

# Global Economic Outlook

— July 2021



# Foreword

Dear Readers,

The first half of this year has been difficult, due largely to the resurgence of the Covid-19 pandemic globally, across Europe and in the Czech Republic. This has reminded us that the reasons for economic decline need not stem solely from the behaviour of economic agents, but can be caused by factors beyond our control, even if perhaps only partially. Epidemics are one such “exogenous” factor. To some extent, the same can be said for armed conflicts, although they are often a consequence of the build-up of extreme economic imbalances.

At a time when part of the economy (primarily the services sector) is paralysed, it is all the more difficult to determine the future course of the economy and inflation. I believe that Global Economic Outlook, our monthly bulletin, can give us some idea of where the global and European economy is headed. From my perspective, GEO provides me with a quick and in-depth overview of the trends in key economic variables. In particular, I follow events in the euro area, a unique European economic integration project that has long been close to my heart. A clearer vision of future developments in the euro area and elsewhere is essential to the formation of expectations, which are crucial for forward-looking central bankers.

The July issue of GEO is of particular interest to me, as its analytical section focuses on crypto assets. This modern and still rapidly emerging phenomenon on the financial markets still raises more questions than answers. It is probably paradoxical to be thinking about crypto assets just a few months ahead of the 20th anniversary of euro cash. What role will crypto assets play in the next 20 years? Will central bank digital currency be used as a matter of course in the second half of this century? And many more besides...

I hope that you enjoy this summer issue of GEO and that it will make for an inspiring read.



Oldřich Dědek, CNB Bank Board member

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#### Cut-off date for data

16 July 2021

#### CF survey date

12 July 2021

#### GEO publication date

23 July 2021

#### Notes to charts

ECB, Fed, BoE and BoJ: midpoint of the range of forecasts.

The arrows in the GDP and inflation outlooks indicate the direction of revisions compared to the last GEO. If no arrow is shown, no new forecast is available. Asterisks indicate first published forecasts for given year. Historical data are taken from CF, with exception of MT and LU, for which they come from EIU.

Leading indicators are taken from Bloomberg and Refinitiv Datastream.

Forecasts for EURIBOR and LIBOR rates are based on implied rates from interbank market yield curve (FRA rates are used from 4M to 15M and adjusted IRS rates for longer horizons). Forecasts for German and US government bond yields (10Y Bund and 10Y Treasury) are taken from CF.

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## I. Introduction

The Delta variant is increasing the number of new cases in Europe and around the globe, but rising vaccination coverage is protecting healthcare systems from disproportionate pressure and sparing advanced economies from appreciable restrictions. Despite the resurging pandemic, economic outlooks are positive. Examples include the Consensus Forecasts outlook and the European Commission's summer macroeconomic forecast. The Commission has increased its GDP growth estimate for EU countries to 4.8% in 2021 and 4.5% in 2022. Euro area countries are expected to see a similar improvement. According to the Commission, real economic output is expected to return above pre-pandemic levels in both the EU and euro area in 2021 Q4. These growth outlooks also assume support from the European recovery fund, which the first Member States could draw on during the summer holidays. In the field of central banking, Fed Chair

Jerome Powell confirmed that the Fed would maintain its current monetary policy stance. The Fed will continue to purchase assets to stimulate the US economy until it has fully recovered from the coronavirus shock. ECB President Christine Lagarde was similarly dovish. The bank came under the spotlight with the publication of its monetary policy strategy review. This includes a change in the hitherto asymmetric inflation target ("close to but below 2%") to 2%. Also, climate change is to be taken into

July GDP growth and inflation outlooks for monitored countries, in %

GDP	EA	DE	US	UK	JP	CN	RU
2021	4.6 ↗	3.4 ↗	6.6 ↗	6.8 ↗	2.5 ↗	8.6 ↗	3.3 ↗
2022	4.4 ↗	4.3 ↗	4.4 ↗	5.3 ↗	3.0 ↗	5.6 ↗	2.7 ↗
Inflation	EA	DE	US	UK	JP	CN	RU
2021	1.9 ↗	2.6 ↗	3.7 ↗	1.9 ↗	0.0 ↗	1.5 ↗	5.2 ↗
2022	1.4 ↗	1.8 ↗	2.8 ↗	2.4 ↗	0.5 ↗	2.3 ↗	4.1 ↗

Source: Consensus Forecasts (CF)

Note: The arrows indicate the direction of the revisions compared with the last GEO.

account when purchasing assets. Last but not least, the cost of owner-occupied housing will be taken into consideration when measuring consumer price inflation.

According to the CF analysts, the **July GDP growth outlooks** for the world's largest economies for 2021 are lower than in June for the USA, Japan and China. The forecasts for the European economy, i.e. the euro area as a whole, Germany and the UK, were again revised up for 2021. There is also optimism about next year – none of the economies under review had their growth outlooks lowered compared to June.

The **consumer price inflation outlooks** were generally revised upwards again compared to June for this year and the next. This trend has continued for several months now, with Japan still the only exception. However, the euro area is not expected to reach its notional ideal (the 2% inflation target) this year or the next, and the question is whether the ECB's new symmetric inflation target will help it achieve this.

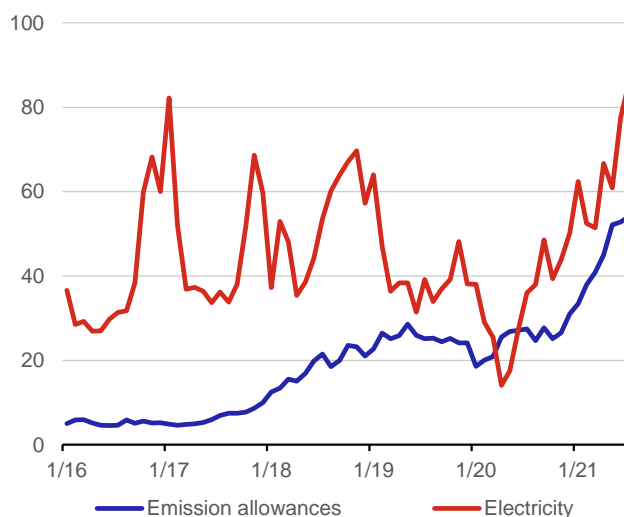
According to the July CF, the **US dollar** will weaken against all the [monitored currencies](#) at both the one- and two-year horizons. The CF forecast for [the Brent crude oil price](#) at the one-year horizon is almost unchanged from June at about USD 68/bbl (range: USD 55–80/bbl).

The **outlook for market rates** is rising for both the 3M USD LIBOR and the 3M EURIBOR, with that for the 3M EURIBOR remaining negative.

The chart in the current issue shows the very rapid growth in emission allowance prices since the start of 2021. Exactly one year ago, the emission allowance price exceeded EUR 30 per tonne for the first time (see [GEO 2020/07](#)). Given that electricity production in Europe is still largely linked to CO<sub>2</sub> emissions, as the emission allowance price rises, so does the electricity price. This is reflected in growth in consumer and industrial prices. Similar to high commodity prices, the high price of emission allowances is strengthening the current inflation pressures.

The current issue also contains an analysis: [Decentralised finance, its prospects and limits: Is blockchain interoperability the only obstacle?](#) The article presents and discusses decentralised finance, i.e. products and services operating on permissionless blockchains in the cyberspace independently of official legal and regulatory institutions. The article focuses on whether it is possible to make decentralised finance a meaningful global alternative to traditional finance and what such a move would entail?

Prices of emission allowances and electricity, EUR



Source: Refinitiv Datastream

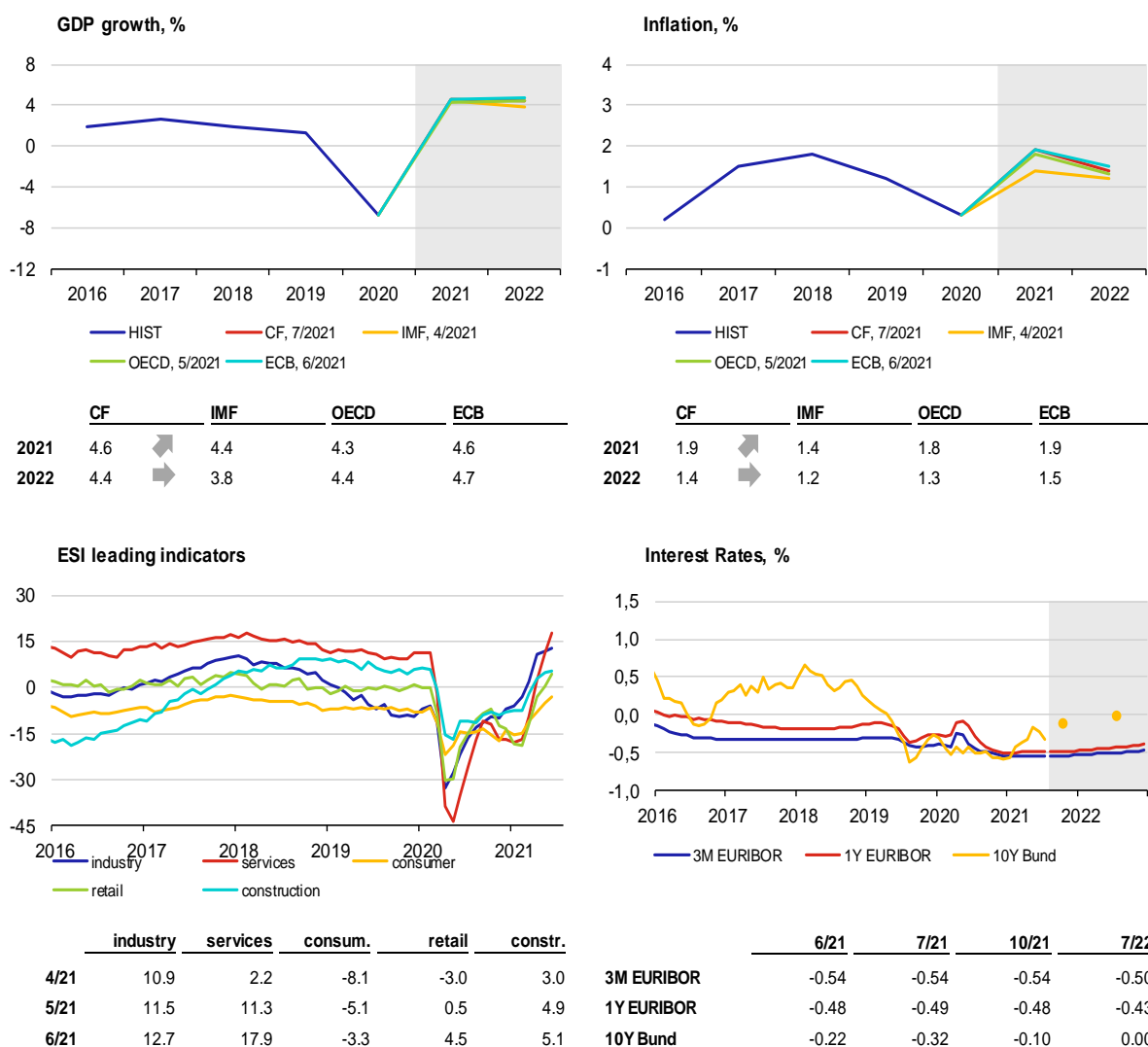
Note: (Monthly averages). The emission allowance price is in EUR/tonne of CO<sub>2</sub> according to the ICE for the euro area. The electricity price is in EUR/MWh according to Powernext for Western Europe.

## II.1 Euro area

The euro area services sector is gradually recovering from the spring wave of the pandemic, while industry has lost its position as driver of growth due to overburdened supply chains. Industrial production in the euro area fell by almost 1% month on month in May, owing mainly to a negative contribution from car manufacture. Of the sectors most affected by material shortages, the situation improved for production of chemicals and metals. However, according to the PMI survey, supplies remained restricted in June, even though the overall manufacturing indicator reached a new all-time high in the euro area. In addition to high output and orders, firms are reporting record pressures on input prices and delivery delays. The easing of pandemic restrictions had a positive impact on May retail sales, which increased by almost 5% on average month on month in the euro area. However, other services industries are also reporting expansion, as indicated by the June services PMI. Demand for labour in both industry and services is also rising. As a result, unemployment in the euro area fell below 8% in May for the first time in the last year.

The opening of the economy has also made the CF analysts more optimistic, causing them to raise their outlook for euro area GDP growth this year to 4.6%. The inflation outlook for this year has also been increased to 1.9%. The GDP growth and inflation forecasts for 2022 are unchanged. Spain and France are expected to record the fastest recoveries this year (5.9% and 5.6% respectively), while Germany is expected to grow by 3.4%. In 2022, the French, Italian and German economies will grow by more than 4%, while Spain will maintain a growth rate of almost 6%. Next year, prices will grow the fastest in Germany (2.6%), while inflation in Italy will be more than 1% lower on average.

The ECB kept its rates and asset purchases unchanged but revised its monetary policy for the first time in years. Its inflation target is now symmetric, fixed at 2%. According to the ECB, owner-occupied housing prices also need to be monitored. The ECB also set out an ambitious asset purchase plan taking issuers' attitude to the climate into account.



## II.2 Germany

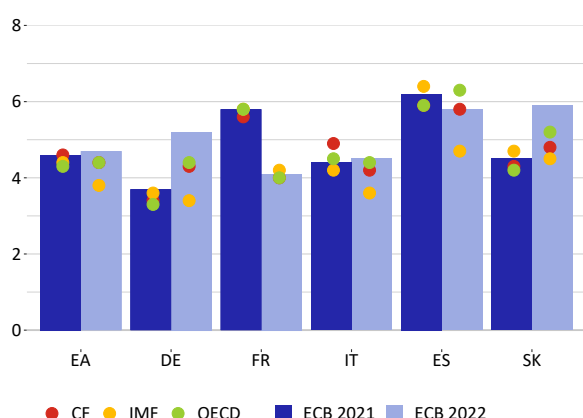
**The German engine lost some of its steam at the start of 2021, due not only to the spring lockdowns, but also to overloaded supply chains. It is slowly getting going again, though.** The restrictions in Germany were lifted more gradually than in other euro area member states, as it took a long time to get the pandemic under control there. The full effect of the recovery will thus be seen in the June data, as confirmed by leading indicators. The Ifo indicator jumped to its highest level since November 2018. The services PMI reached its highest level since March 2011, with growing activity reported mainly in services with a high level of social contact. There was also good news from the industry survey – the price pressure on inputs decreased at last, while production increased sharply after a weak April and May. As a result, the Bundesbank's weekly economic activity index, which takes high-frequency data into account, was indicating quarter-on-quarter GDP growth of just below 3% for 2021 Q2 at the end of June, while the market estimates for Q2 are still below 2%.

**According to the CF analysts, the growth of the German economy will reach 3.4% in 2021 and rise to 4.3% in 2022.**

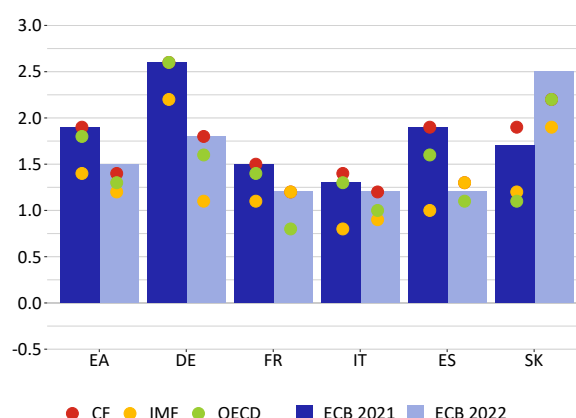
In addition to an improvement in the situation in services, the pressures in industry should also ease as consumer spending becomes spread more evenly across sectors. A recovery will also be seen in construction, which has also been suffering from shortages of materials. In the longer term, drawdown of EU funds under the approved national plan will make a positive contribution to the economic recovery after the pandemic. Germany's plan is focused less on infrastructure and more on investment in digitalisation and climate-friendly projects. The European Commission has raised enough funds in the financial markets for Germany to obtain 13% pre-financing during the summer.

**Inflation in Germany will slow from 2.6% this year to 1.8% in 2022.** Inflation rose to an all-time high of 2.5% in May, but the June figure (2.3%) indicates that the price pressures are now easing. This is mainly due to energy prices and the carbon tax. However, core inflation in Germany is also well above the long-term average. Analysts expect these temporary factors to subside gradually and German inflation to return below 2%.

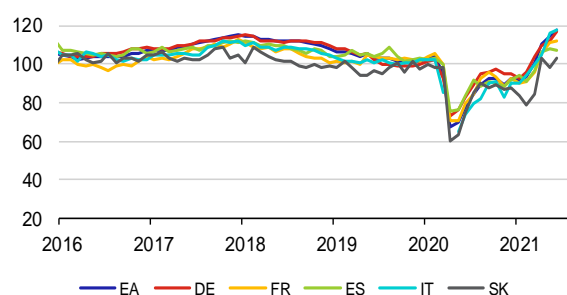
**GDP growth in selected euro area countries in 2021 and 2022, %**



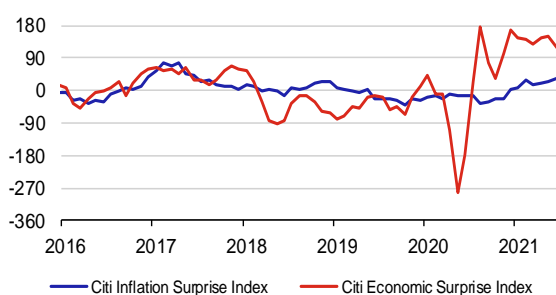
**Inflation in selected euro area countries in 2021 and 2022, %**



**ESI leading indicators**



**Economic and inflation surprises in the euro area, %**



Note: Inflation expectations based on 5year inflation swap and SPF

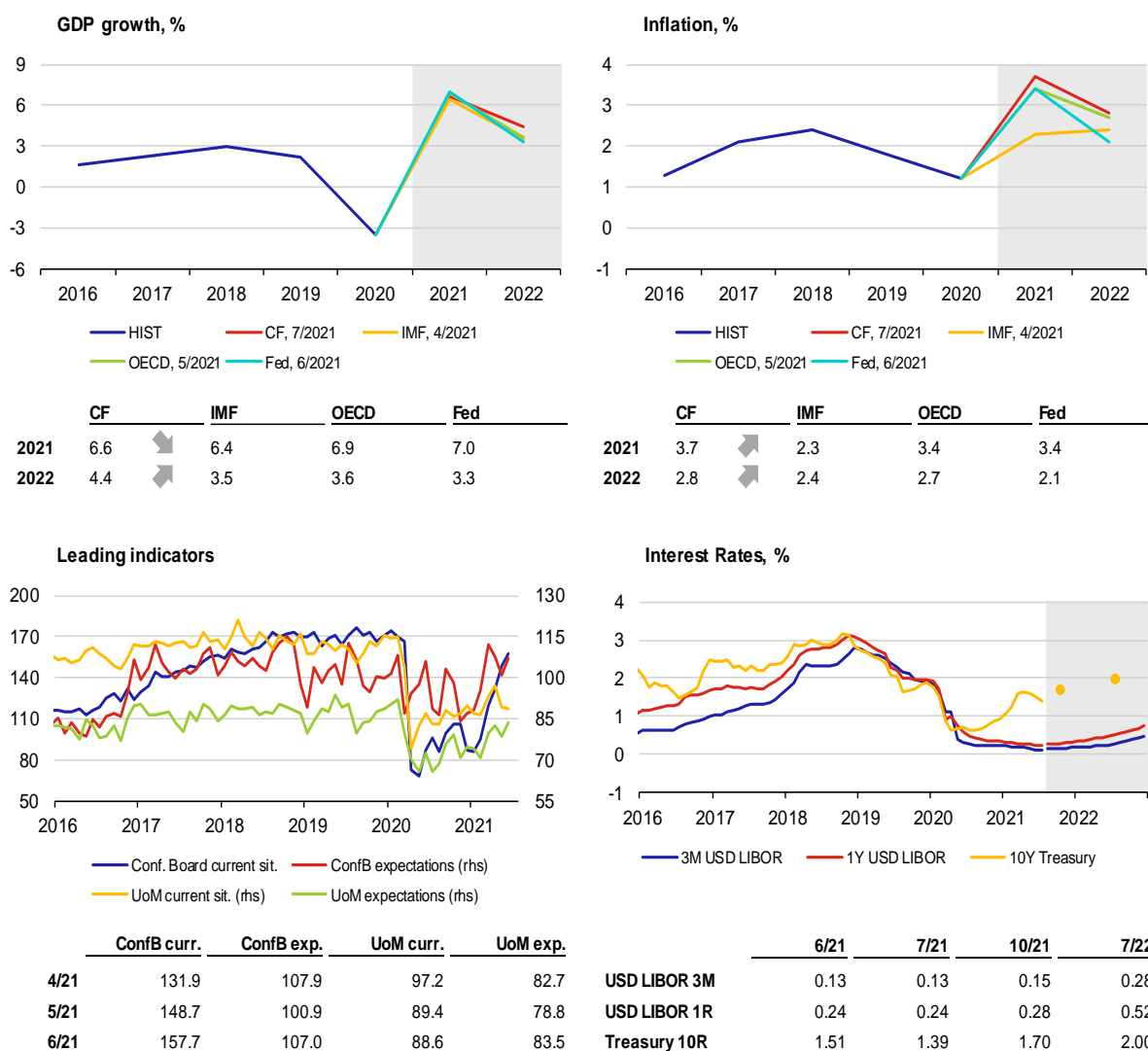
	EA	DE	FR	ES	IT	SK	5y5y	SPF
4/21	110.5	109.4	105.8	106.0	104.8	103.3	1.54	1.68
5/21	114.5	112.2	110.9	108.3	115.8	98.4	1.58	1.68
6/21	117.9	117.2	112.2	107.2	117.9	103.4	1.58	1.68



## II.3 United States

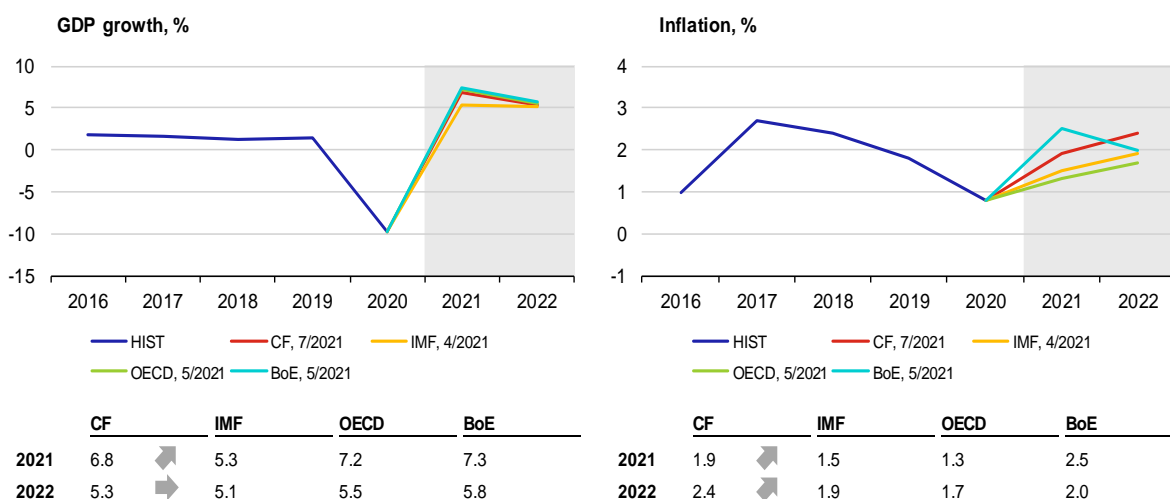
**Inflation is still a big issue in the USA, as the June figures were again higher than expected, and the outlooks were also revised up.** Annual inflation rose to a record high of 5.4% in June. Consumer price inflation is being driven by growth in prices of energy (24.5%), services (3.1%) and food (2.4%). Industrial producer prices are also rising (7.1%), especially in the case of finished products (9.2%). The CF outlook for this year was revised upwards again compared to June (by 0.2 pp to 3.7%). The projection for 2022 was raised by 0.2 pp to 2.8%. US Fed Chair Jerome Powell stated that the Fed will continue to support the US economy until it has fully recovered, so the inflation pressures are not easing yet. The inflation target, which was adjusted last autumn, is not at odds with the current values. However, according to economists, it is important that medium- and even long-term inflation expectations do not shift to higher levels.

**The growth outlooks for the US economy are being hampered by problems in supply chains.** The July GDP growth outlooks for this year were revised downwards by 0.1 pp to 6.6%, while the outlook for next year was moved by 0.3 pp to 4.4%. Consumer purchases reached record levels in 2021 Q1, mainly due to government support, but are now slowing (and even fell month on month in May). The saving rate remains elevated. According to estimates, GDP growth peaked in Q2. Despite the growth and a weakening pandemic, the labour market is recovering very slowly. The unemployment rate was 5.9% in June, although the number of new vacancies is rising (850,000 in June) and the participation rate is still 2 pp lower than before the pandemic. Exports continue to grow and are close to their pre-crisis levels. Goods imports remain about 10% higher than before the pandemic. Leading indicators also confirm positive sentiment – the services PMI is still at high levels (64.6), while the industry PMI is at its highest level in ten years (62.1).



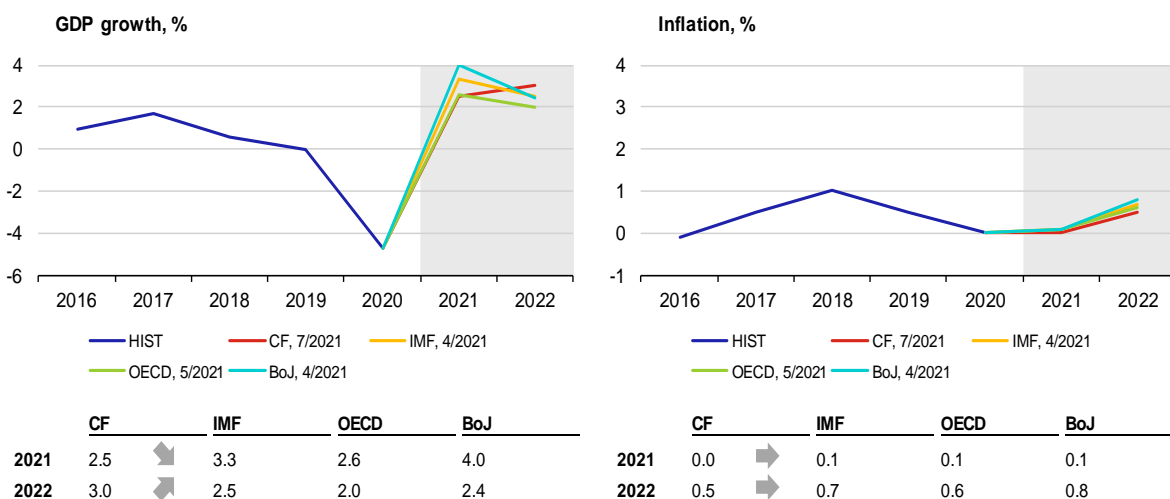
## II.4 United Kingdom

**The economic recovery in the UK is slowing; UK GDP grew by 0.8% month on month in May.** A strong recovery in the hospitality sector is being offset by a halt in growth in retail, construction and production. Despite rising new Covid-19 cases, most of the pandemic-related restrictions end in July. This is due to the UK's successful vaccination programme, which has weakened the link between the number of new cases and hospitalisations. However, there are concerns of labour shortages and subdued consumer spending, which would slow the return to the pre-pandemic activity level. The composite PMI fell slightly to 62.2 in June but continues to indicate strong expansion of activity in the UK private sector. The CF even slightly increased its GDP growth forecast to 6.8% for this year. The BoE held its policy rate at 0.1% and its QE framework at GBP 895 billion in June. BoE is also removing the restrictions on bank dividends and share buybacks introduced during the pandemic, due to an improved outlook for the financial sector and a sufficiently strong economic recovery.



## II.5 Japan

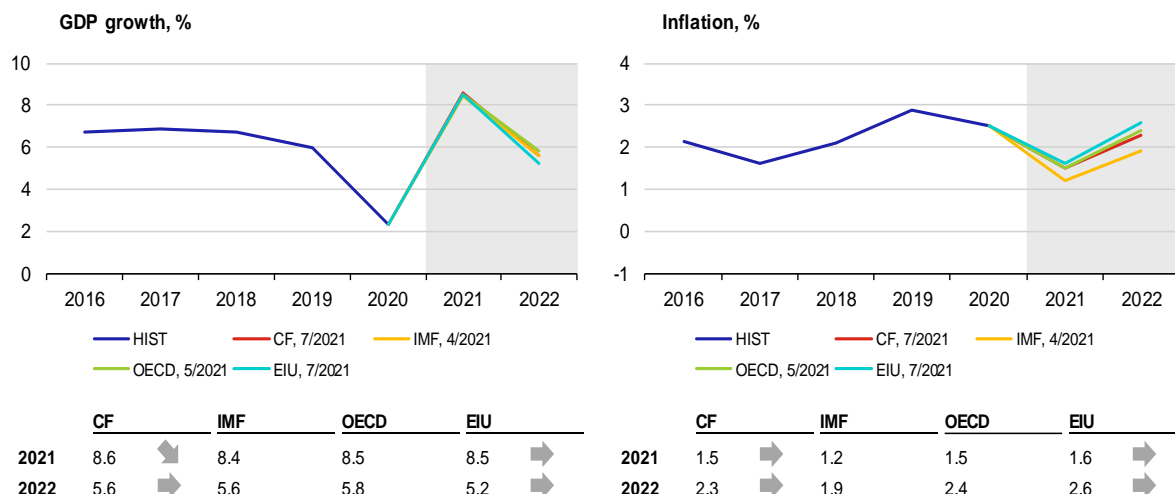
**Corporate sentiment in Japan climbed to its highest level since the end of 2018.** According to the BoJ's Tankan survey in 2021 Q2, the proportion of firms which consider the business conditions favourable was 13 pp higher than the proportion of those which see them as unfavourable. Sentiment was especially strong in machinery sectors but fell modestly in the automotive industry, probably due to the continuing shortage of semiconductors. Conditions also continue to be viewed as highly unfavourable in services affected by government restrictions. Some areas even saw the introduction of stricter restrictions due to the spread of the Delta variant and the upcoming Olympic Games. Consumer sentiment increased in June 2020, approaching pre-pandemic levels for the first time. Owing to a late start, Japan is still lagging in vaccination coverage but is catching up due to recent rapid progress.





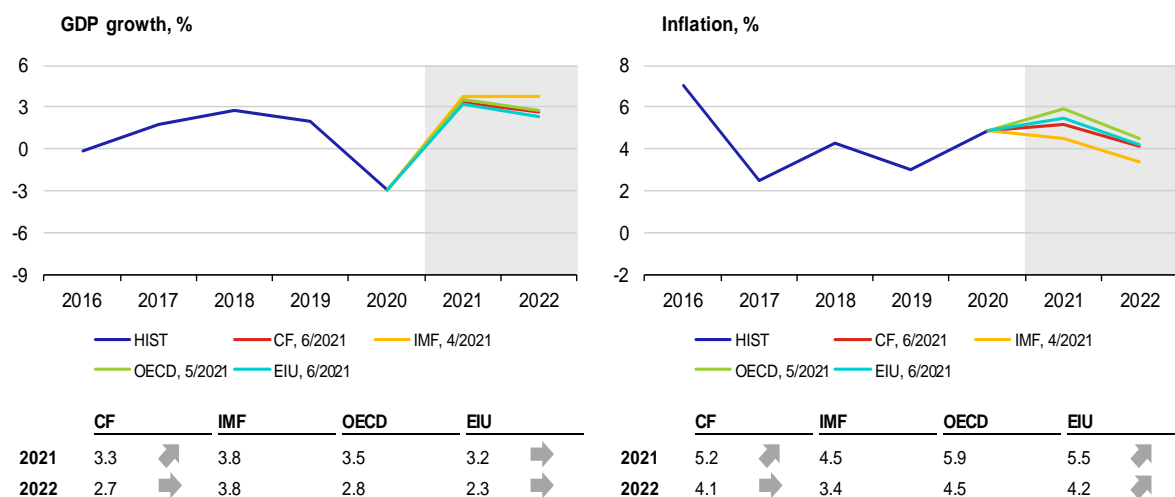
## II.6 China

The annual growth of the Chinese economy slowed markedly from 18.3% in Q1 to 7.9% in Q2. Although quarterly growth picked up from 0.6% to 1.3%, risks persist with regard to the imbalanced structure and the robustness of domestic demand and a renewed deterioration in the epidemic situation. Concerns about economic growth were exacerbated by the Chinese central bank's decision to reduce the reserve ratio by 50 bp in order to boost the money supply. The CF analysts expect the Chinese economy to grow by 8.6% year on year in 2021 and slow to 5.6% in 2022. Consumer prices increased by 1.1% on average in 2021 Q2. Rising inflation pressures, reflecting increasing consumer demand and higher costs associated with rising commodity prices, were partly offset by a stronger exchange rate of the renminbi against the dollar. According to the June CF outlook, consumer price inflation will reach 1.5% this year and 2.3% in 2022.



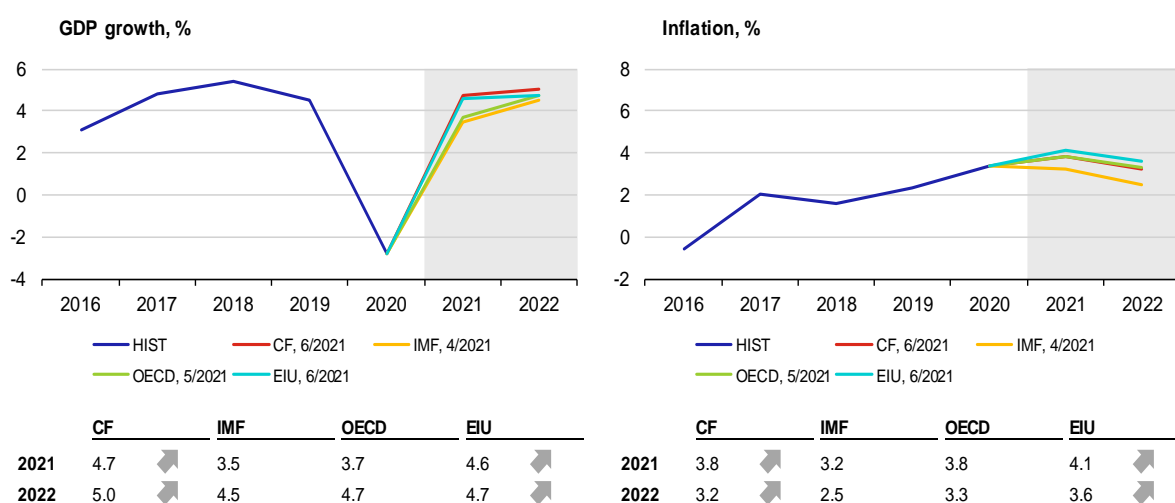
## II.7 Russia

Industrial production in Russia remains slightly below the pre-pandemic level, but prices are now well above this notional threshold. Industrial production increased by 11.8% year on year in May. Similar growth was observed in manufacturing as a whole. However, the June PMI slid into the contraction band due to a sharp decline in new orders (the biggest in eight months) and to signs of possibly weakening output growth. By contrast, growth in industrial producer prices is rising and is well above growth in final goods prices. In this case, a role is also being played by industrial price base effects, due to which growth reached 31.1% year on year in June. Consumer price inflation remains above the inflation target and rose by a further 0.5 pp year on year to 6.5% in June due to both supply and demand factors. The policy rate has been at 5.5% since 15 June and the central bank does not rule out further hikes in the next few months.



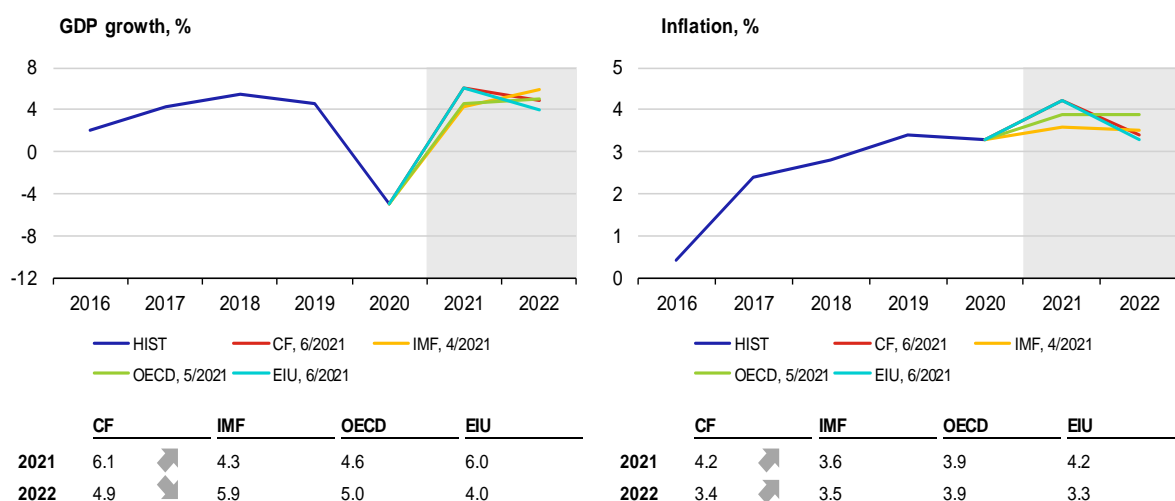
## II.8 Poland

**Poland's economy recorded a year-on-year decline of 0.9% in 2021 Q1 but grew by 1.1% quarter on quarter despite an adverse pandemic situation.** Optimism continues to be visible in international institutions' growth outlooks and in a further upward revision of the 2021 growth outlook by the Polish central bank (NBP) from 4.2% in the March forecast to 5.2% in the June forecast. Annual consumer price inflation dropped to 4.4% in June according to the statistical office's flash estimate, but in May it reached its highest level since November 2011 (4.7%). According to the NBP, rising costs will continue to increase inflation, as can be seen from a further upward revision of the inflation outlook for 2021 (from 3.2% in the March forecast to 4.1% in the June forecast). The NBP's Monetary Policy Council decided at its meeting on 8 July to maintain rates at technical zero and to continue implementing further measures to soften the impacts of the pandemic.



## II.9 Hungary

**The Hungarian economy grew by 2% quarter on quarter in 2021 Q1 but fell by 2.1% in year-on-year terms.** As a result of the restart of the economy and high vaccination coverage, the Hungarian central bank (MNB) expects a significant recovery in Q2 and stronger growth in 2021 than in the previous forecast (6.2% as against 5.0%). Annual consumer price inflation exceeded the May figures in June (5.3% as against 5.2%), reaching its highest level since November 2012, and remained far above the upper bound of the central bank's inflation target (3.0%). The MNB assessed the inflation pressures as generally strengthening and moved its inflation outlook for 2021 up from 3.9% to 4.1%. The MNB expects inflation to fall back into the tolerance band at the start of 2022 as a result of its monetary policy measures. At its meeting on 22 June 2021, the Monetary Council therefore decided to raise the policy rate from its historical low of 0.60% to 0.90%.

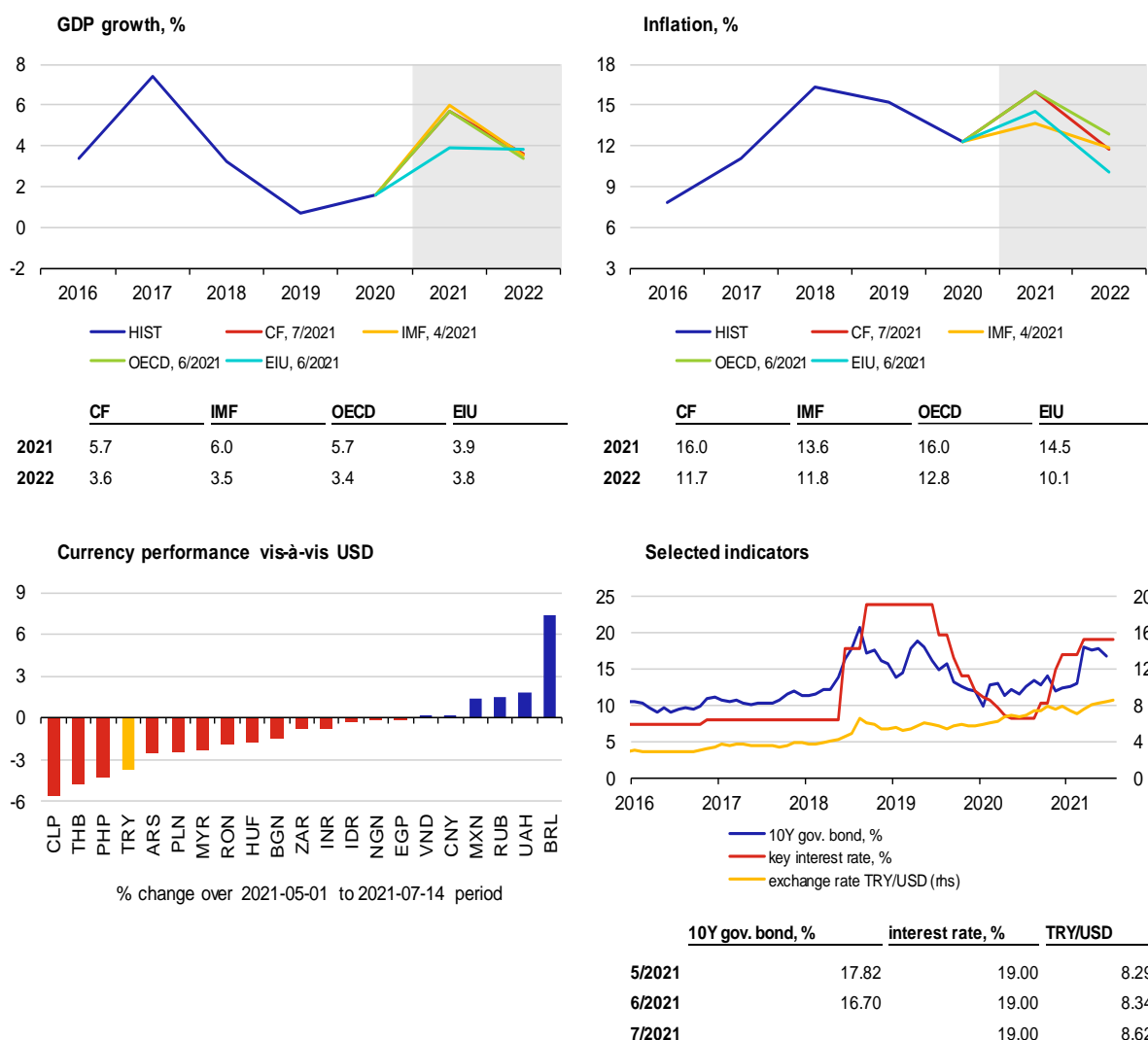


## II.10 Turkey

**A surge in new cases in April slowed Turkey's economic activity, but major international institutions are forecasting GDP growth of up to 6% for this year.** The need to lockdown had a big impact on the economy, which, despite recording positive GDP growth during the pandemic in 2020, faces many risks. Rapid credit expansion and strong liquidity support boosted growth last year, but this policy has also increased the country's economic and financial vulnerability. The risks include a decline in the already low forex reserves, a need for external financing, a weakening lira and high inflation. Annual inflation has increased for seven months in a row and accelerated to 17.1% in April (well above the central bank's 5% target). It is expected to remain in double figures this year, with CF and the OECD predicting 16% inflation for 2021. The inflation pressures are expected to remain elevated next year. The outlooks additionally expect a return to lower GDP growth in 2022 (around 3.5%).

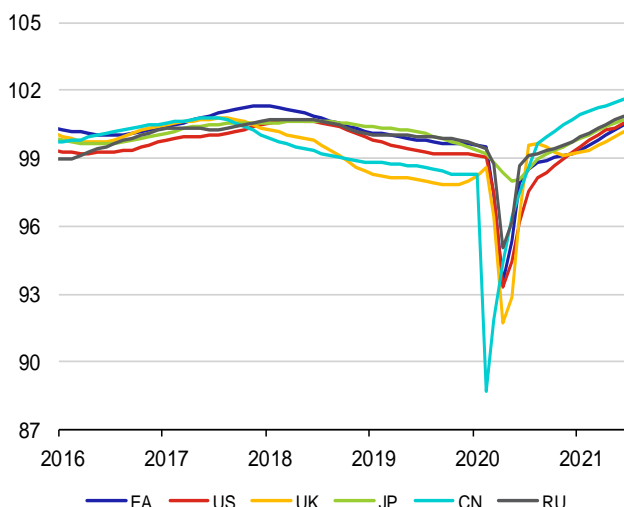
**The Turkish central bank got a new governor in March and has kept its rate unchanged for four months despite the rising prices.** President Erdogan replaced Naci Agbal with Sahap Kavcioglu as central bank governor. In less than two years, he has dismissed three governors over disagreements on monetary policy. Other officials and employees are also disappearing from the bank for political reasons. The change of governor stoked concerns about monetary policy independence, damaged financial market sentiment and significantly weakened the lira. Despite the high inflation and weaker currency, the CBRT is committed to not increasing the interest rate and to keeping it at the current 19%.

**Most of Turkey's pandemic restrictions were lifted on 1 July, mainly due to the success of the mass vaccination programme.** Increasing vaccination coverage and lockdown have reduced the number of new daily cases from 60,000 in April to about 5,000 currently. Sixteen million people have received their second dose (about one quarter of the target population is now fully vaccinated). Herd immunity could thus be achieved by the end of summer. In addition, Turkey is one of the world's leading countries in terms of the number of doses administered daily (over one million).

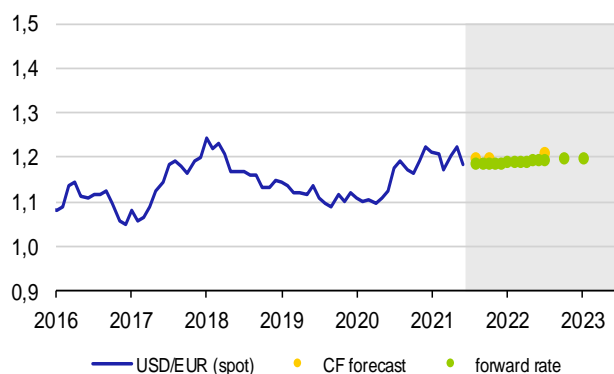


## III. Leading indicators and outlook of exchange rates

OECD Composite Leading Indicator

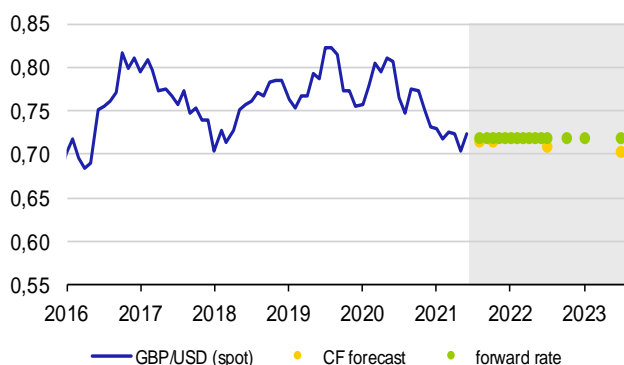


The US dollar (USD/EUR)



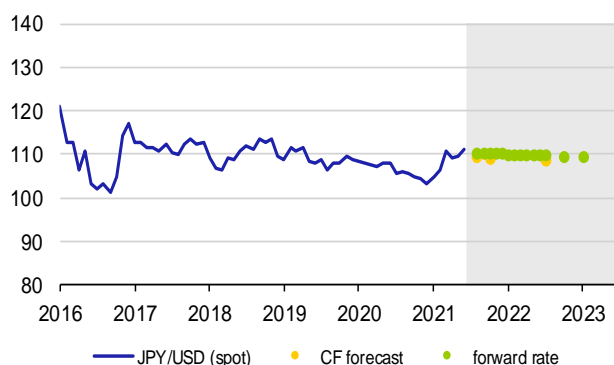
	12/7/21	8/21	10/21	7/22	7/23
spot rate	1.187				
CF forecast		1.198	1.201	1.211	1.218
forward rate		1.187	1.188	1.195	1.207

The British pound (GBP/USD)



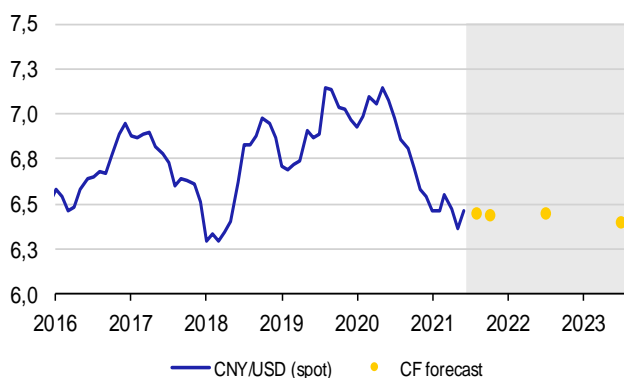
	12/7/21	8/21	10/21	7/22	7/23
spot rate	0.720				
CF forecast		0.716	0.715	0.710	0.704
forward rate		0.720	0.720	0.720	0.720

The Japanese yen (JPY/USD)



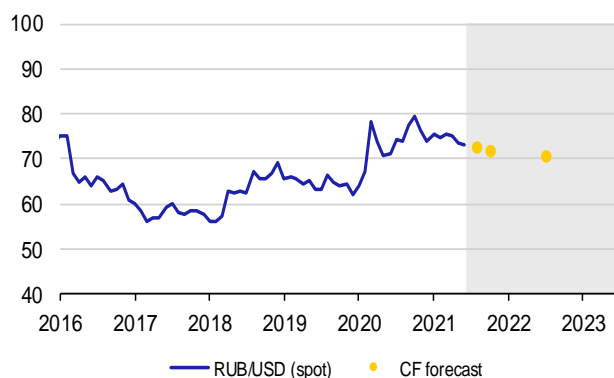
	12/7/21	8/21	10/21	7/22	7/23
spot rate	110.3				
CF forecast		109.5	109.3	108.7	107.0
forward rate		110.3	110.3	109.9	109.1

The Chinese renminbi (CNY/USD)



	12/7/21	8/21	10/21	7/22	7/23
spot rate	6.473				
CF forecast		6.455	6.445	6.452	6.403

The Russian rouble (RUB/USD)



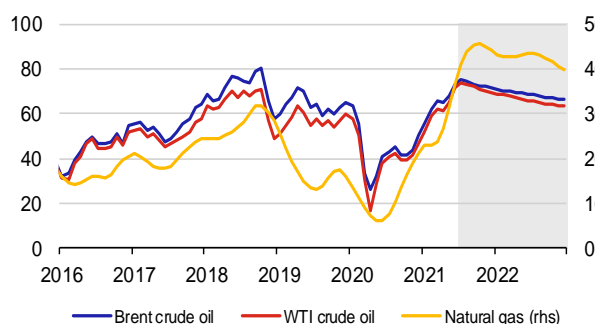
	12/7/21	8/21	10/21	7/22	7/23
spot rate	74.40				
CF forecast		72.57	71.98	70.81	71.23

Note: Exchange rates as of last day of month. Forward rate does not represent outlook; it is based on covered interest parity, i.e. currency of country with higher interest rate is depreciating. Forward rate represents current (as of cut-off date) possibility of hedging future exchange rate.

## IV.1 Oil

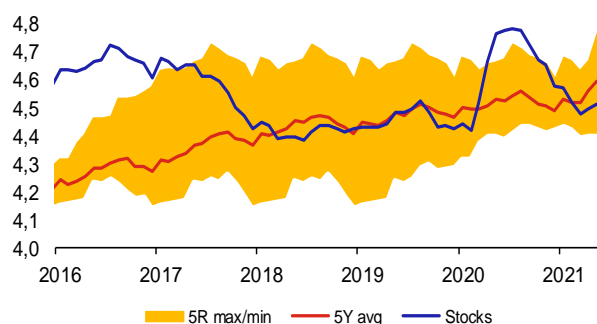
**The seven-week-long surge in crude oil prices peaked in early July, when the Brent price broke through USD 77/bbl in reaction to failed OPEC+ talks on upping production further.** The price growth was supported by a solid pace of vaccination, which is paving the way for an opening up of economies, renewed economic growth and continued growth in global oil demand. Successful OPEC+ policy is also playing an important role. At its talks in early July, OPEC approved a plan for a regular monthly increase in output of 400,000 barrels a day from August to the end of next year. However, this was blocked by the UAE, which made its approval conditional on increasing the baseline from which its production limits are calculated (as it has invested heavily to increase its production capacity in the meantime). The failure of the talks means there will be no increase in production in August and the oil supply deficit on the market will rise further. The oil price immediately responded by rising strongly. As time went on, however, the market also became aware of the increased risk of collapse of the alliance and the possibility of a new price war, which would conversely cause oil prices to drop. The Brent price thus fell back below USD 75/bbl. The uncertainty associated with the rapid spread of the Delta variant (especially in South-East Asia) and the possibility of Iranian oil returning to the market are also pushing oil prices down. There are reports that Saudi Arabia and the UAE have reached a compromise which could allow a renewed increase in oil production in OPEC+ countries. The exchange rate of the dollar is acting against higher commodity prices generally. It appreciated in mid-June in response to a Fed comment that the period of extremely accommodative monetary policy is coming to an end. Commodities are thus losing their attractiveness to financial investors as a hedge against expected inflation. The market curve in the first half of July is signalling a drop in the Brent price from its current level of around USD 75/bbl to about USD 71.5/bbl and USD 66.5/bbl at the end of 2021 and 2022 respectively.

Outlook for prices of oil (USD/barrel) and natural gas (USD / 1000 m<sup>3</sup>)

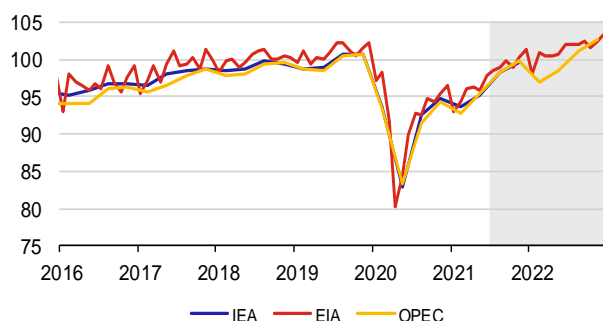


	Brent	WTI	Natural gas
2021	69.12	66.89	357.71
2022	68.64	66.01	425.14

Total stocks of oil and oil products in OECD (bil. barrel)

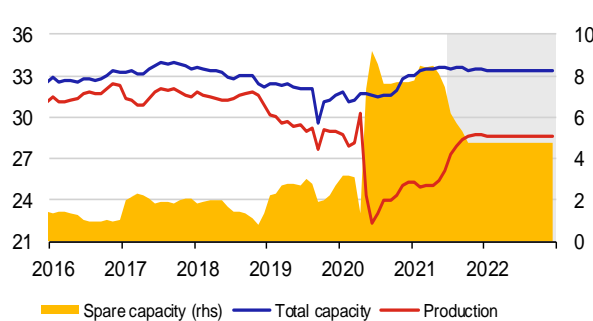


Global consumption of oil and oil products (mil. barrel / day)



	IEA	EIA	OPEC
2021	96.68	97.61	96.55
2022		101.35	99.84

Production, total and spare capacity in OPEC countries (mil. barrel / day)



	Production	Total capacity	Spare capacity
2021	26.78	33.46	6.68
2022	28.63	33.40	4.77

Source: Bloomberg, IEA, EIA, OPEC, CNB calculation

Note: Oil price at ICE, average gas price in Europe – World Bank data, smoothed by the HP filter. Future oil prices (grey area) are derived from futures and future gas prices are derived from oil prices using model. Total oil stocks (commercial and strategic) in OECD countries – IEA estimate. Production and extraction capacity of OPEC – EIA estimate.

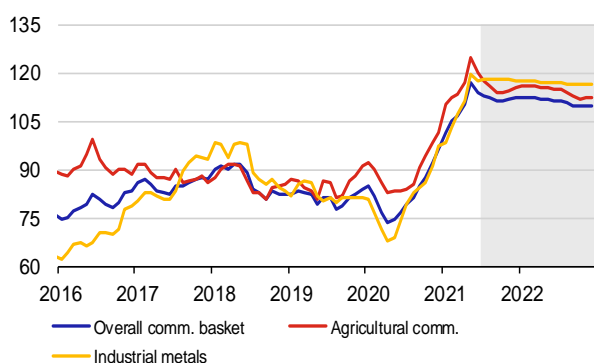
## IV.2 Other commodities

**The average price of natural gas in Europe continued to rise sharply in June.** The 16% growth was driven by still low inventories (48% of total capacity at the end of June, as against 80% a year ago) and further growth in emission allowance prices (see this issue's [chart](#)). The price of Australian thermal coal rose by 21.4% to a ten-year high in June. The high demand for coal stemmed mainly from the energy sector, with unusually warm weather in North East Asia (particularly China) and continued robust industrial activity pushing up electricity consumption in the region. Coal imports to China rose sharply in June, while some exporters limited mining due to bad weather.

**The average monthly base metals price index recorded its first drop since April 2020 in June.** The 1.6% fall is attributed to slowing growth in global manufacturing (mainly in China, Japan and the USA) and the appreciating dollar. However, zinc and copper prices were the only contributors to this decline. The price of copper fell by about 7% from the record high seen in May, due, among other factors, to a 72% rise in stocks at the LME. Prices of aluminium and tin are broadly flat at their May levels, and lead and nickel prices rose in June. Iron ore prices remain near their May all-time high, buoyed by high global steel production in May and strong imports into China in June. The outlook for the base metals price index remains only slightly falling as usual. By contrast, the price of iron ore is expected to fall sharply in the next few years.

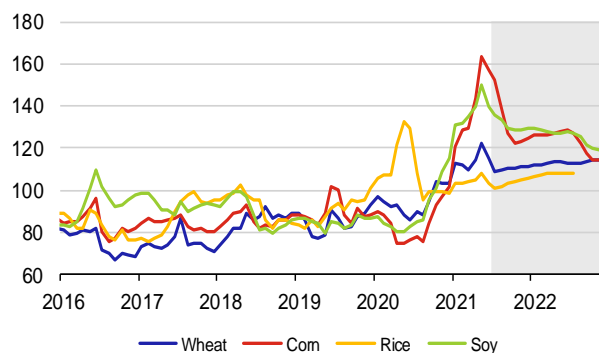
**The food commodity price index, which hit a seven-year high in May, also fell in June and, unlike the metals index, continued to decline in the first half of July too.** Prices of wheat, rice and soy saw a correction, as, to a lesser extent, did the price of pork. Prices of corn, soy and especially pork, and to a lesser extent also sugar, are expected to keep falling rapidly over the outlook horizon. By contrast, beef prices are expected to go up further.

Non-energy commodities price indices



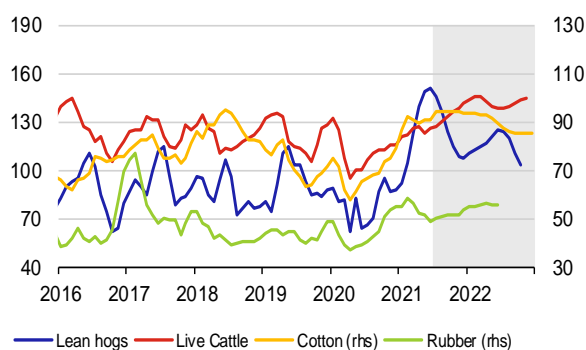
	Overall	Agricultural	Industrial
2021	110.5	115.7	113.6
2022	111.0	114.3	116.9

Food commodities



	Wheat	Corn	Rice	Soy
2021	112.4	135.9	104.0	134.4
2022	113.4	122.8	107.5	125.0

Meat, non-food agricultural commodities



	Lean hogs	Live Cattle	Cotton	Rubber
2021	124.4	129.2	92.0	52.5
2022	115.7	142.2	88.8	55.5

Source: Bloomberg, CNB calculations.

Note: Structure of non-energy commodity price indices corresponds to composition of The Economist commodity indices. Prices of individual commodities are expressed as indices 2010 = 100.



## Decentralised finance, its prospects and limits: Is blockchain interoperability the only obstacle?<sup>1</sup>

*Decentralised finance (DeFi) refers to financial products and services that operate on permissionless blockchains in the cyberspace independently of official legal and regulatory institutions and in disregard of state borders. Since a blockchain was originally meant to be the exclusive operational domain of its user community, facilitating inter-blockchain interaction is the immediate question to be resolved if one wants to make DeFi a meaningful global alternative to traditional finance. In the process of answering this question, one discovers challenges to DeFi deployment that extend well beyond pure technological interoperability.*

### Introduction

**Decentralised finance (DeFi), also called “open finance”, refers to the ecosystem of financial applications developed for use in blockchain systems.** Although it is still in the early stages of development, a number of examples are giving people a taste of what the financial future could look like (Coindesk, 2020). In the minds of its proponents (Bhardwaj, 2020; Eikmanns et al., 2021), DeFi should be an open financial sector that runs on top of a set of public blockchains. Financial applications developed specifically for use in permissionless blockchains are often believed to promote the development of a more inclusive financial system.

**DeFi may be equally defined as a “movement” within digital finance towards implementing financial products and services in decentralised networks based on open source software.** In traditional finance, the source of trust is public governance, which is composed of laws and financial institutions licensed by a central authority. This is why DeFi partisans often refer to it as CeFi (centralised finance). DeFi is meant to give control to users, promising to reduce, among other things, the operational risks they currently face due to the need to rely on a trusted intermediary as an access point to financial services. In contrast, the trust requirements for DeFi are supposedly minimal, as its activities are deployed by means of financial decentralized applications (dApps) that use peer-to-peer (P2P) protocols. This is why it is hoped that DeFi will bring about a more open and transparent financial industry. The lack of barriers to entry means anybody with programming skills can take part in creating new financial tools and services or enhancing the already existing ones. Referring to the extra functionality granted to DeFi users in comparison with CeFi thanks to the quickly evolving open source application codes, aficionados claim that official regulation of traditional finance is a barrier to much-needed innovation. One can say that, currently, DeFi is one of the most prominent incarnations of the pervasive fintech dream of “finance given back to the people” (Derviz, 2019).

### Beginnings

**Decentralised finance started to gain prominence in 2018, when 15 Ethereum-based projects came together with the proclaimed purpose of building an independent, secure and open financial system.** The early members of the DeFi movement included Maker DAO, Origin Protocol and Paradigm. Initially, the primary venue for decentralised finance was Ethereum (Fig. 1), but, in principle, the same functions can be, and are being, implemented on a number of other smart contract platforms. Certain ones (e.g. EOS) eventually overtook Ethereum in terms of funds attracted (Fig. 2).

**The usually cited benefits of DeFi compared to CeFi are cost-effectiveness and accessibility.** Through the use of smart contracts adapted to distributed ledger technologies (DLT), introducing a financial application or product should become less complex and more secure. Beside that, developing most dApps on top of the common – originally Ethereum – blockchain should reduce operational costs and lower entry barriers. DeFi has become one of the critical growth areas for Ethereum since 2019. Other competing blockchains are also building DeFi products, though at a much slower pace. Still, at present, even the Ethereum-based DeFi’s user-side remains small, with an average number of users per month slightly exceeding 40,000; 90% of these users are active on decentralised exchanges (DEXes).

**Currently, the three most important functions of DeFi are:**

- creating monetary banking services (e.g. issuance of stablecoins)
- enabling the operation of decentralised crypto exchanges and supporting advanced financial instruments such as DEX, tokenisation platforms, derivatives and predictions markets
- providing peer-to-peer or pooled lending and borrowing platforms.

**Actually, the latter function, or, more broadly, DeFi lending, was not the originally promoted central objective of the crypto finance “revolution”.** The heaviest PR effort was instead concentrated on the following.

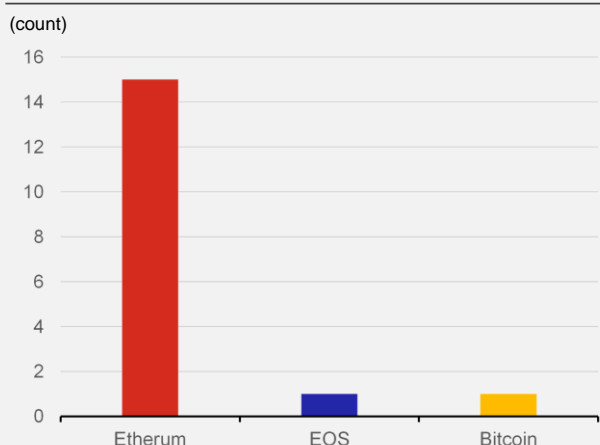
1. Banking in underbanked regions, particularly access to banking services through mobile devices.

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<sup>1</sup> Author: Alexis Derviz. The views expressed in this article are those of the author and do not necessarily reflect the official position of the Czech National Bank.

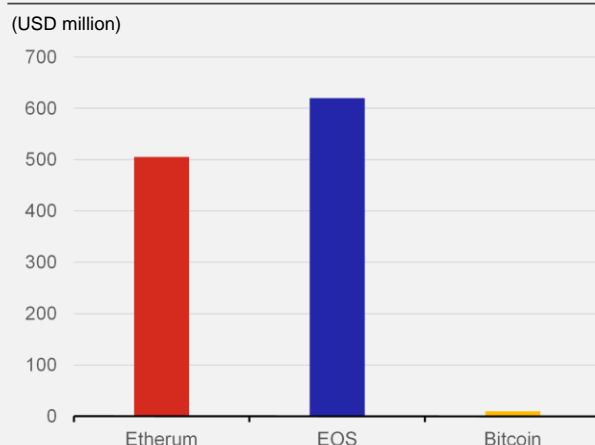
2. Reacting to global financial turbulence: following the Great Financial Crisis, many people became preoccupied with the implicit risks of the current global financial system and started to investigate the fledgling crypto technologies as protection against future upheaval. In many emerging economies, there are also specific concerns about hyperinflation, currency manipulation and unexpected devaluations.
3. Going around censorship and restrictions: DeFi is often considered an opportunity to circumvent bans or restrictions imposed by oppressive governments, especially in the area of cross-border transactions. The hope is that it will enable people to make and receive payments without having to worry about privacy violations by governments.
4. From exactly the opposite vantage point, DeFi dApps may also be used for KYC, AML and other identity management services.
5. Financial Creativity: DeFi is proving to be a reliable tool for enhancing the development of bespoke financial products, primarily derivatives, for small, specialised market segments reliant on DLT.

Figure 1 – DeFi applications by blockchain



Source: Binance Research, DefReview  
Note: Data as of 5 June 2019

Figure 2 – Total amount locked by blockchain



Source: Binance Research, DefReview  
Note: Data as of 5 June 2019

**Still, the real take-off of DeFi is inseparable from its credit provision opportunities.** Among the best known, the Maker DAO platform (MakerDAO, 2017), with a user base of 21,000 people, is ranked as the largest decentralised finance app. The app makes it possible to borrow by depositing Ethereum and receiving the Maker-native stablecoin Dai. Dharma is another decentralised finance app that operates as a lending platform. The app makes it possible for people to lend and borrow Ethereum regardless of their credit score. As a third example, Bancor Network is slightly different from the two aforementioned dApps, as it allows users to trade cryptocurrencies without an intermediary such as a broker. Further examples are Compound and dYdX. The loans are usually denominated in one of the stablecoins the platform supports (most often Dai or USDC). For many, an attractive feature of these smart contracts is that they function as a matching device: a borrower need not actively look for a lender and vice versa. Instead, the smart contract replaces the role of broker/middleman, and interest rates/lent volumes are generated by an algorithmically created order book.

**DeFi projects are often used as a way to generate returns even when crypto asset prices decline.** For instance, some DeFi projects let people take out loans against their digital asset holdings and receive fiat in return, often enabling them to put their capital gains to work in the offline world. Additional innovations include Aave's flash loans, which allow one to borrow instantly with no collateral needed, provided the liquidity is returned to the pool within one transaction block.

### Traditional vs. DeFi lending

**In a world of next-to-zero interest rates, and amid the economic volatility of the global pandemic, it is not surprising that DeFi projects, along with other digital assets, are so attractive to investors seeking a quick yield.** However, investors with a more conservative long-term attitude would currently find DeFi a tad "wild". Whereas a traditional bank, when extending a loan, creates a new balance for the borrower in a fiat currency (which, by definition, receives backing from the reserve bank of the state the bank is chartered in), DeFi loans are denominated in a digital currency. Can the borrower be sure how much he owes? To make this clear, the lender must either acquire some of the existing crypto assets prior to the loan deal and transfer them to the borrower as the loan principal (hugely inconvenient and costly) or create their own tokens for the same purpose (leaving the question of what those tokens are worth to market forces). DeFi lenders cannot expand their balance sheets at will by crediting borrowers' accounts with fiat money (this is what bank charters are for). However, they can, and do, provide borrowers with their stablecoins. The latter, in the absence of a

credibility crisis with regard to the obligation to redeem on demand, may seemingly amount to the same thing. (See Derviz, 2020, for a discussion of the role of stablecoin inside fintech.) Indeed, currently one of the most prominent DeFi lenders, Maker, does exactly that by issuing its Dai stablecoin (with a nominal 1:1 redemption rate to the USD). However, acting as such a crypto bank-cum-stablecoin-issuer is an extremely risky endeavour (Klages-Mundt et al., 2020); many cases of failure have already been recorded. Naturally, this is one of the reasons DeFi lending is not growing as fast as its fans had hoped not so long ago. Another, in the absence of either the usual deposit insurance schemes or credit risk assessment procedures available to traditional banks, is the need to over-collateralise every loan. On the other hand, if the crypto lender/stablecoin issuer departs from this “narrow banking” business model of full collateralisation, it needs to develop liquidity and risk management procedures that inevitably move it closer to a conventional banking firm. This is true notwithstanding the company’s probable effort to remain outside the financial regulation perimeter by staying strictly online, since, even in the “free banking” environment of the crypto ecosystem, it will need to develop trust and maintain partnerships.

### How is credit through DeFi actually used?

**Overall, DeFi lending is not yet a factor of importance for the real economy.** For the most part, it remains a playground for professional crypto speculators. Their business model has become known as yield farming. Holders of borrowed tokens try to earn outside yields on them all around the crypto universe. Yield farmers make a profit when they provide capital to a lending protocol which is then used to supply liquidity to traders or, in the case of Compound Finance and some others, lent out to users of the protocol. There have been some instances of triple digit annual percentage yields being earned for doing so. Some of these projects reach astronomical valuations, whereas others fail entirely.

**Interest rate arbitrage in the DeFi space refers to taking advantage of interest rate differences across DeFi platforms.** DeFi-CeFi arbitrage also exists when there are interest rate differences between centralised and decentralised platforms. Further, carry trade strategies may be pursued, i.e. it is possible to borrow a low-interest asset to invest in an asset yielding higher returns. However, as already mentioned, all existing DeFi platforms rely on over-collateralisation requirements from the borrower’s perspective, which limits potential arbitrage opportunities.

**Several potential market inefficiencies are widespread both within DeFi and in conjunction with CeFi platforms.** Since DeFi is quite new, it has not yet attracted liquidity levels comparable to CeFi. There are also platform-specific uncertainties, such as interest rate volatility, potential smart contract issues (software errors), loan matching uncertainty and redemption risks. Finally, DeFi platforms and protocols are very diverse, with common standards far from settled.

**Eventually, as the DeFi space matures, extra lucrative lending opportunities are expected to become scarcer.** Interest rates across platforms should also converge as long as assets and platforms share similar risk characteristics. Acting against this saturation trend, the advent of dApps that implement instruments able to alleviate market incompleteness, such as interest rate swaps, may soon give rise to a broader range of trading opportunities.

### CBDC-crypto interoperability

**Since DeFi typically makes use of stablecoins as a bridge between crypto and fiat balances, one is bound to ask what place a specific type of (future) stablecoin, namely central bank digital currency (CBDC), takes in this new ecosystem.** At present, the most widespread declared case for CBDC is payment facilitation. Since this is no longer a problem on a national level, one looks for the ability of CBDC to promote speed, inclusion and user cost reduction for international transactions in the retail segment. In an optimistic scenario, CBDCs would be able to create open payment protocols and facilitate frictionless exchange of value across borders. However, central banks cannot create these systems in isolation or they risk rebuilding the silos that already exist today within CeFi, with little improvement in terms of the international value flow. In this regard, partnership with private entities and networks that are currently developing their own DLT-connecting tools could speed up development.

**Central banks currently exploring CBDCs must address the interoperability issue, and the latter requires open standards.** As a part of such standards, neutral bridge assets will eventually be needed to free up capital and enable unrestricted value movement between CBDCs. These neutral bridge assets will allow for frictionless value movement between various CBDCs without requiring each one to solve the liquidity challenges inherent in cross-border transactions. Not surprisingly, the candidates that immediately come to mind are (certain) crypto currencies. For instance, Ripple, with its solidly established record of facilitating retail and lesser-scale wholesale international payment traffic (Fig. 3), including with underbanked destinations, is signalling its willingness to help (Ripple, 2020). RippleNet’s On-Demand Liquidity service allows financial institutions to transact in real time across multiple global markets using its native digital asset XRP as a bridge currency. The company claims XRP to be faster, less costly and more scalable than any other digital asset, making it the ideal instrument in bridging two different currencies quickly and efficiently. This solution can also support the direct exchange of CBDCs, which should be a proposition worth considering, especially for smaller central banks.

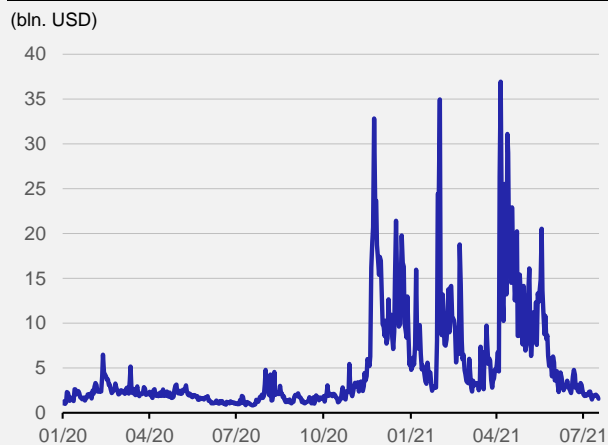
**The clear advantages of a public-private partnership in the CBDC domain (similarly to what Polkadot, Cosmos and Wanchain offer for cryptocurrencies and corporate blockchains) are easy access, global coverage and delegation of most technology tasks to the bridge provider.** The downside – again comparable to cross-blockchain communication protocols in the private sphere – is the dependence on a single connection provider and its well-being: for example, if Ripple falls, all the implemented interoperability solutions and links to CBDCs in other countries will go with it. An alternative would be something like the Hyperledger Fabric for private blockchains, with its less centralised, modular/weblike architecture. Here, the downside is also similar to that present in the private sector: the need for binding common standards, which take time to develop and gain acceptance.

## Conclusion

**There are qualitative differences between traditional (CeFi) and DeFi lending that far exceed the use of technologies.** DeFi start-ups are currently able to intermediate pre-existing crypto asset borrowing by means of smart contracts involving over-collateralisation. In a fractional-backing regime, they know how to procure loans in terms of lender-native tokens, usually stablecoins. However, over-collateralised ultrashort-term loans seldom find other customers than professional crypto speculators (yield-farmers), whereas the stablecoin issuance business on its own has proven to be barely profitable and overly risky. Both factors stand in the way of DeFi adoption by the general public. Therefore, the bold visions of the imminent replacement of CeFi by DeFi currently look unfounded. The money creation mechanism preferred by crypto fans, i.e. coin mining on a permissionless blockchain and transacting via trustless consensus algorithms, may be sufficient for initial wealth accumulation but is no longer sufficient as soon as one needs to extend credit in line with growing demand. There is always a place in the system where trust is required, the same trust that has for centuries allowed CeFi to operate (or occasionally fail) without a decentralised consensus. In traditional finance, trust results not only from a long process of reputation build-up, but also from the state enforcing legal norms. It is currently still unclear whether the beehive mind of the crypto ecosystem is potentially able to provide a similarly strong informal institution in the DeFi case.

**Nonetheless, DeFi development is a mighty force in the discovery and promotion of universal DLT interoperability standards.** As such, it will certainly help crypto assets take an increasingly prominent place in the global financial system. On the other hand, the more a DeFi enterprise strives to replace banks, the more it will itself resemble a bank. Quite probably, what the future has in store for us is a bank wolf in a DeFi platform sheep's skin.

**Figure 3 – XRP transaction volume**



Source: coinmarketcap.com

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## Keywords

Decentralised finance, dApp, Ethereum, blockchain interoperability, CBDC

## JEL Classification

G19, G23, G29

## A1. Change in predictions for 2021

	GDP growth, %				Inflation, %			
	CF	IMF	OECD	CB / EIU	CF	IMF	OECD	CB / EIU
EA	+0.2 2021/7 2021/6	+0.2 2021/4 2021/1	+0.4 2021/5 2021/3	+0.6 2021/6 2021/3	+0.1 2021/7 2021/6	+0.5 2021/4 2020/10	+1.1 2021/5 2020/12	+0.4 2021/6 2021/3
US	-0.1 2021/7 2021/6	+1.3 2021/4 2021/1	+0.4 2021/5 2021/3	+0.5 2021/6 2021/3	+0.2 2021/7 2021/6	-0.5 2021/4 2020/10	+1.5 2021/5 2020/12	+1.0 2021/6 2021/3
UK	+0.2 2021/7 2021/6	+0.8 2021/4 2021/1	+2.1 2021/5 2021/3	+2.3 2021/5 2021/2	+0.2 2021/7 2021/6	+0.3 2021/4 2020/10	+0.6 2021/5 2020/12	+0.5 2021/5 2021/2
JP	-0.1 2021/7 2021/6	+0.2 2021/4 2021/1	-0.1 2021/5 2021/3	+0.1 2021/4 2021/1	0 2021/7 2021/6	-0.2 2021/4 2020/10	-0.1 2021/5 2020/12	-0.4 2021/4 2021/1
CN	-0.1 2021/7 2021/6	+0.3 2021/4 2021/1	+0.7 2021/5 2021/3	0 2021/7 2021/6	0 2021/7 2021/6	-1.5 2021/4 2020/10	-0.8 2021/5 2020/12	0 2021/7 2021/6
RU	+0.2 2021/6 2021/5	+0.8 2021/4 2021/1	+0.8 2021/5 2021/3	0 2021/6 2021/5	+0.4 2021/6 2021/5	+1.3 2021/4 2020/10	+1.8 2021/5 2020/12	+0.2 2021/6 2021/5

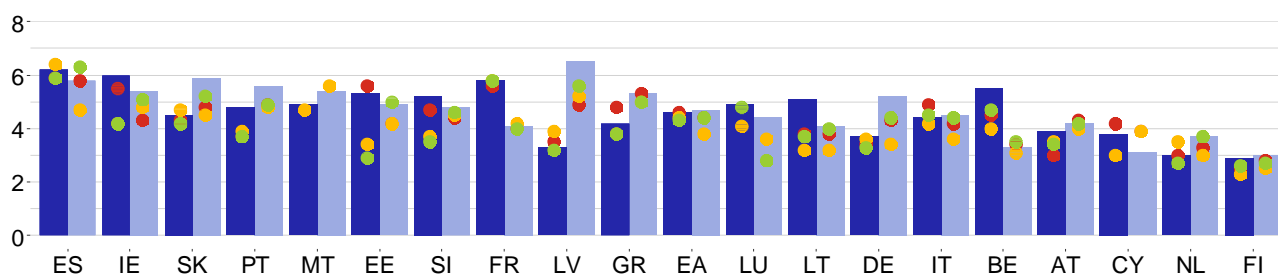
## A2. Change in predictions for 2022

	GDP growth, %				Inflation, %			
	CF	IMF	OECD	CB / EIU	CF	IMF	OECD	CB / EIU
EA	0 2021/7 2021/6	+0.2 2021/4 2021/1	+0.6 2021/5 2021/3	+0.6 2021/6 2021/3	0 2021/7 2021/6	0 2021/4 2020/10	+0.3 2021/5 2020/12	+0.3 2021/6 2021/3
US	+0.3 2021/7 2021/6	+1.0 2021/4 2021/1	-0.4 2021/5 2021/3	0 2021/6 2021/3	+0.2 2021/7 2021/6	+0.3 2021/4 2020/10	+1.0 2021/5 2020/12	+0.1 2021/6 2021/3
UK	0 2021/7 2021/6	+0.1 2021/4 2021/1	+0.8 2021/5 2021/3	-1.5 2021/5 2021/2	+0.1 2021/7 2021/6	+0.2 2021/4 2020/10	+0.2 2021/5 2020/12	-0.3 2021/5 2021/2
JP	+0.2 2021/7 2021/6	+0.1 2021/4 2021/1	+0.2 2021/5 2021/3	+0.6 2021/4 2021/1	0 2021/7 2021/6	0 2021/4 2020/10	+0.2 2021/5 2020/12	+0.1 2021/4 2021/1
CN	0 2021/7 2021/6	0 2021/4 2021/1	+0.9 2021/5 2021/3	0 2021/7 2021/6	0 2021/7 2021/6	-0.7 2021/4 2020/10	+0.3 2021/5 2020/12	0 2021/7 2021/6
RU	0 2021/6 2021/5	-0.1 2021/4 2021/1	+0.2 2021/5 2021/3	0 2021/6 2021/5	0 2021/6 2021/5	+0.2 2021/4 2020/10	+0.4 2021/5 2020/12	+0.1 2021/6 2021/5

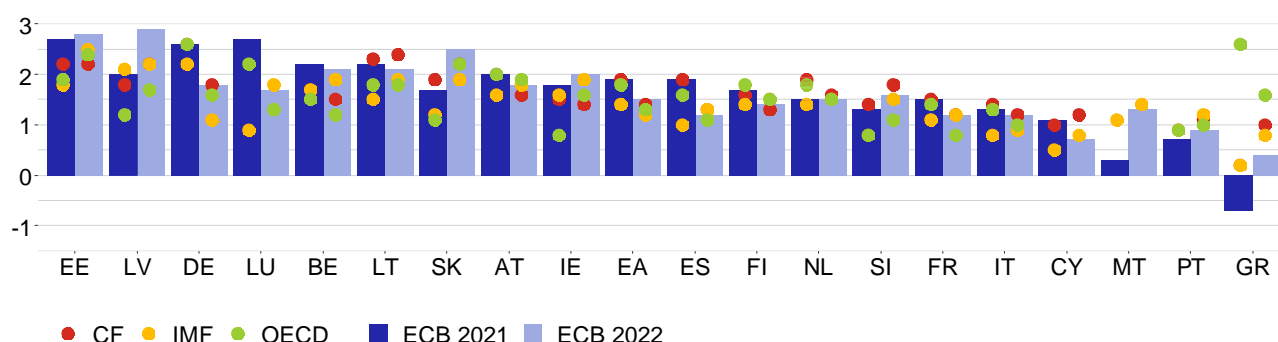


### A3. GDP growth and inflation outlooks in the euro area countries

GDP growth in the euro area countries in 2021 and 2022, %



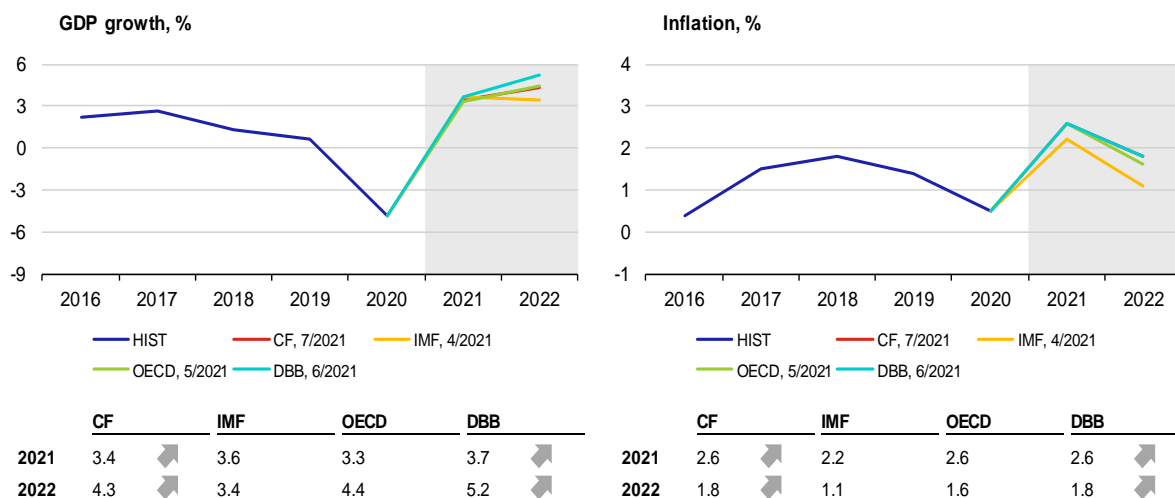
Inflation in the euro area countries in 2021 and 2022, %



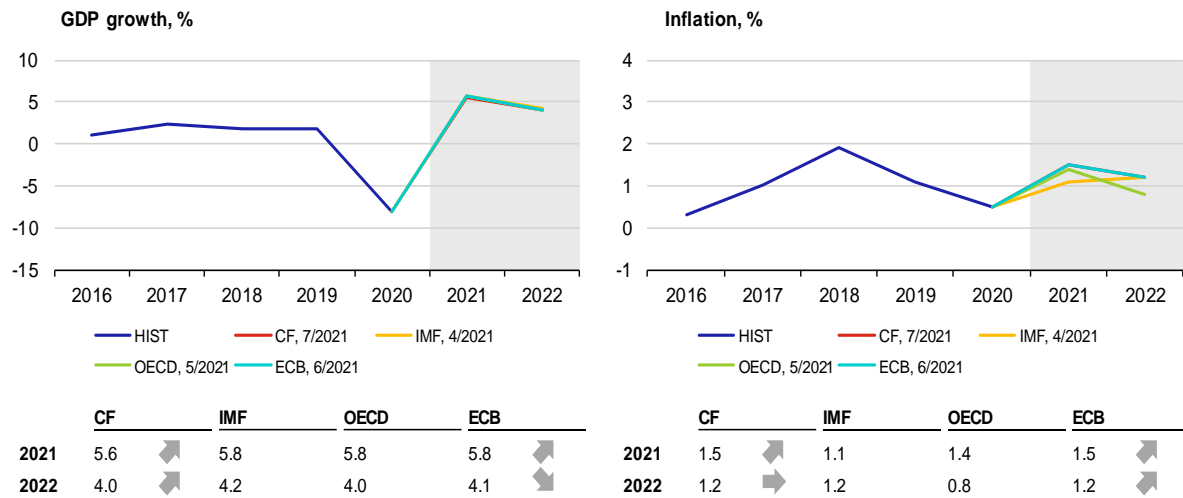
Note: Charts show institutions' latest available outlooks of for the given country.

### A4. GDP growth and inflation in the individual euro area countries

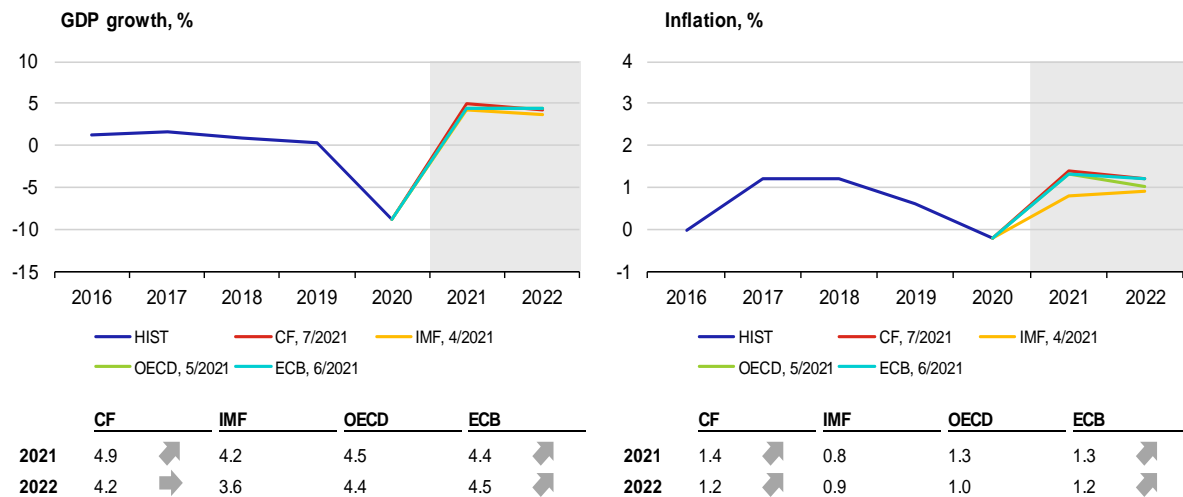
#### Germany



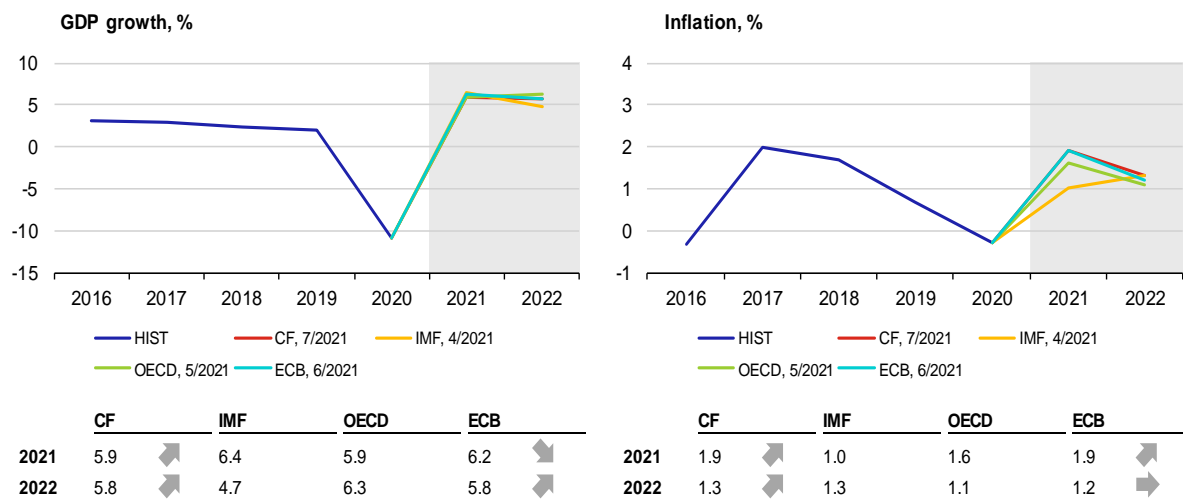
## France



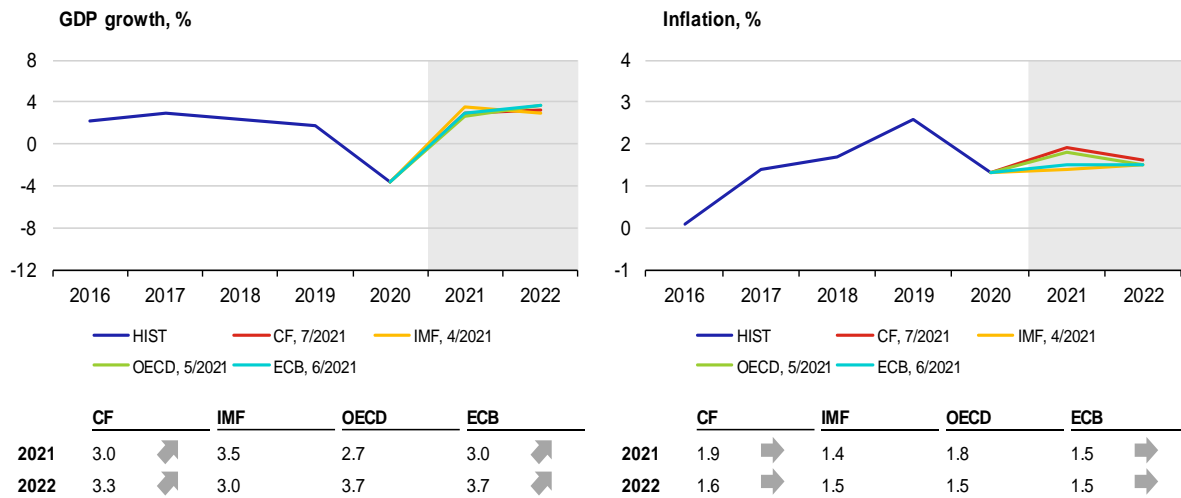
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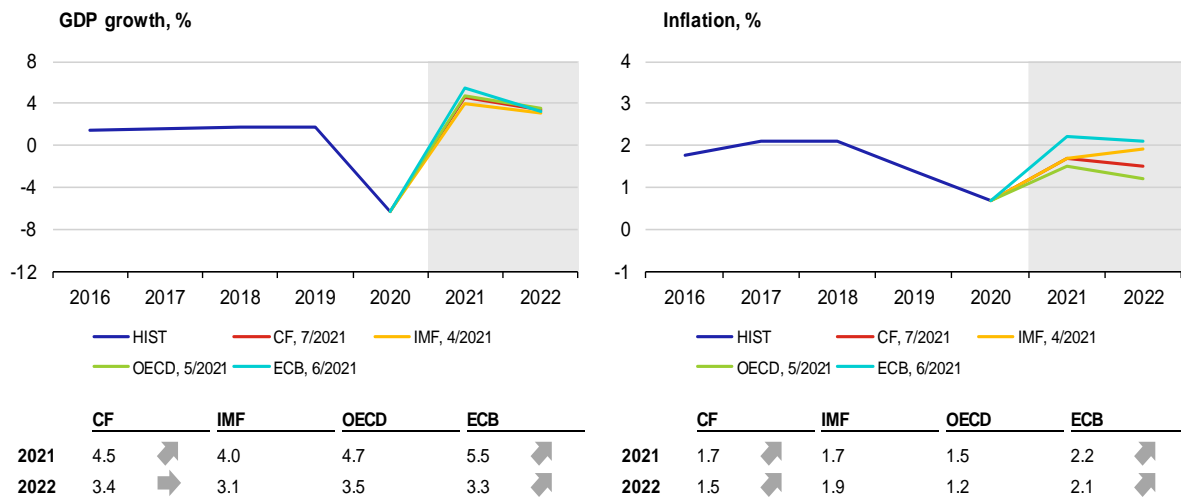
## Spain



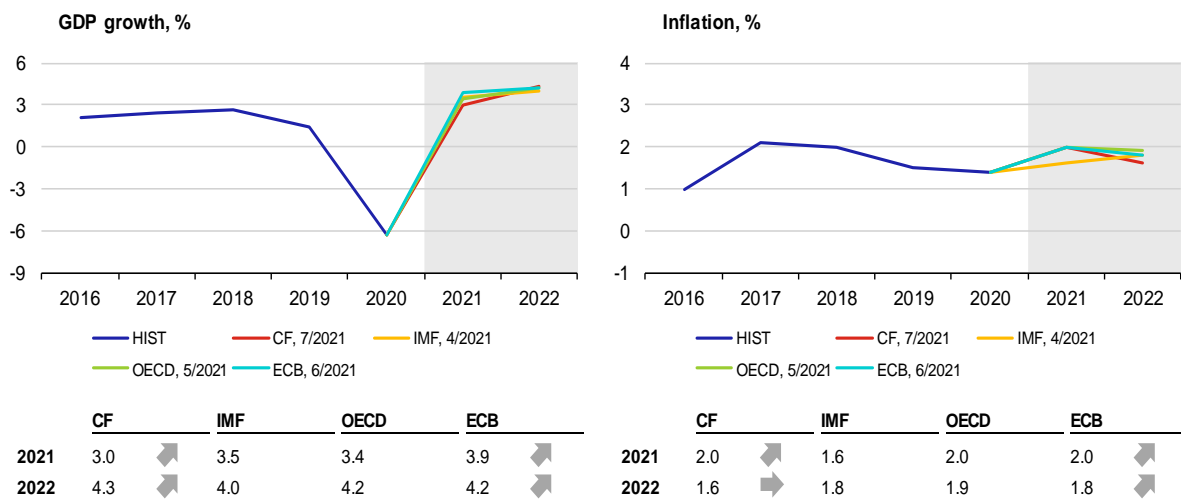
## Netherlands



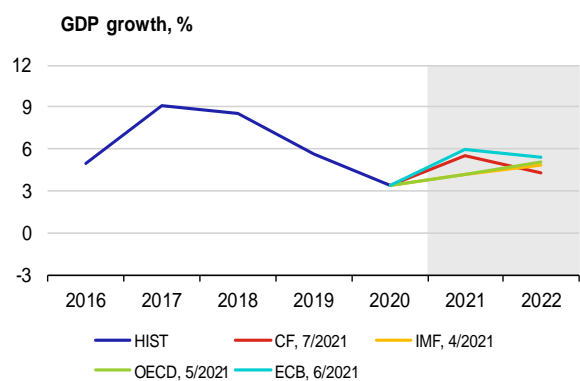
## Belgium



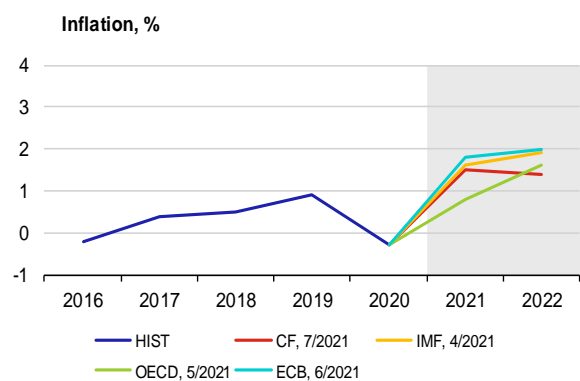
## Austria



## Ireland

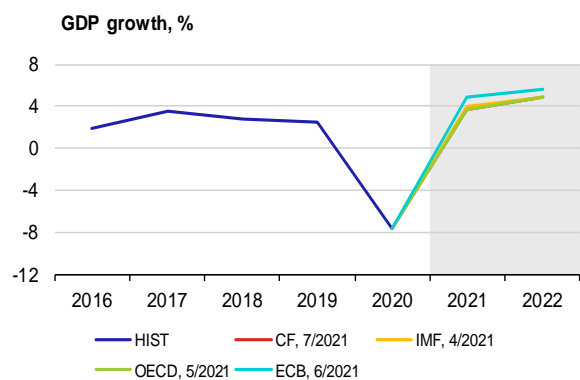


	CF	IMF	OECD	ECB
2021	5.5	4.2	4.2	6.0
2022	4.3	4.8	5.1	5.4

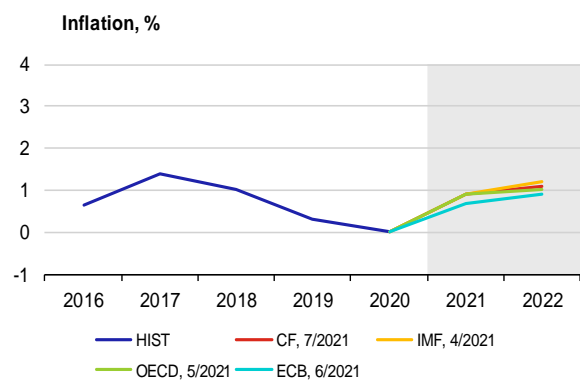


	CF	IMF	OECD	ECB
2021	1.5	1.6	0.8	1.8
2022	1.4	1.9	1.6	2.0

## Finland

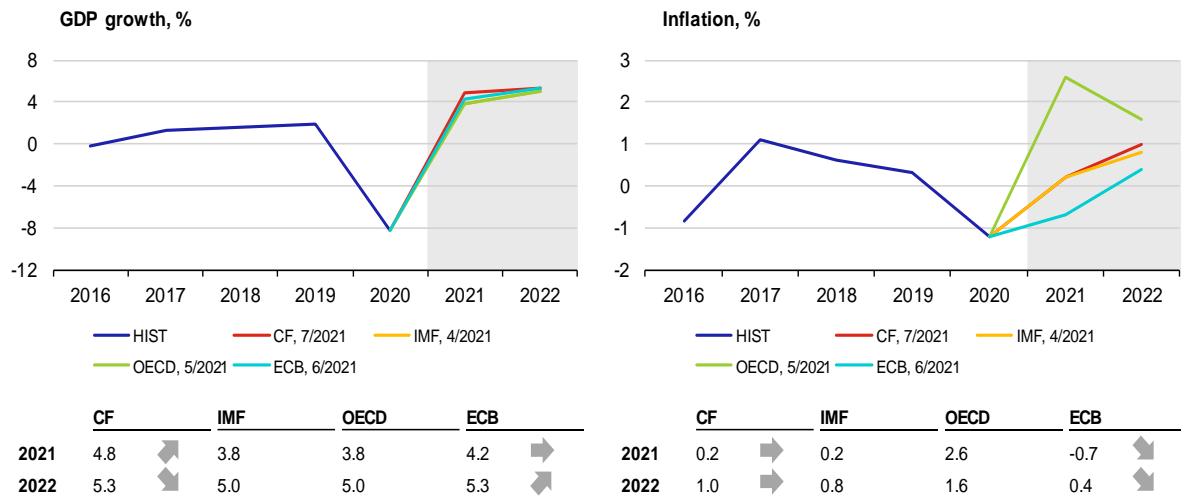


	CF	IMF	OECD	ECB
2021	3.7	3.9	3.7	4.8
2022	4.9	4.8	4.9	5.6

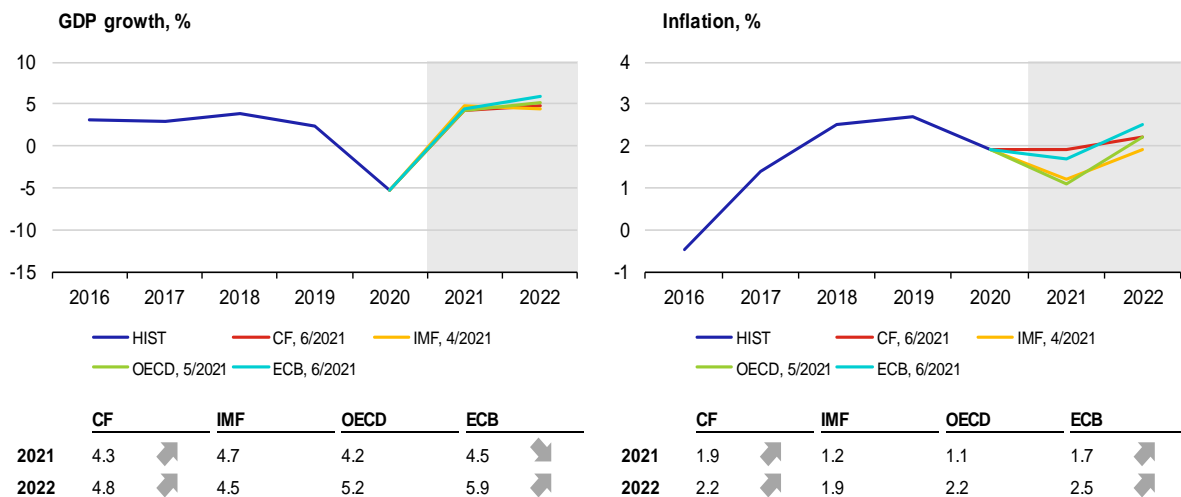


	CF	IMF	OECD	ECB
2021	0.9	0.9	0.9	0.7
2022	1.1	1.2	1.0	0.9

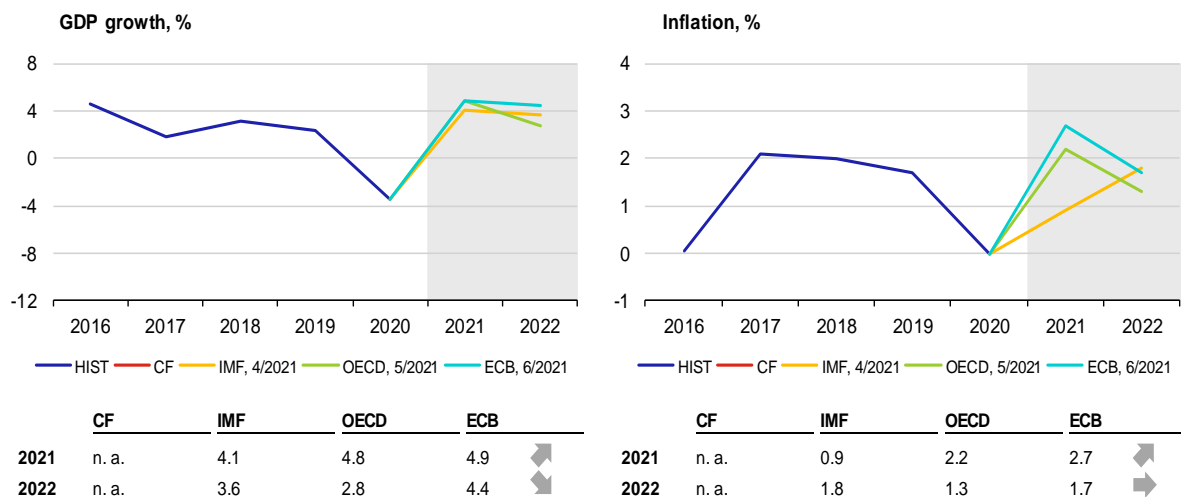
## Greece



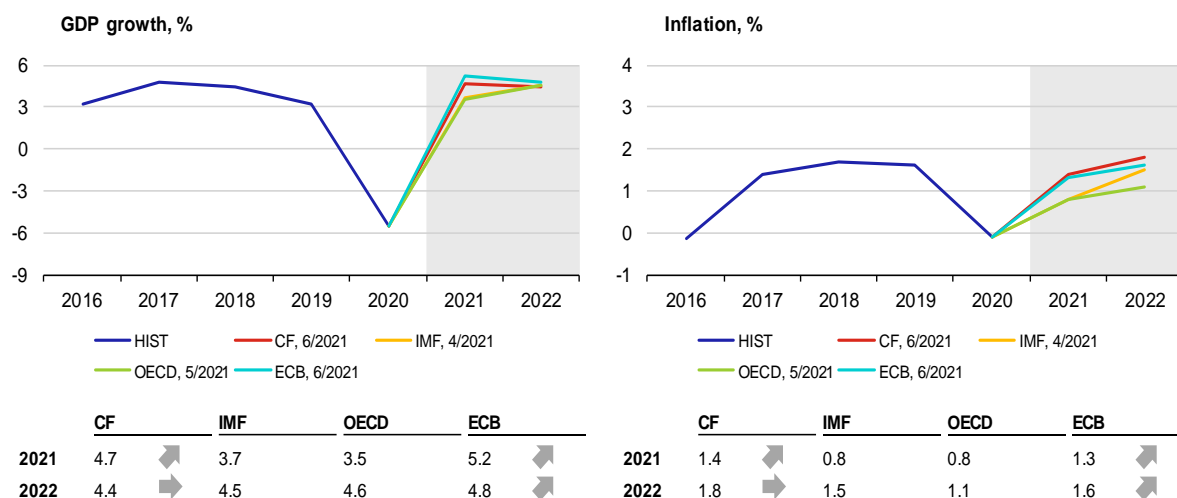
## Slovakia



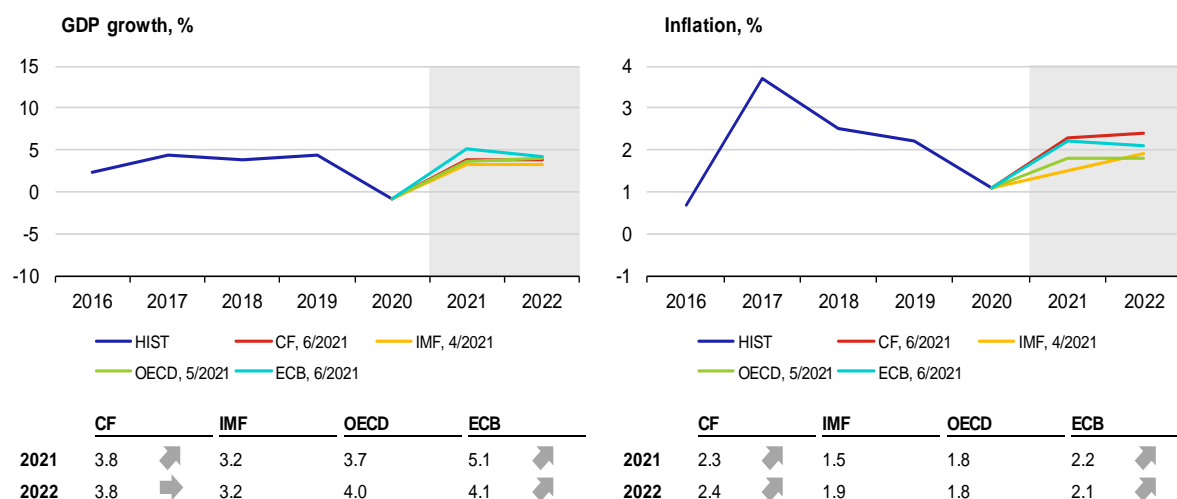
## Luxembourg



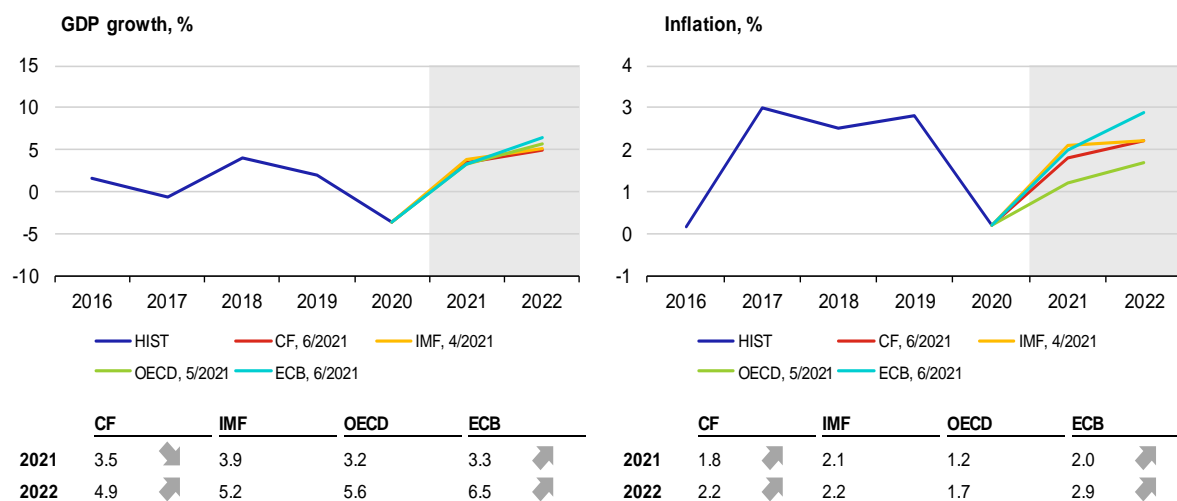
## Slovenia



## Lithuania

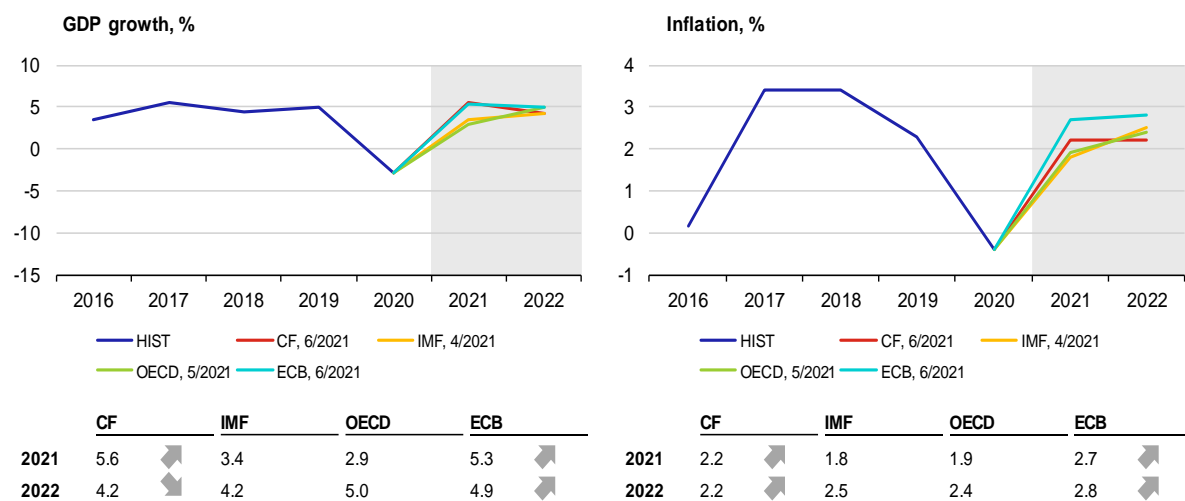


## Latvia

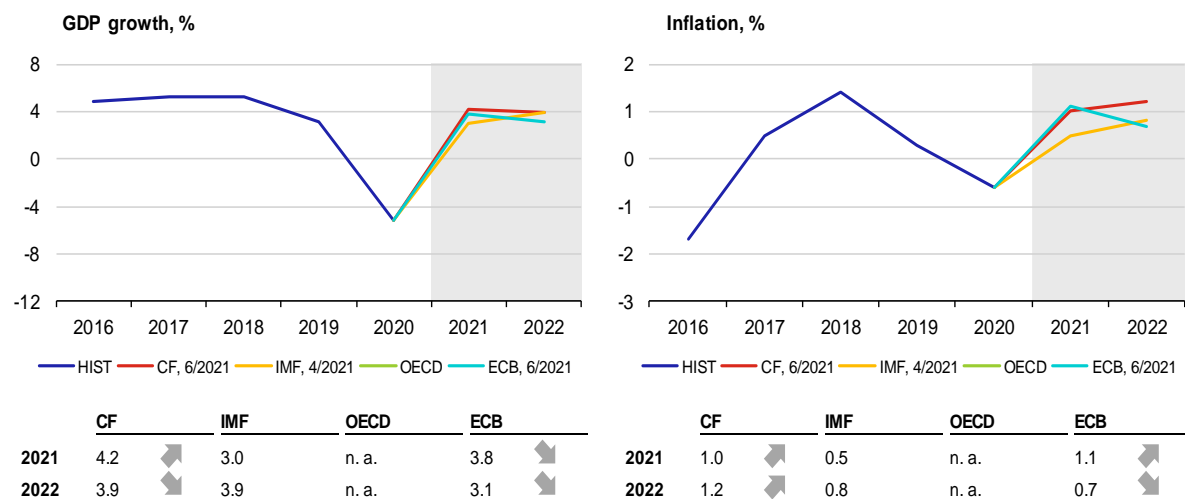




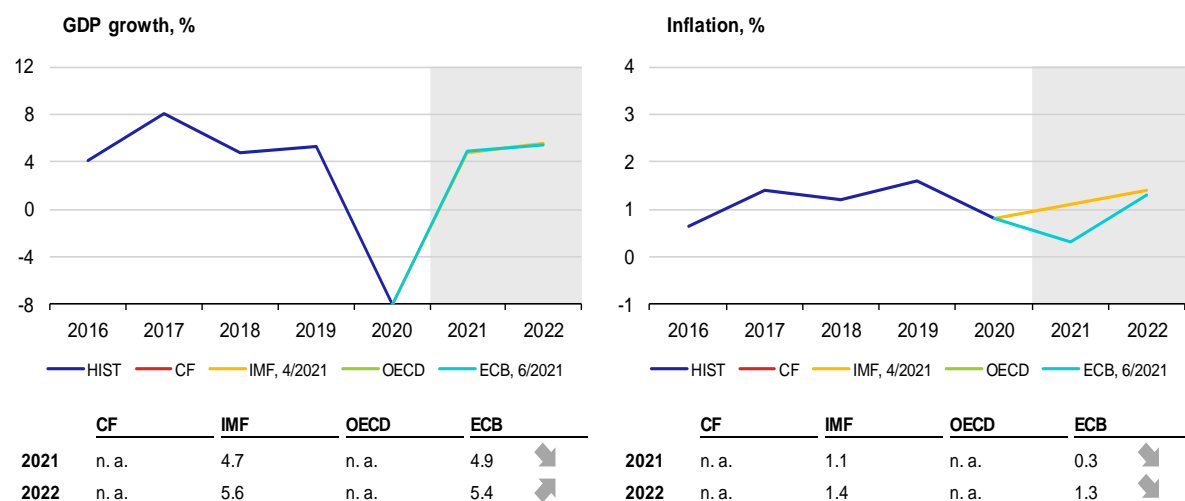
## Estonia



## Cyprus



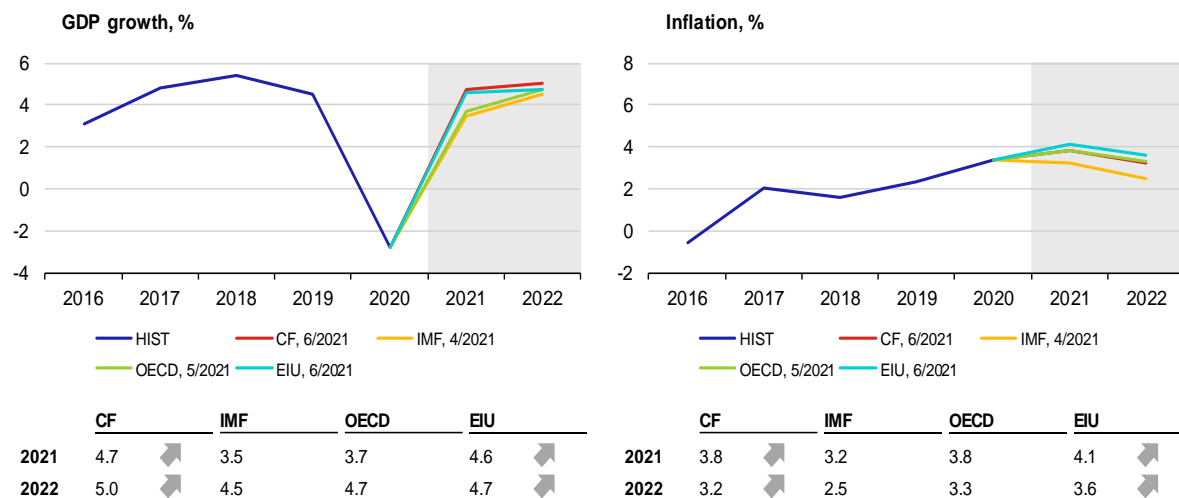
## Malta



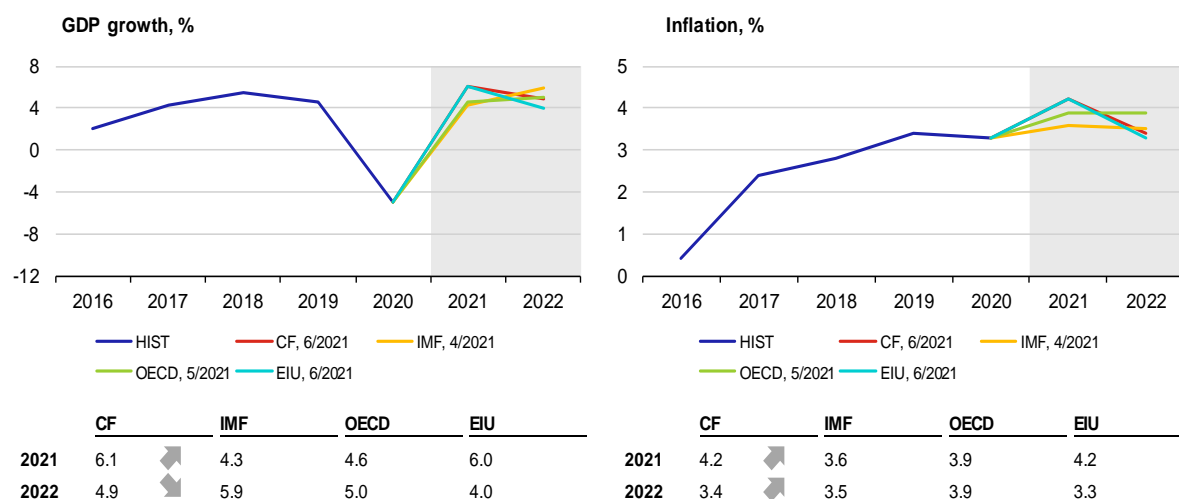
Ddd

## A5. GDP growth and inflation in other selected countries

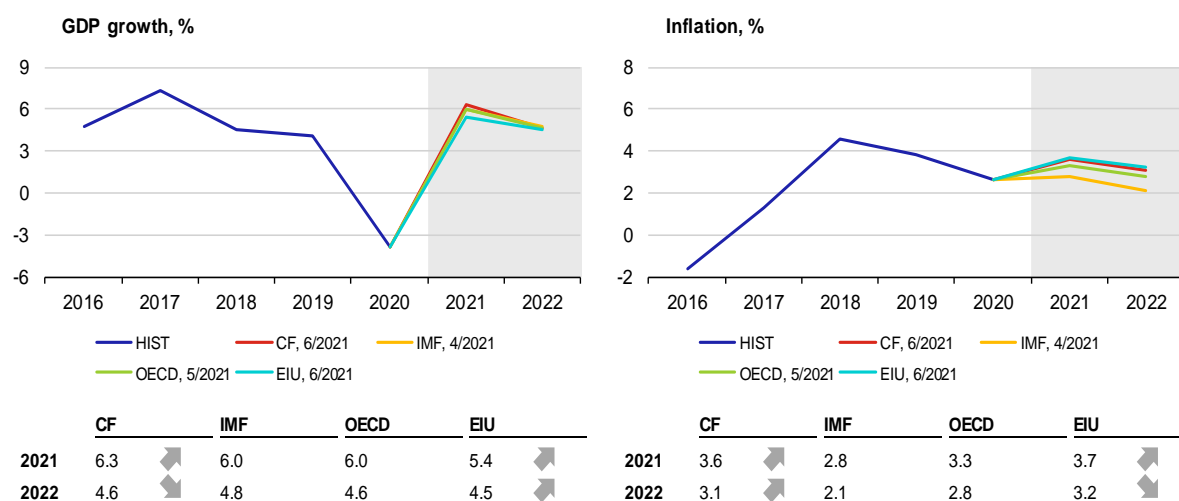
### Poland



### Hungary



### Romania



## A6. List of abbreviations

<b>AT</b>	Austria	<b>IFO</b>	Leibniz Institute for Economic Research at the University of Munich
<b>bbl</b>	barrel	<b>IMF</b>	International Monetary Fund
<b>BE</b>	Belgium	<b>IRS</b>	Interest Rate swap
<b>BoE</b>	Bank of England (the UK central bank)	<b>ISM</b>	Institute for Supply Management
<b>BoJ</b>	Bank of Japan (the central bank of Japan)	<b>IT</b>	Italy
<b>bp</b>	basis point (one hundredth of a percentage point)	<b>JP</b>	Japan
<b>CB</b>	central bank	<b>JPY</b>	Japanese yen
<b>CBR</b>	Central Bank of Russia	<b>LIBOR</b>	London Interbank Offered Rate
<b>CF</b>	Consensus Forecasts	<b>LME</b>	London Metal Exchange
<b>CN</b>	China	<b>LT</b>	Lithuania
<b>CNB</b>	Czech National Bank	<b>LU</b>	Luxembourg
<b>CNY</b>	Chinese renminbi	<b>LV</b>	Latvia
<b>ConfB</b>	Conference Board Consumer Confidence Index	<b>MKT</b>	Markit
<b>CXN</b>	Caixin	<b>MT</b>	Malta
<b>CY</b>	Cyprus	<b>NIESR</b>	National Institute of Economic and Social Research (UK)
<b>DBB</b>	Deutsche Bundesbank (the central bank of Germany)	<b>NKI</b>	Nikkei
<b>DE</b>	Germany	<b>NL</b>	Netherlands
<b>EA</b>	euro area	<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>ECB</b>	European Central Bank	<b>OECD-CLI</b>	OECD Composite Leading Indicator
<b>EE</b>	Estonia	<b>OPEC+</b>	member countries of OPEC oil cartel and 10 other oil-exporting countries (the most important of which are Russia, Mexico and Kazakhstan)
<b>EIA</b>	Energy Information Administration	<b>PMI</b>	Purchasing Managers' Index
<b>EIU</b>	Economist Intelligence Unit	<b>pp</b>	percentage point
<b>ES</b>	Spain	<b>PT</b>	Portugal
<b>ESI</b>	Economic Sentiment Indicator of the European Commission	<b>QE</b>	quantitative easing
<b>EU</b>	European Union	<b>RU</b>	Russia
<b>EUR</b>	euro	<b>RUB</b>	Russian rouble
<b>EURIBOR</b>	Euro Interbank Offered Rate	<b>SI</b>	Slovenia
<b>Fed</b>	Federal Reserve System (the US central bank)	<b>SK</b>	Slovakia
<b>FI</b>	Finland	<b>UK</b>	United Kingdom
<b>FOMC</b>	Federal Open Market Committee	<b>UoM</b>	University of Michigan Consumer Sentiment Index - present situation
<b>FR</b>	France	<b>US</b>	United States
<b>FRA</b>	forward rate agreement	<b>USD</b>	US dollar
<b>FY</b>	fiscal year	<b>USDA</b>	United States Department of Agriculture
<b>GBP</b>	pound sterling	<b>WEO</b>	World Economic Outlook
<b>GDP</b>	gross domestic product	<b>WTI</b>	West Texas Intermediate (crude oil used as a benchmark in oil pricing)
<b>GR</b>	Greece	<b>ZEW</b>	Centre for European Economic Research
<b>ICE</b>	Intercontinental Exchange		
<b>IE</b>	Ireland		
<b>IEA</b>	International Energy Agency		

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