Nominal exchange rates and net foreign assets’ dynamics: the stabilization role of valuation effects

Sara Eugeni
Durham University Business School

Conference on macro-financial linkages and current account imbalances
OeNB, Vienna, July 2nd-3rd 2015
Motivation

What is the role of the nominal exchange rate in driving the composition and the evolution of a country’s balance sheet?

- **Portfolio choices (quantity):** it is rational to...
  ...adjust the portfolio towards assets which are denominated in depreciating currencies (less foregone consumption today)
  ...but also towards those expected to appreciate as they have more purchasing power (more consumption tomorrow)

- **“Valuation effects” (price):**
  If the domestic currency depreciates, then the value of foreign assets (liabilities) might increase (might fall) and therefore the country’s external position might improve.

What we do

we develop a two-country overlapping-generations model of endogenous portfolio choice and nominal exchange rate determination
Stylized fact (1)
The growing importance of valuation effects: United States


Sara Eugeni Durham University Business School
Stylized fact (2)
The growing importance of valuation effects: emerging market economies

Valuation effects

Two sources:

- capital gains and losses (Devereux and Sutherland, 2010; Tille and Van Wincoop, 2010)
- fluctuations of nominal exchange rates (the focus of this paper)

- this paper is the first attempt to model exchange rate-driven valuation effects in a model with endogenous portfolio choice
- Lane and Shambaugh (2010) point out that wealth effects associated with fluctuations of nominal exchange rates are empirically important and positively correlated with overall valuation effects
Stylized fact (3)
The depreciation of the dollar against the currencies of emerging market economies

Set up

Two crucial ingredients:

- **Market incompleteness**: OLG structure + no contingent assets (only currencies)
  - In Lucas’ asset pricing model (1982)...
    ...portfolios are constant across states of nature as markets are complete
    ...this implies no portfolio rebalancing over time ($\Delta NFA = 0$)

- **Currencies are imperfect substitutes**: each currency can only buy the country-specific good
  - As in Lucas (1982), but the timing and the role of money is different with implications for the behaviour of the nominal exchange rate (store of value vs. medium of exchange)
  - Indeterminacy of exchange rates (and portfolios) if no legal restrictions in currency trading (Kareken and Wallace, 1981; Sargent, 1987)
Consumers’ maximization problem

Agent \( h \) born in state \( s \) solves the following maximization problem:

\[
\max_{c_{1h}(s), c_{2h}(ss'), m_h(s)} \sum_{\ell} \frac{c_{1h}(s)^{1-\frac{1}{\sigma}}}{1 - \frac{1}{\sigma}} + \beta \sum_{s'} \rho(ss') \sum_{\ell} \frac{c_{2h}(ss')^{1-\frac{1}{\sigma}}}{1 - \frac{1}{\sigma}} \quad \sigma > 0
\]

subject to his budget constraints:

\[
p^1(s)c_{1h}(s) + p^2(s)e(s)c_{1h}(s) = w_h(s) - m^1_h(s) - e(s)m^2_h(s)
\]

\[
p^1(s')c_{2h}(ss') = m^1_h(s) \quad \forall s'
\]

\[
p^2(s')c_{2h}(ss') = m^2_h(s) \quad \forall s'
\]

where \( w_1(s) = p^1(s)y^1(s) \) and \( w_2(s) = p^2(s)e(s)y^2(s) \).
The role of the exchange rate for portfolio choice (partial equilibrium)

\[
\frac{m_1^h(s)}{m_2^h(s)} = e(s)^\sigma \left[ \frac{\sum_{s'} \rho(ss')p_1(s')^{1-\sigma}}{\sum_{s'} \rho(ss')p_2(s')^{1-\sigma}} \right]^\sigma
\]

- As the exchange rate appreciates \((e(s) \text{ rises})\), the demand for currency 2 falls.
- The demand for a currency is positively related to its expected purchasing power \((\sigma > 1)\).
Some key identities

Using the goods’ market clearing equations and the budget constraints, we get the following expression for the balance of trade of country 1:

\[ tb_1(s's) \equiv [m_1^1(s) - m_1^1(s')] + e(s)[m_1^2(s) - m_1^2(s')] \]

After a few steps, we can highlight the role of valuation effects in the accumulation of net foreign assets:

\[ \Delta NFA_1(s's) = tb_1(s's) + r(s's)e(s')m_1^2(s') \]

where \( r(s's) = R(s's) - 1 \equiv \frac{e(s)}{e(s')} - 1 \).
Portfolio choice and the share of world GDP

**Proposition:** Country $h$’s portfolio holdings in state $s$ depends on its current share of world GDP $w(s)$:

$$\frac{m^\ell_h(s)}{M^\ell} = \frac{w_h(s)}{w(s)} \quad \ell = 1, 2$$

where $w(s) = p^1(s)y^1(s) + p^2(s)e(s)y^2(s)$.

$\Rightarrow$ the nominal exchange rate adjusts in equilibrium so as to counterbalance expectations about future prices.

**Main implication:** countries which run trade surpluses (deficits) are countries whose relative position in the world economy has improved (fallen).

But does this happen in equilibrium?
The rise of emerging markets in the world economy

Can we explain the deterioration of the US external position over the past 20 years as well as the positive valuation effects as due to the rise of emerging countries?

- Country 1 is the US. Country 2 is China.
- Two states example (one period is 20-years long). State 1 (2) is the state of the economy in 1990 (2010).
The rise of emerging markets in the world economy

Parametrization

\[ y^1(1) = 31,342 \quad \quad y^1(2) = 41,627 \]
\[ y^2(1) = 2,005 \quad \quad y^2(2) = 7,693 \]
\[ \sigma = 4 \]
\[ \rho(ss) = 0.9 \]
\[ M^1 = M^2 = M = 1 \]
\[ \beta = 1 \]
The rise of emerging markets in the world economy

Table: Country 1. Numerical results

<table>
<thead>
<tr>
<th>∆NFA_{1(12)} / GDP_{1(2)} %</th>
<th>tb_{1(12)} / GDP_{1(2)} %</th>
<th>VAL_{1(12)} / GDP_{1(2)} %</th>
</tr>
</thead>
<tbody>
<tr>
<td>−1.87%</td>
<td>−6%</td>
<td>4.13%</td>
</tr>
</tbody>
</table>

Table: The external positions of the US and China, 1990-2010

<table>
<thead>
<tr>
<th></th>
<th>NFA_{2010} − NFA_{1990} / GDP_{2010} %</th>
<th>\sum_{t=1990}^{2010} CA_t / GDP_{2010} %</th>
<th>\sum_{t=1990}^{2010} VAL_t / GDP_{2010} %</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>−15%</td>
<td>−41%</td>
<td>26%</td>
</tr>
<tr>
<td>China</td>
<td>25%</td>
<td>31%</td>
<td>−6%</td>
</tr>
<tr>
<td>United States vs. China</td>
<td>−15%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remark: the model obviously overestimates the appreciation of the Chinese nominal exchange rate (+61% against +25%).
## Robustness (1)

### Table: Varying the elasticity of substitution parameter

<table>
<thead>
<tr>
<th>$\sigma$</th>
<th>$m_1(2)$</th>
<th>$e(2)$</th>
<th>$\frac{tb_1(12)}{GDP_1(2)}$ (%)</th>
<th>$\frac{VAL_1(12)}{GDP_1(2)}$ (%)</th>
<th>$\frac{\Delta NFA_1(12)}{GDP_1(2)}$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.1401</td>
<td>6.5061</td>
<td>26%</td>
<td>-23.20%</td>
<td>2.8%</td>
</tr>
<tr>
<td>1</td>
<td>0.5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0.7029</td>
<td>0.4079</td>
<td>-6.24%</td>
<td>5.05%</td>
<td>-1.19%</td>
</tr>
<tr>
<td>4</td>
<td>0.7833</td>
<td>0.2538</td>
<td>-6%</td>
<td>4.13%</td>
<td>-1.87%</td>
</tr>
<tr>
<td>8</td>
<td>0.8167</td>
<td>0.1889</td>
<td>-5.45%</td>
<td>2.89%</td>
<td>-2.56%</td>
</tr>
<tr>
<td>16</td>
<td>0.8314</td>
<td>0.1496</td>
<td>-5.06%</td>
<td>1.8%</td>
<td>-3.26%</td>
</tr>
</tbody>
</table>
Robustness (2)

Table: Varying the persistence parameter

<table>
<thead>
<tr>
<th>$\rho(ss)$</th>
<th>$m_1(2)$</th>
<th>$e(2)$</th>
<th>$\frac{tb_1(12)}{GDP_1(2)} %$</th>
<th>$\frac{VAL_1(12)}{GDP_1(2)} %$</th>
<th>$\frac{\Delta NFA_1(12)}{GDP_1(2)} %$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>0.7903</td>
<td>0.1785</td>
<td>-4.53%</td>
<td>-0.93%</td>
<td>-5.46%</td>
</tr>
<tr>
<td>0.5</td>
<td>0.7896</td>
<td>0.1874</td>
<td>-4.66%</td>
<td>0</td>
<td>-4.66%</td>
</tr>
<tr>
<td>0.6</td>
<td>0.7886</td>
<td>0.1986</td>
<td>-4.84%</td>
<td>1.23%</td>
<td>-3.61%</td>
</tr>
<tr>
<td>0.7</td>
<td>0.7874</td>
<td>0.2128</td>
<td>-5.09%</td>
<td>2.89%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>0.8</td>
<td>0.7856</td>
<td>0.2310</td>
<td>-5.46%</td>
<td>2.47%</td>
<td>-2.99%</td>
</tr>
<tr>
<td>0.9</td>
<td>0.7833</td>
<td>0.2538</td>
<td>-6%</td>
<td>4.13%</td>
<td>-1.87%</td>
</tr>
</tbody>
</table>
Conclusions

Our model shows that:

1. countries’ portfolio choices are influenced by the nominal exchange rates, which are driven by expectations about future prices;

2. exchange rate-driven valuation effects have a “stabilizing effect” on the net foreign assets positions (as long as there is output persistence);

3. formalizes the deterioration of the US external position and the wealth transfer that they received from the rest of the world as a consequence of the rise of emerging market countries (higher real GDP growth);

4. quantitatively important valuation effects can be generated.