

BIS Nominal and Real Effective Exchange Rates (EER): NEER and REER

Abstract: In this article, we introduce the two effective (i.e. multilateral) exchange rates that measure the value of a specific currency in relation to an average group of major currencies: the Nominal Effective Exchange Rates (NEER) and the Real Effective Exchange Rates (REER). Both are calculated by comparing the relative trade balance of a country's currency against each country within the index, but the REER is adjusted by the ratio of domestic price to foreign prices.

Using the BIS time-varying weights, we also look and comment the development of the CNY NEER and JPY REER over the past twenty years.

1 Computing the Nominal Effective Exchange Rate (NEER)

The first step to compute the REER of a specific home country i (currency) would require to determine the Nominal Effective Exchange Rate (NEER) of that specific country i . For instance, the NEER of the Japanese Yen is a summary measure of the Japanese Yen (JPY) vis-à-vis the currencies of Japan's most important trading partners.

The NEER of a specific currency i is calculated as the geometric weighted average of a basket of bilateral nominal exchange rates (M. Schmitz et al., 2012):

$$NEER_i = \prod_{j=1}^N \left(\frac{e_i}{e_j} \right)^{w_j} \quad (1)$$

with $j = 1, \dots, N$, and where:

- $NEER_i$: Nominal Effective Exchange Rate of home country i
- e_i : Nominal Exchange Rate of home country i against numeraire (USD)
- e_j : Nominal Exchange Rate of foreign country j against numeraire (USD)
- w_j : bilateral trade weight of home country i with trading partner j
- N : number of competitor countries in the reference group of trading partners

According to the FX literature, it is common to use geometric averages rather than arithmetic averages to compute effective exchange rates. There are several to compute the weight associate with each economy, but we will use the weighting scheme presented in Turner and Van't dack (1993). Details on the trade-based weighting methodology can be seen in the appendix.

With information and fundamentals becoming more and more transparent for every country, the Bank of International Settlements is now releasing monthly (and daily) data on Effective Exchange Rates (Nominal and Real). There are two monthly indices: the Broad Index comprising 61 economies with data from 1994 and the Narrow Index comprising 26 economies with data from 1964. The reason why the BIS EER (Effective Exchange Rates) has been broadened to 61 economies was to reflect the rising importance of the emerging economies in Asia, Central and Eastern Europe and Latin America.

In addition, the BIS adopted a time-varying weights in the EER calculations in order to match the rapidly changing patterns between countries; they assign a three-year average trade weights and then construct and indices. For today EER calculations, the most recent weights are based on trade in the 2011-2013 period, with 2010 as the indices' base year. The 2011-2013 period will be used

until the next set of three-year data (i.e. 2014-2016) becomes fully available. This time-varying weights method gives accurate picture of medium to long-term exchange rate movements by taking into account the importance of all trading partners in different periods of time.

Figure 1 represents the historical monthly BIS CNY NEER index since 1995. As I wrote in my article on the Chinese Yuan History, the CNY became an international currency in 1995 when it was pegged to the US Dollar at an exchange rate of 8.28 Yuan per US Dollar.

We can see that over the past 20 years, the Chinese Currency has been appreciating against its broad basket of trading partners; the index rose from 75 to 117 (August 2016) and hit a high of 127.4 in July 2015. As you can see, the last ‘sharp’ appreciation of the Chinese Yuan occurred between summer of 2014 and the summer of 2015, which matches the Obama Dollar Rise (The US Dollar appreciated by 25% overall during that period). Therefore, as the Chinese Yuan is loosely pegged to the US Dollar, the Chinese currency followed the Dollar move. The previous appreciation of the Renminbi was not a problem as China was experiencing a double-digit growth and was a huge player in international trade in the 2000s; however, with shrinking global demand (i.e. end of the super-cycle, downward revisions of global growth forecasts) and deteriorating trade conditions, the post-2012 ‘area’ was more concerning for China Officials. As a consequence, the PBoC allowed the Yuan to depreciate by nearly 4% against the USD in August 2015 (two-day depreciation, 11th and 12th). Since then, the NEER CNY index has constantly been decreasing according to the BIS calculations.

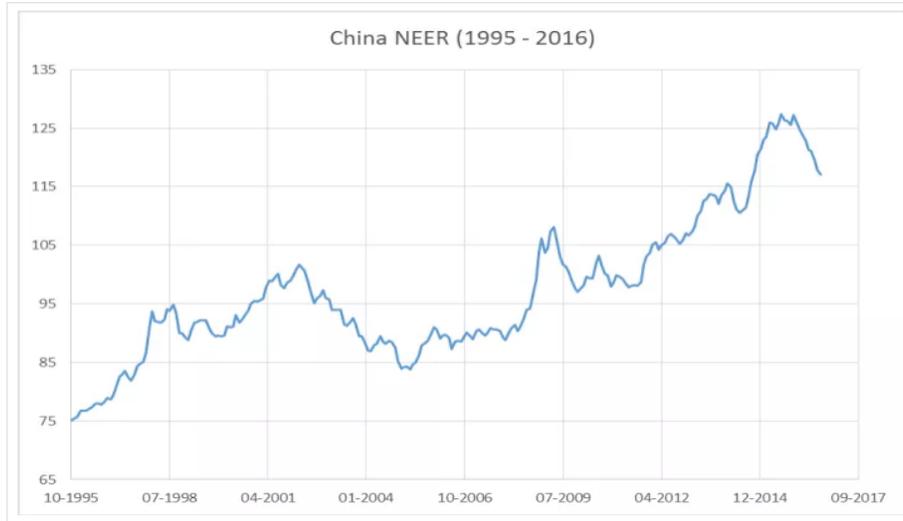


Figure 1: Historical data of BIS CNY NEER (1995 – 2016)

1.1 From NEER to REER (Real Effective Exchange Rate)

Now that we know the definition of the NEER, we can proceed to the calculation of the Real Effective Exchange Rate, which serves as an indicator of international price and costs competitiveness. The REER is also computed using a geometric weighted average, however we need to deflate nominal exchange rates using relative price or cost measures:

$$REER_i = \prod_{j=1}^N \left(\frac{e_i}{e_j} * \frac{P_i}{P_j} \right)^{w_j} \quad (2)$$

where:

- $REER_i$: Real Effective Exchange Rate of home country i
- P_i : Price level of home country i
- P_j : Price level of home country j

The BIS uses consumer price indexes (CPI) to deflate each exchange rate, which is the simplest measure of inflation as data are available everywhere. Other inflation measure that could be used are GDP deflator, PCE deflator, PPI...

For this case, we are going to study historical REER data for Japan (Figure 2).

Since the Housing (and Equity) bubble burst in the early 90s, Japan plunged into a long deleveraging deflationary period, Japan officials and has always tried

to rebuild its economy through fiscal and monetary stimulus. Despite the highest debt-to-GDP ratio in the world (230%, more than 10tr USD of public debt), a concerning declining population and a massive QQME program launched in April 2013 after Abe regained 'power' in December 2012 (three arrows, Abe-nomics), the Japanese Yen has always been considered a safe-haven currency according to market participants and tends to appreciate in period of market stress.

Here are some episodes of 'Yen strengthening':

- JPY strengthened for several years after the Japanese Equity market popped (Nikkei 225 index almost reached 40,000 on December 29, 1989 before it collapsed) as you can see in the appendix (Bloomberg Chart, JPYUSD in candlestick, if it goes up, it means the JPY gains strength).
- JPY strengthen again during the Great Financial Crisis (massive carry unwinds, i.e. AUDJPY); the JPY REER index rose from 80 to 107 in 18 months.
- eventually, after a sharp depreciation due to the post-Kuroda effect (80tr of JGBs purchase to reach a target inflation of 2%) – the JPY REER went down from 97 to 67 in 2-and-half years – the Yen has been strengthening over the past year as a reflection of an equity sell-off (Nikkei 225 is down 20% since June 2015).

The big question today is: could the Yen still be perceived as a safe-haven currency based on Japanese fundamentals? As I wrote it in many articles, it seems that Japanese Officials are running out of options at the moment. The poor performance of the equity market, a negative yield curve up to 10Y and a 'strong' Yen is persistently hurting the Japanese economy (poor exports, sluggish growth, market is still not pricing in inflation...), and today the BoJ doesn't have many bullets to use. The ones we discussed were helicopter money and Reverse Operation Twist.

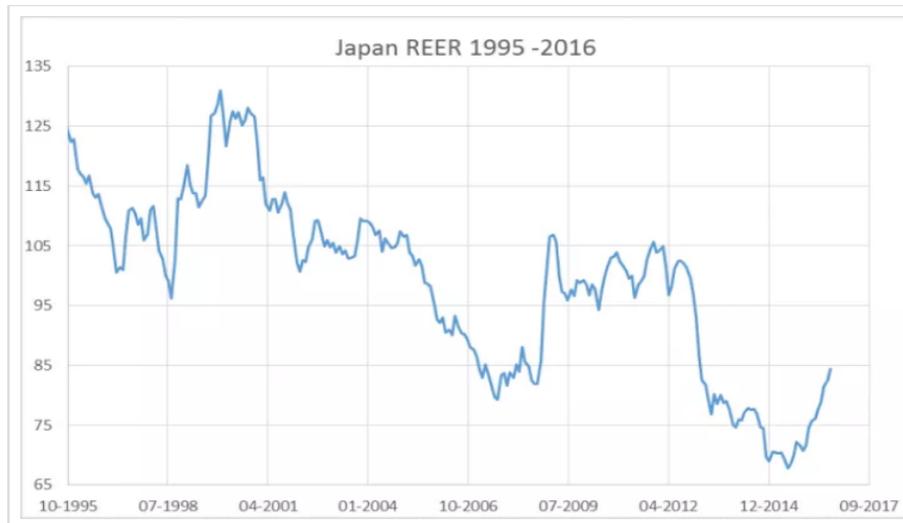


Figure 2: Historical data of BIS JPY REER (1995 – 2016)

To conclude, I believe the EERs released by the BIS are important indexes to watch in addition to the historical spot rates as they reflect a more fair / accurate value of a specific currency. In the next lectures, we will study other approaches to examine if a country’s actual real effective exchange rate is consistent with fundamentals. The BEER (Behavioural Equilibrium Exchange Rate) approach, for instance, uses economic methods to establish a behavioural link between the real rate and relevant economic variables. Another more complex approach is the FEER (Fundamental Equilibrium Exchange Rate), one of the most popular of the underlying balance (UB) models.

2 References

Klau, M. and Fund, S.S. 2006. "The new BIS Effective Exchange rate indices". Bank of International Settlements.

Schmitz, M. 2012. "Revisiting the Effective Exchange Rates of the Euro". European Central Bank.

Turner, P. and Van’t dack, J. 1993. "Measuring international price and cost competitiveness". Bank of International Settlements.

3 Appendix

An explanation of double-weighting[Ⓞ]

This box sets out formally the double-weighting scheme used in the BIS EER calculation. Consider the EER basket of economy j , and the weight it puts on economy i . There are k foreign markets and h foreign producers. Economy j trades bilaterally with i ; in addition, j 's exports compete with i 's exports and all other exports of h in k markets. Thus, to capture the impact of the relative exchange rate changes between i and j , the weights in an EER basket need to reflect import competition, direct export competition and third-market export competition. Algebraically, the weight of i (w_i) in the EER basket of j can be expressed as:

$$(1) \quad \text{Import weight} \quad w_i^m = m_j^i / m_j$$

$$(2) \quad \text{Export weight} \quad w_i^x = \left(\frac{x_j^i}{x_j} \right) \left(\frac{y_i}{y_i + \sum_h x_h^i} \right) + \sum_{k \neq i} \left(\frac{x_j^k}{x_j} \right) \left(\frac{x_i^k}{y_k + \sum_h x_h^k} \right)$$

$$(3) \quad \text{Overall weight} \quad w_i = \left(\frac{m_j}{x_j + m_j} \right) w_i^m + \left(\frac{x_j}{x_j + m_j} \right) w_i^x$$

where: $x_j^i(m_j^i)$ = economy j 's exports to (imports from) economy i
 $x_j(m_j)$ = economy j 's total exports (imports)
 y_i = home supply of domestic gross manufacturing output of economy i
 $\sum_h x_h^i$ = sum of exports from h (excluding j) to i

The import weight (expression (1)) captures the competition among i and other exporters to j . The more dependent j is on imports from i , the stronger the effects of i 's exchange rate variations are on j 's economy and thus i should weigh more heavily in j 's EER basket. In a sense, the import weight measures the *relative* importance among the different economies that j imports from, and this does not depend on the size of the domestic producers of j . Hence, the import weight takes the form of a simple bilateral share and y_i does not enter the equation.

The export weight (expression (2)) is "double-weighted" and can be decomposed into direct export competition and third-market competition. The first term on the right-hand side of the expression measures the direct competition between j 's exports to i and the domestic manufactures in i 's market. Unlike the import weight, which is a simple bilateral import share, the direct export weight is a bilateral export share multiplied by a measure of the openness of economy i . Intuitively, when i is an important market for j 's exports (measured by x_j^i/x_j), and/or when i is relatively less open to trade (ie i supplies domestically a large proportion of manufactures – measured by $y_i/(y_i + \sum_h x_h^i)$), – and j 's exports face stronger competition with i 's domestic manufactures in i 's market), then i should take more weight in j 's EER basket.

The third-market competition is captured by the second term in the right-hand side of expression (2). Consider all other markets k in which i and j compete with each other: from j 's perspective, if k is an important market for j 's exports (measured by x_j^k/x_j), and/or if i 's exports account for a large share of k 's market (measured by $x_i^k/(y_k + \sum_h x_h^k)$), this would imply that i is a more important competitor to j in the third markets and as a consequence should weigh higher in j 's EER basket.

The overall weight is then constructed by weighting the import and export weights with the relative size of total imports and exports in j 's total trade (expression (3)).

[Ⓞ] This box draws on Turner and Van't dack (1993).

Figure 3: Weights for NEER (and REER)



Figure 4: JPYUSD (Candlestick) vs. Japan BIS REER (yellow line) since 1989
 (Source : Bloomberg)