

# Revision Study for Calculating Effective Exchange Rates for Pakistan

## 1. Introduction

The concept of effective exchange rates, which includes nominal (NEER) and real effective exchange rates (REER), occupies a prominent place in macroeconomic analysis as it provides valuable information about a country's relative position, in terms of competitiveness of its goods and services for trade, viz. a viz. other countries relative to a base year. In fact, across the countries, REER is an index and is used as one of many tools for measuring misalignment in the country's nominal exchange rate.

Furthermore, it is worth noting that while the concept of REER is simple, albeit its users often face difficulties in understanding its construction and interpretation. First, quite often the changes in the real exchange rate are misinterpreted since this is presented in the form of an index number and not in terms of currencies. Therefore, unlike bilateral exchange rate interpretation, an increase in value of REER index means real appreciation of currency and vice versa. Second, another important point to mention here is that, often, appreciation (depreciation) of REER is confused with the concept of currency overvaluation (undervaluation) while these are two separate concepts and not necessarily interpreted in the same direction. Third, for assessment of a country's misalignment a more sophisticated analysis is required accounting for factors such as demographics, external and fiscal sustainability, and macro fundamentals over the medium-term.

SBP has been publishing REER data on its external website on monthly basis. REER is computed against the basket currencies of major trading partners/competitors, it is a dynamic concept as trading partners/competitors for each country can change overtime and Pakistan is no exception. Therefore, the weights and trading partners are revised periodically as a routine exercise. For example, SBP's last revision took place in 2014.

In this context, using the updated trade weights and new countries, which are provided by the IMF to its member countries as it has access to extensive dataset needed for calculating basket weights, SBP has revised the NEER and REER series accordingly.<sup>1</sup> The new weights are calculated by the IMF on the basis of 2013-15 trade patterns in the global economy. In case of Pakistan, this update led to increase in number of basket currencies to 37 which were previously 25 based on 2010-12 data. Importantly, the new weights reflect the change in trade dynamics for Pakistan and increasing importance of Chinese and other Asian economies in recent years.

To facilitate its users, next section discusses a brief description about methodology for calculating effective exchange rates for Pakistan.

## 2. Methodology

Arithmetically, REER is a product of NEER and Relative Price Index (RPI) for a given country. RPI is basically an inflation differential between a given country (for instance Pakistan) and its major

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<sup>1</sup> Please check IMF press release regarding the update of trade weights:

<https://www.imf.org/en/News/Articles/2019/03/26/pr1993-the-imf-updates-the-effective-exchange-rates-indices>

trading partners/competitors. Similarly NEER is a bilateral nominal exchange rates of a given country (against a base currency) relative to its major trading partner/competitor nominal exchange rate (against a base currency). Both NEER and RPI are indexed and weighted according to the relative importance of each trading partner in country's overall trade while also incorporating the effect of third market competition. **Table 1** presents the list of updated and old trading partners along their weights used for calculating effective exchange rate indices for Pakistan.

**Table 1: Pakistan's major trading partner/competitors and their weights in REER**  
*in percent*

S. #	Country	New weights (2013-15)	Old weights (2010-12)
1	People's Republic of China	29.1224	13.9945
2	United States	11.4734	19.4990
3	Germany	6.3794	8.4527
4	Japan	4.6707	7.4398
5	United Kingdom	3.4004	5.4926
6	India	3.3288	2.4056
7	Italy	3.0651	4.6922
8	France	2.7233	3.9133
9	Korea, Republic of	2.5049	3.3174
10	Saudi Arabia	2.4562	1.9167
11	Spain	2.2392	2.2283
12	United Arab Emirates	2.1031	2.4810
13	Netherlands	1.9640	2.2563
14	Thailand	1.8889	2.1722
15	Singapore	1.5288	2.0779
16	Turkey	1.4787	2.2740
17	Belgium	1.4675	1.9515
18	Taiwan	1.4547	1.9395
19	Indonesia	1.3606	1.3694
20	Malaysia	1.3412	1.7296
21	Canada	1.2040	2.1979
22	Switzerland	1.0138	1.5085
23	Australia	0.9871	1.7898
24	Russian Federation	0.9079	1.4455
25	Sweden	0.8702	1.4547
<b><i>Additional countries added in new series</i></b>			
26	Mexico	0.8835	
27	Brazil	0.9364	
28	Afghanistan, Islamic Republic of	1.0095	
29	Bangladesh	1.3142	
30	Poland	0.8088	
31	Vietnam	0.6979	
32	South Africa	0.6746	
33	Morocco	0.5770	
34	Kuwait	0.5629	
35	Denmark	0.5412	
36	Egypt	0.5398	
37	Austria	0.5201	

Source: IMF

Using the new weights (2013-15), **Table 2** exhibits the updated NEER and REER series from January 2013 onwards and compare the same with old series based on 2010-12 weights.<sup>2</sup>

**Table 2: NEER and REER indices**  
*2010=100*

Period	New weights (2013-15)		Old weights (2010-12)		Period	New weights (2013-15)		Old weights (2010-12)	
	NEER	REER	NEER	REER		NEER	REER	NEER	REER
Jan-13	84.4900	100.6813	85.7742	102.1789	Jul-17	89.6733	119.6111	90.7945	123.6126
Feb-13	84.3477	99.6707	85.8126	101.2485	Aug-17	88.7770	118.2829	89.8945	122.2365
Mar-13	85.0358	101.1362	86.7377	102.5306	Sep-17	88.0179	117.6544	89.2187	121.5374
Apr-13	84.7000	101.8477	86.4873	103.3287	Oct-17	88.8910	119.5480	90.1051	123.5542
May-13	84.8116	102.7592	86.7681	104.1262	Nov-17	89.0541	120.2306	90.3218	124.1915
Jun-13	84.7074	102.9891	86.4803	104.3559	Dec-17	85.7316	115.3417	86.9509	119.1921
Jul-13	83.6080	103.5022	85.4692	105.1693	Jan-18	82.7452	111.0343	83.9505	115.1076
Aug-13	81.5235	101.4977	83.1594	103.2356	Feb-18	81.9776	109.2191	83.2897	113.3028
Sep-13	79.4735	98.1800	81.0602	99.8007	Mar-18	80.6127	107.8884	81.9310	111.7112
Oct-13	78.0832	98.1066	79.5284	99.8254	Apr-18	78.7223	107.1773	80.0638	111.0999
Nov-13	77.6272	98.8126	79.1459	100.6303	May-18	80.2699	109.7098	81.7094	113.5535
Dec-13	77.8303	97.6852	79.4413	99.5693	Jun-18	78.4221	107.4833	79.7159	111.1915
Jan-14	79.4095	100.0887	81.1675	102.2863	Jul-18	76.1841	104.6808	77.1095	108.4003
Feb-14	79.5540	99.4522	81.2341	101.6803	Aug-18	77.8719	106.7118	78.7474	111.8072
Mar-14	83.3413	104.9586	85.0913	107.1015	Sep-18	77.8306	106.0149	78.6198	111.0818
Apr-14	85.2434	108.8119	86.9195	110.9098	Oct-18	74.1638	103.1371	74.9170	108.0997
May-14	84.2805	107.0936	85.8848	109.1347	Nov-18	72.7696	101.4948	73.4378	106.3348
Jun-14	84.6186	108.1043	86.2525	110.1395	Dec-18	70.0615	97.4692	70.7848	102.2672
Jul-14	84.4264	109.6004	86.0362	111.8335	Jan-19	69.3716	97.6124	70.2073	103.1728
Aug-14	83.7697	109.1233	85.5282	111.3858	Feb-19	69.2257	97.6775	70.1573	103.3471
Sep-14	82.8884	108.3932	84.9342	110.6008	Mar-19	69.0250	98.6660	70.0302	104.4045
Oct-14	83.3164	109.3464	85.5389	111.6056	Apr-19	68.2846	98.5519	69.3375	104.2608
Nov-14	84.8671	111.4406	87.4619	113.8229	May-19	66.9004	96.9998	67.8286	102.5453
Dec-14	86.6603	112.8538	89.5899	115.5342	Jun-19	62.3484	90.5023	63.0832	95.6994
Jan-15	88.1596	115.6210	91.5016	118.7059					
Feb-15	88.2579	114.1023	91.6870	117.2273					
Mar-15	89.2659	115.5468	92.8900	118.4894					
Apr-15	89.0739	116.5609	92.6468	119.5259					
May-15	88.2461	115.8373	91.5188	118.6541					
Jun-15	88.6289	117.0138	91.9919	119.8635					
Jul-15	89.4000	118.4576	92.9237	121.6668					
Aug-15	90.1836	119.0459	93.3048	122.2618					
Sep-15	89.0954	116.9674	91.9056	120.0445					
Oct-15	88.4441	116.5645	91.1577	119.5727					
Nov-15	88.8283	118.1190	91.7681	121.2455					
Dec-15	89.8615	118.2825	92.5797	121.7035					
Jan-16	90.7838	119.4852	93.2670	123.2250					
Feb-16	90.2259	117.5946	92.5413	121.4646					
Mar-16	89.4482	116.3461	91.6575	120.0654					
Apr-16	88.4342	116.3703	90.4011	120.0682					
May-16	88.8634	116.3662	90.7199	119.8011					
Jun-16	89.2890	117.3399	90.9880	120.6236					
Jul-16	89.7041	119.3629	91.4780	122.8587					
Aug-16	89.1889	118.2632	90.9374	121.7939					
Sep-16	89.4504	118.3179	91.1383	121.8231					
Oct-16	90.2882	120.4555	92.2044	123.9441					
Nov-16	92.1265	122.3648	93.4795	125.9629					
Dec-16	93.7125	123.3642	95.1015	127.1001					
Jan-17	93.4178	122.8520	94.8811	126.8968					
Feb-17	92.7121	122.0453	94.1687	125.9148					
Mar-17	92.6922	122.7800	94.1160	126.6839					
Apr-17	92.3127	123.5133	93.6063	127.4468					
May-17	91.7347	122.4700	92.8715	126.4358					
Jun-17	90.9981	121.0086	92.1759	124.9144					

Source: SBP staff calculations

<sup>2</sup> See Annexure for technical details about effective exchange rate indices.

## Annexure

NEER is calculated as follows:

$$NEER = \left[ \prod_{i=1}^N (I/I_i)^{w_i} \right] \text{ as } \sum_{i=1}^N w_i = 1$$

$$NEER = \frac{I}{\exp[\sum_{i=1}^N w_i \ln(I_i)]}$$

$$NEER = \frac{ERI_P}{ERI_{TPC}} \times 100$$

Where:

$I$  is exchange rate index of US dollar per currency of compiling economy (Pakistan).

$I_i$  is exchange rate index of US dollar per currency of trading partner's currency.

$w_i$  is the trade weights for the countries in the basket and  $\sum_{i=1}^N w_i = 1$

$N$  is the number of trading partners countries

$ERI_P$  is the exchange rate index for USD per Pak rupee

$ERI_{TPC}$  is the exchange rate index for USD per trading partner countries' currency

To determine the exchange rates, currency unit per SDR for each partner is taken from IFS-IMF on daily basis. Using these SDR rates, exchange rate for each country against the US dollar is then computed as the US dollar per currency unit and then exchange rate index ( $ERI_P$ ) for Pakistan and  $ERI_{TPC}$  for each trading partner country by using the following formula:

$$ERI = \frac{s(\text{Current period})}{s(\text{Base period})} \times 100$$

Where  $s$  represents US dollar per currency unit of Pakistan and currencies of trading partner countries of Pakistan for currency period (day/month/quarter/year) with respect to the base year 2010, i.e. average of the year 2010.

$ERI_P = \frac{s(\text{Current period})}{s(\text{Base period})} \times 100$ , where  $s$  is selected US dollar per currency unit of Pakistan (Pakistan currency) and

$ERI_{TPC} = \frac{s(\text{Current period})}{s(\text{Base period})} \times 100$ , where  $s$  is selected USD per currency unit of individual currencies of all trading partner countries of Pakistan

RPI is calculated as follows:

After calculation of NEER, relative price index ( $RPI$ ) is prepared using the following formula;

$$RPI = \frac{P}{\exp[\sum_{i=1}^N w_i \ln(P_i)]} \times 100$$

Let, CPI of Pakistan,  $CPI_P = P$ , and  $CPI_{TPC} = \exp[\sum_{i=1}^N w_i \ln(P_i)]$

$$RPI = \frac{CPI_P}{CPI_{TPC}} \times 100$$

CPI values are collected for individual countries (trading partner countries and also for Pakistan) on monthly basis from their websites. The monthly CPI data for different countries have different base years. The CPI data for all countries are then index according to the base year 2010, in order to conform to the RPI calculation.

After calculating NEER and RPI, REER can be obtained by using the following formula;

$$REER = \frac{NEER \times RPI}{100}$$