



Foreign-to-Canadian Price Ratios

Foreign-to-Canadian price ratios provide exact answers to questions such as:

How much more or less would Canadians have paid for the generic drugs they purchased in Q4-2016 had they paid prices prevailing in country X?

Normally the following multilateral measures are reported:

Minimum international price—represents the lowest price available across the comparator countries.

Mean international price—represents a straight average of the prices available across the comparator countries.

Median international price—represents the price at the midpoint of the distribution of the foreign prices.

Maximum international price—represents the highest price available across the comparator countries.

Canadian price—represents the average national price based on all manufacturer ex-factory sales in the retail sector in Canada.

Measures of Central Tendency

Mean: The mean foreign price is the unweighted average of the foreign prices observed for a particular drug.

Median: The median foreign price is the price that divides the foreign prices observed for a particular drug into two sets of equal size, with half of foreign prices below the median and half above. Where the number of foreign prices is odd, the median is simply the middle price. Where the number of foreign prices is even, the median is the average of the two middle prices.

Example: Suppose again foreign prices for a certain drug are \$0.25, \$0.50, \$0.50, \$0.50, \$1.75. Since the number of prices is odd, the median is the middle price, that is, \$0.50.

Comparison: The mean and the median measures will return approximately the same value when foreign prices all lie within a narrow range, but the two measures can diverge dramatically when this is not the case. Extremely high or low prices will typically have more influence on the mean than the median, because extreme values seldom figure in the calculation of the latter.

Calculating Average Foreign-to-Canadian Price Ratios

Foreign-to-Canadian price ratios are constructed as sales-weighted arithmetic averages of the foreign-to-Canadian price ratios obtained at the level of individual drugs.

Algebraically, let

- $i = 1 \dots N$, each number identifying a drug included in the calculation
- $p(i)$ = the Canadian price of drug i
- $q(i)$ = the quantity of drug i purchased by Canadians
- $X(i)$ = total amount spent on drug i by Canadians
- $p^f(i)$ = the foreign price of drug i (converted to Canadian dollars)
- $w(i)$ = the proportion of Canadians' expenditure on the drugs 1 to N accounted for by drug i

The sales-weighted arithmetic average of foreign-to-Canadian price ratios (FTC) is given by:

$$(G1) \text{ } FTC = \sum w(i) [p^f(i) / p(i)]$$

where \sum signifies summation over drugs 1 to N .

With currency conversion at market exchange rates, average ratios constructed this way indicate how much more or less Canadians would have paid for the drugs they purchased had they paid foreign prices instead of Canadian prices. This becomes evident when one observes that:

$$(G2) \text{ } w(i) = p(i) q(i) / X(i)$$

Using (G2) in (G1) gives:

$$(G3) \text{ } FTC = \sum [p(i) q(i) / X(i)] [p^f(i) / p(i)]$$

This equation simplifies to:

$$(G4) \text{ FTC} = [1 / X(i)] \sum [p^f(i) q(i)]$$

The expression $\sum [p^f(i) q(i)]$ represents the dollar amount obtained by pricing out quantities at foreign prices, which is to say, the total amount Canadians would have spent had they paid foreign prices. The right-hand side of equation (G4) is the ratio of this hypothetical amount to the amount Canadians actually paid.

Let D represent the difference between the actual and hypothetical amounts paid expressed as a percentage of the former. Then:

$$(G5) D = (1 - \text{FTC}) \times 100$$

Note that $D \geq 0$ as $\text{FTC} \leq 1$. A value of $\text{FTC} < 1$ thus indicates Canadians would have paid less in total for the drugs they purchased in the relevant period had they paid foreign prices instead of Canadian prices, while an $\text{FTC} > 1$ indicates they would have paid more.