Short-Term Determinants of the Real Exchange Rate
Sudden Stops and the Real Exchange Rate

Case Study: The End of the Argentine Convertibility Plan

What was the Argentine Convertibility Plan? April 1991-December 2001, 1 peso = 1 dollar

<table>
<thead>
<tr>
<th></th>
<th>'99-'01</th>
<th>'02</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Growth Rate</td>
<td>-2.8%</td>
<td>-10.9%</td>
</tr>
<tr>
<td>Inflation</td>
<td>-1.3%</td>
<td>41%</td>
</tr>
<tr>
<td>( S_{\text{Peso/$}} )</td>
<td>1.0</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Dec. 2001 Argentina defaults on its (domestic and) foreign debt. \( \rightarrow \) leads to a cutoff from international capital markets. [This is called a Sudden Stop.]
What happens to the RER?

\[ e_{\text{Peso}/$} = \frac{s_{\text{Peso}/$}}{p_{\text{US}}} \]

Take log differences

\[ \%\Delta e_{\text{Peso}/$} = \%\Delta s_{\text{Peso}/$} + \%\Delta p_{\text{US}} - \%\Delta p_{\text{Arg}} \]
\[ = 250\% + 2.5\% - 41\% \]
\[ \approx 200\%. \]

⇒ After the default Argentina experiences a real depreciation of about \(200\%\).
How can we understand this?

– Tariff? — No, not really.

– Balassa Samuelson — Not that likely an explanation.

Here is a different explanation: The Sudden Stop ($C_T \downarrow$) caused the real depreciation.

The next slides provide some evidence in support of the claim that Argentina experienced a sudden stop in 2002.
Interest Rates shoot up
Figure 1.4. Interest Rate Spreads over U.S. Treasuries\(^1\)
(In basis points)

Source: Datastream.
Current Account Reversal

(the graph shows $-CA_t$)

- we see current account deficits until the year 2000

- then drastic current account reversal beginning in 2001 with current account surpluses in 2001 and 2002
Figure 1.2. Capital Flows
(In billions of U.S. dollars)
Large Real Exchange Rate Depreciation
Figure 2.1. Monthly Real Effective Exchange Rate
(1990 = 100)

Source: IMF database.
Large Contraction in GDP
Figure 1.3. Real Quarterly GDP Growth
(In percent)
Why did the Real Exchange Rate Depreciate so Much?

Recall

\[ e_{\text{Peso} / \$} = \frac{s_{\text{Peso} / \$ P^{US}}}{P^{Arg}} = s_{\text{Peso} / \$} \frac{\phi(P^{US}_T, P^{US}_N)}{\phi(P^{arg}_T, P^{arg}_N)} = \frac{\phi(1, P^{us}_N / P^{us}_T)}{\phi(1, P^{arg}_N / P^{arg}_T)} \]

Taking log differences

\[ \% \Delta e_{\text{Peso} / \$} = \alpha \left[ \% \Delta \left( \frac{P^{us}_N}{P^{us}_T} \right) - \% \Delta \left( \frac{P^{arg}_N}{P^{arg}_T} \right) \right] \]

\[ \simeq 0\% - \alpha \% \Delta \left( \frac{P^{arg}_N}{P^{arg}_T} \right) \]

\[ 200\% \simeq -0.75 \% \Delta \left( \frac{P^{arg}_N}{P^{arg}_T} \right) \]
⇒ So the question of why did the real exchange rate depreciate so much becomes: “Why did the relative price of nontradables fall so much in Argentina after the Sudden Stop”. 
What happens in a Sudden Stop?

Narrative: Argentina had a large trade deficit before the Sudden Stop. With the default it has no more access to international capital markets. The CA must swing into balance, or surplus, \( CA \geq 0 \) and there must be a trade balance reversal from deficits to surplus, \( TB \Rightarrow 0 \). With a trade balance reversal domestic demand for traded goods falls, and absent any relative price changes domestic demand for nontraded goods also falls. Weak domestic demand for nontradables will lead to a decline in the relative price of nontradables bringing about a real depreciation.

We will embed this narrative into a theoretical model next.
The TNT Model

2 goods: $Q_T$ and $Q_N$
$Q_T$ = traded output
$Q_N$ = nontraded output
$P_T$ = domestic currency price of traded good
$P_N$ = domestic currency price of nontraded good

Law of one price holds for traded goods: $P_T = SP_T^*$
Production

Production of Tradables:

\[ Q_T = F_T(L_T); \quad F_T' (\cdot) > 0; \quad F_T'' (\cdot) < 0; \]

\( L_T \) = labor input in the traded sector

Production of Nontradables:

\[ Q_N = F_N(L_N); \quad F_N' (\cdot) > 0; \quad F_N'' (\cdot) < 0; \]

\( L_N \) = labor input in the nontraded sector
Labor Supply

Fixed Labor Supply: $L = L_T + L_N$

$L = \text{total labor supply}$

Increase in labor input in the traded sector must be compensated one for one by decreases in the nontraded sector

$$dL_T = -dL_N \quad (1)$$
Construct the **Production Possibility Frontier**

\[ dQ_T = F'_T(L_T)dL_T \]  \hspace{1cm} (2)

\[ dQ_N = F'_N(L_N)dL_N \]  \hspace{1cm} (3)

[insert graph]

What is the slope of the PPF?

Divide (3) by (2) and use (1) to obtain:

\[
\frac{dQ_N}{dQ_T} = -\frac{F'_N(L_N)}{F'_T(L_T)}
\]
This equations says that the slope of the PPF is equal to the marginal rate of transformation between traded and nontraded goods.

Suppose we move down the PPF, producing more tradables. Then $L_T$ must rise and $L_N$ must fall. This raises the marginal product of labor in the nontraded sector, $F_N'(L_N)$, and lowers the marginal product of labor in the traded sector, $F_T'(L_T)$. This is so because we are assuming that the production functions display decreasing returns to scale, which is to say we assume that the marginal product of labor is decreasing with labor.

This assumption then implies that the PPF becomes steeper as $Q_T$ rises. It follows that the PPF is concave towards the origin,

Our argument is that a Sudden Stop moves the economy down its PPF, reallocating production from the nontraded sector to
the nontraded sector. The above relation says that the sudden stop causes the economy to produce at a point where the PPF is steeper. But we want to link the Sudden Stop to a real exchange depreciations. Is there a link between the slope of the PPF and the relative price of nontradables in terms of tradables? We will show that link in the next slide.
Traded Goods Sector
Firms choose $Q_T$ and $L_T$ to maximize profits

\[
\text{profits} = P_T Q_T - W L_T.
\]

subject to

\[
Q_T = F_T(L_T).
\]

Eliminate $Q_T$

\[
\text{profits} = P_T F_T(L_T) - W L_T
\]

Choose $L_T$ to maximize profits

\[
\frac{\partial \text{profits}}{\partial L_T} = 0 \Rightarrow P_T F_T'(L_T) = W
\] (*
Nontraded Goods Sector
Firms choose $Q_N$ and $L_N$ to maximize profits

\[
\text{profits} = P_N Q_N - W L_N.
\]

subject to

\[
Q_N = F_N(L_N).
\]

Eliminate $Q_N$

\[
\text{profits} = P_N F_N(L_N) - W L_N
\]

Choose $L_N$ to maximize profits

\[
\frac{\partial \text{profits}}{\partial L_N} = 0 \Rightarrow P_N F_N'(L_N) = W
\]

\[ (** \) \]}
Combining (*) with (**) yields

\[ \frac{P_T}{P_N} = \frac{F'_N(L_N)}{F'_T(L_T)} \]  

(4)

As we move down the PPF its slope becomes steeper and steeper implying that the relative price of nontradables relative to tradables falls.
A Sudden Stop is a situation in which the production of nontradables must fall and the production of tradables must rise. That is a move down the production possibility frontier. What will induce firms to shift production out of the nontraded sector and into the traded sector? The relative price of nontraded goods must fall.

Hence a Sudden Stop leads to a real exchange rate depreciation.
A Second Example of observing a large Real Exchange Rate depreciation after a Sudden Stop

Case Study: Chile 1979-1985

In 1982 (after the default of Mexico in August) credit dries up for highly indebted developing countries, particularly in Latin America. These countries were running large current account deficits. The Sudden Stop forces them to run TB surpluses to service their existing debts.

What is the required external adjustment?

\[ Q_T \uparrow \quad \text{and} \quad Q_N \downarrow \]

This adjustment caused a large real exchange rate depreciation (and with it costly reallocations of production away from the nontraded sector towards the traded sector)
Chile, Real Exchange Rate Depreciation and Trade Balance Reversal, 1979-1985

<table>
<thead>
<tr>
<th>Year</th>
<th>$\Delta e$</th>
<th>$\frac{TB}{GDP}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>-1.7</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>-2.8</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>-8.2</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>20.6</td>
<td>0.3</td>
</tr>
<tr>
<td>1983</td>
<td>27.5</td>
<td>5.0</td>
</tr>
<tr>
<td>1984</td>
<td>5.1</td>
<td>1.9</td>
</tr>
<tr>
<td>1985</td>
<td>32.6</td>
<td>5.3</td>
</tr>
</tbody>
</table>

cumulative RER depreciation of close to 90 percent.