

## EQCHANGE Annual Assessment 2019

Carl Grekou

### Highlights

- The global configuration of currency misalignments changed little in 2018, compared to 2017, with a tendency towards the narrowing of the gaps between observed exchange rates and EQCHANGE estimated equilibrium levels;
- The US dollar is still overvalued —although less than in 2017; the Chinese renminbi displays a very slight undervaluation and can be considered in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen are moderately undervalued;
- The euro area, while appearing broadly in line as a whole, is again featured by two opposite situations: in contrast with the rest of the region, Finland, Germany, Ireland, the Netherlands display undervaluations;
- Movements regarding the currency misalignments in EMEs (e.g. Brazil, India, Indonesia, Russia, Turkey) have been generally downwards, largely influenced by the exchange rate depreciations and consequently resulted in an increase of the undervaluations;
- Latin America is marked by a heterogeneity regarding the currency misalignments with Chile, Dominican Rep., Mexico and Panama showing undervaluations higher than 15% (9% for Brazil) while Bolivia and Costa Rica (resp. Guatemala, and Uruguay) display overvaluation higher than 15% (resp. 30%); although almost all countries display an undervaluation, Africa is characterized by an important heterogeneity regarding the levels with Algeria and Swaziland displaying undervaluations higher than 50%.



## Abstract

This publication, accompanying the 2019's update of EQCHANGE, aims at providing an overview of exchange rate misalignments for 2018. In a nutshell, 2018 has been characterized by relatively minor movements in exchange rate misalignments except few EMEs that registered important downward movements owing from the exchange rate depreciations. This is especially the case of Turkey, and to a lesser extent, Brazil, India, Indonesia and Russia. In contrast, most of the major currencies registered a slight appreciation vis-à-vis the US dollar that generally translated in upward movements in currency misalignments. The euro area is again featured two opposite situations with Finland Germany, Ireland and the Netherlands displaying noticeable undervaluations.

## Keywords

EQCHANGE, Exchange Rates, Currency Misalignments, Imbalances.

## JEL

E3, E4, E5, E6, F3.

## Working Paper

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RESEARCH AND EXPERTISE  
ON THE WORLD ECONOMY



**EQCHANGE annual assessment 2019**

Carl GREKOU\*

**Summary**

After the turbulences observed during 2017, the year 2018 was relatively calm, thus leaving the global configuration of currency misalignments that prevailed in 2017 broadly unchanged. Relatively few countries and mainly EMEs, however, registered noticeable changes in their currency misalignments.

Among the advanced economies, the US dollar shaped most of the movements in the currency misalignments. Indeed, the US dollar depreciated vis-à-vis a number of currencies and around 2% in real effective terms. With unchanged fundamentals—despite the sizable fiscal stimulus, the US dollar registered a weak fall in its overvaluation. In the euro area, movements have been generally upwards with more noticeable reductions of undervaluations (e.g. Finland and Germany) than increase of overvaluations. In fact, the improvements in the fundamentals—especially in the peripheral countries like Portugal and Spain—helped to offset the upwards pressure owing from the euro appreciation. Only Ireland and the Netherlands registered an increase of their undervaluations. However, taken together, the movements are supportive of reducing macroeconomic imbalances within the zone. In the United Kingdom, the appreciation of the British pound led to a reduction of its undervaluation. This is also the case for the Japanese yen. Despite a slight appreciation, the renminbi stayed broadly in line with its fundamental value.

Regarding emerging economies, Turkey is the country that registered the most important changes. Due to the Turkish lira fall, the currency misalignment shifted from a moderate to a large undervaluation. This is also the case—although to a lesser extent—for Brazil and Russia that shifted from broadly in line currencies to moderate undervaluations. This downwards movement during 2018 is also shared by a number of EMEs (e.g. India, Indonesia, Malaysia).

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The configuration of currency misalignments examined in this publication results from exchange rate movements and adjustments of macroeconomic fundamentals. In 2018, the formers have mostly been shaped by political factors —e.g. trade wars and sanctions, rise of populism and the Brexit. Regarding the economic fundamentals, the world economy as a whole has been marked by a slowdown in both the world trade and the economic activity. Nonetheless, the configuration of the misalignments remained rather stable compared to 2017. This is rather a good news on the front of global imbalances. In particular, concerns about the resurgence of imbalances in the euro area did not materialize. However, among the factors likely to influence the future trend, is the overhang of private debt at the global level —and the associated rising financial risk— and the political uncertainty that will reach a peak with the forthcoming US elections.

The CEPII's *EQCHANGE* annual assessment 2019 presents estimates of equilibrium exchange rates and corresponding currency misalignments for the year 2018 and discusses the evolutions between 2017 and 2018. It draws on information available from the CEPII's *EQCHANGE* database.

**Convention:**

As used in this publication, the country/economy name, when associated with a term pertaining to the exchange rate level or dynamics —i.e. overvaluation, undervaluation, appreciation, depreciation— refer instead to the country's currency.

This publication was prepared by Carl Grekou. It also benefited from the guidance of Cécile Couharde, Anne-Laure Delatte, Sébastien Jean and Valérie Mignon.

## 1. Overview

The present publication, which accompanies the 2019's update of *EQCHANGE*, aims at providing an overview as extensive as possible of the exchange rate misalignments for the year 2018. It also aims at discussing the evolution of exchange rates and currency misalignments between 2017 and 2018 as well as their underlying factors, hence identifying global patterns and monitoring —global— imbalances.

This publication is organized as follows. Section 2 briefly overviews the configuration of the currency misalignments in 2018 as well as the changes that occurred between 2017 and 2018. Section 3 discusses in greater depth the case of 35 major economies. In Section 4, we provide regional outlooks.

### Box 1 — EQCHANGE: objectives and approach

The widening and persistence of global imbalances have refocused real exchange rate distortions at the core of international debates. However, despite their importance, publicly available data regarding these distortions are very scarce and limited in terms of country and time coverage. In order to fill this gap, the CEPII has developed *EQCHANGE*, a database covering a large sample of countries (187 in the largest sample).

*EQCHANGE* is a global database of annual indicators on effective exchange rates. It includes two sub-databases containing data on (i) nominal and real effective exchange rates (computed using different weighting schemes), and (ii) equilibrium real effective exchange rates and corresponding currency misalignments for advanced, emerging and developing countries.

The substantial enhancement introduced by *EQCHANGE* lays in the latter sub-database which provides estimates based on the Behavioral Equilibrium Exchange Rate (BEER) approach.

**The BEER approach.** The BEER approach is a good alternative to PPP-based measures or normative approaches —such as the Fundamental Equilibrium Exchange Rate approach. Indeed, one of the difficulties when computing equilibrium exchange rates is to identify the long-run equilibrium paths of the economies. The BEER approach here appears more pragmatic as it does not require to estimate or to make assumptions on the long-run values of the economic fundamentals.<sup>1</sup> Instead, the BEER approach consists in directly assessing the equilibrium level of real exchange rates through the estimation of a long-run relationship between the real exchange rates and their fundamentals. We obtain currency misalignments by computing the difference between the real effective exchange rate and its fitted value from the long run relationship. See Couharde et al. (2018) for further details.

<sup>1</sup> We do not postulate that the BEER methodology achieves superior performance against other approaches. On the contrary, all the approaches are rather complementary.

## Box 2 — EQCHANGE: vintage 2019

The 2019's version of *EQCHANGE* includes data on two sub-databases: (i) effective exchange rates and on (ii) equilibrium real effective exchange rates and corresponding currency misalignments. First, the database on effective exchange rates includes both nominal and real effective exchange rates at different frequencies (monthly, quarterly and yearly). All the indicators are available for the three different weighting schemes and the two baskets of trade partners (186 and the top 30 trade partners). This sub-database covers 187 countries.

Regarding the sub-database on equilibrium real effective exchange rates and corresponding currency misalignments, we consider five fundamentals (see below). However, due to a too high uncertainty regarding the assessments of equilibrium exchange rates for a number of countries, this update only covers 142 countries. Countries included are: Albania, Algeria, Antigua and Barbuda, Armenia, Australia, Austria, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia Herzegovina, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Rep., Chad, Chile, China, Colombia, Comoros, Congo Rep., Costa Rica, Croatia, Cyprus, Czech Rep., Côte d'Ivoire, Denmark, Djibouti, Dominica, Dominican Rep., Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Grenada, Guatemala, Guinea Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Kazakhstan, Kenya, Kiribati, Korea Rep., Kuwait, Kyrgyzstan, Lao P.D.R., Latvia, Lesotho, Lithuania, Madagascar, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova Rep., Mongolia, Morocco, Namibia, Nepal, Netherlands, New Zealand, Niger, Nigeria, North Macedonia, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay and Vietnam.

Finally, data on equilibrium exchange rates and currency misalignments available from *EQCHANGE* now correspond to averages over all the models and estimation samples. Accordingly, standard errors are also provided.

### The data used in this publication:

This publication draws on data available from the latest version of *EQCHANGE*. As a result of the inclusion of two new fundamentals, the assessments of the equilibrium exchange rates and currency misalignments were based on five models, each model augmenting the previous with an additional fundamental as specified below:

$$reer_{i,t} = \underbrace{\mu_i + \beta_1 BS_{i,t}}_{\text{Model 1}} + \underbrace{\beta_2 nfa_{i,t}}_{\text{Model 2}} + \underbrace{\beta_3 tot_{i,t}}_{\text{Model 3}} + \underbrace{\beta_4 gov_{i,t}}_{\text{Model 4}} + \underbrace{\beta_5 open_{i,t}}_{\text{Model 5}} + \varepsilon_{i,t}$$

- *REER*: the real effective exchange rate is computed using nominal bilateral exchange rates and the Consumer Price Index from the International Monetary Fund (International Financial Statistics). The trade weights are computed *vis-à-vis* 186 trade partners over the 1973-2018 period.
- *BS*: the Balassa-Samuelson effect is proxied by the different proxies. See the CEPII's *RPROD* database (Box 5).
- *NFA*: the net foreign asset positions | Lane and Milesi-Ferretti database and updated using data on the current account balances from IMF (World Economic Outlook database).
- *TOT*: the terms of trade | United Nations Conference on Trade and Development database.
- *GOV*: the government spending | World Development Indicators database (World Bank).
- *OPEN*: the trade openness | World Development Indicators database.

## 2. Currency misalignments in 2018

Figure 1 maps the exchange rate misalignments for the year 2018, the most recent year for which data are available.<sup>1</sup> They respectively show undervalued and overvalued currencies. A quick look at both figures allows to notice that more currencies were undervalued than overvalued compared to their long run trend. As in 2017, the most important currency misalignments are concentrated in developing countries (DCs) and emerging economies (EMEs). Currency misalignments also appear to be geographically concentrated. Africa is the region where undervaluations are the highest, with Algeria, Swaziland and Ghana heading the list. As the African countries, most of the Asian economies as well as the Near and Middle East countries have undervalued currencies. Among European countries, undervaluations mostly prevailed in Germany, Ireland, the Netherlands, Norway, Sweden and the United Kingdom.

Contrary to undervaluations, overvaluations are particularly concentrated in Southern Europe, South Eastern and Eastern Europe. Outside these regions, cases of overvaluations are associated to relatively few countries.

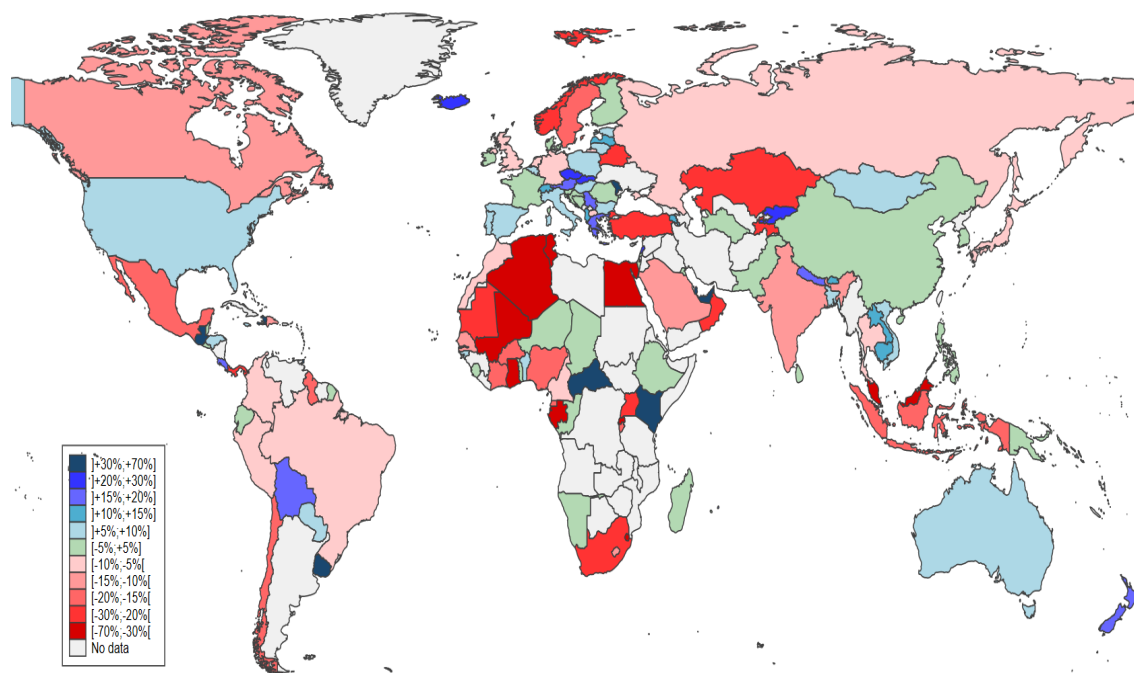


Figure 1 — Currency misalignments in 2018

Source: EQCHANGE (CEPII). Data correspond to the averages of estimates over the different models and weighting systems (vis-à-vis 186 trade partners).

<sup>1</sup>Table A.1 in Appendix A reports the averages and standard deviations of estimated misalignments across the different types of specifications and for each country of the sample.

Overall, the global configuration of currency misalignments in 2018 is slightly different compared to 2017, with minor shifts in line with the dynamics observed the previous years. The changes between 2017 and 2018 are characterized in Figure 2. The left chart plots the distribution of the changes in currency misalignments during this period. As can be seen, the distribution is slightly negatively skewed indicating a small tendency towards a reduction in currency misalignments. Furthermore, around 80% of the changes lie in the  $-/+ 5$  percentage points interval. The right chart, which plots the distribution of the currency misalignments for 2018 and 2017, confirms the similarity of the currency misalignments configuration for the two years.

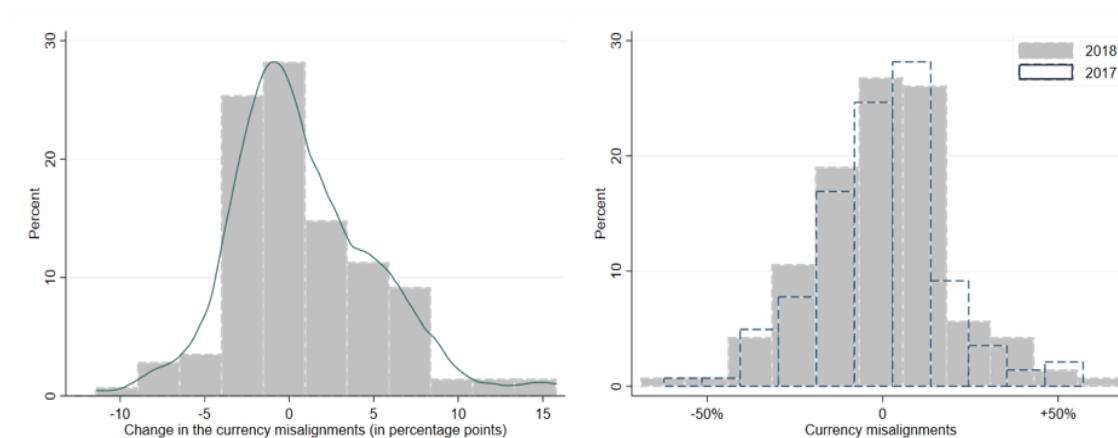


Figure 2 — Distributions of the changes in currency misalignments and the currency misalignments (2018 - 2017)

Notes: The left chart depicts the distribution of the change in the currency misalignments between 2018 and 2017 (the solid line represents the kernel density). The right chart plots the distribution of the currency misalignments for 2018 (gray bars) and 2017 (dashed blue bars).

Source: EQCHANGE (CEPII)

The global pattern noted hitherto, however, hides different dynamics as can be seen in Figure 3. In fact, there have been important disparities across countries and regions. Except a few countries (Algeria, Central African Rep., Kenya, Rwanda and Tunisia) that recorded an increase in their currency misalignment, Africa appears to be the most homogenous region in terms of dynamics as the rest of the countries generally reduced their undervaluations between 2017 and 2018. Changes in Europe were relatively of low amplitudes and quite heterogeneous (even among the euro area). Asia is also characterized by a relatively important heterogeneity of the dynamics. In Latin America, however, changes have been generally towards an increase in the currency misalignments.



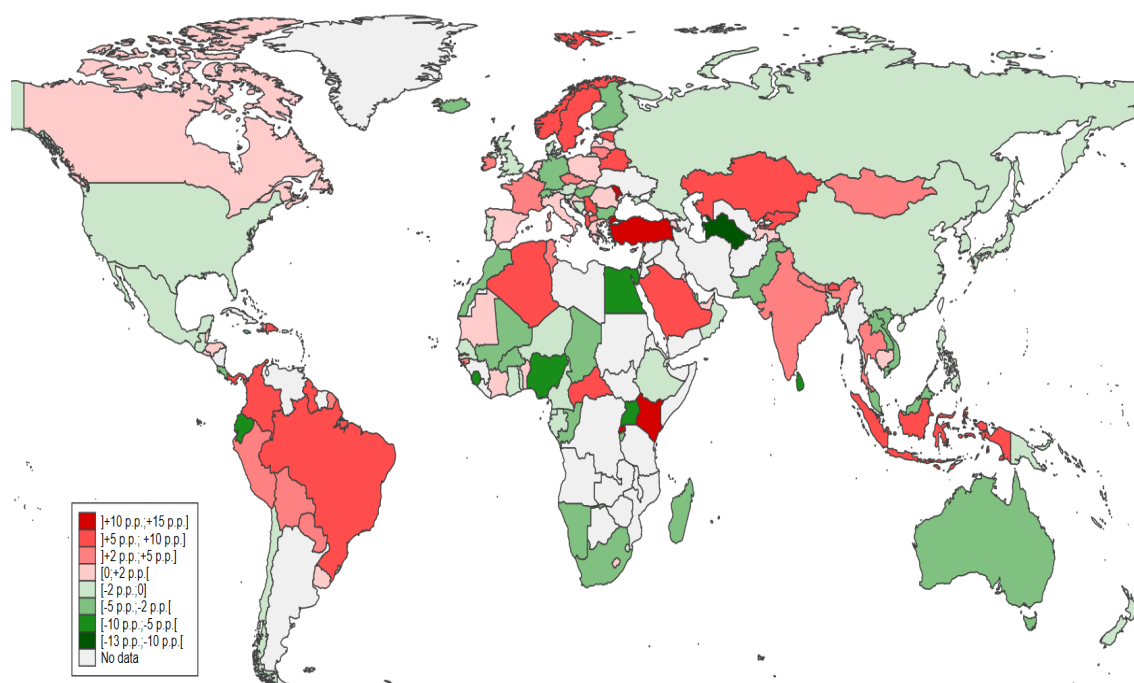


Figure 3 — Changes in currency misalignments between 2017 and 2018

Note: Data correspond to changes (in percentage point) in the averages of estimates over the different models and weighting systems (vis-à-vis 186 trade partners). The green (resp. red) color indicates a reduction (resp. an increase) in the misalignments (in absolute values), the shades reflecting the amplitude of the changes.

Source: EQCHANGE (CEPII)

### Box 3 — Currency misalignments in 2018: key points

- The global configuration of currency misalignments changed little in 2018, compared to 2017, with a tendency towards the narrowing of the gaps between observed exchange rates and EQCHANGE estimated equilibrium levels;
- The US dollar is still overvalued —although less than in 2017; the Chinese renminbi displays a very slight undervaluation and can be considered in line with its fundamental value;
- The euro area, while appearing broadly in line as a whole, is again featured by two opposite situations: in contrast with the rest of the region, Finland, Germany, Ireland, the Netherlands display undervaluations;
- The British pound, the Canadian dollar and the Japanese yen are moderately undervalued;
- Movements regarding the currency misalignments in EMEs (e.g. Brazil, India, Indonesia, Russia, Turkey) have been generally downwards, largely influenced by the exchange rate depreciations and consequently resulted in an increase of the undervaluations;
- Latin America is marked by a heterogeneity regarding the currency misalignments with Chile, Dominican Rep., Mexico and Panama showing undervaluations higher than 15% (9% for Brazil) while Bolivia and Costa Rica (resp. Guatemala, and Uruguay) display overvaluation higher than 15% (resp. 30%);
- Although almost all countries display an undervaluation, Africa is characterized by an important heterogeneity regarding the levels with Algeria and Swaziland displaying undervaluations higher than 50%.

### 3. The misalignments of the major currencies/economies

*The aim of this section is to document the currency misalignments for a set of 35 economies, their evolution —as well as the underlying factors— between 2017 and 2018. The economies considered are Australia, Austria, Belgium, Brazil, Canada, China, Denmark, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States.*

#### 3.1. The misalignments

The exchange rate misalignment estimates for 2018 are represented in Figure 4. Table 1 gives our assessments of these estimates (“coarse categorization”) for each of the countries. Estimates for 2017 are also reported to illustrate the dynamics of the misalignments.

Over our 35 currencies, 10 countries display overvaluations higher than 5% while 19 countries exhibit undervaluations higher than 5% —i.e. below -5%. The remaining 6 countries lie within the  $-/+5\%$  interval suggesting that these countries are in line with their fundamentals, i.e. at their equilibrium value —see countries in green in Table 1. This is the case for China, Denmark, France, Hong Kong, Israel and Korea.

Among the overvalued currencies, three appear with “large” misalignments: Austria, Greece and New Zealand. These three countries already exhibited relatively large overvaluations in 2017. The remaining overvalued countries are concentrated in the 5-10% interval —“Moderate overvaluations”. This group includes Australia, Belgium, Italy, Portugal, Spain and the United States. Switzerland is the only one country in the intermediate overvaluation category.

In the undervalued currencies group, in ascending order, the different categories include respectively 9 countries, 3 countries and 7 countries. The moderate undervaluations group is composed of Brazil, Germany, Ireland, Japan, Luxembourg, the Netherlands, Russia, Thailand and the United Kingdom. Except Germany, Luxembourg and the Netherlands —that maintained themselves in this group, Brazil, Ireland, Russia and Thailand shifted from the “in line group” in 2017 to the moderate undervaluations in 2018. Japan and the United Kingdom, on the other hand, registered a reduction in their undervaluations.

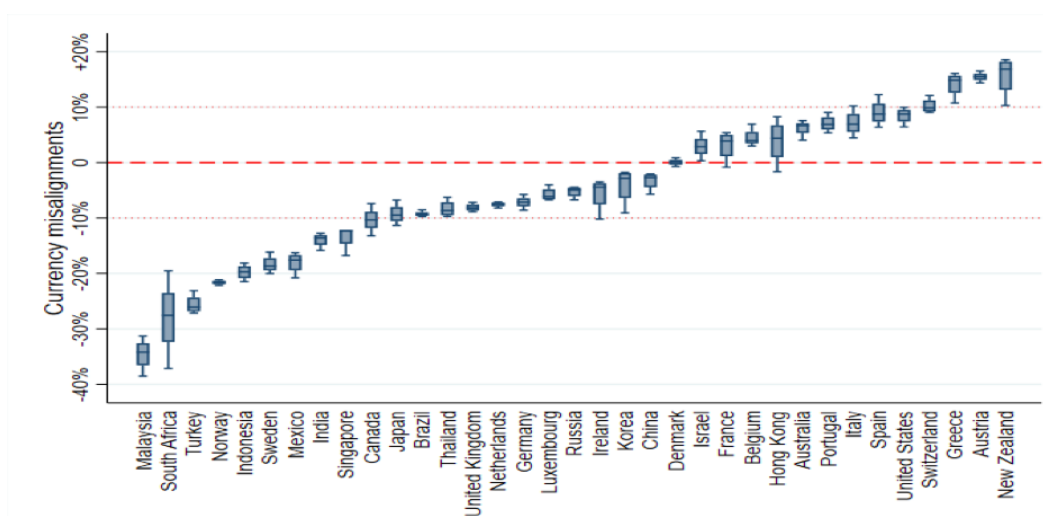


Figure 4 — Currency misalignment in 2018 (estimations range)

Note: Data are from EQCHANGE (CEPII). The red dot lines indicate the +10% and -10% levels.

Table 1 — Currency misalignments assessment

Country	Assessment		Country	Assessment	
	2017	2018		2017	2018
Australia	Light Blue	Light Blue	Luxembourg	Light Blue	Light Blue
Austria	Dark Blue	Dark Blue	Malaysia	Dark Red	Dark Red
Belgium	Light Green	Light Blue	Mexico	Dark Red	Dark Red
Brazil	Light Green	Light Pink	Netherlands	Light Pink	Light Pink
Canada	Light Pink	Light Pink	New Zealand	Dark Blue	Dark Blue
China	Light Pink	Light Green	Norway	Dark Red	Dark Red
Denmark	Light Green	Light Green	Portugal	Light Blue	Light Blue
France	Light Pink	Light Pink	Russia	Light Green	Light Pink
Germany	Light Pink	Light Pink	Singapore	Light Pink	Light Pink
Greece	Dark Blue	Dark Blue	South Africa	Dark Red	Dark Red
Hong Kong	Light Blue	Light Green	Spain	Light Blue	Light Blue
India	Light Pink	Light Pink	Sweden	Light Pink	Dark Red
Indonesia	Light Pink	Dark Red	Switzerland	Dark Blue	Light Blue
Ireland	Light Green	Light Pink	Thailand	Light Green	Light Pink
Israel	Light Green	Light Green	Turkey	Light Pink	Dark Red
Italy	Light Blue	Light Blue	United Kingdom	Light Pink	Light Pink
Japan	Light Pink	Light Pink	United States	Light Blue	Light Blue
Korea	Light Pink	Light Green			

Legend

Undervaluation			Overvaluation		
Large	Moderate	In line	Moderate	Large	
-15%	-10%	-5%	+5%	+10%	+15%

Note: The proposed categorization is based on the average of country's misalignments, taking into account the standard deviation.

Canada, India and Singapore form the intermediate undervaluations group in 2018. The last group, i.e. large undervaluations is composed of Indonesia, Malaysia, Mexico, Norway, South Africa, Sweden and Turkey. Indonesia, Sweden and Turkey are the new entrants in this category. While Indonesia and Sweden moved from the intermediate undervaluations category to the large one, Turkey shifted in a quite abrupt manner from a moderate to a large undervaluation.

### 3.2. Evolutions during 2018 and the driving factors

Despite relatively important movements in some emerging economies, the pattern of currency misalignments in 2018 for the 35 considered economies remained broadly unchanged. Indeed, as can be seen in the left chart of Figure 5, most of the countries appear very close to the 45-degree line hence illustrating a certain inertia/persistence. As noted above, very few countries, however, registered noticeable changes in their currency misalignments. Turkey tops the list. There has been, however, a rather common trend towards the reduction of currency misalignments—although marginal—as indicated by the right chart of Figure 5.

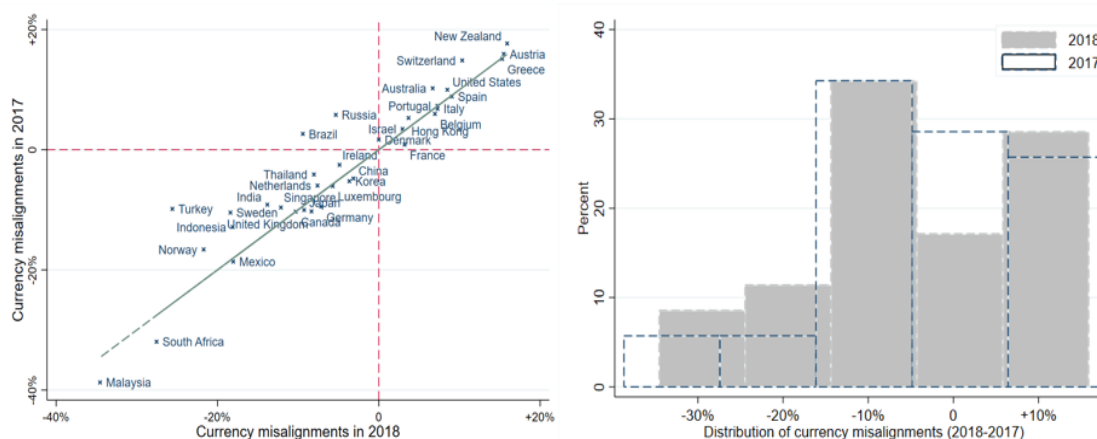


Figure 5 — Currency misalignments & changes (2018 - 2017)

Note: In the left chart, the dashed green line represents the 45-degree line. The solid line in the right chart correspond to the kernel density.

Source: EQCHANGE (CEPII)

Factors driving the reconfiguration of currency misalignments between 2017 and 2018 are diverse. Policy implications about changes in misalignments can be drawn on a number of grounds, including the magnitude of these variations (small or large), the direction of these changes (improvement or worsening) and finally the roots of these evolutions (depending on whether they come from an improvement in fundamentals or an adjustment in the real effective exchange rate which is likely to be

more temporary). In this respect, Figure 6 initiates the identification process of the underlying factors. Indeed, we plotted on the x-axis, the change in the estimated equilibrium exchange rates (ERER) and, on the y-axis, the change in the real effective exchange rate (REER). Hence, Figure 6 aims at illustrating the extent to which the evolutions of the currency misalignments have been related to variations in the real effective exchange rates and/or in the equilibrium real exchange rates. The countries can then be classified in several categories, according to the evolutions of their ERER and their REER. For ease of reading, Figure 6 is divided in four regions defined by two reference lines: country above (resp. below) the horizontal dashed line registered an appreciation (resp. a depreciation) of their REER; those located at the left (resp. the right) of the vertical dashed registered a deterioration (resp. an improvement) of the fundamentals (or their equilibrium exchange rate). The four regions thus correspond to: (i) appreciation of both the REER and ERER (top right region), (ii) depreciation of both REER and ERER (bottom left region), (iii) appreciation of the REER but depreciation of the ERER (top left region), and (iv) depreciation of the REER but appreciation of the ERER (bottom right region).



Figure 6 — Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$

Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represents the 45-degree line. A positive sign in both measures indicates an appreciation.

Source: EQCHANGE (CEPII)

Except few countries, movements in the REER and ERER have been of relatively

small amplitudes. Excluding Turkey, Brazil, India, Indonesia and Russia, the variations in the REER and/or the EREER felt within the  $-/+5\%$  interval —with most countries in the  $-/+2\%$  interval. Movements in the EREER have been however of smaller amplitudes compared to those in the REER hence suggesting that for a number of countries, the changes in the currency misalignments are of a temporary nature.

As can be seen, Brazil, Russia, Thailand and Turkey —and to a lesser extent India, Indonesia, Norway and Sweden— appear at the periphery of the countries cloud. Turkey, followed by Brazil, are the countries that registered the most important changes in the REER —respectively  $-19\%$  and  $-13\%$ . Russia follows behind with a depreciation of  $-8\%$ ; around  $-6\%$  for Indonesia and India. Changes in the EREER are, as aforementioned, of a different magnitude with Turkey exhibiting the most important depreciation of the equilibrium exchange rate ( $-3\%$ ). Changes in the EREER in India and Indonesia are around  $-1\%$  and only  $-0.5\%$  in Brazil. In contrast, Norway, Russia, Sweden and Thailand registered an improvement in their EREER —with Thailand displaying the most important change ( $+7\%$ ). Contrasting the changes in the REER and the ones in the EREER, it appears that the increase in the Turkish lira undervaluation comes from its relatively large depreciation (a more temporary factor). This holds also for the Brazilian real and the Indian and Indonesian rupiah. In the case of Russia and Sweden, the downward movement in the currency misalignments originate from a depreciation concomitant with the improvement in the EREER. Finally, for Norway and Thailand, the changes principally reflect the appreciations of the EREER.

In the selected euro area countries, changes in the currency misalignments have been generally upward mainly driven by the appreciation of the REER. Few countries, however, display more important movements in the EREER —hence revealing different dynamics regarding the evolutions of the misalignments. This is the case of Ireland and the Netherlands which registered more perceptible improvements of their fundamentals. For Austria, Greece, Luxembourg, Portugal and Spain, changes in the REER and the EREER are of the same amplitudes. Overall, only Ireland and the Netherlands saw an increase in their undervaluations —respectively 2.4 and 1.7 percentage points. France and Germany, on the other hand, are the two countries which registered the most important upward movements; Germany has reduced its undervaluation by around 2.3 percentage points while France, at the equilibrium in 2017, now display an overvaluation of  $3\%$ .

The United Kingdom and the United States have registered changes in currency misalignments of similar amplitudes but in opposite directions. Indeed, while the US

dollar overvaluation decreased from 10% in 2017 to 8.5% in 2018, the British pound, due to the US dollar depreciation, appreciate in effective terms which translate into a reduction of its undervaluation —around -2 percentage points.<sup>2</sup> The Japanese yen also registered a very slight reduction of its undervaluations owing to the 1% deterioration of its fundamentals. Singapore, however, saw its EREER appreciate by 2.6%; with a negligible change in the REER, this resulted in an increase of the Singapore dollar undervaluation. China remains relatively close to the first bisector hence indicating minor change in the currency misalignments (a 1.5% reduction of the undervaluation).

As aforementioned, departure from the first bisector implies a major source for the change in the currency misalignments, either the REER or the EREER —influenced by the fundamentals. Figure 7 addresses the issue of the change in the REER.

We plotted, in the left chart, the changes in the NEER (Nominal Effective Exchange Rate) and in the NER (Nominal Exchange Rate vis-à-vis the US dollar) and, in the right chart, the change in the REER against the change in the NEER. The left chart hence addresses the issue of the effect of the REER of the NER —and of the trade structure— while the right chart investigates that of the inflation differential vis-à-vis the trade partners.

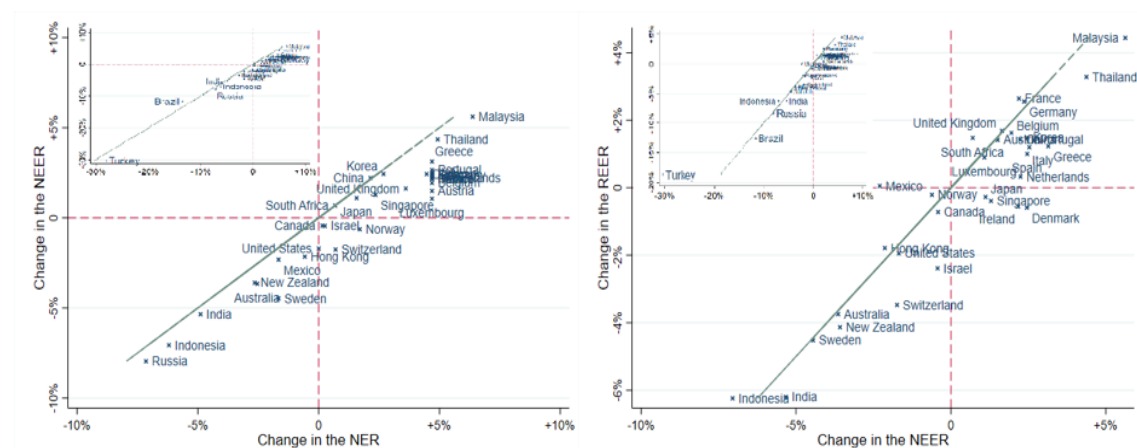


Figure 7 — Exchange rate variations

Note: "REER" (resp. "NEER") stands for the Real (resp. Nominal) Effective Exchange Rates; "NER" stands for the Nominal bilateral Exchange Rate (vis-à-vis the US dollar). A positive sign indicates an appreciation. Both scale express changes in percentage. The green dashed line represents the 45-degree line.

Source: EQCHANGE (CEPII) and IMF

From the left chart, one may note that for most countries, change in the NER vis-à-vis the US dollar translated into a rather equivalent change in the NEER. Hence,

<sup>2</sup>Changes in the EREER of both countries are negligible.

the main determinant of the movements in the NEER appear to be the National currency/ US dollar exchange rate in most countries, especially in China, Korea and South Africa —i.e. countries on the first bisector. Overall, very few currencies depreciated vis-à-vis the US dollar and in effective terms (Australia, Brazil, India, Indonesia, New Zealand, Russia and Turkey). Changes for Hong Kong and to a lesser extent for Mexico and Sweden vis-à-vis the US dollar are negligible. The euro area countries appear in the top right region, all on the same vertical alignment (around +5% along the x-axis) but at different levels due to differences in the trade structure.

The right chart (Figure 7) deals with the other source of change in the REER: inflation or inflation differential vis-à-vis the trade partners. As it shows, inflation have also played a noteworthy role in the dynamics of the REER in some countries. Indeed, while most countries appear on —or close to— the first bisector which here indicates a “complete” pass-through (e.g. Australia, Austria, Belgium, Sweden and the United Kingdom), Turkey, for instance, is the country the more distant from the first bisector. Indeed, stemming from a depreciation —around 28% vis-à-vis the US dollar, the NEER depreciated by around 30% that translated into a 19% depreciation of the REER. The reason for this incomplete pass-through is the 15% increase in the Turkish consumer price index between 2017 and 2018.<sup>3</sup>

Overall, movements in the exchange rates have played a moderate role regarding the evolution of currency misalignments during 2018 in one third of the selected countries. In few countries however, given the magnitudes, these movements played a key role. Concerned countries are Brazil and Turkey —and to a lesser extent India, Indonesia and Russia.

Figure 8 pertains to the factors underlying the changes in the estimated equilibrium exchange rates. We plotted, on the x-axis, the changes in the Net Foreign Asset (NFA) position and, on the y-axis, the change in the Balassa-Samuelson effect proxy —relative GDP per capita in PPP terms (further details are provided in Box 5).<sup>4</sup> In contrast with 2017 where changes in the relative GDP and the NFA were of relatively small amplitudes (except few countries), 2018 is characterized by important movements especially in the NFA. Indeed, the chart is especially distorted along the NFA axis with countries like Ireland, the Netherlands, Switzerland and Singapore displaying the most important improvements in their position (more than +10 percentage points).

<sup>3</sup>Inflation even annihilated the NEER depreciation in Mexico.

<sup>4</sup>Figure B.2 in Appendix B shows the changes in the terms of trade.



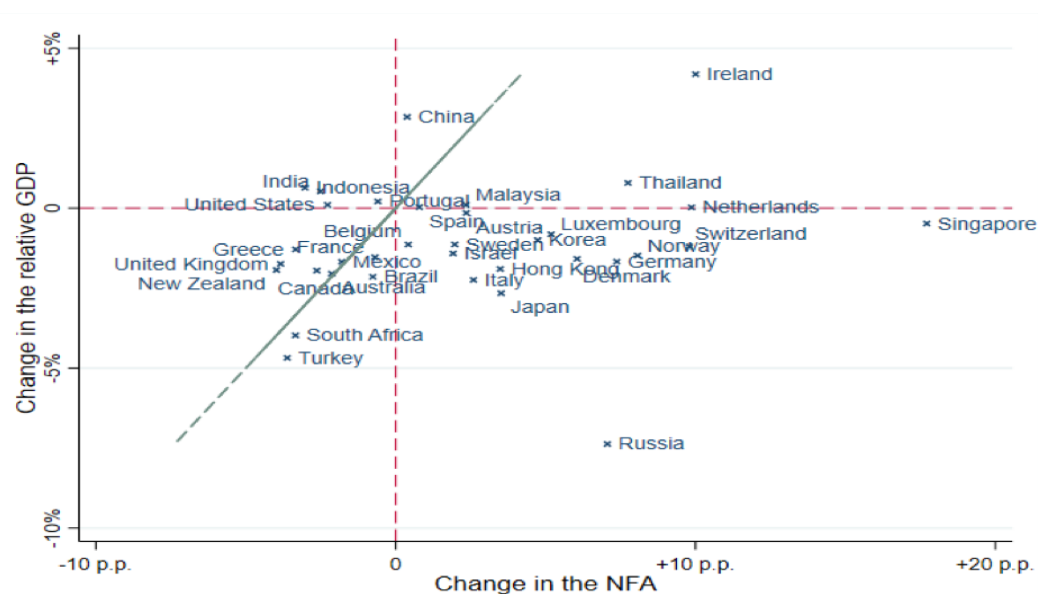


Figure 8 — Changes in the fundamentals: relative *GDP* vs. *NFA*

Note: "Change in the relative GDP" corresponds to the change in the GDP per capita of country *i* relative to the trade partners GDP per capita—both in PPP terms (see Box 5). "*NFA*" stands for the Net Foreign Asset position (as share of GDP). Changes in the relative GDP are expressed in percentage while those in the *NFA* are expressed in percentage points. Source: *EQCHANGE* (CEPII)

Changes in the NFA actually mainly drove the EREER movements in Austria, Denmark, Germany, Korea, Luxembourg, Malaysia, the Netherlands, Norway, Singapore, Spain, Switzerland and Thailand. For Ireland and Russia, both the changes in the relative GDP and in the NFA explain the EREER dynamics. Indeed, while both countries registered an improvement in their NFA, Russia, in contrast with Ireland, experienced a fall in its relative growth per capita. Similarly, except Ireland and to a lesser extent the Netherlands and Portugal, all the euro area countries experienced negative relative growth per capita. This latter is mitigated in the case of Germany by the increase in the NFA. France and Greece are the two euro area countries that registered simultaneously a fall in the NFA and a negative relative growth. This is also the case of Australia, Brazil, Canada, Mexico, New Zealand, South Africa, Turkey and the United Kingdom. The United States appears on the horizontal reference line indicating that the deterioration of its NFA mainly explains the slight deterioration of its EREER. In China, however, the NFA improvement has played a negligible role.

Table 2 provides a summary of the movements in the REER and the EREER for all the 35 selected economies.

#### Box 4 — On the evolution of the key—and some selected—currencies

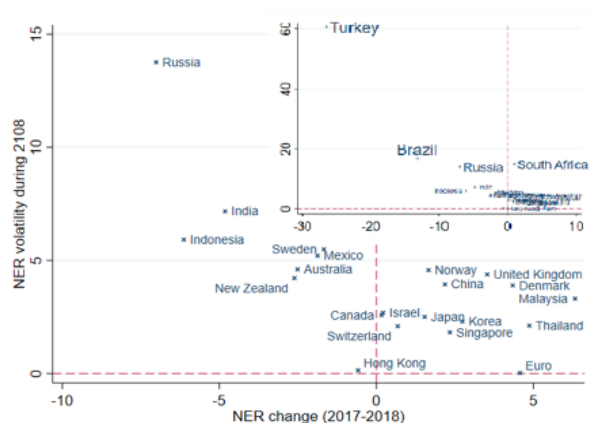
After the turbulences observed during 2017, the year 2018 was relatively calm. Indeed, only few currencies—concentrated in emerging economies—have displayed important changes. This box briefly reviews the root causes of these movements as well as those of the advanced economies' currencies.

Turkey is by far the country that displayed the most important currency movements during 2018. Actually, the Turkish lira depreciated by about 28% vis-à-vis the US dollar (-19% in real effective terms) as a result of the concerns regarding the economy (persistent current account deficit, high levels of debt in the private sector, significant foreign funding in the banking system and government borrowing in foreign currencies). Fears of a bust in the construction sector and the US import tariffs have also increased the pressure on the lira. The Brazilian real also depreciated considerably vis-à-vis the US dollar during 2018. Originating first from the political uncertainty, namely about the future president, the financial crisis in Argentina spilled over and, coupled with the low interest

rates environment in Brazil, undermined further the appetite for the real. The observed depreciation of the Russian rouble is mainly explained by the rather strong devaluation of April. The rouble has also been impacted by the fall in the price of oil. The South African rand for its part alternated between appreciation and depreciation phases during the 2018. Over the first quarter, the rand depreciated before a timid stand in April and a strong appreciation during May and August-Half September. Hence, the dynamics of the rand has been rather bumpy but, in average, the rand moved from around 12.3 per US dollar to 14.4 per US dollar during 2018.

In advanced economies, 2018 has been relatively calm and marked by the slight appreciation against the dollar. Indeed, the euro and the renminbi appreciated slightly against the dollar; only Australia, New Zealand and Sweden depreciated.<sup>1</sup> The Swedish krona weakened during 2018 due to both domestic and external factors. Indeed, on the domestic side, the uncertainty about the September election, the slowing economy and the deteriorating current account, and on the external side, concerns about the global trade direction weighted on the krona. The Australian and the New Zealand dollar both depreciated by around 2.5% due to their tight links with China which expose them to the uncertainty created by the trade dispute between China and the United States.

<sup>1</sup> The depreciation of the Hong Kong dollar is negligible.



**Box Figure 4.1 — Evolution of the exchange rates during 2018**

Notes: A positive sign regarding the NER (Nominal Exchange Rate vis-à-vis the US dollar) indicates an appreciation. The volatility is proxied by the standard deviation.

### Box 5 — Measuring the Balassa-Samuelson effect: the RPROD database<sup>1</sup>

The Balassa-Samuelson (BS hereafter) effect refers to the real exchange rate appreciation inherent in a catching-up process. Why are faster growth and continuing structural changes bound to affect the real exchange rate? The answer is found in two separate 1964 papers by Balassa and Samuelson (Balassa, 1964; Samuelson, 1964). These authors divide all goods in the world economy into two sectors: a tradable sector and a non-tradable sector which essentially supplies domestic residents. They show that when a country is catching up with the income levels in the more economically advanced economies, it will face a continuous real appreciation of its exchange rate. How does this happen? The catching-up process implies that most of the productivity gains appear in the tradable sector. Since traded goods prices are determined in the global market,<sup>2</sup> relatively faster productivity growth in the tradable will translate into rising wages in this sector that will also bid up wages in the non-tradable sector. However, the latter, facing smaller productivity increases than the tradable sector, cannot remain profitable if it accommodates such wages' growth. The solution is to raise prices faster for non-tradable goods. Thus, the supply-side reaction to the larger productivity increases in the tradable sector is to generate a higher rate of price inflation which, in turn, leads to an appreciation of the real exchange rate.

The BS effect being an equilibrium phenomenon, it is a key mechanism when investigating the dynamics of the equilibrium real exchange rate (see, e.g., Chinn, 1999). Indeed, as the real exchange rate behavior driven by the BS effect reflects the natural evolution of a catching-up economy, real appreciation will not necessarily imply for this economy a loss of international competitiveness. Over the last twenty years, the increased availability of high-quality data has allowed researchers to track the existence of the BS effect. This issue has been particularly analyzed in developing and emerging economies—as in Asian countries—that have been growing very rapidly in recent decades, transitioning to free-market-oriented economies and gradually integrating with global markets (Choudhri and Khan, 2005; Imai, 2018). Similarly, the catching-up process of transition economies—such as the Central Eastern European Countries that have joined the European Union or the Economic and Monetary Union—has raised concerns about the validity of the BS hypothesis in those countries (Égert et al., 2006). More recently, the BS hypothesis has also received renewed attention in developed economies (see, e.g., Berka and Steenkamp, 2018; Berka et al., 2018).

To date, however, the issue of the BS effect has mostly concerned limited samples of countries. One reason for this is the absence of long series of internationally comparable productivity measures covering a wide geographical area.<sup>3</sup> The *RPROD* database provided by the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII) aims at filling this gap by delivering a series of internationally comparable measures of the BS effect over an extended sample of countries. While initially the *EQCHANGE* database (Couharde et al., 2018) relied on the most widely used measure to capture the BS effect—cross-country differentials in GDP (Gross Domestic Product) per capita—*RPROD* adds to this proxy four additional ones. Specifically, the measures of the BS effect included in *RPROD* compare, for each country and its main trading partners, five distinct indicators that proxy trends in relative productivity of the tradable to non-tradable sectors. The first two indicators are respectively GDP per capita and labor productivity measured by GDP per worker, available for 182 countries over the 1973–2018 period. The third proxy, mainly available for advanced and some emerging countries, is the consumer-price index (CPI)-to-producer price index (PPI) ratio. Finally, the last two indicators included in *RPROD* are based on three- and six-sectors' value-added deflators. Our five measures of the BS effect use the weighting scheme of the *EQCHANGE* database, which takes into account different samples of trading partners and provides two alternatives to weight relative indicators: (i) time-invariant weights calculated respectively between 2008–2012 and 1973–2016, and (ii) a time-varying scheme based on non-overlapping five-year average weights.

<sup>1</sup> See Couharde et al. (2019).

<sup>2</sup> That is, purchasing power parity (PPP) holds in the tradable sector.

<sup>3</sup> Mano and Castillo (2015) constructed an annual database of productivity in the traded and non-traded goods sectors but it covers only 56 countries. The Groningen Growth and Development Centre has also developed a database that provides comparisons of productivity at a detailed industry level, the GGDC Productivity Level database. This database is, however, restricted to a set of thirty OECD countries (Inklaar and Timmer, 2008).

Table 2 — Summary of the movements in the major currencies

---

<b>Australia:</b>	Reduction of the overvaluation; moderate overvaluation group
<i>REER</i>	Depreciation in line with the NER change
<i>ERER</i>	Slight deterioration due to the negative changes in the relative GDP and NFA but mitigated with the terms of trade improvement
.....	
<b>Austria:</b>	Overvaluation broadly unchanged
<i>REER</i>	Appreciation lower than that of the euro appreciation vis-à-vis the US dollar.
<i>ERER</i>	Slightly higher appreciation due to the improvements of the NFA and the terms of trade.
.....	
<b>Belgium:</b>	Slight increase of the overvaluation; shift from “in line” to “moderate overvaluation”
<i>REER</i>	Appreciation lower than that of the euro appreciation vis-à-vis the US dollar
<i>ERER</i>	Slight improvement due to the positive NFA and terms of trade changes but dampened by the negative relative GDP
.....	
<b>Brazil:</b>	Shift from a currency broadly in line to a moderate undervaluation
<i>REER</i>	Considerable depreciation in line with that vis-à-vis the US dollar
<i>ERER</i>	Slight depreciation due to the negative changes in the fundamentals
.....	
<b>Canada:</b>	Almost negligible increase in the undervaluation; middle category of undervaluation
<i>REER</i>	Very weak depreciation despite the appreciation vis-à-vis the US dollar
<i>ERER</i>	Depreciation of the same amplitude due to the deterioration of the fundamentals
.....	
<b>China:</b>	No major change; currency in line
<i>REER</i>	Slight appreciation
<i>ERER</i>	Smaller depreciation; positive (negative) changes in the relative GDP and in the NFA (terms of trade)
.....	
<b>Denmark:</b>	No major change; currency in line
<i>REER</i>	No significant change
<i>ERER</i>	Weak appreciation mainly due to the improvements in the NFA and in the terms of trade
.....	
<b>France:</b>	Slight increase in the overvaluation; currency broadly in line
<i>REER</i>	Appreciation weaker than the euro appreciation vis-à-vis the US dollar
<i>ERER</i>	Very weak appreciation; positive terms of trade mitigated by the negative relative growth and NFA change
.....	
<b>Germany:</b>	Reduction of the undervaluation; currency moderately undervalued
<i>REER</i>	Appreciation weaker than the euro appreciation vis-à-vis the US dollar
<i>ERER</i>	Very weak appreciation despite the positive changes in the NFA and the terms of trade
.....	
<b>Greece:</b>	No major change; large overvaluation group
<i>REER</i>	Small appreciation
<i>ERER</i>	Slight improvement owing from the terms of trade
.....	
<b>Hong Kong:</b>	Reduction of the overvaluation, currency broadly in line
<i>REER</i>	Small depreciation
<i>ERER</i>	Smaller depreciation despite the improvement in the NFA
.....	
<b>India:</b>	Increase of the undervaluation; middle category of undervaluation
<i>REER</i>	Noticeable depreciation
<i>ERER</i>	Smaller deterioration; small increase in the relative GDP annihilated by the negative change in NFA and terms of trade

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(Continued on next page)

Table 2 — Summary of the movements in the major currencies (*Continued*)

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<b>Indonesia:</b> Increase of the undervaluation; large undervaluation group
<i>REER</i> Depreciation in line with that vis-à-vis the US dollar
<i>ERER</i> Smaller depreciation; negative changes in the NFA and the terms of trade
.....
<b>Ireland:</b> Increase of the undervaluation; currency moderately undervalued
<i>REER</i> Very weak depreciation change despite the euro appreciation
<i>ERER</i> Appreciation mostly due to positive change in the NFA and relative GDP
.....
<b>Israel:</b> No major change; currency broadly in line
<i>REER</i> Depreciation despite the NEER appreciation vis-à-vis the US dollar
<i>ERER</i> Depreciation of lower amplitude; negative changes in the fundamentals (except NFA)
.....
<b>Italy:</b> No major change; currency moderately overvalued
<i>REER</i> Very slight appreciation
<i>ERER</i> Smaller appreciation; positive (negative) change in the NFA and terms of trade (relative GDP)
.....
<b>Japan:</b> Slight reduction of the undervaluation; moderate undervaluation group
<i>REER</i> Very weak depreciation despite the yen appreciation vis-à-vis the US dollar
<i>ERER</i> Slight depreciation; positive change in NFA overturned by the negative changes in the relative GDP and the terms of trade
.....
<b>Korea:</b> Reduction of the undervaluation; currency broadly in line
<i>REER</i> Increase in line with the NEER
<i>ERER</i> No significant change; positive (negative) change in NFA (relative GDP and the terms of trade)
.....
<b>Luxembourg:</b> Undervaluation broadly unchanged; moderate group
<i>REER</i> Very slight appreciation despite the euro appreciation
<i>ERER</i> Smaller appreciation; positive (negative) change in the NFA and the terms of trade (relative GDP)
.....
<b>Malaysia:</b> Reduction of the undervaluation; large undervaluation group
<i>REER</i> Appreciation consistent with the NEER appreciation
<i>ERER</i> No major change despite the improvement in the NFA
.....
<b>Mexico:</b> Undervaluation broadly unchanged; large undervaluation group
<i>REER</i> Broadly unchanged despite the small depreciation vis-à-vis the US dollar
<i>ERER</i> Slight depreciation due to the negative changes in the fundamentals (except the terms of trade)
.....
<b>Netherlands:</b> Slight increase of the undervaluation; moderate group
<i>REER</i> No significant change despite the euro appreciation
<i>ERER</i> Small appreciation due to the positive fundamentals
.....
<b>New Zealand:</b> Reduction of the overvaluation; large overvaluation group
<i>REER</i> Depreciation higher than the that vis-à-vis the US dollar
<i>ERER</i> Smaller depreciation due to the deterioration of the fundamentals
.....
<b>Norway:</b> Increase of the undervaluation; large undervaluation group
<i>REER</i> Almost no change despite the slight NEER appreciation vis-à-vis the US dollar
<i>ERER</i> Appreciation; important positive change in the NFA and the terms of trade
.....
<b>Portugal:</b> Small reduction of the overvaluation; moderate undervaluation category
<i>REER</i> Small appreciation despite the euro appreciation
<i>ERER</i> Appreciation of equal amplitude mainly due to the change in the terms of trade

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*(Continued on next page)*

Table 2 — Summary of the movements in the major currencies (*Continued*)

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<b>Russia:</b>	Shift from a currency broadly in line to the moderate undervaluation group
<i>REER</i>	Sharp depreciation broadly in line with the NER
<i>ERER</i>	Weak appreciation; positive change in the NFA and the terms of trade offset by the negative change in the relative GDP
	.....
<b>Singapore:</b>	Increase of the undervaluation; middle undervaluation category
<i>REER</i>	Negligible depreciation
<i>ERER</i>	Appreciation mainly due to the NFA
	.....
<b>South Africa:</b>	Reduction of the undervaluation; large undervaluation group
<i>REER</i>	Small appreciation
<i>ERER</i>	Higher depreciation due to the deterioration of the fundamentals
	.....
<b>Spain:</b>	Overvaluation broadly unchanged; moderate group
<i>REER</i>	Very slight appreciation despite the euro vis-à-vis the US dollar
<i>ERER</i>	Smaller appreciation; positive changes in the fundamentals
	.....
<b>Sweden:</b>	Large increase of the undervaluation; large undervaluation group
<i>REER</i>	Moderate depreciation
<i>ERER</i>	Appreciation of smaller amplitude due to the change in the NFA and in the terms of trade
	.....
<b>Switzerland:</b>	Reduction of the overvaluation; intermediate overvaluation category
<i>REER</i>	Moderate depreciation
<i>ERER</i>	Smaller appreciation mainly due to the improvement in the NFA
	.....
<b>Thailand:</b>	Shift from a currency broadly in line to the moderate undervaluation group
<i>REER</i>	Appreciation broadly in line with the NER
<i>ERER</i>	Sharp appreciation mainly due to the improvement in the NFA
	.....
<b>Turkey:</b>	Shift from the moderate to the large undervaluation category
<i>REER</i>	Important depreciation; partly offset by the inflation
<i>ERER</i>	Small depreciation; deterioration of the fundamentals
	.....
<b>United Kingdom:</b>	reduction of the undervaluation; moderate undervaluation category
<i>REER</i>	Slight appreciation
<i>ERER</i>	Broadly unchanged; positive change in the terms of trade offset by the deterioration of the others fundamentals
	.....
<b>United States:</b>	Slight reduction of the overvaluation; moderate overvaluation group
<i>REER</i>	Small depreciation
<i>ERER</i>	Negligible depreciation

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Overall, changes in currency misalignments in the major economies during 2017 were of small amplitudes and supportive of reducing currency misalignments. Within the euro area, the corrections —i.e. reduction of the misalignments— observed for Germany —and to a lesser extent for other countries— appear mostly temporary as they mainly result from the changes in the REER. For Austria, Greece, Luxembourg, Portugal and Spain, the improvement in the EREER helped to offset the REER appreciation hence stabilizing the level of the currency misalignments. Ireland and the Netherlands are the two countries that increase their undervaluation as a result of the improvement in the fundamentals. Outside the region, the exchange rate dynamics also played a key role as it shaped the currency misalignments in most countries. The changes observed between 2017 and 2018 are therefore of a temporary nature, except for a few countries that registered an improvement in their fundamentals that played a considerable role (e.g. Norway, Russia, Singapore, Sweden, Thailand).

#### **4. Regional outlooks**

*This section is devoted to an overview of the geographical configuration of currency misalignments in 2018. It also briefly documents the dynamics of these currency misalignments as well as their sources. We relied on the United Nations M49 standard for the country groupings. It covers 142 countries distributed as follows: 37 African countries, 25 for America, 35 Asian countries, 37 countries for Europe and 8 countries for Oceania.*

##### **4.1. Africa**

Overall, the configuration of currency misalignments in Africa was broadly unchanged in 2018 —compared to 2017. Indeed, as Figure 9 shows, most of the countries appear close to the bisector. Few countries however significantly depart from this reference line.

On the one hand, Algeria, Central African Republic, Comoros, Kenya, Rwanda and Sao Tome and Principe increased substantially —i.e. at least 5 percentage points— their misalignments. More specifically, Central African Republic, Comoros, Kenya and Sao Tome and Principe have seen their overvaluation increased while the other countries became more undervalued. For Algeria, Central African Republic, Kenya, Rwanda and Sao Tome and Principe (resp. Comoros) the changes in the REER (resp. EREER) mainly drove these increases. For the Central African Republic, the changes in the misalignments resulted from the movements of similar magnitudes but of opposite direction of the REER and the EREER.

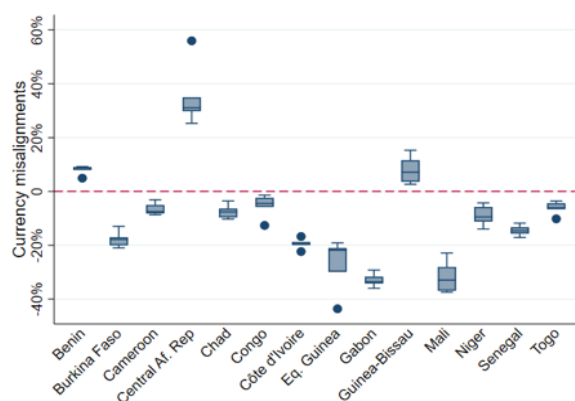
On the other hand, for Egypt, Nigeria, Sierra Leone and Uganda, the misalign-

ments noticeably decreased. In Egypt, Nigeria and Sierra Leone, the appreciations of the REER led to a decrease of the undervaluations. For Uganda, it is however the deterioration of the fundamentals that mainly drove the reduction of the undervaluations.

The rest of the countries display relatively small changes in their misalignments —i.e. within the  $-/+5$  percentage points range. The South African rand continues on its momentum towards the reduction of its undervaluation, process further accelerated during 2018 by the deterioration of the fundamentals. This is also the case, but to a lesser extent, for Burundi, Ethiopia, Morocco and Togo. Ghana is, for the second consecutive year, the country with the most important misalignments in the Sub-Saharan region with an undervaluation around 40%.

### Box 6 — The CFA franc zone

Our regional outlook covers 14 CFA zone countries. As visible in Figure 9, except the Central African Republic, changes in the currency misalignments were of relatively small amplitudes. The situation in 2018 reveals the existence of important differences regarding the currency misalignments. On the one hand, Burkina Faso, Côte d'Ivoire, Equatorial Guinea, Gabon, Mali and Senegal exhibit considerable undervaluations —higher than  $-15\%$ . Cameroon has an undervaluation of around  $8\%$ . On the other hand, Benin and Central African Rep. display noticeable overvaluations. Between these two groups of countries, Chad, Congo Rep., Niger and Togo appear broadly in line with their fundamentals. This picture is fully in line with the one noted last year. However, in contrast with the previous assessment, changes in the currency misalignments during 2018 appear mainly driven by the change in the REER. Indeed, except Central African Republic and Mali where the deterioration of the REER compensated the REER appreciation, changes in the REER of the other countries were almost negligible. This is especially true for Benin, Burkina Faso, Chad, Côte d'Ivoire and Niger (see Figure 10). Among the observed adjustments, only the changes noted for Congo and Gabon appear more sustainable as they result in part from stronger fundamentals. For Cameroon, Senegal and Togo, however, the adjustments —although of small amplitudes— reflect deteriorated fundamentals. The observed misalignments configuration in 2018 is however a longstanding one (see Box Figure 6.1). Over the 2014-2018 —this also applies to a longer period— three groups of countries corresponding to persistent (i) persistent undervaluations, (ii) persistent overvaluations, and (iii) fairly valued currencies can be identified. This pattern naturally questions the issue of the sustainability of the peg system in the long run and the recent project to accelerate the adoption of a single currency, the *eco*.



**Box Figure 6.1 — Average misalignments (2014-2018)**

Source: EQCHANGE (CEPII)



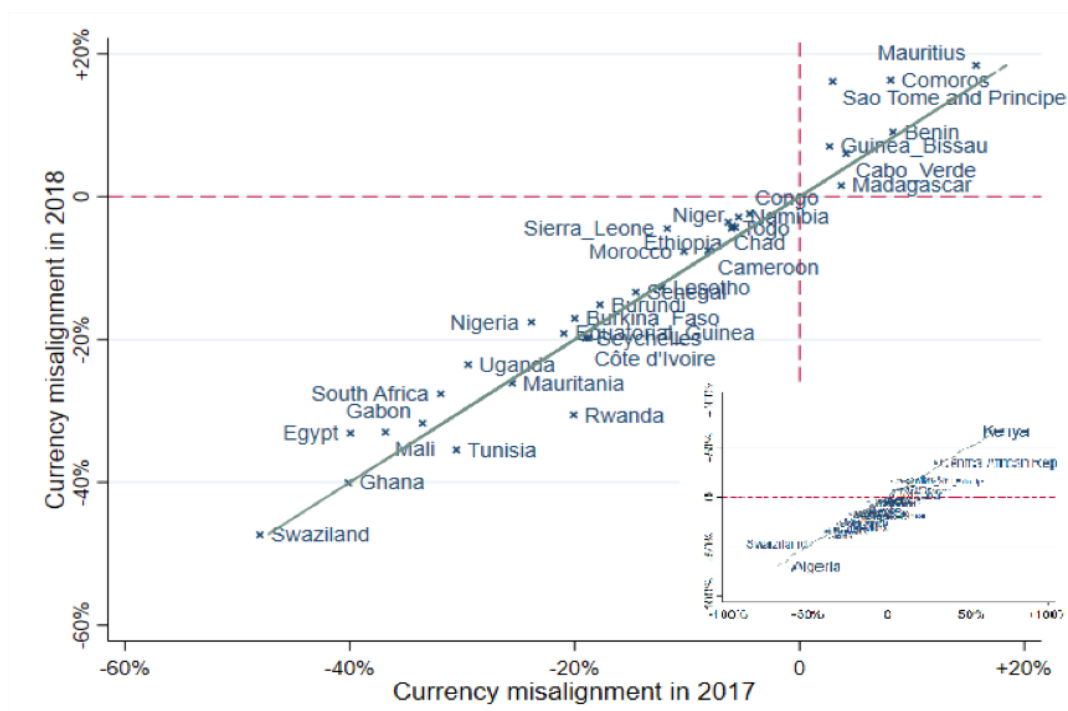


Figure 9 — Africa | Currency misalignments in 2018 and 2017

Note: A positive (resp. negative) sign indicates an overvaluation (resp. undervaluations).  
 Source: EQCHANGE (CEPII)

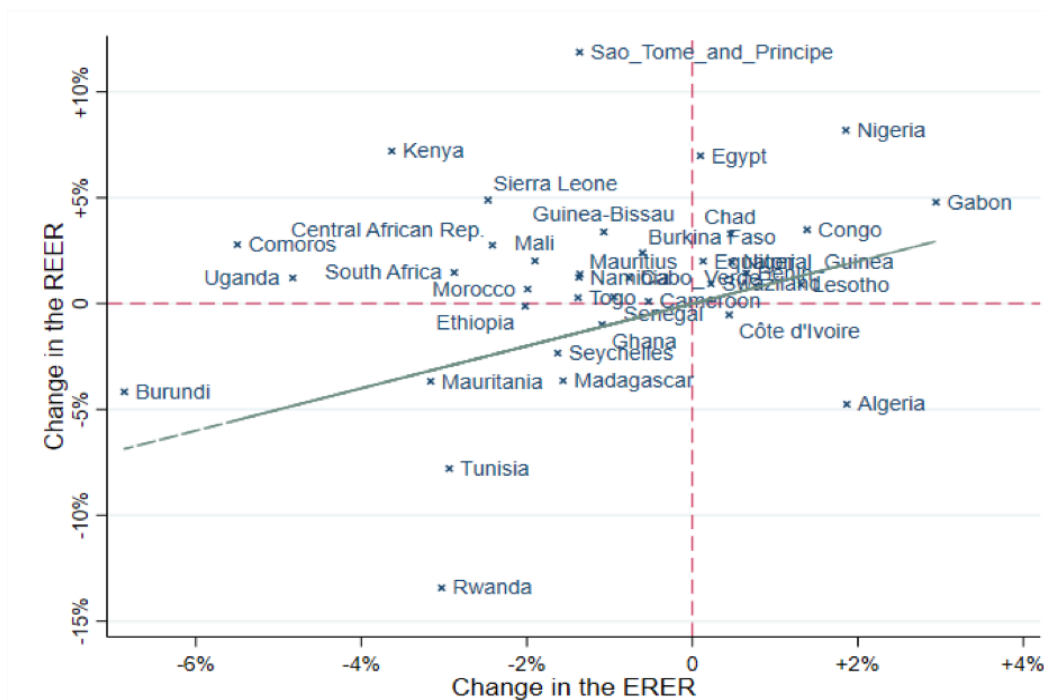


Figure 10 — Africa | Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$

Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represents the 45-degree line. A positive sign in both measures indicates an appreciation.  
 Source: EQCHANGE (CEPII)

## 4.2. America

In America, changes in the currency misalignments have been mostly weak and mainly towards the increase of currency misalignments —both undervaluations and overvaluations.

During 2018, the US dollar depreciated by about 2% in real effective terms. Meanwhile, the change in the EREER has been negligible (around -0.5%). As a result, the US dollar has registered a 1.5 percentage points reduction of its overvaluation. In Canada, the level of the currency misalignment in 2018 is broadly unchanged compared to 2017. Indeed, as noted above, Canada still display an undervaluation around 10%. This unchanged situation reflects similar movements in both the REER and EREER that very slightly depreciated. The situation for Mexico is also the same with a persistent undervaluation around 18% in 2018 —as in 2017.

Among the countries pegged to the US dollar, the appreciation of this latter in nominal terms has had different implications for the exchange rates. Indeed, only the boliviano appreciated in real effective terms while the other country currencies depreciated. Consequently, Bolivia registered an increase in its overvaluation; for the other countries, movements have been downward especially in Ecuador and Panama where the improvement in the fundamentals amplified the changes. The Brazilian real also registered an important fall that translated into an undervaluation around 9%. This fall is fully explained by the behavior of the real which depreciated by around 13% vis-à-vis the US dollar. This is also the case for Jamaica, but to a lesser extent.

At the other end of the spectrum, Paraguay registered the most important increase in its overvaluation. Indeed, Paraguay moved from an in line currency to a moderate overvaluation in 2018. Haiti also recorded an increase of its overvaluation and displayed in 2018 an overvaluation around 50%. Haiti is followed by Guatemala and Uruguay which also displayed important and persistent overvaluations —respectively around 37% and 30%.

Overall, among the considered countries, only four —Dominica, Ecuador, El Salvador and Grenada— appear at their equilibrium level in 2018.

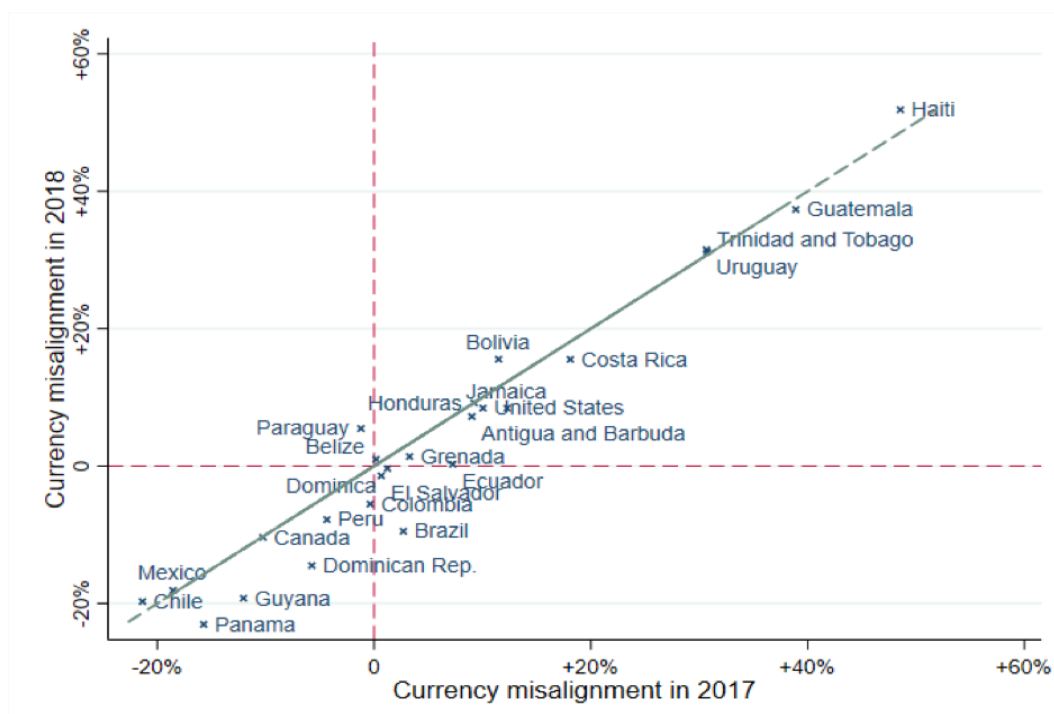


Figure 11 — America | Currency misalignments in 2018 and 2017  
 Note: A positive (resp. negative) sign indicates an overvaluation (resp. undervaluations).  
 Source: EQCHANGE (CEPII)

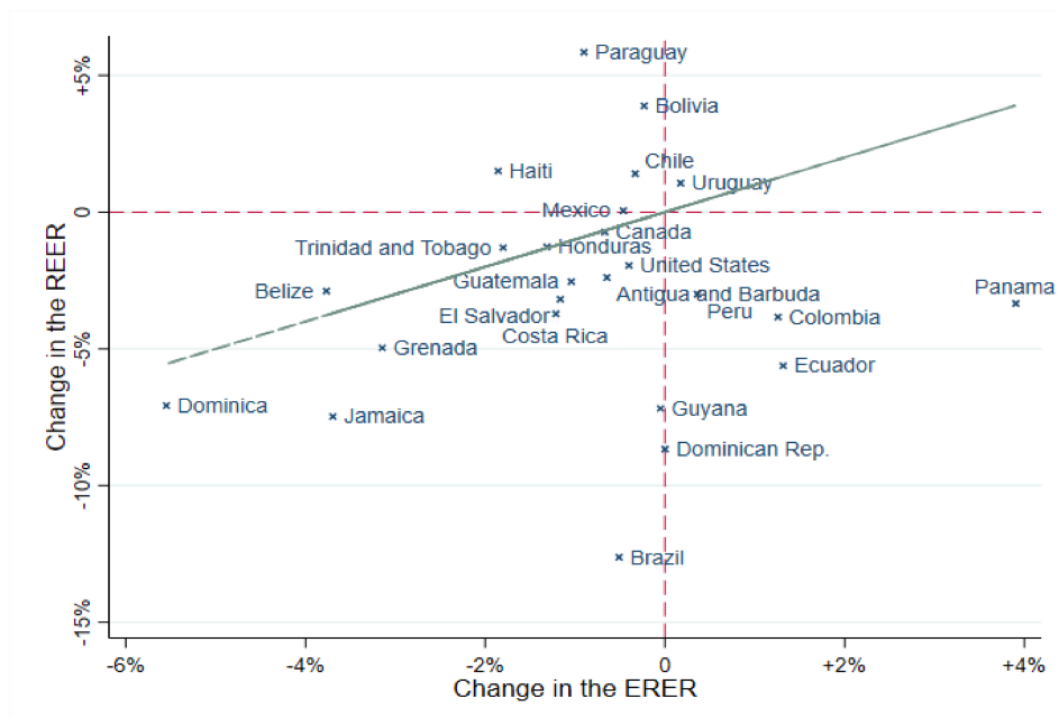


Figure 12 — America | Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$   
 Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represent the 45-degree line. A positive sign in both measures indicates an appreciation.  
 Source: EQCHANGE (CEPII)

### 4.3. Asia

In Asia, changes in the currency misalignments between 2017 and 2018 have been rather heterogeneous. Indeed, five groups of countries can be identified based on the trend (increase, stable or decrease) and the magnitude (moderate vs. large).

China belongs to the stable currency misalignments group despite a rather small (1.5 p.p.) reduction in its undervaluation; the renminbi was broadly in line during 2018 —as in 2017— with an undervaluation around 3%. Hong Kong is assessed to be in line in 2018 thanks to a depreciation of its REER. This also the case for Israel and Philippines —and appreciation of the REER in the case of Korea.

Turkey is the country with the most important changes in the currency misalignments. Indeed, our estimates indicate that the Turkish lira showed undervaluations around 10% and 25% respectively in 2017 and 2018. While the EREER slightly depreciated (only 2%), the REER fell by around 19%. Few currencies have also registered significant changes in their misalignments. On the one hand, Brunei Darussalam, India, Indonesia, Kazakhstan, Malaysia and Saudi Arabia considerably increased their undervaluations. Except Brunei and Malaysia where these changes are explained by the EREER dynamics, these increases in the undervaluations comes from the depreciations of the REER. On the other hand, Bhutan, Kyrgyzstan, Maldives, Nepal and Sri Lanka registered a significant increase in their overvaluation.<sup>5</sup> A common point to these currencies is that they all registered a deterioration of their fundamentals which, coupled with the REER appreciation in Bhutan, Kyrgyzstan and Nepal, explain the changes in the misalignments. For Turkmenistan and Sri Lanka that reduced respectively their undervaluation and overvaluation, the changes are largely explained by the REER.

The gulf countries, despite a positive terms of trade shock, have seen their currency misalignments broadly unchanged. Indeed, the REER did not appreciate and even depreciate for Oman and Qatar. Meanwhile, the EREER slightly depreciated in Oman and Bahrain due to the negative changes in the relative GDP per capita and the current account deficits; it remains relatively stable in Qatar and in the United Arab Emirates.

The rest of the region is marked by relatively small movements in the currency misalignments. As China —that saw a very weak reduction in its undervaluations despite intra-year important changes, Japan also reduced its undervaluation —due to the EREER depreciation— and was moderately undervalued in 2018.

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<sup>5</sup>More specifically, Bhutan shifted from a currency broadly in line to an overvaluation around 10%.

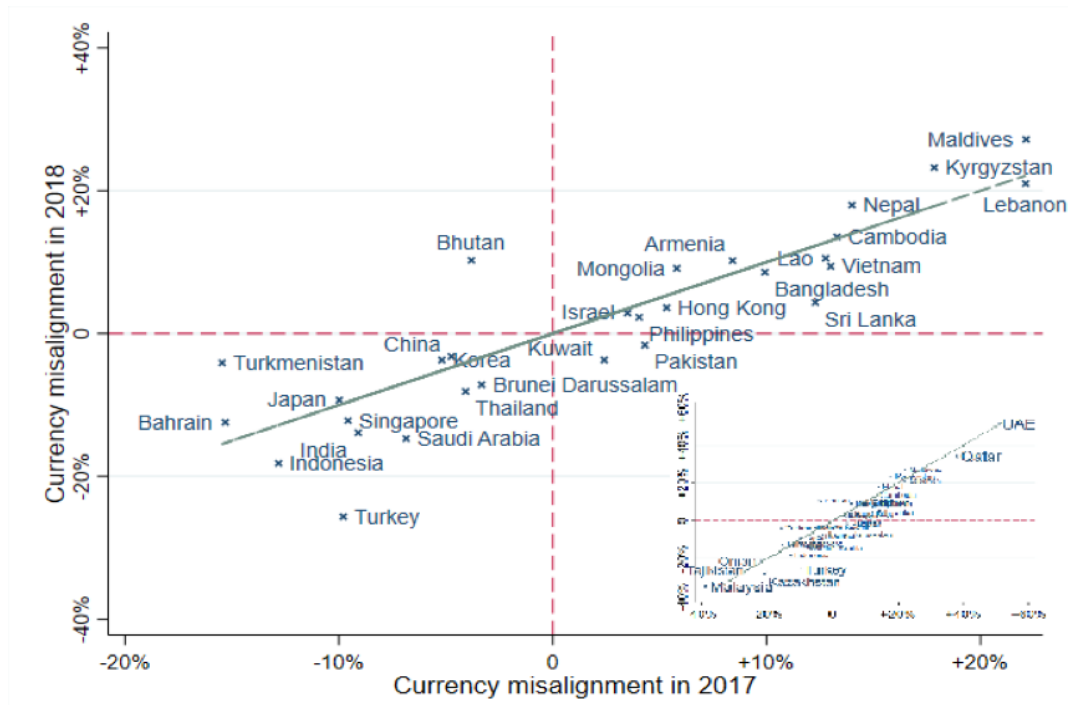


Figure 13 — Asia | Currency misalignments in 2018 and 2017  
 Note: A positive (resp. negative) sign indicates an overvaluation (resp. undervaluations).  
 Source: EQCHANGE (CEPII)

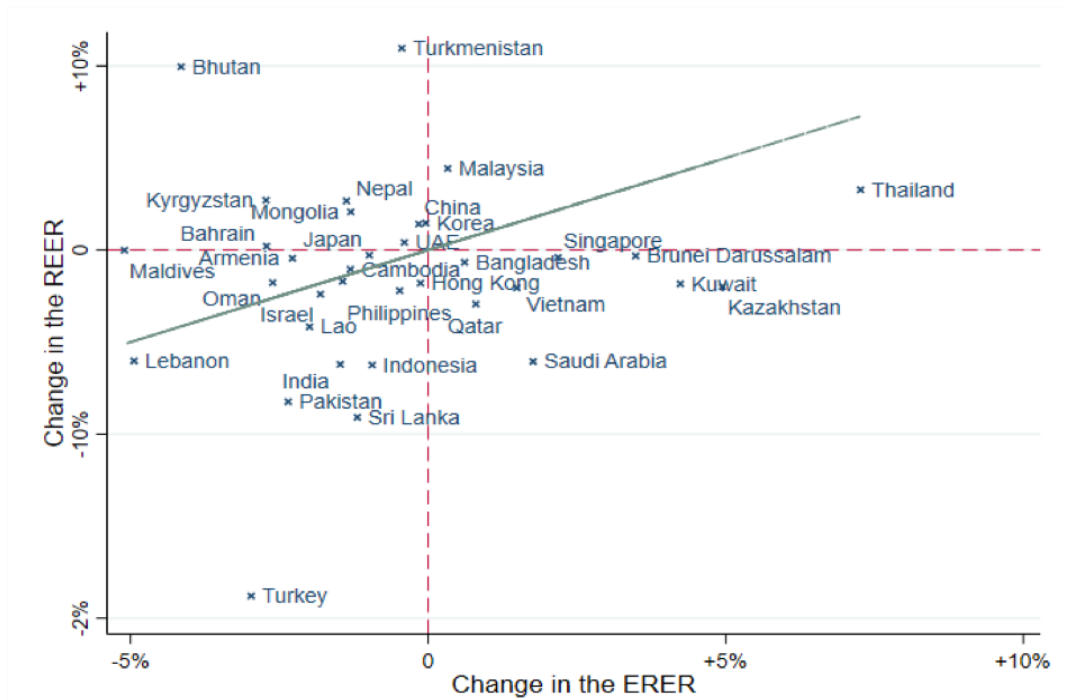


Figure 14 — Asia | Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$   
 Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represent the 45-degree line. A positive sign in both measures indicates an appreciation.  
 Source: EQCHANGE (CEPII)

#### 4.4. Europe

In Europe, movements have been generally towards the increase of currency misalignments. These movements have been however of relatively small amplitudes and mostly driven by the REER dynamics.

Moldova is the country that registered the most important increase in its misalignment. Indeed, the Moldovan leu overvaluation increased by 15 points between 2017 and 2018. As a result, its overvaluation was around 35% in 2018. This considerable variation comes from both the change in the REER that appreciated (around 10%) and the fall in the ERER (around 6%) due to deteriorated fundamentals. The Albanian lek follows behind with an increase of 8 points of its overvaluation. The persistence of the overvaluation is common to almost all the countries of the subregion. Indeed, except Bosnia and Herzegovina and North Macedonia that was undervalued during 2018 (respectively -4% and -5%), the other countries displayed overvaluation. Croatia and Romania are the two currencies that appeared broadly in line with their fundamental values in 2018.

The situation in northern Europe is equally heterogeneous. Indeed, on the one hand, Norway and Sweden were undervalued, respectively around -21% and -18%. Both considerably increased their undervaluations between 2017 and 2018. In the case of Norway, the change reflects the ERER dynamics which appreciated mainly due to the improvement in the NFA and in the terms of trade. For Sweden, the REER depreciation (around -4.5%) and the ERER appreciation (around +3.4%) explain the 8 points increase of the undervaluation between 2017 and 2018. The United Kingdom also displayed an undervaluation around -8% —a 2 p.p. fall compared to the 2017 value. At the other end of the spectrum, Iceland was considerably overvalued with an assessment around 24%. Estonia, Latvia and Lithuania follow behind with overvaluations of respectively 9%, 10% and 8.8%. For all these countries, the REER dynamics shaped the misalignments, especially in Estonia where the overvaluation increased as the result of the 6% REER appreciation —almost no change in the ERER. Finland and Ireland fall within these two extreme groups with moderate undervaluations —Finland is broadly in line.

In eastern Europe, Russia shifted from a moderate overvaluation to a moderate undervaluation due to the opposite movements between the REER and the ERER. Indeed, the Russian rouble depreciated by around 8% in real effective terms; meanwhile, the ERER appreciated due to the improvement in the terms of trade and the NFA. Belarus and Bulgaria followed the same downward trend; this resulted in a reduction of the Bulgarian lev overvaluation (from +10.5% to +7.5%) and an increase

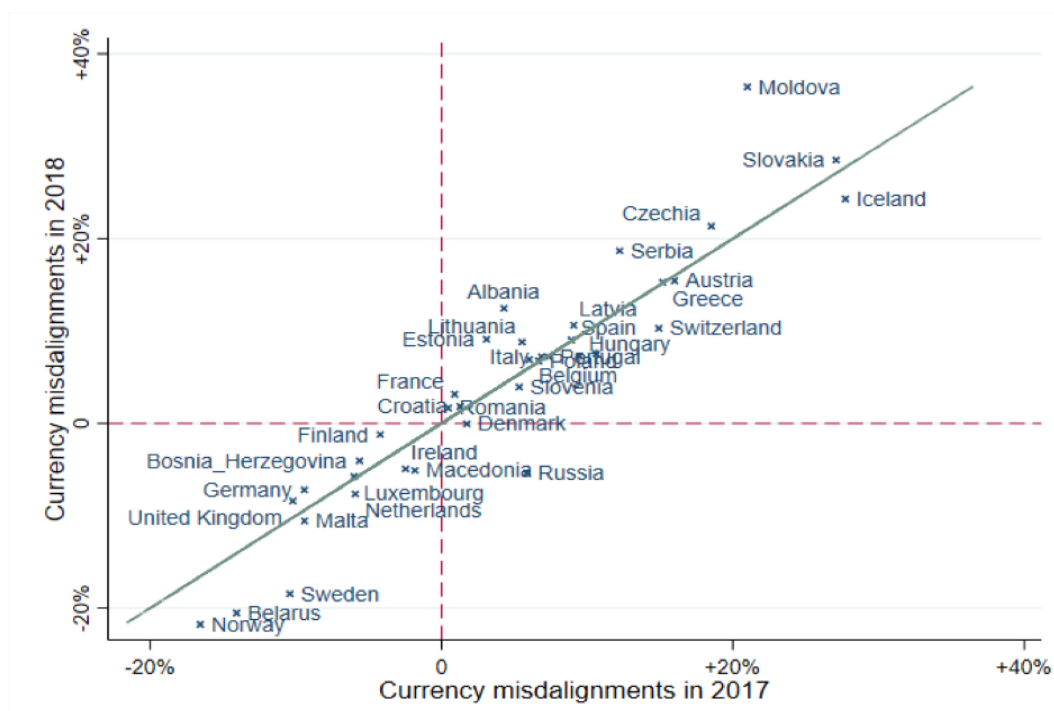


Figure 15 — Europe | Currency misalignments in 2018 and 2017

Note: A positive (resp. negative) sign indicates an overvaluation (resp. undervaluations).  
 Source: EQCHANGE (CEPII)

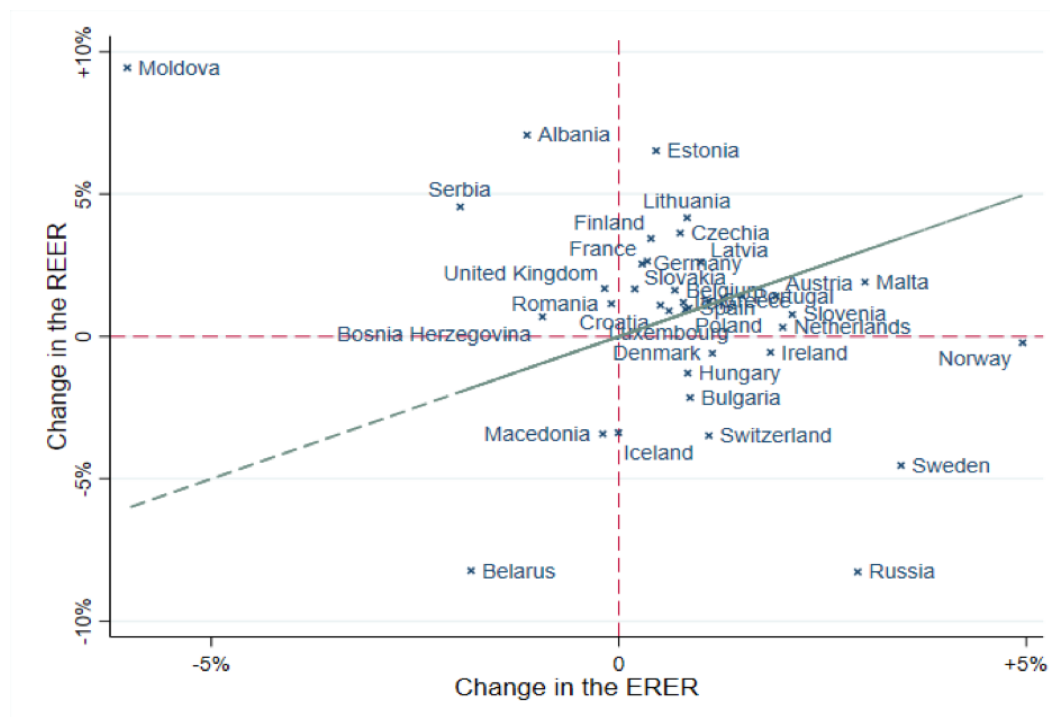


Figure 16 — Europe | Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$

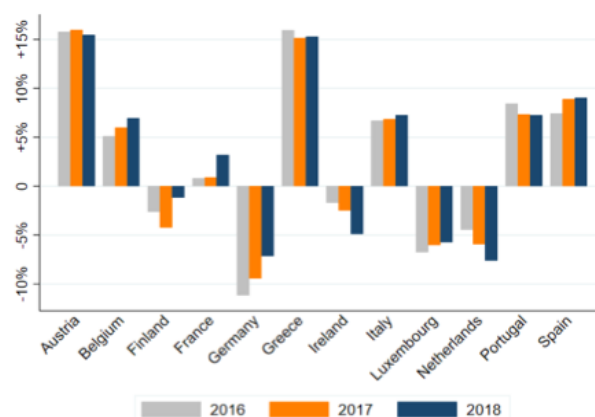
Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represent the 45-degree line. A positive sign in both measures indicates an appreciation.  
 Source: EQCHANGE (CEPII)

### Box 7 — Monitoring (Macroeconomic) imbalances within the euro area

The changes in the currency misalignments —between 2017 and 2018— within the eurozone have been of relatively small amplitudes (see Box Figure 7.1). Indeed, only Finland, France, Germany and Ireland display changes higher than 2 percentage points. While Ireland increased by around 2.4 p.p. its undervaluation, Finland and Germany reduced their respectively by around 3 and 2.3 points. France on its side, slightly increased its overvaluation by 2.3 p.p. Nevertheless, Finland and France can be considered broadly in line with their fundamental equilibrium. These changes in the misalignments are mainly explained by the REER appreciation except for Ireland for which the improvement in the fundamentals played a key role.<sup>1</sup> This is also the case for the Netherlands for which the undervaluation increased due to the EREER appreciation. For the rest of the countries the currencies misalignments were broadly unchanged between 2017 and 2018. Austria and Greece still display important level of overvaluations. These latter are moderate for Italy, Portugal and Spain. For the aforementioned countries, the changes in the REER have completely offset the appreciation of the EREER. Hence, despite the apparent unchanged situation, these countries have improved their fundamentals thus putting themselves on a sustainable path.

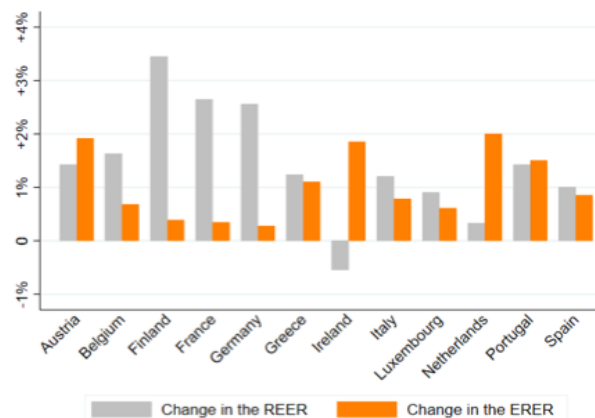
Overall, and compared to 2017, the 2018 configuration of the misalignments is more in phase with the objective of reducing imbalances within the Eurozone. Indeed, for the second year running, the countries tend to move closer to each others as indicated by the decrease in the dispersion measures (see Box Figure 7.3). However, it is worth noting that this configuration is temporary as it was shaped by the REER dynamics in most countries (see Box Figure 7.2). This is especially the case of Belgium, Finland, France and Germany were the EREER barely appreciated.

<sup>1</sup> There is a caveat due to the mismeasurement of the GDP in Ireland and the Netherlands because of their fiscal competition.



Box Figure 7.1 — Currency misalignments

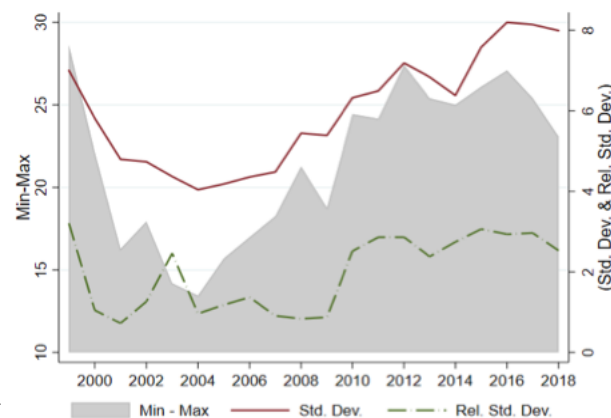
Source: EQCHANGE (CEPII)



Box Figure 7.2 — Underlying factors (2017-18)

Note: Changes are expressed in percentage

Source: EQCHANGE (CEPII)



Box Figure 7.3 — Evolution of the dispersion

Notes: “Min-Max” corresponds to the range; “(Rel.) Std. Dev.” stands for the (relative) standard deviation.



in the Belarussian ruble undervaluation (from -14% to -20%). For Czechia, however, the dynamics of the misalignment was rather upward and reflected the appreciation of the REER. The Czechian koruna overvaluation hence increased from 18% in 2017 to 21% in 2018.

#### **4.5. Oceania**

The changes in Oceania are similar to the global dynamics noted during 2018. Indeed, the changes in the currency misalignments have been downwards except for Samoa and Tonga. All the countries actually depreciated vis-à-vis the US dollar which translated into REER depreciations except in Fiji and Tonga where inflation rose and offset the transmission from the nominal to the real effective exchange rates. Australia for instance depreciated by around 3.7% in real effective terms —2.5% against the US dollar. Meanwhile, the EREER was rather stable. As a result, the Australian dollar reduced its overvaluation from around 10% in 2017 to 6% in 2018. For New Zealand, the REER fell by around 4.1%. However, the EREER also depreciated due to deteriorating fundamentals. Hence, the fall of the REER was only partly reflected in the change in the overvaluation; the New Zealand dollar registered a 2 p.p. decrease of its overvaluation assessed to be around 16% in 2018. Papua New Guinea is the other country that also reduced its overvaluation. Actually, Papua New Guinea shifted from a slight overvaluation to a very weak undervaluation. Nonetheless, Papua New Guinea could be considered broadly in line for the second year running. This is also the case for Fiji even if the overvaluation slightly increased between 2017 and 2018. In contrast, Tonga (resp. Kiribati) significantly increased its overvaluation (resp. undervaluation) due to the fall in its EREER (resp. REER). Finally, the situation for Samoa and Solomon Islands was broadly unchanged.

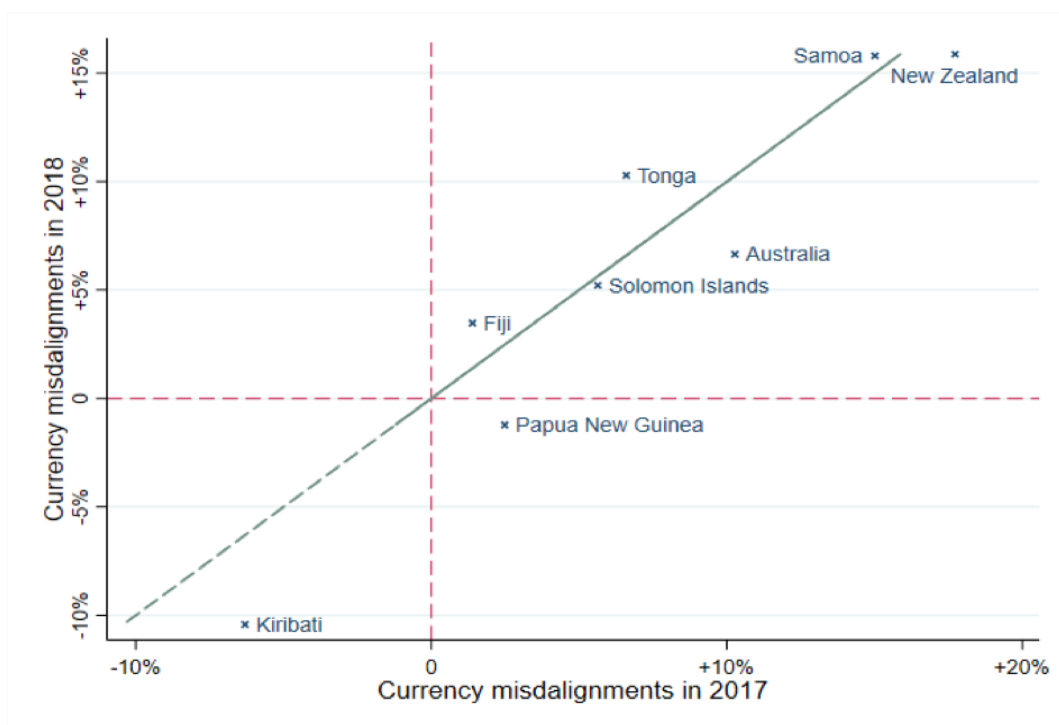


Figure 17 — Oceania | Currency misalignments in 2018 and 2017  
 Note: A positive (resp. negative) sign indicates an overvaluation (resp. undervaluations).  
 Source: EQCHANGE (CEPII)



Figure 18 — Oceania | Changes in the currency misalignments:  $\Delta.ERER$  vs.  $\Delta.REER$   
 Note: "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. Both scale express changes in percentage. The green dashed line represent the 45-degree line. A positive sign in both measures indicates an appreciation.  
 Source: EQCHANGE (CEPII)

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## Appendices

### Appendix A. Estimated currency misalignments

Table A.1 — Estimates of currency misalignments in 2018 (in %)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Albania	12.5	5.0	Denmark	0.0	4.6
Algeria	-68.9	6.5	Dominica	-0.3	7.4
Antigua and Barbuda	7.3	4.3	Dominican, Rep	-14.4	6.1
Armenia	10.3	5.9	Ecuador	0.3	9.6
Australia	6.7	5.2	Egypt	-33.1	5.1
Austria	15.5	4.3	El Salvador	-1.4	7.4
Bahrain	-12.4	2.1	Equatorial Guinea	-19.1	11.6
Bangladesh	8.6	6.5	Estonia	9.1	5.5
Belarus	-20.5	9.1	Ethiopia	-4.1	5.2
Belgium	6.9	5.5	Fiji	3.5	7.7
Belize	1.0	5.6	Finland	-1.2	4.9
Benin	9.1	5.5	France	3.2	3.8
Bhutan	10.3	5.6	Gabon	-31.7	6.1
Bolivia	15.6	6.0	Germany	-7.2	3.0
Bosnia and Herzegovina	-4.0	2.8	Ghana	-40.0	7.0
Brazil	-9.4	1.6	Greece	15.3	5.1
Brunei Darussalam	-7.1	6.0	Grenada	1.4	10.9
Bulgaria	7.6	6.4	Guatemala	37.4	5.4
Burkina Faso	-17.0	5.6	Guinea-Bissau	7.1	7.7
Burundi	-15.1	8.8	Guyana	-19.2	11.6
Cabo Verde	6.1	6.1	Haiti	51.9	6.8
Cambodia	13.6	5.9	Honduras	9.2	4.7
Cameroon	-7.5	9.9	Hungary	7.3	6.6
Canada	-10.3	3.2	Iceland	24.3	8.2
Central African Rep.	35.0	9.6	India	-13.8	6.8
Chad	-3.5	7.3	Indonesia	-18.1	6.9
Chile	-19.7	5.6	Ireland	-4.9	5.0
China	-3.2	4.0	Israel	2.9	3.9
China, Hong Kong, SAR	3.7	6.7	Italy	7.3	3.1
Colombia	-5.5	5.4	Jamaica	8.5	9.1
Comoros	16.4	9.5	Japan	-9.3	6.8
Congo	-2.4	7.7	Kazakhstan	-27.6	3.9
Costa Rica	15.6	3.8	Kenya	68.0	10.3
Croatia	1.9	3.0	Kiribati	-10.4	9.3
Czechia	21.4	4.1	Korea, Rep.	-3.7	3.9
Côte d'Ivoire	-19.7	7.7	Kuwait	-3.7	8.6

Note: The values in the column " Mean " (resp. " Std. Err. ") correspond to the averages (resp. standard errors) of the estimates over all the specifications (i.e. models, number of trade partners, and weighting systems). Positive (resp. negative) sign indicates an overvaluation (resp. undervaluation).

(Continued on next page)

Table A.1 — Estimates of currency misalignments in 2018 (in %; *Continued*)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Kyrgyzstan	23.3	7.8	Qatar	34.2	11.7
Lao P.D.R.	10.6	3.8	Romania	1.7	4.9
Latvia	10.7	1.4	Russian Federation	-5.3	4.2
Lebanon	21.0	4.9	Rwanda	-30.5	7.7
Lesotho	-12.7	4.1	Samoa	15.8	4.0
Lithuania	8.8	5.2	Sao Tome and Principe	16.2	9.6
Luxembourg	-5.7	3.1	Saudi Arabia	-14.7	6.8
Macedonia, TFYR	-5.1	4.5	Senegal	-13.3	5.1
Madagascar	1.6	7.5	Serbia	18.7	1.6
Malaysia	-34.6	12.1	Seychelles	-19.8	10.1
Maldives	27.2	11.7	Sierra Leone	-4.4	7.3
Mali	-32.9	4.8	Singapore	-12.1	7.2
Malta	-10.5	4.8	Slovakia	28.5	2.2
Mauritania	-26.1	7.1	Slovenia	4.0	3.4
Mauritius	18.4	6.8	Solomon Islands	5.2	11.9
Mexico	-18.1	3.0	South Africa	-27.6	9.5
Moldova, Rep.	36.5	4.2	Spain	9.0	5.2
Mongolia	9.2	10.5	Sri Lanka	4.4	6.4
Morocco	-7.6	7.3	Swaziland	-47.3	8.0
Namibia	-2.8	3.1	Sweden	-18.4	7.0
Nepal	18.0	2.5	Switzerland	10.3	3.6
Netherlands	-7.6	5.0	Tajikistan	-26.1	7.7
New Zealand	15.9	6.8	Thailand	-8.1	5.8
Niger	-4.3	5.8	Togo	-4.4	12.0
Nigeria	-17.5	5.3	Tonga	10.3	4.4
Norway	-21.7	5.5	Trinidad and Tobago	31.2	5.5
Oman	-21.1	6.4	Tunisia	-35.4	4.6
Pakistan	-1.6	12.7	Turkey	-25.6	3.9
Panama	-23.0	5.0	Turkmenistan	-4.0	8.8
Papua New Guinea	-1.2	3.7	United States	8.5	2.2
Paraguay	5.5	4.5	Uganda	-23.4	8.7
Peru	-7.7	2.9	United Arab Emirates	51.5	15.7
Philippines	2.3	6.2	United Kingdom	-8.4	2.0
Poland	6.8	2.0	Uruguay	31.5	2.2
Portugal	7.2	5.2	Vietnam	9.5	3.3

Note: The values in the column " Mean " (resp. " Std. Err. ") correspond to the averages (resp. standard errors) of the estimates over all the specifications (i.e. models, number of trade partners, and weighting systems). Positive (resp. negative) sign indicates an overvaluation (resp. undervaluation).

### Appendix B. Evolutions of some fundamentals

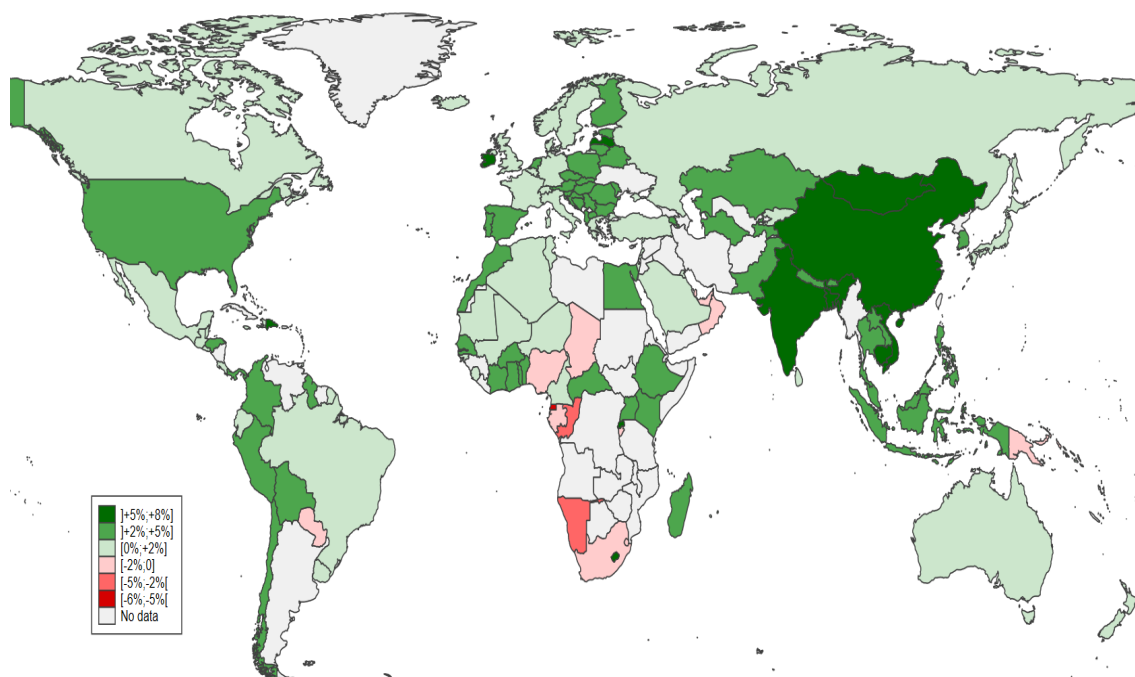


Figure B.1 — Economic growth in 2018

Note: Libya is excluded due to its 26% growth rate (outliers). Data —i.e. real GDP per capita in PPP terms— are from the World Development Indicators database (World Bank).

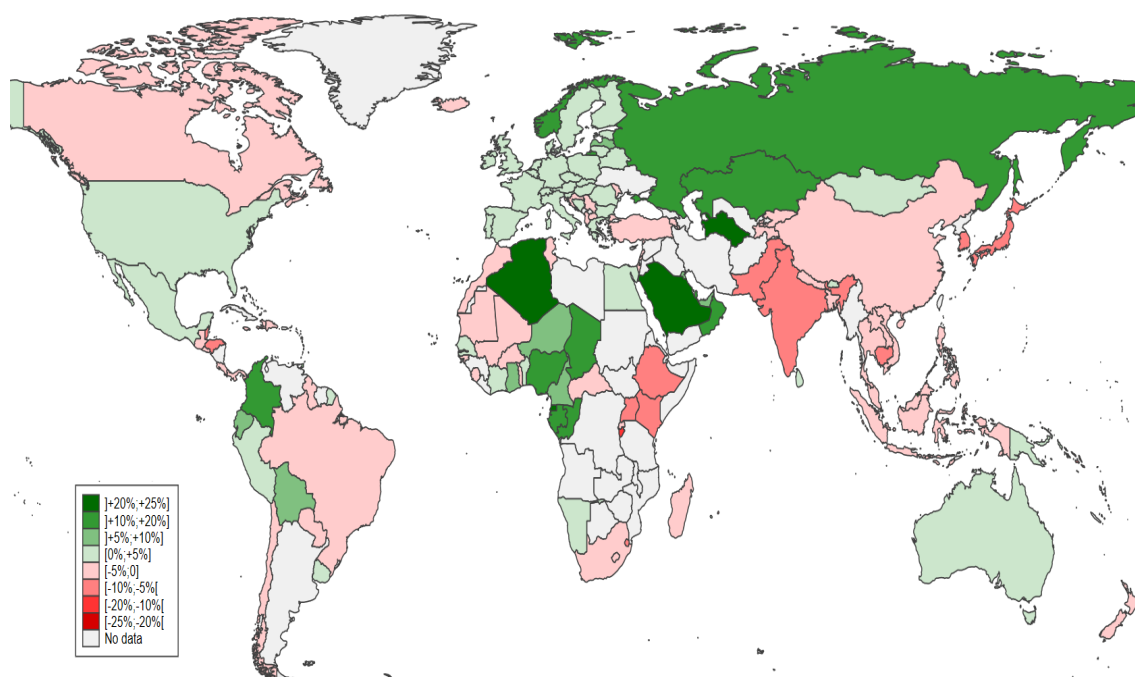


Figure B.2 — Change in the terms of trade (2017-2018)

Note: Data are from the UNCTAD database.

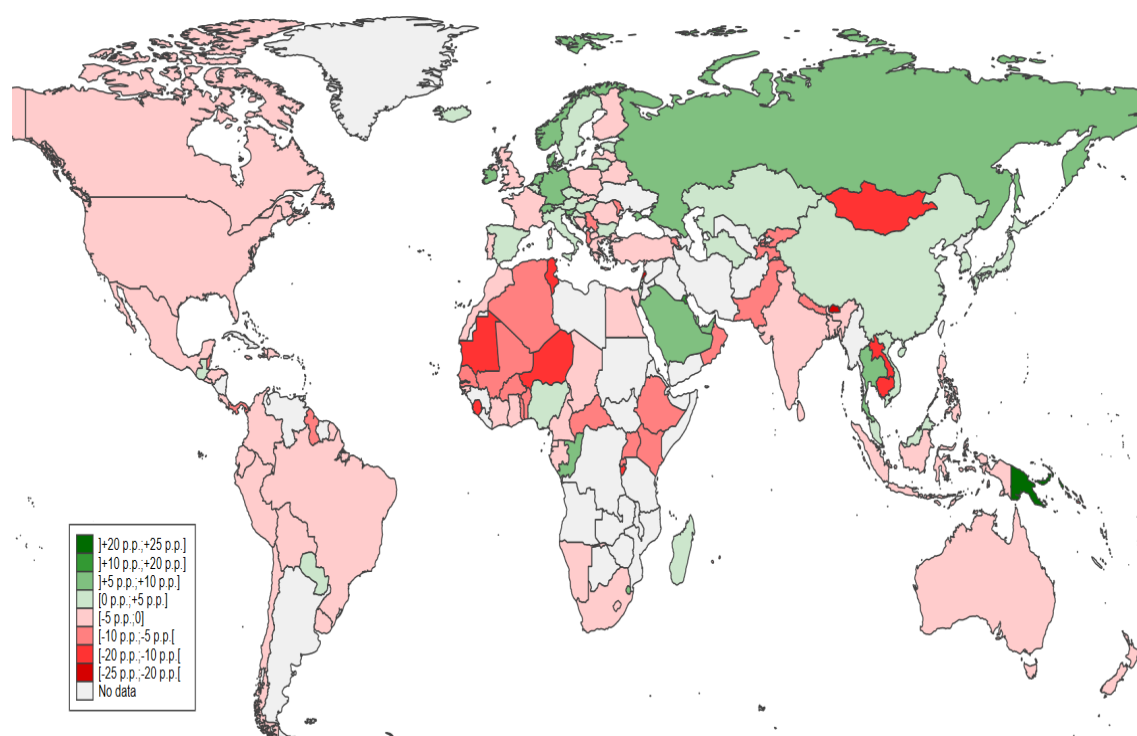


Figure B.3 — Change in the net foreign asset positions (2017-2018)

Note: Changes in the net foreign asset positions correspond to the current balances. Data are from the IMF.

## Appendix C. Comparison with the IMF External Sector Report estimates

*As is done periodically, the IMF, through the External Sector Report (ESR), analyzes and discusses the evolution and the misalignment of 30 systemic economy currencies. In this appendix, we compare our estimates and discuss the major reasons for differences between the estimates.*

The IMF estimates of currency misalignments (or "REER gap" following their terminology) reported in the External Sector Report are based on various equilibrium exchange rate determination approaches. More specifically, the estimates are derived relying on four complementary approaches constituting the so-called External Balance Assessment (EBA) methodology: (i) the current account regression-based approach, (ii) the real exchange rate regression-based approaches (both index and levels), and (iii) the external sustainability approach.<sup>6</sup> The current account-based approach calculates the difference between the current account (CA) projected over the medium term at prevailing exchange rates and an estimated equilibrium current account, or "CA norm". The real exchange rate regression-based approaches directly estimate an equilibrium real exchange rate for each country as a function of the fundamentals of the REER—including controls. Finally, the external sustainability approach calculates the difference between the actual current account balance and the balance that would stabilize the net foreign asset (NFA) position of the country at some benchmark level. Each of these approaches has relative strengths and limitations—which further motivate the need for complementary approaches. Phillips et al. (2013) argues for instance that the current account regression-based approach is often the most informative and reliable of the different EBA approaches because it is able to take full advantage of cross-country information. Its limitations however tend to be most apparent when analyzing countries with high reliance on natural resource sectors (e.g. large oil exporters) and relatively small economies that are financial centers. For a few economies, this approach would yield very large regression residuals, and thus large Total CA Gaps, which require careful further interpretation. The second approach, the real exchange rate regression-based approach (REER index) seem to appear especially useful where the first approach faces a particular difficulty. Its limitations are a reduced reliability in countries with large structural changes, as well as those with short data spans. However, this method, due to fixed effects, forces gaps for each country to be zero on average over time. The third approach,

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<sup>6</sup>These approaches are thus in line with the three methods underlying the CGER methodology, the EBA predecessor. For full details of CGER, see Lee, J., G. Milesi-Ferretti, J. D. Ostry, A. Prati, and L. A. Ricci, 2008, "Exchange Rate Assessments: CGER Methodologies," Occasional Paper No. 261, (Washington: International Monetary Fund).



based on REER levels rather than indices, provides a solution to this issue. The fourth approach, is a bit different from the others in that it suits well (more relevant and informative) for countries with large NFA imbalances, and for which there is a clear view of what would be a more appropriate NFA level.<sup>7</sup>

In light of the above, it appears that the main source of differences between the ESR REER gaps and the *EQCHANGE* estimates should principally lie in the approach retained by the ESR staff—in case there are important divergences between the different approaches.<sup>8</sup>

The different ESR REER gap estimates as well as the *EQCHANGE* estimates are reported in Table C.1. Among the 29 economies reported (including the euro area)<sup>9</sup>, 13 show a very good matching between the ESR staff-assessed REER gap midpoints and the *EQCHANGE* estimates of misalignments for 13 economies: Australia, Belgium, China, France, Germany, Hong Kong, Italy, Korea, the Netherlands, Russia, Spain, Thailand and the United States. However, for a number of these countries, the EBA REER-based estimates differ considerably from the EBA CA-based estimates, these latter constituting the retained estimates. This is particularly the case for the Netherlands and Russia. This is also the case when considering the REER index-based estimate for Germany which points to an overvaluation while the other EBA approaches and *EQCHANGE* point to an undervaluation.

The above economies are followed by 3 others for which the different estimates are very close: the euro area, Singapore and Turkey.<sup>10</sup>

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<sup>7</sup>For further details on the EBA methodology see Phillips, S., Catão, L., Ricci, L., Bems, R., Das, M., Di Giovanni, J., Unsal, F., Castillo, M., Lee, J., Rodriguez, J., Vargas, M., 2013. "The External Balance Assessment (EBA) Methodology," IMF Working Papers 13/272, International Monetary Fund. The technical supplement of the IMF External Sector Report 2018 provides the latest refinements.

<sup>8</sup>The term "principally" is important as there are differences regarding the empirical framework between ESR REER index-based approach and *EQCHANGE*. Indeed, the ESR REER index-based approach departs from strict theoretical background underlying the determination of the equilibrium in many respects (retained regressors, estimation methods)—probably to ensure consistency between the REER approaches and the CA approach regarding the time horizon of the analysis— while the *EQCHANGE* methodology sticks to the BEER approach. It is worthwhile noting that *EQCHANGE* is in its infancy and that refinements—through alternative approaches—are already scheduled.

<sup>9</sup>As a reminder, Argentina is excluded from the 2019's vintage of *EQCHANGE* due to the large uncertainty surrounding the determination of its equilibrium exchange rate.

<sup>10</sup>Comparison of the performances between the *EQCHANGE* methodology and the EBA REER-based approaches is impossible for Singapore since this latter is not included in the EBA estimation samples.

Table C.1 — Comparison of estimates: *EQCHANGE* and *External Sector Report*

	<i>External Sector Report</i>					<i>EQCHANGE</i>	
	<i>Staff-assessed REER gap</i>		<i>Estimates by approach<sup>a</sup></i>			Mis	Std. Err.
	Midpoint	Range	CA	REER index	REER level		
Australia	6	+/-6	4.4	1.7	11.3	6.7	5.2
Belgium	8.5	+/-2.5	8.8	13.2	22.2	6.9	5.5
Brazil	1.5	+/-4.5	-2.7	-9.4	2.1	-9.4	1.6
Canada	7.5	+/-5.5	7.7	2.1	-6.9	-10.3	3.2
China	-1.5	+/-10	-3.5	0	12.6	-3.2	4
Euro area <sup>b</sup>	-3	+/-2	-3.3	6	0.8	1.4	3.9
France	2.5	+/-1.5	2.5	-0.4	7.1	3.2	3.8
Germany	-13	+/-5	-12.2	4.9	-16.1	-7.2	3
Hong Kong	0	+/-5	NR	NR	NR	3.7	6.7
India	0	+/-6	0	5.4	2.5	-13.8	6.8
Indonesia	-4	+/-5	8.3	-3.2	-15.5	-18.1	6.9
Italy	5	+/-5	0.4	9.7	6.9	7.3	3.1
Japan	-1.5	+/-9.5	-1.5	-21.8	-17.1	-9.3	6.8
Korea	-4	+/-3	-3.9	3.8	-5.4	-3.7	3.9
Malaysia	-5	+/-2	-5.2	-25	-36.5	-34.6	12.1
Mexico	-6	+/-8	-6.3	-21	-9.5	-18.1	3
Netherlands	-8.6	+/-2.8	-8.6	14.5	2.2	-7.6	5
Poland	-2.5	+/-2.5	-2	-2.7	-18.9	6.8	2
Russia	-6	+/-4	-6	-14.5	-20.4	-5.3	4.2
Saudi Arabia	7.5	+/-2.5	NR	NR	NR	-14.7	6.8
Singapore	-8.2	+/-6	NR	NR	NR	-12.1	7.2
South Africa	7	+/-5	6.7	-13.9	-1.8	-27.6	9.5
Spain	5	+/-4	5	6.8	6	9	5.2
Sweden	-10	+/-5	-3.7	-16.7	-17.7	-18.4	7
Switzerland	-2.8	+/-3.75	-1.8	11.4	16.7	10.3	3.6
Thailand	-8.5	+/-2.5	-8.4	7.3	-6.1	-8.1	5.8
Turkey	-15	+/-5	0.9	-22.5	-20.5	-25.6	3.9
United Kingdom	7.5	+/-7.5	12.1	-13.2	-8.5	-8.4	2
United States	9	+/-3	11.7	8	11.9	8.5	2.2

Notes: Estimates of "REER gap" or "currency misalignment" are in percentage. "Staff" in the CA column indicates that the estimates from the CA model are consistent with the staff-assessed REER gap. "NR" indicates that the approach-based estimate is not reported in the IMF ESR 2018. Estimates for the different approaches are from the ESR 2019-Individual Economy Assessments. Positive sign (resp. negative) sign indicates an overvaluation (resp. undervaluation).

a: The External Sustainability (ES) approach estimates are not reported since they are not specifically mentioned in the full report except for India and Mexico. The ESA indicates that both currencies were broadly in line in 2018 (India:-2%; Mexico:-3.3%).

b: The staff-assessed euro area CA and REER gaps are calculated as the GDP-weighted averages of staff-assessed CA and REER gaps for the 11 largest Euro area economies (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain). We follow the same approach to assess the misalignments for the euro area which is here presented only for comparison purpose.

For Malaysia, Mexico, Switzerland and the United Kingdom, the ESR staff put more weights on the CA model —if not disregarding the other approaches. Hence, while the EQCHANGE and the EBA REER-based estimates are consistent, the differences are mainly the reflection of the focus on the CA model estimates.<sup>11</sup>

For Brazil, Canada, India, Indonesia, Japan, Poland, Saudi Arabia and South Africa, our estimates of currency misalignments present relatively important differences with the staff-assessed midpoint REER gaps. However, for Brazil, Canada and Indonesia, the misalignment from one of the two REER-based approaches is consistent with the EQCHANGE average misalignments. India, Japan, Poland and South Africa are the countries for which the different estimates divergence the most.

For India, the staff assessed the rupee to be broadly in line for 2018 —with a range of -6 to 6 percent. Our assessment, however, points to an undervaluation around 14% which is in contrast with the estimates from the ESR REER-based approaches (index: 5.4%; level: 2.5%). Compared with the ESR 2018, the staff assessed REER gap only felt by 1 percentage point despite the rupee depreciation in real effective terms. This reflects again the focus on the CA based approach as the REER-based approaches reflected the rupee depreciation. For Japan, the assessment of the REER gaps have been more complicated. Indeed, while the REER index and level approaches pointed to undervaluations of respectively -21.8% and -17.1%, the CA approach assessed the REER gap to be between -11% and 8%. The EQCHANGE assessment therefore fall between the CA-based and the REER-based estimates. Finally, for Poland and South Africa, the staff focused on the CA approach and disregarded the REER based approaches. As pointed last year in the EQCHANGE annual assessment, the gap between the estimates for South Africa tend to indicate that the time horizon of the analysis is at stake. Indeed, the ESR only focus on the period post 1990 while in EQCHANGE we consider the 1974-2018 period.

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<sup>11</sup>This is also the case for Sweden and Turkey. The CA based REER gaps lower the level of the misalignments.