

China | Is RMB undervalued?

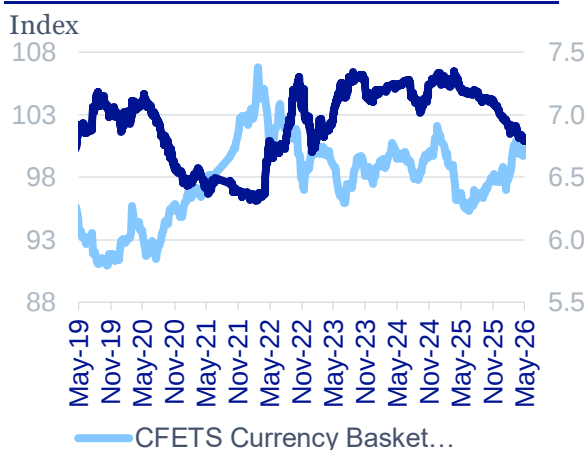
Jinyue Dong and Christian Larrahondo

The potential RMB to USD exchange rate undervaluation has long-lasting been a hot topic in International Economics literature and in the financial market, as China's current account and trade balance have kept large surplus for a long time in the past decades. Thus, people always doubt Chinese government has deliberately guided RMB depreciation in order to keep its exports competitiveness. During the trade disputes between China and the US or EU, it becomes even more likely a typical political rhetoric to give pressure to China. In the past decades, the topic of RMB undervaluation has been deemed to be a political weapon instead of a serious economic discussion.

Apparently, it indeed looks difficult to argue that the RMB exchange rate has not been undervalued. As the International Monetary Fund noted in its country report published in February 2026, China's external position "is assessed to be stronger than the level implied by medium-term fundamentals." (Figure 1)

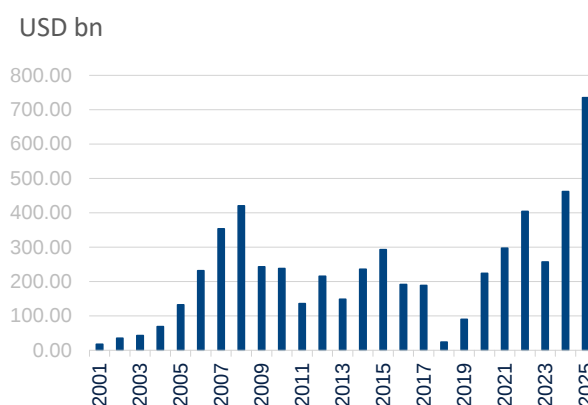
However, to get a more balanced view of this complex topic, let us take a deeper look of what is going on regarding the diverging pattern of China's current account and capital account in recent years. China's official current account surplus last year was USD 735 billion, more than 3% of GDP, or roughly 30% of combined global current account surpluses. And its official trade surplus was USD 1.2 trillion, about 6% of GDP and nearly 40% of all global trade surpluses. These figures are both at record levels in nominal terms. (Figure 2-4) That is the fundamental reason people believe the authorities deliberately lead RMB depreciation to support its export competitiveness thus accumulate a large current account surplus.

FIGURE 1: RMB TO USD NOMINAL EXCHANGE RATE AND THE CFETS BASKET



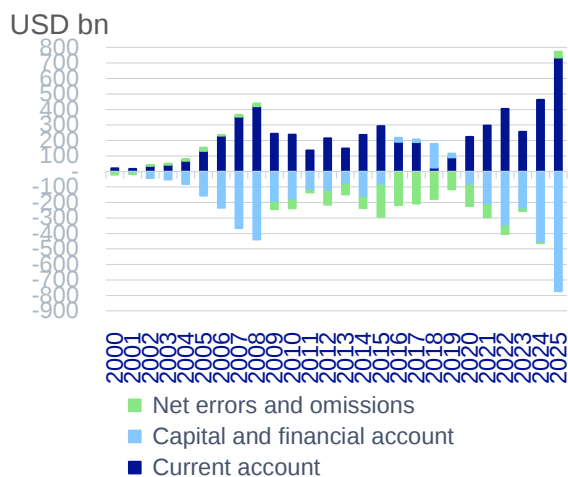
Source: CEIC and BBVA Research

FIGURE 2: CHINA'S CURRENT ACCOUNT LEVEL REACHED HIGHEST IN 2025



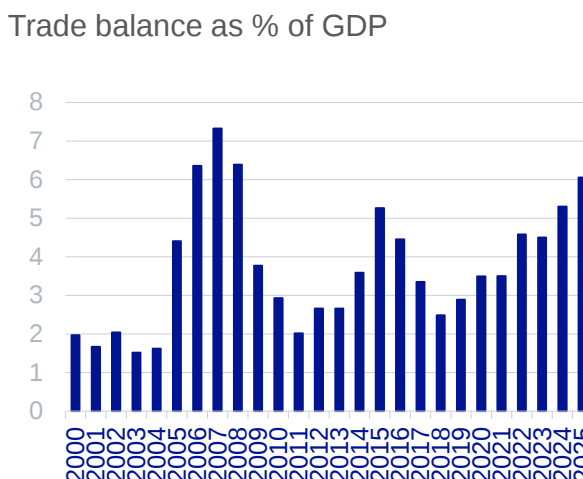
Source: CEIC and BBVA Research

FIGURE 3: CHINA RECENTLY DISPLAYED A STRONG CURRENT ACCOUNT SURPLUS AND CAPITAL ACCOUNT DEFICIT



Source: CEIC and BBVA Research

FIGURE 4: CHINA'S TRADE BALANCE AS % OF GDP HAS BEEN INCREASING OVERTIME AFTER COVID OUTBREAK



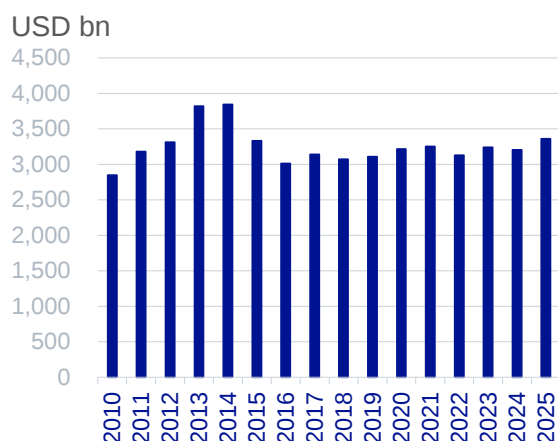
Source: CEIC and BBVA Research

However, the capital account, on the other hand, has displayed a totally different picture. Due to the historical high China-US rate reversion in recent years, accumulated capital outflows from China over the last few years have been huge, reaching USD 425.6 billion in 2025 in terms of portfolio outflows, as the economy has struggled to escape the deflationary funk of an historic property crash, thus domestic money from investors, businesses and institutions has poured overseas. That means, the large amount of capital outflows due to the historical large China-US rate reversion could also be the prime reason of RMB depreciation, instead of the authorities' manipulation of RMB exchange rate.

Altogether, the diverging pattern of current and capital account makes the RMB valuation more challenging to get a unified answer.

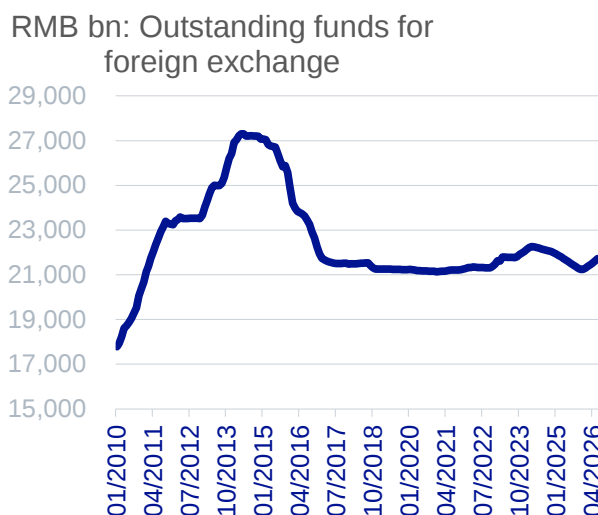
Another observation shows that we have not seen strong evidence that the authorities are actively manipulating RMB exchange rate in the market. The first evidence comes from the stable foreign reserve in the past decade. In order to intervene in RMB exchange rate, the authorities have to deploy the foreign reserves in a large scale to dump RMB and to buy USD. However, in the past decade, China's foreign reserve has been quite stable hovering around USD 3.1-3.3 trillion. (Figure 5) The second evidence is from the "RMB outstanding funds for foreign exchange" which is usually used by the central bank to intervene in the foreign exchange market (such as to dump RMB to purchase USD) has also been quite stable since 2016. (Figure 6)

FIGURE 5: CHINA'S FOREIGN RESERVE HAS BEEN QUITE STABLE, INDICATING NO LARGE SCALE INTERVENTION IN RMB FX MARKET



Source: CEIC and BBVA Research

FIGURE 6: RMB OUTSTANDING FUNDS FOR FOREIGN EXCHANGE ALSO HAS BEEN QUITE STABLE SINCE 2016



Source: CEIC and BBVA Research

How does the economic literature investigate exchange rate valuation?

Beyond the above-stated economic narratives, from the perspective of economics literature, the reason that RMB exchange rate valuation could hardly become a serious economic discussion is that macro foundation-based exchange rate forecast models cannot beat a random walk model. A foundational concept in international finance literature, famously established by economists Richard Meese and Kenneth Rogoff in their 1983 study ("Meese-Rogoff Puzzle"). That means, a simple "naïve" guess predicting that tomorrow's exchange rate will be exactly the same as today's (plus some random error term with zero mean) consistently outperforms complex macro fundamental-based exchange rate valuation method or forecasting models over short- to medium-term horizons (1 to 12 months).

Even though people believe in the above-stated conclusion, it does never halt economists' steps to conduct some exchange rate modelling exercises trying to find some macroeconomic fundamentals (such as current account to GDP ratio, terms of trade, capital flows, interest rate differentials etc.) to explain, forecast and evaluate RMB to USD exchange rate. At least, this kind of exercises could help us to understand the currency dynamics more deeply and more economic intuitively, to find some correlations between macro variables and exchange rate, no matter these macro-based models could beat random walk model or not in the forecasting exercises.

In the economic literature, the basic idea of conducting exchange rate evaluation is to find some macro fundamentals to generate the "intrinsic" value (or "underlying" value, "true" value, "equilibrium" value, used interchangeably in the literature) of RMB to USD exchange rate and to compare these model-generated "intrinsic" value with the actual RMB exchange rate to conclude whether RMB is overvalued or undervalued.

If the model-generated exchange rate is lower than the actual exchange rate, it means RMB is undervalued and should appreciate to approach its “intrinsic” value; vice versa, if the model-generated exchange rate is higher than the actual exchange rate, it means RMB is overvalued and should depreciate to approach its “intrinsic” value.

A review of diverging research results and methodologies on RMB valuation

There has been no universally accepted way to establish a unified model to identify how much has RMB undervalued (or overvalued). Given the different model settings, different researchers in either academic field or the financial market tend to give different and sometimes even diverging, if not controversy, answer of what is the “true” value of RMB exchange rate.

RMB to USD is currently trading at its strongest nominal level against the U.S. dollar in more than three years at around 6.72, but most researchers agree it should still be a lot stronger based on accepted economic fundamentals. But there are also some arguments that RMB is not undervalued, at least not as exaggerating as the degree that many other people analyze. The other thing we have to pay attention is that time frame is also important to discuss this issue, that means, RMB exchange rate may be more undervalued in some period while in some other periods it is much less undervalued.

For instance, in Goldman Sachs’ most recent research based on their GSDEER and GSFEER model, they concluded that the “intrinsic” value of RMB to USD should be around 5 and 6.2 respectively, which means the weighted average of their two models’ result is that RMB is 25% undervalued.

In the economics literature, Gorton and Chang (2005) from Australian Treasury claimed that while the precise figure depends on the equilibrium exchange rate model used, most studies suggest a real RMB appreciation of between 15% and 30% may be required for macroeconomic balance in the medium term.

However, Cheung, Chinn and Fujii (2007), in an NBER working paper, evaluated whether the RMB is misaligned, relying upon conventional statistical methods of inference. A framework built around the relationship between relative price and relative output levels is used and they found that once sampling uncertainty and serial correlation are accounted for, there is little statistical evidence that the RMB is undervalued.

Similarly, Funke and Rahn (2004) employed a Johansen cointegration framework and focused on the behavioral equilibrium exchange rate (BEER) and permanent equilibrium exchange rate (PEER) models, suggesting while the RMB is somewhat undervalued against the USD, the misalignment is not nearly as exaggerated as many popular claims.

Our analytical framework: IMF-type MB (Macro Balance) model and BEER (Behavioral Equilibrium Exchange rate) model

We adopt these two well-established and typically applied models in the literature to analyze the RMB valuation issue. Our interested topics include: (i) In which period of time, RMB is more undervalued compared with other periods; (ii) What is the model-suggested intrinsic value of RMB in different periods; (iii) If RMB is undervalued in different periods, how much was it undervalued; (iv) Compared with other studies, our conclusion is more exaggerating or more conservative regarding the degree of RMB undervaluation; (v) Do the two models suggest different or similar results of RMB evaluation?

The technical details of the BEER and Macro Balance Model are displayed in the attachment.

Understanding the results produced by MB and BEER model

The following four graphs show the results of the BEER and MB model on RMB exchange rate valuation. For each model type, we use two sets of dependent variables: REER (real exchange rate of RMB) and NER (nominal exchange rate of RMB).

The graphs below compare the actual RMB exchange rate (nominal exchange rate and REER) with the model-generated exchange rate. To understand how it goes for RMB exchange rate evaluation, if the model-generated exchange rate (the dotted line) is lower than the actual exchange rate (the real line) in the graph, it means RMB is undervalued and should appreciate to approach its “intrinsic” value (the model-generated value); vice versa, if the model-generated exchange rate (the dotted line) is higher than the actual exchange rate (the real line) in the graph, it means RMB is overvalued and should depreciate to approach its “intrinsic” value (the model-generated value).

Here we summarize some interesting findings based on the outturns of these two currency evaluation models:

- (i) **Based on MB (Macro Balance) model, there was a large RMB undervaluation period during 2005 to 2009.** During this period, the model-generated RMB to USD nominal exchange rate’s intrinsic value should be around 3-5 per USD, but the actual RMB exchange rate was above 8. Even after the famous “2005 8.11 exchange rate reform” to allow RMB have one-time appreciation to 8.11 and at the same time to change previous fixed exchange rate regime to the managed floating exchange rate regime, RMB/USD nominal exchange rate was still around 7. That mean, MB model suggests a 43-57% undervaluation of RMB nominal rate during this period. This period is the largest misalignment among the past several decades based on the MB model.

Intuitively, it is not difficult to understand why RMB is deemed to be largely undervalued during that period. China was enjoying the highest trade balance to GDP ratio during this time (Figure 2) for the past decades, around 4.5-7.4%. But during the same period of time, RMB exchange rate was just released out from the previous fixed exchange rate regime. As the purpose of 2025 “811 exchange rate reform” was aiming at adjusting RMB undervaluation issue and dealing with the US political pressure on RMB undervaluation, we believe the MB model gave us a reasonable answer to the RMB valuation.

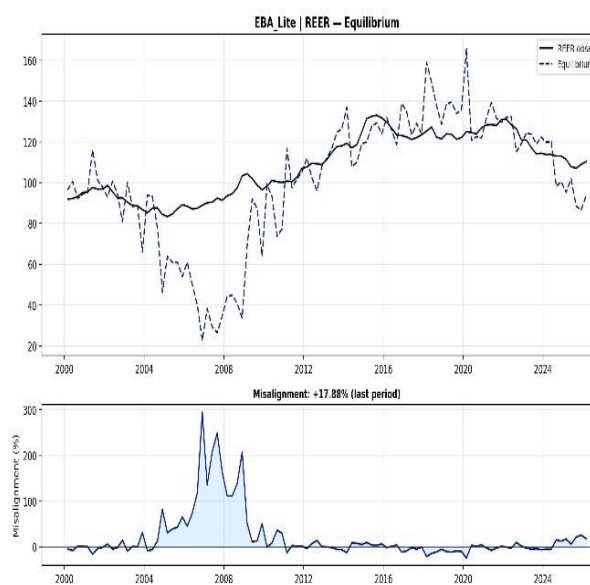
- (ii) **Based on BEER model, the largest RMB undervaluation period is 2021 to 2023.**
The BEER model-generated RMB nominal exchange rate should be around 5.8-6 per USD, given the actual exchange rate was around 6.4, the model suggests the RMB was undervalued by around 9.3%.

Economically, it is also intuitive to understand why MB model suggests RMB exchange rate was undervalued during this period 2021-2023. In the aftermath of Covid-19, due to China's "first-in, first-out" of the pandemic, China became the world factory again when other countries were still struggling with the Covid-19 pandemic. As China speeded up its exports to US, Europe and other regions in the world, the trade balance to GDP ratio became the second largest during this time, from 3.5-6%.

We could summarize our findings on RMB evaluation based on the results of BEER and MB model. RMB to USD exchange rate indeed exists undervalued periods, however, the degree of undervaluation that is suggested by both BEER and MB model is not as exaggerating as suggested by some other researchers or some academic literature that RMB should drop to 5 or even lower.

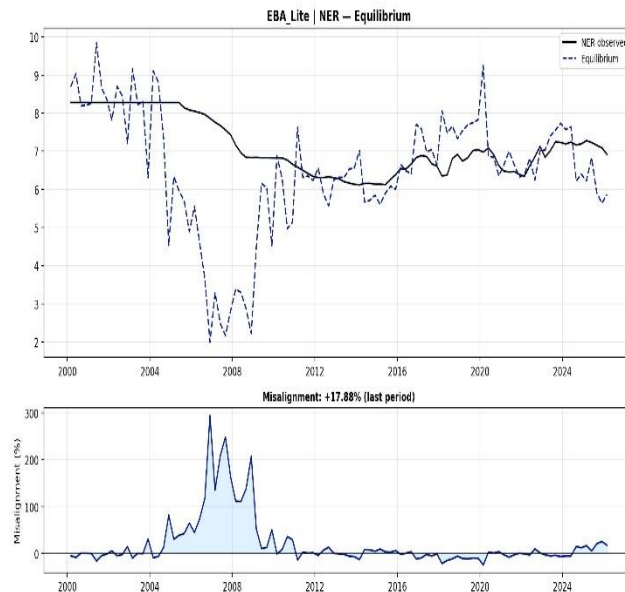
Based on the suggested "intrinsic value" of RMB, the lowest model-generated RMB to USD exchange rate is around 5.8. That means, given the current RMB to USD exchange rate around 6.72, the largest possible percentage that RMB should appreciate to reach its "intrinsic value" is 14%, not as exaggerating as some research suggests of 25-35% undervaluation as we summarized in the previous part of this paper.

FIGURE 7: MACRO BALANCE MODEL: COMPARING ACTUAL REER WITH MODEL-GENERATED REER



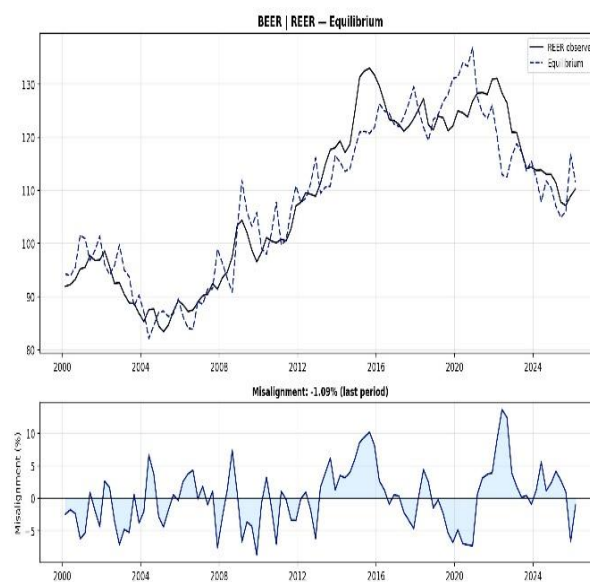
Source: CEIC and BBVA Research

FIGURE 8: MACRO BALANCE MODEL: COMPARING ACTUAL NOMINAL RMB/USD WITH MODEL-GENERATED NOMINAL RMB/USD



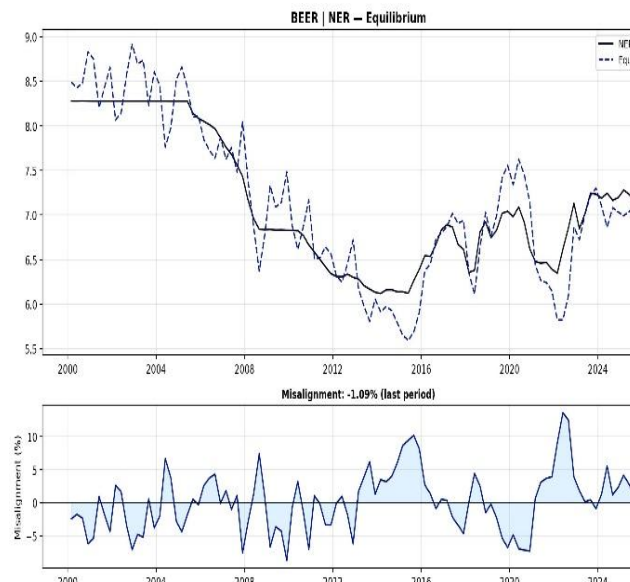
Source: CEIC and BBVA Research

FIGURE 9: BEER MODEL: COMPARING ACTUAL REER WITH MODEL-GENERATED REER



Source: CEIC and BBVA Research

FIGURE 10: BEER MODEL: COMPARING ACTUAL NOMINAL RMB/USD WITH MODEL-GENERATED NOMINAL RMB/USD



Source: CEIC and BBVA Research

ATTACHMENT:

1. BEER model (Behavioral Equilibrium Exchange rate model)

The literature has discussed at length the most plausible choice of fundamentals and the expected sign and magnitude of the parameters to be included in BEER (for a comprehensive literature review see Fidora et al., 2017).

The first popular explanation for long-run trends in equilibrium real exchange rates emphasizes the role of Net Foreign Assets (NFA). The rationale is that a rise in this variable improves the interest income on the current account and should hence be counterbalanced by a deterioration in the trade balance. This, in turn, requires real exchange rate strengthening (Lane and Milesi-Ferretti, 2002).

The second commonly used explanatory variable in BEER regressions is terms of trade (ToT). A rise in this fundamental should lead to higher wealth and an improved trade balance, and therefore to real exchange rate strengthening.

The next two variables include two types of rates differentials-bond yield differential and policy rate differential. Based on carry trade theory, a higher policy rate or higher bond yield country will lead to an appreciation of its currency, because the global markets will buy in their financial assets such as bonds, stocks and currencies in order to get the premium return. The literature also discusses these potential regressors in BEER equations. (MacDonald, 1998; Fidora et al., 2017; Miyamoto et al., 2019)

The last factor, trade openness. Higher trade openness often causes a real appreciation of the domestic currency because increased demand for tradable goods and productivity adjustments shift relative prices.

Based on the above-stated literature, we choose the following economic fundamentals to be included in our BEER model and also MB model:

- (i) Net foreign assets: as % of GDP (nfa);
- (ii) Monetary policy rate differential, which is defined as Chinese central bank policy rate-Fed Fund rate (ratediff);
- (iii) Trade openness, defined as exports plus imports as % of GDP (tradeopenness);
- (iv) Bond yield differential, which is defined as Chinese 19-year bond yield-US treasury bond yield (bondyielddiff).
- (v) Terms of Trade: which is defined as the export prices divided by imports prices. (tot)

Based on the above macro fundamentals, we estimate the level of BEER with the specification used by Faruquee (1995) and Lane and Milesi-Ferretti (2004), so that the value of BEER is given by:

$$rer_{it}^{BEER} = \mu_i + \alpha_1 nfa_{it} + \alpha_2 ratediff_{it} + \alpha_3 bondyielddiff_{it} + \alpha_4 tradeopenness_{it} + \alpha_5 tot_{it}$$

2. MB model (Macroeconomic Balance model)

The macro-balance approach (MB model) forms the backbone of the IMF's External Sector Report. This approach proceeds in two steps:

In the first step, it derives an underlying current account position, which closes domestic and trade-weighted foreign output gaps and feeds through lagged moves in the exchange rate. In the second step, it calculates how much the real effective exchange rate must rise or fall to close the gap between the underlying current account and some notion of equilibrium.

The methodology of the MB approach differs substantially from that of BEER models. Instead of looking at past trends in the real exchange rate and its potential explanatory variables, the MB approach requires solving a system of equations to find the level of the real exchange rate compatible with the dual goal of achieving internal and external balance (Williamson, 1994; Lee et al., 2008). The equilibrium exchange rate is defined as the rate at which the current account stabilizes at the target level, if output gaps at home and abroad are closed.

The equilibrium exchange rate can be simply computed as:

$$rer_{it}^{MB} = rer_{it} - \frac{c\tilde{a}_{it} - ca_{it}^{norm}}{\eta_{it}}$$

In this paper we use a more realistic version of the model. In particular, for ease of exposition we will maintain the assumption that the predicted current accounts are equal to their current values. Next, we relax the assumption that the current account norm is equal to zero. Instead, in the baseline we follow the literature on global imbalances and derive its value from a regression of current account balances on a set of plausible economic fundamentals (Chinn and Prasad, 2003; Ca' Zorzi et al., 2012). And we use the same five endogenous variables as we explained in the BEER model part in order to better compare the results generated by these two models:

$$ca_{it}^{norm} = \omega + \beta_1 nfa_{it} + \beta_2 ratediff_{it} + \beta_3 bondyielddiff_{it} + \beta_4 tradeopenness_{it} + \beta_5 tot_{it}$$

Reference:

Yin-Wong Cheung, Menzie D. Chinn, and Eiji Fujii (2007), "The Overvaluation of Renminbi Undervaluation", NBER Working Paper No. 12850, January 2007 JEL No. F3,F4

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Lane, Philip R. & Milesi-Ferretti, Gian Maria, 2002. "External wealth, the trade balance, and the real exchange rate," European Economic Review, Elsevier, vol. 46(6), pages 1049-1071, June.

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