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On the Instability of Variance Decompositions of the Real Exchange Rate across Exchange-Rate-Regimes : Evidence from Mexico and the United States [1]

by

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Variance decompositions of the Mexico-United States real exchange rate are examined using monthly data on consumer prices and the nominal exchange rate for the period January, 1969 to February, 2000. The results show that the robust result found in industrial-country data that most of the variation of the real exchange rate is due to fluctuations in prices of tradable goods and nominal exchange rates holds only in periods in which Mexico was <u>*not*</u> *under a regime of exchange-rate management. In periods in the sample in which Mexico had a managed exchange-rate regime, the variability of prices of non-tradable goods relative to tradable goods accounts for up to 70 percent of the variability of the peso-dollar real exchange rate.*

JEL Classification codes: F30;F41;G11:
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1. Introduction

This short article examines the contribution of fluctuations in prices of nontradable goods relative to tradable goos vis-a-vis fluctuations in exchange-rate-adjusted relative prices of tradable goods for explaining the variability of the real exchange rate of the Mexican peso against the U.S. dollar. The exercise is motivated by the results reported in Engel (2000) for the peso-dollar real exchange rate, and it makes use of the techniques he proposed in that paper and in his previous work on variance decompositions of real exchange rates (see Engel (1999)). Interest in revisiting the issue follows from Engel's finding that the fraction of the variance of the peso-dollar real exchange rate accounted for by the variance of the Mexico-U.S. ratio of prices of tradable goods adjusted by the nominal exchange rate is in excess of 0.9, regardless of the time horizon over which the data are differenced in computing variability coefficients. This result is at odds with the emphasis that theoretical and empirical studies of exchange-rate management in emerging markets regularly put on fluctuations in the domestic price of nontradables relative to tradables as the main determinant of the real exchange rate. Mendoza and Uribe (2000), for example, reported large variations in Mexico's relative price of nontradables during the exchange-rate-based stabilization of 1988-1994, but did not compute variance ratios to assess their contribution to account for Mexico's real-exchange-rate variability.

The results of the variance analysis reported here show that Engel's finding is consistent with periods in which Mexico did not follow an explicit policy of exchange rate management. In contrast, in periods in which Mexico followed a fixed exchange rate or a crawling peg, the fraction of real-exchange-rate variability accounted for by movements of tradable-goods prices and the nominal exchange rate falls sharply and varies widely with the time horizon of the variance ratio. Data for the periods of managed-exchange-rate regimes in Mexicoalso do not reproduce two other key findings of Engel's work: namely that, (a) covariances across domestic nontradables relative prices and cross-country tradables relative prices tend to be generally positive or negligible and (b) variance ratios corrected to take into account these covariances generally do not change results derived using approximate variance ratios that ignore them. Contrary to these findings, in periods in which Mexico had a managed exchange rate, the correlation between domestic nontradables relative prices and international tradables relative prices is sharply negative. The standard deviation of Mexico's domestic relative prices is also markedly higher during these periods. As a result, measures of the contribution of tradables goods prices to real-exchange-rate variability corrected to take into account these features of the data are significantly lower than those that do not. Movements in domestic nontradables relative prices can account for up to 70 percent of the variance of the real exchange rate in periods in which Mexico managed the value of its currency.

2. Variance Decompositions of the Peso-Dollar Real Exchange Rate

The analysis of variance conducted below follows closely Engel (2000). The data used are non-seasonally-adjusted monthly observations of the consumer price index (CPI) from Mexico (*MX*) and the United States (*US*) covering the period January, 1969 to February, 2000. Mexican data were retrieved from the Bank of Mexico's web site (*http://www.banxico.org.mx*), and those for the United States from the site maintained by the Bureau of Labor Statistics (*http://stats.bls.gov*). Three price indexes were retrieved for each country: the aggregate CPI (P^i for i=*MX*, *US*) and those that apply to durable goods (PD^i for i=*MX*, *US*) and services (PS^i for *i=MX, US*). The dataset was completed with the nominal exchange rate series for the monthly-average exchange rate of Mexican pesos per U.S. dollar (*E*) reported in the IMF's *International Financial Statistics* CD ROM. All price indexes were re-based to February 1988=100 to match the date of the implementation of the exchange-rate-stabilization plan that collapsed in December of 1994. The real exchange rate was generated using the IMF's convention as $RER=P^{MX}/(E*P^{US})$. The data were transformed into logs and logged variables are expressed in lower caps.

Durable goods are treated as tradable goods and services are treated as nontradable goods. This definition is roughly in line with standard treatment and is also roughly consistent with a sectoral classification of the Mexican data based on a definition of tradable goods as those pertaining to sectors for which the ratio of net exports to gross output exceeds 5 percent (see Mendoza and Uribe (2000)). Following Engel (2000), a simple algebraic manipulation of the definition of the real exchange rate is used to decompose its natural logarithm into the following identity: $rer_t \equiv x_t + y_t$. The variable x_t is the exchange-rate-adjusted price ratio of tradables (i.e., durable goods) across Mexico and the United States: $x_t \equiv pd_t^{MX} - e_t - pd_t^{US}$.[1] If the strong assumptions needed for the law of one price to hold in this context were satisfied, x_t should be a constant and should not contribute to explain variations in rer_t. The variable y_t includes the terms that reflect domestic prices of nontradable goods (i.e., services) relative to those of tradable goods: $y_t \equiv b_t^{MX}(ps_t^{MX}-pd_t^{MX}) - b_t^{US}(ps_t^{US}-pd_t^{US})$, where b_t^{MX} and b_t^{US} are the weights of nontradable goods in each country's CPI. Intra-country relative prices of nontradable goods

[1]This is in fact the *negative* of Engel's measure because the real exchange rate used here conforms to the IMF's definition.

are thus defined as: $mxpn_t \equiv ps_t^{MX}$-pd_t^{MX} and $uspn_t \equiv ps_t^{US}$-pd_t^{US}.

The results of variance decompositions of the peso-dollar real exchange rate are summarized in Table 1. The Table presents five panels that correspond to different sample periods. Panel I is for the full sample. Panels II and V are for periods without exchange rate management in Mexico. Panel II corresponds to the same sample period studied by Engel (2000), which is set by a sample of data retrieved from Datastream for the period September, 1991 to August, 1999. Since this sample includes some data for the managed-exchange-rate regime that collapsed at the end of 1994, Panel V shows results for a sample that includes only data for the post-1994 period without exchange rate management. Panels III and IV are for periods of exchange rate management. Panel III (January, 1969-July, 1976) corresponds to a fixed exchange rate. Panel IV (March, 1988-November, 1994) is for the managed exchange- rate regime implemented to anchor the stabilization plan known as *El Pacto*. This regime included an initial one-year period of fixed exchange rate followed by a crawling peg within a narrow band (the boundaries of which were revised occasionally).

The top section of each panel in Table 1 reports the correlation matrix and the standard deviations of *rer, x, y, mxpn,* and *uspn* computed over four time frequencies in which each variable has been transformed using 1-month differences, 6-month differences, 12-month differences and 24-month differences. The bottom section lists four variance ratios that measure the contribution of fluctuations in *x* to explain the variance of *rer* computed over the same frequencies. The first ratio is the basic ratio $\sigma^2(x)/\sigma^2(rer)$ reported by Engel (2000). This ratio ignores covariance terms in the elements that make up the real exchange rate (i.e., it is accurate only when *x* and *y* are independent random variables, in which case $\sigma^2(rer) = \sigma^2(x) + \sigma^2(y)$). The second and third ratios are alternatives discussed in the Appendix to Engel (1995) that consider covariance terms. The second ratio is simply $\sigma^2(x)/[\sigma^2(x)+\sigma^2(y)]$.[2] The third ratio measures the contribution of *x* to the variability of *rer* by assigning to *x* half of the covariance term in the equality that links the variance of *rer* with its two elements (i.e., $\sigma^2(rer)=\sigma^2(x)+\sigma^2(y)+2cov(x,y)$). Thus, the third variance ratio is $[\sigma^2(x)+cov(x,y)] / \sigma^2(rer)$. This variance ratio can be written as:

$$[\sigma^2(x)/\sigma^2(rer)]\ \{1 + \rho(x,y)\ \sigma(y)/\sigma(x)]\ \}.$$

Hence, the basic variance ratio that disregards the covariance of *x* and *y* approximates well this adjusted variance ratio when the correlation between the two variables, $\rho(x,y)$, is low and/or the standard deviation of *x* is large relative to that of *y*. The fourth variance ratio controls only for the covariance between *x* and the domestic relative price of nontradables in Mexico. In this case, the variance ratio is:

$$[\sigma^2(x)/\sigma^2(rer)]\ \{1 + \rho(x,mxpn)[b^{MX}\sigma(mxpn) / \sigma(x)]\ \}.$$

As in the previous case, the basic variance ratio approximates accurately this adjusted variance ratio when the correlation between *x* and *mxpn* is low and/or the standard deviation of *x* is large relative to that of *mxpn*.

The motivation for considering the fourth variance ratio that controls only for the covariance between *x* and *mxpn* follows from the fact that *y* captures the combined changes in domestic relative prices of nontradables in Mexico and the United States, as well as the recurrent revisions to the weights used to compute each country's CPI (which also take place at different

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[2]This ratio includes a covariance term because when *x* and *y* are not independent random variables $\sigma^2(x)/[\sigma^2(x)+\sigma^2(y)] = \sigma^2(x)/[\sigma^2(rer)-2cov(x,y)]$.

intervals in each country).[3] Hence, while the variance ratio adjusted for the *x*-*y* covariance yields correct measures of how much of the variance of the real exchange rate is due to variables *x* and *y*, it is silent about the contributions of the various elements that conform *y*. Computing an exact variance ratio that decomposes these effects requires to control for the full variance-covariance matrix of *y*, *x*, *mxpn*, *uspn*, b^{MX} and b^{N} . Since data to calculate this matrix are not readily available, the fourth variance ratio listed in each panel is seen as a proxy that isolates the effect of the covariance between *mxpn* and *rer*. The complement (i.e., 1 minus the ratio shown) is a good measure of the contribution of Mexico's relative price of nontradables to the variance of the real exchange rate to the extent that: (a) movements in the CPI weights play a minor role, and (b) the correlation between *mxpn* and *uspn* is low and/or the variance of *mxpn* largely exceeds that of *uspn*. Computing this variance ratio still requires an estimate of an assumed constant value of b^{MX}, which was determined using 1994 weights from the Mexican CPI, extracted from a methodological note provided by the Bank of Mexico (b^{MX} is 0.6).[4]

Statistical issues related to the role of covariance terms in the calculation of variance ratios are very well-known. Engel considered them carefully in his work on industrial countries and on the peso-dollar real exchange rate and concluded that they could be safely set aside. For instance, Engel (1995) argued that in the case of the components of the real exchange rate of the

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[3]Since y_t is calculated as the difference rer_t-x_t, and since the aggregate CPIs include nondurables in addition to durables and services, this residual measure of y_t captures also the effects of cross-country differences in the prices of nondurables relative to durables.

[4]This figure reflects weights from the 1989 National Income and Expenditure Household Survey (NIEHS), which were incorporated into the CPI in 1994. Until recently, Mexico did not have a fixed schedule for updating CPI weights. Weights were revised in 1980 using the 1977 NIEHS, in 1994 using the 1989 NIEHS, and in 1998 using the 1994 NIEHS combined with data from the 1995 census. Starting in 2000, weights are to be updated biannually.

United States vis-a-vis industrial countries, "comovements between *x* and *y* are insignificant in all cases, except when we use the aggregate PPI (producer price index) as the traded goods price index" (p. 31). In addition, Engel (2000) noted that the basic variance ratio (i.e., $\sigma^2(x)/\sigma^2(rer)$) "tends to *underestimate* the importance of the *x* as long as the co-variance term (between *x* and *y*) is positive (which it is at most short horizons), but any alternative treatment of the covariance has very little effect on the measured relative importance of the *x* component" (p.9). In these conditions, the basic variance ratio is either very accurate (if $\rho(x,y)$ is low) or in the worst-case scenario it represents a lower bound for the true variance ratio (if $\rho(x,y)$ is positive). In either case, a high ratio $\sigma^2(x)/\sigma^2(rer)$ indicates correctly that real-exchange-rate fluctuations are mostly explained by movements in tradable goods prices and in the nominal exchange rate.

The results reported in Panel I of Table 1 show that for the full sample period (January, 1969 to February, 2000) the findings of Engel's analysis hold. The basic variance ratio exceeds 0.94 at all frequencies and any of the three corrections for covariances across *x* and *y* or across *x* and *mxpn* make no difference. The latter reflects the results that the correlation coefficients $\rho(x,y)$ and $\rho(x,mxpn)$ are very small and that the standard deviations of *x* are larger than those of *y* and *mxpn*. Covariances of *x* with *uspn* are also irrelevant because the correlations between these variables are generally negligible and the standard deviations of *uspn* are all small. Note in addition that the correlations between *mxpn* and *uspn* are negligible as well.

A very similar picture emerges from Panel II for the period of the Datastream sample used by Engel (2000) and from Panel V for the post-1994 period. The one difference is that at frequencies higher than 1 month there are marked negative correlations between *x* and *uspn* and between *mxpn* and *uspn*. These correlations could in principle add to the contribution of domestic relative price variations in explaining the variance of *rer*. However, they can be safely ignored because the standard deviation of *x* dwarfs those of *uspn* and *mxpn* at all time horizons, and the latter still have to be reduced by the fractions b^{MX} and b^{US} respectively (presuming constant weights).

The picture that emerges from Panels III and IV for periods that correspond to managed exchange-rate regimes in Mexico is very different. Two changes are critical to note:

(a) The standard deviations of the Mexican relative price of nontradable goods and of the composite variable *y* increase significantly and become in some cases even larger than the standard deviations of *x*.

(b) The correlations between *x* and *y* and between *x* and *mxpn* fall sharply and become markedly negative (approaching -0.6 in most cases).

The basic variance ratio of *x* to *rer*, which ignores these changes, is still very high, and in several instances it exceeds 1 (which reflects the presence of large covariance terms). However, the two variance ratios corrected to take into account the negative correlation between *x* and *y* and the larger standard deviation of *y*, and the variance ratio that controls only for the covariance between *x* and *mxpn*, show dramatic reductions in the share of real-exchange-rate variability attributable to *x*. For instance, Panel III (for the fixed exchange rate sample) shows that according to the third variance ratio listed in the panel, the contribution of *x* to the variability of the real exchange rate reaches a minimum of 0.29 at the 6-month frequency and remains low at around 0.36 for 12- and 24-month frequencies. The fourth variance ratio, which corrects only for the covariance between *x* and *mxpn*, is below 0.61 at frequencies higher than one month. These effects are also present, albeit with less dramatic results, in the sample of Panel V for *El Pacto's* exchange-rate-based stabilization. In this case, the variance ratios that consider the covariance between *x* and *y* indicate that the contribution of *x* to the variability of the real exchange rate is below 0.6 at all frequencies (except with the third ratio at the 12-month frequency, in which case it increases to 0.7). The fourth ratio shows that if the only covariance considered is that between *x* and *mxpn*, the variance of *rer* attributable to *x* reaches a lower bound of 0.55 at the one-month frequency. This variance ratio increases sharply at the 24-month frequency.

It is important to note that, despite the dramatic reduction in the fraction of real exchange variability that can be accounted for by movements in relative prices of tradable goods and the nominal exchange rate in periods of exchange-rate management, there is still a nontrivial fraction of real-exchange-rate variability that these movements account for (ranging from 0.29 to 0.71). It is equally important, though, not to generalize the results that apply to periods without exchange-rate management to those with managed exchange-rate regimes because during the latter the relative price of nontradable goods plays a very important role in driving the real exchange rate.

Two other important features are worth noting in comparing periods of managed and floating exchange rates:

(a) The correlation between *x* and *rer* is much lower in the former compared with the latter. The correlation between *x* and *rer* is almost perfect at all time horizons in periods of floating exchange rates, while it ranges between 0.29 and 0.7 in the samples of managed exchange rates.

(b) In some of the managed exchange rate scenarios, particularly the 12- and 24-month horizons of the sample of *El Pacto*, the correlation between nontradable goods relative prices between Mexico and the United States is positive (it can be as high as 0.32). This reduces the share of fluctuations in *rer* that can be accounted for by *y* because the variance of the latter is a negative function of that correlation (i.e., if U.S. and Mexican relative prices of nontradable goods are more likely to increase together, differences in the behavior of these domestic relative prices across countries tend to offset each other more and hence are less important for real-exchange-rate fluctuations). This point is also raised by Engel (1995).

The quantitative significance of the second observation depends on how large is the correlation between *mxpn* and *uspn*, compared to the strong negative correlation between *mxpn* and *x*, and on how large is the standard deviation of U.S. nontradable goods prices relative to that of Mexican nontradables goods prices. With regard to the latter, all panels in Table 1 show that the variability of nontradables relative prices in Mexico exceeds by a large margin that of the United States. Indeed, this is about the only result that is robust to the changes in exchange rate regime documented in the Table. The higher volatility of Mexico's domestic relative price of nontradable goods vis-a-vis the United States deserves careful scrutiny regardless of its contribution to the variability of the peso-dollar real exchange rate.

3. Conclusions

The evidence reported here suggests that fluctuations in the domestic relative price of nontradable goods can account for 50 to 70 percent of the fluctuations of the real exchange rate *in economies under exchange rate management* (particularly in those using it as an stabilization policy instrument). Two lessons are to be learned. First, the behavior of the determinants of the real exchange rate differs sharply between countries with the features just described and the industrial countries for which variance decompositions of real exchange rates are normally applied. The overwhelming role of movements in prices of tradable goods and nominal exchange rates found in industrial countries, or even in developing countries with floating exchange rates, is sharply diminished. Second, even though the variance of domestic nontradables relative prices can account for more than a half of the variance of the real exchange rate, there is still a non-trivial fraction accounted for by changes in tradable goods prices and nominal exchange rates.

These lessons lend support to the suggestion in Engel (2000) that a full explanation of the behavior of the real exchange rate in the literature on exchange-rate management is likely to require modifications to the dominant approach that considers only the role of changes in the relative price of nontradable goods. On the positive side, however, the results indicating that roughly a half of the variability of the real exchange rate can be attributed to movements in nontradables goods prices are in line with the quantitative findings that the recent literature has produced (see Mendoza and Uribe (2000)).

The two lessons referred to above are captured clearly by the graph of the peso-dollar real exchange rate and its components at the end of this text. The graph shows that overall fluctuations in tradable goods prices and in the nominal exchange rate are a key determinant of the movements in the real exchange rate. However, in periods like that of Mexico’s 1988-1994 exchange-rate-based stabilization, the real exchange rate was heavily influenced by a massive change in the relative price of nontradable goods within Mexico. This observation also suggests that the role of the relative price of nontradables may not be as critical in episodes of exchange-rate management across industrial countries. If in these cases the relative price of nontradables exhibits similar variability and is positively correlated across countries, fluctuations in non-tradable goods prices will continue to explain a small fraction of the variability of the real exchange rate. In the case of the peso-dollar real exchange rate, the variance of the relative price of nontradables in Mexico is much higher than that in the United States. Further research comparing the experiences of industrial and developing countries could shed light on these conjectures, and could explore whether other real exchange rates pairing emerging markets with industrial countries display similar sensitiveness to the exchange-rate regime as the peso-dollar real exchange rate.

The analysis undertaken here avoided intentionally taking a position on the best modeling strategy to account for the fraction of real-exchange-rate variability explained by movements in tradable goods prices and the nominal exchange rate. This is because the intent of the analysis was to focus exclusively on statistical results and because approaches to model this phenomenon are still subject of controversy. In particular, the evidence reported here for periods without exchange rate management, in which a large fraction of real-exchange-rate variability is due to changes in relative prices of tradable goods and the nominal exchange rate, does not suggest per se that one should view fluctuations in the variable x as deviations from the law of one price or evidence of price stickiness. It simply shows how much x (i.e., the ratio of exchange-rate-adjusted CPI prices of durable goods across Mexico and the United States) contributes to explain the variance of the ratio of exchange-rate-adjusted aggregate CPIs. This is distant from the ideal scenario needed to interpret changes in x as deviations from the law of one price. The law of one price applies to single, homogeneous goods sold in a freely-accessible market and in the absence of frictions like transportation costs and tax and tariff distortions. Clearly, aggregate data for the

CPIs of Mexico and the United States violate these conditions. The goods included in these indexes are different, carry different weights, and the weights change a different intervals. Access to a “common market” has varied widely over the sample period and across goods, and similar caveats apply to transportation costs, taxes and tariffs.

There are detailed studies on purchasing power parity (PPP) and the law of one price that have tried to take the above issues into account, and still find evidence of large price differentials at highly disaggregated levels in consumer goods. Some researchers are more concerned with the impossibility of defining pure concepts of “tradable” goods in the sense that the law of one price requires, and are thus exploring relative price movements introducing measures of the “degree of tradability of goods” (see Betts and Kehoe (2000)) or distribution costs (see Busrtein, Neves, and Rebelo (2000)).

The contribution of the relative price of nontradable goods to real-exchange-rate variability was also documented without taking a position on the modeling strategy to follow in order to capture it. The traditional approach in the literature on exchange-rate management in emerging economies has been to combine isoelastic utility functions that consider tradable and nontradable goods with sectoral neoclassical production technologies. This has generally failed to produce large changes in the relative price of nontradables, as it results in a nearly-linear sectoral production possibilities frontier (PPF) when the models are calibrated to the data. Fernandez de Cordoba and Kehoe (2000) and Mendoza and Uribe (2000) encountered this problem and opted for introducing sector-specific production technologies to increase the curvature of the PPF. However, Mendoza (2000) studied further the composition of the Mexican CPI and found that the change in nontradables relative prices is heavily biased to changes in the cost of use of housing, and that the latter have been identified to be closely related to real estate prices, domestic credit conditions, and international capital flows (see Guerra de Luna (1997) and (1998)). This evidence suggests that one important mechanism driving the real exchange rate may operate through asset-pricing and credit channels.

Finally, the treatment of the data in the analysis conducted here abstracts from medium- to low-frequency considerations, including those related to mean-reverting properties of real exchange rates in the data and the long-run determination of real exchange rates. However, research in this direction is also inconclusive, as the survey by Froot and Rogoff (1995) shows. For example, Asea and Mendoza (1994) find that while the data support predictions of long-run neoclassical models in which cross-country differences in the relative price of nontradable goods reflect differences in productivity across sectors that produce tradables and nontradables, measures of the long-run relative price of nontradables do poorly in explaining cross-country differences in CPI-based measures of the real exchange rate. At medium time frequencies, it is interesting to note that computing the variance ratios reviewed here using 72-month differences of the data, which correspond to the six-year periodicity of recent Mexican business cycles, the contribution of variable x to the variance of the real exchange rate is about 65 percent (both for the full sample and for the period of the managed exchange rate that ended in 1994).

In summary, it seems quite reasonable to agree with Paul Samuelson in that: *"Unless very sophisticated indeed, PPP is a misleadingly pretentious doctrine, promising us what is rare in economics, detailed numerical predictions"* (Samuelson (1964), p. 153).

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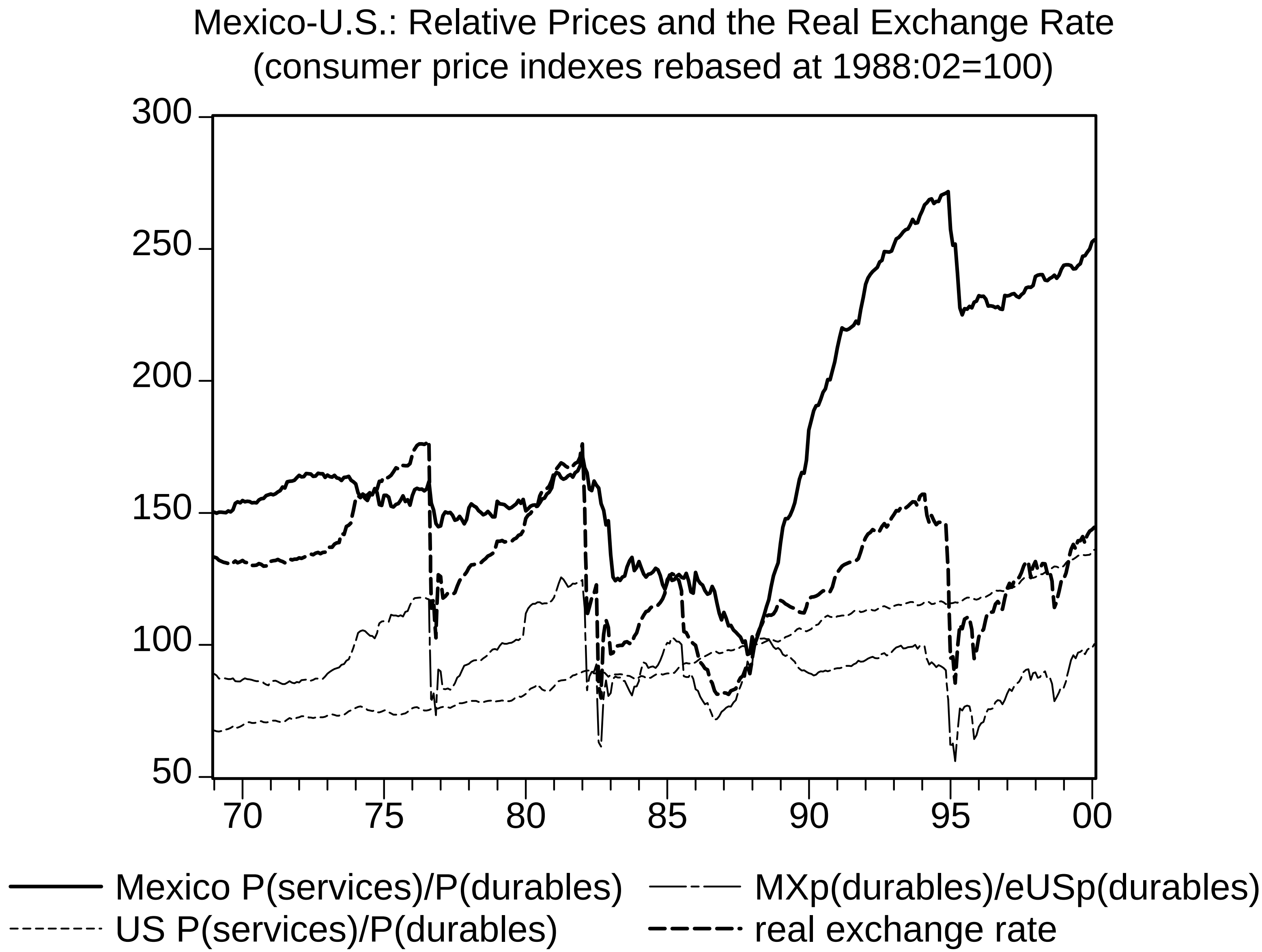

Mexico-U.S.: Relative Prices and the Real Exchange Rate
(consumer price indexes rebased at 1988:02=100)
300
250
200
150
100
50
70
75
80
85
90
95
00
Mexico P(services)/P(durables)
US P(services)/P(durables)
MXp(durables)/eUSp(durables)
real exchange rate

Table 1. Variance Decompositions of the Peso-Dollar Real Exchange Rate

PANEL I. FULL SAMPLE: 1969:01-2000:02

Correlation matrix at 1 month

	rer	x	y	mxpn	uspn
rer	1.0000	0.9595	0.2019	0.1898	-0.0965
x	0.9595	1.0000	-0.0820	-0.0487	-0.0418
y	0.2019	-0.0820	1.0000	0.8410	-0.1962
mxpn	0.1898	-0.0487	0.8410	1.0000	0.1102
uspn	-0.0965	-0.0418	-0.1962	0.1102	1.0000
Std. Dev.	0.0486	0.0477	0.0137	0.0166	0.0045
No. obs	373	373	373	373	373

Correlation matrix at 6 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9646	0.1788	0.2194	-0.2184
x	0.9646	1.0000	-0.0869	-0.0128	-0.1683
y	0.1788	-0.0869	1.0000	0.8767	-0.1970
mxpn	0.2194	-0.0128	0.8767	1.0000	-0.0717
uspn	-0.2184	-0.1683	-0.1970	-0.0717	1.0000
Std. Dev.	0.7226	0.7136	0.1913	0.1949	0.0405
No. obs	368	368	368	368	368

Correlation matrix at 12 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9639	0.2180	0.2865	-0.2434
x	0.9639	1.0000	-0.0498	0.0557	-0.1983
y	0.2180	-0.0498	1.0000	0.8704	-0.1859
mxpn	0.2865	0.0557	0.8704	1.0000	-0.0567
uspn	-0.2434	-0.1983	-0.1859	-0.0567	1.0000
Std. Dev.	38.4599	37.5813	10.2562	10.0604	2.1532
No. obs	362	362	362	362	362

Correlation matrix at 24 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9618	0.2380	0.3355	-0.2663
x	0.9618	1.0000	-0.0370	0.0999	-0.2280
y	0.2380	-0.0370	1.0000	0.8702	-0.1632
mxpn	0.3355	0.0999	0.8702	1.0000	-0.0536
uspn	-0.2663	-0.2280	-0.1632	-0.0536	1.0000
Std. Dev.	131523.600	127831.600	36030.830	34473.330	7092.538
No. obs	350	350	350	350	350

Variance Ratios 1/	1 month	6 months	12 months	24 months
σ(x)^2 / σ(rer)^2	0.9658	0.9754	0.9548	0.9446
σ(x)^2 / [σ(x)^2+σ(y)^2]	0.9236	0.9330	0.9307	0.9264
[σ(x)/σ(rer)]^2 * {1+ρ(x,y)σ(y)/σ(x)}	0.9430	0.9527	0.9419	0.9348
[σ(x)/σ(rer)]^2 * {1+ρ(x,mxpn)[bMXσ(mxpn)]/σ(x)}	0.9560	0.9733	0.9634	0.9599

1/ bMX is the weight of nontradables in Mexico's CPI, which is set at 0.6.

Table 1. Variance Decompositions of the Peso-Dollar Real Exchange Rate
(continued)

PANEL II. DATASTREAM SAMPLE: 1991:09-1999:08

Correlation matrix at 1 month

	rer	x	y	mxpn	uspn
rer	1.0000	0.9767	0.1198	0.1469	-0.0070
x	0.9767	1.0000	-0.0962	-0.0464	0.0538
y	0.1198	-0.0962	1.0000	0.8953	-0.2811
mxpn	0.1469	-0.0464	0.8953	1.0000	-0.0202
uspn	-0.0070	0.0538	-0.2811	-0.0202	1.0000
Std. Dev.	0.0458	0.0457	0.0099	0.0117	0.0034
No. obs	96	96	96	96	96

Correlation matrix at 6 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9894	0.1645	0.0679	-0.4514
x	0.9894	1.0000	0.0195	-0.0671	-0.3859
y	0.1645	0.0195	1.0000	0.9228	-0.4861
mxpn	0.0679	-0.0671	0.9228	1.0000	-0.3470
uspn	-0.4514	-0.3859	-0.4861	-0.3470	1.0000
Std. Dev.	0.6250	0.6166	0.0908	0.1073	0.0229
No. obs	96	96	96	96	96

Correlation matrix at 12 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9917	0.2723	0.1516	-0.5050
x	0.9917	1.0000	0.1462	0.0362	-0.4318
y	0.2723	0.1462	1.0000	0.8951	-0.6533
mxpn	0.1516	0.0362	0.8951	1.0000	-0.4879
uspn	-0.5050	-0.4318	-0.6533	-0.4879	1.0000
Std. Dev.	32.5482	31.6588	4.2331	5.0124	1.0728
No. obs	96	96	96	96	96

Correlation matrix at 24 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9922	0.3340	0.1545	-0.4016
x	0.9922	1.0000	0.2136	0.0424	-0.3720
y	0.3340	0.2136	1.0000	0.8883	-0.3333
mxpn	0.1545	0.0424	0.8883	1.0000	-0.0684
uspn	-0.4016	-0.3720	-0.3333	-0.0684	1.0000
Std. Dev.	105889.300	102165.600	13547.570	18135.650	4152.533
No. obs	96	96		96	96

Variance Ratios 1/	1 month	6 months	12 months	24 months
σ(x)^2 / σ(rer)^2	0.9949	0.9733	0.9461	0.9309
σ(x)^2 / [σ(x)^2+σ(y)^2]	0.9553	0.9788	0.9824	0.9827
[σ(x)/σ(rer)]^2 * {1+ρ(x,y)σ(y)/σ(x)}	0.9742	0.9761	0.9646	0.9573
[σ(x)/σ(rer)]^2 * {1+ρ(x,mxpn)[bMXσ(mxpn)]/σ(x)}	0.9878	0.9665	0.9494	0.9351

1/ bMX is the weight of nontradables in Mexico's CPI, which is set at 0.6.

Table 1. Variance Decompositions of the Peso-Dollar Real Exchange Rate
(continued)

PANEL III. FIXED EXCHANGE RATE SAMPLE: 1969:01-1976:07

Correlation matrix at 1 month

	rer	x	y	mxpn	uspn
rer	1.0000	0.6148	0.2145	-0.0154	0.1734
x	0.6148	1.0000	-0.6385	-0.5543	0.3921
y	0.2145	-0.6385	1.0000	0.6714	-0.3163
mxpn	-0.0154	-0.5543	0.6714	1.0000	0.1307
uspn	0.1734	0.3921	-0.3163	0.1307	1.0000
Std. Dev.	0.0071	0.0090	0.0073	0.0082	0.0049
No. obs	90	90	90	90	90

Correlation matrix at 6 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.2938	0.5943	0.1411	-0.0136
x	0.2938	1.0000	-0.5942	-0.6178	0.1792
y	0.5943	-0.5942	1.0000	0.6386	-0.1622
mxpn	0.1411	-0.6178	0.6386	1.0000	0.1303
uspn	-0.0136	0.1792	-0.1622	0.1303	1.0000
Std. Dev.	0.0982	0.0982	0.1168	0.1195	0.0552
No. obs	85	85	85	85	85

Correlation matrix at 12 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.3441	0.5400	0.0387	-0.0061
x	0.3441	1.0000	-0.6045	-0.6411	0.1362
y	0.5400	-0.6045	1.0000	0.6075	-0.1273
mxpn	0.0387	-0.6411	0.6075	1.0000	0.2226
uspn	-0.0061	0.1362	-0.1273	0.2226	1.0000
Std. Dev.	5.1993	5.4932	6.1282	6.4201	3.0847
No. obs	79	79	79	79	79

Correlation matrix at 24 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.4034	0.5932	-0.0483	0.0241
x	0.4034	1.0000	-0.4974	-0.5571	0.2891
y	0.5932	-0.4974	1.0000	0.4443	-0.2315
mxpn	-0.0483	-0.5571	0.4443	1.0000	0.0500
uspn	0.0241	0.2891	-0.2315	0.0500	1.0000
Std. Dev.	17649.010	16378.790	18616.110	17854.880	9130.945
No. obs	67	67	67	67	67

Variance Ratios 1/	1 month	6 months	12 months	24 months
σ(x)^2 / σ(rer)^2	1.6105	0.9998	1.1163	0.8612
σ(x)^2 / [σ(x)^2+σ(y)^2]	0.6053	0.4145	0.4455	0.4363
[σ(x)/σ(rer)]^2 * {1+ρ(x,y)σ(y)/σ(x)}	0.7803	0.2938	0.3635	0.3743
[σ(x)/σ(rer)]^2 * {1+ρ(x,mxpn)[bMXσ(mxpn)]/σ(x)}	1.1253	0.5488	0.6144	0.5474

1/ bMX is the weight of nontradables in Mexico's CPI, which is set at 0.6.

Table 1. Variance Decompositions of the Peso-Dollar Real Exchange Rate
(continued)

PANEL IV. MANAGED EXCHANGE RATE SAMPLE (*EL PACTO* PERIOD): 1988:03-1994:11

Correlation matrix at 1 month

	rer	x	y	mxpn	uspn
rer	1.0000	0.7065	0.5788	0.3804	-0.0606
x	0.7065	1.0000	-0.1682	-0.2258	0.0375
y	0.5788	-0.1682	1.0000	0.7900	-0.1277
mxpn	0.3804	-0.2258	0.7900	1.0000	0.2684
uspn	-0.0606	0.0375	-0.1277	0.2684	1.0000
Std. Dev.	0.0116	0.0096	0.0084	0.0134	0.0040
No. obs	81	81	81	81	81

Correlation matrix at 6 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.5199	0.4654	0.3734	-0.0285
x	0.5199	1.0000	-0.5141	-0.5321	-0.0443
y	0.4654	-0.5141	1.0000	0.9263	0.0173
mxpn	0.3734	-0.5321	0.9263	1.0000	0.2103
uspn	-0.0285	-0.0443	0.0173	0.2103	1.0000
Std. Dev.	0.1366	0.1410	0.1361	0.1858	0.0286
No. obs	81	81	81	81	81

Correlation matrix at 12 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.6204	0.3032	0.2139	-0.0725
x	0.6204	1.0000	-0.5592	-0.5699	-0.0906
y	0.3032	-0.5592	1.0000	0.9186	0.0334
mxpn	0.2139	-0.5699	0.9186	1.0000	0.2606
uspn	-0.0725	-0.0906	0.0334	0.2606	1.0000
Std. Dev.	7.4596	8.5745	7.0570	9.7303	1.4116
No. obs	81	81	81	81	81

Correlation matrix at 24 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.4556	0.3157	0.1996	-0.1290
x	0.4556	1.0000	-0.7008	-0.6601	-0.2768
y	0.3157	-0.7008	1.0000	0.8636	0.1917
mxpn	0.1996	-0.6601	0.8636	1.0000	0.3214
uspn	-0.1290	-0.2768	0.1917	0.3214	1.0000
Std. Dev.	21057.650	28009.610	26276.680	32313.510	4561.779
No. obs	81	81	81	81	81

Variance Ratios 1/	1 month	6 months	12 months	24 months
σ(x)^2 / σ(rer)^2	0.6843	1.0648	1.3213	1.7693
σ(x)^2 / [σ(x)^2+σ(y)^2]	0.5704	0.5177	0.5962	0.5319
[σ(x)/σ(rer)]^2 * {1+ρ(x,y)σ(y)/σ(x)}	0.5844	0.5365	0.7131	0.6061
[σ(x)/σ(rer)]^2 * {1+ρ(x,mxpn)[bMXσ(mxpn)]/σ(x)}	0.5552	0.6169	0.8086	0.9609

1/ bMX is the weight of nontradables in Mexico's CPI, which is set at 0.6.

Table 1. Variance Decompositions of the Peso-Dollar Real Exchange Rate
(concluded)

PANEL V. POST-1994 FLOATING EXCHANGE RATE SAMPLE: 1994:12-2000:02

Correlation matrix at 1 month

	rer	x	y	mxpn	uspn
rer	1.0000	0.9811	0.0940	0.1303	-0.0006
x	0.9811	1.0000	-0.1005	-0.0459	0.0450
y	0.0940	-0.1005	1.0000	0.9056	-0.2343
mxpn	0.1303	-0.0459	0.9056	1.0000	-0.0002
uspn	-0.0006	0.0450	-0.2343	-0.0002	1.0000
Std. Dev.	0.0560	0.0560	0.0109	0.0131	0.0032
No. obs	63	63	63	63	63

Correlation matrix at 6 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9920	0.1774	0.0846	-0.5357
x	0.9920	1.0000	0.0516	-0.0338	-0.4842
y	0.1774	0.0516	1.0000	0.9308	-0.4620
mxpn	0.0846	-0.0338	0.9308	1.0000	-0.3565
uspn	-0.5357	-0.4842	-0.4620	-0.3565	1.0000
Std. Dev.	0.7731	0.7618	0.0979	0.1182	0.0239
No. obs	63	63	63	63	63

Correlation matrix at 12 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9941	0.3117	0.1807	-0.5854
x	0.9941	1.0000	0.2070	0.0826	-0.5309
y	0.3117	0.2070	1.0000	0.9071	-0.6306
mxpn	0.1807	0.0826	0.9071	1.0000	-0.5367
uspn	-0.5854	-0.5309	-0.6306	-0.5367	1.0000
Std. Dev.	40.2164	39.0582	4.4521	5.1840	1.1699
No. obs	63	63	63	63	63

Correlation matrix at 24 months

	rer	x	y	mxpn	uspn
rer	1.0000	0.9952	0.3748	0.2091	-0.5629
x	0.9952	1.0000	0.2823	0.1238	-0.5121
y	0.3748	0.2823	1.0000	0.8769	-0.6673
mxpn	0.2091	0.1238	0.8769	1.0000	-0.5144
uspn	-0.5629	-0.5121	-0.6673	-0.5144	1.0000
Std. Dev.	131772.400	127348.200	13434.690	15590.970	3614.503
No. obs	63	63	63	63	63

Variance Ratios 1/	1 month	6 months	12 months	24 months
σ(x)^2 / σ(rer)^2	1.0013	0.9711	0.9432	0.9340
σ(x)^2 / [σ(x)^2+σ(y)^2]	0.9636	0.9838	0.9872	0.9890
[σ(x)/σ(rer)]^2 * {1+ρ(x,y)σ(y)/σ(x)}	0.9817	0.9775	0.9655	0.9618
[σ(x)/σ(rer)]^2 * {1+ρ(x,mxpn)[bMXσ(mxpn)]/σ(x)}	0.9948	0.9680	0.9494	0.9425

1/ bMX is the weight of nontradables in Mexico's CPI, which is set at 0.6.