Note on the revision of South Africa's nominal and real effective exchange rate indices

By A Joubert, P Phume and L Pickersgill

Introduction

The South African Reserve Bank (SARB) conducts regular revisions to the calculation of the effective exchange rate (EER) indices of the South African rand. These revisions include both the nominal effective exchange rate (NEER), which measures the external value of the rand against that of a weighted basket of South Africa's largest trading partner countries, and the real effective exchange rate (REER), which is an indicator of domestic producers' competitiveness in foreign markets.

The revised EER indices reflect changes in both major trading partner country coverage and corresponding weights due to the evolution of international trade patterns in manufactured goods.[1] The current (2020) revision is based on trade data for the period 2015 to 2017, indexed to the base year 2015, whereas the previous revision (2014) was based on trade data from 2010 to 2012, indexed to the base year 2010 (Motsumi et al., 2014).

1 The EERs for South Africa is only based on trade in manufactured goods and does not include trade in services.

This note briefly describes the underlying methodology used to compile South Africa's EER indices, some observations pertaining to the 2020 revision as well as a review of changes over time in the composition of these indices. The revised weights applied in the calculation of the NEER and the REER will be effective from 2 January 2015 and the new indices will be published as from 3 August 2020. Further details related to these changes will be provided on the SARB's website.

Methodology

The methodology used to compile South Africa's EERs has not changed since the early 2000s (Walters and De Beer, 1999) and this revision was conducted in accordance with the methodology of the Information Notice System (INS) of the International Monetary Fund (IMF) – a system established in 1983 to facilitate surveillance of the exchange rate policies of IMF member countries. The INS relies on trade data obtained from the United Nations (UN) database[2] that reflects trade in manufactured goods according to the Standard International Trade Classification (SITC), categories 5–8, excluding category 68.[3]

2 See, https://comtrade.un.org/

3 SITC-5: Chemicals and related products, SITC-6: Manufactured goods classified mainly by material, SITC-7: Machinery and transport equipment, SITC-8: Miscellaneous manufactured articles, and SITC 68: Non-ferrous metals.

The lag in the data used in the review of the EERs reflects the time required to publish UN data. As in previous revisions, weights for trading partner countries were computed by taking into account three elements of competition in international trade.

The first is between imports and similar locally produced goods. This reflects the competitiveness of bilateral imports against domestically produced import-competing goods. The second is between own exports and similar produced goods in foreign markets. This reflects competition between local bilateral exports to trading partners and similar goods produced in each trading partner's respective market. The third is between own exports and exports of other countries in third markets. This reflects competition between local exports and exports of bilateral trading partners to other countries, which is referred to as competition in third markets. The second and third elements collectively approximate the competitiveness of locally produced goods against similar foreign produced goods in the international market.

The UN trade data analysis and the aforementioned methodology enable the identification of South Africa's major trading partner countries (retentions, exclusions and new additions) and the new bilateral import and export positions as well as third-market weights (see the table on comparison of weights for international trade in manufactured goods). A further three factors are important in the calculation of EERs, namely the base year, the price deflator and exchange rates.

4 These countries are Botswana, Zambia, Mozambique and the United Arab Emirates. For India and Saudi Arabia, the wholesale price index was used.

The base year should be a period of relative stability in economic and financial market conditions and hence 2015 was selected as the suitable base year for the 2020 revision. The price index used as deflator to calculate the REER should be representative of traded goods, preferably manufactured goods. In the case of South Africa, the producer price index (PPI) has been regarded as the appropriate price deflator since the introduction of the REER methodology. For a few countries for which PPIs are not available, the SARB reverted to the use of the consumer price index (CPI)[4] as a proxy for the price deflator. Bose (2014) noted that 'no single REER price measure captures all the aspects of international price/cost competitiveness'. Other price measures include relative export prices, unit labour cost, gross domestic product and expenditure deflators as well as import and export unit values. Middle spot exchange rates and geometric averages are used in the calculation of the EERs. The percentage changes in daily bilateral exchange rates against the South African rand are weighted according to the major trading partner countries.

Comparison of weights for international trade in manufactured goods*

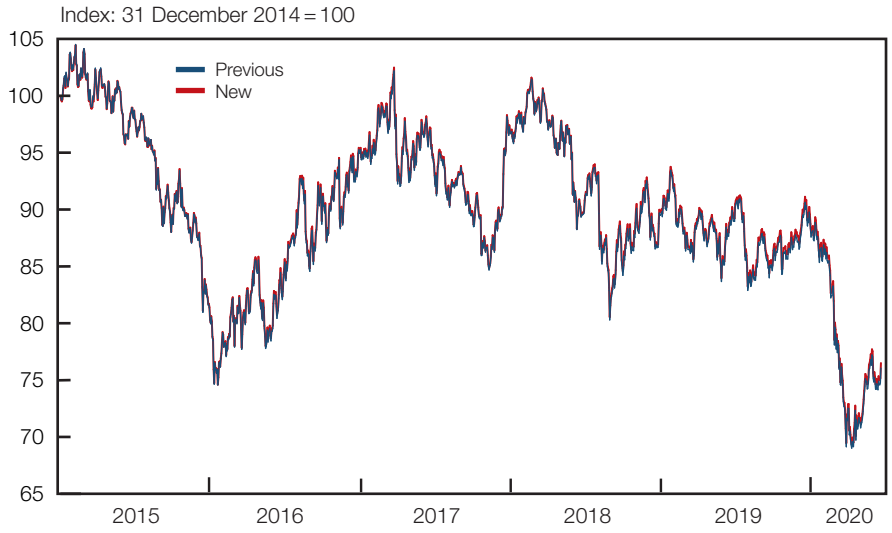
Country/area	Bilateral imports		Bilateral exports		Third markets	
	Previous 2010–2012	New 2015–2017	Previous 2010–2012	New 2015–2017	Previous 2010–2012	New 2015–2017
China	24.82	30.25	2.03	5.89	22.48	15.18
Euro area	30.83	30.04	26.87	34.65	25.58	31.72
United States	12.19	10.43	18.14	11.60	15.23	10.77
India	4.39	5.27	2.29	2.14	4.07	4.15
Japan	6.04	4.42	2.97	3.89	9.06	5.81
United Kingdom	5.12	3.94	5.94	4.24	8.39	4.18
Vietnam	–	2.34	–	0.20	–	1.09
Republic of Korea	3.57	2.11	0.74	2.29	3.61	3.78
Thailand	2.14	2.01	0.81	1.12	1.82	1.59
Sweden	2.21	1.51	0.55	0.47	1.50	0.72
Switzerland	1.94	1.36	1.13	1.07	1.81	1.28
Poland	0.92	1.23	1.01	0.41	0.67	0.61
Brazil	1.18	1.21	1.74	1.24	0.51	0.83
Malaysia	1.48	1.00	0.28	0.99	1.48	1.26
Saudi Arabia	–	0.85	–	0.77	–	0.66
Botswana	0.41	0.79	10.28	10.21	0.40	5.17
Australia	0.86	0.49	3.04	2.79	0.58	1.70
United Arab Emirates	–	0.39	–	3.80	–	3.13
Zambia	0.13	0.24	7.66	7.33	0.17	3.73
Mozambique	0.08	0.12	5.29	4.89	0.10	2.63
Canada	0.90	–	1.07	–	1.17	–
Israel	0.63	–	1.78	–	0.98	–
Zimbabwe	0.15	–	6.36	–	0.39	–

* Ranked according to new bilateral imports

Outcome

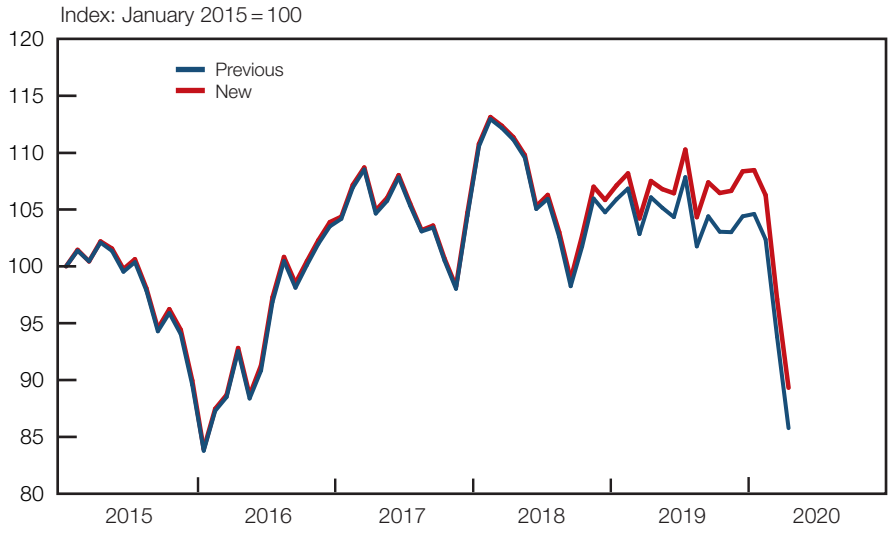
The newly calculated EER indices display movements that are fairly similar to the previously published time series. The newly calculated NEER does not deviate much from the 2014 calculations, though marginally higher with a daily average deviation of 0.2 index points. The REER shows slightly larger deviations, especially from late 2018, and reflects a slightly less competitive position as South Africa's inflation differential widened compared to the basket of trading partner countries.

Figure 1 Nominal effective exchange rate of the rand



Source: SARB

Figure 2 Real effective exchange rate of the rand



Source: SARB

Comparison of trading partner country total trade weights

Country/area	Prior to 1999	1999	2003	2008	2014	2020
Euro area	38.58*	35.70	36.38	34.82	29.26	30.68
China	2.91	3.11	3.14	12.49	20.54	24.53
United States	14.44	15.15	15.47	14.88	13.72	10.56
Japan	9.90	10.26	10.43	10.12	6.03	4.95
India	–	–	–	2.01	3.98	4.85
United Kingdom	14.09	14.91	15.37	10.71	5.82	4.03
Republic of Korea	2.50	2.57	2.64	1.96	3.10	2.75
Botswana	–	–	–	–	2.09	2.45
Vietnam	–	–	–	–	–	1.87
Thailand	–	–	–	–	1.86	1.85
Zambia	–	–	–	0.80	1.42	1.56
United Arab Emirates	–	–	–	–	–	1.43
Switzerland	4.99	5.28	5.54	2.83	1.78	1.33
Sweden	1.58	1.79	1.81	1.99	1.81	1.21
Malaysia	–	–	–	–	1.27	1.10
Mozambique	–	–	–	–	0.97	1.07
Brazil	–	–	–	1.37	1.16	1.06
Poland	–	–	–	–	0.89	0.99
Australia	1.59	1.62	1.68	2.04	1.19	0.95
Saudi Arabia	–	–	–	–	–	0.78
Hong Kong SAR	2.59	2.62	2.70	1.48	–	–
Zimbabwe	2.27	2.27	–	–	1.25	–
Canada	1.87	1.93	1.96	–	0.98	–
Singapore	1.55	1.62	1.66	1.40	–	–
Israel	1.14	1.17	1.22	1.11	0.88	–
Total	100	100	100	100	100	100

* Prior to 1 January 1999, the Euro area weights comprised Germany, Italy, France, Netherlands, Belgium, Spain, Ireland, Australia, Finland and Portugal.

Observations from the 2020 revision

- The total number of South Africa's trading partner countries remained at 20, with the inclusion of Vietnam, Saudi Arabia and the United Arab Emirates, which replaced Canada, Israel and Zimbabwe.
- The exclusion of Zimbabwe, similar as in 2003 and 2008, was due to currency volatility and high inflation.
- The remaining African countries, namely Botswana, Zambia and Mozambique together account for a total trade weight of 5.1%.
- The export and import cover ratios of total manufactured goods reflected minor changes with the import ratio increasing from 86.9% in the 2014 revision to 89.7% in the 2020 revision, while the export ratio decreased from 81.7% to 78.1%.
- The import ratio increased as trading partner countries now account for a larger portion of South Africa's imports relative to the previous period. Zimbabwe's exclusion did not impact the import ratio much due to its negligible contribution of less than 1.0%.

- The decrease in the export ratio is partially explained by the exclusion of Zimbabwe, which is a prominent bilateral export trading partner of South Africa. This is reflected in the UN trade data which show that Zimbabwe accounts for, on average, 4.6% of total South African exports of manufactured goods during the period 2015–2017.[5] The lower export than import ratio also reflects the exclusion of Namibia, Lesotho and Eswatini, which are important trading partner countries within the Common Monetary Area, linking into the monetary union with currencies pegged to the South African rand.
- The United States (US) has maintained its position with the third largest total trade weight among all trading partners in the basket, despite a decrease from 13.7% in 2014 to 10.6% in 2020. This decrease reflects a significant decline in overall trade of machinery and transport equipment, which lowered both the bilateral import and export weights in the 2015–2017 period to 10.4% and 11.6% respectively.
- China has been South Africa's fastest growing trading partner since 2003, moving from having the sixth largest trade weight in 2003 to having the second largest trade weight in 2020. China's trade weight remained the second largest and increased from 20.5% in 2014 to 24.5% in 2020, reflecting the significant importation of machinery and transport equipment from 2015 to 2017, which increased the bilateral import weight to 30.3%. South African exports to China also increased during the period as reflected by the increase in the bilateral export weight to 5.9%. In addition, China's exports to the other 19 countries decreased relative to South African exports to those countries as reflected by a decrease in the third-market weight to 15.2%.
- The almost doubling of India's trade weight, from 2.0% when first included in the basket of 15 trading partner countries in 2008 to almost 4.0% in 2014, reflects its increased ranking from the eighth to the fifth largest trade weight during this period. Subsequently, India's trade weight increased even further to 4.9% in 2020. This has resulted in India replacing the United Kingdom (UK) as South Africa's fifth largest trading partner, which reflects increased integration of India's manufactured goods market with South Africa and its top 20 trading partners. The increase in India's trade weight from 2014 to 2020 reflects the importation of machinery and transport equipment during the period 2015–2017, which increased South Africa's bilateral import weight with India to 5.3% while South African exports to India moderated.

5 South African exports to Zimbabwe during the period 2015–2017 averaged US$1.42 billion while the total exports of South Africa averaged US$31.25 billion, according to the UN trade data for manufactured goods.

Review of changes in weights and trading partners over time

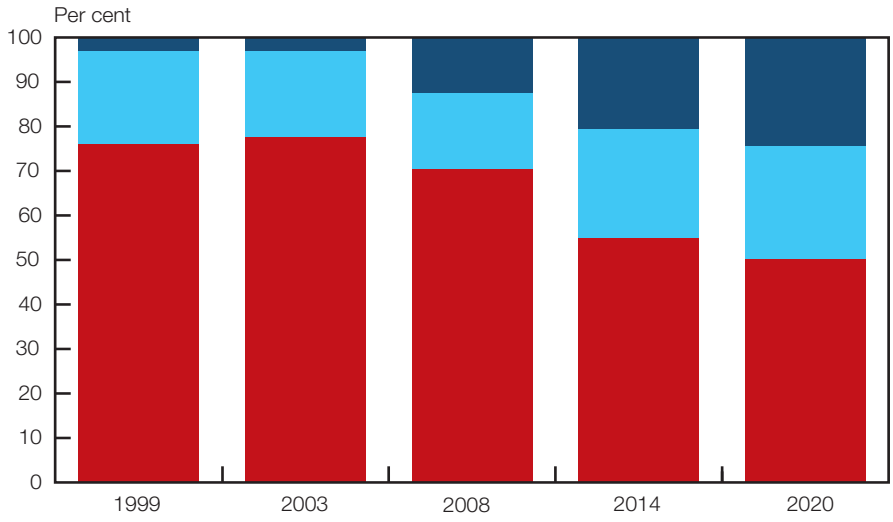
South Africa's initial EERs included only four major trading partner countries, namely the US, the Euro area, the UK and Japan, compliant with the global calculation methodology applied by major central banks and other official institutions such as the Bank for International Settlements (BIS) (Turner and Van't dack, 1993) and the European Central Bank (ECB) (Buldorini, Makrydakis and Thimann, 2002) prior to the 2000s. The evolution of the EERs included the change to the Euro area after 1 January 1999 and the increase in the number of trading partner countries to 14 in 1999.

This was followed by minor changes in 2003 with the exclusion of Zimbabwe due to lack of a representative exchange rate and a liquid foreign exchange market. Following a comprehensive review of structural changes in both domestic and global trade, related to economic developments as well as trade agreements and import tariff adjustments, the number of countries was increased from 13 to 15 in 2008 to reflect increased trade with Africa and other emerging market countries such as Zambia, India and Brazil. In addition, China's weight also increased significantly from 3.1% to 12.5%. In 2014, the number of countries increased to 20, with the inclusion of Botswana and Mozambique in addition to Zambia as well as more emerging market countries such as Malaysia, Thailand and Poland. These 20 countries reflected 86.9% and 81.7% respectively of total manufactured imports and exports. With the 2020 revision, the number of trading partner countries selected remained unchanged at 20 and now reflects 89.7% and 78.1% respectively of total manufacturing imports and exports. A further increase in the number of trading partner countries to 30[6] would only marginally increase the coverage to 95.2% and 85.0% respectively.

6 These 30 countries still exclude Zimbabwe.

The shift over time in the relative contribution of the Euro area, the US, the UK and Japan to the total weight of the basket of South Africa's trading partner countries showed a decline from 76.0% in 1999 to 50.2% in 2020. By contrast, the share of the remaining countries, mostly emerging market countries, inclusive of China, increased from 24.0% to 49.8% over the same period. China's trade weight increased the most, from around 3.0% in 2003 to 24.5% in 2020, while the weight of other emerging market countries also increased significantly. By contrast, the contribution of the UK shrank the most, from 15.4% in 2003, when it had the third largest weight in the basket prior to 2008, to only 4.0% in 2020, when it was overtaken by India.

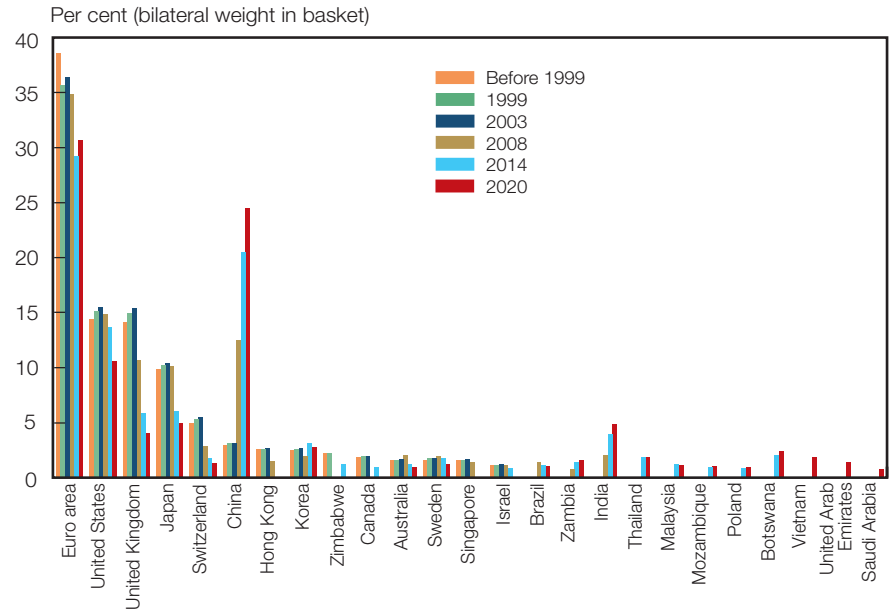
Figure 3 Contribution to total trade weight



Sources: United Nations and SARB calculations

Despite the decline in the contribution of the Euro area to the total trade weight, from 38.6% prior 1999 to 30.7% in 2020, it remained the largest among all trading partner countries in the basket across all the revision periods. The trade weight of the US also declined progressively, from 15.5% in 2003 to 14.9% in 2008 and 13.7% in 2014 and further to 10.6% in 2020, switching from second to third place in 2014, when China moved to second position.

Figure 4 Evolution of trading partner total weights



Sources: United Nations and SARB calculations

Annexure A: Formulae

The following formulae were used in the calculation of the appropriate exchange rate weights: $X_i^k(M)$ represents a country i's exports of manufactured goods to market k. $S_j^k(M)$ represents country j's share of all manufactured exports to market k and $W_i^k(M)$ is the share of country i's exports of manufactured goods shipped to market k. Therefore,

$$S_j^k(M) = \frac{X_j^k(M)}{\Sigma_{1 \neq k} X_i^k(M)}$$

$$W_i^k(M) = \frac{X_i^k(M)}{\Sigma_{n \neq i} X_i^n(M)}$$

$\beta_i^m(M)$ and $\beta_i^x(M)$ represent the share of imports and exports respectively in country i's international trade in manufactured goods.

$$\beta_i^m(M) = \frac{\Sigma_{1 \neq i} X_1^i(M)}{\Sigma_{1 \neq i} X_1^i(M) + \Sigma_{n \neq i} X_i^n(M)}$$

$$\beta_i^x(M) = \frac{\Sigma_{n \neq i} X_i^n(M)}{\Sigma_{1 \neq i} X_1^i(M) + \Sigma_{n \neq i} X_i^n(M)}$$

$W_{ij}(M)$ represents the sum of two components: the import component $\beta_i^m(M)\ MW_{ij}(M)$, which reflects competition in the home market (country i), and the export component $\beta_i^x(M)\ XW_{ij}(M)$, which reflects competition in all foreign markets.

$$W_{ij}(M) = \beta_i^m(M)\ MW_{ij}(M) + \beta_i^x(M)\ XW_{ij}(M) \text{ where}$$

$$MW_{ij}(M) = S_j^i(M) \text{ and}$$

$$XW_{ij}(M) = \tfrac{1}{2}\ BXW_{ij}(M) + \tfrac{1}{2}\ TXW_{ij}(M)$$

$$= \tfrac{1}{2}\ W_i^j(M) + \tfrac{1}{2}\ \frac{\Sigma_{k \neq ij} W_j^k(M)\ S_j^k(M)}{\Sigma_{k \neq i} W_j^k(M)\ (1 - S_i^k(M))}$$

The import weight, $MW_{ij}(M)$, is the share of country i's imports of manufactured goods from country j. The bilateral export weight, $BXW_{ij}(M)$, is the share of country i's exports of manufactured goods to country j. The third-market export weight, $TXW_{ij}(M)$, is equal to the weighted average over all third-country markets of country j's import share divided by a weighted average of the combined import share of all country i's competitors, where the weights are the shares of country i's exports to the various markets. The bilateral and third-market export weights are arbitrarily given equal importance in the computation of the overall export weight, $XW_{ij}(M)$.

References

Bose, D. 2014. 'Real exchange rates and international competitiveness concepts, measures and trends in New Zealand'. Paper presented at the New Zealand Association of Economists Conference. Wellington: New Zealand, July.

Buldorini, L, Makrydakis, S and Thimann, C. 2002. 'The effective exchange rates of the euro'. *European Central Bank Occasional Paper No. 2.* February. Frankfurt am Main: European Central Bank.

Motsumi, L, Swart, P, Lekgoro, H, Manzi, V and de Beer, B. 2014. 'Note on the revision of South Africa's nominal and real effective exchange rate indices'. *Quarterly Bulletin. June.* Pretoria: South African Reserve Bank.

Turner, P and J Van't dack. 1993. 'Measuring international price and cost competitiveness'. *Economic Paper No. 39.* November. Basel: Bank for International Settlements.

Walters, S and De Beer, B. 1999. 'An indicator of South Africa's external competitiveness'. *Quarterly Bulletin*. September. Pretoria: South African Reserve Bank.

Zanello, A and Desruelle, D. 1997. 'A primer on the IMF's Information Notice System'. *Working Paper 97/71.* May. International Monetary Fund.