COMMENTS ON THREE PAPERS ON BEER MODELS
PRESENTED BY

A. BÉNASSY-QUÉRE ET. AL.
T. STOLPER AND M. FUENTES
R. MACDONALD AND PREETHIKE DIAS

BY
BERND SCHNATZ[1]
9 FEBRUARY 2007

When assessing the issue of global imbalances, the relevant part in the latest G7 statement of 16 September 2006 constitutes a useful starting point. This asserts: "[…] We reaffirm that exchange rates should reflect economic fundamentals. Excess volatility and disorderly movements in exchange rates are undesirable for economic growth. We continue to monitor exchange markets closely and cooperate as appropriate. Greater exchange rate flexibility is desirable in emerging economies with large current account surpluses, especially China, for necessary adjustments to occur. […]". The statement highlights, *inter alia*, three important areas: the relationship between exchange rates and fundamentals, the need to monitor exchange rates and the request for more flexibility in certain exchange rates.

The statement does not only suggest that exchange rates are expected to play some vital role in the resolution of global imbalances, but it also indicates that there is a need for a quantitative framework for guidance. Such a framework should be able to tell us (1) which exchange rates should adjust to help restoring global balance, (2) what magnitudes of exchange rate adjustment this could imply, and (3) to what extent the exchange rate can contribute to the resolution of global imbalances. In other words, it requires a sound judgement of the equilibrium exchange rate configuration.

The papers presented in this session can help to respond – at least partly – to these questions. What the empirical models included in these papers have in common is that they belong to the strand of literature called "behavioural equilibrium exchange rates (BEER)". Reading through these analyses, I arrived at the following overall conclusions: (1) Conceptually, there appears to be rather broad-based agreement which variables should account for the time-varying path

---

of the equilibrium exchange rate. (2) In practice, however, there appears to be less agreement about the precise definition of the variables to be included in the estimation. (3) Notwithstanding this, the results for the BEERs are qualitatively rather robust across different models, with the exception of China (and transition economies), where estimates need to be interpreted with (even) more caution. (4) Linking the BEER results presented in these papers to the resolution of global imbalances is not straightforward.

Before addressing in more detail the studies presented in this session, please let me briefly put the BEER model into a "fundamental equilibrium exchange rate (FEER)" perspective, which was the subject of the previous session. Overall, the FEER incorporates a more normative structure and asks about the exchange rate configuration under some "ideal" conditions of internal and external balance. Accordingly, the results are often shown as a snapshot of the exchange rate configuration at a certain point in time rather than the evolution of the FEER (as in the paper by W. Cline presented at the workshop). At the same time, in order to be a meaningful equilibrium concept, it would be important to verify that the actual exchange rate indeed fluctuates around some equilibrium schedule over the medium to long term. Indeed, there seems to be some evidence in a panel data framework for cointegration between the FEER and the actual rates, suggesting that misalignments would follow a stationary process (see Barisone et al. 2006). For individual countries, however, this does not necessarily seem to hold. Notably for the USD, the charts in the study shows a divergence from equilibrium since the early 1990s, which may cast some doubts on the relevance of this equilibrium approach.

The BEER models presented in this session avoid by construction this problem. As the papers are based on cointegration analysis (in a panel setting and two papers also examine equilibrium rates in a country-by-country framework) the resultant misalignment must be stationary. As emphasised by Dias/MacDonald, the BEER is also subject to more rigorous statistical testing, particularly, as to which economic fundamentals have indeed affected the exchange rate over longer horizons. By contrast, the justification of the fundamentals in the FEER is based more on economic reasoning. Overall, however, there seem to be strong complementarities between the BEER and the FEER approaches because the fundamentals to be included in BEER models are also commonly guided by considerations related to internal and external balance.

While a first look at the different studies suggests that they use a similar set of economic fundamentals, there are significant differences in the detail (see Table 1). All studies include a productivity differential – justified either by the Balassa-Samuelson theory or by new open economy macro models – and a measure related to external balance. While Bénassy-Quéré et al. and Stolper/Fuentes include the net foreign asset position to proxy for the latter, Dias/MacDonald include the trade balance which – on theoretical grounds – can be justified as being equivalent for including the net foreign asset position in the long run (I will turn to

this later again). Stolper/Fuentes and Dias/MacDonald also include the terms of trade as an additional fundamental. Finally, Dias/MacDonald feature the real interest rate differential in their study as a transitory factor, which is stationary and washes out in the longer term, implying, in turn, that the time horizon underlying their equilibrium concept is more short-term/cyclical.

Table 1: Overview of empirical approaches

Study	CEPII	GSDEER	MacDonald
Economic fundamentals	Productivity NFA	Productivity Terms of Trade NFA*	Productivity Terms of Trade Trade balance Real interest rate differential
Sample	15 REER bilateral, RoW 1980-2004	35 bilateral rates versus USD (1980 -	10 REER (1988-
Econometric approach	Country-by-country analysis Panel cointegration	Panel cointegration	Country-by-country analysis, Panel cointegration

In the empirical implementation, however, there are significant differences in the definition of the fundamentals. As regards the productivity term, Bénassy-Quéré et al. employ an indirect measure of productivity, as defined by the relative price of non-traded and traded goods (consistent for instance with Alberola et al (1999)). By contrast, Stolper/Fuentes include a direct measure for labour productivity in the traded and the non-traded sectors. Although it can be shown in a simple Balassa-Samuelson framework that these measures should be equivalent in theory, the evolution of the variables is most likely rather different in practice. Finally, Dias/MacDonald also include a more direct but also much broader measure for economy-wide productivity by using the per-capita income.

As regards the net foreign asset position, Bénassy-Quéré et al. use data from the well-known Lane and Milessi-Feretti (2006) database. Consistent with Faruqee (1995) as well as with Lane and Milessi-Feretti (2004), they find a significant impact of the net foreign asset variable. Stolper/Fuentes, by contrast, using the IMF IIP database to the extent possible, cannot discover a significant relationship between their net foreign asset position and the exchange rate in their sample. This may suggest that the relationship is rather sensitive to the exact data source and/or to the underlying sample. However, it may also relate to the fact that Stolper/Fuentes examine bilateral US dollar rates, while the net foreign asset variable should be more relevant for the effective exchange rate. Instead of employing the net foreign asset position, Dias/MacDonald decided to follow Lane and Milessi-Feretti (2002) and decompose

the link between the net foreign asset position and the real exchange rate into (1) a relationship between the net foreign asset position and the trade balance and (2) a relationship between the trade balance and the real exchange rates and argue in favour of including the trade balance as an exchange rate determinant.

Given the diversity of the actually employed fundamentals and the underlying samples, it appears rather striking how similar the results for the equilibrium exchange rates are (see Table 2). The results presented in Bénassy-Quéré et al. and in Stolper/Fuentes unanimously agree that (1) the euro and the pound sterling have been overvalued and (2) the Japanese yen and the Chinese remimbi (CNY) have been undervalued while (3) the results on the US dollar are more ambiguous. While Bénassy-Quéré et al. find some US dollar overvaluation (5-10%), Stolper/Fuentes would suggest some undervaluation (5%). Given the uncertainties surrounding estimates of equilibrium exchange rates, the differences on the US dollar do not seem large enough to identify them as a matter of substantial disagreement. For the CNY, however, there is a significant discrepancy in terms of the magnitude of the misalignment. While Bénassy-Quéré et al. find an undervaluation of the Chinese currency of 30-45%, Stolper/Fuentes suggest a more moderate undervaluation of the CNY (about 5%).

Table 2: Estimated effective equilibrium exchange rates/misalignments

	Bénassy-Quéré et al.	Stolper/Fuentes
USD	Overvalued (5-10%)	Undervalued (around 5%);
EUR	Overvalued (1-10%)	Overvalued (around 6%)
CNY	Undervalued (30-45%)	Undervalued (around 5%)
JPY	Undervalued (7-12%)	Undervalued (around 8%)
GBP	Overvalued (15-20%)	Overvalued (around 20%)

Overall, the disagreement on the fair value of the CNY may be due to the specific problems related to estimating equilibrium exchange rates for countries like China which have been subject to a transition process. For such countries, the useable time series are short; non-stationary, and subject to special, transition-related developments. The issue related to the estimation of equilibrium exchange rates for such currencies is illustrated in Chart 1, which plots – in blue – the REER of the CNY (in logs). Moreover, I generated a second time series assuming the China's productivity has grown by 5% faster than in its partner countries. If I now simply regress the productivity differential on the real exchange rate (country-by-country approach with only two variables) over the full sample period, I would find the wrong sign for

the productivity variable and the CNY would actually turn out to be *overvalued* (see dotted line). In a second exercise, if I impose the productivity coefficient estimated by Stolper/Fuentes in a panel framework and construct the equilibrium exchange rate since 1980, I would get the green line for the equilibrium exchange rate. This would indeed suggest a strong undervaluation of the CNY with only one intersection of the actual real exchange rate and the equilibrium rate. Is this too simplified? Probably yes, but if you look at the charts on China and India based on the panel estimates in Bénassy-Quéré et al., it actually does not look so different. At least there is also only one intersection of the equilibrium and the actual rate. Furthermore, if we can agree that China was in 1980 far away from having market determined prices and exchange rates and plot the equilibrium exchange rate since the early 1990s, we get the red line, suggesting a much smaller undervaluation.
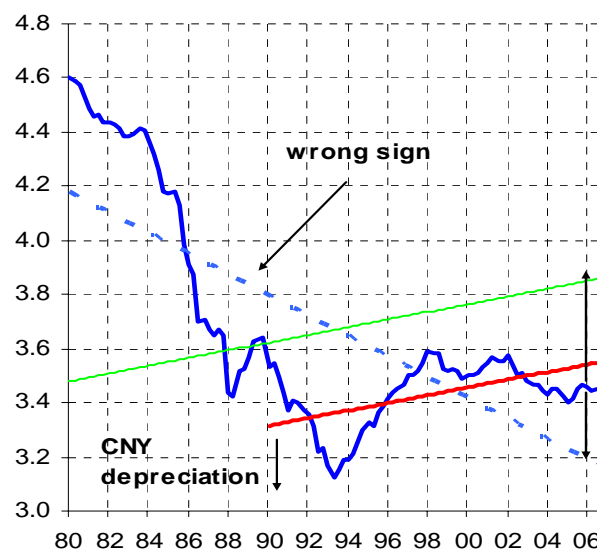
Let me emphasise that, by this example, I do not wish to put forward a preference for the one result over the other. Rather, I would like to underscore that it is crucial that the results are well understood and not interpreted too mechanistically, particularly, if they are used for policy advice. In view of these pitfalls, we have proposed in a recent paper a two-step approach for computing equilibrium exchange rates for transition economies (see Maeso-Fernandez et al. 2006): We first estimate the coefficients for non-transition economies and then

Chart 2. Real effective RMB exchange rate and illustrative equilibria: a methodological discussion
Vertical axis: logarithm of the real exchange rate index.

Source: ECB staff, IMF.
Note: A rise in the real exchange rate reflects a real appreciation.

apply the estimated coefficients to the transition countries. Obviously, this approach is not a panacea, as the range of uncertainty becomes very big, but, eventually, it may be provide a more appropriate guide for assessing the "fair value" of the Chinese currency.

Finally, I would like to briefly address the link of the BEER results to the resolution of the US current account deficit. In principle, there are two methods available: Firstly, one could calibrate a BEER with some more normative structure placed on the economic fundamentals. For instance, one could set the net foreign asset position at a level perceived to be sustainable and derive the associated equilibrium exchange rate. This would be consistent with the "total misalignment" mentioned by Dias/MacDonald. Secondly, as the BEER (particularly in a country-by-country setting) commonly employs vector-error correction model modelled as a

system of equations, one could iterate the exchange rate and the fundamentals to arrive at some desired equilibrium for the external position.

As the external balance term (net foreign asset position) drops out in the regression by Stolper/Fuentes, they decide to compute the change in the exchange rate consistent with more sustainable external imbalances outside the model. In more detail, they estimate price elasticities of exports and imports for four major countries and regions. In their scenario analysis – based on international forecasts produced by Goldman Sachs – they find that the US trade deficit would decline to 4.4 % of GDP by 2011, while the US dollar would depreciate by only 3.5%. At the same time, China's trade balance would move strongly into deficit, reaching 6.6% of GDP by 2011. Moreover, they suggest that reasonable exchange rate changes (stronger than those in the baseline) would be insufficient to produce a US trade deficit of 3% of GDP. As a result, this analysis suggests that exchange rate adjustment alone would be insufficient for global rebalancing.

The results, however, require a rather cautious interpretation. While the magnitude of the rebalancing is strongly influenced by the price elasticities of exports and imports, their estimation is clouded by several caveats. As mentioned by the authors, the price elasticities of imports have consistently the wrong sign, which, in turn, has a strong impact on the results. Furthermore, in view of the underlying data properties, the overall econometric methodology requires some refinement before the conclusions can be taken literally. As a result, the adjustment in the exchange rate configuration to restore global balance remains an interesting topic for the research agenda.

References

Alberola, E., S. G. Cervero, H. Lopez, and A. Ubide (1999) "Global equilibrium exchange rates: euro, dollar, "ins", "outs" and other major currencies in a panel cointegration framework", *IMF Working Paper, 175*.

Barisone, G., R. Driver, and S. Wren-Lewis (2006) "Are our FEERs justified?", *Journal of International Money and Finance*, 25, 741-759.

Faruqee, H. (1995) "Long run determinants of the real exchange rate: a stock-flow perspective", *IMF Staff Papers*, 42, 80-107.

Lane P. and G. M. Milesi-Feretti (2000) "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities", *IMF Working Paper, 69*.

Lane P. and G. M. Milesi-Feretti (2002) "External wealth, the trade balance, and the real exchange rate", *European Economic Review*, 46, 6, 1049-1071.

Lane, P. and G. M. Milesi-Ferretti (2004) "The Transfer Problem Revisited: Net Foreign Assets and Real Exchange Rates", *The Review of Economics and Statistics*, 86, 4, 841-857.

Lane P. and G. M. Milesi-Feretti (2006) "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities", *IMF Working Paper, 69*.

Maeso-Fernandez, F., C. Osbat, B. Schnatz (2006) "Towards the estimation of equilibrium exchange rates for transition economies: Methodological issues and a panel cointegration perspective", *Journal of Comparative Economics*, 34, 499-517.