Inflation of Tradable Goods.

Rodrigo A. Cerda
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Rodrigo A. Cerda*

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* Correspondence address: Casilla 76, Correo 17, Santiago, Chile, Telephone: 56-2-3547101, Fax: 56-2-5532377, E-mail: rcerda@faceapuc.cl
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This paper explores which large economy blocks determine foreign inflation around the world. In the analysis, we focus on importable goods of 15 countries ranging from 1992 to 2002 at monthly basis. Using a SUR estimation, we find the US driving the inflation of importable goods around the world. However, decomposing the variation of importable good price indexes by frequency, by means of the Baxter-King approximate band pass filter, we find that the Euro and Asian areas might be a source of considerable inflation on the short run.

1. INTRODUCTION

Foreign inflation is becoming an important macroeconomic topic as globalization expands around the world. In one hand, larger foreign inflation compromises the accomplishment of inflation goals while on the other hand, increases on foreign inflation might produce imbalances on real exchange rate that must be corrected either by movements on nominal exchange rates or by real allocations of resources in the non tradable sector.

We follow the idea of different authors (Ridler and Yandle 1972, Sjaastad and Scacciavillani, 1996) in which inflation from large economy blocks might produce foreign inflation in other economies, if the large economy blocks have market power in tradable goods. This paper explores which economies, representing large economy blocks, have market power in tradable goods and thus determine foreign inflation around the world. In the analysis, we focus on importable goods.

We use monthly data on importable prices from a set of 15 different economies from January 1992 to December 2002. We initially present results using seemingly unrelated regressions (SUR). Later we show, by using spectral density analysis, that there exists significant variability at frequencies different from zero. Thus we decompose the time variation between long run variation and short run variation by using the Baxter-King filter. Next, we present SUR estimates using both the long run
and the short run variation, which show different sources of movements in importable goods’ inflation. The paper is organized as follows. Section 2 sets out a simple model of tradable goods’ inflation. Section 3 discusses the data while section 4 presents the econometric results and concludes.

2. THE MODEL

Consider a world of M countries. Let $D_{q,j}^j$ be the excess demand function for good $q$ in country $j$, which is a function of its real price, $P_{q,j}^j - P_j^j$, ($P_{q,j}^j$ is the natural log of the price of good $q$ while $P_j^j$ is natural log of the price of a reference basket, both in country $j$) plus other fundamentals variables, $Z_{q,j}^j$. In the world economy, the equilibrium condition requires the excess demand functions to add up to zero as in:

$$\sum_{j=1}^{M} D_{q,j}^j\left[(P_{q,j}^j - P_j^j), Z_{q,j}^j\right] = 0$$

Ignoring transport costs, tariffs and other barriers to trade, we may write (1) by using the “law of one price” as in:

$$\sum_{j=1}^{M} D_{q,j}^j\left[(P_{q,j}^j - EX_{X,j}^j - P_j^j), Z_{q,j}^j\right] = 0$$

Where $X$ is the notation for a reference country while $P_{q,X}$ and $EX_{X,j}^j$ are the natural log of the price of good $q$ in currency $X$ and the exchange rate between currency $j$ and $X$. Totally differentiating this summation yields:

$$\sum_{j=1}^{M} \eta_{q,j,d}\left[(P_{q,X} - (EX_{X,j}^j + P_j^j)) + \xi_{q,j,d}(Z_{q,j})\right] = 0$$
Where \( \eta_{qj} = \frac{\partial D_{qj}}{\partial \left( P_{qj} X J \right)} \) and \( \xi_{qj} = \frac{\partial D_{qj}}{\partial Z_{qj}} \). Finally, rearranging and integrating we obtain:

\[
P_{q,X} = \sum_{j=1}^{M} v_j (E X_j + P_j J) + \sum_{j=1}^{M} \lambda_j Z_{qj} J
\]

(4)  

Where \( \nu_j = \frac{\eta_{qj}}{\sum_{j=1}^{M} \eta_{qj}} \) and \( \lambda_j = \frac{\xi_{qj}}{\sum_{j=1}^{M} \eta_{qj}} \). Equation (4) states that the price of good \( q \) in terms of currency \( X \) is a function of national prices of foreign countries measured in currency of country \( X \), plus the evolution of other fundamentals that determine the excess demand functions of good \( q \). Note that as \( 1 \leq \frac{\partial \nu_j}{\partial \lambda_j} \geq 0 \), it follows \( \nu_j \geq 0 \). When \( \nu_j = 0 \), country \( j \) does not affect the price of good \( q \) while when \( \nu_j > 0 \) country \( j \) affects the price of good \( q \). Thus we interpret \( \nu_j \) as a measure of market power of country \( j \) in the world market of good \( q \).

3. THE DATA AND METHODOLOGY

In this section we explain the source of data and methodology used to test the validity of equation (4). The left hand side variable of equation (4) will be measured by a basket of importable goods measured in US dollars as reference currency while the right hand side variables will be measured by national price indexes, measured in US dollars, of countries with potential market power in the world market of tradable goods.

We obtained from Bloomberg, data on price indexes of importable goods measured in US dollars for 15 countries at monthly basis from January 1992 to December 2002. Those 15 countries are Brazil, Canada, US, France, Germany, Ireland, Italy, Netherlands, Spain, Sweden, UK, South Korea, Hong Kong, Japan and Singapore.

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1 It is a measure of the substitution effect in the excess demand function.
To compute national price indexes from countries with potential market power in the tradable goods market, we obtained data from four major countries representing four different areas which might have market power: Asia, Latin America, Europe and North America. From Bloomberg we obtained: (1) data on wholesale national price index from the US, the Euro zone, South Korea and Brazil, and (2) exchange rates vis-à-vis the US dollar of the same economies. Those data allow us to construct national price index measured in US dollar by diving wholesale national price index by its corresponding exchange rate.

We decide to estimate by means of Seemingly Unrelated equations (SUR) the following system:

$$\ln(IM_j) = \beta_0 + \beta_1 \ln(WPUSA_i) + \beta_2 \ln(WPEURO_{EURO}) + \beta_3 \ln(WPBRASIL_{BRAZIL})$$

$$+ \beta_4 \ln(WPKOREA_{KOREA}) + G_i(Z_t) + u_{ij}$$

Where IM is the importable price index of the jth country measured in US dollars, while WPUSA, WPEURO, WPBRAZIL and WPKOREA are the wholesale price index of the US, the Euro Zone, Brazil and South Korea respectively, while \( e^{X_y} \) denotes the exchange rate level of currency “y” in terms of currency X. The variable Z indicates other fundamentals, which we approximate by including a time trend and its square. The SUR system allows us to correct serial-correlation among the disturbance terms of different equations that might occur due to supply shocks that can impact import prices worldwide.

4. RESULTS

Table 1 shows the estimates of the SUR system from January 1992 to the December 2002. The first row presents the results when we restrict the coefficients to be the same in the 15 equations while the next rows allow heterogeneity in the coefficients among countries. From the table, we may conclude that the US shows the largest market power in almost all the countries in analysis. The Euro Zone also shows an important degree of market power while Latin America and the Asian area show smaller market power.
Figures 1 to 21 plot the spectral density of the growth rate of the series by means of the Fourier transformation of their autocorrelation function. These figures provide interesting information: the larger is the mass away from the zero frequency, the more important is the short run component of the series (high frequency). In the figures there is a significant fraction of the variation at high frequencies—in general, almost 30 percent of total variation is due to movements lasting less than 7 months. Thus, we decide to separate the movements of the series between high and low frequencies by using the approximate band-pass filter developed by Baxter and King (1999). In the empirical applications, we adopt movements lasting 7 months or less as definition of high frequency component. The specification results in a particular two-sided moving average (a linear filter) band-pass filter, i.e. a filter which passes through components of the time series with fluctuations of 7 months or larger while removing components at higher frequencies. The resulting moving average is of infinite order and an approximation to this filter is necessary to be applicable to finite time series. We chose the number of leads and lags in the filtered series to be equal to 4 to avoid unnecessary lost of data. Thus the approximate band-pass used in this analysis is the BP_{4}(7) filter, as described in Baxter and King (1999). The high frequency component is next defined as the difference between the original and the filter data.

Table 1 also presents the results of the SUR system when we estimate using the low and the high frequency components of the data. The results confirm the influence of the US on the long run component. However, the short run components of the series appear mainly influenced by the Euro and Asian areas. This result is not surprising. In fact, exchange rates had experienced significant movements on short period of time which produce inflation on tradable goods in the short run. On the long run, the evolution of US inflation is the main determinant.

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2 The notation indicates that the filter passes through components of the data with cycles higher than 24 months while the construction of the filter uses 4 leads and lags of the data.
REFERENCES


Table 1: SUR estimates by frequency

<table>
<thead>
<tr>
<th></th>
<th>ln(WPUSA)</th>
<th>ln(WPEuro)</th>
<th>ln(WPBrazil)</th>
<th>ln(WPKorea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricted System</td>
<td>1.60</td>
<td>1.31</td>
<td>0.37</td>
<td>0.57</td>
</tr>
<tr>
<td>Brazil</td>
<td>18.5**</td>
<td>18.6**</td>
<td>5.89</td>
<td>5.89</td>
</tr>
<tr>
<td>USA</td>
<td>1.50**</td>
<td>1.56**</td>
<td>1.60**</td>
<td>1.50**</td>
</tr>
<tr>
<td>Korea</td>
<td>0.44</td>
<td>0.41</td>
<td>0.01</td>
<td>0.14</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.51</td>
<td>0.54</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Sweden</td>
<td>2.47</td>
<td>2.72</td>
<td>1.61</td>
<td>1.61</td>
</tr>
<tr>
<td>UK</td>
<td>1.77</td>
<td>1.91</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>USA</td>
<td>1.50</td>
<td>1.56</td>
<td>1.60</td>
<td>1.50</td>
</tr>
</tbody>
</table>

The regressions include a time trend and a time trend squared. Standard errors are in parenthesis. **, * indicates significant at 1 and 5 per cent.
Figures 1 to 21: Spectral Density of the Growth Rate of Importable Price Index, Measured in US Dollars