Working Paper

CEPII

EQCHANGE
annual assessment 2021

Carl Grekou

Highlights

- Despite the large shock that represented the Covid-19 pandemic, the global configuration of currency misalignments in 2020 did not undergo any significant changes;

- The US dollar registered a slight increase of its overvaluation; the Chinese renminbi remained relatively stable and again appeared broadly in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen registered an upward movement that led to the reduction of the undervaluations;

- The euro area is featured with various situations: Germany, Ireland and the Netherlands displayed undervaluations; Belgium, France, and Italy were close to their equilibrium; Austria, Greece, Portugal and Spain displayed overvaluations;

- Europe is also characterized by a considerable heterogeneity with undervaluations prevailing in Northern countries (Norway, Sweden), overvaluations in Eastern and South Eastern countries and scattered cases of currency in line (e.g., the United Kingdom);

- Movements in the EMEs were very heterogenous; the Brazilian real plunged and settled at around 30% below its equilibrium value; the Turkish lira continued to fall hence increasing the undervaluation; the Korean won and the Indian rupee remained stable and maintained their moderate undervaluations; most emerging economies in Europe and South-East Asia experienced the opposite an upward movement (increase in overvaluations/reduction of undervaluations).

RESEARCH AND EXPERTISE
ON THE WORLD ECONOMY

▍ Abstract

This publication, accompanying the 2021's update of EQCHANGE, aims at providing an overview of exchange rate misalignments for 2020. Overall, changes in currency misalignments during 2020 have been rather modest except few EMEs that registered important movements. Among advanced economies, the picture was broadly unchanged. The US dollar registered a slight increase of its overvaluation; the British pound, the Canadian dollar and the Japanese yen registered an upward movement that led to the reduction of the undervaluations. The euro area is again featured with various situations with undervaluations prevailing in Germany, Ireland and the Netherlands while Belgium, France, Italy were close to their equilibrium. In EMEs, the Brazilian real registered the largest swings against the US dollar and have consequently seen a dramatic increase of its undervaluation. The Turkish lira continued its plunge against the US dollar and also increased its undervaluation. In contrast, the Chinese renminbi remained relatively stable and appeared broadly in line with its fundamental value.

▍ Keywords

EQCHANGE, Exchange Rates, Currency Misalignments, Global Imbalances.

▍ JEL

E3, E4, E5, E6, F3.

Working Paper ▪

CEPII

RESEARCH AND EXPERTISE
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EQCHANGE annual assessment 2021

Carl GREKOU[*]

Summary

The year 2020 will undoubtedly remain marked by the outbreak of the Covid-19 pandemic. The sanitary emergency, considering the human toll (five million deaths as of late November 2021), has led governments around the world to take exceptional actions. If the voluntary social distancing and mobility restriction measures —particularly lockdowns— have allowed to limit the spread of the virus, they have led to a notable slowdown of the world economy. With a 10% contraction in world GDP in the second quarter of 2020 —compared to the same quarter of the previous year— and an estimated 3.3% drop in world production, the Covid-19 crisis appears unprecedented since World War II. Although dramatic, the outcomes of the crisis turned out to be less severe than expected. This owes not only to the short-lived impact of the pandemic on trade, currencies, capital flows, current accounts, but also to the exceptional fiscal supports that shielded economies even against the subsequent waves of contagion and variants.

However, despite the large shock that represented the Covid-19 pandemic, the global configuration of exchange rate misalignments remained broadly unchanged between 2019 and 2020. Major currencies (e.g., US dollar, euro) have shown, given the circumstances, relatively high stability. After appreciating first as a result of the flight to safety at the onset of the crisis (reserve currencies) but also to a depreciating dollar (due to the Federal reserve's actions[1]), most major currencies depreciated afterward owing to the responses given by the authorities (i.e., expansionary fiscal packages, unconventional monetary policies).

On balance, movements in the exchange rates were mostly modest, well below changes observed during previous turmoil periods. The US dollar hence appreciated

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[1]The swift and decisive actions of the Federal reserve (Fed) namely through temporary swap lines to central banks around the world —to improve the liquidity of global dollar funding markets— lifted sentiments on the financial markets at the cost of a depreciating dollar.

by 2.8% in real effective terms (REER). Meanwhile, the equilibrium exchange rate (ERER) merely improved (+0.4%). As a result, the US dollar registered a slight increase in its overvaluation that settled around 15.9% in 2020. The euro has also registered an appreciation against the US dollar (+1.6%) that had uneven impact on the member countries' real effective exchange rates. While the $REER$ change was equivalent to the exchange rate change *vis-à-vis* the US dollar for Belgium, France and Italy, the pass-through was incomplete for Luxembourg, Portugal and Spain. For Austria, Germany and the Netherlands, the appreciations of the REERs were higher than the euro's appreciation. The euro area was still characterized by a certain degree of heterogeneity: Germany, Ireland, and the Netherlands displayed undervaluations; Austria, Greece, Portugal and Spain displayed overvaluations; and Belgium, Finland, France, Italy and Luxembourg were close to their equilibrium. The Chinese renminbi also remained relatively stable and again appeared broadly in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen registered an upward movement that led to the reduction of the undervaluations. In emerging economies, movements were very heterogenous but mainly marked by the Brazilian real and the Turkish lira plunges against the US dollar. While the real settled at around 30% below its equilibrium value, the Turkish lira displayed a 34.9% undervaluation. The Korean won and the Indian rupee remained stable and maintained their moderate undervaluations. Most emerging economies in Europe and South-East Asia experienced the opposite an upward movement (increase in overvaluations/reduction of undervaluations).

Overall, the Covid-19 pandemic does not seem to have had, so far, any significantly impact on the global configuration of currency misalignments. However, it is worth noting the conjunctural nature of the adjustments noted for 2020 arising mainly from the exchange rates movements. Indeed, coming years might unveil important changes especially as the health crisis continues. The first waves of the pandemic have let the world with important scars. Among others, most economies will experience lasting damage to supply potentials and therefore persistent output losses that will exacerbate the crisis direct effects, particularly in terms of human capital accumulation and inequality. While the different support policies (i.e., fiscal packages, unconventional monetary policies) aimed at minimizing these setbacks, they also raise the issue of debt —in the medium term— and therefore of structural reforms that might have an impact on potential growth. At the same time, the large fiscal stimulus in advanced economies will potentially led to an increase in absolute current account balances. Overall, with rising energy price, supply disruptions in

global value chains and the important scheduled fiscal supports, coming years might see important changes in the global configuration of currency misalignments.

The CEPII's *EQCHANGE* annual assessment 2021 presents estimates of equilibrium exchange rates and corresponding currency misalignments for the year 2020. It draws on information available from the CEPII's $EQCHANGE$ database.

<u>Convention</u>:

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 and Valérie Mignon.

1. Overview

The present publication, which accompanies the 2021's update of $EQCHANGE$, aims at providing an overview as extensive as possible of the exchange rate misalignments for the year 2020. It also aims at discussing the evolution of exchange rates and currency misalignments between 2019 and 2020 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 2020 as well as the changes that occurred between 2019 and 2020. 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

Concerns about the persistence of relatively large macroeconomic 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 —compared to existing databases— 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.

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[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 2021

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. Last year, *EQCHANGE* was amended with the *MULTIPRIL* subdatabase providing price levels-based measures.

The 2021'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 135 countries (territories). Countries (territories) included are: Albania, Algeria, Antigua Barbuda, Armenia, Aruba, 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, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czechia, Denmark, Djibouti, Dominica, Dominican Rep., Ecuador, Egypt, 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, Kenya, Kiribati, Korea, Kuwait, Kyrgyzstan, Lao P.D.R., Latvia, Lesotho, Lithuania, Luxembourg, Madagascar, Malaysia, Mali, Malta, 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, Russian Federation, Rwanda, Samoa, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Togo, Trinidad Tobago, 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:

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

Model 2
Model 3
Model 4
Model 5

• *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.

2.   The global configuration of currency misalignments

Figures 1 maps out the exchange rate misalignments for the year 2020, the most recent year for which data are available.[2] As visible, it reveals diversified situations but most importantly, a relative stability with previous years given the unprecedented crisis. Again, developing countries (DCs) and emerging economies (EMEs) displayed the most important currency misalignments. Currency misalignments also appear to be geographically concentrated. Africa is the region where undervaluations are the more prevalent and highest, with Algeria, Ghana and South Africa heading the list. As the majority of 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 and Sweden.

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.
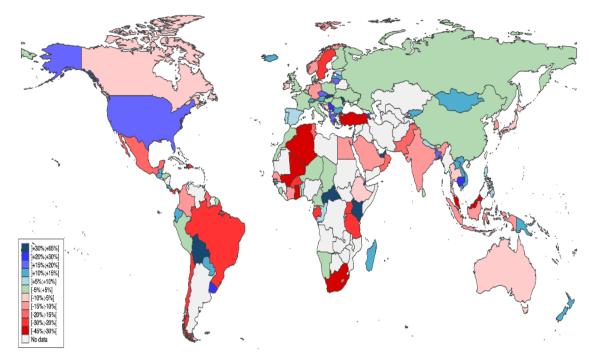

Figure 1 — Currency misalignments in 2020

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

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[2]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 2020, as noted above, was marked by minor changes that left broadly unchanged the global configuration of currency misalignments despite the unprecedented shock caused by the pandemic. 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 2019 and 2020. As can be seen, the distribution of the changes in currency misalignments appear slightly skewed to the right with more than 75% of the changes falling in the -/+5 percentage points interval. The relative stability of the misalignments between 2019 and 2020 —notwithstanding the slight right shift— is also confirmed by the right chart that overlays the distribution of currency misalignments for the two years.
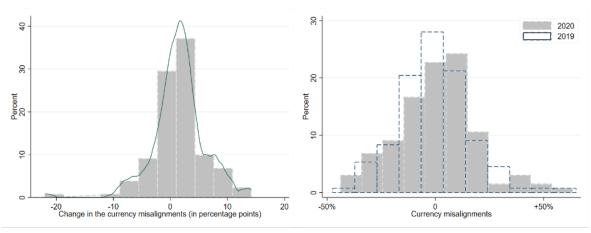

Figure 2 — Distributions of the changes in currency misalignments and the currency misalignments

Notes: The left chart depicts the distribution of the change in the currency misalignments between 2020 and 2019 (the solid line represents the kernel density). The right chart plots the distribution of the currency misalignments for 2020 (gray bars) and 2019 (dashed blue bars).
Source: *EQCHANGE* (CEPII)

The global configuration of the currency misalignments noted hitherto, however, hides large disparities across countries and regions, as can be seen in Figure 3. Notwithstanding few countries displaying downward movements in their currency misalignments (e.g., Ireland, Norway), Europe appears to be the most homogenous region in terms of dynamics with countries experiencing upward movements in their misalignments between 2019 and 2020. This is also the case for most African countries, particularly the CFA franc zone countries that replicated the general evolution of the euro area countries —due to the peg to the euro. In America however, the situation was quite heterogenous with most Latin American countries having registered downward movements. Similarly, changes in Asia were also heterogenous —both in amplitudes and dynamics.
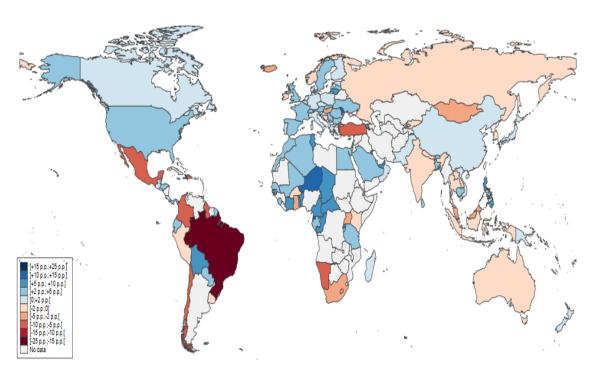
Figure 3 — Changes in currency misalignments between 2019 and 2020

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 2020: key points

• Despite the large shock that represented the Covid-19 pandemic, the global configuration of currency misalignments in 2020 did not undergo any significant changes;

• Developing countries (DCs) and emerging economies (EMEs) again exhibited the most important currency misalignments;

• The US dollar registered a slight increase of its overvaluation; the Chinese renminbi remained relatively stable and again appeared broadly in line with its fundamental value; the British pound, the Canadian dollar and the Japanese yen registered an upward movement that led to the reduction of the undervaluations;

• The euro area is featured with various situations: Germany, Ireland and the Netherlands displayed undervaluations; Belgium, Finland, France, Italy and Luxembourg were close to their equilibrium; Austria, Greece, Portugal and Spain displayed overvaluations;

• Europe is also characterized by a considerable heterogeneity with undervaluations prevailing in Northern countries (Norway, Sweden), overvaluations in Eastern and South Eastern countries and scattered cases of currency in line (e.g., the United Kingdom);

• Movements in the EMEs were very heterogenous; the Brazilian real plunged and settled at around 30% below its equilibrium value, the Turkish lira continued to fall hence increasing the undervaluation; the Korean won and the Indian rupee remained stable and maintained their moderate undervaluations; most emerging economies in Europe and South-East Asia experienced the opposite an upward movement (increase in overvaluations/reduction of undervaluations).

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 evolutions and their underlying factors between 2019 and 2020. The considered economies 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 2020 are represented in Figure 4. Table 1 gives our assessments of these estimates for each of the countries. The assessments for 2019 are also reported to illustrate the dynamics of the misalignments.

Over our 35 economies, 8 countries display overvaluations higher than 5% while 17 countries exhibit undervaluations higher than 5% —i.e., below -5%. The remaining 10 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 Australia, Belgium, China Denmark, France, Israel, Italy, Luxembourg and Russia that maintain themselves in this group, but also for the United Kingdom that makes its entry in this group.

Among the overvalued currencies, the US dollar was —on average— the most overvalued currency (among our sample of major currencies) in 2020 with an estimated overvaluation around 16%. With a relatively unchanged misalignment, Greece followed behind with an overvaluation around 15%. Austria, Hong Kong, New Zealand and Switzerland follow behind. The remaining overvalued countries are concentrated in the 5-10% interval —"Moderate overvaluations". This group consists of Portugal and Spain.

Turning to undervalued currencies, different groups can be distinguished. The moderate undervaluations group is composed of Canada, India, Japan, the Netherlands and Thailand. Compared to 2019, Canada and Thailand are new entrants in this group. While Canada registered an upward movement that reduced its undervaluation, Thailand experienced the opposite movement and shifted from the "(broadly) in line group" in 2019 to the moderate undervaluations group in 2020. Germany, Indonesia, Korea, Norway and Singapore form the intermediate undervaluations group in 2020. The last group —"large undervaluations"— is composed of Brazil, Malaysia, Mexico, South Africa, Sweden and Turkey.
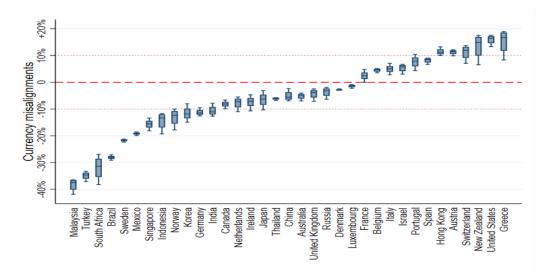
Figure 4 — Currency misalignment in 2020 (estimations range)

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	
	2019	2020		2019	2020
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				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.

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3.2.   Evolutions during 2020 and the driving factors

Changes during 2020 were generally modest. As a consequence, the pattern of currency misalignments in 2020 for the 35 considered economies is similar to the one identified in 2019. 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.
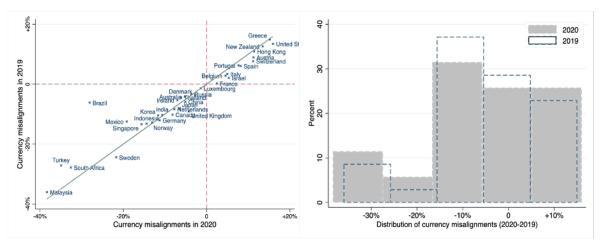

Figure 5 — Currency misalignments in 2020 and 2019
Note: In the left chart, the dashed green line represents the 45-degree line..
Source: *EQCHANGE* (CEPII)

Factors that shaped the evolutions of currency misalignments between 2019 and 2020 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 (see Box 4 for the definition of these various concepts). 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 4 — 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 ($NEER_{i,t}$) measures the value of the currency of country i against a weighted average of foreign currencies:

$$NEER_{i,t} = \prod_{j=1}^{N} NER_{ij,t}^{w_{ij,t}} \qquad \text{(Box Eq. 4.1)}$$

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:

$$REER_{i,t} = \prod_{j=1}^{N} RER_{ij,t}^{w_{ij,t}} \qquad \text{(Box Eq. 4.2)}$$

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.

$$Mis_{i,t} = reer_{i,t} - erer_{i,t} \qquad \text{(Box Eq. 4.3)}$$

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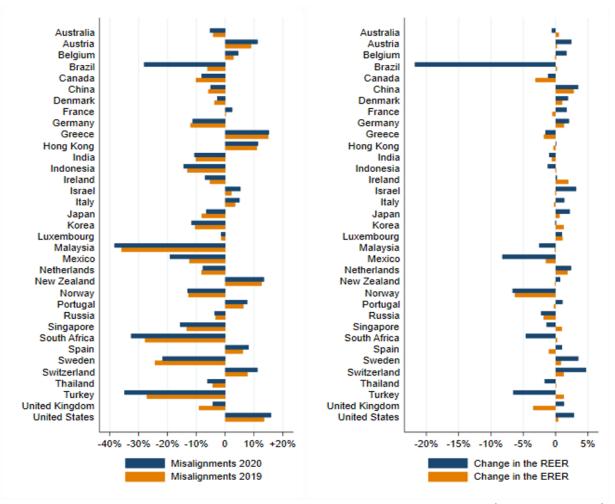
Figure 6 — The misalignments and the exchange rates' dynamics (percent change)
Note: The left chart displays the average of the estimated currency misalignments. In the right chart, we plot the percentage changes in the Real Effective Exchange Rates (REER) and in the estimated Equilibrium Real Exchange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

Despite the large economic shock caused by the Covid-19 pandemic, exchange rates in major economies remained surprisingly stable. Indeed, except Brazil, Mexico, Norway and Turkey, changes in the $REER$ were modest and contained within the -/+5% interval. Changes in the $ERER$ were even of smaller amplitudes —excluding Norway.

As visible in the left panel, Brazil is by far the economy that registered the most important change in its misalignment after falling from the "broadly in line currencies" group in 2019 to an undervaluation around -28% in 2020. This change for Brazil was exclusively driven by the change in the $REER$, originating itself from the large depreciation of the real *vis-à-vis* the US dollar (see Figure 7). In Turkey, despite the 21% depreciation of the lira against the US dollar, the change in the $REER$ was of only 6% due to the countering effect of inflation. Still, with a small improvement

in the $ERER$, the Turkish lira has seen an increase its undervaluation that settled around -35%. Regarding Mexico and Norway, the depreciations of the $REER$ were of -8.2% and -6.7%, respectively.

As aforementioned, changes in the $ERER$ are of different magnitudes, principally ranging from -3% to +2%. Norway is the only exception and registered a 6% depreciation of its equilibrium exchange rate —due to the fall in oil price. Excluding Norway, Canada and the United Kingdom appear as the economies that registered the most important depreciations of the $ERER$, -3.1% and -3.4% respectively —owing from lower relative GDP growth and current account deficits. At the other end of the spectrum, China, Ireland and the Netherlands display improvement in their $ERER$ of 2.7%, 2% and 1.9%, respectively. Germany, Turkey, Korea, Switzerland, Luxembourg and Denmark follow behind —in decreasing order— with improvements greater than 1%.

In the euro area countries, changes in the currency misalignments have been generally upward, although marginal, and mostly driven by the appreciation of the $REER$ —changes in the $ERER$ were actually negligible in most countries. France displayed the largest changes in the currency misalignments, 2.2 percentage points (p.p.) increases from 2019 to 2020 that led to a 2.4% overvaluation. Spain and Ireland follow behind with respectively a 2 and 1.7 percentage points increase in the misalignments. Finland, Germany and the Netherlands are the only economies that registered a downward movement in their misalignments (a small increase in their undervaluations).

The United States, owing to the appreciation of its $REER$, registered a 2.5 p.p. increase of its overvaluation. The appreciation of the $REER$ also explains the 3 p.p. increase of the overvaluations of Israel and Switzerland. In contrast, for China, the appreciation of the $REER$ was tempered by an improvement of the $ERER$.

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 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.

As visible in the left chart, changes in the currencies appear to have been rather
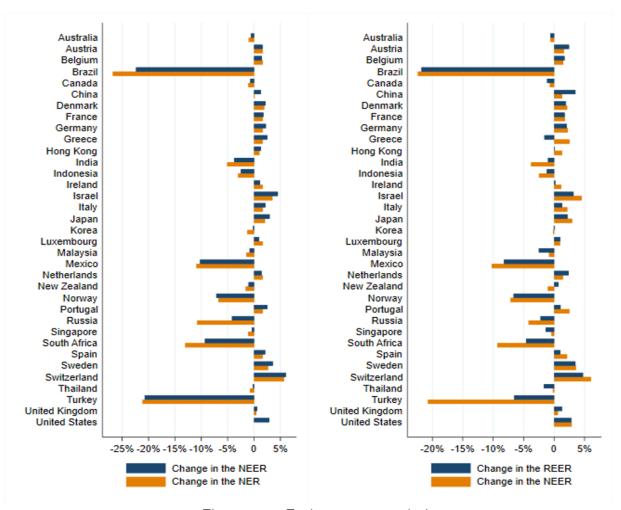
Figure 7 — Exchange rate variations

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

balanced with an almost equivalent number of depreciations and appreciations. In most cases, the changes in the *NEER* reflected the evolutions of the currencies *vis-à-vis* the US dollar. Looking first at depreciations, the Brazilian real plunged amid concerns related to the resilience of the economy in the Covid-19 pandemic context. As noted above, the real depreciated by 26.7% *vis-à-vis* the US dollar and 22.4% in nominal effective terms. With a contained inflation (3.2% in 2020), these nominal movements translated almost integrally into a real depreciation (-21.8% in real effective terms; see right panel). To a lesser extent, the Mexican peso also shared this feature as the 11% depreciation *vis-à-vis* the US dollar translated into a 8.2% depreciation of the *REER*.[3] The lira on its side continued its depreciation against the US dollar and loose 21% of its value during 2020. However, the *REER* only

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[3]This is also the case for Norway.

depreciated by around 6% owing to the inflation. This is also the case of the South African rand that depreciated by around 13% *vis-à-vis* the US dollar but only 4.6% in real effective terms.

Unlike these devaluations, appreciations have been of smaller amplitudes. Excluding few countries, they were essentially contained below 2%. Indeed, only Switzerland and Israel appreciated —vis-à-vis the US dollar— by 5.6% and 3.5%, respectively. In both cases, the appreciations translated into almost equivalent changes in real effective terms.

Overall, changes in the currency misalignments between 2019 and 2020 came principally from the changes in the real effective exchange rates. Indeed, exchange rate movements explain the changes in 20 countries. For the other countries, the evolutions of the fundamentals have also been at stake, reinforcing or countering the effects of the exchange rates. Regarding the exchange rates, much of the movements were related to the direct consequences/suites of the pandemic that also had indirect effects by exacerbating existing vulnerabilities especially in EMEs (e.g., Brazil, Turkey). While appreciating first as a result of the flight to safety at the onset of the crisis (reserve currencies) but also to a depreciating dollar, most major currencies depreciated afterward owing to the responses given by the authorities (i.e., expansionary fiscal packages, unconventional monetary policies).[4] In EMEs, the Fed's action has been key to "end" —somehow— the sudden stop in capital flows. However, in some EMEs, the relatively smaller fiscal responses along with bad health outcomes fueled pressures on the currencies.

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 change in the Balassa-Samuelson effect proxy —relative GDP per capita in PPP terms— and the changes in the Net Foreign Asset (NFA) position.[5]

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[4]Among other measures, the temporary swap lines to central banks around the world have substantially improved the liquidity of global funding markets and raised downward pressures on the US dollar.

[5]Both fundamentals are the main drivers of the equilibrium exchange rates in advanced economies (for further details see Couharde et al. 2018). Figure B.2 in Appendix B shows the changes in the terms of trade.
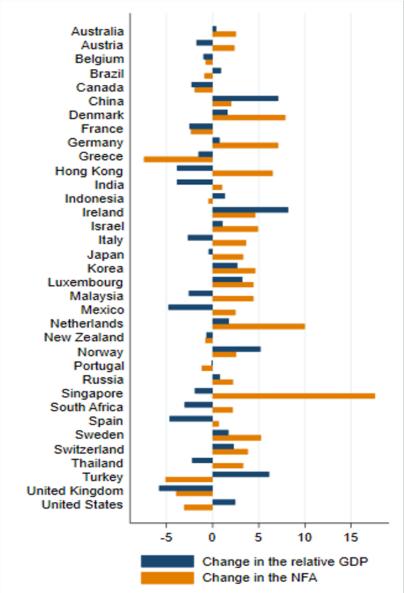
Figure 8 — Changes in the fundamentals: relative GDP $vs.$ NFA

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), the changes in the fundamentals and especially the net foreign asset position (NFA) during 2020 were quite significant. Indeed, countries like Denmark, Germany, the Netherlands, Switzerland and Singapore display the most important improvements in their position (more than +5 percentage points). These improvements were, as visible in Figure B.4 in Appendix B, mainly driven by the large trade surpluses registered during 2020. In general, and in contrast with previous years, most countries actually registered an improvement in their net foreign assets position. However, at the other end, Greece followed by Turkey, the United Kingdom and

the United States, have seen a deterioration of their positions —owing principally to their trade deficits that drove their current account deficits.

The picture regarding the relative GDP is more nuanced. China and Ireland are the two countries that registered the largest increase in their GDP relative to trading partners. Within the euro area, the Covid-19 pandemic had uneven growth impacts. On the one hand, France, Greece, Italy and Spain have registered a fall in their relative GDP. Spain in the country that registered the most important fall, -4.6%, followed by Italy and France, -2.7% and -2.5% respectively. Excluding Ireland, Luxembourg and the Netherlands displayed the highest increase in their relative GDP (3.2% and 1.7%, respectively). Portugal is the only country with a negligible change. Considering our whole sample of major economies, the worst growth performance was displayed by the United Kingdom with a -5.8% fall in the GDP relative to the trading partners. Finally, for the United States, the increase in the relative GDP offset the negative effect of the deteriorated net foreign assets position. 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 2019 and 2020.

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	-4.2	-5.3	-0.6	-0.6	-1.0	0.5	-3.2	2.5	0.7
Austria	9.0	11.2	2.5	1.6	1.6	0.2	-7.3	2.3	0.7
Belgium	2.8	4.5	1.7	1.5	1.6	0.0	-7.2	-0.7	1.3
Brazil	-6.1	-28.1	-21.8	-22.4	-26.8	0.2	-4.7	-0.9	1.5
Canada	-10.1	-8.2	-1.2	-0.7	-1.1	-3.1	-6.7	-1.9	-5.8
China	-5.8	-5.1	3.5	1.3	0.1	2.8	1.9	2.0	6.6
Denmark	-3.7	-2.8	1.9	2.1	1.9	1.0	-3.6	7.9	0.7
France	0.2	2.4	1.7	1.8	1.6	-0.5	-8.8	-2.3	1.3
Germany	-12.0	-11.3	2.1	2.3	1.6	1.3	-5.1	7.1	1.6
Greece	15.0	15.2	-1.6	2.5	1.6	-1.8	-8.5	-7.4	-2.3
Hong Kong	11.0	11.4	0.1	1.3	1.0	-0.3	-5.7	6.5	0.7
India	-10.2	-10.7	-1.0	-3.8	-5.1	-0.6	-9.1	1.0	7.0
Indonesia	-13.2	-14.4	-1.2	-2.5	-3.0	0.1	-3.3	-0.4	-1.7
Ireland	-5.3	-7.0	0.2	1.1	1.6	2.0	1.6	4.6	0.1
Israel	2.1	5.3	3.2	4.5	3.5	0.0	-4.2	4.9	-2.3
Italy	3.4	5.0	1.3	2.2	1.6	-0.2	-9.1	3.6	1.8
Japan	-8.1	-6.5	2.2	3.0	2.1	0.6	-4.6	3.3	7.7
Korea, Rep.	-10.4	-11.7	0.0	-0.2	-1.3	1.3	-1.1	4.6	3.7

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2019 and 2020 (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.

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	-1.4	-1.4	1.0	1.0	1.6	1.1	-3.3	4.4	0.4
Malaysia	-36.0	-38.4	-2.5	-0.8	-1.5	-0.1	-7.0	4.4	0.6
Mexico	-12.5	-19.2	-8.2	-10.2	-10.9	-1.5	-9.6	2.5	-4.6
Netherlands	-8.3	-7.8	2.4	1.4	1.6	1.9	-4.6	10.0	0.0
New Zealand	12.7	13.5	0.7	-1.0	-1.6	-0.1	-5.1	-0.8	2.4
Norway	-12.8	-13.1	-6.7	-7.1	-6.8	-6.3	-1.4	2.5	-25.6
Portugal	6.3	7.6	1.1	2.5	1.6	-0.3	-7.9	-1.2	-0.4
Russian Federation	-3.3	-3.7	-2.2	-4.2	-10.8	-1.9	-3.1	2.2	-21.8
Singapore	-13.3	-15.7	-1.4	-0.4	-1.1	1.0	-6.7	17.6	-3.5
South Africa	-27.8	-32.6	-4.6	-9.3	-13.0	0.2	-8.6	2.2	9.2
Spain	6.1	8.2	1.0	2.1	1.6	-1.0	-11.6	0.7	3.3
Sweden	-24.4	-21.7	3.5	3.6	2.7	0.8	-3.4	5.2	0.2
Switzerland	7.7	11.2	4.7	6.0	5.7	1.3	-3.7	3.8	1.7
Thailand	-4.4	-6.1	-1.7	-0.2	-0.8	0.1	-6.5	3.3	3.2
Turkey	-27.1	-34.9	-6.6	-20.7	-21.1	1.3	0.6	-5.1	5.0
United Kingdom	-9.1	-4.3	1.3	0.6	0.4	-3.5	-10.9	-3.9	-7.0
United States	13.5	15.9	2.8	2.9	0.0	0.4	-4.1	-3.1	-0.3

Notes: Entries —excluding the misalignment columns— correspond to the variable's changes between 2019 and 2020 (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 misalign-
ments in 2020. 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 group-
ings. It covers 133 countries distributed as follows: 34 African countries, 26 for America, 30
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 2019 and 2020. Actually, 13 countries (out of 34)
registered change in their misalignment greater —or equal— to 5 percentage points.

On the one hand, Cabo Verde, Central African Rep., Congo, Guinea-Bissau and
Mauritius increased by at least 5 percentage points their misalignments. More specif-
ically, except Mauritius, these countries experienced upward movements that resulted
in an increase of their overvaluation. In contrast, Mauritius experienced a downward
movement that led to an undervaluation of the rupee —after having been broadly in
line the previous years.

On the other hand, for Cameroon, Chad, Côte d'Ivoire, Equatorial Guinea, Niger,
Tunisia and Rwanda, the misalignments —actually undervaluations— noticeably de-
creased. The changes are particularly substantial in Niger, Chad and Tunisia were
the undervaluations plummeted by 12 p.p. and 9 p.p. for the latter two, respectively.
For Cameroon, Côte d'Ivoire, Equatorial Guinea and Rwanda, the changes ranged
from -5 p.p. to -7 p.p. As previously, the right chart of Figure 9 gives more details
on the sources of the changes by disentangling the dynamics of the $REER$ and that
of the ERER. For Niger that registered the most important change, this latter al-
most exclusively reflects the dynamics of the $REER$ that appreciated by 16% —the
change in the $ERER$ is actually small.[6] The picture holds also for Guinea-Bissau,
Chad and Tunisia that registered —after Niger— the most important changes.

The rest of the countries display relatively small changes in their misalignments
—i.e., within the -/+5 percentage points range. While the majority of African coun-
tries experienced an upward movement, the trend was generally downward in southern
region. The general picture remained however the same between 2019 and 2020 as
the "major" changes that occurred in few countries did not end up with an overturn-
ing of the situations.

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[6]The appreciation of the Niger's $REER$ owes much to the fall of the naira during 2020. This
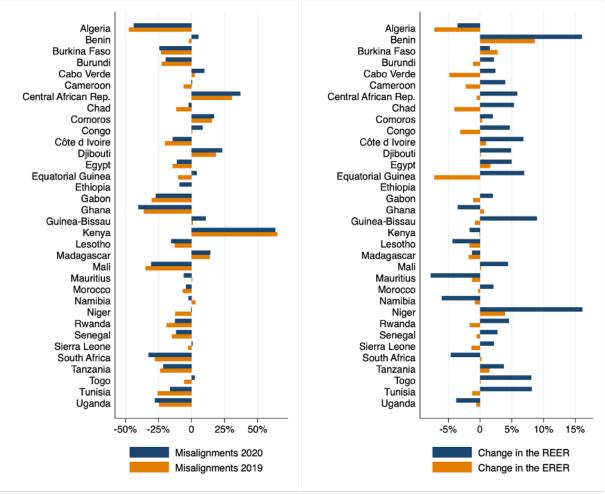explanation holds also for Benin.

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 the latter —both undervaluations and overvaluations.

During 2019, the US dollar appreciated by around 3% in real effective terms. Meanwhile, the change in the $ERER$ has been negligible. As a result, the US dollar has registered a 2.4 percentage points increase of its overvaluation. In Canada, the level of the currency misalignment in 2020 is broadly unchanged compared to 2019. Indeed, as can be seen, Canada has witnessed a very slight reduction of its undervaluation, -1.5 p.p., owing to the 3% depreciation of its ERER, twice the amount of its REER's change.
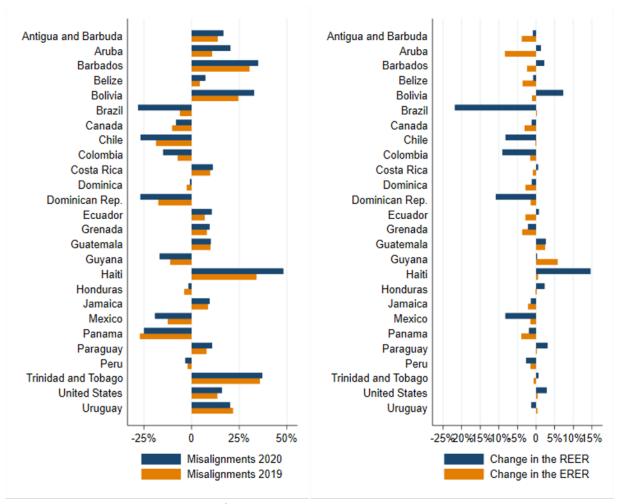
Figure 10 — America | Currency misalignments and sources of the changes

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. Indeed, expect Dominica, Honduras, Panama and Uruguay, currency misalignments, both under- and overvaluations increased from 2019 to 2020. As noted above, Brazil registered the largest increase in its misalignment with a 22 p.p. increase of its undervaluation ——owing exclusively to the fall in the REER. Dominican Rep., Chile, Colombia and Mexico share the same evolution with an increase of their undervaluation ——of 9.4 p.p., 8 p.p., 7.5 p.p. and 6.7 p.p., respectively. On the other hand, Haiti, Aruba and Bolivia have seen increases in their overvaluation by more than 5 p.p. While for Bolivia and Haiti the appreciations of the $REER$ explains these changes, the increase of the overvaluation in Aruba in explained by the fall in the ERER.

Overall, excluding the above countries, movements in currency misalignments

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for the American countries between 2019 and 2020 were relatively modest. Most importantly, most countries experienced both a depreciation in the $REER$ and the ERER. While movements in the $ERER$ entail longer term adjustment, those related to the $REER$ can be considered temporary. However, for the latter, countries like Brazil that registered important changes in the REER, the existence of vulnerabilities, potentially exacerbated by the pandemic, might imply durable misalignments.

4.3. Asia

In line with the other regions, changes in the currency misalignments between 2019 and 2020 have been rather weak. Only emerging Asian economies have been rather shacked by the Covid-19 pandemic crisis.

Armenia, Turkey, the United Arab Emirates and Philippines have registered the largest increase in their misalignments. Excluding the Turkish lira that has seen its undervaluation increased, and Philippine peso that moved from a broadly in line currency to a moderate overvaluation (8%), the other countries have registered an increase —more than 7 p.p.— in their already large overvaluation. In all these countries, the dynamics of the currency misalignments was explained by that of the REER. Bangladesh and Israel follow behind with 4 p.p. and 3p.p. increases in their overvaluations —owing also to the $REER$ appreciations. At the other end, Kuwait registered the most important reduction in the misalignment — -6 p.p. As a result, the Kuwaiti dinar was broadly in line during 2020. This fall occurred against the background of falling oil price —due to the pandemic— that led to the depreciation of the ERER. Saudi Arabia and Bhutan (resp. Mongolia) follow behind with a reduction of the undervaluations (resp. overvaluation) of 3 p.p. In contrast with Kuwait, all these changes were driven by the $REER$ dynamics.

Apart from these countries, the relative stability of 2020 has thus entrenched —somehow— the groups of countries identified in 2019. 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; the renminbi was undervalued by about 5%. This is also the case for Bhutan, Cyprus, Israel and Sri Lanka that appeared again broadly in line despite movements of their $REER$ and/or ERER. Similarly, the Japanese yen, despite the slight appreciation of the REER, still displayed in 2020 a moderate undervaluation.
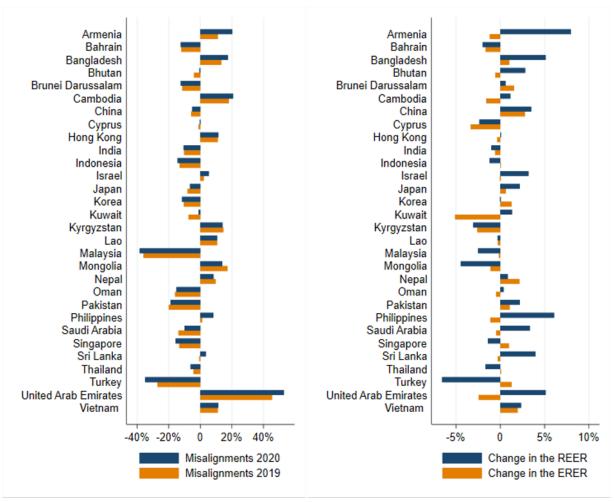
Figure 11 — Asia | Currency misalignments and sources of the changes

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 2019 and 2020. Indeed, as visible in Figure 12, Lithuania and Moldova Rep. are the only countries that displayed changes between 2019 and 2020 higher than 5 p.p. Regarding Moldova Rep., the leu was the currency that experienced the largest swing in Europe with a 11% appreciation of the $REER$ that increased the 2019's 25% overvaluation. Thus, in 2020, the leu was displaying a large overvaluation around 35%. Lithuania has also seen an increase in its overvaluation, by 6 p.p., owing mainly to the 8% appreciation of the $REER$ (the $ERER$ appreciated by 2%), that led to an overvaluation around 15% in 2020. At the other hand, the United Kingdom and Iceland registered the highest fall in the misalignments in Europe, -4.7 p.p. and -4

p.p., respectively. While for the United Kingdom this fall is mainly explained by the depreciation of the ERER, for Iceland, it is rather the depreciation in the $REER$ that explain the adjustment.
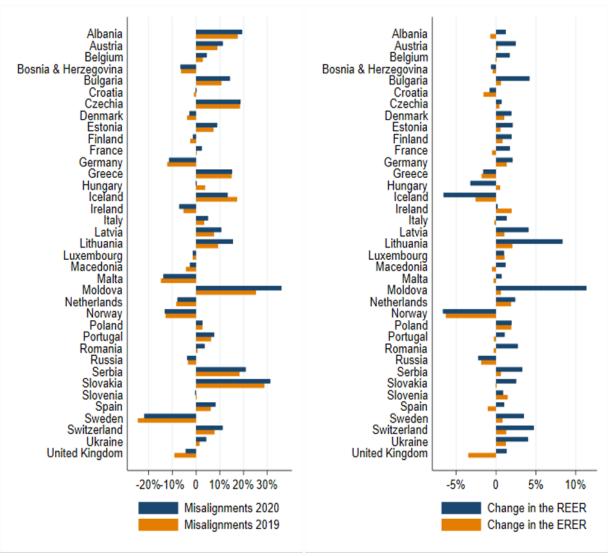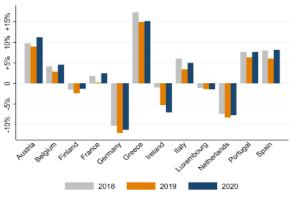

Figure 12 — Europe | Currency misalignments and sources of the changes

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)

Elsewhere in Europe, movements in the $REER$ and/or in the $ERER$ have been of small amplitudes and generally upward. However, Norway stands as an exception with movements in both the $REER$ and $ERER$ above 5%. Indeed, the Norwegian krone depreciated by around 7% *vis-à-vis* the US dollar in 2020 that translated entirely to the REER. In the meantime, with the fall in oil price, Norway faced a significant and negative terms of trade shocks that mainly explained the deterioration of the equilibrium exchange rate. With quite equivalent changes in both the $REER$ and

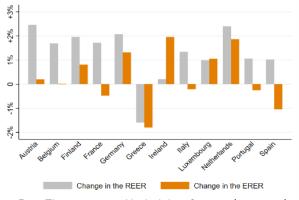## Box 5 — Monitoring (Macroeconomic) imbalances within the euro area

The changes in the currency misalignments —between 2019 and 2020— within the eurozone have been of relatively small amplitudes (see Box Figure 5.1). Indeed, only Austria, France and Spain displayed changes of at least 2 percentage points. All three countries actually experienced an increase in their overvaluation. This upward movement was also shared by the other countries (except Ireland) by to a lesser extent. The latter led to a slight fall in the undervaluations of Finland, Germany and the Netherlands. In general, the observed movements did not change the overall assessment of the currency misalignments between 2019 and 2020. Finland, France and Luxembourg were thus considered broadly in line during 2020.

As can be seen in Box Figure 5.2, the evolution of the misalignments was principally shaped by the $REER$ dynamics except in Greece, Ireland, Luxembourg and Spain —and to a lesser extent in Germany and the Netherlands. Actually, both the $REER$ and $ERER$ depreciated for Greece. In Ireland, it is rather the $ERER$ appreciation that explained the increase in the Irish undervaluation. In Spain, the effect of the appreciation of the $REER$ was countered by the deterioration in the ERER. In contrast, for Germany and the Netherlands, the $ERER$ appreciation annihilated the $REER$ appreciation. However, as noted above, it should be kept in mind that the adjustments noted for 2020 were marginal and mostly conjectural —because they were generally driven by the effect of the Covid-19 pandemic. 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 5.3.

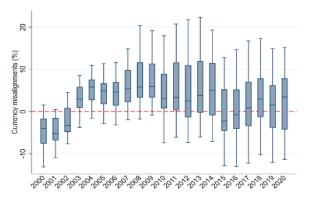Box Figure 5.1 — Currency misalignments

Source: *EQCHANGE* (CEPII)

Box Figure 5.2 — Underlying factors (2019-20)

Note: Changes are expressed in percentage

Source: *EQCHANGE* (CEPII)

Box Figure 5.3 — Evolution of the distribution of currency misalignments in the euro area

Notes: The figure presents boxplots of the misalignments over time.

the ERER, the undervaluation of the krone remained stable around 13%. Russia also faced a negative terms of trade shock —energy prices— that deteriorated the equilibrium exchange rate. However, the fall in the $REER$ eased the effect on the currency misalignment that remained broadly unchanged between 2019 and 2020.

4.5. Oceania

The global pattern noted hitherto holds also for Oceania. Indeed, as visible in Figure 13, currency misalignments have marginally evolved between 2019 and 2020. Samoa and Fiji are the countries that registered the most important changes during 2020. On the one hand, Samoa has seen an almost 3 p.p. reduction of its overvaluation (from 15% to 12%) due to the depreciation of the REER. On the other hand, Fiji has seen its overvaluation increased by 3.5 p.p. —but remained broadly in line. While the Fijian $REER$ also depreciated, the evolution of the currency misalignments has been shaped by the deterioration of the ERER. For Australia, both the $REER$ and $ERER$ changes were negligible. As a result, the Aussie dollar maintained its undervaluation and can still be considered broadly in line with its fundamental value. For New Zealand and Papua New Guinea also, the picture is broadly unchanged between 2019 and 2020 —despite the slight appreciation of the REERs. For both countries, estimates suggested overvaluations around 13% for 2020.

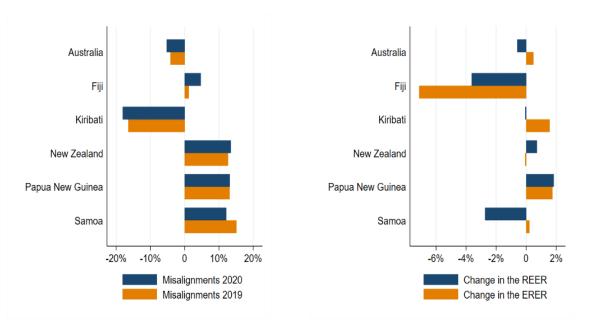Figure 13 — Oceania | Currency misalignments and sources of the changes

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 2020 (in %)

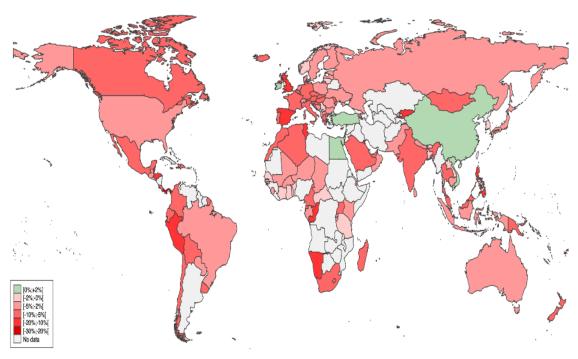| Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Albania	19.4	2.8	Croatia	0.0	1.8
Algeria	-43.7	4.0	Cyprus	-0.2	4.6
Antigua & Barbuda	16.6	2.3	Czechia	18.7	1.4
Armenia	20.2	4.3	Denmark	-2.8	4.0
Aruba	20.3	5.2	Djibouti	23.2	7.5
Australia	-5.3	2.8	Dominica	-0.9	4.7
Austria	11.2	1.6	Dominican Rep.	-26.9	5.6
Bahrain	-12.4	2.8	Ecuador	10.5	5.3
Bangladesh	17.4	4.4	Egypt	-11.1	7.7
Barbados	34.9	6.0	Equatorial Guinea	3.9	3.4
Belgium	4.5	2.6	Estonia	8.9	3.4
Belize	7.1	2.1	Ethiopia	-9.2	1.8
Benin	5.2	4.6	Fiji	4.7	4.9
Bhutan	-0.6	6.4	Finland	-1.3	2.0
Bolivia	32.8	4.1	France	2.4	2.4
Bosnia & Herzegovina	-6.5	2.0	Gabon	-27.1	4.0
Brazil	-28.1	4.8	Germany	-11.3	3.3
Brunei Darussalam	-12.4	4.1	Ghana	-40.3	3.9
Bulgaria	14.3	2.0	Greece	15.2	4.8
Burkina Faso	-24.4	6.6	Grenada	9.4	1.1
Burundi	-19.6	4.1	Guatemala	10.0	3.1
Cabo Verde	9.7	4.4	Guinea-Bissau	10.7	4.6
Cambodia	20.7	4.4	Guyana	-16.7	4.9
Cameroon	0.2	7.0	Haiti	48.1	3.8
Canada	-8.2	2.1	Honduras	-1.6	5.2
Central African Rep.	36.9	4.9	Hong Kong	11.4	2.4
Chad	-2.2	4.8	Hungary	0.1	1.0
Chile	-26.7	6.1	Iceland	13.3	2.2
China	-5.1	2.4	India	-10.7	5.3
Colombia	-14.8	3.3	Indonesia	-14.4	5.7
Comoros	17.1	2.4	Ireland	-7.0	4.2
Congo	8.4	3.0	Israel	5.3	2.0
Costa Rica	11.1	3.7	Italy	5.0	2.1
Côte d'Ivoire	-14.3	3.4	Jamaica	9.4	3.4

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).

Table A.1 — Estimates of currency misalignments in 2020 (in %; *Continued*)

Country	Misalignment		Country	Misalignment	
	Mean	St. Err.		Mean	St. Err.
Japan	-6.5	3.6	Philippines	8.3	4.7
Kenya	63.4	3.4	Poland	2.7	4.5
Kiribati	-18.1	4.0	Portugal	7.6	3.1
Korea Rep.	-11.7	3.5	Romania	3.6	4.6
Kuwait	-1.1	3.7	Russian Federation	-3.7	2.4
Kyrgyzstan	14.1	4.0	Rwanda	-12.7	6.3
Lao P.D.R.	10.6	4.1	Samoa	12.1	3.3
Latvia	10.6	2.1	Saudi Arabia	-10.1	4.7
Lesotho	-15.5	3.1	Senegal	-11.8	5.7
Lithuania	15.6	3.2	Serbia	20.9	3.9
Luxembourg	-1.4	2.2	Sierra Leone	0.8	5.7
Madagascar	14.2	6.4	Singapore	-15.7	2.4
Malaysia	-38.4	3.1	Slovakia	31.3	4.5
Mali	-30.6	4.2	Slovenia	-0.4	1.1
Malta	-13.7	2.3	South Africa	-32.6	7.4
Mauritius	-6.0	2.8	Spain	8.2	3.9
Mexico	-19.2	2.1	Sri Lanka	3.5	4.1
Moldova Rep.	35.9	3.1	Sweden	-21.7	4.1
Mongolia	13.8	1.8	Switzerland	11.2	4.6
Morocco	-4.2	1.8	Tanzania	-21.5	2.8
Namibia	-2.4	1.0	Thailand	-6.1	5.6
Nepal	8.3	2.2	Togo	2.4	6.1
Netherlands	-7.8	2.9	Trinidad & Tobago	37.1	2.6
New Zealand	13.5	3.7	Tunisia	-16.3	3.0
Niger	-0.2	4.6	Turkey	-34.9	5.2
North Macedonia	-2.5	1.8	Uganda	-27.8	2.7
Norway	-13.1	4.1	Ukraine	4.3	2.9
Oman	-15.1	4.2	United States	15.9	3.2
Pakistan	-18.9	2.9	United Arab Emirates	52.9	4.5
Panama	-25.0	5.5	United Kingdom	-4.3	3.8
Papua New Guinea	13.2	2.7	Uruguay	20.1	4.2
Paraguay	10.8	5.0	Vietnam	11.4	4.0
Peru	-3.3	2.4			

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 2020

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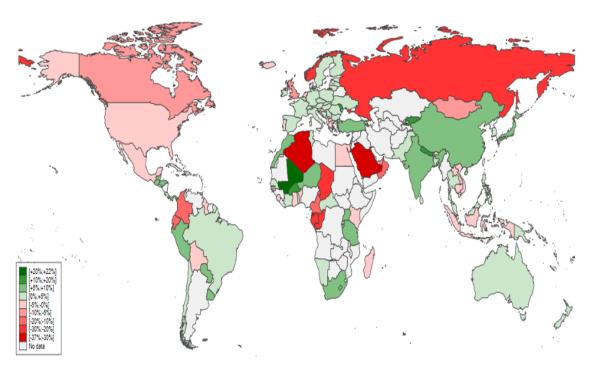

Figure B.2 — Change in the terms of trade (2019-2020)
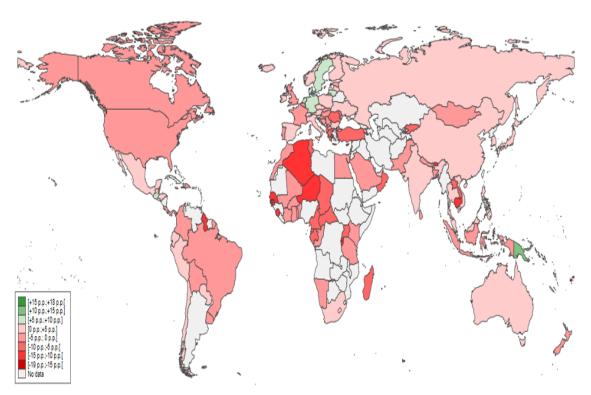
Note: Data are from the UNCTAD database.

Figure B.3 — Change in the net foreign asset positions (2019-2020)

Note: Changes in the net foreign asset positions are proxied by the current balances. Data are from the IMF.
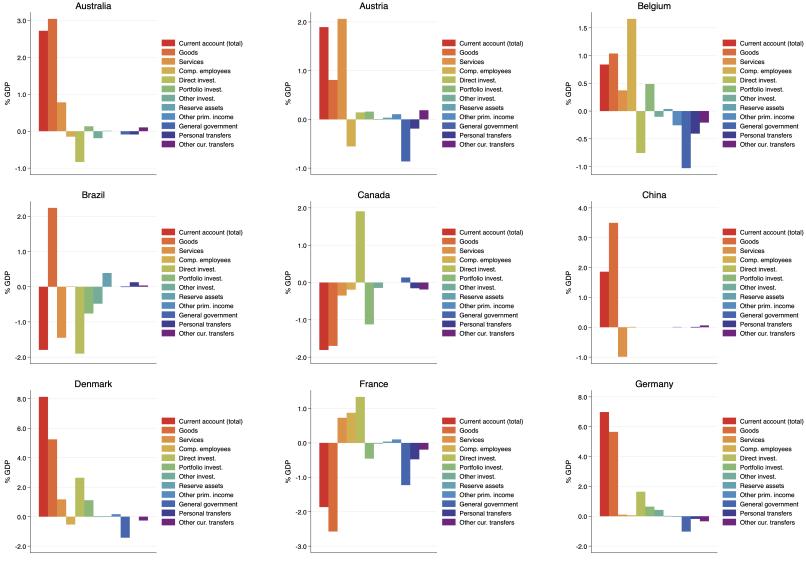
Figure B.4 — Current account and its components (2020, %GDP)

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 (2020, %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.
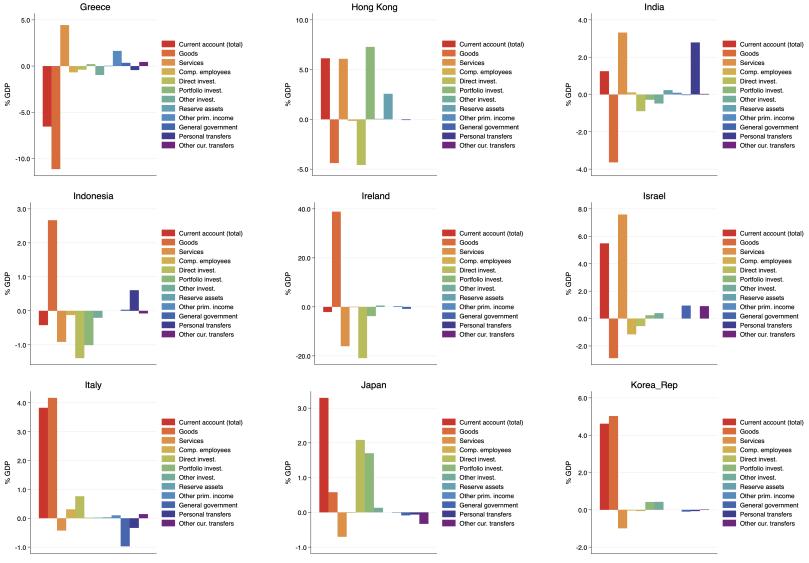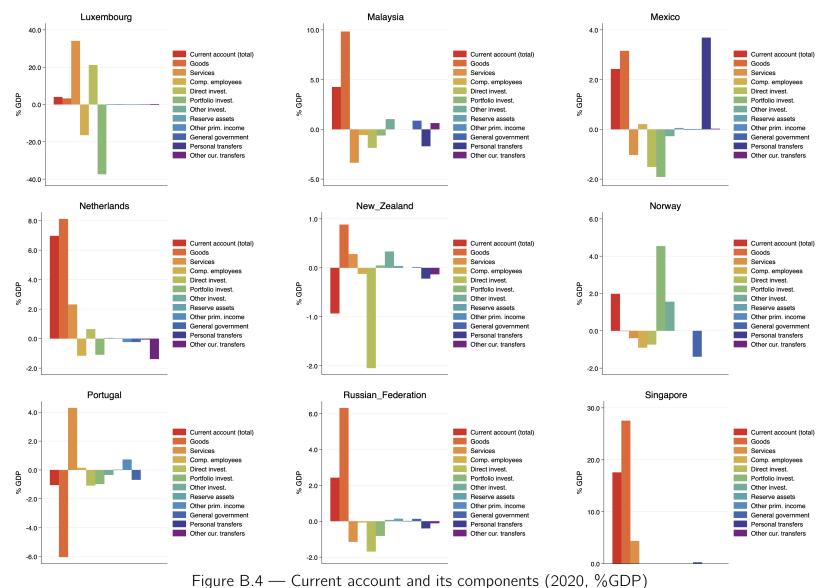
Figure B.4 — Current account and its components (2020, %GDP)

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.
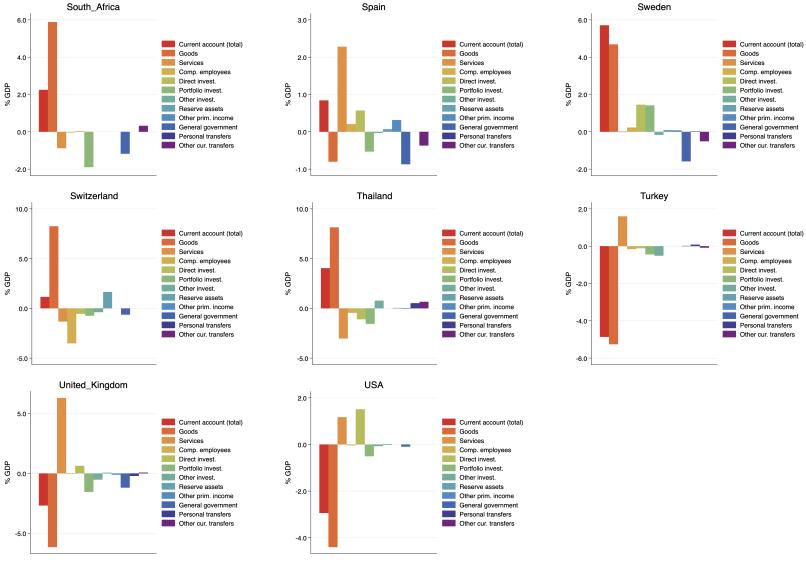
Figure B.4 — Current account and its components (2020, %GDP)

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.[7] 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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[7]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.[8]

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.[9]

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)[10], 6 show a very good match between the ESR staff-assessed $REER$ gap midpoints and the $EQCHANGE$ estimates of misalignments. These are: Australia, Belgium, the euro area, Germany, Mexico and Thailand. 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 when considering the $REER$ index-based estimates for the euro area, Germany and Thailand which point to overvaluations while the other EBA approaches and $EQCHANGE$ point to undervaluations. The above economies are followed by 11 others for which the different estimates are very close: China, France, India, Italy, Japan, the Netherlands, Russia, Spain, Switzerland, Turkey and the United States.[11]

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[8]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.

[9]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.

[10]As a reminder, Argentina is excluded from the 2021's vintage of $EQCHANGE$ due to the large uncertainty surrounding the determination of its equilibrium exchange rate.

[11]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. This holds also for the United States.

Table C.1 — Comparison of estimates: *EQCHANGE* and *External Sector Report* (2021)

| | External Sector Report | | | | | EQCHANGE | |
| | Staff-assessed REER gap | | Estimates by approach[a] | | | | |
	Midpoint	Range	CA	REER level	REER index	Mis	Std. Err.
Australia	-3.0	+/- 5	-4.5	9.8	-2.1	-5.3	2.8
Belgium	4.3	+/- 2.5	4.3	18.2	9.6	4.5	2.6
Brazil	-7.1	+/- 7.5	-7.1	-21.3	-36.6	-28.1	4.8
Canada	3.9	+/- 5.5	3.9	-6.5	2.6	-8.2	2.1
China	-0.5	+/- 10	-3.1	13	-0.3	-5.1	2.4
Euro areaa	-1.8	+/- 2	-1.8	-0.6	5.3	-1.6	2.6
France	8.0	+/- 2	8.0	2.9	-2.3	2.4	2.4
Germany	-9.2	+/- 5	-9.2	-15.4	5.6	-11.3	3.3
Hong Kong	-1.3	+/- 4	-1.3	NR	NR	11.4	2.4
India	-6.3	+/- 6.5	-6.3	6.6	10.9	-10.7	5.3
Indonesia	-1.0	+/- 5	-3.9	-11.6	2.1	-14.4	5.7
Italy	-0.3	+/- 4	-0.3	2.5	7.7	5.0	2.1
Japan	0.7	+/- 9	0.7	-12.0	-20.2	-6.5	3.6
Korea	0.2	+/- 2.5	0.2	-12.0	-3.7	-11.7	3.5
Malaysia	-9.0	+/- 2	-9.0	-42.0	-31.5	-38.4	3.1
Mexico	-21.8	+/- 8	-21.8	-10.0	-20.9	-19.2	2.1
Netherlands	-3.5	+/- 3	-3.5	4.2	17.8	-7.8	2.9
Poland	-11.1	+/- 1.5	-11.1	-19.1	-2.7	2.7	4.5
Russia	-7.6	+/- 6	-7.6	-20.8	-12.3	-3.7	2.4
Saudi Arabia	7.0	+/- 6	NR	NR	NR	-10.1	4.7
Singapore	-8.5	+/- 6	-8.4	NR	NR	-15.7	2.4
South Africa	4.0	+/- 4	4.0	-10.5	-20.9	-32.6	7.4
Spain	2.6	+/- 4	2.6	4.0	6.2	8.2	3.9
Sweden	-8.0	+/- 5	-10.9	-16.8	-18.4	-21.7	4.1
Switzerland	6.2	+/- 4	6.2	26.4	15.4	11.2	4.6
Thailand	-4.0	+/- 2.5	-4.0	-5.2	10.8	-6.1	5.6
Turkey	-20	+/- 5	4.9	-30.8	-34.5	-34.9	5.2
United Kingdom	7.5	+/- 7.5	10.0	-3.8	-12.2	-4.3	3.8
United States	8.2	+/- 3	8.2	12.4	8.3	15.9	3.2

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 2021. 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.

For the remaining 12 economies presented in Table C.1, the IMF assessments differ —sometimes dramatically— from ours. However, for 3 of them —namely Hong Kong, Saudi Arabia and Singapore— the comparison of the estimates is not really possible since they are not included in the EBA estimation samples.[12]

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 Brazil, Canada, Indonesia, Korea, Malaysia, Sweden and the United Kingdom for which the $EQCHANGE$ estimates match in some way with one of the EBA REER-based estimates.[13] 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.

Overall, the differences noted this year are coherent with those noted for previous years. In fact, as noted in previous versions of this report, 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 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 2020, although indicating again opposite misalignments, the gap between the ESR estimates and the $EQCHANGE$ ones have narrowed. This owes to the uncertainty surrounding the assessment of the CA norm. With a lower midpoint (-1.1 %GDP, in contrast with -1.9 %GDP in 2019), the extent of the overvaluation suggested by the ESR estimates is lower —with a relatively important uncertainty as suggested by the range.

For Indonesia, the midpoint was again 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.

In the case of Poland, our estimates point to a very slight overvaluation while the

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[12]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.
[13]Poland can also be considered in this group.

ESR estimates tend to indicate a 11% undervaluation of the zloty. While the difference between the retained midpoints seems quite important, the estimated based on the REER-index approach, 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 REER-index 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 in previous versions of the $EQCHANGE$ annual assessment, the difference is related to the time horizon considered for the estimation. While in $EQCHANGE$ we consider the 1974-2020 period, the ESR only focus on the period post 1990.