quite different between countries.

Although the PPP can not be fully met even in the long term, it is a useful method for identifying differences between the nominal and real exchange rates (derived from short term lack of fit of the PPP) in order to analyze how the rate influences a country’s foreign trade.

**NOMINAL AND REAL EXCHANGE RATES**

In order to define theoretical real exchange rate which should exist at a given moment according to the PPP, the absolute equation is again used; this time not in reference to one product but to a set of products traded in both countries. The price index is used:

\[
E^I = \frac{P^I}{P^{M*}}
\]

where \(E^I\) = nominal exchange rate (local currency per unit of foreign currency); \(P^I\) = price index of the local economy, and \(P^{M*}\) = price index of the foreign economy.

When purchasing power parity is met, the nominal exchange rate \((E)\) is equal to the real exchange rate \((e)\). Thus \(E^I = e^I\). Substituting into Equation 5 gives:

\[
e^I = \frac{P^I}{P^{M*}}
\]

Theoretical real exchange rate \((e)\) at a given moment is the product of the nominal exchange rate in the base year (the year originally meeting purchasing power parity, defined as \(E^B\)) and the index of real exchange rate:

e = E^b e^i \quad [7]

Multiplying both sides of Equation 6 by E and substituting 7 into 8 gives

\[ e^i e = p^i / p^i_M \times e \quad [8] \]
\[ e^i e = p^i / p^i_M \times (E^b e^i) \quad [9] \]

Eliminating terms and reordering, we obtain:

\[ e = E^b p^i / p^i_M \times \quad [10] \]

Theoretical real exchange rate can be determined using Equation 10. The price indexes may be consumer or producer, or indexes derived from the GDP deflator, labor cost indexes or others. In the present study, theoretical real exchange rate is determined using consumer price indexes, GDP deflators and unit labor costs from Mexico and the United States.

Once the real exchange rate has been determined, it is compared with the nominal exchange rate to determine by how much local currency is over or undervalued compared to foreign currency. This quantity is a variable which could influence foreign trade.

The over or undervaluation rate is determined by dividing the real exchange rate by the nominal exchange rate and expressing the result as a percentage. If the rate is positive, it means that the currency is overvalued. If it is negative, the currency is undervalued in comparison to the foreign currency to which it is being compared.

A fundamental aspect in determining theoretical real exchange rate and overvaluation of the nominal rate is the definition of the base period, the period in which the PPP is met. The choice of period may dictate whether local currency is found to be over or undervalued in comparison to the foreign currency, since the price indexes of both countries must be 1 during the base period. Changing the base period will create differences between price indexes.

While the base period is identifiable if the PPP is applied to a single product, the method becomes much more complex when several products are used, due to the disadvantages of the PPP model discussed above. In this case, rather than precisely defining a base period, the period is approximated, assuming that at a given time some of the variables will behave in a given manner. These include:

1) When the trade balance of the country being considered is close to equilibrium, assuming that over or undervaluation of the exchange rate influences exports and imports. If the balance is in equilibrium, it may be assumed that this is so because at that point the nominal exchange rate and theoretical real exchange rate do not differ.
2) When the economy of the country being studied undergoes a significant structural change in a number of policies influencing its international relations. It is assumed that at that point the economy begins a new relationship with other countries and its main variables are reset to zero.

OVERVALUATION OR UNDERVALUATION OF THE NOMINAL EXCHANGE RATE IN MEXICO

Overvaluation or undervaluation of Mexican currency against one or several foreign currencies depends on the percent difference between the nominal and theoretical real exchange rates. In theory, when the local currency is overvalued, it means that Mexican currency is expensive and the foreign currency is inexpensive. Products priced in Mexican currency (domestic goods and services) become expensive while goods priced in foreign currency become less expensive.

This can be seen by considering the earlier example where the exchange rate was 10 pesos per dollar and the same product cost 10 pesos in Mexico and one dollar in the United States. In this case the price of the product in pesos would be exactly the same in Mexico as in the United States:

\[ P_{\text{Mexico}} = 10 \text{ pesos} \]

\[ P_{\text{USA}} = E(P_{M^*}) = 10 \times 1 = 10 \text{ pesos} \]

But now suppose that in the following month the product cost 12 pesos in Mexico and $1.10 in the United States while the exchange rate remained at 10 pesos per dollar. In this case, the price in pesos in the two countries would be calculated as:

\[ P_{\text{Mexico}} = 12 \text{ pesos} \]

\[ P_{\text{USA}} = E(P_{M^*}) = 10 \times 1.10 = 11 \text{ pesos} \]

The consumer would rather buy the product in the United States than in Mexico. This situation is the result of an overvaluation of the peso. Equation 10 demonstrates this:

\[ P (\text{Mexico consumer price index}) = \frac{12}{10} = 1.20 \]

\[ P_{M^*}(\text{United States consumer price index}) = \frac{1.10}{1} = 1.10 \]

\[ E = 10, e = EP/P_{M^*}, e = (10)(1.20)/(1.10) = 10.91, \]

Overvaluation: \( (10.91 - 10)/10 = 9\% \)
In theory, when the exchange rate is overvalued, exports (domestic goods) decrease (being more expensive than foreign products) while imports increase (as they become less expensive), bringing down the trade balance. When local currency is undervalued, the opposite happens.

As mentioned above, in Mexico one of the most important reasons cited as a cause of the 1994 crisis was the high overvaluation of the peso against the dollar. The dollar was too cheap according to the inflation rates of the two countries, lowering the price of imports and making exports more expensive, with the result that the current account trade balance was put out of equilibrium.

To test whether this theory is true, the behavior of the exchange rate from 1989 (when economic liberalization was accelerated) to the early months of 2002 has been analyzed.

The base year used is 1996, because the crisis of 1995 had passed, and price differentials (very high in 1995 due to the crisis) had recovered from the undervaluation caused by the December 1994 devaluation. Moreover, in 1996 levels of real compared to nominal exchange rate were similar to those of 1989, the year in which the Mexican economy changed to an outward focus and the trade balance was closest to zero. Why not use 1989 as the base year? Simply because the some of the data used for the calculations were not available for 1989.

Figure 2 shows the nominal exchange rate and real exchange rate considering price differentials between Mexico and the United States using three different variables a] consumer price indexes; b] GDP deflators, and c] unit manufacturing labor costs.

The real exchange rate is fairly similar whether consumer price index or GDP deflator are used, but the same is not true if labor costs are used. In this case there are significant fluctuations. Nevertheless, even with fluctuations, the trends are similar for the three real exchange rates from 1996 on. In early 2002, they coincide.

From this it may be concluded that regardless of which of the three variables is used, theoretical real exchange rate in the first quarter of 2002 should have been between 13.08 and 13.21 pesos per dollar. The average nominal exchange rate was actually 9.21. The data show that the Mexican peso is quite overvalued; even after the mid-2002 depreciations, which took it to approximately 10.08 pesos per dollar.
Figure 3 shows the overvaluation of the peso from 1989 to 2002 using the three variables described. It can be seen that in early 2002 overvaluation was some 42%, higher even than in December 1994 when it stood at just under 30%.

Does this suggest an imminent depreciation? The amount of overvaluation alone does not answer the question; in any case it is the influence of overvaluation on other macroeconomic variables (especially the balance of payments) that could predict a large-scale depreciation.

Even though the three variables coincide in 2002, and show similar trends, it is clear that fluctuations are greatest when labor costs are used. Evaluations of real exchange rate before 1996 would be quite different using this variable in place of either of the other two. In fact, after 1996, the exchange rate would be undervalued using the labor cost measure, but overvalued using the other two variables.

It may be argued that these wide fluctuations are due to the fact that labor costs in Mexico rise at the end of the year, then return to their normal values. But even using annual averages, Figure 4 shows that up to 2000 labor cost differentials between Mexico and the United States were less marked than
inflation differentials. This reduced the overvaluation of the peso, although it is worth recalling that the figures coincide for the end of 2001 and the beginning of 2002.
EFFECTS OF THE EXCHANGE RATE ON MEXICAN FOREIGN TRADE

As mentioned above, the significance of the overvaluation or undervaluation of the peso against the dollar is its effect on other macroeconomic variables, in particular foreign trade (more than 80% of Mexico's foreign trade is conducted with the United States). An analysis was therefore done to find out whether differentials between theoretical real and nominal exchange rate in Mexico from January 1989 to April 2002 influenced exports and imports. The analysis was carried out by sector and overall. The variables used are consumer price indexes.

Upon calculating the influence of overvaluation on trade balance from January 1989 to March 2002, it would seem, based on Table 3, that there is a moderate influence. While the coefficient $\beta$ has the expected negative sign (the higher the overvaluation, the more negative the trade balance), the $R^2$ value measuring the goodness of fit of the regression is barely 0.60.

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<tr>
<td>$\alpha$</td>
<td>135.51</td>
<td>164.49</td>
<td>193.78</td>
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<td>$\beta$</td>
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<td>-4,868.57</td>
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<tr>
<td>$R^2$</td>
<td>0.60</td>
<td>0.87</td>
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<th>Trade balance (excluding maquiladoras)</th>
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<tbody>
<tr>
<td>$\alpha$</td>
</tr>
<tr>
<td>$\beta$</td>
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<tr>
<td>$R^2$</td>
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a. To March.

Independent variable (overvaluation of peso with respect to dollar).
Equation: $TB = \alpha + \beta_{ov}$.
$TB =$trade balance.
$ov =$overvaluation of peso in relation to the dollar (base 1996).

Nevertheless, as will be demonstrated later, the repercussions of exchange rate on trade balance have been more coincidental than real. In the devaluation of 1995, the trade balance changed from deficit to surplus (particularly because of decreased imports), but this was not repeated in later periods.

It can also be observed that the maquiladora sector (a key element in Mexican foreign trade in recent years) distorts the estimates, as its surplus trade balance does not correspond to an overvaluation in the exchange rate. Rather it is a result of the momentum in the American economy and liberalization of the Mexican economy. A piece of supporting evidence is the fact that
maquiladora exports have dropped considerably since the American recession, which started in late 2000.

When the maquiladora sector is excluded from the calculations, the influence of exchange rate on Mexican foreign trade increases, which does not completely explain the influence of the overvaluation rate. This can be seen in Table 4, which shows the effect broken down into exports and imports.

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<tr>
<th>T</th>
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<td>5 711.86</td>
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<tr>
<td>β</td>
<td>9 034.03</td>
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<tr>
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<td>12 782.79</td>
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<td>R²</td>
<td>0.21</td>
<td>0.89</td>
<td>0.81</td>
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<sup>a</sup> To March.

Independent variable (overvaluation of peso with respect to dollar).

Equations: EXP = α + β<sub>ov</sub>; IMP = α + β<sub>ov</sub>.

EXP = exports; IMP = imports.

The regression is not valid for either exports or imports when the entire study period is considered. However, if the time is divided into two periods; before and after the 1994 devaluation, the R² values increase considerably.

For exports the sign is not in the expected direction. A positive value would imply that an overvalued peso increases exports, the opposite of what theory predicts. It can therefore be concluded that during the study period the main influence on the momentum of exports was trade liberalization in Mexico, as the rate of economic growth in the United States (Mexico's largest buyer) had only a partial effect during certain periods (for example, February 2000 to April 2001). In contrast, during other periods, the increase in exports moved against the current of economic growth in the United States (particularly prior to the 1994 devaluation).

The positive sign for imports is consistent, implying that the more the peso is overvalued, the more imports increase. This shows that the influence of exchange rate on Mexican foreign trade can be seen mostly on imports. Nevertheless, it is important to note that the goodness of fit of the regression decreases considerably when the study period is analyzed as a whole. What does this signify? The answer is that when imports are growing, consistent with increased overvaluation, it appears to be a result more of other economic forces (particularly trade liberalization and growth of the Mexican economy)
than of exchange rate. Were it not so, the $R^2$ value for the entire period would have been significant.

Figure 5 allows the two periods to be clearly identified. If the overvaluation rate had influenced imports, they would have decreased considerably in 1995 (following the massive devaluation of December 1994), when the exchange rate shifted from high overvaluation to undervaluation. Although they did drop, the magnitude of the decrease was small compared to that of devaluation. What was instead observed was a change of ordinate or the height of the regression line (the coefficient $\alpha$) as a result of devaluation. The drop in imports in 1995 was due to the crisis which followed the devaluation rather than to the depreciation in exchange rate. In later periods depreciation occurred in the absence of crisis (November 1995, September 1998, February 2001) and imports, far from decreasing, continued to grow (see Figure 6). But when imports decreased considerably, as in the period following October 2001, overvaluation still continued to grow, confirming that the drop was due to the recession in that period and not to the exchange rate.

**Figure 5** MEXICO: IMPORTS AND OVERVALUATION OF THE PESO, 1989-2000 (MILLIONS OF DOLLARS; PERCENT)

In fact, on calculating the effect of GDP increases in Mexico and the change in imports, it was found that before the December 1994 devaluation these changes had no significant repercussion; trade liberalization had more influence. Following the devaluation, the effect of economic growth on imports
did, however, increase to a striking degree. A regression on real GDP change and overvaluation gave an $R^2$ value of 0.915. The estimate of the coefficient of GDP was 2.807 (a 1% increase in GDP would increase imports by 2.8%), while the coefficient of overvaluation of exchange rate was −0.166; having the opposite sign to that predicted by theory.

To conclude, Table 5 shows the industries disturbed by exchange rate overvaluation. As might be expected, during the period 1991–2002, imports were adversely affected in only five industries (of the 263 INEGI classifications) and these only moderately ($R^2$ between 0.5 and 0.7). When the period is divided, the effects of exchange rate on imports are much greater, but, as mentioned above, this is more a coincidence than a real relationship.

It has already been seen that the effects on exports were slight; in the first period only six industrial classifications were adversely affected by exchange rate, and these represented fewer than 1% of total exports on the average. In the second period only four industries were affected by overvaluation, and these only moderately; a mere 0.33% of exports.
EXCHANGE RATE AND PURCHASING POWER PARITY IN MEXICO

<table>
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<th>T A B L E 5</th>
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<tbody>
<tr>
<td><strong>Imports</strong></td>
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<tr>
<td>Number of sectors</td>
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<tr>
<td>1991–2002&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>High</td>
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<td>Moderate</td>
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<td>1991–1994</td>
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<td>High</td>
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<td>Moderate</td>
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<td>1995–2002&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>High</td>
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<sup>a</sup> To March.  
Note: R<sup>2</sup> >0.7 indicates high repercussions; R<sup>2</sup> >0.5 indicates moderate repercussions.

**CONCLUSIONS**

The exchange rate is one of the most important variables for a country's economic foreign relations. While in theory exchange rate should reflect the differences in price increases between countries, in practice the value of one currency relative to another is set by other variables, at least in the short term. For example, the market may be strongly influenced by speculation by market participants and by the official monetary body.

The purchasing power parity method, in spite of its significant deficiencies as described in the present article, and the fact that the model is satisfied much better in the long than the short term, provides a good approximation for predicting theoretical real exchange rate based on the nominal exchange rate, and determining the rate of overvaluation.

The importance of the relationship is, however, seen only to the extent to which it affects foreign trade of the country being studied. For Mexico, it has been shown that overvaluation of the peso had minor effects following the intensification of economic liberalization in 1989, and that other variables had a greater influence on foreign trade. Specifically, for imports these variables were trade liberalization and the growth of the Mexican economy, and for exports; the growth of the US economy.

According to the Marshall-Lerner Condition, for an exchange rate depreciation to significantly disturb foreign trade, the import price elasticities of the country under study and of the other country (or the rest of the world) must have a sum greater than one. Although this calculation is outside the scope of the
present article, it is clear that this condition would not be met in the case of exports, as exports have increased overvaluation of the peso when the opposite should be true.

Thus, although the Mexican peso is quite overvalued in comparison with the US dollar, the question should be whether it would be worthwhile initiating a depreciation that would bring the peso in line with its theoretical real value. The answer is "no", for several reasons:

• As shown here, a depreciation would not encourage exports sufficiently to reverse the drop they have experienced over recent months, a drop which is primarily due to the US recession and the drop in oil prices.

• In the case of imports, these have decreased essentially due to the recession in Mexico, and are now not such a red flag as they were in 1994. Moreover, more than 75% of Mexican imports are intermediate goods; materials required by Mexican industry, while only 10% of imports are consumer goods. Rather than decreasing imports, a depreciation would cause industry costs to increase, with an almost immediate effect on inflation. As indicated earlier, prices and exchange rate influence each other. In this case, the effect of the exchange rate is high, given the scale of liberalization of the Mexican economy.

• Moreover, Mexico currently has a flexible foreign exchange regimen. Although the possibility always exists that the Bank of Mexico could step in to modify parity, if it did not act with the utmost care, doing so at this time could send signals of mistrust to economic actors, provoking a deeper depreciation than that intended by the Bank. In any case, the state of the economy and the long-term PPP method demonstrate that the peso can be expected to continue to depreciate as it has in recent months. Preferably, such depreciation should be gradual, so as not to cause alarm, particularly at a time when expectations are troubled by uncertainty.

Finally, it is to be hoped that when the liberalization process in Mexico is fully implemented, both exports and imports will be more sensitive to exchange rate. At such a time, any analysis of overvaluation should prove to be much more constructive than at present.