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- **Euro area inflation shaped by two years of COVID-19 pandemic** by Christian Buelens and Vaclav Zdarek
- **Potential output & output gaps against the backdrop of the COVID-19 pandemic** by Anna Thum-Thysen, Francois Blondeau, Francesca d'Auria, Björn Döhring, Atanas Hristov and Kieran Mc Morrow
- **The market performance of EU bonds** by Daniel Monteiro
- **The 'exorbitant privilege' of an international currency status: theory & evidence** by Eric Meyermans
- **Annex: The euro area chronicle** by Jakub Wtorek

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The **Quarterly Report on the Euro Area** is written by staff of the Directorate-General for Economic and Financial Affairs. It is intended to contribute to a better understanding of economic developments in the euro area and to improve the quality of the public debate surrounding the area's economic policy.

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We live in challenging times. Geopolitical tensions intensified dramatically across the European continent in recent weeks, while the impact of the COVID-19 pandemic lingers on. Two years have already passed since the first wave of the COVID-19 pandemic hit the world economy, causing a 6.4% fall in real GDP in the euro area in 2020. In 2021, growth returned to the euro area, and the Commission's economic forecasts published 2 weeks before the Russian war of aggression against Ukraine forecasted growth at 4.0% in 2022, moderating to 2.7% in 2023. Russia's unjustified invasion of Ukraine certainly has a negative impact on the growth outlook, but quantifying the macroeconomic impact of this major geopolitical shock is difficult as the situation is unfolding fast.

Before the Russian war of aggression against Ukraine, the main drags on the economy were the spread of the Omicron variant of COVID-19, persistent supply-chain disruptions and rising energy prices. Nevertheless, the fundamentals remained strong and a robust expansionary phase was underway. Related to this, inflation had picked up strongly in 2021, and just before the invasion it was expected to reach 3.5% in 2022, before falling to 1.7% in 2023. However, the geopolitical tensions and especially their adverse impact on energy and commodity markets, will both increase inflation and ensure that this high inflation persists for a longer period than expected before the invasion.

This issue of the Quarterly Review on the Euro Area (QREA) was planned long before the Russian war of aggression against Ukraine. It provides analyses of the macroeconomic effects of the COVID-19 pandemic, and of the opportunities and challenges posed by some ongoing structural changes. More specifically, this issue includes an analysis of the volatile inflation in the euro area since the outbreak of the COVID-19 pandemic. Next, it examines developments in potential output and output gaps across the euro area against the backdrop of the COVID-19 pandemic. The third section compares the yields on the euro area's gross external assets over liabilities with those of a selected group of countries that also enjoy a strong international currency status. The fourth section

investigates the market performance of EU bonds since October 2020, a period that saw the introduction of large scale EU issuance under two programmes: NextGenerationEU (NGEU) and the Support to mitigate Unemployment Risks in an Emergency (SURE). As usual, a short summary of recent policy developments in the euro area concludes the QREA.

Since the outbreak of the COVID-19 pandemic, inflation has been very volatile, falling to multi-year lows initially, but increasing to multi-decade highs at an unexpectedly rapid pace more recently. To a significant extent, the elevated inflation in recent quarters is caused by rising energy prices, production shortfalls and frictions in transport capacity, combined with robust demand. Before the Russian war of aggression, inflation expectations remained firmly anchored at levels consistent with price stability, and wage pressures had not intensified significantly. Therefore, it was reasonable to expect inflation to moderate once the pandemic was overcome. It will require further analysis to assess the impact on inflation of Russia's invasion of Ukraine.

In recent years, estimating potential output has been challenging due to the complex mixture of supply, demand and liquidity shocks in the wake of the COVID-19 pandemic. More time and data are needed to enable a full assessment of the specific nature and longer term effects of the COVID-19 shock on the euro area's supply-side capacity. However, the current autumn 2021 estimates for the euro area and its Member States do not show any persistent negative impact from COVID-19 on potential output. This is in stark contrast with the global financial crisis, and reflects the different nature of the two shocks. While this analysis indicates that the pandemic has not affected growth, more work is needed to analyse the consequences of the Russian war of aggression against Ukraine and of the EU's reaction to it.

One of the aspects of the policy response to the COVID-19 crisis was the large-scale issuance of EU bonds to finance two temporary support schemes, i.e. NGEU and SURE. Empirical analysis presented in the

third section suggests that the EU bonds issued under these two programmes trade with a modest, though non-negligible, spread compared to measures of the risk-free rate, tracking to some extent changes in the spreads of both ‘lower-yield’ and ‘higher-yield’ Member States. In addition, bonds issued under the NGEU and SURE programmes benefit from a favourable pricing effect that EU bonds issued under previous programmes do not have.

The creation of large amounts of EU bonds may also strengthen the international-currency status of the euro. A strong international-currency status is often associated with an ‘exorbitant privilege’ of low interest rates and safe-haven status. However, so far the euro has been punching below its weight in the international context. The euro is the second most used currency in the world. However, compared with the returns on gross external assets over liabilities of other countries with strong international-currency status, in particular the US, those of the euro area have been comparatively modest in the last two decades. Moreover, the capacity to supply assets with a strong international-currency status still diverges significantly among the different euro-area Member States. Econometric evidence confirms a pattern of intensifying flows into liquid assets issued by the US in times of global stress, of which we see some signs at present.

The future remains highly uncertain and fluid. Before Russia’s unprovoked invasion of Ukraine, the analytical work presented in this report and the previous ones painted a relatively optimistic picture of the medium-term effect of the COVID-19 crisis on the economy. Forecasts pointed to a solid recovery supported by an improving labour market, high household savings, still favourable financing conditions, and the full deployment of the Recovery and Resilience Facility. At the same time, inflation was expected to decline by the end of 2022 as the pressures from supply constraints and high energy prices were expected to fade. However, in addition to the very high human cost, the Russian military aggression is likely to cause severe economic disruptions, probably resulting in significantly lower growth and higher inflation. In these times of geopolitical tensions that are unprecedented in the history of the euro area, it is of the utmost importance to coordinate policies factoring in the evolving economic outlook.

I. Euro area inflation shaped by two years of COVID-19 pandemic

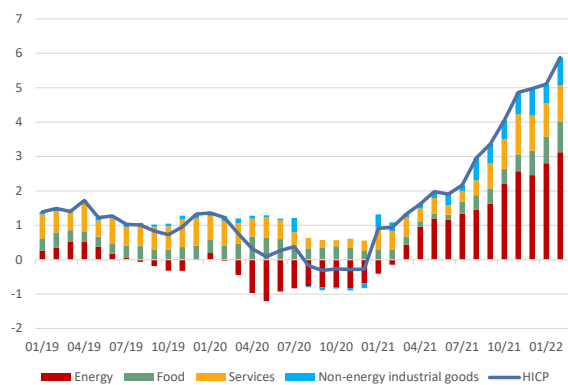
By Christian Buelens and Vaclav Zdarek

Abstract: This section reviews inflation in the euro area over the 2 years that followed the outbreak of the COVID-19 pandemic and prior to the military aggression of Russia against Ukraine. In line with many key economic indicators, inflation has been very volatile, falling to multi-year lows following the outbreak of the pandemic, before increasing to multi-decade highs at an unexpectedly rapid pace. The pandemic has caused various supply and demand shocks – both aggregate and idiosyncratic in nature. These shocks hit the global economy with varying intensity – both across time, as the health crisis evolved, and across sectors, depending on how contact-intensive they are. The shocks, and the substantial policy response put in place to cushion their impact, have played a key role in overall and relative price movements over the past 2 years. The section assesses and discusses how large swings in commodity prices (particularly energy), disruptions to the supply side of the economy, and compositional shifts in demand towards spending on goods have impacted prices and inflation. It also illustrates the high degree of uncertainty that remains about the short-term outlook for inflation and how this may affect views on longer-term inflation ⁽¹⁾.

I.1. Introduction

The 2 years following the outbreak of the COVID-19 pandemic were marked by high volatility in the economy, including in relation to price developments ⁽²⁾. Inflation varied greatly during the pandemic, falling to multi-year lows following the outbreak of the pandemic, before increasing to historical highs at an unexpectedly rapid pace (Graph I.1). With the benefit of (some) hindsight, this section reviews the drivers and stylised facts of euro area inflation during that period. It studies the relative impact of disruptions directly resulting from the public health shock and the strong economic policy response to cushion the pandemic's short- and long-term effects (see Box I.1 for a simple conceptual framework). It also offers some considerations on the inflation outlook directly based on the experience of the pandemic.

Graph I.1: Euro area inflation (% year-on-year (yoy) and percentage point (pp) contributions, January 2019 to February 2022)



Source: Eurostat

I.2. Inflation dynamics during the pandemic

The inflation path since the beginning of the pandemic can be split into two phases, running until the end of 2020 and starting in 2021, respectively. The transition from the first phase to the second notably coincides with the roll-out of vaccination campaigns, which started in early 2021 and charted practical paths for exiting from the pandemic and for economic recovery.

⁽¹⁾ The authors wish to thank an anonymous reviewer for useful comments. Box I.2 was prepared by Aron Kiss and Anneleen Vandeplas. This section represents the authors' views and not necessarily those of the European Commission.

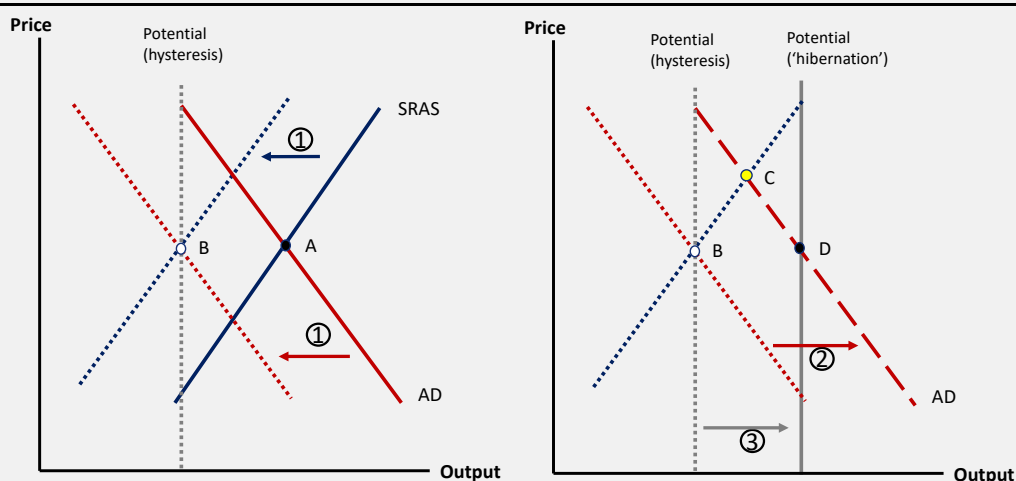
⁽²⁾ This section covers the period until end February 2022 and hence includes the start of the military aggression of Russia against Ukraine at the end of that month. This section refers to the impact of the aggression where necessary, but otherwise remains focussed on the pandemic. Readers interested in assessments of the economic impact of the Russian war of aggression against Ukraine on the EU economy, are invited to consult the European Commission's regular publications, in particular the forecast documents.

Box 1.1: The effects of the pandemic on prices: a simple framework

This box discusses the effects of the pandemic on prices using a simple aggregate supply-aggregate demand (AS-AD) framework (see Graph A). The COVID-19 pandemic has been an unprecedented global health crisis, which has been met with an equally unprecedented and forceful policy response. While medical progress (e.g. vaccines or medical treatments) and behavioural (non-pharmaceutical) adjustments should help to overcome it, the deep recession triggered by the pandemic nonetheless has had the power to force permanent changes upon consumer habits and economic structures ⁽¹⁾.

From a macro-economic perspective, the pandemic was an adverse exogenous shock (i.e. unrelated to the state of the economy), which has affected both supply and demand, often in an interrelated manner ⁽²⁾. The disease itself, fears of contracting it, and overall uncertainty in identifying the nature of the shock as a temporary or permanent one, initially led to a sharp contraction in activity. In line with the life-cycle hypothesis, this triggered higher precautionary savings and a drag on the general price level (i.e. a leftward shift of the AD schedule). On the supply side, the temporary suspension of production, notably because of non-pharmaceutical interventions to curb the spread of the virus (e.g. lockdowns), lowered effective supply, generating forced savings (for a given income stream). In turn, this exerted upward pressures on the general price level (i.e. a leftward shift of the AS schedule). While the pandemic's impact on activity was thus unambiguously negative, with the two shocks reinforcing each other, their respective impacts on the aggregate price level appear to have been mutually offsetting (illustrated by point B in the chart).

Graph A: Stylised framework: pandemic shock, policy response and hibernation



Note: at outbreak of the pandemic, economy is at A; pandemic jointly shifts both short run aggregate supply (SRAS) and AD (1) to left; at point B, output is unambiguously lower, price effect unclear; policy support offsets shift in AD (2) at least partially and ensures stability (hibernation) of long-run aggregate supply (LRAS) (3); in short/medium run, policy cannot shift AS to the right and economy moves to C: lower output than before the pandemic, higher prices; economy expected to eventually settle at a point D.

This health shock was countered by an unprecedented economic policy reaction (in the monetary, fiscal and financial policy areas) to both mitigate the adverse demand shock and minimise long-term scarring (hysteresis) of productive capacity, in an effort to put (segments of) the economy into a state of hibernation.

⁽¹⁾ Ball, *Long-term damage from the Great Recession in OECD countries*, European Journal of Economics and Economic Policies: Intervention. 2014 Sep 1;11(2):149-60.
⁽²⁾ Guerrieri, Lorenzoni, Straub and Werning, *Macroeconomic Implications of Covid-19: Can Negative Supply Shocks Cause Demand Shortages?*, American Economic Review, 2022 (forthcoming).

(Continued on the next page)

Box (continued)

On the demand side, for example, reliance on job-retention schemes safeguarded incomes and employment, thus reducing household uncertainty and the need for precautionary savings. Lockdowns imposed for public health purposes precluded short-term stimulation of production, implying a constraint on effective supply and irrevocable losses of production. However, policy support measures appear to have succeeded so far in sheltering the economy from large hysteresis effects ⁽³⁾. In the short run, however, the combination of constrained measures to stabilise supply and demand has implied an upward effect on prices, as illustrated by point C in the chart. This approximately corresponds to a situation of recovering demand in a context of prevailing supply bottlenecks, which generates an upward price push, as has been observed in many economies in the reopening phase (see subsection 4).

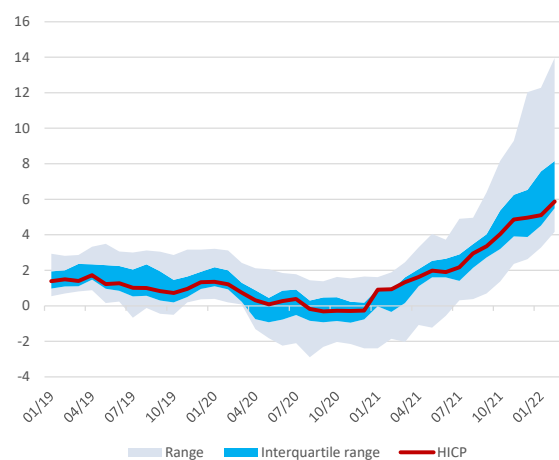
Meanwhile, in the longer run, the successful preservation of economic potential should ensure that the release of supply restrictions would enable the economy to move to a point D, with higher output and eventually lower prices. Importantly, in this comparative statics analysis, point C is a transitory episode in the economy's path from A to D. In the short run, point B is the counterfactual to the observed point C, where the price level would be lower, albeit at the expense of lower output. Likewise, with hysteresis effects, point B represents the long-run counterfactual to the targeted point D. While the implications for the price level would be ambiguous, this counterfactual would indisputably feature lower potential output, as shown by the dotted vertical LRAS curve.

This framework is necessarily a simplification, but it is a useful support in framing the analysis of price developments during the pandemic. A first significant limitation concerns the aggregate perspective, as it overlooks the unprecedented asymmetric effect of the pandemic across sectors, some of which saw demand increase (e.g. consumer electronics) or were lockdown-immune, given the possibility for employees to work remotely. Secondly, while the framework can be used for comparative statics, it does not show lagged and unsynchronised effects of the various shocks. Both limitations are elaborated on in subsections 4 and 5.

⁽³⁾ Policy support has suppressed some traditional cyclical relationships. Job-retention schemes, for example, 'broke' Okun's law by ensuring that the large drop in GDP did not translate into a proportional rise in unemployment. Likewise, liquidity support and the suspension of bankruptcy provisions have resulted in a 'bankruptcy gap', i.e. the non-materialisation of insolvencies that would typically be associated with a drop in activity of the observed magnitude (see Banerjee, Noss and Vidal Pastor (2021), *Liquidity to solvency: transition cancelled or postponed?*, BIS Bulletin March 2021).

In the first phase, the economic collapse was marked by falling prices, with inflation decelerating in all euro area countries and dipping into negative territory in 15 out of the 19 countries. From July to December 2020, aggregate prices in the euro area contracted for 5 consecutive months, matching an equally long period of contraction in 2009 after the global financial crisis (GFC). By contrast, the second phase, starting in 2021, was characterised by surprisingly vigorous inflation, culminating at a historical high of 5.9% in February 2022. The extent and speed of this rise came as a surprise, repeatedly exceeding both institutional and market forecasts throughout the year (see below).

Graph I.2: Intra-euro area inflation dispersion (% yoy, January 2019 to February 2022)



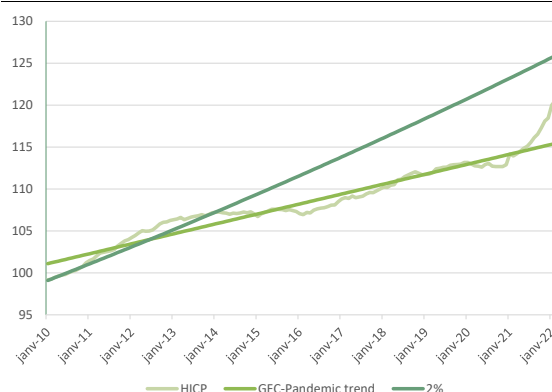
Note: the interquartile range shows the middle 50% of the sample.

Source: Eurostat, own calculations

To a large extent, this profile of inflation was shaped by energy prices, which dragged inflation down into negative territory in the second half of 2020, before substantially pushing it back up as of early 2021 (Graph I.1). However, price changes for non-energy industrial goods and services, have also been noteworthy. Non-energy industrial goods started to play a significant part in increasing headline inflation in 2021. The impact of services on headline inflation declined in 2020 before increasing again substantially at the end of 2021. Both non-energy industrial goods and services are discussed in more detail below.

The dynamics of euro area inflation are generally also apparent across individual Member States. While inflation dispersion picked up at the end of 2021 (Graph I.2), this primarily reflects the uneven impact of strong increases in oil and gas prices. The pandemic has not only led to higher inflation volatility ⁽³⁾, it also marks a clear break from the ‘lowflation’ period that followed the GFC, during which inflation remained persistently below the intended 2% path (Graph I.3) ⁽⁴⁾. Even with the elevated rates of inflation observed since mid-2021, the aggregate price level remains far below the one that would have corresponded to an annual price growth of 2% since the GFC, in line with the inflation target.

Graph I.3: Medium-term HICP trend (January 2010 to February 2022)



Note: HICP is seasonally adjusted. The trend is estimated from 2010 to 2019 (2010=100).

Source: Eurostat, own calculations

I.3. Commodity price swings and their impact on inflation

High price volatility is a distinctive trait of energy commodities. Nonetheless, the price swings during the pandemic were remarkable. The onset of the pandemic – and with it the bleaker growth prospects, lockdowns, drop in aggregate demand and mobility – led to a fall in demand for energy commodities. Oil demand in particular collapsed, while supply initially remained robust, as oil producers failed to agree on production cuts. With storage capacities approaching their limits, oil prices nosedived to all-time lows in April 2020. The West Texas Intermediate (WTI) crude oil price even turned negative for a day, a first in its history ⁽⁵⁾.

As global demand rebounded with the economic reopening that followed the first lockdowns and the more successful virus containment strategies, energy commodity prices strongly recovered from the mid-2020 troughs. Many commodities returned to or exceeded pre-pandemic prices, often climbing to multi-year highs. As an example, in January 2022 crude oil was trading 25% above its pre-pandemic price levels.

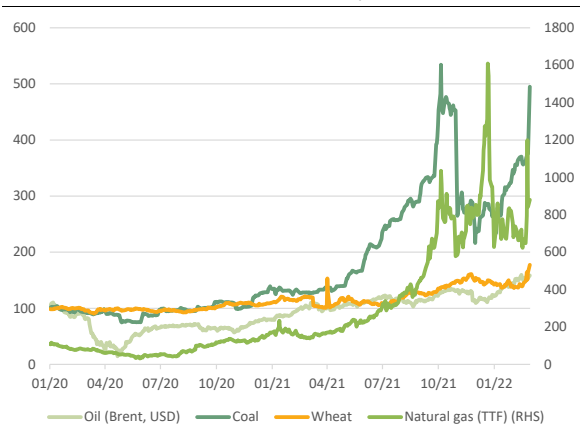
⁽³⁾ Several coinciding factors further amplified inflation volatility. These factors were either directly related to the pandemic (e.g. temporary changes in value added tax rates and shifts in seasonal sales periods) or were inherent to the way inflation is measured (e.g. revisions of the Harmonised Index of Consumer Prices (HICP) weights or imputation of prices). The relative importance of those factors has varied across countries.

⁽⁴⁾ Between 2010 and 2019, inflation averaged 1.4%. Between 2014 and 2019, inflation averaged 0.9%. Following its monetary strategy review, the ECB adopted a symmetric inflation target of 2% in July 2021, implying that negative and positive deviations from target being equally undesirable. Before this, the ECB had been aiming for inflation to be below, but close to 2%.

⁽⁵⁾ Naturally, low energy prices were of limited benefit to consumers, who at the time were generally under lockdown. Moreover, low prices dissuaded investment in the energy sector, a large share of which is solely aimed at upholding existing levels of supply (International Energy Agency, *Oil Market Report*, April 2020). This potentially drove up production costs and prices after the lockdown. In addition, temporary closures of oil fields and refineries triggered by the fall in demand were costly in their own right.

Still, a number of idiosyncratic factors – both geographic and commodity-specific, and not always directly associated to the pandemic – added to what had otherwise been a largely global price pattern. This is notably the case for natural gas prices in Europe, which have skyrocketed since the second half of 2021. While related to the tight global market for gas, upward pressure on wholesale gas prices was further accentuated by lower than expected gas supplies from Russia. This took place in a context of: (i) escalating geopolitical tensions that led to the Russian attack on Ukraine in February 2022; (ii) low gas stocks; and (iii) weather-related disruptions to renewable energy production. Two other factors also played a role – albeit a less significant one – in the high gas prices: infrastructure maintenance and higher carbon prices. Accordingly, gas prices in early 2022 were seven times higher than before the pandemic hit.

Graph I.4: Prices of selected commodities, January 2020 to February 2022 (January 2020=100)



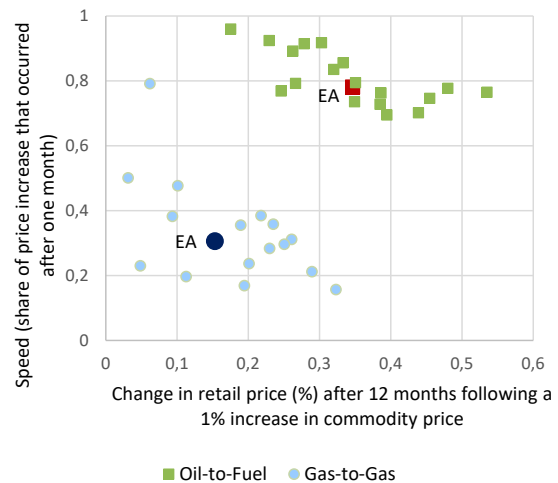
Source: IHS Markit

These swings have shaped consumer price developments. Households have been affected as direct purchasers of energy (e.g. for transport fuel or heating), the demand for which is typically inelastic. They have also been affected indirectly, as energy is a key input in production and hence represents a cost for firms in other sectors. As energy is a necessary good, price changes have significant income effects for households, and consequently affect the demand for – and price of – other consumption goods or services.

The time it takes for changes in commodity prices (e.g. of oil and natural gas) to feed through to consumer prices varies, and can be gauged by relating consumer prices to contemporaneous and

past commodity prices. The results of such a pass-through estimation ⁽⁶⁾ are summarised in Graph I.5, which displays on its horizontal axis the cumulated effect of a 1% increase in crude oil and gas prices on retail fuel prices after 12 months, and plots this against the speed at which this occurs ⁽⁷⁾.

Graph I.5: Pass-through of crude oil to retail fuel prices and of natural gas to retail gas prices



Note: Cyprus, Finland and Malta are excluded from the analysis on the gas pass-through due to the negligible share (or absence) of gas in the HICP.

Source: Eurostat and own calculations

The direct effects differ across commodities: the pass-through from crude oil to fuel prices at the consumer level is found to be strong and immediate. For the euro area as a whole, a 1% increase in oil prices would imply around 0.3%

⁽⁶⁾ The pass-through is estimated with an auto-regressive distributed lag model (ARDL) of the form:

$$dlog(P^H)_t = \beta_0 + \beta_1 dlog(P^H)_{t-1} + \sum_{j=0}^n \delta_j dlog(Commodity)_{t-j}$$

where P^H is the (seasonally adjusted) price index of HICP item H and $dlog$ is its rate of change (first difference of the log-transformed index). A fixed lag order is imposed with one autoregressive term and the contemporaneous value and 12 lags of the exogenous variable ($Commodity$), i.e. the price of the commodity. The model is estimated at monthly frequency from 1996 to 2021 (the sample is shorter for Member States for which HICP series start later). The cumulated impact of changes in the commodity over the past year is thus given by $\sum_{j=0}^{12} \delta_j$ and the transmission speed is defined as $(\delta_0 + \delta_1) / \sum_{j=0}^{12} \delta_j$.

⁽⁷⁾ These pass-through estimates are based on linear relationships between the series in the past, which warrants some caveats. First, there may be non-linear effects, i.e. the pass-through may be different when prices are at an unusual level or change very rapidly. Second, structural changes in the functioning of markets over time, e.g. as a result of regulation and government intervention, may imply that past relationships no longer hold.

higher fuel prices one year later (as retail prices include distribution costs, taxes and profit margins, the pass-through will not be one-to-one). Most of that increase, about 80%, would already have occurred after one month. The size and speed of the pass-through is a characteristic that generally holds across Member States. By contrast, the transmission of natural gas prices to retail prices of gas has in the past been somewhat slower. For the euro area, a 1% increase in the natural gas price index would imply some 0.1% higher consumer prices one year later, with merely a quarter of this being priced in after one month. Variation in the size of the pass-through across Member States is similar for both transmission pairs, but variation in speed is higher for the gas pass-through. This reflects notably the diversity in taxation, distribution costs, national market structures and regulations ⁽⁸⁾.

I.4. Constrained effective supply

After the lockdown, inflation dynamics have become more broad-based (Graph I.1), affecting the prices of non-energy industrial goods in particular. In the second year of the pandemic, these prices have started to play a significant role in increasing headline inflation. The main reason for this appears to be insufficient supply to meet robust demand for goods. This demand has been bolstered by economic policies supporting incomes, and the shift in the composition of demand away from (contact-intensive) services (see next subsection).

Since the onset of the pandemic, supply shortages – often combined under the term ‘bottlenecks’ – have become a feature of the economy. Some firms’ operations have been limited by missing inputs, while other firms have been limited in their ability to dispatch their output. These disruptions turned out to be more persistent than many observers had thought, and originate from a combination of interrelated factors set out below.

⁽⁸⁾ Transmission of commodity (natural gas) to electricity prices is related to a country’s energy mix and market characteristics (e.g. regulation or share of long-term contracts). Under the ‘marginal-pricing’ model, the retail electricity price eventually depends on the price of the commodity used as a balancing power for electricity generation at a given point in time. While time series thus unsurprisingly suggest a low correlation and a small pass-through, EU electricity markets have been undergoing a number of structural changes, related both to pricing and to the transition to more renewable energy sources. In recent years, this has implied a closer association between natural gas and (retail) electricity prices.

- **Production shortfalls** due to lockdowns are the primary explanation for the scarcity of intermediate and final goods with limited substitutability (shown by point C in the illustration in Box I.1) ⁽⁹⁾.
- **Lower transport capacity** has also played a role. This was due to restrictions on cross-border movement of shipping crews and transport operators, but also because of reduced aircraft ‘belly cargo’ capacity due to the lower number of international passenger flights. As a result, steep increases in transport costs have been observed across modes of transportation and materials carried (see Graph I.6) ⁽¹⁰⁾.
- Related to this, **frictions in supply chain logistics** have led to inefficient use of the available transport capacity. These frictions were similar to fluctuations in stop-and-go traffic, and led to repeated alternations between deceleration and acceleration of activity. These alternations replaced the steady and smooth logistic processes that otherwise enable world trade. Port congestions implied long waiting times for vessels to be unloaded (in turn reducing their ocean time). In many parts of the world, this situation eventually extended to other modes of transport, such as cargo trucks and trains, lengthening delivery time. Local disruptions – because carriers were unavailable or containers were stranded unemptied in other parts of the world – caused ripple effects across supply chains ⁽¹¹⁾.
- **Bullwhip effects and precautionary hoarding caused further problems.** By holding input inventory buffers, firms can protect themselves against upstream supply disruptions. In just-in-time manufacturing

⁽⁹⁾ Stopping and restarting production processes in an orderly way can rarely be done by simply turning on or off a switch, and it often takes time. Therefore, production shutdowns may entail additional fixed costs.

⁽¹⁰⁾ As transport costs typically account for a small share of the final cost of goods, the direct upward impact on consumer prices should be of second order. The United Nations Conference on Trade and Development (UNCTAD) estimates that elevated sea transport costs (throughout 2022) could add 1.5% to consumer price levels and 12% to the level of imported prices by 2023 (see UNCTAD, *Review of Maritime Transport 2021*, UNCTAD, November 2021).

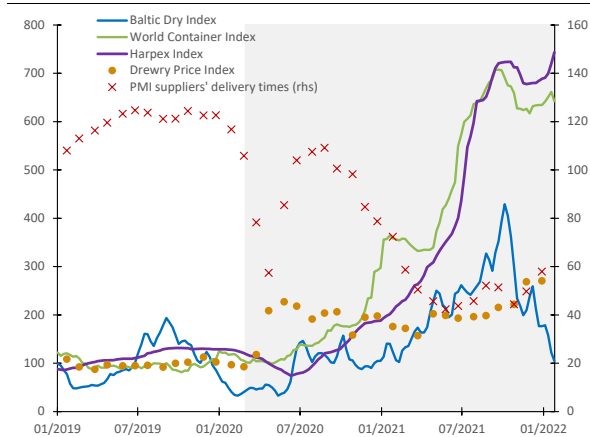
⁽¹¹⁾ These disruptions were aggravated by events unrelated to the pandemic, such as the temporary closure of the Suez Canal in March 2021 and of several ports in China in summer 2021 as a typhoon hit its east coast.

settings, such buffers are typically small, for example to absorb shortfalls arising from maintenance. In reaction to the actual and anticipated inventory depletion that followed pandemic-related production stops, many firms sought to secure inputs as a precaution, notably by placing multiple orders. This created ‘bullwhip effects’⁽¹²⁾, amplifying initial supply disruptions. Such a run on inputs would be rational behaviour for an individual firm, but it happened in a non-coordinated and simultaneous manner involving many firms, leading to suboptimal outcomes for all.

The broader impact of individual supply chain disruptions on downstream industries depends on the nature of the products affected. Among intermediate goods, for example, shortages of semiconductors stood out during this pandemic. They caused production stops and pushed up consumer prices of goods that use them intensively, such as cars or consumer electronics.

production facilities and logistics caused by individual infection clusters have been ongoing since the emergence of the virus. Greater disruptions occurred in parts of the world with particularly stringent lockdowns and comparatively low vaccination uptake, or at times when new variants emerged.

Graph I.6: Evolution of transport costs (January 2019 to February 2022)

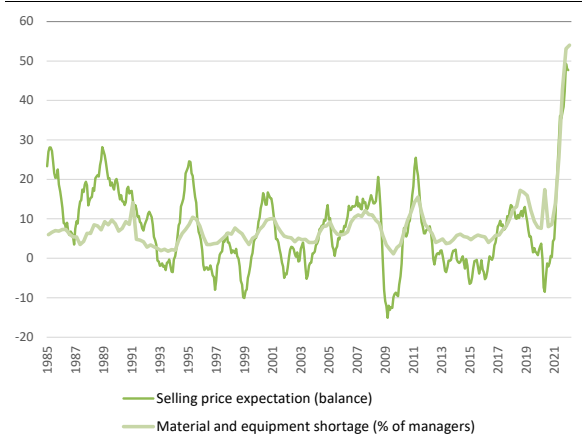


Note: the indices show the cost of hiring vessels for major raw materials (Baltic Dry), shipping goods in containers (Harper), freight rates for major east-west trade routes (World Container Index) and airfreight rates (Drewry, last observation December 2021). The IHS Markit PMI suppliers' delivery times show the extent of supply chain delays for the euro area (2017–2019 indices average = 100).

Source: Bloomberg, Harper Peterson, IHS Markit, own calculations

The lockdown was not a ‘one-off’ event, but has been a permanent condition over the past 2 years, albeit of varying intensity and implication. Infections occurred in waves – not necessarily synchronised globally – but disruptions to both

Graph I.7: Shortage of equipment and materials and selling price expectations, industry (1985 to 2022)

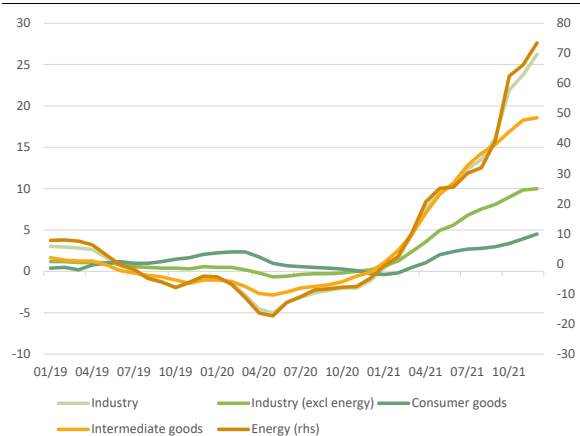


Source: European Commission (Business and Consumer Surveys)

In the Commission’s business and consumer surveys, an unprecedentedly high share of managers (54% of managers in the latest January round) reported the scarcity of material and equipment as a factor limiting business activity. This has in turn translated into record-high selling-price expectations across sectors affected by shortages (Graph I.7). Intentions to raise prices have been fulfilled, as reflected in producer prices – which increased by 26% in the year to December 2021 (Graph I.8) – and consumer goods prices (see next section).

⁽¹²⁾ Rees, D., Rungcharoenkitkul, P., *Bottlenecks: causes and macroeconomic implications*, Bank for International Settlements, 2021.

Graph I.8: **Producer price inflation (% yoy, January 2019 to December 2021)**



Source: Eurostat, own calculations

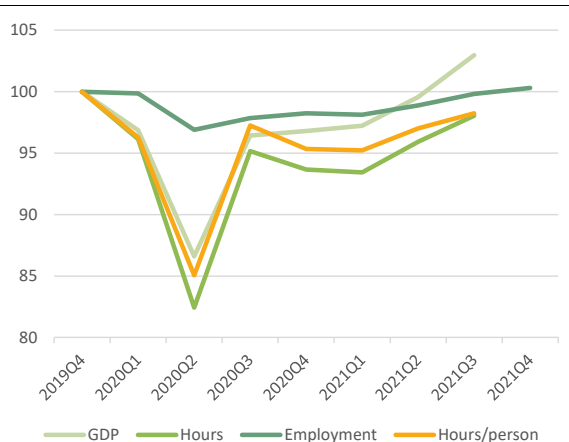
I.5. Wage dynamics

The labour market reaction to the pandemic largely consisted in reducing hours worked, as job-retention schemes ensured the resilience of employment against the background of the drop in GDP. GDP and hours worked were 14% and 18% lower respectively in the second quarter of 2020 than at the end of 2019. Employment, however, fell by merely 3%, limiting the risk of longer-term damages to the labour market (Graph I.9). The rebound in activity was matched by the recovery in labour markets, as the number of people employed reached its pre-pandemic level in the third quarter of 2021. While the number of hours worked has also recovered, it still remained almost 2% below pre-pandemic levels by the third quarter of 2021. As a result of these improvements, labour shortages have been reported by a record number of managers in the industry, services and construction sectors⁽¹³⁾. Consistent with this, reliance on job-retention schemes (JRS) generally declined throughout 2021⁽¹⁴⁾.

⁽¹³⁾ See Box 1.1 of the European Commission Winter Forecast 2022. Some of the labour shortages may be related to the Omicron wave and may thus be temporary.

⁽¹⁴⁾ ECB estimates suggest that workers in JRS represented 1.6% of the labour force in December 2021, compared to 2.7% in July 2021 (ECB, Economic Bulletin 1/2022 and previous editions).

Graph I.9: **Impact of COVID-19 on GDP, hours worked and employment (2019 Q4 to 2021 Q4; 2019 Q4 = 100)**



Source: Eurostat, own calculations

Wages appear to have been relatively stable during the pandemic, and labour market improvements have not translated into upward pressures. The ECB indicator of negotiated wages remained at or below its pre-pandemic average throughout the pandemic⁽¹⁵⁾. While the labour market recovery should ultimately sustain wage growth, the significant increase in the cost of living caused by elevated inflation may further drive up wage demands. In principle, this risks setting off a wage-price spiral, whereby compensation for lost purchasing power and firms' need to cover higher wage costs by raising their prices mutually reinforce each other. However, wage settlements concluded at the end of 2021 in large euro-area economies (see Box I.2), which provide some indication on whether the current elevated inflation can be expected to spill over to wages, have generally turned out rather moderate. This confirms the quantitative information from the negotiated wage indicator. At any rate, the flattening of the Phillips curve observed in recent years, i.e. the declining responsiveness of inflation to economic slack, would suggest that the recovery's impact on wage growth should remain contained, at least as long as inflation expectations remain well-anchored.

⁽¹⁵⁾ Many labour cost indicators are affected by national statistical institutes' practices for recording JRS in national accounts, and suffer from distortions. This makes them difficult to interpret.

Graph I.10: **Negotiated wages, euro area (% yoy, 2019 Q1 to 2021 Q4)**

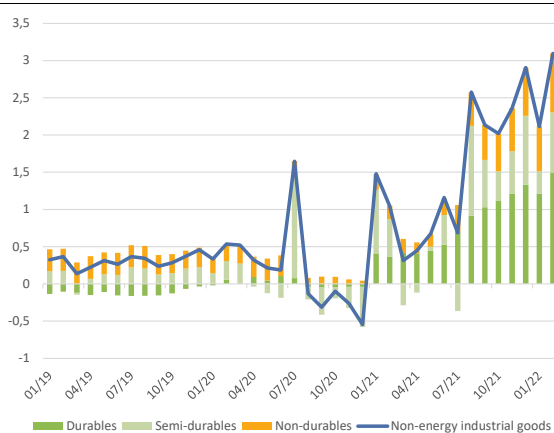


Source: ECB

I.6. Compositional shifts in demand

High goods prices are the outcome of constrained ‘effective supply’ combined with robust demand. However, the pandemic has also changed households’ needs and preferences and has induced significant compositional shifts in households’ spending behaviour. To some extent this was by lack of choice, as consumers simply redirected their spending from unavailable items (e.g. travel and movie theatres) to available ones (e.g. home entertainment or refurbishment). Furthermore, structural changes in the organisation of work, such as telework, increased the demand for office equipment and furniture. Likewise, preferences for non-collective – and hence non-contagious – activities increased. For example, shifts from collective to individual transport plausibly played a part in increasing demand for cars, motorcycles and bicycles, the price of which hit new peaks. Overall, price increases for non-energy industrial goods since 2021 (which averaged 0.4% yoy before the pandemic and 1.6% since 2021) were mainly driven by durable goods, but have become more broad-based over time (see Graph I.8).

Graph I.11: **Non-energy industrial goods inflation (% yoy and pp contributions, January 2019 to February 2022)**



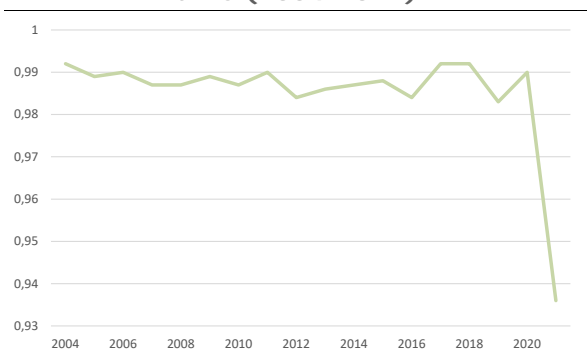
Source: Eurostat, own calculations

These compositional shifts in spending also raised important issues for the measurement of inflation. While spending on items sold on markets that were closed down (e.g. restaurants or culture) inevitably dropped, they nonetheless retained their previously attributed (non-zero) weight in the inflation basket throughout 2020. Estimates of ‘COVID-19 inflation’⁽¹⁶⁾, allowing for an intra-year change in inflation weights, reveal significant differences compared to the conventional inflation rate in some countries⁽¹⁷⁾. The HICP weighting scheme for 2021 took better account of consumption patterns during the pandemic and the lockdowns. Changes to the scheme were predictably exceptional, both at euro area and Member State level (Graph I.12).

⁽¹⁶⁾ See for example Cavallo, A., ‘Inflation with Covid Consumption Baskets’, *NBER Working Papers*, No 27352, 2020; Reinsdorf, M., ‘COVID-19 and the CPI: Is Inflation Underestimated?’, *IMF Working Papers*, No 20/224, 2020; Kouvaras, O., et al., ‘Consumption patterns and inflation measurement issues during the COVID-19 pandemic’, *ECB Economic Bulletin*, No 7/2020, 2020.

⁽¹⁷⁾ The direction of these differences is unknown and depends on the composition of a given jurisdiction’s inflation basket. More generally, no relationship between changes in weights and their impact on inflation can be deduced.

Graph I.12: **Similarity of HICP baskets over time (2004-2021)**

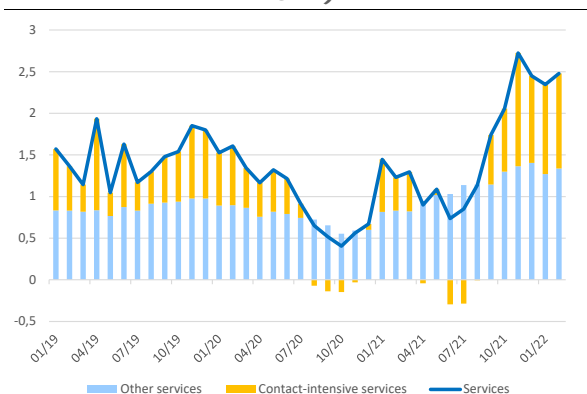


Note: the line represents the similarity of the HICP basket relative to that of the previous year. Similarity is defined as $SIM_t = \sum_i \min(w_{t-1}^i, w_t^i)$, where w^i is the share of a given item in the HICP basket. Similarity is hence bounded between 0 and 1 (identical).

Source: Eurostat, own calculations

The lockdowns and other types of restrictive measures imposed during the pandemic mostly affected sectors requiring greater personal interaction (e.g. contact-intensive services) and in which physical distancing rules are difficult to apply (e.g. cultural activities, restaurants, hairdressers or collective travel) ⁽¹⁸⁾. Throughout the euro area, these firms have generally been supported by various government-sponsored compensation schemes, which helped them shoulder liquidity shortages, and prevented large-scale bankruptcies.

Graph I.13: **Services inflation (% yoy and pp contribution, January 2019 to February 2022)**



Source: Eurostat, own calculations

With the gradual reopening of contact-intensive sectors, a key question is how that reopening has affected their prices (and their price setting

⁽¹⁸⁾ In some sectors, firms were able to adjust their offering, e.g. restaurants selling take-away rather than seated meals.

decisions), and whether and to what extent it has played a part in increasing inflation. To answer this question, services inflation is broken down into a group of contact-intensive services, such as air transport and hospitality, and remaining services ⁽¹⁹⁾. Contact-intensive services accounted for about 12% of the HICP basket in 2021, a combined weight that has dropped sharply from 16% in 2020, testimony to the substantial reshuffle within the consumer basket during the pandemic.

Services inflation during the pandemic owes much of its shape to the price dynamics of contact-intensive services (see Graph I.13). These dynamics dragged down services inflation between mid-2020 and mid-2021 – with a temporary uptick in the first quarter of 2021. Price growth in contact-intensive services accelerated from mid-2021 onwards, primarily reflecting the impact of tourism and restaurants. Overall, this points to a return of price levels to pre-pandemic trends rather than a lasting change in price dynamics.

I.7. Uncertainty and forecast revisions

The vicissitudes of the virus and the difficulty of predicting how it would develop have translated into unprecedented economic volatility and greater uncertainty around the outlook, including the outlook for inflation ⁽²⁰⁾. A number of one-off factors added to inflation volatility. These one-off factors include: (i) temporary changes in value added tax rates; (ii) temporary changes in environmental taxation in some Member States; (iii) shifts in the timing of seasonal sales by retailers; and (iv) large changes in HICP weights. In addition, many data relevant for inflation analysis have become more challenging to interpret, making it difficult to infer information about the state of the economy. This has especially been the case for labour market and wage data, which have been distorted by JRS, making it more difficult to measure slack and the risk of wage pressures.

⁽¹⁹⁾ The following items are included in the index of contact-intensive sectors: passenger transport by air (cp0733), other purchased transport services (cp0736), recreational and cultural services (cp094), package holidays (cp096), restaurants and hotels (cp11), and hairdressing salons and personal grooming establishments (cp1211).

⁽²⁰⁾ There was also uncertainty on potential policy support (volume, timing, etc.), notably in the early stages of the pandemic.

Box 1.2: Wage dynamics in recent collective agreements of four large euro area Member States

The recent surge in inflation has raised the question of whether transitory upside deviations from the inflation target could spill over to wages. On the one hand, this would be undesirable as it could imply the onset of a wage-price spiral. On the other hand, if transitory spikes in inflation become protracted, this may give rise to concerns over the erosion of households' purchasing power. This box surveys evidence on wage negotiations in four large euro area economies (Germany, France, Italy and Spain) in 2021 and finds that wage settlements have turned out rather moderate so far ⁽¹⁾. This was true even towards the end of 2021 when elevated inflation already translated into higher wage demands.

During the pandemic in 2020 and 2021, negotiated wage growth decelerated. In the first three quarters of 2021, negotiated wages in the euro area grew at an average rate of 1.5%, slower than before the pandemic (2.2% in 2019) ⁽²⁾. According to DG ECFIN's autumn forecast, wage growth was expected to pick up in 2022 and decelerate afterwards. This implies that real wages are projected to return, in 2022 and 2023, to growth rates similar to those seen before the crisis and to fall short of productivity growth.

In Germany, negotiated wages grew at an annual average rate of 1.4% in the first three quarters of 2021, against 3.2% in 2019 ⁽³⁾. Collective wage agreements concluded in October and November 2021 (in construction, wholesale and retail, and the public sector), in a context of elevated inflation, settled on wage increases below 3%, and considerably below unions' wage demands. As a compensation for lower increases in base pay, many agreements include one-off payments (or 'pandemic bonuses'). Wage agreements for about a quarter of the workforce will be renewed in 2022. However, a majority of these renewals will take place in the second half of the year ⁽⁴⁾, when inflation is expected to start moderating. A minimum wage increase to EUR 12 per hour (an increase of about 20% compared to January 2022 (EUR 9.82)) is planned for October 2022. This increase is expected to drive up low wages ⁽⁵⁾.

In France, the annual growth rate of base wages (both monthly and hourly) was 1.5% in the third quarter of 2021, somewhat below growth rates observed before the pandemic (1.7% in 2019) ⁽⁶⁾. Recent wage-contract renewals show significant differentiation across sectors. In light of the strong effect of the French minimum wage on collectively bargained minima, the automatic indexation of the minimum wage to inflation is likely to shape wage dynamics ⁽⁷⁾. However, government measures to offset inflation's effect on purchasing power may limit spillovers to wages.

In Italy, the growth rate of negotiated hourly wages was 0.6% in the first three quarters of 2021, which is below the growth rate observed from 2018 to 2019 (1.3% on average) ⁽⁸⁾. In industry, negotiated wage growth climbed back above 1% in June 2021, as collective bargaining resumed after having been interrupted during the pandemic. By the end of 2022, about 30% of collective contracts will expire. Negotiations on the renewal of these contracts could take place in an environment already characterised by a moderating inflation rate, especially considering the typical long delays in reaching an agreement.

⁽¹⁾ OECD data for 2018 shows that collective bargaining coverage is 54% in Germany, 80% in Spain, 98% in France, and 100% in Italy. The box is based on information on wage agreements up to the beginning of December 2021.

⁽²⁾ At the same time, the indicator tends to react to changing labour market conditions with a lag; the pandemic may also have led to fewer wage agreements being concluded. The indicator is only available as a euro-area aggregate, not for individual Member States. See for example ECB, *Assessing wage dynamics during the COVID-19 pandemic: can data on negotiated wages help?* ECB Economic Bulletin 8/2021.

⁽³⁾ DESTATIS quarterly report on agreed earnings: www.destatis.de/EN/Press/2021/11/PE21_543_622.html. The figures include extra payments, such as one-off bonuses.

⁽⁴⁾ Ardagna, Cabau, Sapio, Cus Babic, Shelepko and Gudin, *Euro themes: Pay on display, Part I*, Barclays Economics Research, 10 November 2021.

⁽⁵⁾ At the time of drafting, the plan was reflected in a draft bill by the Federal Ministry of Labour and Social Affairs.

⁽⁶⁾ DARES survey, November 2021, <https://dares.travail-emploi.gouv.fr/publication/evolution-des-salaires-de-base-et-conditions-demploi-dans-le-secteur-prive-T32021p>.

⁽⁷⁾ In addition to past inflation, the minimum wage indexation formula also includes half of the past growth rate of hourly wages of blue-collar workers.

⁽⁸⁾ ISTAT, *Contractual wages and salaries*, July - September 2021⁷.

(Continued on the next page)

Box (continued)

In Spain, the growth rate of negotiated wages was moderate in 2021. The 415 collective agreements negotiated in 2021 up to October (covering about 10% of the workforce) settled on an average wage increase of 1.4% for 2021, a rate below the pre-pandemic average ⁽⁹⁾. Wage increases agreed for 2022 and 2023 were in line with pre-pandemic rates. The growth rate of low wages will additionally be supported by an increase in the monthly minimum wage of about 3.6% to EUR 1 000 from January 2022 ⁽¹⁰⁾. Only a small share of contracts (20%, covering about 5% of the workforce) have a guarantee clause factoring in compensation for higher realised inflation.

All in all, wage growth is set to pick up, but negotiated wages in the four largest economies in the euro area grew only moderately in 2021. Higher wage demands (against the background of the employment recovery and rising inflation) were not followed by correspondingly higher wage deals. Overall, there are no signs yet that a price-wage spiral has started. Moreover, the risk of persistent effects of past inflation is lower now than in past periods of high inflation, as automatic wage indexation has become much less widespread across the EU (and largely concentrated in Belgium, Cyprus, Malta and Luxembourg) ⁽¹¹⁾. Nevertheless, elevated inflation for a longer period than is expected now would further erode purchasing power. This would likely translate into higher wage demands and a higher likelihood that these are reflected in agreements, especially in countries with tighter labour markets, where workers' bargaining power is stronger. Such a scenario would thus give rise to risks of second-round effects.

⁽⁹⁾ Calculations by Barclays economic research, paper cited above.

⁽¹⁰⁾ The decision was made retroactively in February. The monthly minimum wage is paid 14 times a year.

⁽¹¹⁾ For a more detailed discussion, see Koester and Grapow: *The prevalence of private sector wage indexation in the euro area and its potential role for the impact of inflation on wages*, [ECB Economic Bulletin 7/2021](#).

The degree of uncertainty and forecaster disagreement (e.g. simultaneous concerns about extreme outcomes, i.e. high inflation/deflation) has increased and large 'real-time' revisions to current-year inflation forecasts were made in both years. This was related primarily to unexpected departures from the commodity price assumptions used to inform those forecasts, but much can be attributed to the development of the pandemic, which at times seemed under control (e.g. summer season, vaccine roll-out) and then suddenly seemed to be out of control again (e.g. emergence of the Omicron variant).

Financial market participants' inflation expectations have fluctuated significantly, at both short and long horizons (see Graph I.14). At the beginning of the pandemic, sharp drops occurred across all horizons, albeit with larger falls at the shorter end, suggesting that markets initially expected a dominance of (disinflationary) demand-side drivers. The 5y5y inflation-linked swap (ILS) rate ⁽²¹⁾ dropped to 0.7% in late March 2020. It then recovered to over 1% during the summer, and has been steadily increasing since the end of 2020.

⁽²¹⁾ The 5y5y inflation expectation stands for five-year inflation in 5 years' time and is calculated from inflation-linked swaps. Market-based inflation expectations represent both 'true' inflation expectations and various risk premiums.

Graph I.14: Market-based inflation expectations (% , January 2010 to February 2022)



Note: 1y1y (5y5y) is the 1 (5) year inflation expectation in 1 (5) years' time, calculated from inflation-linked swaps.

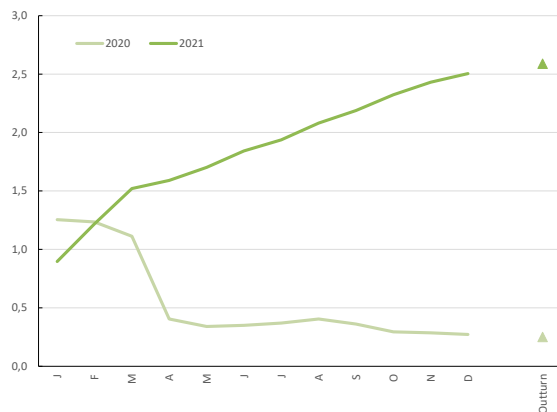
Source: Bloomberg, own calculations

The scale of forecast revisions has been large and essentially one-sided in both pandemic years. This is illustrated in Graph I.15, which shows monthly survey-based inflation forecasts for the current year, as published by Consensus Economics in 2020 and 2021 ⁽²²⁾. In 2020, the outbreak of the pandemic triggered a sharp downward revision to inflation forecasts. In 2021, inflation forecasts were

⁽²²⁾ Consensus Economics forecasts are updated monthly. However, revisions to current-year inflation expectations are very representative of forecast revisions made by institutional forecasters during that period.

revised up in each month from 0.9% in January to 2.5% in December, still slightly below the eventual annual out-turn of 2.6%. This suggests that forecasters adapted their forecasts incrementally to integrate incoming monthly inflation surprises, but failed to predict the persistence of these increases.

Graph I.15: Revisions of current-year inflation forecasts in 2020 and 2021



Note: 2020 (2021) displays the inflation expectation for 2020 (2021) in each month of 2020 (2021).

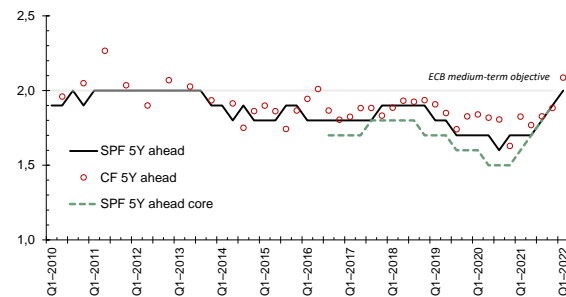
Source: Consensus Economics

Volatile inflation (and in particular the significant upside deviation of actual inflation from the ECB's inflation target more recently) may lead economic agents to revise their inflation expectations and adjust their price- and wage-setting behaviour in a way that is suboptimal for all. Despite the temporary nature of the shocks to inflation described in this section, the context could be conducive to potentially de-anchoring inflation expectations from the inflation target. However, while the 5y5y ILS rate briefly exceeded 2% in November 2021, it re-anchored around the inflation target more recently, following years of sub-target expectations in the pre-pandemic period. Longer-term survey-based expectations remained more stable throughout the pandemic, relative to longer-term market-based expectations (see Graph I.16). After initially easing somewhat, they recovered and stood at about 2% (ECB Survey of Professional Forecasters) to 2.1% (Consensus Forecast) in the first quarter of 2022.

Based on the information set available in early 2022, it appears that economic agents are 'looking through' the elevated inflation levels (i.e. expecting these current elevated levels to fall back in the future). Nevertheless, long-term inflation expectations are clearly higher than in the pre-pandemic 'lowflation' period. Their current level

seems more consistent with the inflation target compared to then ⁽²³⁾.

Graph I.16: Survey-based inflation expectations (% , 2010 Q1 to 2022 Q1)



Source: ECB (Survey of Professional Forecasters), Consensus Economics

I.8. Concluding considerations

This section has reviewed inflation dynamics during the first 2 years of the pandemic. Following the rapid increase to elevated inflation levels, a question that has often come up is whether these high rates are of a transitory nature or whether they could become entrenched. This is related to the question of whether the pandemic has marked a definitive break with the period of 'lowflation' that characterised the years before the pandemic and posed a number of challenges of its own, notably for monetary policy. While this section has focused on the effect of the pandemic on inflation, the transition to a post-pandemic steady state is occurring in the context of the war Russia has been waging on Ukraine since February 2022. This war will likely have significant negative consequences for the EU economy and will push up global commodity prices and inflation. Questions on the inflation outlook raised before the outbreak of the war remain valid, but the addition of new powerful price drivers has added further uncertainty and increased risks of inflation becoming entrenched.

As the pandemic is still ongoing, it is anyhow too early to offer conclusive answers. There is also no precedent of exiting a global pandemic that could serve as a benchmark. Still, based on the evidence reviewed here, some tentative considerations can help frame an answer.

⁽²³⁾ As noted above, this may also reflect the ECB's adoption of a symmetric inflation target of 2% as of July 2021, following its monetary strategy review.

- The recent profile of inflation prior to the military aggressions, was directly linked to, and should not be dissociated from, the policy choices made around the globe during the pandemic. On the one hand, this includes the measures to contain the spread of the pandemic and ultimately save lives, which held back production. On the other hand, this includes economic policies to support demand and preserve economic potential. Without these policies, the inflation profile would plausibly have been a different one. However, as hinted at in this section, in a counterfactual scenario without resolute policy support, inflation would arguably have been lower, but also part of a different set of economic circumstances that would have included a weak recovery, high unemployment and ‘scarring’.
- The events of the past 2 years have exerted both upward and downward pressures on prices. However, the dominance of one pressure over the other has varied over time. For example, disinflationary pressures dominated the first phase of the pandemic. More recently, upward pressures have dominated, with impacts on households’ costs of living. While the directions of the changes in inflation have coincided with the changes in economic activity, the size of the changes has clearly been asymmetric: the fall in inflation in 2020 was contained, relative to the strong increase in 2021.
- Control of the pandemic would eventually imply the fading of many contingencies that have driven inflation since its outbreak. In this sense, these drivers can be considered transitory. That does not mean short-lived. The scale and duration of the pandemic and the many disruptions it caused have been hard to predict. Indeed, these disruptions have exceeded expectations. Moreover, the transmission lags of supply disruptions imply that high inflation volatility will likely remain with us for some time to come, even once the pandemic is under control. That said new supply side and logistics disruptions are likely appearing as a result of the aggression of Russia against Ukraine.
- Once the pandemic is over, these pandemic-related drivers should moderate and price pressures should ease. Nevertheless, two

scenarios linked to the pandemic are possible under which inflation could remain elevated. In the first scenario, the supply-side disruptions could persist and further push up prices for some time. Such a ‘more of the same’-scenario, marked by recurrent supply shocks, would imply losses in purchasing power. However, such a scenario should gradually lose its traction, as supply disruptions become less serious as producers and consumers adapt (‘learning to live with the virus’). This has already become evident during the most recent infection waves. Transport backlogs also seem to be gradually improving and delivery times and costs seem to be normalising⁽²⁴⁾. In a second scenario, transitory inflation spikes could partly spill over to wages, as wage earners seek to limit the erosion of their purchasing power (see Box I.2). A wage-price spiral scenario would become more likely if inflation expectations were to become unanchored. So far, there is limited evidence of broad-based wage pressures emerging or unmoored inflation expectations. However, the persistence of elevated inflation and repeated upward inflation surprises, which has become more likely because of the war, raises the risk that economic agents will increasingly adapt their inflation expectations to actual inflation outturns.

- It is also possible and plausible that the pandemic fostered or accelerated some structural changes that may entail relative price adjustments (this is also the case for war). For example, the experiences of supply disruptions during the crisis may trigger changes in how firms manage risk in their supply chains and inventory strategies. In particular, firms may seek more resilient production models that provide more certainty but are more costly. Meanwhile, consumers may have adopted new habits, particularly digital ones. The aggregate impact of these potential structural shifts on both price levels and dynamics is uncertain, but transition to a post-pandemic steady state may entail higher inflation volatility and change exposure to future price shocks.

⁽²⁴⁾ There are other scenarios that could affect future inflation volatility, including climate change, mitigation policies, and demographic ageing. As these structural drivers are unrelated to the pandemic, they go beyond the scope of this section.

II. Potential output and output gaps against the backdrop of the COVID-19 pandemic

By Anna Thum-Thyssen, Francois Blondeau, Francesca d'Auria, Björn Döhring, Atanas Hristov and Kieran Mc Morrow

Abstract: *This section examines developments in potential output and output gaps across the euro area against the backdrop of the COVID-19 pandemic. Whilst mindful of the “normal” uncertainty which inevitably surrounds an unobservable variable such as potential output, it stresses that estimating potential has been especially challenging in the current crisis due to the complex mixture of supply, demand and liquidity shocks which COVID-19 provoked. In addition, standard business-cycle filtering methods are susceptible to producing excessively pro-cyclical potential output trends if key features of the COVID-19 crisis, such as labour hoarding and the underutilisation of physical capital, are not properly accounted for. Consequently, to handle the specificities of this unprecedented event, a number of stability-inducing methodological adjustments were made to the European Union’s Commonly Agreed Methodology (EUCAM) for the estimation of potential output and output gaps. In terms of results, the current Autumn 2021 EUCAM estimates for the euro area and its Member States do not show any persistent negative impact on potential output from COVID-19, in stark contrast with the global financial crisis and reflecting the different nature of the respective shocks⁽⁴⁹⁾. It should be noted that the potential implications of Russia’s invasion of Ukraine are completely excluded from the analysis since it is based on forecasts from last autumn.*

II.1. Introduction

The EU’s economy has experienced a recession in 2020 of unprecedented depth, outside of war times. The observed drop in output was caused by a combination of supply shocks (closure of parts of the economy to dampen the propagation of the pandemic); demand shocks (postponed consumer spending and investment plans); and liquidity shocks (precipitate revenue declines, cushioned by public income and liquidity support measures). The relative contribution of these shocks was often not directly observable and their interpretation was plagued with an unusually high degree of uncertainty.

The metaphor of ‘frozen’ potential output was coined at the outset of the crisis, in spring 2020, to account for the sudden non-availability of a large part of the EU’s productive capacity and to reflect the view that, as long as the policy response was sufficiently robust, and the recovery process was rapid, that it was legitimate to expect that the “frozen” portion of the EU’s supply side capacity could emerge largely unscathed from the COVID-19 crisis.

This initial “frozen potential” assessment of the effects of the COVID-19 crisis has proven

prescient, with incoming data and subsequent forecasting exercises reinforcing the view that any effects of the COVID-19 crisis on the EU’s potential output capacity were likely to be temporary in nature.

However, whilst the evidence to date is encouraging, more time is needed before a full assessment can be made of the specific nature and longer run effects of the COVID-19 shock on the EU’s supply side capacity⁽⁵⁰⁾. While strong policy action at the EU and Member-State levels has dampened the initial impact of COVID-19 on workers and businesses and contributed to a rapid and vigorous economic recovery, many uncertainties still persist as to the productivity and labour market implications of COVID-19. In particular, the labour market could suffer more long-term scars (hysteresis) than currently expected; solvency problems could emerge for more companies; and difficulties in the sectoral reallocation processes, combined with greater repatriation of global value chains, could adversely affect the euro area’s already fragile productivity trends.

It needs to be stressed that the potential implications of Russia’s invasion of Ukraine are not included in the analysis. The effects of the policy decisions which may be made as a result of this invasion could have a large and lasting impact on

⁽⁴⁹⁾ We would like to thank Werner Roeger, Valerie Vandermeulen, Rafal Raciborski, and an anonymous reviewer for their very valuable insights; as well as the participants of the “Joint OGWG-ECFIN-JRC Conference: “Assessment of output gaps and potential output in the context of the COVID-19 pandemic and its aftermath” for their highly pertinent comments

⁽⁵⁰⁾ See, for example, Ademmer et al (2021), ‘Output Gap Estimates and Fiscal Policy in the context of the Covid-19 crisis’, Kiel Institute for the World Economy.

the productive structure of the European Union in the years to come.

Based on the Autumn 2021 Commission forecasts, this section of the QREA is exclusively focused on examining developments in potential output and output gaps across the euro area against the backdrop of the COVID-19 pandemic and based on the EU's Commonly Agreed Methodology ("EUCAM") for calculating potential output and output gaps. At the outset it should also be noted that this section does not discuss the link between output gaps and current inflation dynamics for a number of reasons. Firstly, this edition of the QREA also includes an article on euro area inflation developments. Secondly, whilst there is undoubtedly a correlation between the output gap and inflation, a one-to-one co-movement relationship should not be expected since inflation is not only driven by demand pressures but also by supply shocks and by shifts in inflationary expectations. Thirdly, whilst economic stability and monetary stability are complementary, the fiscal and monetary authorities focus on different priorities. EUCAM is primarily an economic analysis tool focused on fiscal policy surveillance, not a monetary policy inflation forecasting tool. EUCAM takes the inflation forecasts from ECFIN's desk officers and uses this information, along with a wide range of additional cyclical indicators, to try to isolate where the euro area is currently in the cycle; with the Commission's latest Autumn 2021 forecasts suggesting that the euro area's output gap will be fully closed this year ⁽⁵¹⁾.

II.2. Why was it challenging for EUCAM to estimate output gaps and potential output in the face of the COVID-19 shock?

The EPC's Output Gap Working Group (OGWG) has been responsible, over the last 20 years, for the development of EUCAM (the EU's commonly agreed methodology for estimating potential output and output gaps). Over this period of time, EUCAM has been regularly updated, most notably in the aftermath of the 2008 Financial Crisis, with significant changes being made to its core productivity and structural unemployment components. In early 2020, it quickly became clear

that COVID-19 would necessitate a series of temporary, stability inducing, adjustments to the methodology to avoid excessive, and unwarranted, procyclicality in its potential output estimates (essentially, the two modifications related to COVID-19, which were introduced in Spring 2020, were first, the use of linear interpolation for the hours worked part of the methodology and, second, the use of "dummy variables" in the NAWRU calculations. See Box II.1 for a more detailed description). These adjustments, unanimously endorsed by the OGWG, ensured that almost all of the COVID-19 related downturn in actual GDP went into the output gap estimates rather than into a reduction of potential output. The unprecedentedly large negative output gaps produced by EUCAM in spring 2020, for the year 2020 (more than double that of the financial crisis year of 2009), underpinned the need for a robust policy response.

EUCAM is used by EU policy makers for assessing both the productive capacity and cyclical position of the EU's economies. Its central block for the estimation of potential output is a production function, with potential being represented by a combination of factor inputs (labour and capital), multiplied with the technological level or total factor productivity (TFP). The trend components of the individual GDP production factors are estimated by filtering out trend (potential) and cyclical (output gap) components from noisy real time and forecast data. This decomposition of actual GDP developments into the part linked to the normal transitory fluctuations of the economic cycle and the part that is more permanent in nature, aims to reduce the uncertainty facing policy makers taking policy decisions in real time by providing an assessment of the sustainability of short-term growth patterns over the medium to long run.

Ultimately, the robustness of EUCAM's trend/cycle decomposition of the latest short-term economic developments, depends on the quality of the factor input indicators used by EUCAM's filtering tools to isolate the cyclical component of growth. These are essentially a range of labour market and product market indicators that try to capture shifts in the utilisation patterns of the labour and capital factors of production. In this context, disentangling the supply- and demand-induced effects of the COVID-19 shock has been severely hampered by the lockdown-induced uncertainty around those factor input data,

⁽⁵¹⁾ For readers interested in a more in-depth discussion on the link between output gaps and inflation, additional information is provided in the December 2021 VOX EU article "Output gaps, potential output and the Covid-19 crisis: Policymaking under uncertainty"

especially for labour (with significant distortions to the employment, wage and productivity indicators). In addition, standard business-cycle filtering methods are susceptible to excess pro-cyclicality in a crisis such as COVID-19, in particular when key features of the crisis, like for example labour hoarding⁽⁵²⁾, are not properly taken into account in the analysis (see Box II.1 for the technical details).

II.3. Current EUCAM estimates of potential output and output gaps

As mentioned earlier, since the COVID-19 pandemic affected both supply and demand over the same short run time horizon, this inevitably led at the outset of the crisis to the emergence of different conceptual interpretations of the effects of COVID-19 and, as a consequence, on the appropriate short and longer run policy responses. Faced with this enormous degree of uncertainty, there were two extreme ways of interpreting the effects of COVID-19 put forward in the literature⁽⁵³⁾:

- Under the first interpretation, one could assume that the available supply of the factors of production are not directly affected by the lockdown measures so that the degree of potential capacity is unchanged (implying a large output gap and stable potential output). Under this view, the temporarily “frozen” capital and labour supply side elements, as well as the demand side “COVID-19 restrictions” part of economic slack, should both be included in the output gap estimates. In terms of policy, this view stresses that a robust, policy-induced, recovery process is essential for avoiding any scarring of this “frozen” portion of the euro area’s supply side capacity.
- An alternative interpretation is that, during lockdown, full capacity collapses to zero in firms that are closed. This is equivalent to a steep drop in supply and thus in potential

output, with the result that the output gap is significantly smaller than under the first interpretation. Under this view, as the containment measures are gradually lifted, the degree of full capacity will only gradually recover towards its level before the crisis. In other words, this view stresses that the recovery of the “frozen” portion of the euro area’s supply side capacity could be a much slower process. As the economic recovery process is more drawn out, the medium to long-term impact of the crisis on potential growth would be much more negative.

The view taken in successive European Commission Economic Forecasts since Spring 2020⁽⁵⁴⁾, was much more consistent with the first interpretation of the crisis, given their repeated prediction of a close-to-V shaped actual GDP recovery. This interpretation led to the conclusion that the euro area’s potential output would in fact stay very stable and would not decline. More precisely, EUCAM suggested in spring 2020 that, with a forecast for a rapid and vigorous actual GDP recovery, the effects on potential output of the crisis would be limited and transitory, with over 90% of the fall in actual GDP in 2020 being reflected in the output gap, rather than the potential, component of growth. In terms of numbers, in spring 2020 the output gap for the euro area was estimated by EUCAM at -7.3% compared with -3.5% in the financial crisis year of 2009.

The unprecedented size of EUCAM’s negative output gap for the euro area supported a strongly expansionary policy response to the crisis and underlined the key message for policy makers that the weaker the policy response, the greater the risk of long-term damage to the EU’s supply potential. The latter would emanate from a range of transmission channels including delayed or cancelled investments; skill losses due to disrupted education and training; scarring effects in the labour-market; and from frictions in the reallocation of capital and labour.

This policy message from EUCAM has been consistent since the start of the crisis in spring 2020. Indeed Graph II.1 shows that EUCAM’s potential growth rate estimates for 2020 remained

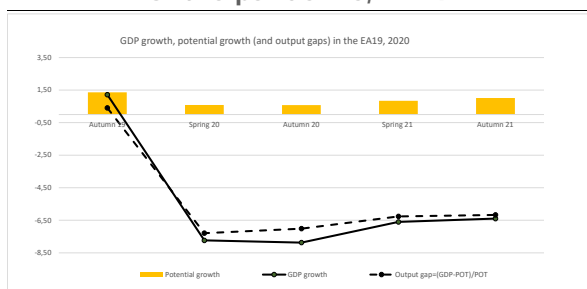
⁽⁵²⁾ See Hristov, A. and A. Thum-Thysen (2022), ‘Measuring Labour Hoarding with Existing Firm-Level Survey Data’, (Forthcoming); Leitner, S. M. and R. Stehrer (2012), ‘Labour hoarding during the crisis: evidence for selected new member states from the financial crisis survey’, *wiiw Working Paper* No. 84.; Hristov, A (2022), ‘Labour Effort and the European Wage Phillips Curve’, (Forthcoming).

⁽⁵³⁾ See, for example, Bodnar, K., Le Roux, J., Lopez-Garcia, P. and B. Szoerfi (2020), ‘The impact of COVID-19 on potential output in the euro area’, *ECB Economic Bulletin*, Issue 7/2020.

⁽⁵⁴⁾ European Commission (2020), European Economic Forecast. Spring 2020, *European Commission Institutional Paper* No. 125.

remarkably stable over all of the subsequent forecast vintages, with little evidence of any procyclicality bias. For the euro area aggregate, while GDP growth was revised down from about 1% to around -7½ % and then back up to -6½ % over the different post-Spring 2020 forecast vintages, potential growth estimates always stayed strongly positive. Graph II.1 also highlights the fact that the output gap continued to absorb the vast bulk of the shock in all of the forecast vintages (55).

Graph II.1: Revisions for 2020 in potential growth, GDP growth (and the output gap) over all available vintages since the onset of the pandemic, EA19



Source: Own calculations

In addition, as shown in Graph II.2, in stark contrast with the global financial crisis, and reflecting the different nature of the shocks, EUCAM does not currently project any persistent negative impact on potential output from the COVID-19 shock.

Indeed, while the global financial crisis was characterised by a sustained decline in investment, with knock-on negative implications for the efficiency of the capital stock and labour demand, the COVID-19 shock is characterised by a collapse in demand provoked by much more transitory, private consumption-driven, factors (56). One would consequently expect an economic shock of the COVID-19 type to be associated with much less pronounced medium-term supply-side effects. The COVID-19-type of shocks need to be clearly distinguished from the asset-bubble induced 2009 recession, which had much more profound implications for potential output, not least due to

(55) Note that the output gap is expressed as the difference between GDP and potential output as a percentage of potential output and can hence not be directly compared with the growth figures.

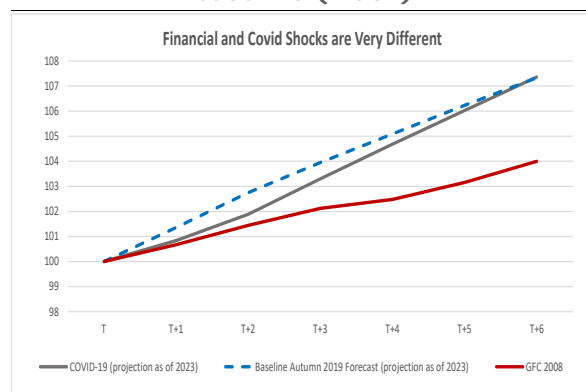
(56) See Croitorov, O., Filippeschi, G., Licchetta, M., Pfeiffer, P., Reut, A., Simons, W., Thum-Thysen, A., Vandeplas, A. and L. Vogel (2021), 'The macro-economic impact of the COVID-19 pandemic in the euro area', *Quarterly Report of the Euro Area*, Vol. 20, No.7.

the shifts in expectations it induced regarding long-run rates of return on capital.

Incoming data have tended to support the view that potential output has not been severely and persistently affected. Employment in the euro area was already higher at the end of 2021 than at the end of 2019, and the unemployment rate lower. Broader underemployment is being absorbed and has fallen almost to its pre-pandemic level (Commission Winter Forecast).

Gross fixed capital formation dropped sharply in the first half of 2020, but rebounded afterwards. While it remains somewhat below pre-COVID-19 levels so far, it is projected to recover further this year and next.

Graph II.2: GFC and COVID-19 projections of euro-area potential output compared to baseline (index)



(1) T refers to the pre-crisis value of the GFC crisis (i.e. 2008) and the COVID-19 crisis (i.e. 2019) respectively. T+1, T+2, etc. refer to 1, 2, etc. years after the pre-crisis value. For 'COVID-19' and 'Baseline Autumn 2019 Forecast', the graph is based on realised data for 2020, DG ECFIN's short-term forecast for 2021 and 2022 and a technical extension of the short-term forecasts for 2023 to 2026. For GFC 2008 the graph shows only realised data (2008-2014) i.e. it also includes the effects of the subsequent Euro Area debt crisis characterised by a double-dip recession.

Source: Own calculations, based on Autumn 2021 Forecast

EUCAM's T+10 estimates, based on the Commission's Autumn 2021 forecasts (57), continue to project weak scarring effects on potential output over the coming decade, at least at the euro area aggregate level. In fact, thanks to the policy support at national and EU levels, potential output in the coming years is even estimated to be slightly higher than expected back in 2019. EUCAM estimates that average potential growth

(57) European Commission (2021), European Economic Forecast. Autumn 2021, *European Commission Institutional Paper* No. 160.

rates will be a $\frac{1}{4}$ of a percentage point higher over the coming decade than in the equivalent pre-COVID-19 baseline from the Autumn 2019 projections, with the euro area now expected to grow over the period 2022-2031 at an annual average potential growth rate of 1 $\frac{1}{4}$ %, instead of 1%.

The somewhat surprising aspect with this better-than-expected growth outlook is the fact that roughly half of the growth rate gain comes from the labour component of growth⁽⁵⁸⁾. This is driven by the unexpectedly strong resilience of European labour markets. Euro area labour markets performed remarkably well in the re-opening phase of COVID-19 in spring 2021, with a better-than-expected employment creation performance. In addition, unemployment rates have quickly moved back towards their pre-crisis levels and average hours worked per worker have rebounded swiftly, as many workers exited job retention schemes.

Some caution is needed however in over-interpreting the sustainability of this seemingly robust labour market performance, due to the caveats raised earlier about a number of the labour market input variables. Regarding the non-labour growth drivers, small labour productivity improvements explain the other half of the hike in euro area potential growth rates over the coming decade. In addition, it is important to stress that whilst the projections at the ten-year horizon do allow for NGEU / RRF investments, they do not include the effects of the structural reforms part of NGEU / RRF which constitute a significant upside potential for the euro area's growth potential going forward.

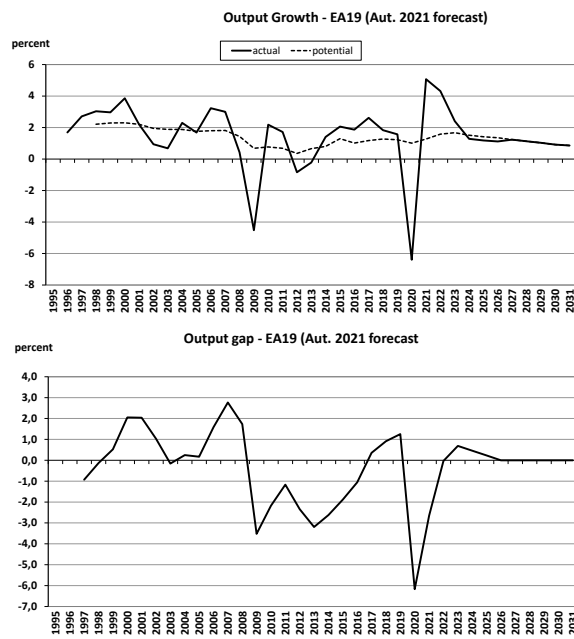
Whilst the Autumn 2021 forecasts are reassuring, some caveats / downside risks need to be borne in mind in interpreting the results⁽⁵⁹⁾, since it is still much too early to reach a definitive conclusion regarding the effects of COVID-19 over the medium to long-term :

- The first caveat is that the pandemic is not over and it continues to exert a significant constraining influence on the consumption and investment drivers of output growth.

⁽⁵⁸⁾ Box II.1 describes how labour hoarding affected the estimation of the NAWRU.

⁽⁵⁹⁾ Please note that the potential implications of Russia's invasion of Ukraine are excluded from this analysis, including the medium to long term implications of energy diversification etc.

Graph II.3: Output growth and output gap, Autumn Forecast 2021



Source: own calculations

- Secondly, there is a considerable risk that, without sustained policy support and the implementation of targeted structural reforms, the COVID-19 shock could still inflict permanent damage to the productive capacity of euro area economies. Policy measures implemented so far have avoided severe damage to the euro area's economic tissue but many more structural measures will be needed to prepare for the future, in the form of facilitating the reallocation of resources and the reskilling / upskilling of workers to avoid skill mismatches. The more these processes are blocked, the greater the impact on potential and the slower the process of reallocating workers / capital from declining sectors towards the new digital & green sectors which constitute the lynchpins of the EU's long run sustainable growth ambitions.
- Finally, it should be remembered that various pre-COVID-19 headwinds to potential growth have not gone away. In particular the euro area's ageing population constitutes a persistent drag on potential growth going forward. Moreover, the jury is still out as to whether the secular decline in the euro area's TFP growth rate experienced in the run up to COVID-19 can be reversed, post COVID-19, via the

investments and structural reforms linked to the NGEU.

II.4. Conclusions

The COVID crisis has underlined, yet again, that policymaking under uncertainty is an unavoidable fact of life and that a deep analysis of the likely implications on potential growth of any crisis constitutes an essential first step in drawing up an effective policy response. In this context, from the outset of the crisis in spring 2020, EUCAM's potential growth and output gap estimations provided valuable information to policy-makers regarding the short, medium and longer-term economic implications of COVID, including in particular an assessment of the temporary versus permanent nature of the associated economic disruption.

The key macroeconomic take away from EUCAM's analysis of the crisis so far is that the COVID-19 shock to the EU's potential output is very different from that of the 2008-2009 Financial Crisis, with the likelihood of limited long term scarring effects on the level of GDP, also thanks to the policy support that has been deployed. In this context, the EU's coordinated discretionary fiscal response, in the form of NGEU / RRF, has undoubtedly helped in stabilising growth expectations.

The pandemic led to large and overlapping shocks to supply, demand and liquidity, with the result that trend developments became much more difficult to isolate. This article has reviewed the adaptations to EUCAM in this particularly challenging context. These methodological adaptations have so far been successful in ensuring that the method produced realistic and relatively stable potential output estimates in real time, thereby reducing, to the greatest extent possible, the risk of policy errors.

On the basis of the Autumn 2021 forecasts, EUCAM's trend growth projections, over the coming decade, are pointing to an annual average growth rate which is about a ¼ of a percentage point higher than the one predicted just before the onset of the COVID-19 crisis in Autumn 2019. This encouraging outlook however mainly reflects an unexpectedly robust recovery in the contribution of labour to growth, with some question marks continuing to surround the sustainability of this specific trend. Small impulses to trend growth are also evident from both the

coming on stream of a wide range of RRF related investments and from TFP. It has to be stressed once again, however, that the analysis does not cover the potential consequences for trend growth from Russia's invasion of Ukraine.

Whilst the policy decisions taken so far in the COVID-19 crisis have been judicious, the relatively modest current improvement in TFP (the key long-term driver of growth), combined with the ongoing uncertainties regarding potential employment, could be an early signal to policymakers of the emergence of a number of new secular growth headwinds to add to the pre-existing ones. Many of these headwinds are linked to a reversal of some of the pivotal factors that have underpinned trend growth (and low trend inflation rates) over the last 30 years and constitute downside risks to EUCAM's baseline projection for the coming decade:

- Firstly, the risks related to de-globalisation have increased, with a specific concern linked to the future economic relationship between the US and China;
- Secondly, related to the wider de-globalisation issue, is the specific COVID-related risk that given the production bottlenecks experienced during COVID-19 and the logistical disruptions at the start of the "re-opening" phase, there is a risk that efficient, pre-COVID-19, global supply chains could lead to less efficient, more fragmented, regional variants;
- Finally, in addition to the relatively recent emergence of concerns related to globalisation and COVID-19, the pre-existing issues of ageing populations / shrinking labour forces and the entrenched decline in trend TFP growth rates in the pre-COVID-19 period, constitute two fundamental risks that always need to be considered in forming any realistic assessment of the EU's, post-COVID-19, growth prospects.

Box II.1: Adjustments to EUCAM introduced in 2020

The Output Gap Working Group (OGWG) of the EU Council’s Economic Policy Committee is responsible for determining the underlying growth potential of the EU’s economies. It has developed, and regularly adapted, EUCAM over the last 20 years. This box summarises the adjustments to EUCAM made in Spring 2020 in order to disentangle the various supply and demand side aspects of the COVID-19 crisis and to avoid any excess procyclicality in the potential output estimations.

Potential output is commonly viewed as being determined by supply shocks ⁽¹⁾ and hence for an estimation of potential output one would aim at identifying the nature of such supply shocks – i.e. shocks which are typically persistent. In the case of the COVID-19 pandemic, it is however not clear a priori whether supply or demand shocks prevailed. Moreover, as Guerrieri et al (2020) discuss ⁽²⁾, one shock can trigger the other: the authors refer to “Keynesian supply shocks” in which supply shocks can trigger demand shocks that are larger than the initial supply shocks and they argue that the economic shocks related to COVID-19 may be of this kind.

Bodnar et al (2020) provide a short empirical literature overview and point towards mixed evidence regarding the type of shock stemming from COVID-19. The authors also argue that, whatever the nature of the shock, it is likely to fade out relatively quickly – based on an analysis of previous similar shocks. In a recent paper and based on a structural macro-economic model for the euro area, Croitorov et al (2021) argue that the COVID-19 pandemic shock is mainly driven by a collapse in domestic demand and most notably in private consumption. This feature distinguishes COVID-19 from the Global Financial Crisis which was much more driven by a period of extended low investment.

Filtering methods are useful for identifying slow-moving trends, which are typically interpreted as supply developments. Adding additional informative variables as well as structural relationships can also be of help – especially if the added variables are mainly correlated with the cyclical elements of output. An example of such variables are changes in real unit labour costs and the unemployment gap and their relationship via the wage Phillips curve.

At the heart of EUCAM lies a Solow growth model where potential output (YPOT) is linked to labour input (L), the capital stock (K) and total factor productivity (TFPS) through a Cobb-Douglas production function (i.e. assuming constant returns to scale and a factor price elasticity equal to one and that factor elasticities equal factor shares):

$$YPOT_{it} = L_{it}^{\alpha} K_{it}^{(1-\alpha)} TFPS_{it}$$

The output gap (YGAP) is defined as the difference between actual and potential output in percent ⁽³⁾.

$$YGAP_{it} = \frac{Y_{it}}{YPOT_{it}} - 1$$

⁽¹⁾ See Chen, J. and L. Górnicka. Measuring Output Gap: Is It Worth Your Time?. International Monetary Fund, 2020.

⁽²⁾ Guerrieri, V., Lorenzoni, G., Straub, L. and Werning, I. (2020). Macroeconomic implications of COVID-19: Can negative supply shocks cause demand shortages? (No. w26918). National Bureau of Economic Research.

⁽³⁾ For a complete overview see Havik, K., Mc Morrow, K., Orlandi, F., Planas, C., Raciborski, R., Röger, W., Rossi, A., Thum-Thysen, A. and Valerie Vandermeulen. The production function methodology for calculating potential growth rates and output gaps. No. 535. Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, 2014; Blondeau, F., Planas, C. and A. Rossi (2021), Output Gap Estimation using the European Union’s Commonly Agreed Methodology, ECFIN Discussion Paper 148.

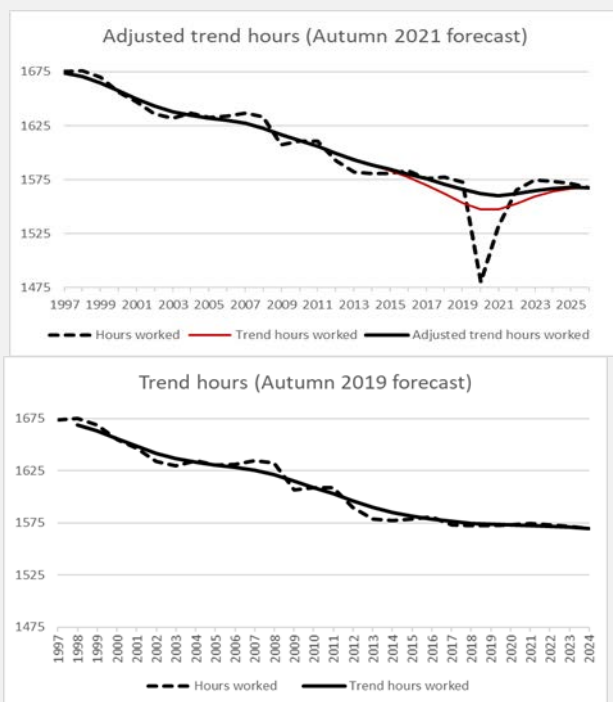
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Box (continued)

The containment measures and policy support to workers and firms during the COVID-19 pandemic have necessitated adaptations to the estimation of labour supply. As firms received support for keeping workers with reduced or zero hours on their payroll (labour hoarding); hours worked ceased to be a good proxy for the amount of labour going into production. To a lesser extent, adaptations to the estimation of the TFP trend were also necessary, while the capital stock was relatively less affected (notwithstanding the possibility that some capital may have experienced a process of accelerated obsolescence). Below is a short summary of all of the modifications made to EUCAM at the outset of the crisis in Spring 2020 :

1. Average hours worked per person employed : In normal times, the official statistics for average hours worked per person employed are expected to make a clear distinction between hours actually worked and paid hours. However, during COVID-19, given the temporary nature of the short-time work schemes, this distinction between paid, and worked, hours became more difficult to disentangle from the official statistics. The actual data at the time of the Spring 2020 Commission forecasts were pointing to a significant decline in hours worked in 2020, with ECFIN's desk officers forecasting that such declines would be temporary and that there would be a large bounce back in 2021. Since EUCAM's potential growth and output gap estimates are strongly driven by the desk officer forecasts, and in order to avoid unrealistic second-round effects in terms of trend hours worked, it was agreed that an adjustment was needed to avoid excessively pro-cyclical movements of trend hours. Following a comparison of the effects of a number of options for smoothening out the effect of such large, but temporary, shifts in hours worked, it was decided to replace the 2020 average-hours-worked value by a simple linear interpolation of the 2019 value and the 2021 forecast. As graph 1 below indicates, this adjustment had the desired effect of cushioning the labour market impact linked to the widespread adoption of various types of short-term work schemes by the EU's Member States.

Graph 1: Average hours worked per employed person for the Euro Area, Autumn 2021 and Autumn 2019 forecast vintages



Source: own calculations

2. Non-accelerating wage rate of unemployment (NAWRU) : Labour hoarding also affected the estimation of trend unemployment (the NAWRU). Labour cost statistics provided in the national income accounts do not reflect the savings to employers from using short-time work. This is because both the benefits to the workers and the full social security payments are initially paid by the employer and only

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Box (continued)

subsequently rebated. In order to dampen the impact of particularly noisy compensation data, “labour hoarding/short-time work” dummy variables were introduced into EUCAM.

3.Total Factor Productivity (TFP) : Data on capacity utilisation from business surveys is taken into account in the TFP detrending procedure. Only a minor adjustment was needed to the TFP methodology in the Spring 2020 forecast exercise to reflect the fact that insufficient monthly survey data for 2020 was available at the time when the effects of COVID-19 started to impact economic trends in March 2020. To overcome this problem, a proxy capacity utilisation value for 2020 was calculated based on forecasted 2020 TFP growth, adjusted on the basis of the change in capacity utilisation in the year following the financial crisis. By Autumn 2020, this short term data problem had been resolved and no further adjustments were necessary on the TFP side. Nonetheless, it should be noted that capacity utilisation from survey data captures mainly utilisation patterns on the capital side but is an imperfect control for utilisation on the labour side. The labour hoarding indicator under development may therefore also lead to an improvement in terms of TFP trend estimation.

At the current juncture, the use of interpolation for hours worked and dummy variables for the NAWRU have proven to help considerably in addressing the risk that a failure to allow for the distorting effects of labour hoarding could lead to excessively pro-cyclical potential output estimates. But this is manifestly only a short term solution. The ongoing development of a specific labour-hoarding indicator aims at a more structural improvement of EUCAM. In this context, and with the goal of making the method more robust to the use of temporary labour protection mechanisms in future crisis situations, the integration of a suitable pan-EU labour hoarding indicator constitutes an important research goal, with the OGWG already making progress in this area.

III. The market performance of EU bonds

By Daniel Monteiro

Abstract: Since the launch of the NextGenerationEU (NGEU) and SURE programmes in the midst of the 2020-2021 COVID-19 crisis, the amount of bonds issued by the European Union has grown rapidly, and is expected to reach a market footprint comparable to that of a medium-to-large-sized EU sovereign. This section investigates the market performance of EU bonds since October 2020, when the first SURE bond was issued, focusing on their yields, spreads and liquidity measures. An empirical analysis shows that EU bonds trade with a modest, though non-negligible, spread compared to the 'risk-free' rate, tracking, to some extent, changes in the spreads of euro area Member States. At the same time, bonds issued under the NGEU and SURE programmes benefit from lower yields when compared with EU bonds issued under previous programmes. This favourable price effect is stronger at shorter maturities and fades away at longer horizons. Empirical analysis likewise suggests that the single EU green bond in the sample benefitted from a favourable 'green' label effect as at January 2022, although this result should be interpreted with caution. Finally, EU bonds issued under NGEU and SURE have been somewhat less liquid than benchmark sovereign bonds, but more liquid than EU bonds issued under previous programmes. The liquidity of EU bonds issued under NGEU and SURE is high overall and has also been increasing since mid-2021 as the total amount of EU issuance rapidly expanded and EU bills were introduced ⁽⁶⁰⁾.

III.1. Introduction

One of the consequences of the policy response to the COVID-19 crisis has been the large-scale issuance of EU bonds to finance two temporary support schemes: NextGenerationEU (NGEU) and the Support to mitigate Unemployment Risks in an Emergency (SURE) ⁽⁶¹⁾. The EU had already issued bonds in the past to fund: (i) its balance-of-payments assistance facility; (ii) its macro-financial assistance programmes; (iii) the European Atomic Energy Community; and (iv) the European Financial Stabilisation Mechanism. However, the latest issuances under NGEU and SURE are remarkable for their planned total size, specific governing framework ⁽⁶²⁾ and diversified funding strategy.

The first SURE bond was issued in October 2020, while the first NGEU bond appeared in June 2021. By January 2022, EUR 89.6 bn had been issued under SURE, out of a maximum issuance of EUR 100 bn. By the same date, EUR 99.9 bn had been issued as NGEU bonds and bills, out of a maximum issuance of EUR 806.9 bn ⁽⁶³⁾ in long-term funding. Graph III.1 shows the increase in EU bond issuance since October 2020, while Graph III.2 shows a projection for outstanding EU bond amounts over the coming decades. Even though this projection is subject to uncertainty, notably over the degree of take-up by Member States of the NGEU loans, it shows that total EU bonds outstanding may reach more than 6% of euro-area GDP by 2026. If the EU issuer were a country, such an absolute amount of debt outstanding would place it fifth among European Member States, just behind Spain, and ahead of Belgium and the Netherlands. One segment in particular, the green bond market, is set to represent 30% of total issuance under NGEU, making the EU the world's largest issuer of green bonds.

⁽⁶⁰⁾ The author would like to thank Puck Boom for the excellent statistical assistance, as well as Eric Ruscher, Matteo Salto and two anonymous referees for helpful comments.

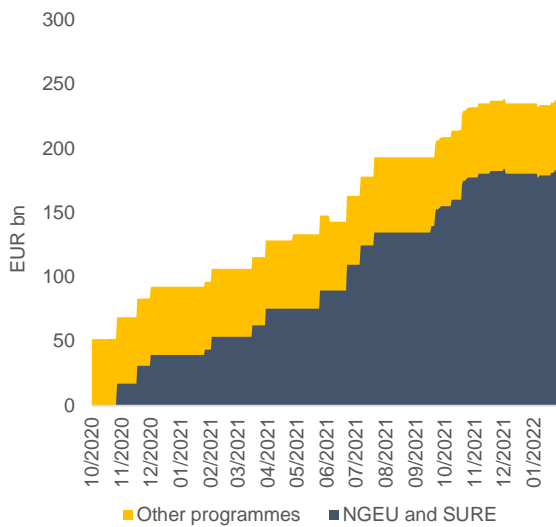
⁽⁶¹⁾ See https://ec.europa.eu/info/strategy/recovery-plan-europe_en and https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/financial-assistance-eu/funding-mechanisms-and-facilities/sure_en.

⁽⁶²⁾ In particular, as regards the use of the proceeds and the repayment mechanisms. For example, under NGEU the proceeds are to be applied by Member States on investments and reforms, as set out in EU-approved recovery and resilience plans. As for SURE, the proceeds seek to support employment through short-time work schemes and similar measures. On financing, NGEU and SURE have involved an expansion of the EU budget and the possibility of new EU own resources, in particular in connection with the repayment of grant-related NGEU funding. Budgetary safeguards have also been implemented, such as a system of voluntary guarantees from Member States for the

SURE loans, as well as an increase in the EU's own-resources ceiling in connection with NGEU.

⁽⁶³⁾ Current prices.

Graph III.1: Total EU bond amounts outstanding



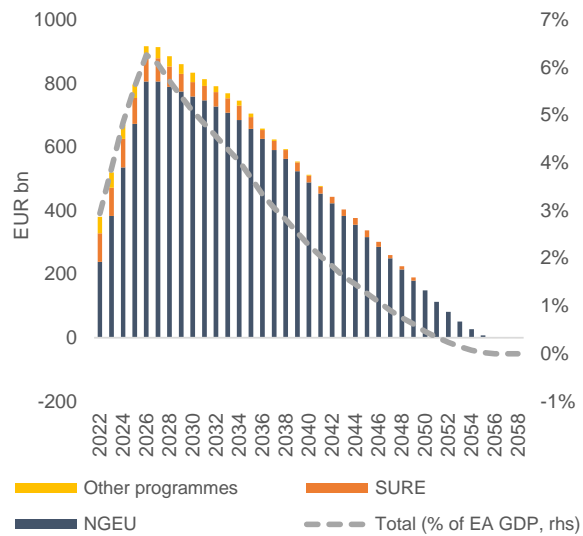
Source: Bloomberg, own calculations.

NGEU and SURE bonds have been well received by investors, as evidenced by: (i) the large primary market demand; (ii) the low spreads compared to measures of the ‘risk-free’ rate (e.g. the yields on German Bunds); (iii) the strong interest shown by both domestic and foreign investors; and (iv) their AAA rating from two out of the three largest rating agencies. The diversified funding strategy of the EU⁽⁶⁴⁾ has made possible the formation of a full yield curve, which compares well with that of reference EU issuers, such as France and other EU supranationals. As can be observed in Graph III.3, EU bonds trade: (i) with a spread with respect to Germany; (ii) with no systematic spread with respect to France; and (iii) broadly in line with other EU supranationals such as the European Stability Mechanism (ESM). It is worth noting that the spread with respect to France tends to be positive at short-to-medium maturities, and negative at longer ones. In addition, the EU yield curve compares favourably with that of the ESM when considering only NGEU and SURE bonds, which generally trade at somewhat lower yields along the full maturity spectrum than EU bonds issued under previous programmes.

⁽⁶⁴⁾ Under the EU’s diversified funding strategy, lending operations to Member States are decoupled from borrowing operations by the EU (i.e. there is no ‘back-to-back’ lending), which can rely on different funding instruments and techniques. See:

https://ec.europa.eu/info/strategy/eu-budget/eu-borrower-investor-relations/next-generation-eu-diversified-funding-strategy_en.

Graph III.2: Projected EU bond amounts: 2022-2058



(1) Projections assume no further issuance under SURE and programmes classified as ‘other’.
Source: Commission projections, Bloomberg, own calculations.

Large-scale issuance by the EU matters at a macroeconomic level as it has the potential to both improve the functioning of the monetary union and support important strategic objectives. The decision to issue bonds at EU level has provided an immediate confidence boost⁽⁶⁵⁾ to financial markets and to the EU economy. In addition to its positive effect in signalling Member States’ commitment to the European project, EU issuance can be instrumental in: (i) developing green finance; (ii) deepening the capital markets union⁽⁶⁶⁾; and (iii) offering financial institutions more options for diversifying and de-risking their assets, thus helping to break the direct channels of the sovereign-bank loop that has afflicted European economies in the past⁽⁶⁷⁾. In addition, EU bonds provide markets with a sizeable supranational safe asset, thus helping to support the international role of the euro⁽⁶⁸⁾.

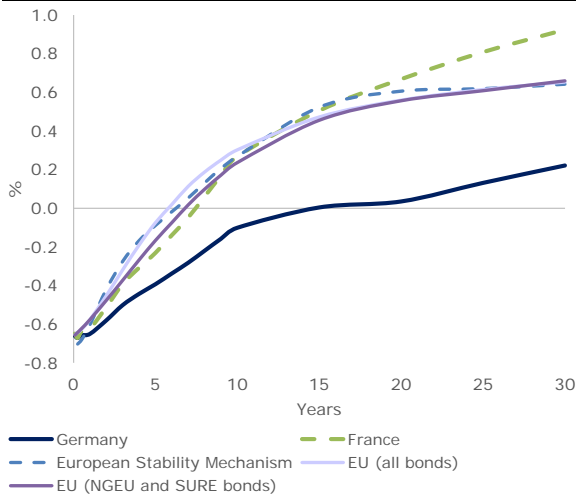
⁽⁶⁵⁾ For example, this was observable in a decrease in the CDS spreads of euro-area sovereigns following: (i) the Franco-German proposal of 18 May 2020 for a recovery fund, to be financed by joint EU debt issuance; and (ii) the subsequent NGEU proposal by the European Commission on 27 May.

⁽⁶⁶⁾ See for example CEPS-ECMI Task Force (2019), ‘Rebranding capital markets union - a market finance action plan’.

⁽⁶⁷⁾ See Bellia, M., L. Calès, L. Frattarolo, D. Monteiro and M. P. Giudici (2021), ‘COVID-19: the stabilising impact of EU bond issuance on sovereigns and banks’, *Quarterly Report on the Euro Area*, Vol. 20, No. 3 (2021).

⁽⁶⁸⁾ For example, see Ilzetzki, E., C.M. Reinhart and K. S. Rogoff (2020), ‘Why Is the Euro Punching Below Its Weight?’, *Economic*

Graph III.3: European yield curves



(1) As at 14/01/2022.

Source: Bloomberg, own calculations.

In the remainder of this article we conduct an empirical assessment of the market performance of EU bonds, starting with a longitudinal analysis of yield drivers since October 2020 in Subsection III.2, before moving on to an assessment of spreads as at January 2022 in Subsection III.3, and a discussion of market liquidity and its determinants in Subsection III.4. Subsection III.5 provides some concluding thoughts.

III.2. The evolution of the yields on EU bonds

Average EU bond spreads with respect to AAA euro-area sovereigns ⁽⁶⁹⁾ have been small, although systematically positive since the issuance of the first SURE bond in October 2020 (Graph III.4). Spreads are also lower for SURE and NGEU bonds when compared with other EU issuances. During the period under consideration, spreads initially decreased until early 2021 and then embarked on an upward trend until summer 2021. They tended to fall somewhat in August and September 2021, and have not presented a clear trend since then. These movements correlate with risk factors in ‘higher-yield’ and ‘lower-yield’

Policy, Volume 35, Issue 103, July 2020; De Grauwe, P. (2018), ‘Economics of Monetary Union’ and ECB (2019), ‘The international role of the euro, June 2019’.

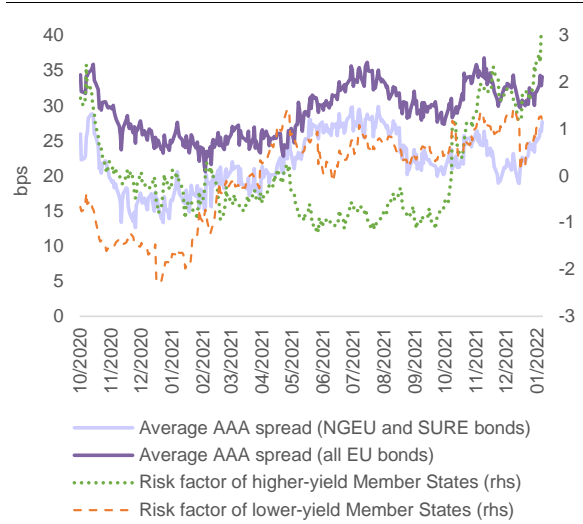
⁽⁶⁹⁾ We consider the AAA yield curve fitted by the ECB for the euro area, available from:

https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html.

AAA euro-area sovereigns are those so rated by Fitch. For the period under consideration, these comprise Germany, Luxembourg and the Netherlands.

euro-area Member States (whose spreads are calculated with respect to Germany).

Graph III.4: EU bond spreads and risk factors



(1) Spreads are simple averages of the bonds in the sample and are computed with respect to the yield curve of AAA euro-area sovereigns, for the relevant maturity. Risk factors are constructed as the first principal component of the 10-year spreads with respect to DE of two sets of Member States: AT, BE, FI, FR and NL (‘lower-yield’ countries); and EL, IE, IT, PT and ES (‘higher-yield’ countries). Risk factors have been normalised in the graph to zero mean and unit standard deviation.

Source: Bloomberg, ECB, own calculations.

We formalise our assessment of the evolution of the yields of EU bonds in a panel regression based on a sample of 68 bonds and bills tracked from October 2020 to January 2022 ⁽⁷⁰⁾. In particular, we estimate the following equation in a random effects setting:

$$y_{i,t} = \alpha + \beta_1 y_{i,t}^{AAA} + \beta_2 \overline{BAS}_i + \beta_3 BAS_{i,t} + \beta_4 \bar{T}_i + \beta_5 \bar{T}_i^2 + \beta_6 Risk_t^{LY} + \beta_7 Risk_t^{HY} + \beta_8 NGEU_SURE_i + \beta_9 Green_i + \beta_{10} (\bar{T}_i \times Risk_t^{LY}) + \beta_{11} (\bar{T}_i \times Risk_t^{HY}) + \beta_{12} (NGEU_SURE_i \times \bar{T}_i) + \varepsilon_{i,t}$$

where:

- $y_{i,t}$ denotes the yield of bond i in month t ;
- $y_{i,t}^{AAA}$ is the yield of AAA sovereign bonds ⁽⁷¹⁾, for the same residual maturity as bond i , with

⁽⁷⁰⁾ Here and elsewhere, the data on EU bond yields, bid prices, ask prices and amounts outstanding are sourced from Bloomberg.

⁽⁷¹⁾ As in Graph IV.4, we consider the AAA yield curve fitted by the ECB for the euro area.

respect to bond i 's issue date; i.e., $y_{i,t}^{AAA}$ tracks the relevant risk-free rate for a given bond;

- \overline{BAS}_i is the average in-sample bid-ask spread of bond i , a measure of market liquidity computed as the ask price of a bond minus its bid price ⁽⁷²⁾;
- $BAS_{i,t}$ is a time series for bond i 's bid-ask spread;
- \bar{T}_i is the average in-sample maturity of bond i , and \bar{T}_i^2 the square of that figure;
- $Risk_t^{LY}$ is a risk factor computed as a rescaled ⁽⁷³⁾ first principal component of the spreads of 'lower-yield' euro area sovereigns (i.e., AT, BE, FI, FR and NL) with respect to DE;
- $Risk_t^{HY}$ is an equivalent risk factor computed for 'higher-yield' euro area sovereigns (i.e., EL, IE, IT, PT, ES);
- $NGEU_SURE_i$ is a dummy variable that takes the value of one if a bond was issued under the NGEU or the SURE programmes;
- $Green_i$ is a dummy variable that takes the value of one if bond i is a green bond;
- and $\varepsilon_{i,t}$ is an error term.

The motivation for the above specification, the estimation method and the estimated coefficients are discussed in Box III.1. The goodness-of-fit of the regression is 95% and all the parameters are statistically significant, with the exception of the parameter associated with $Green_i$ ⁽⁷⁴⁾.

A number of relevant conclusions can be extracted from the estimated coefficient values:

⁽⁷²⁾ The bid and ask prices that are used to calculate the BAS are expressed as a percentage of par value. For this reason, we express the BAS in basis points throughout the article.

⁽⁷³⁾ More precisely, the first principal component loadings are divided by their sum, so that they add up to one and the risk factor can be interpreted in 'interest rate' percentage point terms. This normalisation method is thus different from that depicted in Graph IV.4.

⁽⁷⁴⁾ As explained in Box III.1, this parameter is included for specification consistency with the cross-sectional regression in the next subsection.

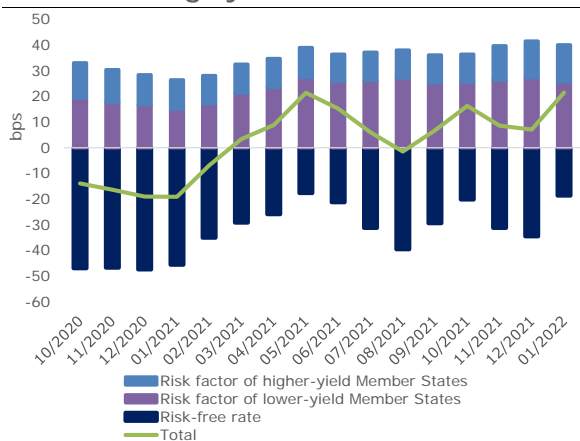
1. As expected, the risk-free rate is by far the main driver of EU bond yields: a 10 basis point (bp) increase in the risk-free rate (for the relevant maturity) translates into an 8.2 bp increase in EU bond yields.
2. The EU inherits credit risk from both the 'lower-yield' and 'higher-yield' regions: a 10 bp increase in the spread of 'lower-yield' countries raises EU yields by a minimum of 2.4 bps, a figure that increases by 0.2 bps for each year of average bond maturity. Likewise, a 10 bp increase in the spread of 'higher-yield' Member States raises yields by a minimum of 0.6 bps, and by a further 0.05 bps for each year of bond maturity ⁽⁷⁵⁾. It is worth noting that a positive credit risk dependence with respect to Member States is to be expected from the viewpoint of economic fundamentals. This is because the EU is directly exposed to EU countries via: (i) the loans it grants under NGEU (which are concentrated in the 'higher-yield' countries); and (ii) its budgetary claims on Member States, which form the basis for the repayment of the NGEU grants (with these claims being concentrated on 'lower-yield' countries, whose contributions to the EU budget are comparatively larger).
3. NGEU and SURE bonds enjoy a significant price advantage: bonds issued under NGEU and SURE benefit from a yield reduction when compared with EU bonds issued under other programmes, which can reach up to 11 bps as they approach zero residual maturity. This positive pricing effect fades away for longer maturities, and is no longer observable beyond the ten-year horizon.
4. Liquidity matters: a 10 bp increase in average bid-ask spreads increases yields by 3.8 bps, on average.

Graph III.5 provides a decomposition of the main time-varying contributors to the average yields on EU bonds, allowing us to extract a fifth relevant conclusion:

⁽⁷⁵⁾ These results do not show a priori that the EU is more exposed to movements in the spreads of 'lower-yield' countries than to movements in the spreads of 'higher-yield' countries, as the spread magnitude and volatility in the latter region has been higher than in the former one. However, the decomposition presented in Graph IV.5 ultimately demonstrates a higher exposure to the 'lower-yield' Member States.

5. The ‘lower-yield’ countries have been somewhat more important than the ‘higher-yield’ ones in driving EU bond spreads: for the period under analysis, and considering only the role of regional risk factors, ‘lower-yield’ euro area Member States have contributed with a relative share of 66% to average yields. This compares with a share of 34% for ‘higher-yield’ countries. A possible interpretation of this result would be a market perception that the ‘lower-yield’ countries play a larger role as ultimate guarantor of the very low risk of EU bonds. It should be noted, however, that the period under analysis was characterised by relatively low volatility in Member State spreads, and that the relative importance of the drivers could change under a regime of higher volatility.

Graph III.5: Main dynamic drivers of the average yields on EU bonds



(1) In simple average terms, covering all bonds in the sample at a given point in time.
Source: Own estimations.

Before concluding this longitudinal analysis of EU bond yields, it is worth noting two ‘negative’ results. Under the present sample and methodology, a green bond label does not confer a statistically significant change in yields⁽⁷⁶⁾. However, this result should be read with caution for two reasons: (i) it is not confirmed by the cross-sectional analysis conducted for January 2022 (see the following subsection); and (ii) there is only one green bond in the sample. Likewise, while EU short-term bills trade at very low spreads, this appears to be explained by general factors such as

⁽⁷⁶⁾ In other words, the inclusion of a ‘green’ dummy variable in the regression reveals a coefficient that is not statistically significant.

their short residual maturity and high liquidity, rather than by a ‘bill label’ per se⁽⁷⁷⁾.

III.3. EU bond spreads in January 2022: a cross-sectional assessment

This subsection takes a ‘snapshot’ of the drivers of EU bond spreads at a specific point in time by estimating the following cross-sectional equation for 65 EU bonds as at January 2022:

$$y_i - y_i^{AAA} = \alpha + \beta_{BAS}BAS_i + \beta_T T_i + \beta_{T^2} T_i^2 + \beta_{NS} NGEU_SURE_i + \beta_G Green_i + \beta_{NS,T} (NGEU_SURE_i \times T_i) + \varepsilon_i$$

where the left-hand side of the equation captures bond spreads, T_i denotes bond i 's residual maturity, and remaining variables have the same meaning as in the previous subsection. Focusing only on January 2022 implies strongly reducing the number of available observations, which in turn requires reducing the number of explanatory variables. The above specification can be therefore understood as a ‘collapsed’ form of the panel data equation previously estimated, streamlined to a lower number of estimated parameters. An advantage of taking a cross-sectional approach relates to its robustness with respect to parameter instability⁽⁷⁸⁾.

The cross-sectional equation is estimated via OLS and with robust standard errors. The goodness-of-fit is 76%⁽⁷⁹⁾ and all parameters are significant and have theoretically-valid signs. The results are reported in Box III.1 together with additional details.

Graph III.6 provides a decomposition of EU bond spreads based on the estimated cross-sectional equation, where we consider the ‘average bond’⁽⁸⁰⁾ for each of the following three categories:

⁽⁷⁷⁾ I.e. the inclusion of a ‘bill’ dummy variable in the regression reveals a coefficient that is not statistically significant.

⁽⁷⁸⁾ I.e., if parameters are time-varying in the panel regression, the cross-sectional approach provides a picture of their value at a specific point in time.

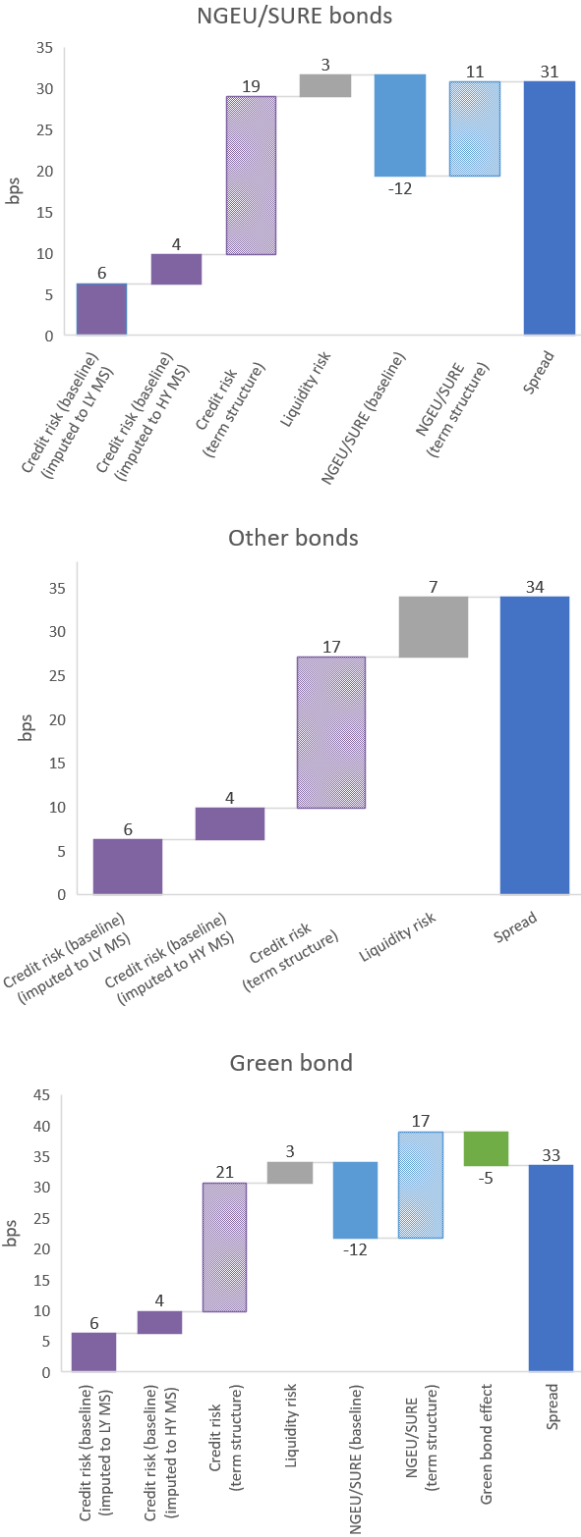
⁽⁷⁹⁾ A lower goodness-of-fit when compared with the panel data model should not be understood as evidence of lower explanatory power. Rather, it is the result of the fact that the cross-sectional regression explains spreads rather than yields. Given that spreads are a form of ‘residual’, they are harder to explain.

⁽⁸⁰⁾ By ‘average bond’ we mean a hypothetical bond with maturity and bid-ask spreads equal to the simple average calculated over the respective subsample (i.e. the NGEU/SURE, green and other subsamples).

NGEU/SURE, green and other. As before, a number of key conclusions can be extracted. These conclusions are generally in line with those of the previous subsection (except on the existence of an EU green bond effect):

1. EU spreads can be interpreted as mainly reflecting a modest amount of perceived credit risk. In the decomposition shown in Graph III.6, perceived credit risk is taken as that part of the spread that cannot be explained by a bond's liquidity or other factors. In particular, the intercept a is interpreted as a measure of baseline credit risk and decomposed into two regional contributions, according to weights derived from the estimated parameters of the panel regression considered in Subsection III.2⁽⁸¹⁾. The maturity variables T and T^2 are likewise assumed to reflect a term structure component of credit risk, according to which bonds with longer residual maturities tend to show higher spreads⁽⁸²⁾. This is the reason why NGEU/SURE bonds show a total perceived credit risk that is slightly higher than that of other bonds, as their residual maturity is approximately two years longer on average in the sample.
2. The liquidity of NGEU and SURE bonds is higher on average, allowing for a more favourable liquidity premium. This liquidity advantage is estimated at approximately 4 bps in simple average terms.

Graph III.6: **Decomposition of spreads on 'average' EU bonds as at January 2022**



⁽⁸¹⁾ Concretely, the share of the intercept value assigned to the 'lower-yield' region is given by:

$$\frac{\beta_6 Risk_{Jan 22}^{LY} + \beta_{10} (T_{Jan 22} \times Risk_{Jan 22}^{LY})}{\beta_6 Risk_{Jan 22}^{LY} + \beta_{10} (T_{Jan 22} \times Risk_{Jan 22}^{LY}) + \beta_7 Risk_{Jan 22}^{HY} + \beta_{11} (T_{Jan 22} \times Risk_{Jan 22}^{HY})}$$

The share of the 'higher-yield' region is the complement of this figure.
⁽⁸²⁾ In principle, β_T and β_{T^2} could also capture term premia differentials between the EU and AAA sovereign bonds that are unrelated to liquidity and credit risk. However, given the relatively similar characteristics of both types of bonds, we assume that any such term premia spread would be only of secondary importance. It is also worth noting that, while this was not the presentational option chosen in Graph IV.6, the term structure component of credit risk could have been decomposed into regional contributions, just like baseline credit risk.

(1) LY MS refers to "lower-yield" Member States while HY MS refers to "higher-yield" Member States.

Source: Own estimations.

3. NGEU and SURE bonds benefit from a favourable spread-lowering effect, which fades away at longer maturities. This effect is estimated as lowering spreads by 12 bps for bonds approaching zero residual maturity, and is absent beyond the 10-year horizon. Because it disappears at longer horizons, the total effect tends to be modest for the ‘average’ NGEU/SURE bond (given the associated long average maturity) but it can be quite significant for short residual maturities, as is notably the case for EU bills.
4. The EU green bond appears to benefit from a specific price advantage. The EU green bond is a 15-year bond issued under NGEU and its green label-specific advantage is estimated at 5 bps, although any results involving just one observation should be interpreted with additional caution.
5. There appears to be no statistically significant change in spreads from an ‘EU bill label’, after controlling for the favourable characteristics of EU bills (i.e. short residual maturity, high liquidity and issuance under the NGEU programme).

Before concluding the present cross-sectional assessment, it may be worth reflecting on the estimated NGEU/SURE effect, discussed under conclusion 3 above. While determining its ultimate nature is beyond the scope of this article, it may be that the perceived credit risk of EU bonds issued under NGEU and SURE benefits from the related guarantees and budgetary safeguards⁽⁸³⁾, as well as from the specific legal framework surrounding the loans to Member States under NGEU. Another possibility may be that certain characteristics of NGEU and SURE bonds have been optimised to cater to current market demand. It may also be the case that investor preferences, preferred habitat effects or other undefined ‘goodwill’ towards large-scale EU bond issuance under NGEU and SURE play a role. One particular explanation though – related to pricing advantages usually associated with recently issued or ‘on the run’ bonds – can be apparently be ruled out, as including a dummy

variable capturing the latest issued bond (in either the panel data or the cross-sectional regression) produces a statistically insignificant coefficient.

III.4. Liquidity drivers

The previous subsections established that market liquidity, measured by (average) bid-ask spreads (BAS), is a relevant factor driving bond yields. We conclude our empirical investigation of the market performance of EU bonds by looking at the evolution and drivers of this liquidity.

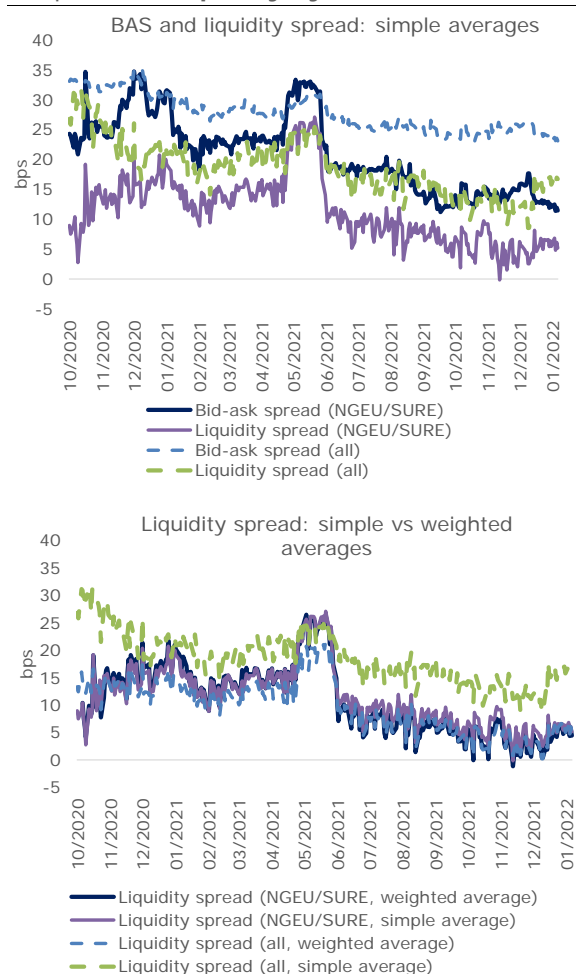
Graph III.7 plots the changes in the average BAS for all EU bonds, as well as for the NGEU/SURE subsample. In addition, the graph also shows an alternative measure of liquidity, which we denote as ‘liquidity spread’, computed as the difference between a bond’s BAS and the BAS of the respective benchmark bond (i.e. the BAS of a ‘risk-free’ bond of comparable characteristics selected by Bloomberg)⁽⁸⁴⁾.

As can be observed in the top part of the graph, the average BAS of EU bonds has been on a slight downward trend since October 2020, when the first SURE bond was issued. This downward trend appears largely driven since June 2021 by the NGEU/SURE subsample, whose BAS began reducing from that date onwards. However, the BAS of NGEU/SURE bonds was more volatile before June 2021 (which can also be understood as a consequence of having fewer such bonds in the sample). In the bottom part of the graph, simple averages of liquidity spreads are compared with their weighted average counterparts. The increasing relative size of NGEU/SURE bonds becomes apparent as their low liquidity spreads quickly dominate and lead to a convergence in weighted averages across subsamples. In fact, towards the end of our sample period, average liquidity spreads for NGEU/SURE bonds are consistently low and approaching zero.

⁽⁸³⁾ Namely as established in the latest EU own resources decision. See, for example, the European Parliament briefing of June 2021 on National ratification of the Own Resources Decision, available from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690520/EPRS_BRI\(2021\)690520_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690520/EPRS_BRI(2021)690520_EN.pdf)

⁽⁸⁴⁾ In our sample, benchmark bonds are mostly sovereign bonds and bills issued by Germany.

Graph III.7: Liquidity dynamics of EU bonds



(1) The liquidity spread was calculated as the difference between an EU bond's bid-ask spread and the bid-ask spread of the respective benchmark bond, as selected by Bloomberg.

Source: Bloomberg, own calculations.

We formalise the assessment of liquidity drivers in our EU bond sample by running the following panel regression in a random effects setting:

$$BAS_{i,t} = \alpha + \beta_{AMNT}AMNT_{i,t} + \beta_T T_{i,t} + \beta_{TAMNT}TAMNT_t + \beta_{TAMNT2}TAMNT_t^2 + \varepsilon_{i,t}$$

where $AMNT_{i,t}$ is the amount outstanding of bond i in month t ; $T_{i,t}$ is the residual maturity of bond i in month t ; and $TAMNT_t$ is the total amount of EU bonds outstanding in month t . Box III.1 discusses the estimation method and presents the estimation results. The goodness-of-fit is 40%, and all the coefficients are highly statistically significant and have the expected sign.

Three key conclusions can be extracted from the estimation results:

1. Market liquidity increases with lower residual maturity. According to the estimated β_T coefficient, reducing residual maturity by one year lowers the BAS by approximately 2 bps, indicating higher liquidity⁽⁸⁵⁾. This result is thus supportive of the option of issuing EU bills, from a purely financial viewpoint.
2. Larger issue sizes increase liquidity. According to the estimated coefficient β_{AMNT} , an increase in issuance size by EUR 1 bn lowers the BAS by approximately 2.4 bps. As a reference, the average size of the non-NGEU/SURE bond in our sample in January 2022 was EUR 1.33 bn, a figure that rises to EUR 9.6 bn for NGEU/SURE bonds (excluding bills), and to EUR 3.78 bn for NGEU bills. This result is supportive of a strategy whereby EU issuance would be consolidated under large bond amounts.
3. Liquidity conditions improved as the pool of total EU bonds outstanding increased. Not only does the size of an individual bond issue improve its liquidity, but the size of the total pool of outstanding EU bonds also appears to improve liquidity. This latter effect is assessed as non-linear in the regression, as it becomes weaker for larger amounts. According to the estimated coefficients, moving from a pool of EU 55 bn in October 2020 to one of EUR 235 bn in January 2022 has decreased the average BAS by 14 bps⁽⁸⁶⁾.

There is no evidence from the previously described panel data model that an 'NGEU/SURE', 'green' or 'bill' label affects liquidity per se in a statistically significant manner.

III.5. Conclusion

We have looked at the market performance of EU bonds in terms of their secondary market yields, spreads and market liquidity. Our investigation suggests that EU bonds are low-risk assets with relatively high and increasing liquidity. Their spreads correlate to some extent with those of both

⁽⁸⁵⁾ Shorter residual maturities also lower the interest rate risk taken on by bond dealers, which may also lead to lower BAS.

⁽⁸⁶⁾ The introduction of an EU primary dealer network (PDN) at the of end-May 2021 may also have helped to increase liquidity over time, as the framework governing the PDN provides an incentive for participating institutions to engage in EU bond market making. See https://ec.europa.eu/info/strategy/eu-budget/eu-borrower-investor-relations/primary-dealer-network_en.

'lower-yield' and 'higher-yield' Member States, being somewhat more influenced by the former. This risk dependence appears consistent with economic fundamentals given the loan and budgetary claims of the EU.

Bonds issued under the recent NGEU and SURE initiatives enjoy higher liquidity and lower spreads than bonds issued under previous EU programmes. This NGEU/SURE effect appears in our regression analysis as a statistically significant reduction in yields that fades away at longer maturities, and which cannot be explained by other factors. Whether a similar effect also exists for the single green bond in the sample is more uncertain, although the analysis suggests that was the case as at January 2022. EU bills show particularly low spreads and very high liquidity, which can be largely explained by their short residual maturities and other observable characteristics. In fact, short maturities and large issuance amounts are seen as key drivers of high market liquidity. Another important factor behind the increasing market liquidity of EU bonds has been the swift expansion of the pool of total EU bonds outstanding since October 2020.

The rapid introduction of large-scale EU bond issuance has been an unexpected development brought about by the joint EU policy response to the COVID-19 crisis. The market reception and dynamics of this large and increasing issuance has been very favourable so far, although its main effects extend well beyond the purely financial realm and into the macroeconomics of the euro area. Joint EU issuance has provided a strong signal of commitment to the European project, has helped to fund its main crisis-response tools and has, at the same time, offered the economy a sizeable, temporary Pan-European safe asset.

Box III.1: Estimation approach and results

Subsection IV.2 presents a **panel regression of the drivers of the yields of EU bonds**. The sample runs from October 2020 to January 2022 and covers 64 bonds, for a total of 804 observations. Our time-dependent variables are monthly averages of daily figures to reduce possible noise in the data and to focus on the more fundamental relations between variables. The sample comprises 54 active EU bonds (of which 11 were issued under SURE and 6 were issued under NGEU), 6 active NGEU bills, and 4 bonds that matured during the time period under consideration (of which 2 NGEU bills)⁽¹⁾. It should be noted that the panel is unbalanced due to bonds being issued and maturing over time.

The following equation is estimated as a random effects (RE) model, where the variables' meaning is explained in the main text:

$$y_{i,t} = \alpha + \beta_1 y_{i,t}^{AAA} + \beta_2 \overline{BAS}_i + \beta_3 BAS_{i,t} + \beta_4 \bar{T}_i + \beta_5 \bar{T}_i^2 + \beta_6 Risk_t^{LY} + \beta_7 Risk_t^{HY} + \beta_8 NGEU_{SURE\ i} + \beta_9 Green_i + \beta_{10} (\bar{T}_i \times Risk_t^{LY}) + \beta_{11} (\bar{T}_i \times Risk_t^{HY}) + \beta_{12} (NGEU_{SURE\ i} \times \bar{T}_i) + \varepsilon_{i,t}$$

The choice of estimation is strongly supported by a Hausman test of RE versus fixed effects, where the null hypothesis of RE is not rejected for a p-value of 0.95. At the same time, a Breusch-Pagan LM test rejects a pooled OLS approach, thus further confirming the suitability of an RE approach.

The explanatory variables control for the risk-free rate, market liquidity, average maturity (where we allow for a quadratic effect), credit risk in euro area 'lower-yield' and 'higher-yield' regions, NGEU/SURE and green bond effects, as well as for interaction terms that are empirically significant. The latter are namely related to the interplay between maturity and risk factors; and to the interplay between maturity and the NGEU/SURE effect.

The values of the estimated parameters are as follows:

Table 1:
Estimated parameters (random effects yields model)

Parameter	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}
Value	-23.62	0.82	0.38	-0.13	1.16	-0.09	0.24	0.06	-11.44	-2.55	0.022	0.005	1.11
p-value	0.000	0.000	0.000	0.000	0.021	0.000	0.000	0.002	0.003	0.747	0.000	0.003	0.010

All parameters are significant at either a 1% or a 5% significance level, with the exception of the parameter associated with *Green_i*, which is not significant. Nevertheless, we retain this variable in our specification for consistency with the cross-sectional regression discussed below, where *Green_i* will be seen to be significant. The signs of the estimated coefficients are theoretically valid in all cases, with the exception of β_3 , the coefficient associated with *BAS_{i,t}*. In fact, while the coefficient associated with the average bid-ask spread \overline{BAS}_i has the expected positive sign (as higher \overline{BAS} implies lower liquidity and thus higher spreads), the evolution of the bid-ask spread over time does not. We attribute this to peculiarities in the sample, as suggested by an observation of Graph IV.7, where: (i) *BAS* tends to decrease over time, even when spreads embarked on a slight upward trend (Graph IV.4); and (ii) *BAS* exhibits an unusual jump in May-June 2021.

In Subsection IV.3, the focus is on an **explanatory cross-sectional regression of the spreads of EU bonds as at January 2022**. The sample includes 61 bonds (of which 11 were issued under SURE and 6 were issued under NGEU) and 7 NGEU bills (one of which matured in early January 2022). The following equation is estimated through OLS and by employing robust standard errors, where the variables' meaning is explained in the main text:

(1) The sample covers all bonds issued by the EU that have traded during the time period under consideration, as listed in our Bloomberg data source, with the exception of bonds issued by the European Atomic Energy Community. The latter group includes a total of seven bonds, which are characterised by higher yields when compared with the other EU issuances.

(Continued on the next page)

Box (continued)

$$y_i - y_i^{AAA} = \alpha + \beta_{BAS}BAS_i + \beta_T T_i + \beta_{T^2} T_i^2 + \beta_{NS} NGEU_SURE_i + \beta_G Green_i + \beta_{NS,T} (NGEU_SURE_i \times T_i) + \varepsilon_i$$

This equation can be understood as a reduced form of the full panel data version, where time-variant variables that are not bond-specific, namely the regional risk factors, collapse to the intercept. Given the decrease in the sample size, the dependent variable is expressed as a spread in order to further reduce the number of parameters. The values of the estimated parameters are as follows:

Table 2:
Estimated parameters (cross-sectional spreads model)

Parameter	α	β_{BAS}	β_T	β_{T^2}	β_{NS}	β_G	$\beta_{NS,T}$
Value	9.80	0.21	2.95	-0.10	-12.04	-5.49	1.14
p-value	0.005	0.003	0.000	0.000	0.010	0.001	0.005

All parameters are significant at a 1% or a 5% significance level, and their signs are theoretically valid.

Subsection IV.4 looks into the **drivers of market liquidity in a panel data regression model** for the same bond sample as in Subsection IV.2. The following equation is estimated as an RE model, where the variables' meaning is explained in the main text:

$$BAS_{i,t} = \alpha + \beta_{AMNT} AMNT_{i,t} + \beta_T T_{i,t} + \beta_{TAMNT} TAMNT_t + \beta_{TAMNT^2} TAMNT_t^2 + \varepsilon_{i,t}$$

The inclusion of a quadratic term in total amounts outstanding allows for a non-linear effect, such as a decreasing contribution of this variable for reducing BAS. The RE model is chosen over a fixed effects model following a Hausman test where the RE null hypothesis is not rejected for a p-value of 0.56. The values of the estimated parameters are as follows:

Table 3:
Estimated parameters (random effects BAS model)

Parameter	α	β_{AMNT}	β_T	β_{TAMNT}	β_{TAMNT^2}
Value	29.01	-2.43	1.96	-0.16	0.00043
p-value	0.000	0.000	0.000	0.000	0.000

All parameters are highly significant and the signs of the estimated coefficients are as expected.

IV. The 'exorbitant privilege' of an international-currency status: theory and evidence

By Eric Meyermans

Abstract: A strong international-currency status may provide the issuing country an 'exorbitant privilege'. This privilege can take several forms, ranging from an 'excess return' on the country's gross external assets over liabilities, to an almost unlimited capacity to issue internationally accepted liabilities to purchase its imports and service its foreign debt. At the same time, this 'exorbitant privilege' can also entail an 'exorbitant duty'. This is because in times of global stress the issuing country is expected to supply its international currency in large amounts, and the exchange rate of its currency may appreciate as capital flows to safe havens. This section compares, for a selected group of countries and areas, including the euro area and the US, their possible 'excess return' on foreign assets over liabilities, as well as changes in global demand for their liquid assets in times of global stress. After a brief literature review, the empirical part highlights that the 'excess return' has been modest for the euro area so far, as well as for most other countries in the sample. The section then illustrates econometrically that periods of global stress have induced significant increases in the demand for liquid assets issued by the US. Finally, it shows notable differences in the performances of euro-area Member States in terms of excess return⁽⁸⁷⁾.

IV.1. Introduction

Since the second world war, the widespread use of US financial assets across the globe has facilitated the invoicing and settling of international trade⁽⁸⁸⁾, conducting of international financial transactions⁽⁸⁹⁾ and storing of wealth.

This unique position of the US in the international monetary system came about with the creation of the Bretton Woods system⁽⁹⁰⁾. However, by the early 1960s it was already argued that this unique

position also entailed an 'exorbitant privilege' for the US⁽⁹¹⁾. This claim has often been repeated since then, albeit with a broader understanding of the nature of this privilege over time.

Under the Bretton-Woods system⁽⁹²⁾, when international financial flows were primarily linked to international transactions of goods and services, the 'exorbitant privilege' referred mainly to the low interest rate on US government securities and the (almost unconstrained) ability of the US to finance its external deficits with liabilities denominated in its own currency - thus shielding itself from balance of payments crises⁽⁹³⁾.

After the Bretton Woods system ended in 1971⁽⁹⁴⁾ and global financial markets became more integrated, this 'extraordinary privilege' broadened as these developments created more opportunities for non-governmental US residents to issue internationally traded financial assets such as debt

⁽⁸⁷⁾ The author wishes to thank an anonymous reviewer and colleagues for useful comments. This section represents the author's views and not necessarily those of the European Commission.

⁽⁸⁸⁾ Including its use as 'vehicle currencies' by two trading partners that do not have the international currency as their home currency - because of lower transaction costs. See, for instance, Goldberg, L. and C. Tille (2005), 'Vehicle Currency Use in International Trade', *Federal Reserve Bank of New York Staff Report* No 200 and Devereux, M. and S. Shi (2013), 'Vehicle currency', *International Economic Review*, Vol. 54, No. 1, pp. 97-133.

⁽⁸⁹⁾ Canzoneria, M., Cumby, R., Diba, B. and D. López-Salido (2013), 'Key currency status: An exorbitant privilege and an extraordinary risk', *Journal of International Money and Finance*, Vol. 37, pp. 371-393. For instance for the private sector the international currency may serve as collateral in many financial markets or as liquidity buffers. For the public sector, international currencies may serve as strategic reserves to withstand severe shocks to the balance of payments. These strategic reserves were greatly strengthened by emerging-market economies in the wake of the Asian Financial Crisis of 1997

⁽⁹⁰⁾ Eichengreen, B. (2010), *Exorbitant Privilege. The Rise and Fall of the Dollar and the Future of the International Monetary System*, Oxford University Press, argues that the first steps were made with: (i) the founding of the Federal Reserve System, which reduced financial volatility in the US; and (ii) the first world war which forced European countries off the gold standard. After the second world war, a strong international-currency status became unavoidable with the creation of the Bretton Woods system and economic reconstruction assistance from the Marshall Aid programme.

⁽⁹¹⁾ A term coined by former French finance minister Valéry Giscard d'Estaing in 1965.

⁽⁹²⁾ During the Bretton Woods System the exchange rate of national currencies was fixed vis-à-vis the US dollar (but adjustable within a 1 percent band), while foreign central banks could convert US dollars into gold at fixed prices.

⁽⁹³⁾ See, for instance, Portes, R., Rey, H., De Grauwe P. and S. Honkapohja (1998), 'The Emergence of the Euro as an International Currency', *Economic Policy*, Vol. 13, No. 26, pp. 305-343.

⁽⁹⁴⁾ I.e. the international monetary system switched from a gold exchange standard to the dollar exchange standard. See for instance De Grauwe, P (1989), *International Money. Post-War Trends and Theories*, Clarendon Press.

by financial institutions and equity by enterprises as well as inward foreign direct investment ⁽⁹⁵⁾.

Outline of this section

Since the end of the Bretton Woods system, ongoing structural changes in the global financial and trade order have created room for other currencies to also exploit their potential as an international currency ⁽⁹⁶⁾.

Against this background, this section assesses for a selected group of countries their international-currency status by: (i) comparing their returns on gross external assets over liabilities; and (ii) assessing shifts in the demand for internationally traded liquid assets issued by these countries in times of global stress.

The second subsection (IV.2) provides a brief literature review of the channels, such as liquidity and safety premiums, that may give rise to the exorbitant privilege, and the macro-economic implications of exorbitant privilege for the issuing country. It also highlights that the literature argues that a strong international-currency status may entail an ‘exorbitant privilege’ ⁽⁹⁷⁾ such as acting as an international lender of last resort in times of global stress.

The third subsection (IV.3) compares the return on gross external assets over liabilities for the euro area, US, UK, Switzerland and Japan. This analysis shows that this return has been modest for the euro area so far – but also for most other countries.

The fourth subsection (IV.4) examines the impact of macroeconomic factors on the demand for the

international liquid assets of the above-mentioned countries ⁽⁹⁸⁾. This analysis shows how the share of liquid assets issued by the US in recent decades increased significantly in times of global stress.

The fifth subsection (IV.5) explores the capacity of euro-area Member States to benefit from the euro’s international-currency status so far. The last section draws some conclusions.

IV.2. Exorbitant privileges and possible drawbacks: a brief literature review

Strong international currencies are key to the good functioning of the international monetary system ⁽⁹⁹⁾. However, if only a few strong international currencies are available, then this may give the countries that supply those currencies the opportunity to use their monopoly currency-issuing power to their own benefit, giving rise to an ‘exorbitant privilege’.

‘Exorbitant’ privileges ...

The recent economic literature identifies several channels via which this market power may give rise to ‘exorbitant privileges’ in an open world economy. These channels refer mainly to the safety and liquidity premiums and to seigniorage on cash held by foreigners. These channels may in turn have significant macroeconomic feedbacks for the issuing country.

Firstly, the issuing country supplies an asset for which there is strong worldwide demand because it is perceived to be a safe asset. As long as this demand remains strong, the interest rate on these assets will remain low as a compensation for the safety it provides (compared to assets with an

⁽⁹⁵⁾ See, for instance, Gourinchas, P. and H. Rey (2014), ‘External Adjustment, Global Imbalances, Valuation Effects’, Chapter 10 in Gopinath G., Helpman E. and K. Rogoff (Ed.), *Handbook of International Economics*, Vol. 4, pp. 585–645; and Rogoff, Kenneth and T. Takeshi (2015), ‘Japan’s exorbitant privilege’, *Journal of the Japanese and International Economies*, Vol. 35, pp. 43–46

⁽⁹⁶⁾ See, for instance, Juncker (2018), ‘State of the Union 2018: the Hour of European Sovereignty’, in which President Juncker stated that ‘... we must do more to allow our single currency to play its full role on the international scene. ... The euro must become the face and the instrument of a new, more sovereign Europe. For this, we must first put our own house in order by strengthening our economic and monetary union, as we have already started to do. Without this, we will lack the means to strengthen the international role of the euro. We must complete our economic and monetary union to make Europe and the euro stronger.’

⁽⁹⁷⁾ As argued by Gourinchas, P., H. Rey and N. Govillot (2010), ‘Exorbitant privilege and exorbitant duty’, Bank of Japan, *IMES Discussion Paper 2010-E-20*.

⁽⁹⁸⁾ I.e., the third subsection (IV.3) focuses on all external assets and liabilities which include liquid assets and liabilities as well as (illiquid) inward and outward foreign direct investment. The fourth subsection (IV.4) focuses only on the countries’ liquid external liabilities covering portfolio investment, financial derivatives and other investments, such as trade credits and loans. See also Box IV.1.

⁽⁹⁹⁾ Albeit with different shades ranging from an international currency mainly used in a limited domain (such as foreign exchange reserve by foreign central banks), to a major international currency used for accounting, transactions and a store of value by the private and public sectors far beyond the borders of the issuing country. Cohen, B (2013), ‘Currency and State Power’, Chapter 8 in Finnemore, M. and J. Goldstein (eds.), *Back to Basics. State Power in a Contemporary World*, Oxford University Press.

average rating). This phenomenon is known as the safety-premium channel ⁽¹⁰⁰⁾.

In addition, large and homogeneous financial markets, such as the US Treasury market, may create network effects ⁽¹⁰¹⁾ and lower transaction costs ⁽¹⁰²⁾, thus strengthening demand for the international currency and putting downward pressure on the interest rate. This phenomenon is known as the liquidity-premium channel. Moreover, in times of severe global crisis, when the international demand for liquidity may increase strongly, there may be an additional flight to these liquid markets (Engel (2020) ⁽¹⁰³⁾).

The foreign holdings of international currencies also provides seigniorage to the issuing country ⁽¹⁰⁴⁾. Bernanke (2015) ⁽¹⁰⁵⁾ estimates that about two thirds of US currency in circulation (about 1.4 trillion US dollar in 2015) is held abroad.

Domestic firms may also benefit because they do not have to pay currency-conversion fees in their international trade, use a currency that is relatively immune to exchange-rate risks, and are able to borrow from foreigners without issuing foreign-currency bonds (Maggiore et al. (2018) ⁽¹⁰⁶⁾).

... carrying beneficial macroeconomic effects ...

A lower interest rate triggered by a currency's international status may generate significant macroeconomic benefits for the issuing country.

Firstly, lower interest rates may induce domestic firms to invest more and households to consume more. In the short-to-medium term, this may deteriorate the reserve country's current account, but external financing constraints are less binding because the issuing country can use its currency to purchase its imports and service its foreign debt ⁽¹⁰⁷⁾.

In the long run, a major benefit for the issuing country is that it will have the opportunity to develop a more capital intensive (and productive) economy because interest rates are lower. At the same time, the trade deficit stemming from increased investment and consumption, may partly be financed by the 'excess return' on its net asset position. Nevertheless, as discussed below, holding higher yielding, but riskier foreign assets may also induce severe wealth losses for the reserve country in times of global stress (Maggiore (2017) ⁽¹⁰⁸⁾).

... but also macroeconomic costs via the exchange rate channel ...

The macro-economic costs of a strong international-currency status are mainly transmitted via the exchange-rate channel. Firstly, strong demand for the international currency may appreciate its exchange rate ⁽¹⁰⁹⁾, especially in times of global stress as capital flows to safe havens (Adler et al. (2013) ⁽¹¹⁰⁾). In turn, this will make the exports of the country issuing the international currency less competitive thus adversely affecting the output of domestic exporting firms (Eichengreen (2011) ⁽¹¹¹⁾).

Moreover, when the issuing country's international trade is mainly invoiced and settled in the international currency, then the intensity at which

⁽¹⁰⁰⁾ As the issuing country has a comparative advantage in risk taking, this premium can also be interpreted as an 'insurance fee' for guaranteeing the safety of its assets in times of a severe crisis. See, for instance, Maggiore, M. (2017), 'Financial Intermediation, International Risk Sharing, and Reserve Currencies', *American Economic Review*, Vol. 107, No. 10, pp. 3038, Gourinchas, P. and H. Rey (2022), 'Exorbitant Privilege and Exorbitant Duty', *CEPR Discussion Paper Series DP 16944*, or Farhi, E. and M. Maggiore (2018), 'A Model of the International Monetary System', *The Quarterly Journal of Economics*, Vol. 133, No. 1, pp. 295–355.

⁽¹⁰¹⁾ 'Money is like language', the more people speak the same language, the easier it becomes to communicate – without a rise in the cost for those people already speaking the language.

⁽¹⁰²⁾ I.e., lower transaction costs for larger volumes.

⁽¹⁰³⁾ Engel Ch. (2020), 'Safe US Assets and US Capital Flows', *Journal of International Money and Finance*, Vol. 102, pp.1-13

⁽¹⁰⁴⁾ I.e. a monopoly rent via the creation of fiat money (at negligible cost) in exchange for real resources; and also giving rise to a rent generated by an inflation tax on foreigners

⁽¹⁰⁵⁾ Bernanke, B. (2015), 'Federal Reserve Policy in an International Context', paper presented at the *Mundell-Fleming lecture*, International Monetary Fund, Washington DC, November 5, 2015

⁽¹⁰⁶⁾ Maggiore, M., B. Neiman and J. Schreger (2018), 'International currencies and capital allocation', *NBER Working Paper 24673*

⁽¹⁰⁷⁾ At least as long as confidence in the currency does not wane. Also giving rise to the so-called "net position" puzzle, in which the net international investment position of the US shows a negative position, while its net foreign income is positive (e.g. Obstfeld, M. (2012), 'Does the current account still matter?', *American Economic Review*, Vol. 102, No. 3, pp. 1–23).

⁽¹⁰⁸⁾ Maggiore (2017), *op.cit.*

⁽¹⁰⁹⁾ An appreciation despite a low interest rate, i.e. the paradox of the reserve currency. See, for instance, Caballero, R., Farhi, E. and P. Gourinchas (2015), 'Global imbalances and currency wars at the ZLB', *NBER Working Paper* No. 21670.

⁽¹¹⁰⁾ See, for instance, Adler, G. and D. Garcia-Macia (2018), 'The stabilising role of net foreign asset returns', *IMF Working Paper* No. 18/79.

⁽¹¹¹⁾ Eichengreen, B. (2011), *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System*, Oxford University Press.

changes in the exchange rate are transmitted to import prices and final consumer prices may weaken considerably (Goldberg and Tille (2006) ⁽¹¹²⁾). As a result of this, more of the external adjustment may need to be borne by domestic aggregate demand ⁽¹¹³⁾. However, with a stronger international-currency status, the issuing country's monetary autonomy may benefit from a stronger insulation from foreign spill-overs ⁽¹¹⁴⁾ in setting interest rates (Cœuré (2019) ⁽¹¹⁵⁾).

Last but certainly not least, when the exchange rate of the issuing country appreciates in times of global stress, its foreign assets denominated in foreign currency lose value, while its liabilities issued in its own currency stay stable. This may then trigger important wealth transfer to the rest of the world (Gourinchas and Rey (2022) ⁽¹¹⁶⁾).

... and the interest rate channel ...

When global demand for safe assets increases, the issuing country may experience a stronger risk that interest rates hit the effective lower bound at which monetary policy becomes ineffective (e.g. Eichengreen (2019) ⁽¹¹⁷⁾). Moreover, once the interest rate hits the effective lower bound and is unable to decline further, the exchange rate may appreciate thereby exerting downward pressure on economic activity.

In turn, a lower yield may create stronger incentives for the domestic financial sector to 'search for yield', taking on riskier investments.

Moreover, lower yields raise the market value of financial assets, thus relaxing banks' balance-sheet constraints and this may lead to banks making more risky loans (Engel (2020) ⁽¹¹⁸⁾).

... as well as an 'exorbitant duty' ...

A strong international-currency status also entails an 'exorbitant duty'. This is because in times of global stress, the issuing country is expected to supply its international currency as international lender of last resort ⁽¹¹⁹⁾, while at the same time addressing moral hazard risks. More specifically, the presence of an international lender of last resort may reduce the incentives of other countries to implement reforms that strengthen their economies' resilience or reduce their need to hold international reserves ⁽¹²⁰⁾.

... and 'exorbitant risk'.

Finally, the supply of – and demand for – international currencies is characterised by a delicate balance between liquidity and confidence. An excessive supply of international currencies may undermine confidence in their long-run viability, while an insufficient supply of the currency may hinder the full realisation of the economies of scale and network externalities that underpin its liquidity.

This means that an international-currency status also entails an 'exorbitant risk' as a sudden sell-off of assets denominated in the international currency – triggered by a loss of confidence in the currency – could have severe economic consequences (Canzoneri et al. (2013) ⁽¹²¹⁾).

Gourinchas and Rey (2007) ⁽¹²²⁾ as well as Farhi and Maggiori (2017) ⁽¹²³⁾ warn that this risk of a

⁽¹¹²⁾ Goldberg and Tille (2006), *op. cit.*

⁽¹¹³⁾ See for instance Smets, F., and R. Wouters (2002), 'Openness, imperfect exchange rate pass-through and monetary policy', *Journal of Monetary Economics*, Vol. 49, No. 5, pp. 947–981.

⁽¹¹⁴⁾ See, for instance, Burlon, L., Notarpietro, A. and M. Pisani (2018), 'Exchange rate pass-through into euro area inflation. An estimated structural model', *Banca D'Italia Working Paper* No. 1192. In this article the authors use quarterly data covering the period from the first quarter of 1999 until the second quarter of 2017. The authors estimate that, every quarter, only 3.8% of exchange-rate fluctuations are passed-through into retail prices of euro-area non-oil imports from the rest of the world. All in all, the pass-through depends on several factors, such as the cost of adjusting prices, expectations as to the duration of the depreciation, and pricing behaviour of the exporter whereby exporters may set their prices in the currency of the importing country (local currency pricing) or in their own currency (producer currency pricing).

⁽¹¹⁵⁾ Cœuré, B. (2019b), 'Should the ECB care about the euro's global role?', *VoxEU*.

⁽¹¹⁶⁾ See Gourinchas and Rey (2022), *op. cit.* They estimate that such wealth transfers from the US to the rest of the world amounted to about 20% of US GDP at the height of the global financial crisis.

⁽¹¹⁷⁾ Eichengreen B. (2019), 'Two Views of the International Monetary System', *Interconomics*, Vol. 54, No. 4, pp. 233–236.

⁽¹¹⁸⁾ Engel (2020), *op. cit.*

⁽¹¹⁹⁾ For instance, the US Federal Reserve has swap lines with other central banks which allow other central banks to borrow dollars in exchange for the equivalent amount in their own currencies. See, for instance, Bordo, M. and R. McCauley (2019), 'Triffin: Dilemma or myth?', *IMF Economic Review*, Vol. 67, pp. 824–851.

⁽¹²⁰⁾ However, in the absence of a lender of last reserve counter-parties could be inclined to insure themselves by holding excessive reserves – which in turn may raise the demand for euro safe assets thereby putting downward pressure on the euro interest rate and appreciate the euro exchange rate. See, for instance, Bordo, M., Humpage, O. and A. Schwartz (2015), 'The Evolution of the Federal Reserve Swap Lines since 1962', *IMF Economic Review*, Vol. 63, No. 2.

⁽¹²¹⁾ Canzoneri et al. (2013), *op. cit.*

⁽¹²²⁾ Gourinchas, P. and H. Rey (2005), 'From World Banker to World Venture Capitalist: US External Adjustment and the Exorbitant Privilege', *NBER Working Paper* No. 11563.

sudden sell-off may intensify when there is an alternative reserve asset to which capital may flow, i.e. the new Triffin dilemma. However, Eichengreen (2011) ⁽¹²⁴⁾ emphasises that the emergence of additional strong reserve currencies may bring about diversification benefits and a stronger capacity to meet the growing demand for safe assets, which in turn will bring more stability to the international monetary system.

IV.3. Return differences

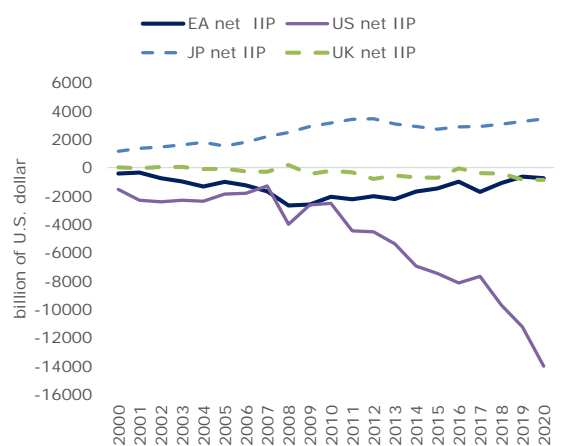
This subsection highlights some notable variation in return differences ⁽¹²⁵⁾ between the external assets and liabilities ⁽¹²⁶⁾ of the euro area, US, UK, Switzerland and Japan ⁽¹²⁷⁾. These returns are not directly observable and have to be estimated. (See Box IV.1)

Level

Graph IV.1 shows the net international investment position of a selected group of countries in US dollar ⁽¹²⁸⁾. The sharply deteriorating position of the US since the early 2010s is striking ⁽¹²⁹⁾. In discussions on sustainability in the economic

literature ⁽¹³⁰⁾, this position is often attributed to the US dollar’s strong currency status entailing a strong demand for US financial assets by the rest of the world. This means that the US receives a higher return on its external assets than it pays on its external liabilities within the same asset class (i.e. the return effect ⁽¹³¹⁾). In addition, the external supply of US liabilities with a low return, such as Treasuries, is usually transformed into claims on the rest of the world with a higher return, such as outward foreign direct investment (i.e. the composition effect ⁽¹³²⁾) ⁽¹³³⁾. See also the discussion and Graph IV.4 in the next subsection (IV.4).

Graph IV.1: Net international investment position



(1) Net international investment position measures the difference between a nation’s stock of external assets and a external liabilities

Source: IMF databases

Composition

A key feature of the balance sheet of countries issuing an international currency is that their liability side shows a higher share of liquid assets than their asset side ⁽¹³⁴⁾. Graph IV.2 illustrates this phenomenon for both the euro area and the US.

⁽¹²³⁾ Farhi, E. and M. Maggiori (2017), ‘The new Triffin Dilemma: The concerning fiscal and external trajectories of the US’, VoxEU. In this article the authors discuss the example of international monetary instability during the 1920s when investors were constantly shifting their holdings between the pound and the dollar.

⁽¹²⁴⁾ Eichengreen (2011), *op. cit.*

⁽¹²⁵⁾ Total return is equal to yield plus capital gains, as described in more detail below.

⁽¹²⁶⁾ Which include – on both sides of the balance sheet – liquid asset classes, such as equities, and non-liquid asset classes. The non-liquid assets are the asset-classes that enable a resident entity in one economy to obtain a lasting interest in an enterprise resident in another economy.

⁽¹²⁷⁾ I.e. the so-called broad definition of the ‘exorbitant privilege’ that takes into account returns across all asset classes. The narrow definition only focusses on the uncovered interest-rate parity, whereby the difference in interest rates on government bonds between two countries is equal to the change in their foreign exchange rates over the same period. Rogoff, K. and T. Takeshi (2015), *op. cit.*

⁽¹²⁸⁾ I.e. not as percentage of GDP, to get a better impression of the relative size of the countries net international investment positions in absolute terms.

⁽¹²⁹⁾ A similar pattern can be seen when looking at developments in terms of percentage of GDP. The negative net international investment position (NIIP) of the US as a percentage of its GDP weakened further by about 50 pps between 2010 and 2020 to reach about 68% of GDP in 2020. Over the same period, the euro area, which had almost the same NIIP position as a percentage of GDP as the US in 2010 improved its negative NIIP position by about 10 pps to about 6% of GDP in 2020. Over the same period, Japan improved its positive position by about 15 pps reaching 68% of GDP in 2020, while the very strong position of Switzerland decreased by 25 pps, but still came out at almost 100% of GDP in 2020.

⁽¹³⁰⁾ See for instance Gourinchas and Rey (2005) and (2020), *op.cit.*

⁽¹³¹⁾ I.e. the first right-hand side term in equation (2.A) in Box IV.1, $\sum_i w_i (R_i^A - R_i^L)$.

⁽¹³²⁾ I.e. the second right-hand side term in equation (2.A) in Box IV.1 $\sum_i (w_i^A - w_i^L) R_i$.

⁽¹³³⁾ IMF (2021), *2021 Article IV Consultation*, Staff Report, projects the NIIP to remain broadly unchanged through the medium term as the current account balance reverts to its pre-COVID average.

⁽¹³⁴⁾ The liquid external asset class covers portfolio investment, financial derivatives and other investments that includes trade credits and loans; as well as reserve assets on the asset side but not on the liability side. Non-liquid assets such as direct

Box IV.1: The excess return on assets over liabilities

This box describes how the returns on external assets and liabilities for various asset classes have been estimated ⁽¹⁾, making use of the IMF Balance of Payments and International Investment Position database.

A. Accounting identities

The total return of a particular asset or liability comprises its yield (such as its interest, dividend and FDI earnings) and capital gains (such as changes in asset prices and exchange rates) ⁽²⁾. The return (R) on external assets (A_i) and liabilities (L_i) of asset class i is computed as:

$$(1.a) R_{it}^A = \frac{A_{it} - A_{it-1} - FL_{it}^A}{A_{it-1}} + \frac{INC_{it}^A}{A_{it-1}} \quad \text{and} \quad (1.b) R_{it}^L = \frac{L_{it} - L_{it-1} - FL_{it}^L}{L_{it-1}} + \frac{INC_{it}^L}{L_{it-1}}$$

A_{it} (or L_{it}) is the stock of external assets (or liabilities) of class i at the end of year t , FL_{it}^A (or FL_{it}^L) is flows to (or from) the rest of the world during the year t , while INC_{it}^A (or INC_{it}^L) is income (including interest, dividend and FDI earnings) during the year t . The capital gain is captured by the first term on the right-hand side of the equations, while the yield is captured by the second term. The return differential per asset class is measured as $R_{it}^A - R_{it}^L$.

The total return differential of the portfolio comprising all asset classes is not only affected by differences in return on the external assets and liabilities across the asset classes (i.e. the return effect), but also by differences in the composition of assets and liabilities across these classes (i.e. the composition effect). More formally speaking:

$$(2.a) R^A - R^L = \sum_i w_i (R_i^A - R_i^L) + \sum_i (w_i^A - w_i^L) R_i$$

with the average share (w) of the asset class i in the portfolio and the average return per asset class i as:

$$(2.b) w_i = \frac{w_i^A + w_i^L}{2} \quad \text{and} \quad (2.c) R_i = \frac{R_i^A + R_i^L}{2}$$

In equation (2.a) the first term on the right-hand side refers to the excess return per asset class, while the second term refers to the difference in weight between assets and liabilities for each asset class ⁽³⁾.

B. Asset classes

A distinction is made between direct investment, portfolio investment and other investments ⁽⁴⁾. Direct investment reflects the objective of a resident entity to obtain a lasting interest in an enterprise resident in another economy. Direct-investment capital transactions cover mainly equity capital and various intercompany debt transactions for a longer period.

Portfolio investment aims primarily to receive a return and collect an appreciation in value ⁽⁵⁾. This means that portfolio investors may often shift their capital. Portfolio investment comprises equity securities and debt securities ⁽⁶⁾ which are traded (or tradable) in financial markets.

Financial derivatives other than reserves consist of cross-border transactions arising from financial contracts that are linked to underlying financial instruments, commodities, or indicators ⁽⁷⁾. No primary income accrues on financial derivatives; they involve risk transfer rather than supply of funds.

⁽¹⁾ As proposed elsewhere in the literature, such as Gourinchas, P. and H. Rey (2005), 'From World Banker to World Venture Capitalist: US External Adjustment and the Exorbitant Privilege', *NBER Working Paper* No. 11563; Habib, M. (2010), 'Excess Returns on Net Foreign Assets. The Exorbitant Privilege from a Global Perspective', *ECB Working Paper Series* No 1158.

⁽²⁾ By construction it may include data revisions, new measurement techniques and reclassifications. Gourinchas and Rey (2022), *op. cit.*

⁽³⁾ The return effect will be equal to zero if returns in the asset class are equal, while the composition effect will be equal to zero if the weights of the different asset classes are equal. See Gourinchas and Rey (2005), *op. cit.* for more details.

⁽⁴⁾ For more details see IMF (2013), *Balance of Payments Manual*, Sixth edition.

⁽⁵⁾ Excluded are the instruments included in the categories of direct investment and reserve assets.

⁽⁶⁾ Debt securities are subdivided into bonds and notes, money market instruments, and financial derivatives.

(Continued on the next page)

Box (continued)

Other investments comprise trade credits ⁽⁸⁾, loans ⁽⁹⁾, currency and deposits, and other assets and liabilities such as miscellaneous accounts receivable and payable.

Reserve assets, such as foreign exchange and monetary gold, are foreign financial assets available to the monetary authorities for financing or regulating payments imbalances.

In the following subsections, the liquid external asset class covers portfolio investment, financial derivatives, other investments (these other investments include trade credits and loans) and reserve assets on the asset side but not on the liability side.

- (7) See for instance ECB (2016), European Union Balance of Payments and International Investment Position statistical sources and methods
- (8) Trade credits consist of claims and liabilities arising from the direct extension of credit by suppliers and buyers for transactions in goods and services and advance payments for work in progress (or to be undertaken) that is associated with such transactions.
- (9) Loans comprise those financial assets created through the direct lending of funds by a creditor (lender) to a debtor (borrower) through an arrangement in which the lender either receives no security evidencing the transaction or receives a non-negotiable document or instrument. It includes the use of IMF credit and loans from the IMF.

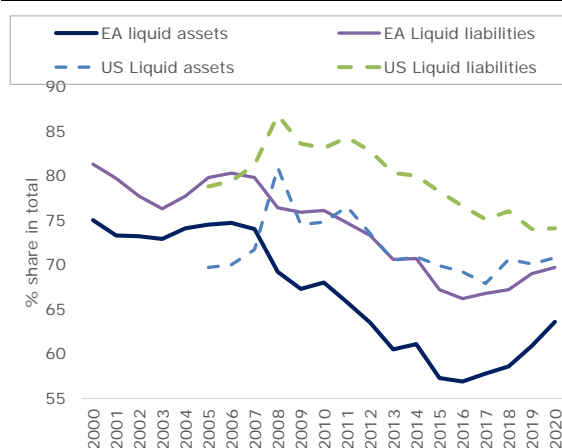
As expected, for both currency areas the share of liquid liabilities is larger than the share of liquid assets. However, the shares of external liquid assets and liabilities of the US have been persistently higher than in the euro area. While the share of liquid assets and liabilities has been rising somewhat in recent years in the euro area, it has been falling in the US.

Yields and capital gains

The upper pane of Graph IV.3 shows yield differences between external total assets and liabilities. While the US and Japan show a persistent positive differential, in Japan this differential followed a more stable pattern. The yield differential was less strong for the euro area and the UK, even turning negative in the early 2000s and at the height of the global financial crisis. For Switzerland, the yield differential shows a notable fall at the start of the global financial crisis.

The lower pane of Graph IV.3 shows the differences in capital gains in external assets and liabilities. One of the most notable aspects of this lower pane is the strong capital gains in the run-up to the global financial crisis in the US and the sharp capital losses in 2008. These capital gains reflect a variety of changes, including the change in exchange rates and stock-market prices.

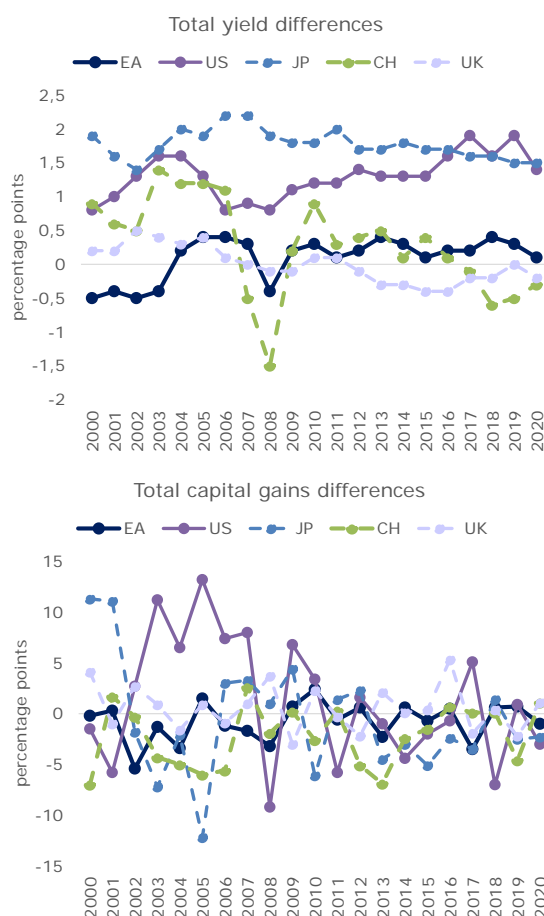
Graph IV.2: Share of liquid assets and liabilities in total assets and liabilities



(1) Liquid assets/liquid liabilities cover portfolio investment (equity and debt), other investment, financial derivatives and reserves. See part 2 of Box IV.2 for more details

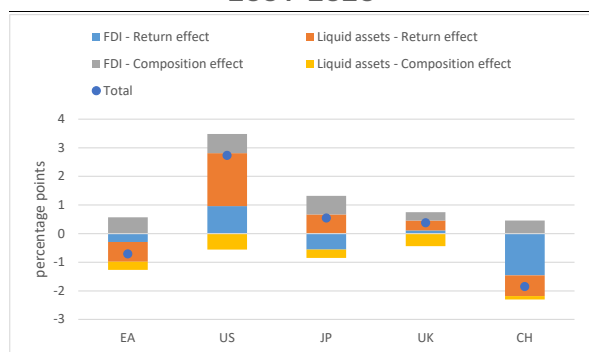
Source: Authors' calculations based on IMF data.

Graph IV.3: Return differences between total assets and total liabilities
(scales differ)



(1) See Box IV.2 for methodology.
Source: Authors' calculations based on IMF data.

Graph IV.4: Breakdown return differential 2001-2020



(1) See Box IV.2 for technical details.
Source: Authors' estimates.

Breakdown into return effect and composition effect

Making a distinction between liquid and illiquid assets for the 2001-2020 period, Graph IV.4 shows

a breakdown of the total return differential into a return effect and a composition effect for a selected group of countries (see Box IV.1).

The return on illiquid foreign direct investment (FDI) (blue bar) shows that the net contribution of the difference between outward and inward FDI is only notably positive in the US. The FDI composition effect (grey bar) shows that the difference in the share of outward and inward FDI made a positive contribution on average to return differences in all countries.

The difference between the returns on liquid assets and liabilities (orange bar) was by far the strongest and most positive in the US⁽¹³⁵⁾, followed by the UK and Japan. However, this difference was negative in the euro area and Switzerland. The difference in the composition of the liquid assets (yellow bar) was negative in all areas, indicating a stronger share of liquid assets on the liability side than on the asset side.

All in all, this breakdown suggests that the euro area recorded a rather weak performance in terms of its returns on liquid assets between 2001 and 2020.

IV.4. Substitutability between liquid assets

This subsection investigates – for the euro area, the US, Switzerland and the UK⁽¹³⁶⁾ – how their share in the global demand for international liquid assets⁽¹³⁷⁾ was affected during times of severe global stress over the period from the first quarter of 2006 until the fourth quarter of 2020⁽¹³⁸⁾ ⁽¹³⁹⁾.

In normal times, a diversified portfolio of international liquid assets is used to facilitate international trade and finance or to store wealth. However, in times of severe global stress, the holding of international liquid assets is expected to shift sharply towards the asset with the strongest international-currency status (typically the US).

⁽¹³⁵⁾ This graph shows net outcomes. However, compared with – for instance – the euro area, the external liquid liabilities of the US provided on average a lower return than those of the euro area (with the notable exception of returns in 2008). At the same time, US external liquid assets provided on average a higher return than the euro area external liquid assets.

⁽¹³⁶⁾ For Japan the quarterly data series is too limited.

⁽¹³⁷⁾ I.e. liquid liabilities from the perspective of the issuing countries.

⁽¹³⁸⁾ I.e. the available sample size.

⁽¹³⁹⁾ In other words, it does not examine the factors affecting global demand for liquid assets as a whole, only the distribution of this demand.

Box IV.2: The allocation of external liquid liabilities

This box examines whether there has been a significant shift towards the liquid assets issued by the US in recent times of global stress. For this purpose, a vector error correction mechanism is estimated for the demand for external liquid liabilities ⁽¹⁾ issued by the euro area, the US, the UK and Switzerland – making use of quarterly data ⁽²⁾.

Specification

The representative economic agent who wants to hold liquid assets faces a multi-stage decision process. First, they have to decide the total amount of liquid assets they want to hold. Next, they have to decide how to allocate this amount over the various liquid assets available. This box focuses on the latter decision and assumes that rigidities prevent an immediate adjustment of the portfolio and that short-term dynamics follow a vector error-correction scheme, i.e.

$$(1) \Delta S_{it} = \alpha_i + \rho_i SCALE_t + \sum_{j=1}^n \beta_{ij} \Delta R_{jt} + \sum_{k=1}^m \gamma_{ik} \Delta X_{kt} + \sum_{l=1}^n \theta_{il} ECT_{it-1} + u_{it}$$

whereby S_i is the share of asset i in the portfolio, $SCALE_t$ is the total demand for assets, R_{jt} is the return on asset j , X_k are other relevant macro-economic variables, ECT is the error correction term and u_i is a stochastic component. The subscript i indicates the country, while the subscript t indicates the quarter.

In other words, equation (1) regresses for the euro area, the US, the UK and Switzerland the change in their share in total liquid assets (S) ⁽³⁾ upon a set of common explanatory variables that include: (i) the change in total demand for liquid assets (SCALE); (ii) the returns on these assets (R); (iii) some other macroeconomic variables (X) discussed in more detail in the data section below; and (iv) lagged error-correction terms (ECT).

The parameters satisfy the adding-up conditions ⁽⁴⁾, i.e.

$$(2) \sum_{i=1}^n \alpha_i = 0, \sum_{i=1}^n \beta_{ij} = 0, \sum_{i=1}^n \gamma_{ik} = 0 \text{ and } \sum_{i=1}^n \theta_{il} = 0,$$

while the variables meet the adding-up conditions, i.e.

$$(3) \sum_{i=1}^n S_i = 1, \sum_{i=1}^n \Delta S_i = 0, \sum_{i=1}^n u_{it} = 0 \text{ and } \sum_{l=1}^n ECT_{it} = 0. \text{ (5)}$$

Data

The data are retrieved from the IMF Balance of Payments and International Investment Position database, and the IMF World Economic Outlook. Liquid assets held by the representative agent cover, on the debit side of the issuing country, equity and debt, as well as financial derivatives and other investments as described in Box IV.1. The return (R) on the asset issued by country i is computed as described in Box IV.1 ⁽⁶⁾.

Additional explanatory variables, obtained from the IMF World Economic Outlook (WEO) database, are the state of overall economic activity (measured by the G7 output gap ⁽⁷⁾), world inflation (measured as a percentage of world-wide average consumer prices) and world trade volume ⁽⁸⁾. Stress in financial markets is

⁽¹⁾ I.e. liquid 'assets' from the perspective of the non-residents who hold them.

⁽²⁾ Japan not included because its quarterly data series are too limited.

⁽³⁾ Total liquid assets is the sum of the external liquid assets of the euro area, the US., the UK and Switzerland – which is a nominal variable measured in dollars.

⁽⁴⁾ In the economic literature the adding-up conditions implies that the economic agent allocates his/her whole budget over the available goods and services.

⁽⁵⁾ The latter condition implies perfect multicollinearity if all ECT terms are included in the regression equation. This requires then the additional restriction that $\sum_{k=1}^n \theta_{ik} = 0$

⁽⁶⁾ These are ex post total returns; and not the ex ante expected returns that cannot be observed. Assuming rational expectations, one could argue that the ex post returns are equal to: (i) the ex ante returns; plus (ii) returns created by new developments (with 'new developments' being a random variable). To remove this random variable in the subsequent regression analysis, the fitted values, obtained after regressing the observed returns on lagged returns, have been used as explanatory variables.

⁽⁷⁾ The G7 is the largest entity for which an output gap is available in the WEO database.

⁽⁸⁾ These data with annual frequency have been interpolated to quarterly frequency.

(Continued on the next page)

Box (continued)

measured by the VIX index. The SCALE variables is the sum of liquid assets issued by the euro area, the US, the UK and Switzerland divided by world nominal GDP (IMF WEO database). The error-correction terms are estimated by regressing the share levels on the levels of the explanatory variables. The sample covers the period ranging from the first quarter of 2006 up to the fourth quarter of 2020.

Estimation results and hypothesis testing

Table 1 summarises the estimation results of the short-term dynamics. The first four columns show point estimates and their level of significance for the factors affecting the change in the share of liquid assets for each of the four countries. The last four columns elaborate further on the sensitivity of the share of the euro area to global inflation (as discussed below.) While the main text provides more discussion of these results, the following technical issues may be worth taking into account when interpreting the point estimates.

Firstly, the point estimates have to add up to zero across the equations for each variable ⁽⁹⁾, even though they have been estimated separately with ordinary least squares ⁽¹⁰⁾. The point estimates of the total-return variables add up to zero in each equation, indicating that it is relative returns (and not absolute returns) that matter for the allocation between the different assets. Secondly, the error-correction terms of each country share appears in each equation. The point estimates of the lagged own-error-correction term (with an expected value between 0 and -1) measures how much of the disequilibrium in the previous quarter is carried over to the present quarter ⁽¹¹⁾. In an allocation system, past disequilibria in a specific component will also spill over to the other components of the allocation system, hence their inclusion in the other equations. This point estimate is expected to be between -1 and +1.

Looking at the point estimates in Table 1, it can be concluded that: (i) the null-hypothesis that the point estimates of the output gap and the VIX indicator (i.e. the proxies for global stress) are equal to zero can be rejected at a fairly high confidence level (i.e. first panel of Table 1); and that (ii) the level and significance of the short-run sensitivity of the share of the euro area to inflation is fairly robust to the choice of other explanatory variables such as the output gap, international trade and the VIX indicator (i.e. second panel of Table 1).

Table 1: Changes in the share of external liquid assets and its drivers

Dependent variable: change in share of external liquid liabilities	All countries				EA inflation sensitivity conditional on deleted variables			
	EA	US	UK	CH	Base model	Output gap	Trade	VIX
Scale	-0.00	-0.02	0.05 ***	-0.03 ***	-0.00	-0.00	-0.00	-0.02
EA total return	0.07 ***	-0.04 **	-0.02	-0.02 ***	0.07 ***	0.07 ***	0.07 ***	0.10 ***
US total return	-0.04 **	0.09 ***	-0.05 ***	0.00	-0.04 **	-0.04 **	-0.04 *	-0.07 ***
UK total return	-0.03 **	-0.05 ***	0.07 ***	0.01	-0.03 **	-0.03 **	-0.03 **	-0.04 **
CH total return	0.00	-0.01	-0.01	0.01 ***	0.00	0.00	0.00	0.01
Output gap G7 economies	-0.00	-0.07 ***	0.08 ***	-0.00	-0.00	0.00	0.01	-0.02
World trade growth	-0.02	0.00	0.01	-0.00	-0.02	-0.02		-0.02
VIX (first differences)	-0.05 ***	0.03 ***	0.02 *	-0.00	-0.05 ***	-0.05 ***	-0.05 ***	
World inflation (first differences)	0.41 **	-0.23	-0.19	0.01	0.41 **	0.41 **	0.29 *	0.46 **
EA_ECT (-1)	-0.29 **	0.03	0.23 **	0.03	-0.29 **	-0.29 **	-0.28 **	-0.30 **
US_ECT (-1)	0.00	-0.15	0.07	0.07 ***	0.00	0.01	0.03	0.00
UK_ECT (-1)	0.08	-0.04	-0.11	0.07 **	0.08	0.08	0.06	0.09
CH_ECT (-1)	0.20	0.16	-0.19	-0.17 **	0.20	0.20	0.19	0.21
Adjusted R-squared	0.63	0.59	0.62	0.65	0.63	0.64	0.62	0.50
Durbin Watson	1.58	2.02	1.70	1.93	1.58	1.58	1.60	1.38
Total number of observations	59	59	59	59	59	59	59	59
Total number of explanatory variables	11	11	11	11	11	10	10	10

Note: Sample 2006Q3-2020Q4; estimated with OLS with adding-up and homogeneity constraints;
 Note: Point estimates with their significance level: * for p<0.05 and ** for p<0.01.

⁽⁹⁾ See for instance Theil, H. (1971), Principles of Econometrics, John Wiley and Sons, Inc.

⁽¹⁰⁾ The values of the point estimates should not be affected if they would have been estimated as a system that takes explicitly into account that the stochastic components are correlated across equations, as in the case of – for instance – the SURE (seemingly unrelated regression equations) estimator. In that case, the standard errors and t-values are affected. However, for the exercise in this box, no qualitative changes in terms of significance level (i.e. number of * in Table 1) are made applying the SURE estimator. Here, it should also be noted that the covariance matrix of the stochastic components is singular because these elements meet the adding-up constraint. This implies then, that one equation of the system has to be deleted when estimating the equations as a system, but the estimation results should not depend on the equation deleted if properly specified.

⁽¹¹⁾ The higher this value (in absolute terms) the faster any past disequilibrium will be absorbed.

To assess demand for liquid assets, each currency’s share in total demand for international liquid assets is regressed on a set of common macroeconomic indicators. These indicators refer to: (i) total demand for international liquid assets; (ii) the returns on the various international liquid assets; (iii) international trade growth; (iv) the output gap of the G7 countries (as a proxy for overall pressures in the real economy); and (v) the VIX indicator (as a proxy for tensions in financial markets). The overall specification is a vector error-correction mechanism with lagged own-error and cross-error correction terms reflecting that a disequilibrium in the demand for liquid assets of one country or currency area trickles down to the demand for liquid assets of the other countries or currency areas (See Box IV.2 for more details).

Econometric results

The econometric results presented in Box IV.2 suggest that, whenever there has been a global economic cyclical downturn (measured by the IMF’s output gap of the G7 economies) and rising stress in financial markets (measured by the VIX indicator), there has been a significant shift towards liquid assets issued by the US ⁽¹⁴⁰⁾.

The other point estimates also provide interesting insights. Firstly, the point estimates of the own return have the expected positive sign and are significant for the four assets in the sample. In addition, euro-area assets as a share of total liquid assets is also significantly affected by changes in US and UK returns (with increases in these returns inducing a drop in the share of the euro area), while the share of the US is also significantly affected by the return on assets of the euro area and the UK. UK liquid assets as a share of total liquid assets is mainly sensitive to changes to its own and to US returns, while the share of Swiss assets is significantly affected by its own return and the return on euro-area liquid assets.

Secondly, higher worldwide inflation induces a significant increase in the share of liquid assets issued by the euro area. The stability of this point estimate for the euro area has been tested by re-estimating the equation after deleting other explanatory variables, suggesting that this point

⁽¹⁴⁰⁾ I.e. the point estimates of the output gap and the VIX indicator are negative and positive respectively, suggesting that a negative output gap and a rise in the VIX indicator induce an increase in the share of liquid assets issued by the US.

estimate is fairly stable (See the right-hand pane in Table 1 in Box IV.2).

Thirdly, changes in global trade do not seem to have a significant impact on the geographical allocation of liquid assets. Finally, in the absence of other disturbances, the share of liquid assets tend to be reallocated towards UK liquid assets when the total demand for liquid assets ⁽¹⁴¹⁾ increases ⁽¹⁴²⁾.

Two episodes of global stress: illustrative simulations

Graph IV.5 provides a breakdown of how liquid assets were reallocated at the height of the global financial crisis and the COVID-19 crisis; making use of the point estimates in Table 1 of Box IV.2.

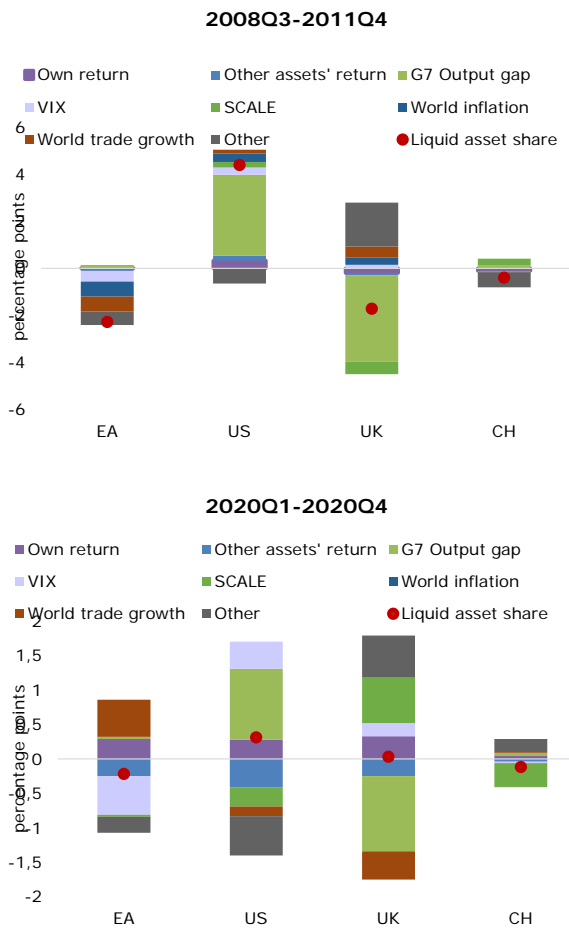
Between the fourth quarter of 2008 and the fourth quarter of 2011 (i.e. the top panel of Graph 5), the US share of liquid assets increased notably (up by 4.4 pps), while the share of external liquid assets issued by the euro area, Japan and Switzerland fell (down by 2.3 pps for the euro area). The overall global downturn in economic activity (measured by the output gap of the G7 countries) induced a notable rise in the share of US liquid assets (3.4 pps), mainly compensated for by a decrease in the share of UK liquid assets (down 3.7 pps). Rising stress in financial markets led to a rise in the share of US liquid assets (by 0.3 pps) and to a lesser extent in the share of UK assets (0.1 pps), mainly compensated by a decrease in the share of euro-area assets (0.5 pps). The global deflationary pressures generated an additional fall in the share of euro-area assets (0.6 pps.) The changes in relative returns had only a minor impact ⁽¹⁴³⁾.

⁽¹⁴¹⁾ As measured by the scale variable in equation (1) of Box IV.2 that measures the total external liquid assets. The scale variable is assumed to be predetermined in this analysis.

⁽¹⁴²⁾ As a corollary to this, the share of liquid assets tends to be reallocated away from UK liquid assets when the total demand for liquid assets decreases. Similarly, in consumption theory, when income increases ‘luxury’ goods experience increases greater than income. And when income decreases, ‘luxury’ good experience decreases by more than income.

⁽¹⁴³⁾ Interpreting the data in Graph IV.5, note that in equation (1) in Box IV.1 the return part $\sum_{j=1}^n \beta_{ij} \Delta R_{jt}$ can be re-written for currency i as $\beta_{ii} \Delta R_{it} + \sum_{j=1, j \neq i}^n \beta_{ij} \Delta R_{jt}$, where the first term is labelled “own return” and second term “other assets’ return”.

Graph IV.5: The liquid asset shares and their drivers: a breakdown of change



(1) Variables measured in quarter-on-quarter growth rates; simulations based on point estimates in Table A of Box IV.2.
 (2) Other assets' return: return on all assets except the return on the asset issued by the country; VIX: measure of stress in the stock market; SCALE: sum of liquid assets issued by the euro area, the United States, the United Kingdom and Switzerland divided by world nominal GDP. For more details see Box IV.2.
Source: Authors' estimates.

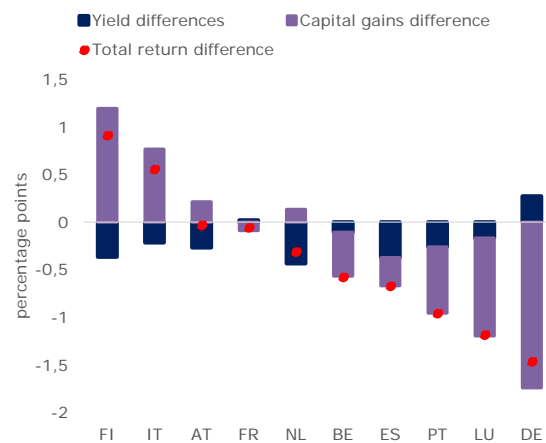
A similar pattern can be found for the period from the first to the fourth quarter of 2020 (i.e. bottom panel of Graph IV.5) (albeit with a lower intensity with the US share of liquid assets rising by 0.3 pps). Again, the overall slowdown in economic activity induced a 1 pp. increase in demand for liquid assets issued by the US, while rising stress in financial markets induced a 0,4 pp increase in the demand for US liquid assets. Changes in returns of these assets had only a limited impact on demand. On balance, the declines in the share of liquid assets issued by the other currency areas during this period remained fairly subdued (down by 0.2 pps for the euro area).

IV.5. Heterogeneity across euro-area Member States: some illustrative evidence

While it would be beyond the scope of this section to provide a full assessment of differences in the capacity of euro-area Member States to issue external liabilities with a strong currency status, the available evidence seems to suggest some notable differences between the Member States.

For instance, Graph IV.6 shows the average return differences on liquid assets for the Member States that were members of the euro area in 1999 (except Ireland) for the period from 2006 to 2020.

Graph IV.6: Return differences – euro area 2006-2020 average



(1) Euro-area Member States since 1999 (except IE).
 (2) For each of the Member States intra-euro area claims are included.
Source: Authors' estimates

Germany is the only country that recorded, on average, a positive yield difference on its external liquid assets in this period. However, it is also the country recording the strongest negative difference in capital gains, indicating that non-residents earned a much stronger capital gain on their German liquid assets than German residents earned on their foreign liquid assets. This loss was especially strong at the start of the global financial crisis (2008), during the euro crisis (2010-2011) and the early stage of the COVID-19 pandemic (2020) ⁽¹⁴⁴⁾.

⁽¹⁴⁴⁾ This finding is in line with the hypothesis discussed in subsection IV.2 that a reserve country may experience a strong wealth transfers to the rest of the world in times of severe stress. See also Gourinchas and Rey (2022), *op. cit.*

All in all, these large differences in return reflect strong cross-country differences in the structural characteristics that underpin a country's international-currency status⁽¹⁴⁵⁾, and some country-specific developments. In this respect, one could test hypotheses related to the impact of specific developments such as for instance the decline of prominent companies in the mobile device industry in Finland, elevated Target2 balances of Germany⁽¹⁴⁶⁾, or some attractive features of the tax system in Luxembourg and the Netherlands. However, testing these hypotheses would be beyond the scope of this section.

IV.6. Conclusions

A strong international currency status can provide the issuing country with significant benefits. However, this section presented some evidence which indicates that the euro area is not yet fully making the most of its potential as an international currency. More particularly, the findings suggest that: (i) the excess return that can be attributed to a strong international-currency status has been moderate for the euro in the last two decades; (ii) in times of global stress, it is mainly liquid assets supplied by the U.S. that increased their share in total liquid assets, and (iii) there is still a significant

divergence in the capacity of Member States to supply assets with a strong international-currency status, partly reflecting differences in Member States' structural characteristics as well as country-specific features.

Strengthening the euro's international-currency status and spreading the benefits and costs of a strong international-currency status in a balanced way across the euro area will require further reforms at national and euro-area level.

More particularly, this task calls for the completion of the architecture of the Economic and Monetary Union, and a full convergence towards resilient economic structures across the euro area Member States.

In addition, these reforms will also have to recognise that a stronger international role for the euro will: (i) affect some specific transmission channels that have a direct impact on the euro area's capacity to withstand shocks such as an appreciation of the euro and (ii) lead to calls for the euro area to act as international lender of last resort in times of global stress.

⁽¹⁴⁵⁾ Several economic factors affect the strength of a currency's international status, including: (i) the issuing country's economic size and openness to trade; (ii) the depth and liquidity of the issuing country's financial markets; (iii) whether the issuing country has low and stable inflation; (iv) fiscal and external debt sustainability of the issuing country; and (v) habit persistence among investors. See, for instance, Chinn, M. and Frankel, J. (2008), 'Why the euro will rival the dollar', *International Finance*, Vol. 11, No. 1, pp. 49-73; Eichengreen, B., Mehl, A. and Chițu, L. (2017), *How Global Currencies Work: Past, Present and Future*, Princeton University Press.

⁽¹⁴⁶⁾ Target2 balances are part of an euro area Member State net foreign asset position, booked under "other investments". They may provide a low return.

Annex. – The euro area chronicle

The European Commission, the Ecofin Council and the Eurogroup regularly take decisions that have a bearing on the functioning of the Economic and Monetary Union (EMU). In order to keep track of the most relevant decisions, the QREA features a chronicle of major legal and institutional developments, presented in a chronological order and containing appropriate references. This issue of the chronicle covers developments between early December 2021 and the end of February 2022. In December, the Ministers of Finance of the euro area Member States concluded that Greece met the conditions necessary for the implementation of further policy-contingent debt measures, and the Commission proposed new own resources for the EU budget. Starting from the end of 2021, first funds have been disbursed to Member States under the Recovery and Resilience Facility ⁽¹²³⁾.

Agreement on policy-contingent debt measures for Greece. On 6 December, the Eurogroup welcomed the assessment by the European institutions that Greece met the conditions necessary for the release of the sixth tranche of policy-contingent debt measures, worth EUR 767 million ⁽¹²⁴⁾. The Eurogroup welcomed the further policy reforms implemented in the challenging circumstances of the Covid-19 pandemic and the catastrophic fires in August 2021, in particular, the fulfilment of the specific commitment in the area of public financial management and the adoption of anti-trust remedies in the energy sector. Furthermore, Greece has achieved good progress in the simplification of investment licensing, privatisation and governance of state-owned enterprises, social welfare and public administration. The Eurogroup encouraged the Greek authorities to continue and advance their efforts with regard to financial sector reform and clearance of arrears, while noting delays in the areas of justice and health. Since August 2018, after Greece successfully completed its European Stability Mechanism (ESM) programme, it has been monitored under the enhanced surveillance framework. The quarterly reporting provides a comprehensive framework for monitoring economic developments and the pursuit of policies needed to ensure a sustainable economic recovery. Should the European Commission decide to end the enhanced surveillance, Greece would transit to bi-annual post-programme surveillance, coming on top of surveillance under the European Semester.

Proposal of new own resources for the EU budget. On 22 December, the European Commission proposed three new sources of revenue for the EU budget. The first own resource would be based on revenues from the EU Emissions Trading (ETS), in the context of its revision under the Fit-for-55 proposals. The second would draw on the resources generated by the proposed EU carbon border adjustment mechanism. The third would be based on the share of residual profits from very large and profitable multinationals that would be re-allocated to EU Member States under the recent OECD/G20 agreement on a re-allocation of taxing rights. In the years 2026-2030, these new sources of revenue would generate on average a total of up to EUR 17 billion annually for the EU budget. The new own resources would help to repay the funds raised by the EU to finance the grant component of NextGenerationEU, including the Recovery and Resilience Facility (RRF). The RRF is a temporary recovery instrument that allows the Commission to issue debt on behalf of the Union to help Member States implement reforms and investments. Although it is an EU instrument, the RRF is expected to improve the functioning of the euro area as it fosters economic convergence by design. The European Commission is now working with the European Parliament and the Council, where unanimity is needed, towards a swift implementation of the package.

First recovery fund disbursements to Spain, France, Greece and Italy. Until 17 January 2022, 18 Member States have received pre-financing of their recovery and resilience plans under the RRF (13% of the amounts requested) for a total of EUR 54.2 billion. To fund the plans, the European Commission borrowed EUR 71 billion through long-term instruments and EUR 28 billion through short-term

⁽¹²³⁾ Annex compiled by Jakub Wtorek. The cut-off date for this annex is 25 March 2022.

⁽¹²⁴⁾ See Eurogroup statement on Greece of 6 December 2021: <https://www.consilium.europa.eu/en/press/press-releases/2021/12/06/eurogroup-statement-on-greece-of-6-december-2021/>

instruments on the financial markets. On 11 November 2021, Spain submitted to the Commission a payment request for the first instalment under its recovery and resilience plan based on the achievement of the 52 milestones. The milestones cover reforms in the areas of sustainable mobility, energy efficiency, decarbonisation, connectivity, public administration, skills, education and social, research and development, labour and fiscal policy, as well as Spain's audit and control system for the implementation of the RRF. On 3 December 2021, the European Commission adopted a positive preliminary assessment of Spain's request ⁽¹²⁵⁾. Following the discussion between the Member States, including in the Economic and Financial Committee, the Commission transferred EUR 10 billion before the end of 2021. A similar process was followed after France submitted its request on 26 November 2021. Based on progress in the area of public finance, mobility, housing, unemployment insurance, skills and health, EUR 7.4 billion was paid to France ⁽¹²⁶⁾. At the end of 2021, payments request of Greece and Italy were received for assessment. The Greek request for EUR 3.6 billion (of which EUR 1.7 billion of grants and EUR 1.9 billion of loans) covers reforms and investments in the areas of energy efficiency, electric mobility, waste management, labour market, taxation, business environment, healthcare, or public transport ⁽¹²⁷⁾. The Italian request for EUR 21 billion (of which EUR 10 billion of grants and EUR 11 billion of loans) covers reforms in the areas of public administration, public procurement, justice, the spending review framework, tertiary education, or active labour market, and also investments in the field of digitalisation of businesses, energy efficiency and renovation of residential buildings ⁽¹²⁸⁾.

IMF report on euro area policies. On 7 February, the IMF published its Article IV report following the 2021 consultations with the euro area authorities ⁽¹²⁹⁾. The report finds that during the pandemic, economic policies in the euro area have forcefully supported household incomes and protected corporate balance sheets. The challenge now is to coordinate the normalisation of economic policy in the face of elevated uncertainty. Once the expansion is firmly underway, highly indebted countries in particular will need to reduce their debts. Under the baseline, medium-term inflation dynamics are expected to remain weak, but upside inflation risks have clearly increased. Some euro area countries could tighten their macroprudential stance given stretched asset valuations, especially in real estate markets. The labour market recovered rapidly but unevenly across sectors. Structural reforms and investment envisioned in the Next Generation European Union package are crucial to enhance resilience, support the green and digital transitions, and boost potential growth.

Fiscal guidance for euro area Member States. On 2 March, the European Commission adopted a communication providing EU Member States with guidance on the conduct of fiscal policy in 2023 ⁽¹³⁰⁾. It sets out the key principles that will guide the Commission's assessment of Member States' stability and convergence programmes. The principles include the need to ensure policy coordination and debt sustainability, fostering investment, making fiscal strategies differentiated between countries and consistent with a medium-term approach, while taking into account the euro area dimension. The communication also draws implications for fiscal recommendations, which the Commission will propose to Member States in May 2022 for their budgetary plans in 2023. Finally, the communication provides an overview of the state of play on the economic governance review.

⁽¹²⁵⁾ https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6597

⁽¹²⁶⁾ https://ec.europa.eu/commission/presscorner/detail/en/ip_22_576

⁽¹²⁷⁾ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1354

⁽¹²⁸⁾ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1356

⁽¹²⁹⁾ <https://www.imf.org/en/News/Articles/2022/02/07/cf-euro-area-is-recovering-strongly-but-challenges-lie-ahead>

⁽¹³⁰⁾ European Commission, "Fiscal policy guidance for 2023", COM(2022)85 final. https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/stability-and-growth-pact/fiscal-policy-guidance-2023_en

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