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THE FOG ENCIRCLING THE RENMINBI DEBATE

YIN-WONG CHEUNG

Department of Economics, E2
University of California, Santa Cruz
CA 95064, USA
cheung@ucsc.edu

MENZIE D. CHINN

University of Wisconsin, Madison and NBER, USA

EIJI FUJII

University of Tsukuba, Japan

We assess some recently advanced arguments for the claim that the RMB is undervalued. These arguments are those based on the direct valuation of the RMB, trade imbalances, the accumulation of foreign exchange reserves, and the degree of policy dependence. The extant evidence does not support a strong verdict regarding RMB undervaluation that meets the statistical standards of academic empirical studies. One interpretation is that the evaluation of the equilibrium RMB exchange rate is far more complicated than it appears. Another view is that the data are insufficiently informative. Some related policy concerns are also discussed.

Keywords: Exchange rate uncertainty; trade surplus; international reserves; policy dependence.

1. Introduction

Essentially a dormant topic in the international forum until 2003, China's foreign exchange policy is now the focus of attention. Since then, criticism of the Chinese currency regime has been mounting. Some countries, among which the US is the most vocal one, sternly accuse China of gaining unfair advantages by keeping its currency, the renminbi (RMB), undervalued, and as a result, running a huge trade surplus, thereby exacerbating global imbalances. Even though the exchange rate regime reform instituted by China in July 2005 was warmly, albeit cautiously, welcomed, it has not silenced the calls for further flexibility of China's exchange rate.

During the high profile two-day US–China Strategic Economic Dialogue that took place in Beijing in December 2006, the US delegation led by Treasury Secretary Paulson, as expected, reiterated concerns about the RMB's undervaluation and urged China to allow further RMB appreciation. Interestingly, in its semi-annual report to the Congress released

a few days after the Dialogue, the US Treasury Department maintained its prior stance and refrained from officially labeling China as a currency manipulator.[1]

The theme of the current exercise is to review some reasons advanced in the recent literature to sustain the claim that RMB is undervalued. First, we assess the argument based on the direct valuation of RMB. Then, we assess the arguments related to trade surpluses, international reserves, and policy dependence. In Section 3, some policy implications are presented.

2. Assessment

For economists, a currency is undervalued when the rate at which it exchanges for foreign currency is higher than what economic fundamentals indicate it should. In this case, the allegation is that it takes more units (yuan) of the Chinese currency RMB to buy a single dollar than is deemed appropriate. The overarching issue is, of course, how to define the appropriate or, in economic jargon, the equilibrium value of RMB. A quick review of the current status of exchange rate economics offers a grim hope to determine an equilibrium exchange rate in an unambiguous manner.

Since Meese and Rogoff published their seminal piece (Meese and Rogoff, 1983) that amplifies the difficulties inherent to empirical exchange rate modeling in 1983, a voluminous collection of studies echoing their conclusion has accumulated. Cheung, Chinn and Garcia Pascual (2005) present some recent evidence on this issue.

Given the lack of a commonly agreed theoretical model, assertions about the equilibrium (and disequilibrium) level of an exchange rate should be interpreted with great caution. The quintessential problem is that "undervaluation" — or currency misalignment in general — is in the eye of the beholder. Whether one sees a misalignment depends upon what economic model one has in mind. A hasty decision on RMB policy based on ill-founded evidence can do more harm than benefit to China and to its trading partners, especially the developing economies in the region.

In the next two sections, we take up the RMB valuation issue, not with a mind to proving that RMB is or is not undervalued. Rather, we wish to highlight the uncertainty surrounding the issue, both in terms of figuring out the right model for addressing the issue and the actual calculation of the degree of undervaluation.

2.1. *Analyses based on exchange rate indexes*

At the heart of the debate over the right way of determining the appropriate exchange rate level are contrasting ideas of what constitutes an equilibrium exchange rate, what time frame

[1] See The Treasury Department (2006). Indeed, the Treasury's semi-annual report, "International Economic and Exchange Rate Policies", has not labeled any country as a currency manipulator, at least, in the last decade. Reflecting their dissatisfaction with the report, the Grassley–Baucus bill on "The United States Trade Enhancement Act of 2006" was introduced with the intention to revamp the procedure of identifying a currency with a fundamental misalignment and provide explicit sanctions. See Frankel and Wei (2007) for a discussion of the empirical determinants of Treasury decisions.

the equilibrium condition pertains to, and, not least, what econometric method to implement. Some shortcuts have been used so often that some forget that they are shortcuts.

Most of the extant studies fall into some familiar categories, either relying upon some form of relative purchasing power parity (PPP) or cost competitiveness calculation, the modeling of deviations from absolute PPP, or structural models. The Appendix offers a brief review of these different approaches.

The relative PPP comparisons are the easiest to make, in terms of numerical calculation. On the other hand, relative PPP is uninformative about how a country's actual exchange rate stands *relative to others*.

To highlight the drawbacks of this oft-used relative PPP approach, we examine briefly what this methodology says about the RMB. While the exchange rate between the Chinese yuan and the US dollar is the usual focal point, trade-weighted exchange rates provide better measures of relative prices. As a matter of principle, trade-weighted rates are to be preferred to bilateral rates since the reliance on the latter can lead to misleading inferences about overall competitiveness. Figure 1 depicts the IMF's trade-weighted effective RMB exchange rate index from January 1986 to February 2007, and a fitted linear trend. The index is expressed so lower values mean a stronger Chinese currency. In line with expectations, in the years since the East Asian crisis, the RMB has experienced a downward decline in value.

In the early warning system literature that developed in the wake of the financial crises of the 1990s, a typical measure of currency misalignment was the deviation from a deterministic trend. The linear trend in Figure 1 suggests that, during the new millennium, RMB is undervalued for some very brief periods. Indeed, such a measure yields a 5.5% RMB overvaluation in February 2007.

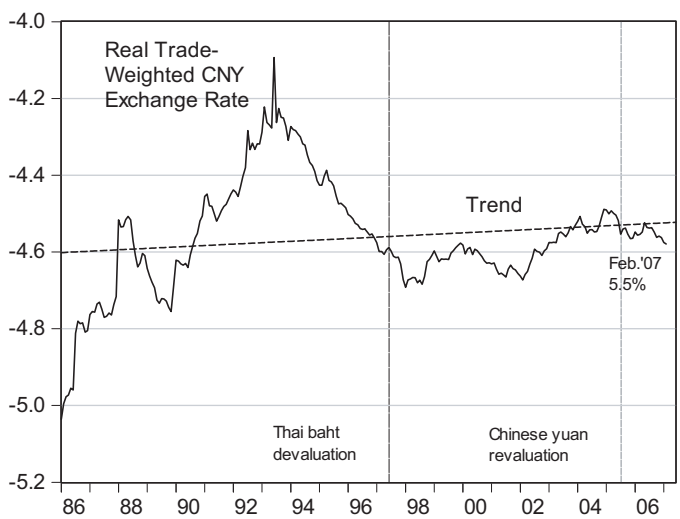

Figure 1. Log Trade-Weighted Real Chinese Yuan (CNY) Exchange Rate, 1986M01–2007M02, and Linear Time Trend
Source: IMF, *International Financial Statistics*, and authors' calculations.

Of course, a quick glance at the data indicates that a simple trend is much too simplistic a characterization. For instance, suppose instead that one assumed that the relevant period was 1990 onward; then a different degree of misalignment would be the determination. The observation essentially echoes those reported in Cheung *et al.* (2007a), which shows that the deviation from a deterministic trend approach can yield either an over- or under-valuation estimate depending on the choices of exchange rates and sample periods. We also noted that using the bilateral China–US real exchange rate gives similar ambiguous results on RMB misalignments.

The fact that working with simple straight line extrapolations can lead to such diverging conclusions suggests that we need to take a closer look at where the Chinese currency should stand, both over time and across countries.

2.2. *The real exchange rate–income relationship*

It is well-known that standard exchange rate models — including the fundamental/behavioral equilibrium exchange rate models commonplace in the practitioner literature — are not well-suited to explain exchange rate behavior of developing and transition economies. Thus, we opt to discuss some results from a more straightforward and robust relative price and relative output framework to highlight the issues in assessing the degree of RMB misalignment. Some brief remarks on results derived from standard exchange rate models will be discussed later.

The empirical real exchange rate–income relationship is documented in Summers and Heston (1991) using data from the Penn World Table. Apparently, Frankel (2006) is the first study exploiting this empirical regularity to assess the degree of RMB undervaluation. To be sure, this framework does not give a small estimate of RMB undervaluation — that is, choosing this model does not bias against the claim of undervaluation.

Specifically, Cheung *et al.* (2007a) consider a pooled time series cross-section regression, where all variables are expressed in terms relative to the US;

$$q_{it} = \beta_0 + \beta_1 y_{it} + u_{it}, \tag{1}$$

where q is expressed in real terms relative to the US price level, and y is real *per capita* income also relative to the US. The data are drawn from the Penn World Table. Not surprisingly and consistent with Frankel's results, estimates of Equation (1) show that the RMB is substantially undervalued by 54% in 2004.[2]

The results that are relevant to our discussion is highlighted in Figure 2, which plots the actual and resulting predicted rates and standard error bands derived from the regression results. There are a few observations. First, the observations are quite dispersedly scattered. The wide dispersion in the scatter plots should give pause to those who would make strong statements regarding the exact degree of misalignment. Second, the RMB misalignment has switched from overvaluation to undervaluation in the mid-1980s. Third, and perhaps most importantly, in 2004, the RMB was more than one standard error — but less than two standard errors — away from the predicted value, which in the present context is interpreted

[2]Cheung *et al.* (2007a) give a detailed discussion of empirical results obtained from Equation (1).

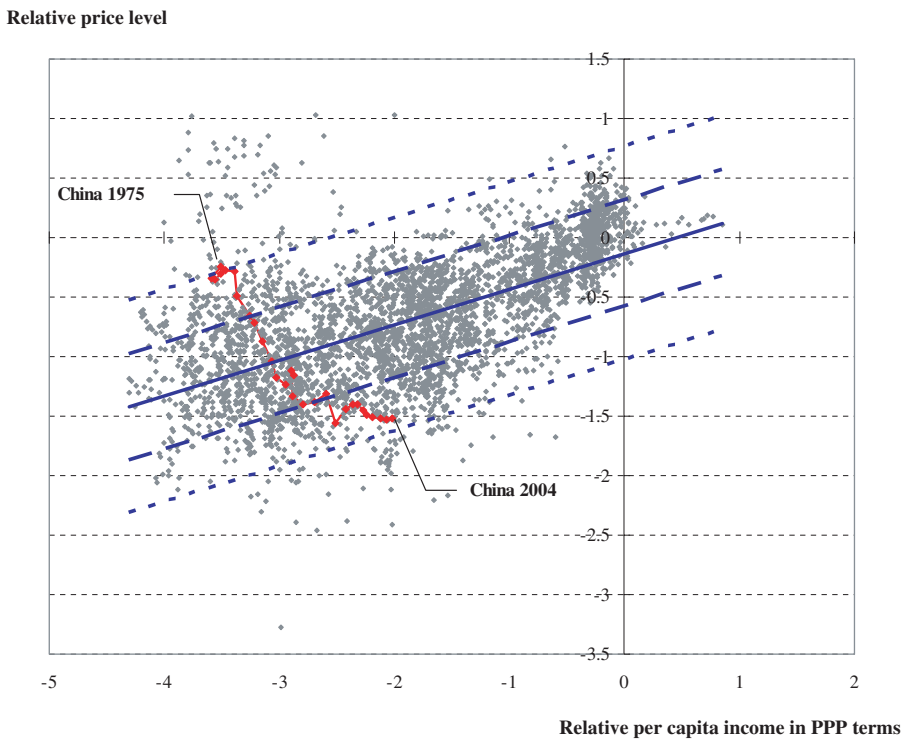

Figure 2. The Rate of RMB Misalignment Based on the Pooled OLS Estimates with the PPP-Based Per Capita Income

as the "equilibrium" value. In other words, by the standard statistical criterion that applied economists commonly appeal to, the RMB is not undervalued (as of 2004) in a statistically significant sense.

Before discussing whether the use of two standard errors is too stringent a criterion for assessing the degree of RMB misalignment, we note that the deviations from the estimated equilibrium exchange rates are persistent; that is, deviations from the real exchange rate–income relationship exhibit serial correlation. In order to obtain estimates that are statistically correct in the presence of serial correlation, we implemented a panel version of the Prais–Winsten procedure. Figure 3 offers a temporal dimension of the estimated misalignment that is not plagued by serial correlation problems — it traces the evolution of the RMB level over time, its predicted value, and the associated confidence bands.

The figure shows a striking feature — after controlling for serial correlation, the actual value of the RMB is mostly staying within one standard error prediction interval surrounding the (predicted) equilibrium value in the last 20 plus years — the two values virtually have converged by 2004 and there is little indication of undervaluation. In fact, the 2004 actual value slightly exceeds the predicted one, suggesting an *over*valuation of 0.2%, albeit statistically insignificant. Recalling the huge data dispersion observed in Figure 2, we believe the data are not informative for a sharp misalignment inference — not just for the recent period, but for most of the sample period.

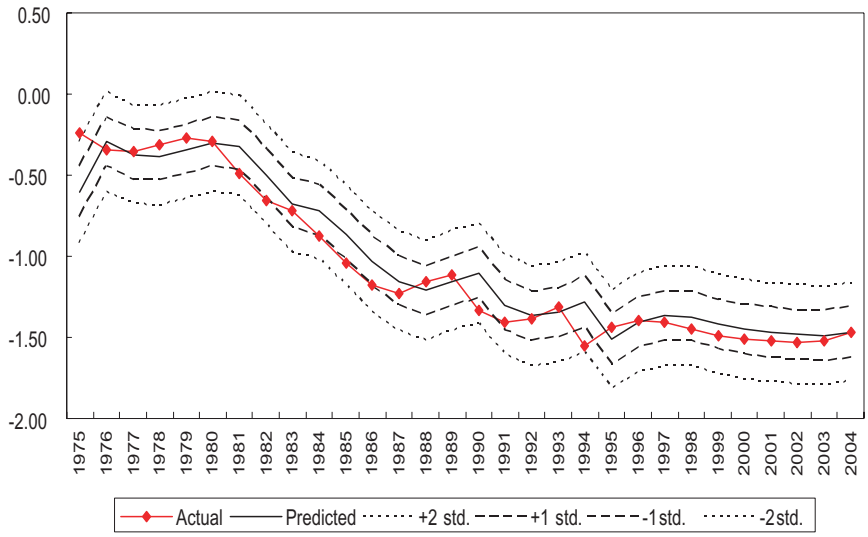

Figure 3. The Actual and Predicted RMB Values by the Prais–Winsten Estimates

In passing, we should mention that augmenting the bivariate model with various control variables does not change the basic story — the estimated RMB undervaluation is not statistically significant, and the allowance of the effect of serial correlation substantially reduces the estimated rate of undervaluation.

2.3. *Other approaches*

Most studies that made it into the headlines indicated a large degree of RMB undervaluation. Indeed, the pending Schumer–Graham bill cites the reported undervaluation estimates are between 15% to 40%, thus justifying the imposition of an across-the-board 27.5% tariff on imports from China.

Two recent IMF studies — Dunaway and Li (2005) and Dunaway *et al.* (2006) — assess the reliability of the reported RMB undervaluation estimates obtained from some typical modeling approaches, which are briefly reviewed in the Appendix.

These authors noted the difficulties, both methodological and empirical, in measuring an equilibrium exchange rate, and raised certain concerns about the robustness of the reported estimates of the degree of RMB undervaluation. For instance, it is puzzling to see that a given approach can give rise to a wide range of undervaluation estimates. They also reported that substantial changes in equilibrium exchange rate estimates resulted from minor changes in model specifications, variable definitions, and sample periods. In a sense, the two IMF studies reinforce the message from the seminal Meese and Rogoff (1983) article.

It is worth pointing out that most of these reported undervaluation estimates do not come with a measure of sampling uncertainty — a point stressed in the previous subsection. We anticipate that accounting for sampling uncertainty will reinforce the conclusion that a precise and accurate measure of the degree of RMB misalignment is a very elusive goal.

2.4. *Trade surplus*

The case for RMB undervaluation is built upon several arguments, in addition to direct estimation of the equilibrium exchange rate. One phenomenon is the large and growing trade surplus China has with the US. It is argued that the trade surplus persists because China enjoys an unfair trade advantage from its significantly undervalued currency. Economic theory, for instance, suggests that the RMB value should be linked to the magnitude of the overall trade balance instead of to the size of a specific bilateral trade balance.

Figure 4 shows the Chinese current account balance expressed in dollar terms and as a share of GDP. Note that the Chinese current account is mainly driven by its trade account performance. Clearly, the Chinese current account balance has ballooned in recent years. It should be noted that, however, China's external balances have not — until quite recently — constituted a *prima facie* case for RMB undervaluation. Yet in 2004, China's trade surplus relative to GDP was not particularly large compared with, say, those recorded by Japan and Germany. Indeed, Chinn and Ito (2007) argue that China's current account surplus over the 2000–2004 period — while exceeding the predicted value — was within the statistical margin of error, according to a model of the current account based upon the determinants of saving and investment.

China's trade surplus with the US should be viewed in light of China's role in the international production process. With its current framework of incentives and its abundant labor, China has grown into a global production/manufacturing hub. As it is developing its manufacturing capacity, China participates in the international production process and plays the role as the last leg of the production chain.

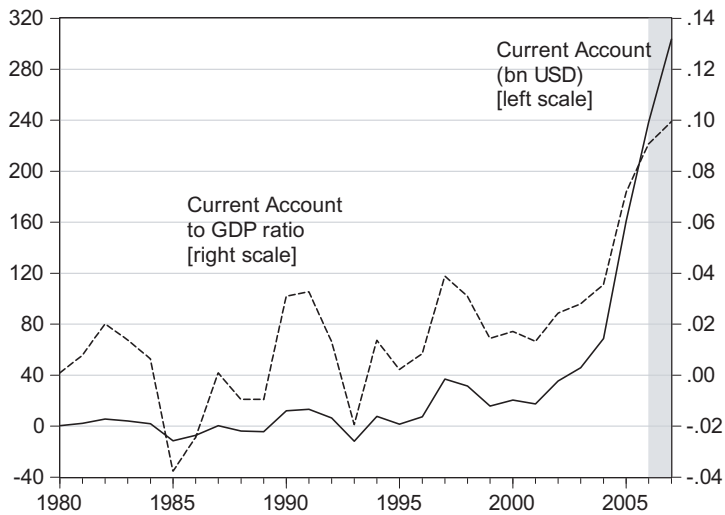

Figure 4. Current Account Balance (in billions of US dollars) and Current Account to GDP Ratio
Note: Statistics for 2006–2007 are IMF projections.
Source: IMF, *World Economic Outlook* (April 2007) and authors' calculations.

For example, in the case of the electronics industry, China imports primary materials and capital goods, implements labor-intensive processing and assembly of imported (high-end) components, and exports the final products to, say, end consumers. Thus, instead of exporting directly to, say, the United States, economies in Asia export raw materials and components to China, take advantage of the low labor cost and manufacture facilities, and export their products via China. As expected, China incurs large trade deficits with these countries and enjoys substantial trade surplus with, in this case, the United States. Thus, the observed China trade surplus with the United States may exaggerate the trade imbalance between these two countries.

The link between the trade surplus and an undervalued exchange rate is obscured by the difficulty in establishing a strong exchange rate effect on China's trade. Cheung *et al.* (2007b), for instance, represents a recent effort to determine the exchange rate effect on China's trade balance. Such an effort is hampered by data problems, including the lack of the relevant trade price indexes. Further, estimated conventional trade equations may be deprived of relevancy because of the drastic economic and structural changes experienced by China in recent years. Against this backdrop, Cheung *et al.* (2007b) obtains very different exchange rate effect estimates across some plausible trade equations — a result that echoes some other studies on exchange rate effects on China's trade balances.

With these caveats, there is some evidence that China's trade balance is affected by its exchange rate. Even with some possible estimates of trade elasticities, the exchange rate effect on overall trade flows is relatively small, and sometimes goes in the direction opposite of anticipated. When one ignores the "perverse" estimates and uses only plausible estimates from their study, one obtains for a 10% RMB real appreciation a US$46 billion (in year 2000 unit) reduction in the Chinese trade balance, which while not inconsequential, is still not tremendously large when measured against a 2006 balance of US$401 billion (again, in year 2000 unit).

These findings suggest that exchange rate policy alone will not be sufficient to reduce the Chinese trade balance, especially when taken in the context of a trend increase in China's manufacturing capacity. It is also worth mentioning an issue not commonly discussed in the debate. With its non-trivial shares of the global manufacturing capacity, China is not necessarily a price-taker in the world product market and its action can have implications for the world price level. For instance, while China has experienced real appreciation since 2005, its trade surplus is not dwindling, but swelling at a time the prices of its exports are not declining. It is likely that China's trade surplus is affected by, other than the exchange rate, factors including consumption behaviors and macro-policies of China and, say, the US.

2.5. *International reserves*

Another eye-catching situation is China's rapid build-up of international reserves. Some people consider China's recent phenomenal international reserve accumulation as *prima facie* evidence that the RMB is significantly undervalued. Nonetheless, official reserve holdings might be deemed insufficient as concerns over China's contingent liabilities come to the fore. For instance, one recent report (Ernst & Young, 2006) estimates that, in 2005, China's total

non-performing loan liability, a key component of China's contingent liability, stood at $900 billion, a figure higher than its reserve holdings. The subsequent retraction of this report by the company does not negate the fact that there are substantial amounts of non-performing loans, the estimation of which is surrounded by considerable uncertainty.

Indeed, the claim that China's rapid international reserve accumulation is a proof of RMB undervaluation may require additional scrutiny. For instance, Prasad and Wei (2005), examining the composition of capital flows into and out of China, argue that much of the international reserve accumulation that has occurred in recent years is due to changes in the capital account rather than in the current account. These inflows are sensitive to expectations of the future RMB exchange rate and, thus, this component of build-up may be self-fulfilling.

The empirical evidence that China is holding an excessive amount of international reserves, indeed, is quite tenuous. Cheung and Ito (2007) trace the evolution of the theory of demand for international reserves and estimate several vintages of international reserve demand equations. These demand equations are used to illustrate the evolving roles of the traditional macro-variables, the financial variables and the institutional variables. Using data from more than 100 countries over the last 30 years, these authors report international reserve equations estimated from different sample periods, for developed and developing countries, and with different combinations of explanatory variables.

Interestingly, all these different specifications do not suggest that China was holding an excessive amount of international reserves during the 1999–2004 period. During this period, China is deemed to hold a level of international reserves (per GDP) that is 15.4% less than the level predicted by the model estimated using developing countries' data. If the model fitted to developed countries is used, the underhoarding is in the order of 30%. Further, using model specifications obtained from other historical periods tend to yield an even higher level of underhoarding. There is a possibility that China's recent large accumulation of international reserves is part of a catch-up process that the country is going through in the recent decades.

In the last two or three years, however, China experienced quite a drastic increase in its level of international reserve holding. It is not clear whether the results for 1999–2004 carry over to the post-2004 period. Apparently, the case for RMB undervaluation is, on this count, now stronger. Nonetheless, the experience suggests that it would be prudent to evaluate the conditions systematically before drawing conclusions.

2.6. *Interest rate dependence*

Instead of arguing that the RMB should be appreciated, some commentators call for a more flexible Chinese currency. In fact, there is no shortage of proposals in both the media and academia for China to reform its foreign exchange market and policy stance. Some recent examples are Eichengreen (2006), Goldstein (2004), Goodfriend and Prasad (2006), Roberts and Tyers (2003) and Williamson (2005). McKinnon (2005, 2006) and Mundell (2004) are among the few that favor RMB stability. McCallum (2004) and Schwartz (2005) represent yet another view on the issue: China, and not outside sovereignties, should determine the complex issue of reforming its foreign exchange policy.

One argument offered by advocates of a flexible RMB is that it is to China's benefit to float its currency. With a *de facto* fixed exchange rate, China has to give up monetary policy independence and follow the policy set by the US, which is the anchor currency country, in order to maintain the pegged exchange rate. Despite its increasing integration into the world economy, there is no apparent evidence that China and the US share common business cycles. In the absence of similar cyclical behavior, it is very costly for China to follow US monetary policy.

Will exchange rate flexibility allow China to pursue an independent monetary policy? Apparently, existing theoretical and empirical results are ambiguous regarding the link between exchange rate flexibility and policy independence, which is usually measured by interest rate independence. Without the benefit of foresight, one may like to ask whether China has lost its policy independence and, for example, followed the US interest rate policy under the current *de facto* pegged exchange rate arrangement.

In the case of China, even a casual observer will not rule out the possibility of imperfect interest rate pass through. For instance, despite China's capital account is perceived to be porous, its restrictions on capital flows are effective enough to yield a wedge between the Chinese and US interest rates. Figure 5 plots the Chinese one-month interbank and the US one-month Fed fund interest rates. There is no visual evidence that the Chinese interest rate follows the US rate.

Cheung *et al.* (forthcoming) offer a formal analysis of the interaction between the Chinese and US interest rates. To ensure the robustness, these authors consider results from the cointegration procedure, vector autogression models, and the bounds test approach. Together, these three types of econometric techniques cover various conceivable dynamic model specifications of interest rates.

In sum, there is no convincing evidence that the Chinese interest rate is affected by the US rate during the 1996 to 2005 period. All the three different econometric frameworks give

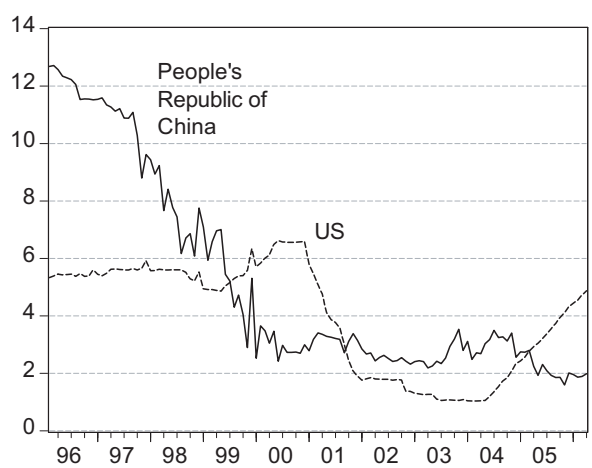

Figure 5. One-Month Chinese and US Interest Rates

the similar lack of dependence result.[3] If the current Chinese interest rate is not driven by the US rate and if the Chinese economy is performing reasonably well, then abandoning the peg for policy independence may not be a relevant argument.

While there is no substantial evidence of policy dependency, it is not our intention to argue in favor of an inflexible RMB exchange rate. What we meant is to discuss the RMB issue in a more informed manner. With both ambiguous theoretical and empirical results, a reasonable policy recommendation is, instead of a drastic change policy, a policy that allows for gradual changes with continual monitoring and assessment of the effects of the policy change.

3. Policy Concerns

Undeniably, the valuation of the Chinese currency is one of the most intensely debated issues in the international community. However, some of the arguments do not appear to hold water and some are likely to be *non sequiturs*. In the previous section, we discussed issues inherent to some arguments for the undervaluation of the Chinese currency.

One rationale for undertaking this exercise was our firmly held conviction that many strong policy recommendations were being made on the basis of weak empirical evidence. We believe the limitations of our knowledge regarding the appropriate model and the true nature of the relevant data needs to be acknowledged. At the same time, it is worth mentioning that our results, while highlighting the difficulty of drawing a clear verdict, do not necessarily mean that there is no undervaluation.

One message is that the evaluation of the equilibrium RMB exchange rate is far more complicated than it appears. Simply put, with current theoretical and empirical technologies, it is not feasible to deliver an RMB undervaluation verdict that meets the standards of empirical work expected of academic work.

Our preceding discussion has been somewhat academic, in that we focus on the strength of empirical evidence. But policymakers operate in the here and now of the real world. They need to take as given certain conditions, and may perceive the burgeoning trade/current account surpluses and foreign exchange reserves as indicators of RMB undervaluation. It is reasonable, then, for policymakers to ask for some currency adjustment, perhaps even more than what has taken place.

Relatedly, to the extent that one believes the value of the RMB is related to the Chinese current account surplus, one might believe RMB appreciation is desirable as it would reduce reserve accumulation, and the consequent ongoing credit boom that threatens to overheat the economy. This is not a policy implication leading from a finding, merely a description of how the exchange rate affects the economy, given the other policies in place.

At the same time, some concerns regarding RMB appreciation should be heeded. The first is that RMB appreciation in and of itself is unlikely to alter the basic problem of a massive and expanding US trade deficit. That problem is first and foremost a "made-in-America" issue, driven by collapsed household and public sector savings, and our heavy dependence

[3]These results are reported in Cheung, Tam and Yiu (forthcoming).

upon imported oil. The RMB is probably misaligned by at least one or two criteria. But it would be an enormous mistake to think a stronger RMB is a panacea for what ails America (or China, for that matter).

Another concern is the implications for regional economies. The extant discussion routinely stresses the impact of RMB valuation on global trade relationships and global trade imbalances. Given the role of modern China in East Asia, we cannot ignore the implications of China's foreign exchange policy for the region. In this regard, two observations are worth mentioning.

First, the Asian economies have tended to link their currencies to the US dollar via either a *de facto* or *de jure* peg, even after the 1997 financial crisis. To the extent that these currencies were stabilized at low values, the East Asian exchange rate regimes are often viewed as part of a mercantilist approach to economic development (Dooley *et al.*, 2005).

Second, the integration of China into the world economy has brought about substantial adjustment in production and trade in developing economies, especially those in East Asia. These economies, while sharing extensive production and trade linkages with China, possess both real and financial sectors that are less sophisticated than those in developed countries. Therefore, they are very susceptible to the (adverse) effects of RMB exchange rate volatility. It is highly possible that China's Asian trading partners would suffer more from a volatile RMB exchange rate than they would benefit from, say, a stronger RMB. A volatile RMB is likely to impose extra costs on the integration between China and its neighboring economies and hinder the cooperation between these economies.

The biggest uncertainty pertains to shocks that are difficult to model but could nonetheless induce large changes to the equilibrium value of the exchange rate — namely, the shocks that could spring from contingent liabilities and loopholes in capital controls. The mere act of quickly revaluing — or of moving to a relatively free float — might in itself change the equilibrium exchange rate if it triggers corporate defaults or causes changes in the balance sheets of unhedged firms. The end of capital controls, either by fiat or by slow erosion, might also alter the equilibrium exchange rate.

Thus, one natural concern is whether the Chinese economy, given its fragile financial systems and hidden domestic economic problems, is capable of handling a floating RMB exchange rate without incurring a substantial domestic economic backlash which would cause repercussions for the regional and even the global economies.

Even though some people perceive China to be a market economy, the reality is that China is still intrinsically a transition economy with a relatively primitive and inefficient banking and financial sector. It is also still in the early stages of devising and developing prudential legal and regulatory framework that promotes governance and financial stability. It is highly questionable whether the current Chinese economy could withstand the potential financial instability induced by full foreign exchange flexibility. A volatile RMB exchange rate would most likely hinder China's financial development. Systemic financial difficulties in China could in turn create ripple effects across the global economy.

That being said, we do believe that China should pursue a policy of gradually loosing its grip on the RMB. In a well-functioning foreign exchange market, a market-determined

exchange rate enhances resource allocation and improves efficiency by providing correct price signals.

The pace of liberalizing its foreign exchange policy has to be linked to developments in its financial markets. With a growing role in an uncertain world, China's foreign exchange policy can have unexpected (instead of expected) effects on the world in general and to other regional economies in particular. Given the high degree of uncertainty surrounding the determination of the equilibrium exchange rate, and the potentially adverse implications of sharp exchange rate movements, it seems appropriate for a large transition economy like China to take a cautious approach to enhance exchange rate flexibility and, at the same time, augment the policy change with a parallel development of the sophistication of domestic financial markets. Continuous monitoring and assessment of the situation will be an essential adjunct in this process.

Acknowledgments

The views expressed are solely the responsibility of the authors, and do not necessarily reflect those of any other individuals or institutions the authors are associated with.

Appendix. A Brief Literature Review

A couple of surveys of the RMB misalignment literature have compared the estimates of the degree to which the RMB is misaligned. Government Accountability Office (2005) provides a comparison of the academic and policy literature, while Cairns (2005) briefly surveys recent point estimates obtained by different analysts. Here, we review the literature to focus on primarily theoretical papers and their economic and econometric distinctions.

Most of these papers fall into familiar categories, either relying upon some form of relative purchasing power parity (PPP) or cost competitiveness calculation, the modeling of deviations from absolute PPP, a composite model incorporating several channels of effects (sometimes called behavioral equilibrium exchange rate models), or flow equilibrium models.

The relative PPP comparisons are the easiest to make, in terms of calculations. Bilateral real exchange rates are easy to calculate, and there are now a number of trade-weighted series that incorporate China. On the other hand, relative PPP in levels requires the cointegration of the price indices with the nominal exchange rate (or, equivalently, the stationarity of the real exchange rate),[4] but these conditions do not necessarily hold, regardless of the deflator adopted in empirical analyses. Wang (2004) reports interesting IMF estimates of unit labor cost deflated RMB. This series has appreciated in real terms since 1997; of course, this comparison, like all other comparisons based upon indices, depends upon selecting a year that is deemed to represent equilibrium. Selecting a year before 1992 would imply that the RMB has depreciated over time.

Bosworth (2004), Frankel (2006), Coudert and Couharde (2005) and Cairns (2005) estimate the relationship between the deviation from absolute PPP and relative per capita

[4]For a technical discussion, see Chinn (2000).

income. All obtain similar results regarding the relationship between the two variables, although Coudert and Couharde fail to detect this link for the RMB.

Zhang (2001), Wang (2004) and Funke and Rahn (2005) implement what could broadly be described as behavioral equilibrium exchange rate (BEER) specifications.[5] These models incorporate a variety of channels through which the real exchange rate is affected. Since each author selects different variables to include, the implied misalignments will necessarily vary.

Other approaches center on flow equilibriums, considering savings and investment behavior and the resulting implied current account. The equilibrium exchange rate is derived from the implied medium-term current account using import and export elasticities. In the IMF's "macroeconomic approach", the "norms" are estimated, in the spirit of Chinn and Prasad (2003). Wang (2004) discusses the difficulties in using this approach for China, but does not present estimates of misalignment based upon this framework. Coudert and Couharde (2005) implement a similar approach. Finally, the external balances approach relies upon assessments of the persistent components of the balance of payments condition (Goldstein, 2004; Bosworth, 2004). This last set of approaches is perhaps most useful for conducting short-term analyses. But the wide dispersion in implied misalignments reflects the difficulties in making judgments about what constitutes persistent capital flows. For instance, Prasad and Wei (2005), examining the composition of capital inflows into and out of China, argue that much of the reserve accumulation that has occurred in recent years is due to speculative inflow; hence, the degree of misalignment is small.

Two observations are of interest. First, as noted by Cairns (2005), there is an interesting relationship between the particular approach adopted by a study and the degree of misalignment found.[6] Analyses implementing relative PPP and related approaches indicate the least misalignment. Those adopting approaches focusing on the external accounts (either the current account or the current account plus some persistent component of capital flows) yield estimates that are in the intermediate range. Finally, studies implementing an absolute PPP methodology result in the greatest degree of estimated undervaluation. Dunaway and Li (2005) make a similar observation.

Second, while all these papers make reference to the difficulty of applying such approaches in the context of an economy ridden with capital controls, state-owned banks and large contingent liabilities, few have attempted a closer examination of these issues. Cheung *et al.* (2007a) directly incorporate some institutional factors including corruption and capital controls in their analysis.

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[5] Also known as BEERs, a composite of exchange rate models.

[6] All the studies reviewed by Cairns imply undervaluation or no misalignment.

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