How Undervalued is the Chinese Yuan?  
A New Examination of Purchasing Power Parity

There is increasing international pressure on the Chinese yuan to increase in value. The yuan is criticized as undervalued under dollar-pegged currency exchange regime and this increases the trade imbalances with other countries. At the recent Asia-Pacific Economic Cooperation conference held in Thailand in this September, a joint statement emphasizing the importance of “more flexible currency management” was released. In the United States, which will hold a presidential election next fall, President Bush and Treasury Secretary Snow have also commented on this issue.

However, it is difficult to determine proper currency exchange levels simply by looking at trade balances or foreign currency reserves. One measurement which is used in economics is called the Purchasing Power Parity, or PPP. There is, however, disagreement when it comes to calculating the rate of yuan’s undervaluation, with figures ranging from 40% (from the U.S. National Association of Manufacturers) to 14% (from Japan’s Ministry of Finance) with respect to the dollar.

This report will focus on the issues involved in applying the PPP to the actual economy. Specifically, two points will be examined. The first is the extent of undervaluation of the yuan. The second point is how the undervaluation is changing. If indeed currency exchange is to be accepted as a factor in ongoing trade imbalances, the currency must not only be undervalued, but the undervaluation must be expanding. What is the reality?

Purchasing Power Parity is a relative price of internationally traded commodity. Let’s take a simple dollar/yen example. If a personal computer that costs 200,000 yen in Japan costs 1000 dollars in the U.S., the PPP is 1 dollar=200 yen. If the actual exchange rate is 1 dollar=100 yen, the export price becomes 2000 dollars, twice the domestic U.S. price and export competitiveness is reduced. Thus, by looking at the PPP, we can determine if the currency is overvalued or undervalued. If the PPP/exchange rate>1, it is overvalued. If this figure<1, it is undervalued. If it equals 1, the currency is at the proper level.

The theory is simple enough, but actual calculation of the PPP is rather problematic. The biggest problem is a lack of price data. Only if the actual price data of various goods traded among different countries (in the personal computer example above 1 dollar=200
yen) are available can the true PPP level be calculated. In fact, however the sole clear-cut example where we can easily apply this calculation seems the Economist's Big Mac Index. It is impossible to apply this on macro level.

Because the above has shown us that it is difficult to obtain an “Absolute Purchasing Power Parity (Absolute PPP)” the index that is generally used is the “Relative Purchasing Power Parity (Relative PPP).” This is used instead of actual price research to equate domestic and international prices. In practice, “PPP=actual exchange rate” is assumed for a given base year. Then, for years before or after the base year, the PPP is measured as a percentage change in the domestic/foreign price indexes (consumer prices, producer prices, etc) from the base year. This method requires no actual price research. For reference, chart 1 shows the relative PPP of the yuan and the actual exchange rates. PPP is based on the consumer price index with 1987 given as the base year. After 1999, the gap between the PPP and the actual rate widened and the undervaluation of the yuan is apparent. Japan’s Ministry of Finance also employs this basic method, and the fact that the U.S. trade imbalance with China widened in the same period seems to support this method. However, this method of calculation may not be the most appropriate due to the fact that the selection of the base year becomes all important.

For the base year, a year in which trade is relatively balanced is chosen. It is assumed that if trade is balanced, the domestic and foreign prices are basically equal (PPP = actual exchange rate) but this holds true only if the trading nations produce and export similar products. Actually, trades among developed nations are quite different from those between developed and developing nations like China. In the latter case trading in differing types of commodities each other, or “one way trade” is more common. By making use of trade data (covering approx. 240 items) from the Organization for Economic Co-operation and Development (OECD) based on Standard International Trade Classification (SITC) to check the share of one way trade in total trade in the case of China and Japan, China's figure was at 41% as compared to 18% for Japan (2001). Here one way trade in each commodity is defined such that export (import) value is less than 10% of import (export) value. Given this, the assumption that balanced trade levels display balanced relative price levels is hard to justify. When calculating PPP for years other than the base year, by using price indexes is also not appropriate due to the large discrepancy in the makeup of trade commodities

At the very least, it seems true that in evaluating the true level of the yuan, we must go back to Absolute PPP instead of Relative PPP. The difficulty to collect price data has already been mentioned, and the only source which is of useful reference in this matter is data from the ICP (International Comparison Program) which consists of information researched and released primarily by the United Nations. The U.N. works with the governments of member nations to do price research based on unified standards and
publishes research data concerning Absolute PPP with respect to the U.S. dollar (data compiled by the UN’s World Development Indicators. For more information on the ICP, see the UN Web site http://www.worldbank.org.data/icp/index.htm).

Chart 2 shows changes in the ICP based PPP against the actual exchange rate of the yuan / U.S. dollar. From this we can see that in 2001 with a level of 1 being appropriate exchange rate level, the yuan was at 0.23, which means the Chinese yuan was a full 4 times undervalued (1/0.23=4.34). Due to this type of extreme result the ICP has not widely been discussed in the current debate concerning the value of the yuan.

However, if we look back, we can see that relative PPP does not fit with the basic definition of relative price and that absolute PPP is more beneficial here for data analysis. What we have to do is to correct the ICP analysis more grounded in reality.

Chart 3 shows a blot graph of 129 nations around the world, including OECD nations with the vertical axis showing the ICP PPP/nominal exchange rate for 2001 and the horizontal axis showing PPP gross national income (U.S.=1) for the same year. It seems clear that in developing countries where the income level is relatively low, the currency is proportionately undervalued. In other words, it is natural for the currency in developing nations to be somewhat undervalued. If this is taken into account, the level of the undervaluation shrinks.

One reason that the currency levels in developing nations is generally undervalued is that since the price levels in these nations stay at lower levels, the Purchasing Power Parity (Domestic Prices/Foreign Prices) stays at a lower level. In these nations, the gap between productivity in manufacturing and non-manufacturing sectors is small and it becomes more difficult for the “Balassa-Samuelson Effect”, in which the rise in wages in highly-productive manufacturing sector causes national prices to rise, take effect. In developed countries, this effect causes prices to rise.

On chart 3, China is marked with an arrow. Because of the above factor, the PPP/nominal exchange rate of the yuan to the U.S. dollar does not need to rise to a level of 1, but merely needs to reach the baseline value of 0.31. The extent of undervaluation drops from more than 4 times down to 35% (=0.31-0.23)/0.23)

Next topic is what about the time series change in undervaluation as mentioned earlier? We can see from chart 2 that the undervaluation of the yuan has shrunk slightly in recent years. Therefore, the rate of the yuan cannot realistically be called a factor in the widening trade imbalance with China. It seems more natural to view foreign direct investments in China raise its technology (total factor productivity) which has resulted in higher growth rates of domestic production and export. When looking at U.S. imports and
exports to China, this point becomes clear. Though no noticeable changes were seen in the types of products the U.S. exported to China in the 1990's, when we look at imports from China, the share of miscellaneous manufactured articles (SITC8) dropped from 63% (1991) to 49% (2001) while highly-valued machinery and transport equipment (SITC7) soared from 16% to 34%.

The conclusions reached in this study concerning the Purchasing Power Parity of the Chinese yuan could differ greatly if a different sample were taken, as seen in chart 3. Also, concerning the ICP data taken as the base, since the amount of price data available is limited, even the UN itself recognizes that there may be some inaccuracies contained therein. However, it at least seems clear that we should not only attempt to obtain better data, but also take a closer look at what role Purchasing Power Parity plays in the actual economy.

Chart 1  Relative PPP and Exchange Rate of the Yuan against the U.S. Dollar

Source: IMF, International Financial Statistics

calendar year
Chart 2  PPP / Exchange Rate
(Chinese Yuan / U.S. dollar)

Source: UN, World Development Indicators

Chart 3  PPP/Exchange rates and PPP Per Capita GNI (USA=1)  2001

Source: UN, World Development Indicators

Japan

China

PPP per capita GNI (USA=1)