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EQCHANGE
Annual Assessment 2020

Carl Grekou

Highlights

- This publication provides an overview of exchange rate misalignments on the eve of the Covid-19 crisis.
- In 2019, the US dollar was still overvalued; the Chinese renminbi appeared broadly in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen were moderately undervalued.
- Europe appeared as the most heterogenous region; Germany, Ireland, Norway, Sweden, and the United Kingdom displayed undervaluations; Finland, France, Italy and Luxembourg were close to their equilibrium; Belgium, Austria, Greece, Portugal and Spain displayed overvaluations.
- Movements in the EMEs (e.g. Brazil, India, Indonesia, Russia) were generally upwards and resulted in a reduction/an increase of the undervaluations/overvaluations; in Turkey, the inflation spur countered the nominal depreciation of the lira and let the undervaluation broadly unchanged.
- Overall and despite the changes observed during 2019, the global configuration of currency misalignments remained broadly unchanged.

RESEARCH AND EXPERTISE
ON THE WORLD ECONOMY

Abstract

This publication, accompanying the 2020's update of EQCHANGE, provides an overview of exchange rate misalignments on the eve of the Covid-19 crisis. In a nutshell, changes in the exchange rate misalignments were relatively modest except for few EMEs and DCs that registered large swings. This is especially the case of Egypt, India and Nigeria, and to a lesser extent of Brazil, Indonesia and Thailand. The Turkish lira, despite a continued plunge, maintained its large undervaluation due to the inflation spur. The US dollar, owing to its appreciation, registered a small increase in its overvaluation. The currency movements vis-à-vis the US dollar shaped most of the dynamics in the advanced economies that generally registered downward movements in the currency misalignments. This holds also for the Chinese renminbi that still appeared broadly in line —with its fundamentals— despite a depreciation. In Europe, Germany, Ireland, Norway, Sweden, and the United Kingdom displayed undervaluations; Finland, France, Italy and Luxembourg were close to their equilibrium; and Belgium, Austria, Greece, Portugal and Spain displayed overvaluations.

Keywords

EQCHANGE, Exchange Rates, Currency Misalignments, Global Imbalances.

JEL

E3, E4, E5, E6, F3, F4.

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

EQCHANGE annual assessment 2020

Carl GREKOU*

Summary

This working paper relies on the latest vintage of the CEPII *EQCHANGE* database and offers an overview of the most meaningful changes in exchange rates in 2019 and their consequences in terms of currency misalignments.

On the eve of the Covid-19 pandemic, the global configuration of exchange rate misalignments remained relatively stable. Few countries, mainly emerging economies, however stood out with noticeable changes in their currency misalignments.

Among the advanced economies, the US dollar dynamics shaped most of the movements in the currency misalignments before the Covid-19 crisis. Indeed, the US dollar appreciated *vis-à-vis* most currencies in 2019 (around 3% in effective terms, both nominal and real). With unchanged fundamentals, it registered a small increase in its overvaluation. Meanwhile, the Chinese renminbi registered the opposite movement in the exchange rate but could still be considered in line with its equilibrium value. In the euro area, movements were generally downwards and of small amplitudes. The zone was still characterized by a certain degree heterogeneity: Germany, Ireland, and the Netherlands displayed undervaluations; Finland, France, Italy and Luxembourg were close to their equilibrium; and Belgium, Austria, Greece, Portugal and Spain displayed overvaluations. The British pound registered also a slight depreciation that comforted its undervaluation. This latter is of the same order than that of the Canadian dollar and of the Japanese yen.

In emerging economies, Turkey, despite a continued fall of the lira against the backdrop of an economic turmoil, registered no change in the misalignment due to the inflation spur. Breaking with previous years' trend, Turkey cedes its place to India regarding of EMEs with the largest changes in the misalignments. The rupee indeed appreciated by 7%, thus reducing by half its undervaluation. In Brazil, the real's appreciation (in real effective terms), despite a fall against the dollar, even

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cleared the undervaluation.

Overall, the configuration of currency misalignments examined in this publication resulted mainly from exchange rate movements, particularly the *vis-à-vis* the US dollar. Indeed, the US-China trade tensions —and its spillovers— that escalated for much of 2019, have ended-up with an appreciated dollar against most currencies. The global pattern of the reconfiguration —again, marginal given the amplitudes of the changes— appears therefore conjectural. With the Covid-19 crisis, the coming years might be accompanied by a global reconfiguration of currency misalignments. Indeed, the pandemic has caused, among others, a sharp decline in global trade, tighter external financing conditions, lower commodity prices and unprecedented budgetary stimulus packages —in response— that all have important macroeconomic implications —especially for current accounts.

The CEPII's *EQCHANGE* annual assessment 2020 presents estimates of equilibrium exchange rates and corresponding currency misalignments for the year 2019. 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, Thomas Grjebine, Sébastien Jean and Valérie Mignon.

1. Overview

The present publication, which accompanies the 2020's update of *EQCHANGE*, aims at providing an overview as extensive as possible of the exchange rate misalignments for the year 2019. It also aims at discussing the evolution of exchange rates and currency misalignments between 2018 and 2019 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 2019 as well as the changes that occurred between 2018 and 2019. 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 indicators on effective exchange rates. It includes two sub-databases containing data on (*i*) nominal and real effective exchange rates (both levels and indices data computed using different weighting schemes), and (*ii*) equilibrium real effective exchange rates and corresponding currency misalignments for advanced, emerging and developing countries.
The substantial enhancements introduced by *EQCHANGE* cover both sub-databases. Regarding the first sub-database, *EQCHANGE* provides not only the largest coverage (both temporal and spatial), but also different measures grouped in two categories: (*i*) *Indices* including nominal and real effectives exchange rate indices, and (*ii*) *Levels* consisting of multilateral price levels data. The second sub-database itself constitutes a major contribution by providing estimates of currency misalignments based on different approaches —including the Behavioral Equilibrium Exchange Rate (BEER) approach used for this publication.

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.[1] 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)[2] for further details.

[1] We do not postulate that the BEER methodology achieves superior performance against other approaches. On the contrary, all the approaches are rather complementary.
[2] Couharde, C., Delatte, A.-L., Grekou, C., Mignon, V., Morvillier, F., (2018), "EQCHANGE: A world database on actual and equilibrium effective exchange rates", *International Economics*, Vol. 156, p.p. 206-230.

Box 2 — EQCHANGE: vintage 2020

Since its inception, the *EQCHANGE* database is updated every year and these updates are accompanied by a number of new features aiming to reinforce the interest and comprehensiveness of the database. This year, *EQCHANGE* was amended with the *MULTIPRIL* sub-database providing price levels-based measures (further details are provided in Box 3).

The 2020's version of *EQCHANGE* therefore includes —both levels-based and indices-based— data on (*i*) effective exchange rates (monthly, quarterly and yearly frequency in the case of indices) and on (*ii*) equilibrium real effective exchange rates and corresponding currency misalignments.

Regarding the sub-database on equilibrium real effective exchange rates and 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 126 countries(territories). Countries (territories) included are: Albania, Algeria, Antigua and Barbuda, Armenia, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Congo Rep., Costa Rica, Croatia, Cyprus, Czechia, Côte d'Ivoire, Denmark, Dominica, Dominican Rep., Ecuador, Egypt, Equatorial Guinea, Estonia, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Grenada, Guatemala, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Korea Rep., Kuwait, Lao P.D.R., Latvia, Lesotho, Lithuania, Luxembourg, Macedonia (TFYR), Madagascar, Malaysia, Mali, Malta, Mauritius, Mexico, Moldova Rep., Mongolia, Morocco, Namibia, Nepal, Netherlands, New Zealand, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Samoa, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay and Vietnam.

Finally, data on equilibrium exchange rates and currency misalignments available from *EQCHANGE* 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:

$$reer_{i,t} = \underbrace{\underbrace{\underbrace{\underbrace{\underbrace{\mu_i + \beta_1 BS_{i,t}}_{Model\ 1} + \beta_2 nfa_{i,t}}_{Model\ 2} + \beta_3 tot_{i,t}}_{Model\ 3} + \beta_4 gov_{i,t}}_{Model\ 4} + \beta_5 open_{i,t}}_{Model\ 5} + \varepsilon_{i,t} \quad \text{(Box Eq. 2.1)}$$

• *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.

• *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).

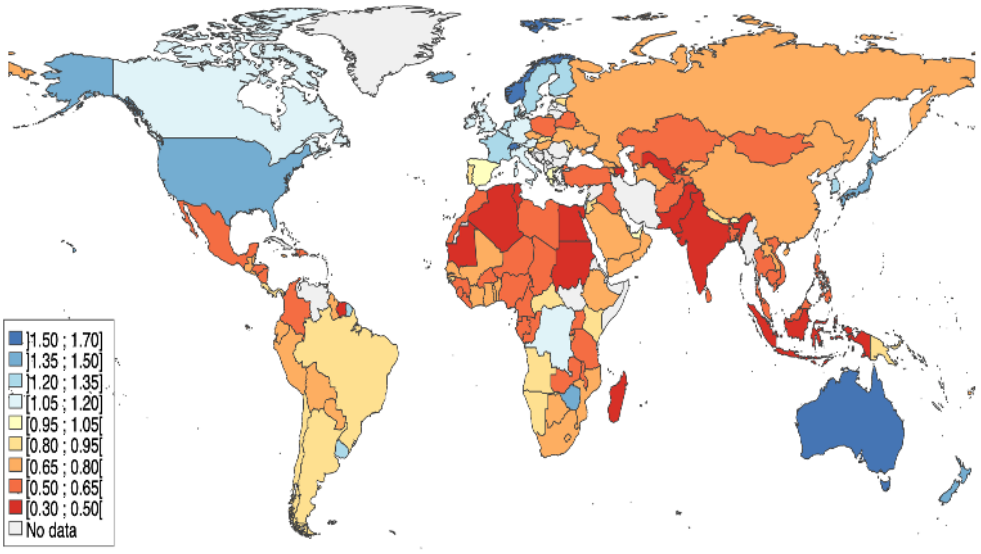
• *OPEN*: the trade openness | World Development Indicators database.

Box 3 — MULTIPRIL: a new database on multilateral price levels and currency misalignments*

The *MULTIPRIL* database on Multilateral Price Levels (*MPL*) covers a wide sample of 178 countries over the 1990-2018 period. The multilateral price level of each country is obtained by computing the geometric weighted average of its bilateral relative prices relative to its trading partners:

$$MPL_{i,t} = \prod_{j=1}^{N} \left(\frac{PL_{i.US,t}}{PL_{j.US,t}} \right)^{w_{ij,t}} \qquad \text{(Box Eq. 3.1)}$$

where $\frac{PL_{i.US,t}}{PL_{j.US,t}}$ is the price level of country i relative to the trading partner j in period t; $PL_{i,US,t}$ and $PL_{j,US,t}$ are respectively the price levels of country i and country j relative to the US; N denotes the number of trading partners, and $w_{ij,t}$ is the trade-based weight associated to the partner j.[1] Defined this way, *MPL* corresponds to the level of the real effective exchange rate of country i against its N trading partners. Thus, a value of, for instance 1.2 indicates that prices in country i are on average twenty percent higher than in its trading partners—at date t.



Box Figure 3.1 — Global distribution of multilateral price levels in 2018

While the *MPL* series actually reproduce stylized facts noted with the traditional relative price to the US —e.g. a positive relationship between the price level and the development level; see Box Figure 1—, they also offer a different vision of relative prices and price-competitiveness around the world since the *MPL* series have almost always been higher than bilateral price levels (further details in Couharde et al., 2020).[2]

The *MULTIPRIL* database also contains *MPL*-based currency misalignments series for 156 countries over the 1991-2018 period. By focusing on price *level* data, it usefully complements the *EQCHANGE* database on equilibrium exchange rates and currency misalignments derived from series in *indices*. Its multilateral setting also provides a more comprehensive picture of relative price levels and currency misalignments compared to existing bilateral measures.

[1] For the sake of homogeneity, the trade-weighting schemes are similar to those used in the EQCHANGE database (see Couharde et al., 2018, for further details) —i.e. computed *vis-à-vis* two sets of trading partners (177 and the top 30) according to three different trade-weighting schemes.

[2] Couharde, C., Grekou, C., Mignon, V., (2020), "*MULTIPRIL*, a new database on multilateral price levels and currency misalignments", CEPII Working Paper N°2020-12.

* The *MULTIPRIL* database is embedded in the *EQCHANGE* database. The access to the data (free upon registration) is via the *EQCHANGE* download page: http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id = 34

2. The global configuration of currency misalignments

Figures 1 maps out the exchange rate misalignments for the year 2019, the most recent year for which data are available.[1] As visible, it reveals diversified situations. As in 2018, 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 more prevalent and highest, with Algeria 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.

Overvaluations, contrary to undervaluations, are more scattered. Nonetheless, one can note clusters of relatively few countries particularly in South-East Asia and in Europe. Among advanced economies, only few countries such as New Zealand, Switzerland and the United States remain overvalued.

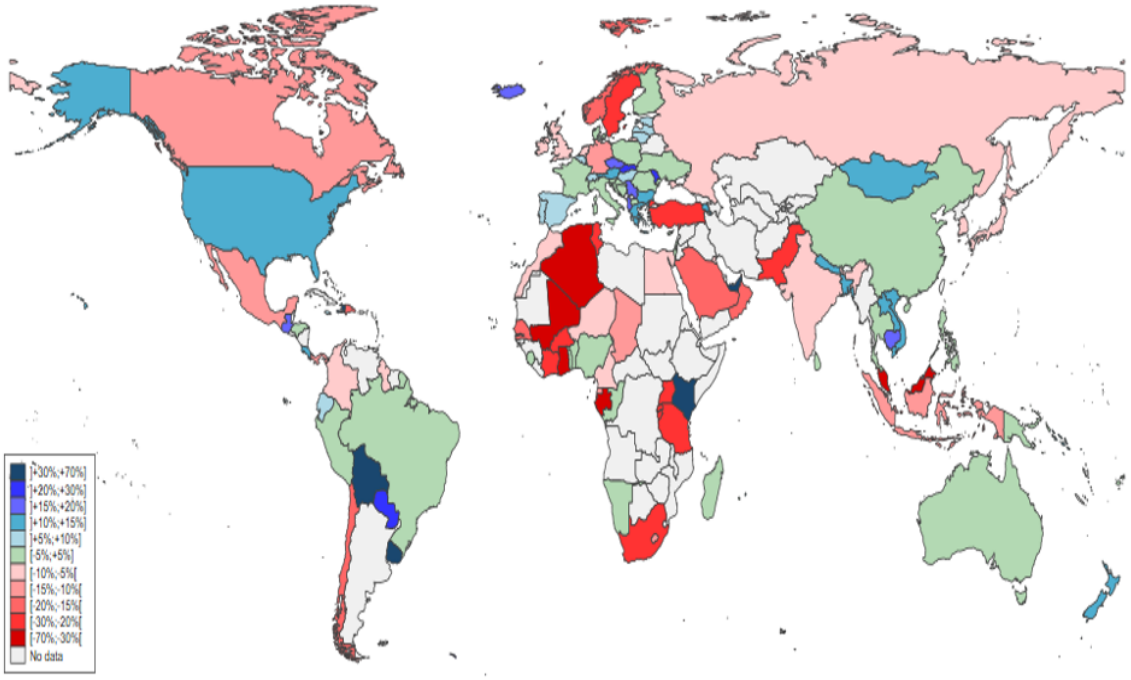


Figure 1 — Currency misalignments in 2019

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

[1] 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 year 2019 was marked by minor changes that leaved broadly unchanged the global configuration of currency misalignments. These changes are characterized in Figure 2. The left chart plots the distribution of the changes in currency misalignments during this period while the right chart depicts the distributions of the currency misalignments for 2018 and 2019. As can be seen, the distribution of the changes in currency misalignments appear centered around 0 with almost 75% of the changes falling in the -/+5 percentage points interval. The stability of the misalignments between 2018 and 2019 is also confirmed by the right chart that overlays the distribution of currency misalignments for the two years.

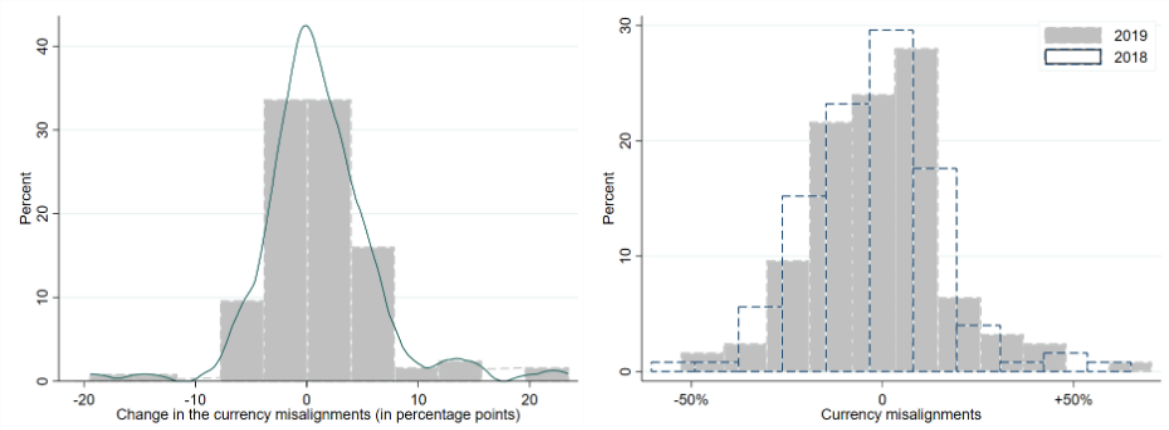


Figure 2 — Distributions of the changes in currency misalignments and the currency misalignments

Notes: The left chart depicts the distribution of the change in the currency misalignments between 2018 and 2019 (the solid line represents the kernel density). The right chart plots the distribution of the currency misalignments for 2019 (gray bars) and 2018 (dashed blue bars).
Source: *EQCHANGE* (CEPII)

The global configuration of the currency misalignments noted hitherto, however, hides different dynamics as can be seen in Figure 3. In fact, there have been important disparities across countries and regions. Notwithstanding few Eastern European countries displaying upward movements in their currency misalignments, Europe appears to be the most homogenous region in terms of dynamics as the rest of the countries generally reduced their misalignments between 2018 and 2019. It is also the case of most Western African countries, particularly the CFA franc zone countries that replicated the general evolution of Western European countries —due to the peg to the euro. In America however, the tendency has been towards an increase in the currency misalignments except Canada and few Caribbean and Latin American countries that slightly reduced their misalignments. Finally, changes in Asia were quite heterogenous —both the amplitudes and dynamics— with China, Korea and

few other countries having reduced their misalignments.

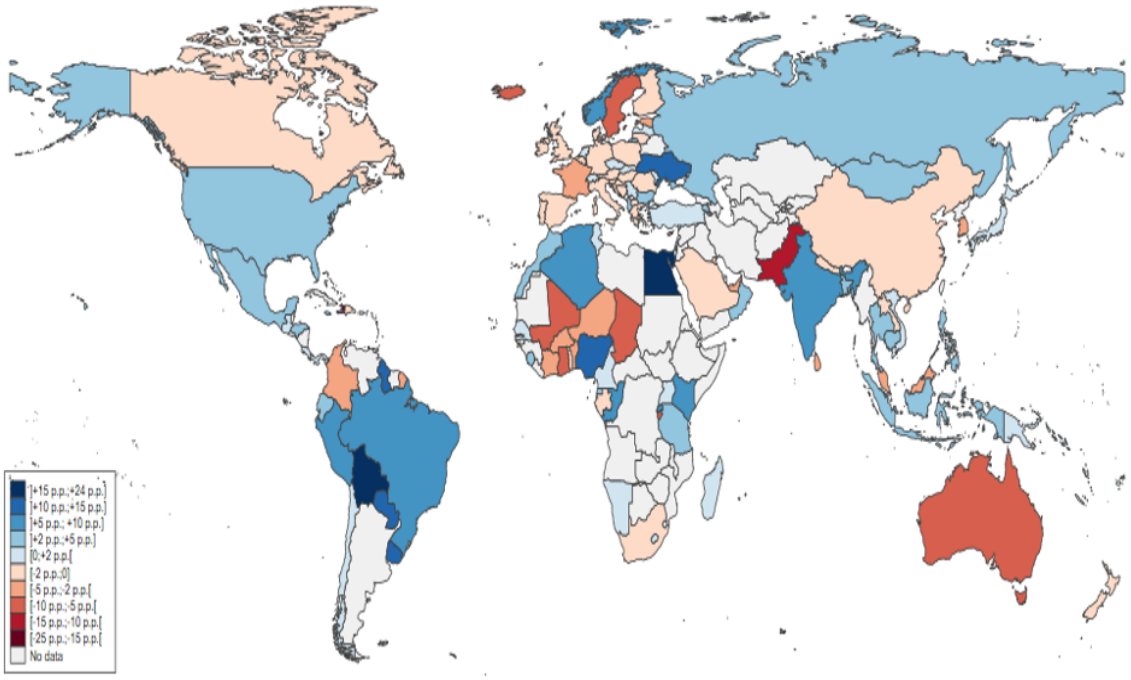


Figure 3 — Changes in currency misalignments between 2018 and 2019

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 4 — Currency misalignments in 2019: key points

• As for 2018, the most important currency misalignments were concentrated in developing countries (DCs) and emerging economies (EMEs);

• In 2019, the US dollar was still overvalued; the Chinese renminbi appeared broadly in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen were moderately undervalued;

• Europe appeared as the most heterogenous region; Germany, Ireland, Norway, Sweden, and the United Kingdom displayed undervaluations; Finland, France, Italy and Luxembourg were close to their equilibrium; Belgium, Austria, Greece, Portugal and Spain displayed overvaluations;

• Movements in the EMEs (e.g. Brazil, India, Indonesia, Russia) were generally upwards and resulted in a reduction/an increase of the undervaluations/overvaluations; in Turkey, the inflation spur countered the nominal depreciation of the lira and let the undervaluation broadly unchanged;

• Overall and despite the changes observed during 2019, the global configuration of currency misalignments remained broadly unchanged.

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 2018 and 2019. 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 2019 are represented in Figure 4. Table 1 gives our assessments of these estimates for each of the countries. The assessments for 2018 are also reported to illustrate the dynamics of the misalignments.

Over our 35 currencies, 10 countries display overvaluations higher than 5% while 18 countries exhibit undervaluations higher than 5% —i.e. below -5%. The remaining 7 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 and France but also for Australia, Brazil, Denmark, Israel and Luxembourg.

Among the overvalued currencies, none appear with a "large" misalignment. Greece has actually registered a reduction of its 2018's "large" overvaluation. Nonetheless, Greece still tops the intermediate overvaluation group which also includes Austria, Hong Kong, New Zealand and the United States. The remaining overvalued countries are concentrated in the 5-10% interval —"Moderate overvaluations". This group consists of Belgium, Italy, Portugal, Spain and Switzerland.

In the undervalued currencies group, in ascending order, the different categories include respectively 8 countries, 4 countries and 6 countries. The moderate undervaluations group is composed of India, Ireland, Japan, Korea, the Netherlands, Russia, Thailand and the United Kingdom. Compared to 2018, India and Korea are new entrants in this group. While India registered an upward movement that reduced its undervaluation, Korea experienced the opposite movement and shifted from the "(broadly) in line group" in 2018 to the moderate undervaluations group in 2019. Canada, Germany, Indonesia and Mexico form the intermediate undervaluations group in 2019. The last group is composed of Malaysia, Norway, Singapore, South Africa, Sweden and Turkey that still display "large undervaluations" as in 2018.

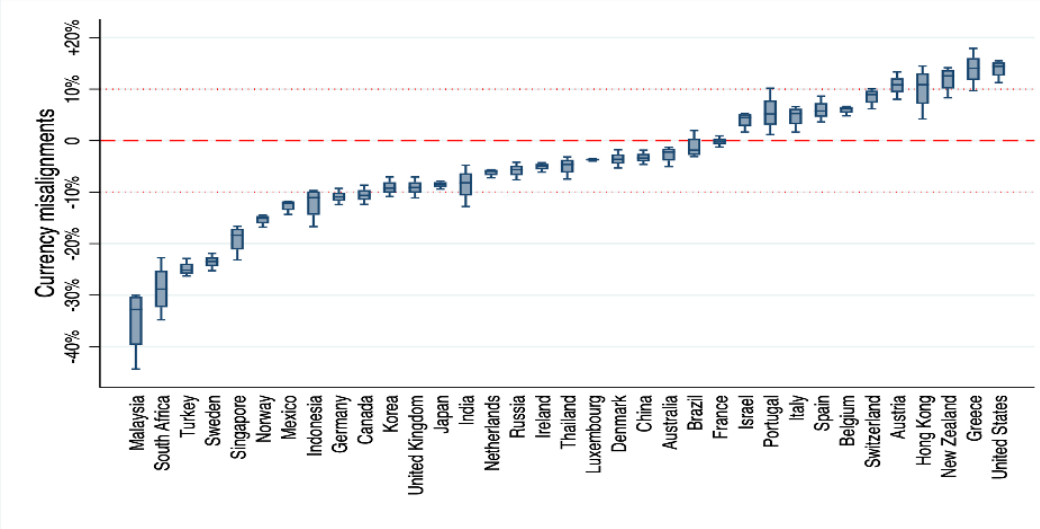


Figure 4 — Currency misalignment in 2019 (estimations range)

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

Table 1 — Currency misalignments assessment

Country	Assessment 2018	Assessment 2019	Country	Assessment 2018	Assessment 2019
Australia			Luxembourg		
Austria			Malaysia		
Belgium			Mexico		
Brazil			Netherlands		
Canada			New Zealand		
China			Norway		
Denmark			Portugal		
France			Russia		
Germany			Singapore		
Greece			South Africa		
Hong Kong			Spain		
India			Sweden		
Indonesia			Switzerland		
Ireland			Thailand		
Israel			Turkey		
Italy			United Kingdom		
Japan			United States		
Korea					

Legend

Undervaluation — Large — Moderate — In line — Moderate — Overvaluation — 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.

3.2. Evolutions during 2019 and the driving factors

Changes during 2019 were generally modest. As a consequence, the pattern of currency misalignments in 2019 for the 35 considered economies is similar to the one identified in 2018. Figure 5, and especially the left chart, supports this point, i.e. the existence of a certain inertia in the currency misalignments —most countries being very close to the 45-degree line.

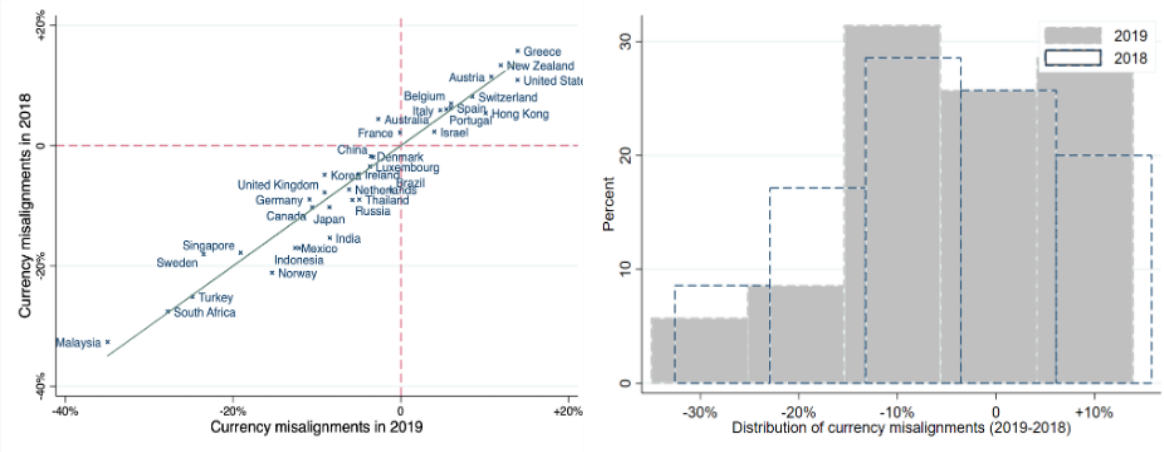


Figure 5 — Currency misalignments in 2018 and 2019

Note: In the left chart, the dashed green line represents the 45-degree line..
Source: *EQCHANGE* (CEPII)

Factors that shaped the evolutions of currency misalignments between 2018 and 2019 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 the changes in the estimated equilibrium exchange rates (ERER) and the changes in the real effective exchange rates (REER) —as well as the changes in the average currency misalignments in the left panel. 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.

Box 5 — Concepts and definitions

Nominal and real effective exchange rates (2010=100)

An effective exchange rate measures the rate at which a country's currency exchanges against a basket of other currencies, in either nominal or real terms.

The nominal effective exchange rate of country i in period t($\text{NEER}_{i,t}$) measures the value of the currency of country i against a weighted average of foreign currencies:

$$NEER_{i,t} = \prod_{j=1}^{N} NER_{ij,t}^{w_{ij,t}} \qquad \text{(Box Eq. 5.1)}$$

where $NER_{ij,t}$ is the index of the nominal bilateral exchange rate between the currency of country i and the currency of its trade partner j in period t, N denotes the number of trading partners and $w_{ij,t}$ is the trade-based weight associated to the partner j. These weights are normalized so that their sum is equal to one, i.e. $\sum_{j=1}^{N} w_{ij,t} = 1$ (see Couharde et al., 2018).

The real effective exchange rate of country i in period t ($REER_{i,t}$) is calculated as the weighted average of real bilateral exchange rates against each of its N trading partners j:

$$REER_{i,t} = \prod_{j=1}^{N} RER_{ij,t}^{w_{ij,t}} \qquad \text{(Box Eq. 5.2)}$$

where $RER_{ij,t} = \frac{NER_{ij,t}P_{i,t}}{P_{j,t}}$ is an index of the real exchange rate of the currency of the country i *vis-à-vis* the currency of the trading partner j in period t. $P_{i,t}$ and $P_{j,t}$ stand respectively for the price index of country i and of country j.

With these definitions, an increase in the real (nominal) effective exchange rate index corresponds to a real (nominal) appreciation of the domestic currency.

Equilibrium real effective exchange rates and currency misalignments

The equilibrium exchange rate series correspond to the average of the estimated equilibrium real exchange rates (ERER) over different models and samples (see Box 1). The ERER series therefore correspond to the equilibrium levels of the exchange rates suggested by the fundamentals of the economies, i.e. the fitted values from the models — an increase reflecting an overall improvement in the fundamentals. Thus, the ERER serves as a summary variable for the economies' performances but also as the benchmark for the REER. This benchmark level is used to derive the extent of the currency misalignments. There are calculated by doing the log-difference between the actual real effective exchange rate ($reer_{i,t}$) and its estimated equilibrium level ($erer_{i,t}$) at date t.

$$Mis_{i,t} = reer_{i,t} - erer_{i,t} \qquad \text{(Box Eq. 5.3)}$$

The misalignments' values then give the magnitude of the real exchange rate adjustment that would restore equilibrium. Given the definition of the real effective exchange rate, a negative sign of the misalignment ($reer_{i,t} < erer_{i,t}$) indicates an undervaluation (the real exchange rate must appreciate to converge towards its long-run equilibrium value), whereas a positive sign ($reer_{i,t} > erer_{i,t}$) indicates an overvaluation of the real effective exchange rate (the real exchange rate must depreciate to converge towards its long-run equilibrium value).

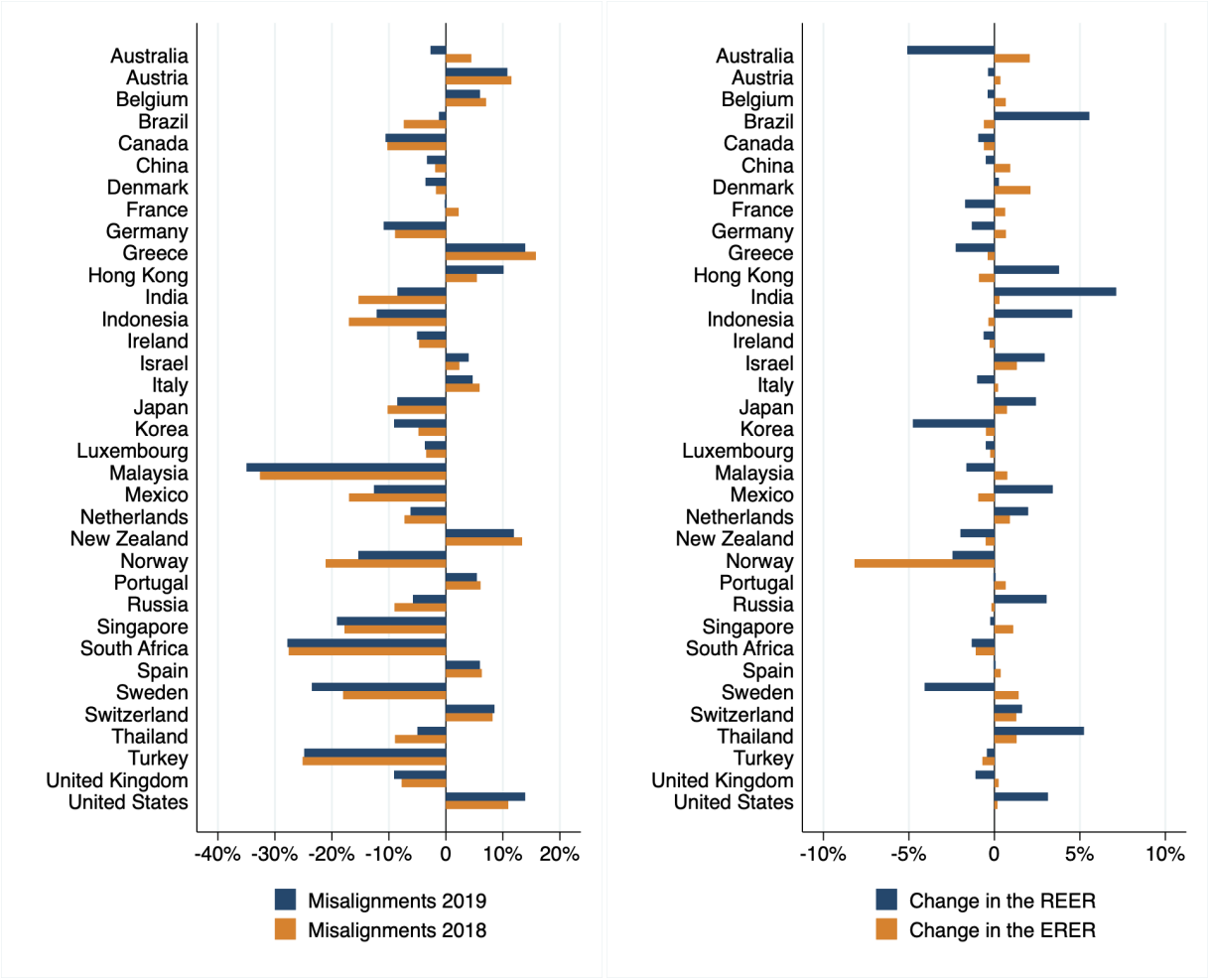


Figure 6 — The misalignments and the exchange rates' dynamics (percent change)
Note: The left chart displays the average of the estimated currency misalignments. In the right chart, we plot the percentage changes in the Real Effective Exchange Rates (REER) and in the estimated Equilibrium Real Exchange Rates (ERER). A positive sign in both measures indicates an appreciation.
Source: EQCHANGE (CEPII)

Except few countries, movements in the REER and in the ERER have been of relatively small amplitudes. Indeed, excluding Australia, Brazil, India and Thailand (resp. Norway), the variations in the REER (resp. the ERER) remained within the -/+5% (resp. -/+2%) interval. However, it is worth noting that changes in the REER are greater than changes in the ERER only for 40% of the observations (17 countries), hence suggesting that the resulting changes in the misalignments are of a more temporary nature.

As can be seen, Australia, India, Korea, Norway and Sweden —and to lesser extent Brazil, Indonesia and Thailand— display the largest changes. India, followed by Brazil and Thailand, are the countries that registered the most important changes in the REER —respectively +7%, +5.5% and +5%. Australia, Korea and Sweden on their part experienced a depreciation of respectively -5%, -4.7% and -4% of their

REER. As aforementioned, changes in the ERER are of different magnitudes, principally ranging from -1% to +2%. Norway is the only exception and registered a 8% depreciation of its equilibrium exchange rate. At the other end of the spectrum, Australia and Denmark display improvement in their ERER —around +2%. Contrasting the changes in the REER and the ones in the ERER, it appears that movements observed for Brazil and India (i.e. a fall in the undervaluation) and for Korea and Sweden (i.e. an increase in the undervaluation) are of a temporary nature since they were driven by the REER dynamics. In contrast, the reduction of the undervaluation of Norway was principally driven by the fall in the ERER and is therefore likely to be more persistent —if not offset in the coming years by the dynamics of the REER. Australia falls between the above two groups as its shift from a 4.5% overvaluation to a 2.7% undervaluation was shaped by both the REER (-5%) and the ERER (+2).

In the euro area countries, changes in the currency misalignments have been generally downward, although marginal, and mainly driven by the depreciation of the REER —changes in the ERER were actually negligible. France display the largest change in the currency misalignment, a 2.3 percentage points (p.p.) fall from 2018 to 2019. Germany and Greece follow behind with respectively a 2 and 1.8 percentage points decrease in the misalignments. The Netherlands is the only country displaying an upward movement, a 1 p.p. reduction of its undervaluation.

The United States, owing to the appreciation of its REER, registered a 3 p.p. increase of its overvaluation. The appreciation of the REER also explains the 4.6 p.p. increase of the overvaluation of Hong Kong. Mexico, also thanks to the REER appreciation, registered a movement of the same amplitude that reduced its undervaluation. To a lesser extent, this is also the case for Japan and Russia. China, Singapore and the United Kingdom have registered changes in currency misalignments of similar amplitudes —with those of Japan and Russia— but in the opposite direction. These latter countries actually experienced a marginal increase of their undervaluations. The United Kingdom is however the only country for which the change was shaped by the REER. Finally, for Canada, South Africa, Switzerland and Turkey, changes in the currency misalignments were negligible.[2]

In the continuity of Figure 6, Figure 7 focuses on the sources underlying the REER movements. 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

[2]It should be noted that these unchanged situations do not reflect opposed —and large— movements of the REER and the ERER but rather very small changes in both variables.

dollar) and, in the right chart, the changes in the REER against the changes in the NEER. The left chart hence addresses the issue of the effect of the NER —and of the trade structure— while the right chart investigates that of the inflation differential *vis-à-vis* the trade partners.

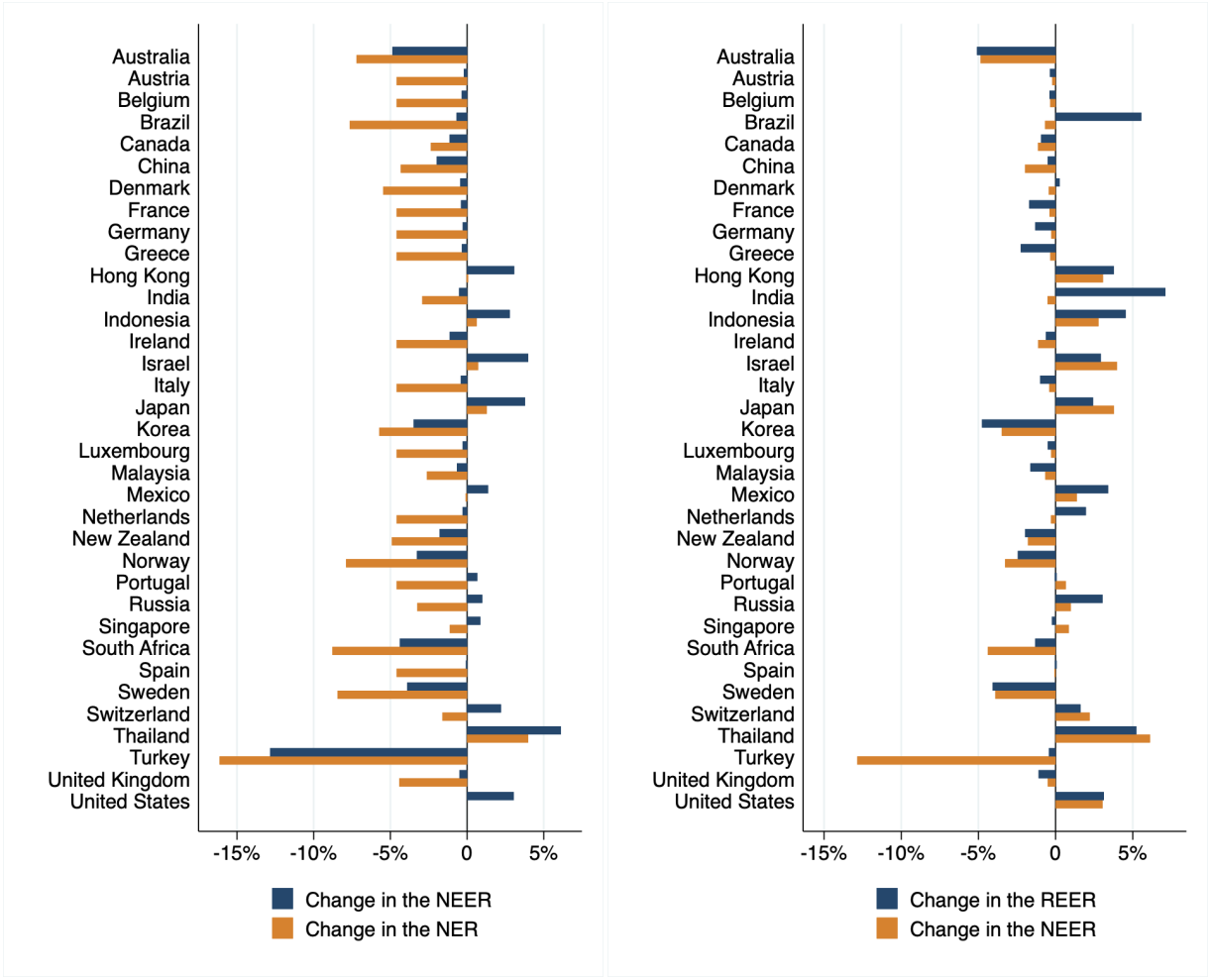


Figure 7 — Exchange rate variations

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.
Source: EQCHANGE (CEPII) and IMF

As visible in the left chart, most currencies depreciated *vis-à-vis* the US dollar. However, these changes did not translate into equivalent changes in the NEER. Moreover, a number of countries actually registered a depreciation against the US dollar but appreciated in effective terms. This the case of Switzerland and to a lesser extent of Portugal, Russia and Singapore. Hong Kong and Mexico have also registered an appreciation in effective terms despite the absence of nominal variations against the dollar. The nominal appreciations *vis-à-vis* the US dollar only translated into NEER appreciations in Indonesia (+2.8%), Israel (+3.9%), Japan (+3.8%) and Thailand

(+6%). As in past years, the Turkish lira is by far the currencies that depreciated the most *vis-à-vis* the US dollar —16%— and in effective terms —13%.[3] Australia, Korea, Norway, South Africa and Sweden follow behind with orders of magnitudes in the changes twice or three times smaller. Brazil, while displaying similar nominal changes *vis-à-vis* the US dollar, only depreciated by 0.6% in effective terms.[4] Along the same lines, one also finds the euro area countries and the United Kingdom.

As aforementioned, the right chart (Figure 7) deals with the other source of changes 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 (countries where the pass-through from the NEER to the REER was limited). Among these countries, Turkey again stands out as the rise in its inflation rate (around 14%) annihilated the NEER depreciation. Inflation also almost exclusively explains the appreciation of the REER in Brazil, India, the Netherlands and Russia.

Overall, and in contrast with previous years, changes in the currency misalignments between 2018 and 2019 came from many sources. Exchange rate movements (resp. inflation) principally accounts for the changes in only 14 (resp. 6) countries. For the other countries, different forces have been at stake. Regarding the exchange rates, much of the changes owes to the US-China trade tensions —and its spillovers— that escalated for much of 2019. The resulting appreciation of the US dollar —and depreciation of the Chinese renminbi— have thus been the main driver of the changes in the exchange rates during 2019 for most countries.

In Figure 8, we dig a bit further the issue of the changes in the estimated equilibrium exchange rates by investigating the underlying factors. We plotted the changes in the Balassa-Samuelson effect proxy —relative GDP per capita in PPP terms— and the changes in the Net Foreign Asset (NFA) position.[5]

[3]This 16% depreciation of the Turkish lira followed the 28% fall observed between 2017 and 2018. The persistence of the Turkish lira crisis is fueled by the concerns about the risk of rising inflation —already high— and even a balance-of-payment crisis. Currency reserves depletion, costly interventions (including buying foreign currencies) and the trade and political tensions with the US have also contributed to the lira plunge.

[4]The Brazilian real also continue its fall —*vis-à-vis* the US dollar— against a background of a social, political and economic crisis. The lack of credibility in the authorities and the slowdown of the economic reforms process have particularly increased the pessimism about the prospects for recovery of the Brazilian economy.

[5]Figure B.2 in Appendix B shows the changes in the terms of trade.

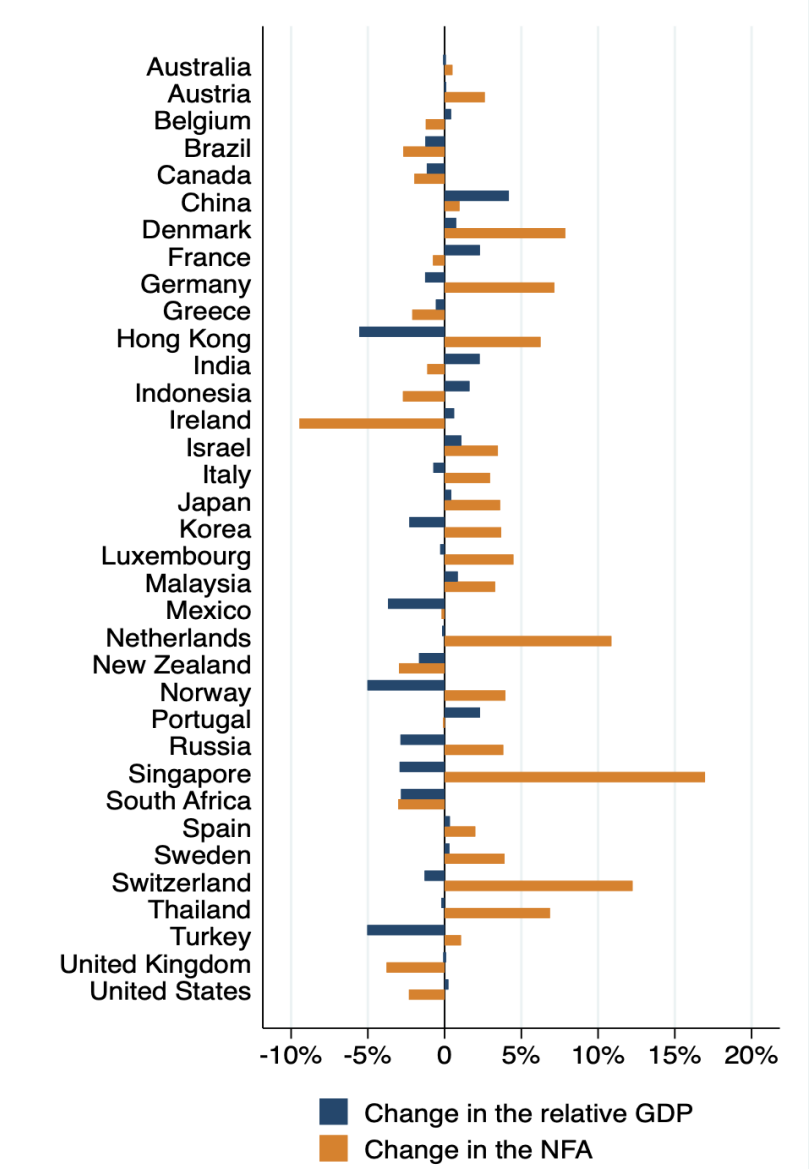


Figure 8 — Changes in the fundamentals: relative *GDP vs. NFA*

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. "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)

In contrast with the resulting ERER (estimated Equilibrium Real Exchange Rates) dynamics above discussed, the changes in the fundamentals and especially the net foreign asset position (NFA) during 2019 were quite significant. Indeed, countries like the Netherlands, Switzerland and Singapore display the most important improvements in their position (more than +10 percentage points). These improvements were, as visible in Figure B.4 in Appendix B, mainly driven by the large trade surpluses registered during 2019. As the Netherlands, all the euro area countries appear along the 0-reference line regarding the changes in the relative GDP. However, while Austria, Germany, Italy, Luxembourg and Spain registered an improvement in their

NFA, Belgium, France, Greece and Ireland experienced a deterioration of their position.[6] The largest fall for the here selected euro countries is displayed by Ireland and is explained by the services and primary income (more specifically the direct investment income) deficits —see Figure B.4. France and Portugal, however, registered the highest relative GDP increase (around 2.3%) among the euro area countries —in contrast with Germany displaying a 1.27% fall. As most euro area countries, changes in the relative GDP in Australia, Sweden, the United Kingdom and the United States are negligible. China and Turkey display opposed changes regarding the relative GDP; a 4.18% increase for the former and a 5% fall for the latter —both registered a 1 p.p. increase in the NFA. Changes regarding the relative GDP in Hong Kong and Norway are equivalent to that of Turkey. Finally, note that for Norway, the noted 8% fall in the estimated equilibrium exchange rate is largely due to the large negative terms of trade shock (-16% between 2018 and 2019) —see Figure B.2 in Appendix B. As a wrap-up —but also to give more insights, Table 2 provides an overview of the different movements that shaped the evolutions of currency misalignments between 2018 and 2019.

[6] The change for Portugal is negligible.

Table 2 — Summary of the movements in the major currencies

	Misalignments		Exchange rates			Equilibrium exchange rates and fundamentals			
	2018	2019	REER	NEER	NER	ERER	Rel. GDP	NFA	TOT
Australia	4.5	-2.7	-5.1	-4.9	-7.2	2.1	0.0	0.5	9.4
Austria	11.5	10.8	-0.4	-0.2	-4.6	0.3	0.1	2.6	0.3
Belgium	7.0	6.0	-0.4	-0.4	-4.6	0.7	0.4	-1.2	0.9
Brazil	-7.4	-1.2	5.6	-0.7	-7.7	-0.6	-1.3	-2.7	0.7
Canada	-10.2	-10.6	-0.9	-1.1	-2.4	-0.6	-1.2	-2.0	-0.6
China	-1.9	-3.3	-0.5	-2.0	-4.3	0.9	4.2	1.0	1.3
Denmark	-1.7	-3.6	0.3	-0.4	-5.5	2.1	0.8	7.9	3.8
France	2.2	-0.1	-1.7	-0.4	-4.6	0.6	2.3	-0.8	0.5
Germany	-8.9	-10.9	-1.3	-0.3	-4.6	0.7	-1.3	7.1	1.2
Greece	15.8	13.9	-2.3	-0.3	-4.6	-0.4	-0.6	-2.1	-1.5
Hong Kong	5.4	10.1	3.8	3.1	0.0	-0.9	-5.6	6.3	0.0
India	-15.3	-8.5	7.1	-0.5	-2.9	0.3	2.3	-1.1	1.1
Indonesia	-17.0	-12.1	4.5	2.8	0.6	-0.3	1.6	-2.7	-0.8
Ireland	-4.7	-5.1	-0.6	-1.1	-4.6	-0.3	0.6	-9.5	0.3
Israel	2.3	4.0	2.9	4.0	0.7	1.3	1.1	3.5	2.3
Italy	5.9	4.7	-1.0	-0.4	-4.6	0.2	-0.7	3.0	2.0
Japan	-10.2	-8.5	2.4	3.8	1.3	0.7	0.4	3.6	1.6
Korea, Rep.	-4.8	-9.1	-4.8	-3.5	-5.7	-0.5	-2.3	3.7	-4.2

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2018 and 2019 (year average values) expressed in percentage —except changes in NFA which are expressed in percentage points. "REER" (resp. "NEER") stands for Real (resp. Nominal) Effective Exchange Rate; "NER"= Nominal bilateral Exchange Rate *vis-à-vis* the US dollar; "ERER"=estimated Equilibrium Real Exchange Rate; "Rel. GDP" stands for Relative GDP per capita in PPP terms (our Balassa-Samuelson effect proxy); "NFA"= Net Foreign Asset position; "TOT"= terms of trade.

(Continued on next page)

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

	Misalignments		Exchange rates			Equilibrium exchange rates and fundamentals			
	2018	2019	REER	NEER	NER	ERER	Rel. GDP	NFA	TOT
Luxembourg	-3.4	-3.7	-0.5	-0.3	-4.6	-0.2	-0.3	4.5	-1.5
Malaysia	-32.6	-35.0	-1.6	-0.7	-2.6	0.8	0.9	3.3	1.1
Mexico	-17.0	-12.6	3.4	1.4	-0.1	-0.9	-3.7	-0.2	-1.4
Netherlands	-7.3	-6.2	2.0	-0.3	-4.6	0.9	-0.2	10.9	0.2
New Zealand	13.4	11.9	-2.0	-1.8	-4.9	-0.5	-1.7	-3.0	1.2
Norway	-21.1	-15.4	-2.4	-3.3	-7.9	-8.2	-5.0	4.0	-16.1
Portugal	6.1	5.4	0.0	0.7	-4.6	0.7	2.3	-0.1	0.4
Russian Federation	-9.0	-5.8	3.1	1.0	-3.2	-0.2	-2.9	3.8	-2.3
Singapore	-17.8	-19.1	-0.2	0.9	-1.1	1.1	-2.9	17.0	-2.3
South Africa	-27.6	-27.8	-1.3	-4.4	-8.8	-1.1	-2.8	-3.0	1.2
Spain	6.3	6.0	0.0	-0.1	-4.6	0.4	0.3	2.0	0.7
Sweden	-18.0	-23.5	-4.1	-3.9	-8.4	1.4	0.3	3.9	2.1
Switzerland	8.2	8.5	1.6	2.2	-1.6	1.3	-1.3	12.2	2.0
Thailand	-8.9	-5.0	5.2	6.1	4.0	1.3	-0.2	6.9	0.2
Turkey	-25.1	-24.9	-0.4	-12.8	-16.1	-0.7	-5.0	1.1	-0.2
United Kingdom	-7.8	-9.1	-1.1	-0.5	-4.4	0.2	0.0	-3.8	1.2
United States	10.9	13.9	3.1	3.0	0.0	0.2	0.2	-2.3	0.5

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2018 and 2019 (year average values) expressed in percentage —except changes in NFA which are expressed in percentage points. "REER" (resp. "NEER") stands for Real (resp. Nominal) Effective Exchange Rate; "NER"= Nominal bilateral Exchange Rate *vis-à-vis* the US dollar; "ERER"=estimated Equilibrium Real Exchange Rate; "Rel. GDP" stands for Relative GDP per capita in PPP terms (our Balassa-Samuelson effect proxy); "NFA"= Net Foreign Asset position; "TOT"= terms of trade.

4. Regional outlooks

This section is devoted to an overview of the geographical configuration of currency misalignments in 2019. 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 125 countries distributed as follows: 31 African countries, 23 for America, 28 Asian countries, 37 countries for Europe and 6 countries for Oceania.

4.1. Africa

Overall, as visible in Figure 9, the configuration of currency misalignments in Africa evolved marginally between 2018 and 2019. Actually, 11 countries (out of 31) registered change in their misalignment greater —or equal— to 5 percentage points.

On the one hand, Burundi, Chad, Congo, Kenya, Mali and Ghana increased by at least 5 percentage points their misalignments. More specifically, except Congo and Kenya, these countries experienced a downward movement that resulted in an increase of their undervaluation. In contrast, Congo and Kenya experienced an upward movement that led to an increase of the overvaluation of the Kenyan shilling and a shift from a slight undervaluation to an overvaluation —although moderate— in Congo.

On the other hand, for Algeria, Egypt, Nigeria, Rwanda and Seychelles, the misalignments —actually undervaluations— noticeably decreased. The changes are particularly substantial in Egypt and Nigeria were the undervaluations plummeted by 23 p.p. and 14 p.p., respectively. For Algeria, Rwanda and Seychelles, the changes are around -7 p.p. As previously, the right chart of Figure 9 give more details on the sources of the changes by disentangling the dynamics of the REER and that of the ERER. For Egypt that registered the most important change, this latter fully reflects the dynamics of the REER that appreciated by 23% —the change in the ERER is actually negligible. This also the case for Nigeria and Rwanda, with a minor role of the ERER depreciation in the case of Nigeria.[7] For Algeria, however, both the REER appreciation and the ERER depreciation contributed to the reduction of the misalignment.

The rest of the countries display relatively small changes in their misalignments —i.e. within the -/+5 percentage points range. While the majority of western African countries experienced a downward movement, the trend was generally upward in other regions. The general picture remained however the same between 2018 and 2019 as the major changes that occurred in few countries did not ended up with

[7] Similarly, for the above countries that registered an increase in their misalignment (i.e. Burundi, Chad, Congo, Kenya, Mali and Ghana), the REER dynamics principally shaped the evolutions.

an overturning of the situations, i.e. changes from overvaluation to undervaluation — and vice versa.

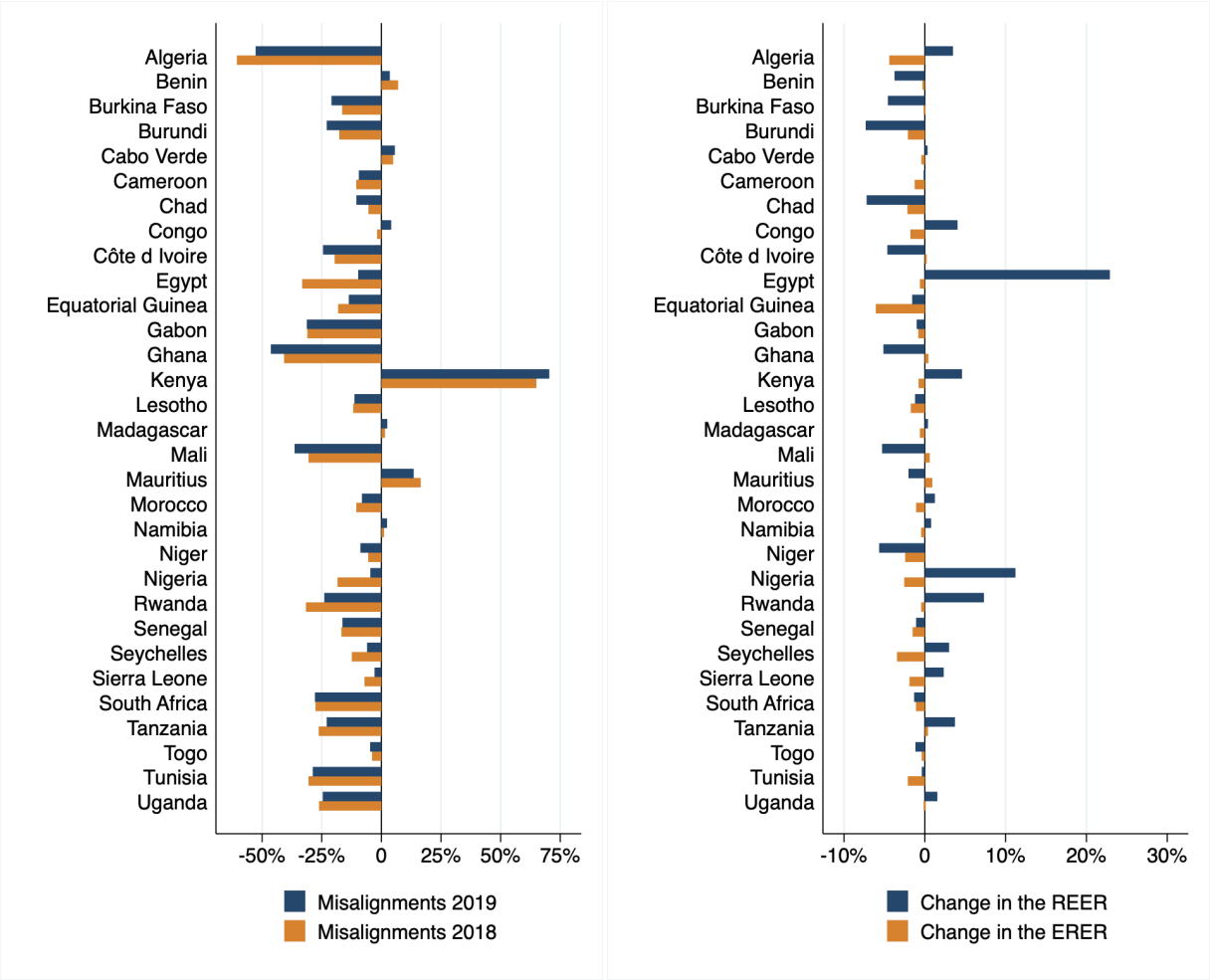


Figure 9 — Africa | Currency misalignments and sources of the changes

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

4.2. America

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

During 2019, the US dollar appreciated by about 3% in real effective terms. Meanwhile, the change in the ERER has been negligible. As a result, the US dollar has registered a 3 percentage points increase of its overvaluation. In Canada, the level of the currency misalignment in 2019 is broadly unchanged compared to 2018.

Indeed, as noted above, Canada still display an undervaluation around 10%. This unchanged situation reflects the (near) absence of variations of both the REER and the ERER.

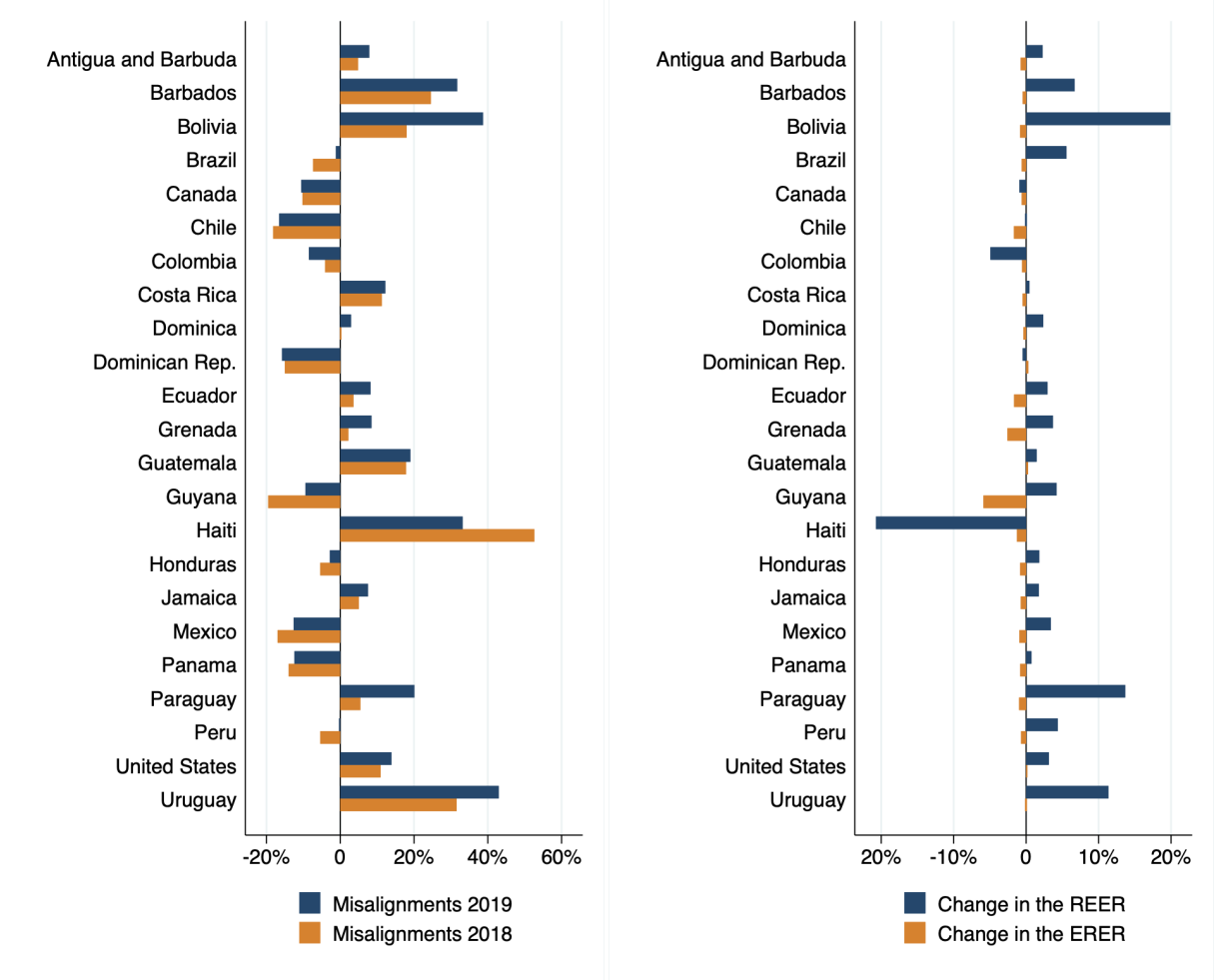


Figure 10 — America | Currency misalignments and sources of the changes

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

In Latin America, the changes regarding currency misalignments were generally upward. From 2018 to 2019, currency misalignments have thus declined in Brazil, Guyana, Haiti, Mexico and Peru, while increasing in the other countries. Haiti registered the largest fall with a 19 p.p. reduction of its overvaluation owing to the depreciation of its REER. Guyana, Brazil and Peru follow behind with a reduction of 10 p.p., 6 p.p., and 5p.p., respectively.[8] In contrast with this group, Bolivia tops the list of countries that experienced an increase in their misalignments. Bolivia has seen

[8] Chile and Panama also registered a reduction of their undervaluations but the magnitudes of these changes are relatively small.

its overvaluation increased by 20 p.p. due to the appreciation of its REER (19%). Similarly, Paraguay and Uruguay, due to the appreciation of their REER, have seen their overvaluation increased by 15 p.p. and 11 p.p., respectively.

Overall, the dynamics of the exchange rates principally explain the changes in the misalignments for the American countries between 2018 and 2019. Therefore, the observed adjustments appear purely temporary. The 2019's configuration of currency misalignments in America is characterized by important misalignments with Canada, Chile, Dominican Rep., Mexico and Panama displaying undervaluations higher than 10%, and Barbados, Bolivia, Costa Rica, Guatemala, Haiti, Paraguay, the United States and Uruguay displaying overvaluations above 10%.

4.3. Asia

In Asia, changes in the currency misalignments between 2018 and 2019 have been rather weak. Indeed, excluding India and Pakistan, changes were in the -/+5 p.p. interval.

Pakistan is the country that registered the most important increase in its misalignment; a 14.5 p.p. increase in its undervaluation. India follow way behind with a 7 p.p. reduction of its undervaluation. However, for both countries, the changes are the outcomes of the REER dynamics, a depreciation in the case of Pakistan and an appreciation for India.

Apart from these countries, the relative stability of 2019 has thus entrenched —somehow— the groups of countries identified in 2018. Among the different groups, that of the "stable and in line currencies" still be composed of very few countries. China still belongs to this group despite a rather small (1.4 p.p.) increase in its undervaluation; the renminbi was undervalued by about 3%. This is also the case for Cyprus, Israel and Philippines that appeared again broadly in line despite slight movements of their REER. Sri Lanka, is the entrant to the "in line currencies" group thanks to the depreciation of its REER that reduced its "moderate overvaluation".

Countries that displayed very important misalignments have also and surprisingly shown —a relative— stability. More specifically, the United Arab Emirates saw its overvaluation decreased by only 3 p.p. and settle around 45%. At the other end, Malaysia increased its undervaluation by 2 p.p. while no change was noted for Turkey —the undervaluations are respectively of -35% and -25%. As discussed above, the stability of the Turkish lira undervaluation —in a context of a "currency crisis"— is explained by the absence of pass-through from the nominal to the real exchange

rate due to the inflation spur. In the same vein, the Japanese yen, owing to its appreciation, marginally reduced its undervaluation. Bangladesh and Hong Kong on the one hand, and Korea and Thailand, on the other hand, registered changes in misalignments of similar amplitudes —around 5 p.p.— but in opposite directions. Bangladesh and Hong Kong (resp. Korea and Thailand) have actually registered an increase (resp. decrease) of their overvaluation (resp. undervaluations).[9]

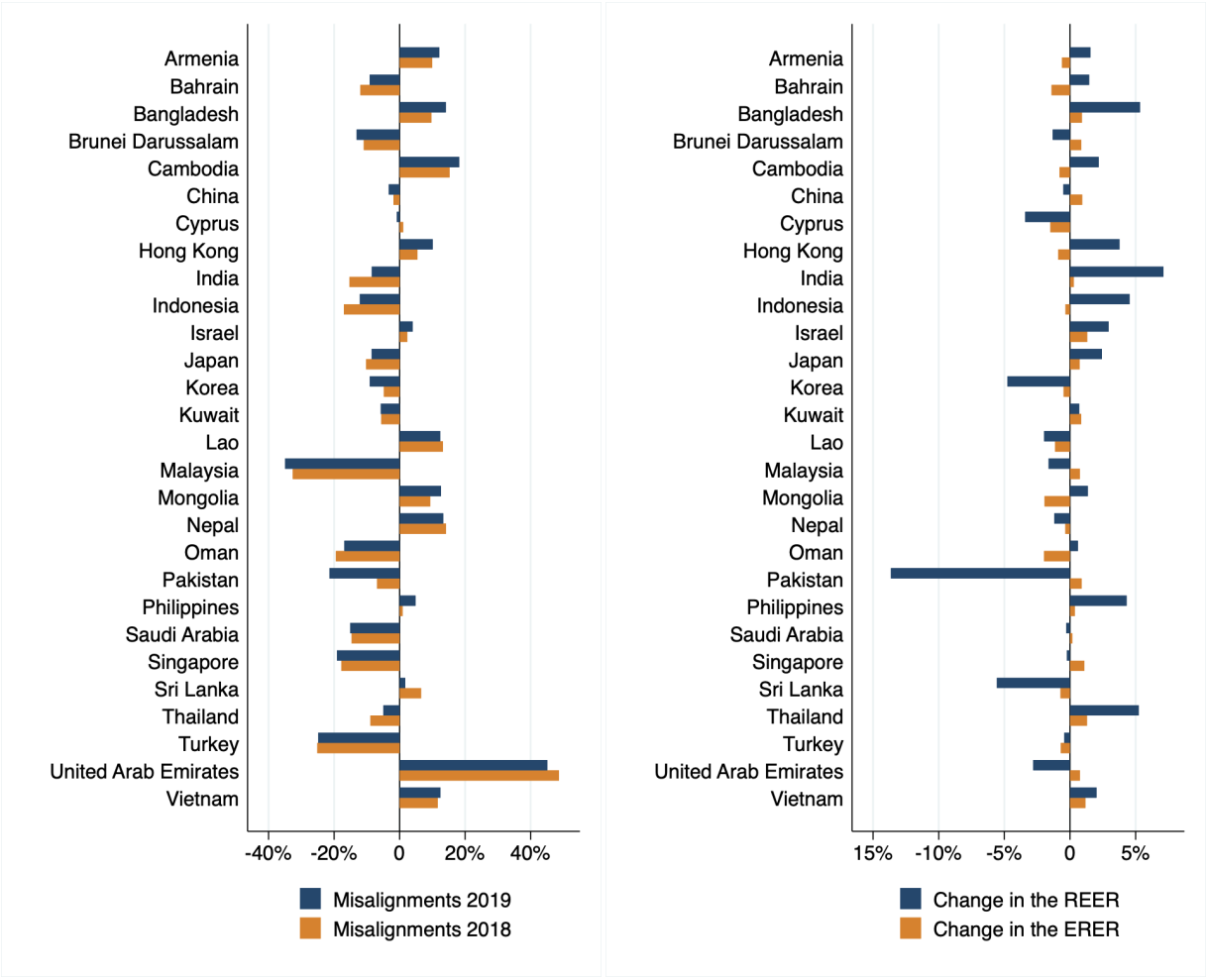


Figure 11 — Asia | Currency misalignments and sources of the changes

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

4.4. Europe

Europe is no exception regarding the relative stability of currency misalignments between 2018 and 2019. Indeed, as visible in Figure 12, Iceland, Norway, Sweden

[9] The rest of the region is marked by relatively small movements in the currency misalignments. As previously noted, the REER dynamics again principally shaped the evolution.

and Ukraine are the only countries that displayed significant changes between 2018 and 2019. Regarding Ukraine, the hryvnia was the currency that experienced the largest swing in Europe with a 14% appreciation of the REER that closed the 2018's 11% undervaluation. Thus, in 2019, the hryvnia was broadly in line with a very slight overvaluation around 3%. Iceland, Norway and Sweden, contrary to Ukraine, registered a downward movement. For Iceland and Sweden, this movement was fueled by the REER depreciation and resulted in a fall of the overvaluation (-7.6 p.p.) in Iceland and a 5.5 p.p. increase of the undervaluation in Sweden. Change in the Norwegian krone's misalignment was similar to that of the Swedish krona in terms of magnitude but originated principally from the depreciation of the equilibrium exchange rate —due to the negative terms of trade shock and relative growth. These changes in Northern Europe, essentially conjectural, are not of a corrective nature and leave unchanged the considerable heterogeneity between the countries. Northern Europe was actually marked in 2019 with a wide range of misalignments; from -23% for Sweden, to +17% for Iceland. Within this range, the British pound saw its undervaluation sticks around 9% —a value relatively stable compared to the 2018's undervaluation (around -7%).

Elsewhere, especially in Western and Central Europe, movements have been of small amplitudes and generally downward. The Netherlands and Switzerland are the two exceptions to the general dynamics. In contrast with the other euro area countries, the Dutch REER appreciated by around 2% which led to a marginal reduction of the undervaluations (see further details in Box 6). The Swiss franc also appreciated in real effective terms but the similar increase in the ERER let unchanged the misalignment. As in 2018, the Swiss franc displayed a 8% overvaluation in 2019.

Changes in Eastern Europe have been more balanced. Like Ukraine, Albania, Bulgaria and Russia —among others— registered an upward movement in their misalignment. While this movement resulted in an increase of the misalignment for Albania and Bulgaria, it led to a reduction of the ruble's undervaluation. In 2019, the ruble was undervalued by about 6%. The picture holds also for Latvia and Slovakia even if the magnitudes of the changes are smaller. In contrast, countries like Croatia, Estonia, Macedonia or Poland registered a downward movement that reduced the overvaluations —and increased the undervaluation in the case of Macedonia.

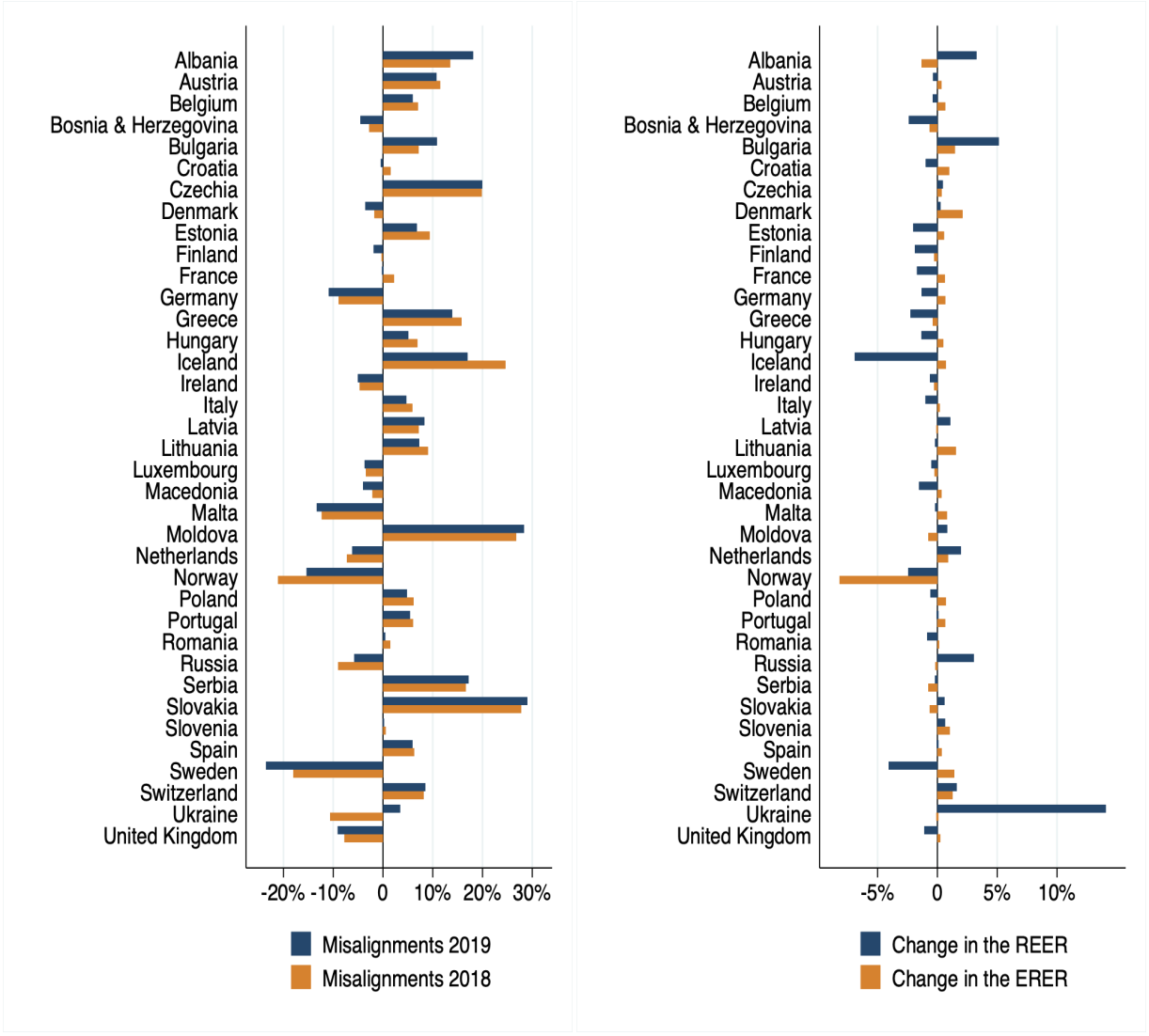
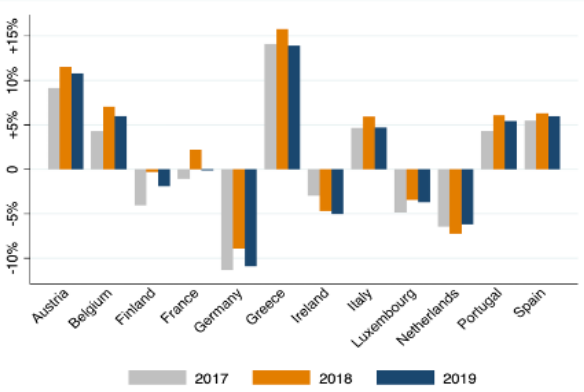


Figure 12 — Europe | Currency misalignments and sources of the changes

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

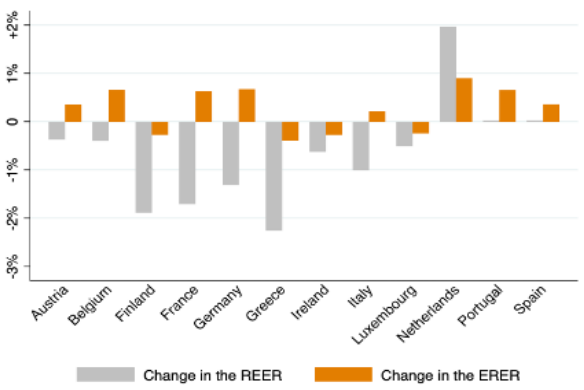
Box 6 — Monitoring (Macroeconomic) imbalances within the euro area

The changes in the currency misalignments —between 2018 and 2019— within the euro-zone have been of relatively small amplitudes (see Box Figure 6.1). Indeed, only France and Germany displayed changes of at least 2 percentage points. While Germany increased its undervaluation, the movement noted for France resulted in a slight undervaluation and does not change the overall assessment of the currency misalignments. As in 2018, France remained broadly in line. Finland and Greece follow behind with changes around 1.5 p.p. Actually, as visible, all the countries except the Netherlands experienced a downward movement in their misalignment. As a result, after a reduction of its overvaluation, Italy joined the group of countries broadly in line with their fundamental equilibrium. This latter group also includes Finland, Ireland and Luxembourg.

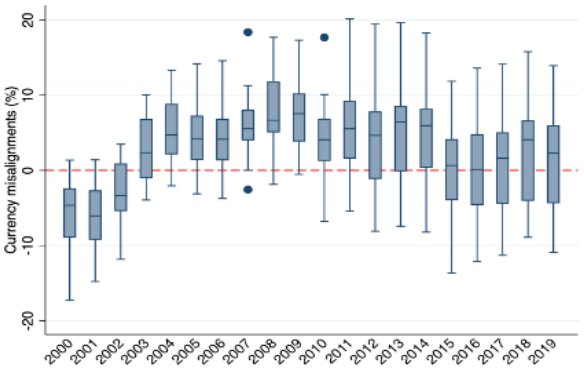


Box Figure 6.1 — Currency misalignments
Source: *EQCHANGE* (CEPII)

As can be seen in Box Figure 6.2, the evolution of the misalignments was principally shaped by the REER dynamics except in Portugal and Spain. In these latter countries, the —slight—reduction of the overvaluation comes from the appreciation of the ERER. To a lesser extent, the story holds also Belgium where the appreciation of the ERER played a more important role than the REER depreciation —regarding the reduction of the overvaluation. However, as noted above, it should be kept in mind that the adjustments noted for 2019 were marginal and mostly conjectural —because they were generally driven by the REER dynamics. In addition, it appears that they had no consequences regarding the heterogeneity between the countries. This latter, proxied overtime by the dispersion of currency misalignments in the zone, remains relatively stable since 2011 —see the boxplots in Box Figure 6.3.



Box Figure 6.2 — Underlying factors (2018-19)
Note: Changes are expressed in percentage
Source: *EQCHANGE* (CEPII)



Box Figure 6.3 — Evolution of the distribution of currency misalignments in the euro area
Notes: The figure presents boxplots of the misalignments over time. The dots in 2007 and 2011 correspond to outliers.

4.5. Oceania

The evolution of currency misalignments in Oceania has been principally marked by the fall in the Australian dollar misalignments. Between 2018 and 2019, the Aussie dollar depreciated by 5% in real effective terms. Meanwhile, the ERER appreciated by 2%. As a result, the Australian dollar closed its 2018's 5% overvaluation and was, in 2019, undervalued by around 2.7%. Similarly, the New Zealand dollar depreciated during 2019, although to a lesser extent (2%). With a negligible change regarding the ERER, the New Zealand dollar reduced its overvaluation from 13% to 11%. In contrast with the above countries, the other retained countries experienced an upward movement in their misalignments. This was particularly the case for the Solomon Islands that have registered an almost 6 p.p. increase of its overvaluation. In 2019, the currency misalignment for the Solomon Islands was estimated around 14%. The Solomon Islands are followed by Fiji and Papua New Guinea that both registered a 2 p.p. increase of their misalignment. However, these latter two countries remained broadly in line in 2019. Finally, as previous years, the situation for Samoa was broadly unchanged —a 18% overvaluation.

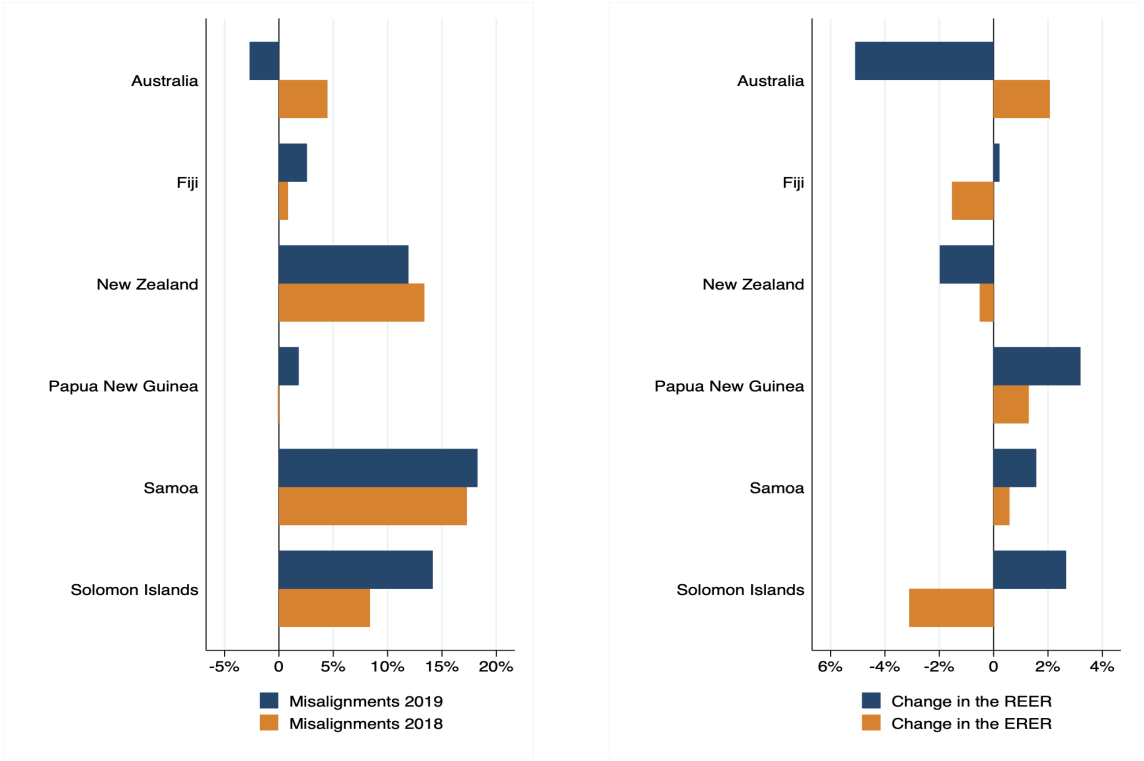


Figure 13 — Oceania | Currency misalignments and sources of the changes

Note: In the left chart, a positive (resp. negative) sign indicates an overvaluation (resp. undervaluations). In the right chart, "REER" (resp. "ERER") stands for the Real Effective (resp. Equilibrium Real Effective) Exchange Rates. A positive sign in both measures indicates an appreciation. Both scale express changes in percentage.
Source: EQCHANGE (CEPII)

Appendices

Appendix A. Estimated currency misalignments

Table A.1 — Estimates of currency misalignments in 2019 (in %)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Albania	18.1	5	Denmark	-3.6	4
Algeria	-52.7	5	Dominica	3.0	5
Antigua and Barbuda	7.9	2	Dominican Rep.	-15.8	5
Armenia	12.1	5	Ecuador	8.2	1
Australia	-2.7	5	Egypt	-9.7	5
Austria	10.8	2	Equatorial Guinea	-13.6	5
Bahrain	-9.1	1	Estonia	6.8	4
Bangladesh	14.1	5	Fiji	2.6	5
Barbados	31.7	5	Finland	-1.9	5
Belgium	6.0	1	France	-0.1	1
Benin	3.5	1	Gabon	-31.2	1
Bolivia	38.7	3	Germany	-10.9	3
Bosnia & Herzegovina	-4.5	4	Ghana	-46.3	5
Brazil	-1.2	2	Greece	13.9	5
Brunei Darussalam	-13.1	2	Grenada	8.5	5
Bulgaria	10.8	5	Guatemala	19.0	2
Burkina Faso	-20.9	3	Guyana	-9.4	2
Burundi	-22.9	4	Haiti	33.2	4
Cabo Verde	5.6	5	Honduras	-2.8	2
Cambodia	18.2	3	Hong Kong	10.1	5
Cameroon	-9.4	5	Hungary	5.1	5
Canada	-10.6	1	Iceland	17.0	3
Chad	-10.4	4	India	-8.5	5
Chile	-16.5	5	Indonesia	-12.1	5
China	-3.3	5	Ireland	-5.1	5
Colombia	-8.5	5	Israel	4.0	3
Congo	4.1	5	Italy	4.7	1
Costa Rica	12.2	3	Jamaica	7.5	1
Côte d'Ivoire	-24.4	5	Japan	-8.5	5
Croatia	-0.4	2	Kenya	70.4	5
Cyprus	-0.8	5	Korea, Rep.	-9.1	5
Czechia	20.0	2	Kuwait	-5.7	5

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 2019 (in %; *Continued*)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Lao PDR	12.4	2	Romania	0.5	5
Latvia	8.3	1	Russian Federation	-5.8	4
Lesotho	-11.2	1	Rwanda	-23.9	2
Lithuania	7.3	3	Samoa	18.3	0
Luxembourg	-3.7	5	Saudi Arabia	-15.1	0
Macedonia, TYFR	-4.0	2	Senegal	-16.3	2
Madagascar	2.4	2	Serbia	17.2	3
Malaysia	-35.0	5	Seychelles	-6.0	1
Mali	-36.3	5	Sierra Leone	-2.8	2
Malta	-13.3	5	Singapore	-19.1	5
Mauritius	13.5	4	Slovakia	29.0	5
Mexico	-12.6	2	Slovenia	0.2	1
Moldova, Rep.	28.4	3	Solomon Islands	14.1	5
Mongolia	12.6	5	South Africa	-27.8	5
Morocco	-8.2	5	Spain	6.0	5
Namibia	2.3	3	Sri Lanka	1.7	4
Nepal	13.3	4	Sweden	-23.5	3
Netherlands	-6.2	4	Switzerland	8.5	4
New Zealand	11.9	5	Tanzania	-22.9	5
Niger	-8.7	4	Thailand	-5.0	5
Nigeria	-4.6	5	Togo	-4.7	5
Norway	-15.4	3	Tunisia	-28.8	5
Oman	-16.9	2	Turkey	-24.9	3
Pakistan	-21.4	4	Uganda	-24.6	2
Panama	-12.4	4	Ukraine	3.4	5
Papua New Guinea	1.8	5	United States	13.9	2
Paraguay	20.1	4	United Arab Emirates	45.1	5
Peru	-0.3	5	United Kingdom	-9.1	4
Philippines	4.9	5	Uruguay	43.0	2
Poland	4.8	3	Vietnam	12.5	2
Portugal	5.4	5			

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

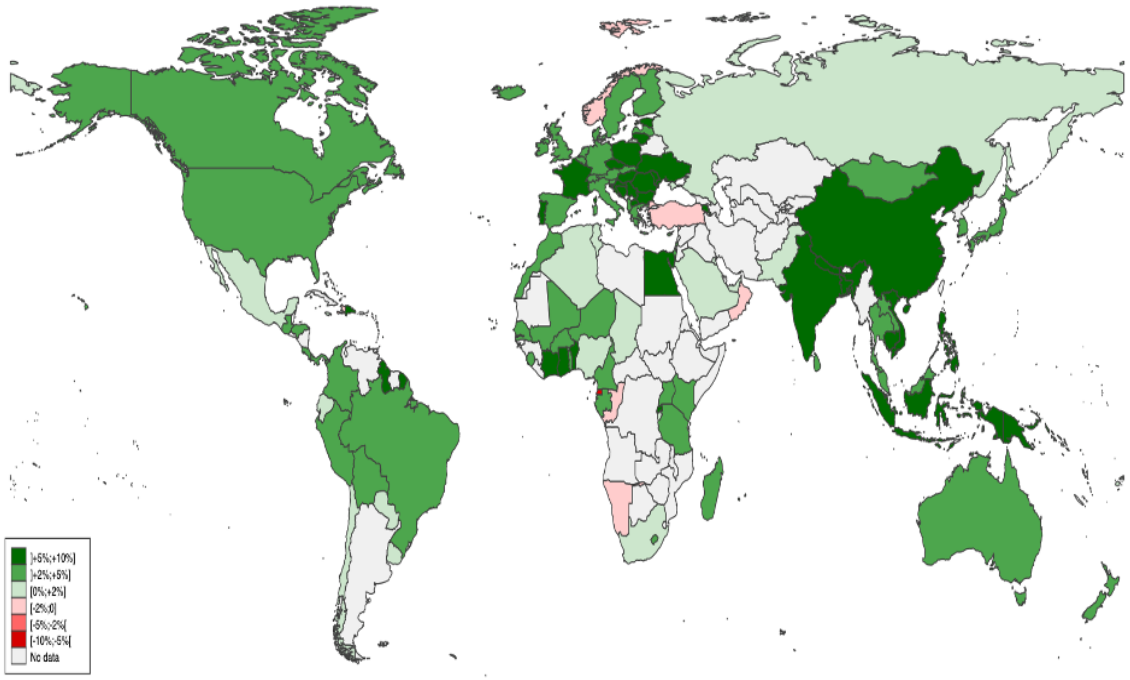


Figure B.1 — Economic growth in 2019

Note: Data —i.e. real GDP per capita in PPP terms— are from the World Development Indicators database (World Bank).

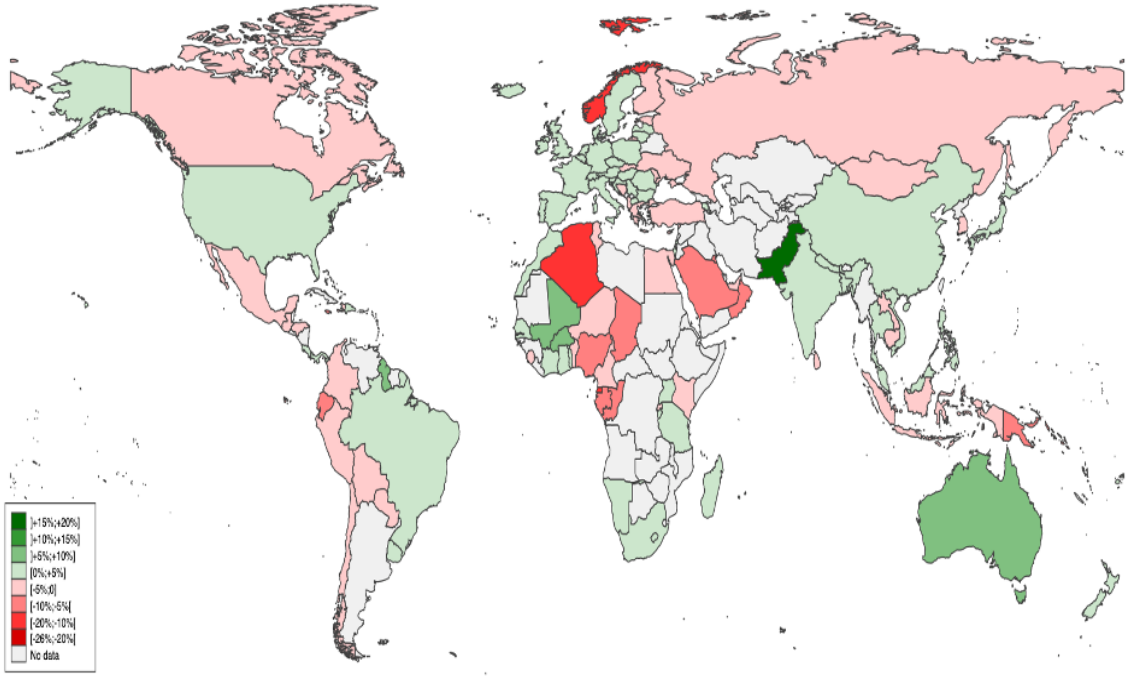


Figure B.2 — Change in the terms of trade (2018-2019)

Note: Data are from the UNCTAD database.

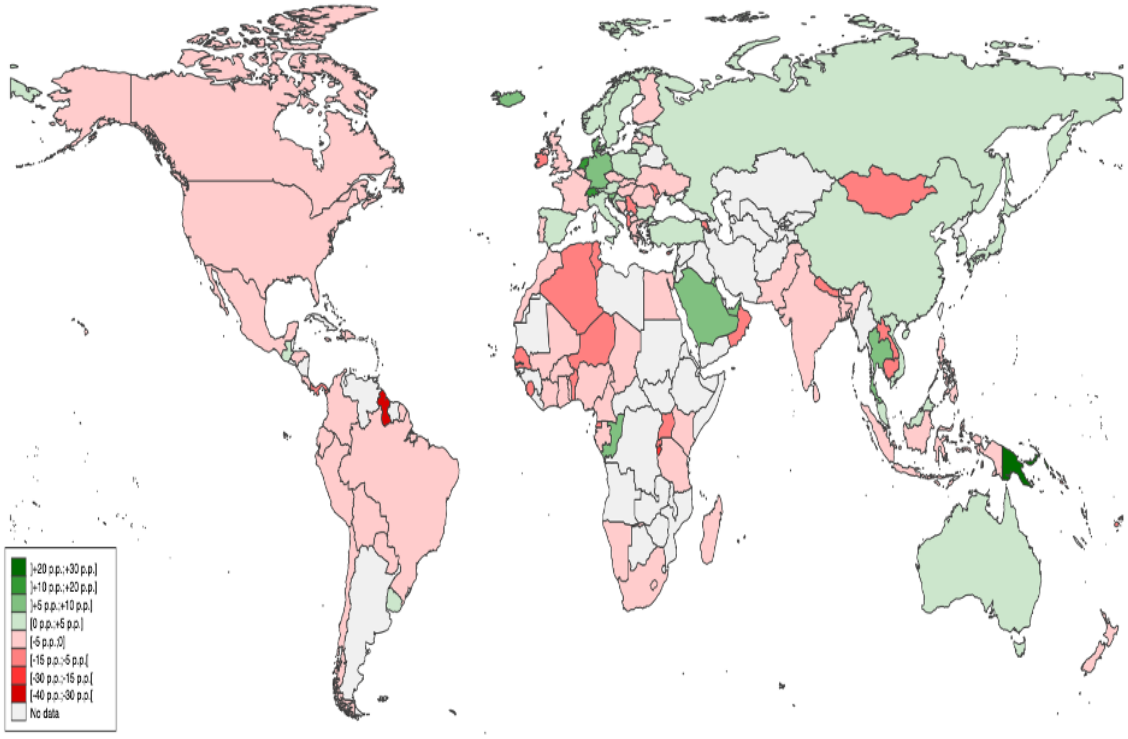


Figure B.3 — Change in the net foreign asset positions (2018-2019)

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

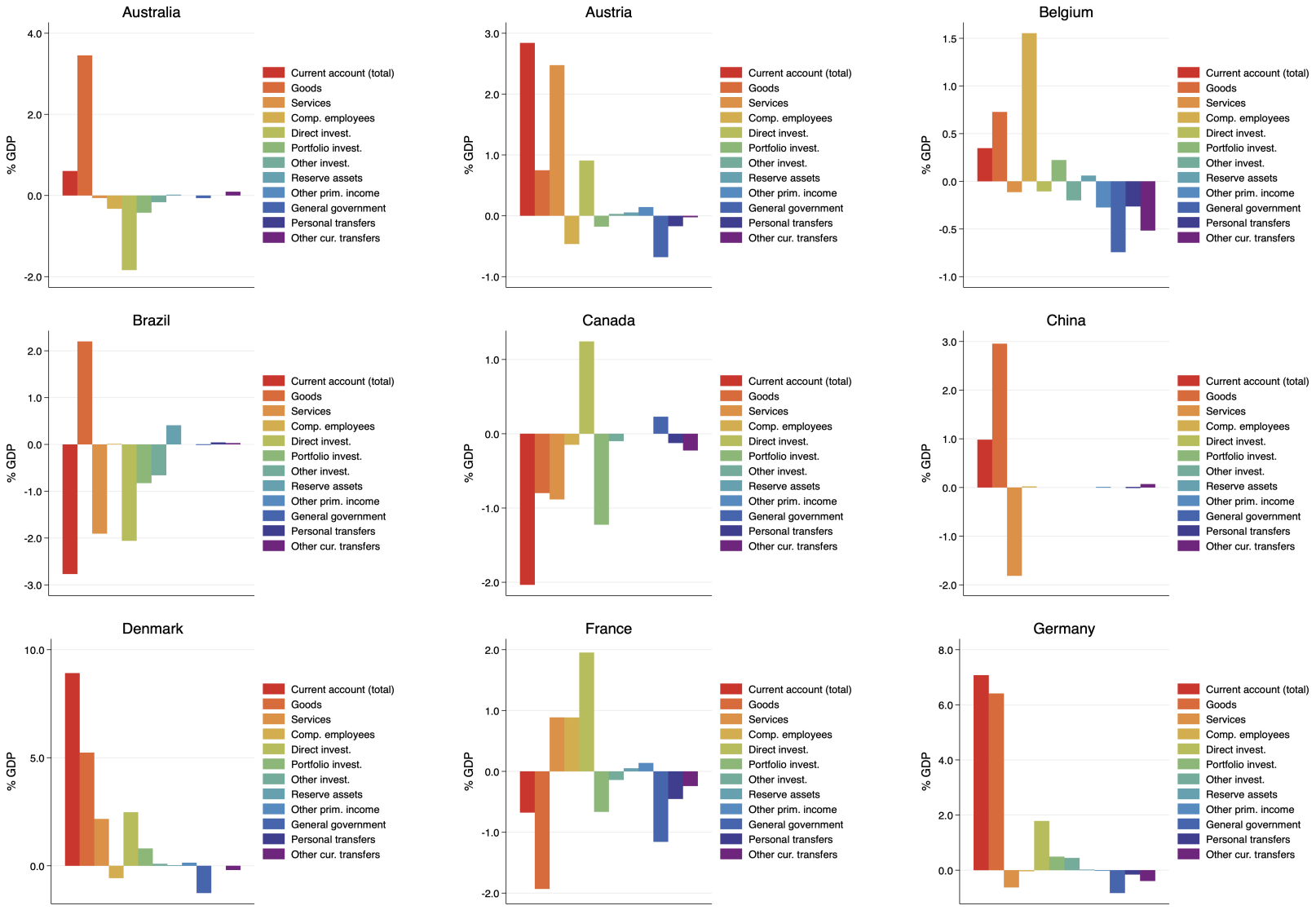


Figure B.4 — Current account and its components (2019, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

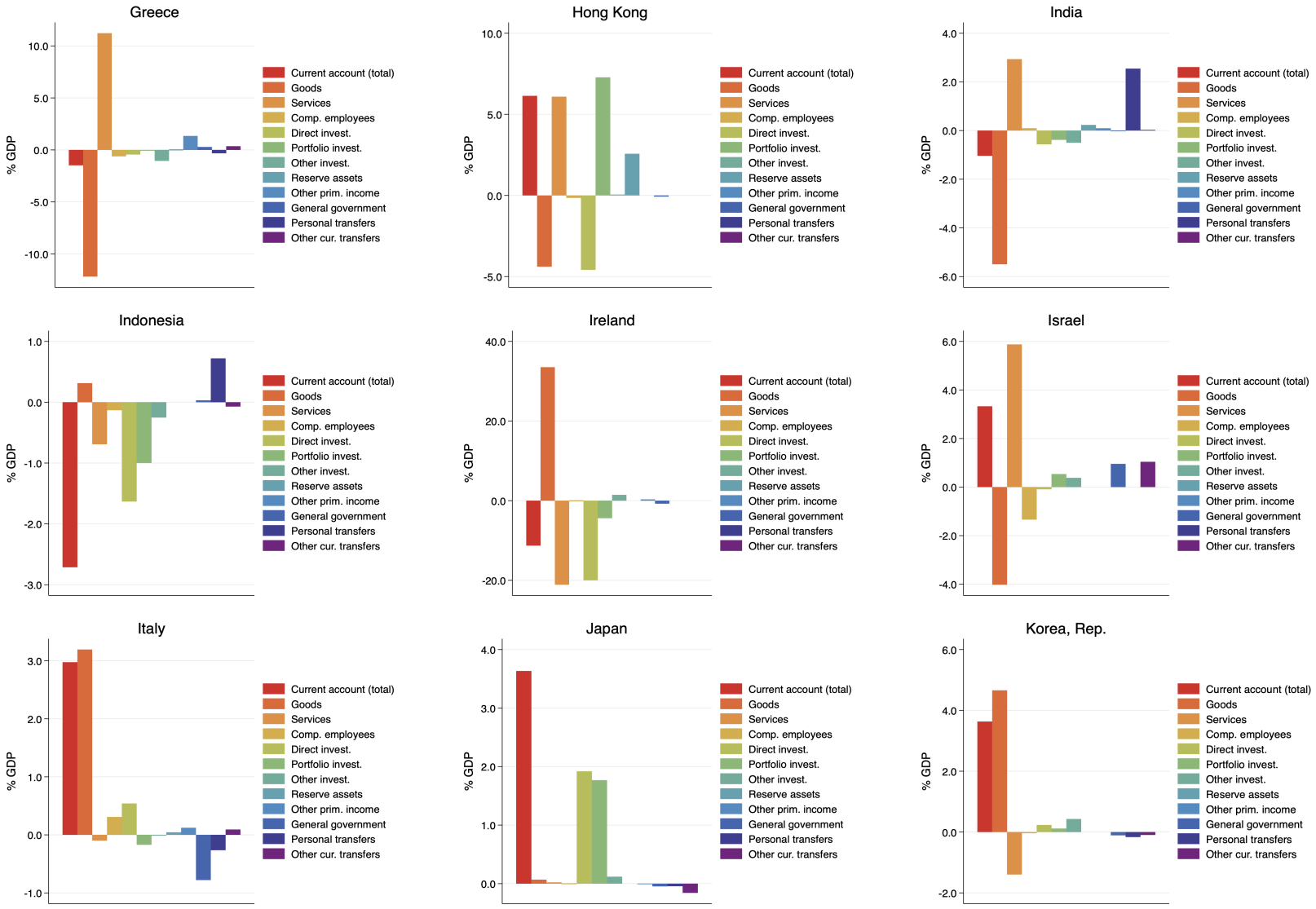


Figure B.4 — Current account and its components (2019, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

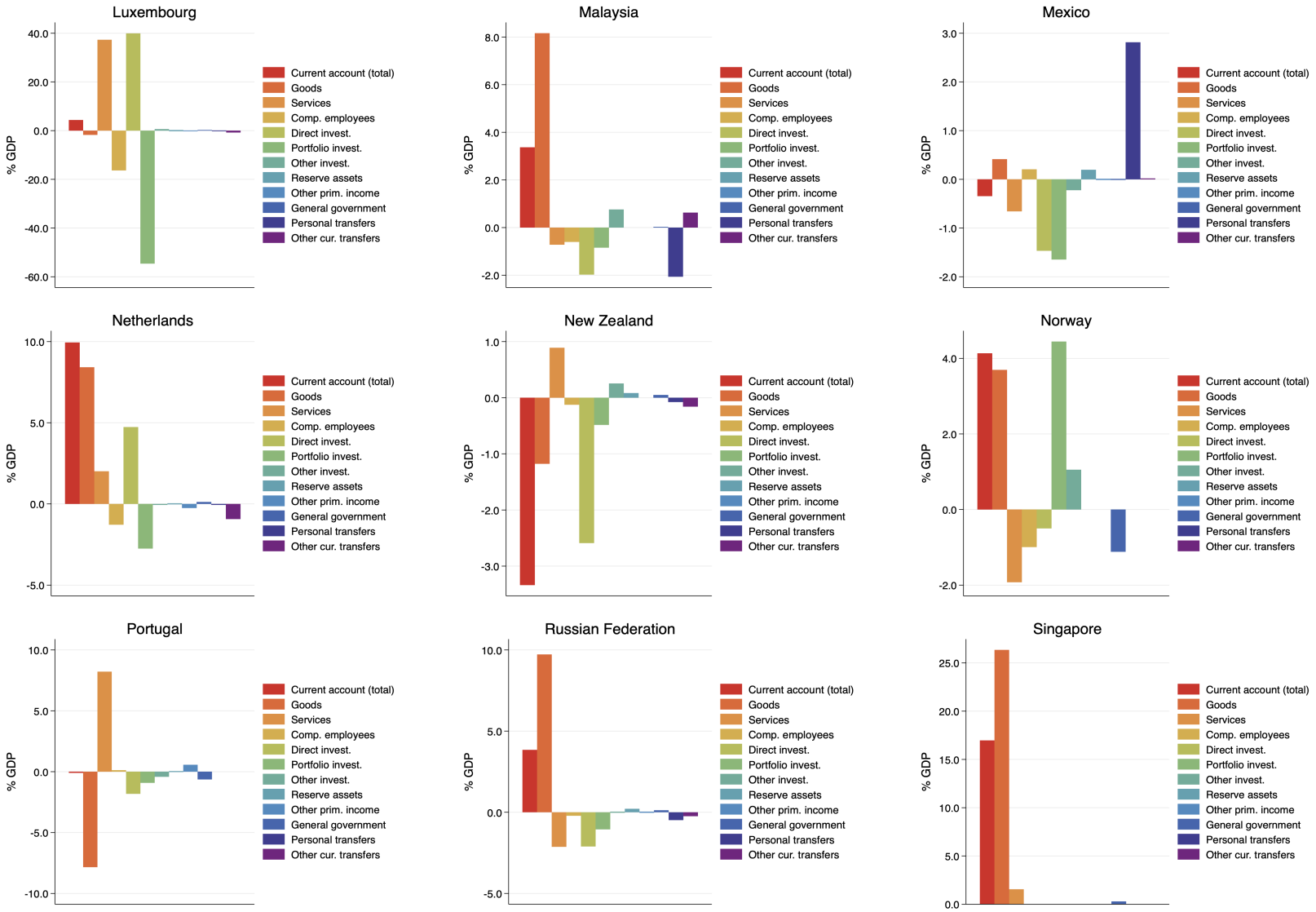


Figure B.4 — Current account and its components (2019, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

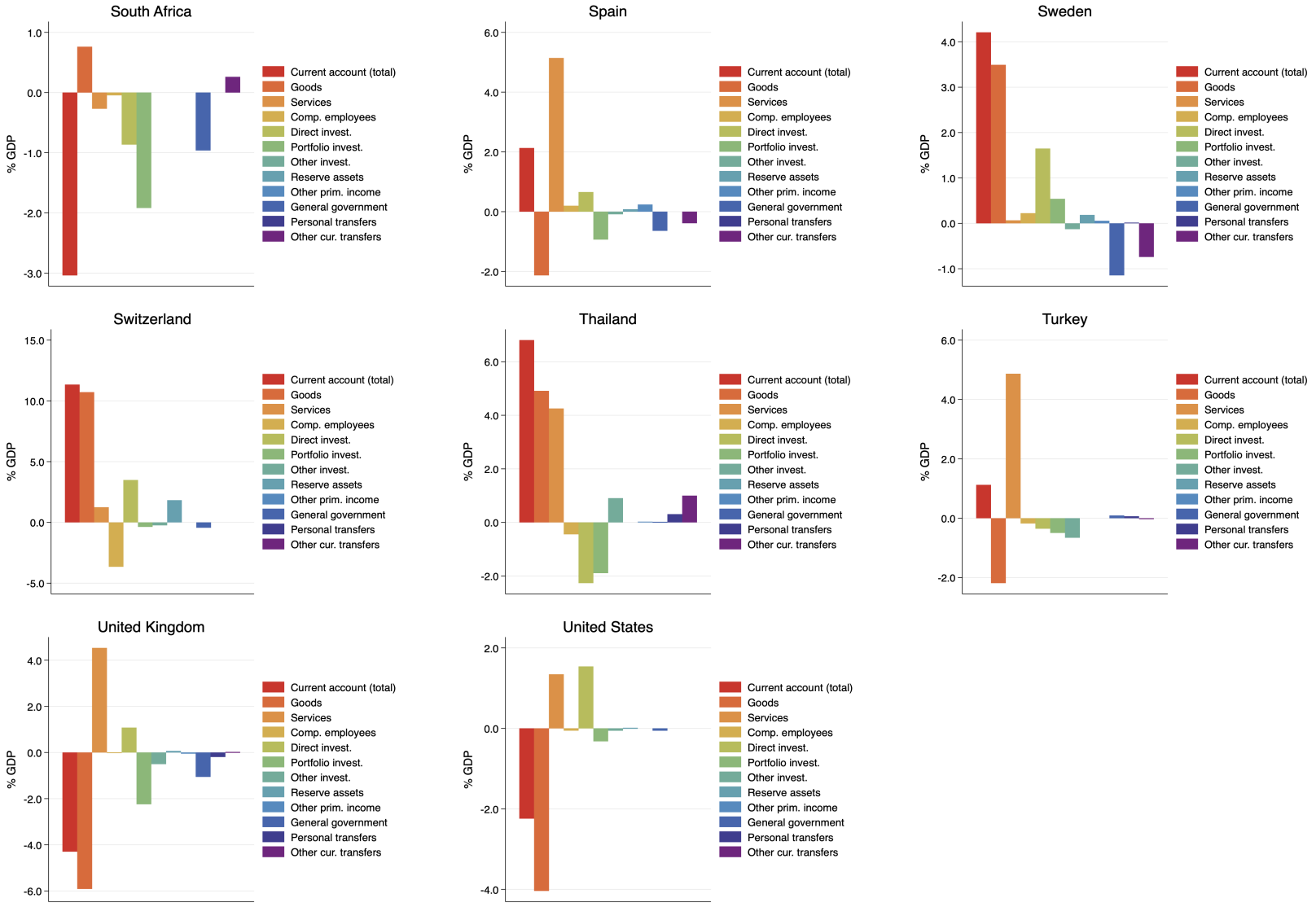


Figure B.4 — Current account and its components (2019, %GDP)

Note: Data are from the Balance of Payments Statistics (BOPS; IMF). "Comp. employees" = compensation of employees; "invest." stands for investment; "Other prim. income" = other primary income; "Other cur. transfers" = other current transfers.

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.[10] 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,

[10] 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.[11]

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.[12]

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)[13], 9 show a very good match between the ESR staff-assessed REER gap midpoints and the *EQCHANGE* estimates of misalignments. These are: Australia, Belgium, China, the euro area, Germany, India, Italy, the Netherlands 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 India and the Netherlands. 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 8 others for which the different estimates are very close: Brazil, France, Mexico, Russia, Spain, Thailand, Turkey and Japan.[14]

For the remaining 11 economies presented in Table C.1, the IMF assessments differ —sometimes dramatically— from ours. However, for three of them —namely Hong Kong, Saudi Arabia and Singapore— the comparison of the estimates is not

[11] 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.

[12] 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.

[13] 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.

[14] In the specific cases of Japan and Turkey, it is note worth noting that the large uncertainty surrounding the IMF estimates of the REER gaps —through the different approaches— makes that our estimates overlap. Somehow, this is also the case of Korea.

really possible since they are not included in the EBA estimation samples.[15]

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

	External Sector Report					*EQCHANGE*	
	Staff-assessed REER gap		*Estimates by approach*[a]				
	Midpoint	Range	CA	REER level	REER index	Mis	Std. Err.
Australia	-4	+/-2.5	-4	10.2	-1.4	-2.7	5
Belgium	8.5	+/-2.5	8.3	17.1	9.3	6	1
Brazil	3.5	+/-7.5	11.4	2.3	-10.7	-1.2	2
Canada	7.1	+/-5.6	6.8	-6	2.1	-10.6	1
China	-2	+/-10	-4.4	11.4	-1.1	-3.3	5
Euro area[a]	-2.8	+/-2.9	-3.4	-0.7	4.2	-1.6	2.6
France	4.1	+/-1.9	4.1	3.2	-2.7	-0.1	1
Germany	-11	+/-5	-11.8	-16	3.6	-10.9	3
Hong Kong	-2.5	+/-5	NR	NR	NR	10.1	5
India	-5.6	+/-5.5	-5.6	10.2	13.4	-8.5	5
Indonesia	3.9	+/-5.1	5.6	-9	2.1	-12.1	5
Italy	4	+/-4	0	4.4	6.8	4.7	1
Japan	0	+/-9	0	-12.5	-18	-8.5	5
Korea	0	+/-3	0	-8	0.6	-9.1	5
Malaysia	-7.2	+/-2	-7.2	-38	-25	-35	5
Mexico	-7	+/-8	-6.9	-3.5	-15.4	-12.6	2
Netherlands	-7	+/-2.9	-7.1	4.2	16.1	-6.2	4
Poland	-6	+/-2	-6.1	-18.6	-2.7	4.8	3
Russia	-0.4	+/-5	-0.4	-14.5	-9.3	-5.8	4
Saudi Arabia	5.7	+/-3	NR	NR	NR	-15.1	1
Singapore	-8	+/-6	NR	NR	NR	-19.1	5
South Africa	5.7	+/-4	5.7	-3.3	-15.7	-27.8	5
Spain	-0.9	+/-4	-0.9	4.9	5.2	6	4
Sweden	-10	+/-5	-9.1	-19	-19.4	-23.5	3
Switzerland	-3.5	+/-3.9	-3.5	19.7	13.5	8.5	4
Thailand	-9.5	+/-2.5	-9.8	-1.3	14	-5	5
Turkey	-15	+/-8	-7.3	-20.5	-22.8	-24.9	3
United Kingdom	7.5	+/-7.5	11.7	-5.6	-12.6	-9.1	4
United States	11	+/-3	10.8	10.9	8.1	13.9	2

Notes: Estimates of "*REER* gap" or "currency misalignment" are in percentage. "NR" indicates that the approach-based estimate is not reported in the IMF ESR 2020. Positive sign (resp. negative) sign indicates an overvaluation (resp. undervaluation).
a: 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.

[15]Actually, the REER gaps for Hong Kong, Saudi Arabia and Singapore are derived by applying the different models' estimated coefficients to the data. Cautious should therefore be taken when extrapolating from these assessments.

As a general statement before diving into explanations of the differences, it is important to note that for these countries, the ESR staff put more weights on the CA model —if not disregarding the other approaches. This is particularly true for Canada, Indonesia, Korea, Malaysia, Sweden, Switzerland and the United Kingdom for which the *EQCHANGE* estimates match in some way with one of the EBA REER-based estimates. That being said, the discussion is therefore restricted to countries for which we have considerable differences between the *EQCHANGE* estimates and the ESR estimates —particularly those based on the REER index model that is closer to our methodology.

For Canada, the differences go back to the year 2018 for which we noted significant changes in the IMF ESR estimates. In the ESR 2017, the CA (resp. REER index and REER level) model pointed to an overvaluation (resp. undervaluation) of 6% (9.5% and 19.9%). From 2018, the ESR estimates are remained constants; the CA model and REER index model point to an overvaluation of 7% and 2% —respectively, while the REER level model still indicate an undervaluation but of only 6%. While these important changes in the REER based estimates from 2017 to 2018 were hardly explicable —and actually not explained, it fully explains, coupled with the focus on the CA-based estimates, the retained overvaluation for Canada.

For Indonesia, the midpoint was obtained by averaging both the REER index and CA models-based estimates. The range was then derived by applying the standard +/-5 interval to the midpoint. As visible, the ESR's range and our overlap barely. To a lesser extent, this also the case for Korea. For both countries therefore, the differences mainly originate from the trade-off made by the ESR staff regarding the methodology to favor.

In the case of Poland, our estimates point to a moderate overvaluation while the ESR estimates tend to indicate a small undervaluation of the zloty. While the difference between the retained midpoints seems quite important, the overall assessments, more meaningful than midpoint comparison, are less distant. Actually, based on our estimation, one would conclude that the zloty is not far from its equilibrium value. The same conclusion can also be reached based on the ESR retained estimates.

Finally, for South Africa, the staff focused on the CA approach and disregarded the REER based approaches. While both REER-based approaches tend to indicate an undervaluation of the rand, the discrepancy between our estimate and that of the IMF is large. As pointed last year in the *EQCHANGE* annual assessment, the difference is related to the time horizon considered for the estimation. While in *EQCHANGE* we consider the 1974-2018 period, the ESR only focus on the period post 1990.