

## NOTES ON DEFLATOR SERIES

### Original Data:

US Textile price index with base 1910-1914=100, 1837-1890  
US Cotton Sheeting prices (in yards and pieces), 1837-1932  
Nominal Peso Exchange Rate, 1837-1932  
MX cotton piece prices, 1886-1911  
MX yarn kilo prices, 1886-1911

### Transformations:

Cotton sheeting prices were reported sometimes in yards, sometimes in pieces. US pieces were approximately 100 yards per piece. Mexican pieces were 27 varas or approximately 24.86 yards. Therefore, I calculated cotton sheeting prices for 24.86 yards to be able to compare them with the Mexican price series.

A piece was equivalent to 2.688 kilograms. We calculated a new adjusted price for yarn equivalent to the weight of a cotton piece by multiplying the listed value by the factor 2.688.

### Methodology:

Mexico's real exchange rate has the following formula:

(1) where  $R$  is the real exchange rate,  $e$  is the nominal exchange rate,  $P_{US}$  is the level of US prices and  $P_{MX}$  is the level of Mexican prices.

From this equation, one can get a growth equation as follows:

(2) where a dotted variable indicates its rate of growth.

If we assume that the real exchange rate does not change (its parity remains unchanged), then the above equation implies that the rate of change of domestic prices (i.e., inflation) is equal to the sum of the rates of change of the nominal exchange rate and foreign prices, or:

(3)

Since both US price series go back to 1837, I created two US price indices with base year 1837=100. I also created a nominal exchange rate index with the same base year. The estimated Mexican price index would thus begin with a value equal to 100 for 1837. Later years would add up the rate of change of domestic prices as shown in equation (3). Example:

Year	Estimated Price Index
1837	$I_{1837}=100$
1838	$I_{1838}=I_{1837}*(1 + \text{rate of change of domestic prices})$
n	$I_n=I_{n-1}*(1 + \text{rate of change of domestic prices})$

Starting in 1837 was necessary to construct a series from years prior to 1886 when we don't have Mexican prices because we could assign a value of 100 for the index without knowing the absolute price level. Later, we could renormalize our 1837=100 price index to any other base year we preferred.

## Index Series in attached handout

1. This is an index of cotton sheeting prices with base year 1837=100. This series was used to calculate US inflation to estimate index 3.
2. This is an index of Textile prices converted from the original base year of 1910-1914=100 to 1837=100. This was also used to calculate inflation for the new index shown in column 4.
3. Estimated index of domestic (Mexican) prices using equation (3) and measuring US inflation with index 1.
4. Estimated index of Mexican prices using equation (3) and US inflation rates from index 2.
5. This is a patched index of Mexican price levels.

1837-1885	equals Index 3
1886-1911	equals actual Mexican price index (index 6)
1912-1932*	applies equation (3) starting with year 1911=89.09

\* Indices 3 and 4 show a highly inflationary path after 1890. Compounded increases in US price levels along with huge appreciations in the nominal exchange rate lead to even higher inflation if we use equation (3) continuously. Thus, we only use it for 1837 thru 1885; then we use the actual data that we have; then we use the actual price level of 1911 (instead of the 1911 estimates of indices 3 and 4) to continue estimating domestic price levels with equation (3).

6. Mexican prices were calculated as a weighted average of cotton piece and adjusted yarn prices. ( $=0.21 \times \text{adjusted yarn price} + 0.79 \times \text{price of cloth piece}$ ). From this average, we created an index with base year 1890=100.

NOTE: The nominal exchange rate increased from approximately 1 peso per dollar in the early 1830s to 3 pesos per dollar in the 1930s. The movement was pretty much smooth for the whole period with the exception of the years 1915 and 1916 when its value increased dramatically.

1914	3.30
1915	11.15
1916	23.83
1917	1.91

The jump in value in 1915-1916 does affect the results in a major way because the estimated price index is calculated with cumulative rates of change. Series 7 thru 11 are similar to series 1 thru 5 with the exception that the nominal exchange rate is treated as if it didn't change in the two years following 1914 (i.e., 1915=3.30 and 1916=3.30).

7. Counterpart of index 1.
8. Counterpart of index 2.
9. Counterpart of index 3.
10. Counterpart of index 4.
11. Counterpart of index 5.