

# Inflation in the Euro area

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**Abstract** At present, the concept of inflation is often mentioned in connection with the COVID-19 pandemic, especially its growth. Inflation is defined and corrected by the monetary policy managed by the European Central Bank. It represents a general increase in the prices of goods and services, not just individual prices. In this paper, we mention important studies that deal with inflation, inflation developments and the relationship between inflation and other macroeconomic variables. We focus on the evolution of the inflation rate, as measured by the HICP index in 19 euro area countries. We compare the development in individual countries with the development in the euro area as a whole. We focus on the development of inflation in the period from 1997 to 2020. We look at inflation rate forecasts for 2021, 2022, 2023 and 2024. We compare these inflation rate forecasts with our forecasts.

**Key words** Inflation, euro area, prediction of inflation, HICP

## 1. INTRODUCTION AND LITERATURE REVIEW

Inflation is a term that has been common in euro area countries in recent years. In a market economy, the prices of goods and services can change at any time. In a market economy, the term inflation refers to a general rise in the prices of goods and services, not just a rise in the prices of individual items. The consequence of inflation is a reduction in the purchasing power of money. In practice, inflation is a manifestation of economic imbalances. In the euro area, consumer price inflation is measured by the harmonized index of consumer prices (HICP). All euro area countries use the same methodology to calculate this index, so that data for individual countries can be compared with each other. The role of the European Central Bank is to maintain price stability - to keep inflation below but close to 2% over the medium term. All goods and services consumed by households are taken into account when measuring inflation. These are current consumption goods, durable goods and services (ECB, 2021a).

Several economists have been intensively examining inflation. In their research, Gerlach and Svensson (2003) focused on the role that the ECB should give to broad money in conducting monetary policy. In the research, they used data on prices, production, money and interest rates for the period 1980-2001 in euro area countries. The research was motivated by the Eurosystem's adoption of a monetary policy framework that emphasizes the role of monetary aggregates. The Eurosystem has indicated that the main variable in policy-making is broad money growth, denominated in the M3

monetary aggregate. Therefore, monetary aggregates are examined as indicators of future inflation. The results of the model they applied in their research showed that the output gap indicates future inflation developments. When assessing price pressures, it is appropriate to take into account the real money supply gap and the output gap. Barro (1996) draws attention to the causal relationship between inflation and economic growth. Inflation is an endogenous variable. An inverse relationship between growth and inflation would arise if an exogenous slowdown in growth tended to generate higher inflation. This would happen if the monetary authorities responded to the economic slowdown with expansionary policies.

Inflation is one of the most important macroeconomic variables, as it governs monetary policy. In the field of econometrics, intensive research has focused on forecasting methods. In his study, Marcellino (2004) evaluates the performance of one-dimensional methods. In the study, he found that simple autoregressive models work well, but some data series need to use nonlinear methods. Marcellino, Stock and Watson (2003) used factor models to predict industrial production, inflation and unemployment for the euro area as a whole and its member countries, finding benefits in particular for nominal variables. The aim of the Benerjee, Massimiliano and Masten (2005) research is to conduct a detailed assessment of a large set of key indicators of inflation and GDP growth in the euro area, as well as using US macroeconomic variable data. Studies suggest that there may be interconnections between the US and the euro area, with euro area GDP growth dependent on US GDP growth and the ECB's decisions partly following the FED's policy. The authors presented a thorough analysis of the main indicators of inflation and GDP growth for euro area countries. Comparison of indicator prediction models was performed with respect to the autoregressive model, ex post and in the context of pseudo-real time. The loss function is important in the context of policy making.

In their study, Roncaglia de Carvalho, Ribeiro and Marques (2018) studied the relationship between the level of inflation and economic development, finding their statistically significant inverse correlation. They used a panel analysis for 65 countries between 2001 and 2011. The analysis revealed that the level of inflation is influenced by factors related to the countries' development. The theoretical model has shown that the persistence of inflation and the degree of openness to trade are positively related to inflation, while the increased level of economic prosperity (per capita income), the share of high-tech exports and rising unemployment correspond to lower inflation. Bhatia (1960) also studied inflation and economic development.

Hung (2003), Rousseau and Yilmazkuday (2009) focused on inflation, financial development and economic growth. Research by Rousseau and Yilmazkuday (2009) has shown that inflation directly and indirectly hampers economic growth through its impact on financial sector developments. The direct effects are caused by situations where inflation is high. If inflation is moderate, these effects will largely disappear. The indirect effects of inflation through its impact on financial depth are strongest when inflation is moderate. The authors also found a strong impact of the depth of the financial sector on economic growth, which is largely unaffected by the presence of inflation.

Another author on the relationship between inflation and economic growth is Wai (1959). He examined this relationship on the example of less developed countries.

The aim of the article is to point out the development of inflation in individual euro area countries and the euro area as a whole, while showing the development of HICP - annual rate of change in the period 1997 to 2020. We show the development of HICP in 2021 in monthly intervals and we look at the forecast of inflation from 2021 to 2024, which we compare with our ex post forecast.

## 2. DEVELOPMENT OF INFLATION IN EURO AREA

In this part of our article, we will look at inflation developments in individual euro area countries between 1997 and 2020 at annual intervals. We will show the development of inflation in 2021 on the basis of data at monthly intervals. The euro area includes the following countries: Belgium, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia, Finland. To show the development of inflation in these countries, we used the data of the Harmonized Index of Consumer Prices as an annual percentage change. We obtained the used data from the Eurostat database.

The COICOP / HICP classification of individual consumption by purpose is used to compile the harmonized index of consumer prices (HICP) of the European Union and the euro area. It is a United Nations classification. The table below lists the 12 categories of the COICOP classification.

Table 1 Individual consumption expenditure of households (COICOP/HICP Classification)

1.	Food and non-alcoholic beverages
2.	Alcoholic beverages, tobacco
3.	Clothing and footwear
4.	Housing, water, electricity, gas and other fuels
5.	Furnishings, household equipment and routine maintenance of the house
6.	Health
7.	Transport
8.	Communication
9.	Recreation and culture
10.	Education
11.	Restaurants and hotels
12.	Miscellaneous goods and services

Source: own research according to Eurostat, 2021a

In the following chart (Figure 1) we can see the development of the HICP index in the year-on-year percentage change in the euro area countries, while the red curve shows the development of inflation for the euro area (19 countries) as a whole.

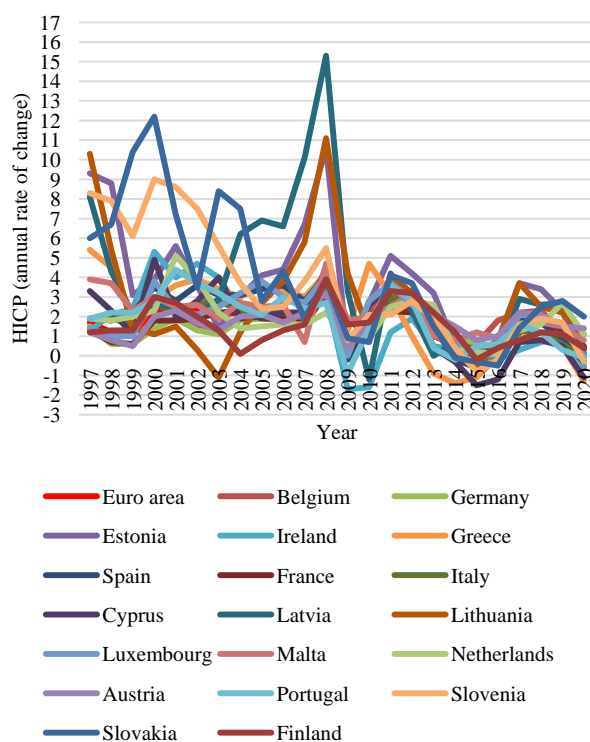


Figure 1 Development of inflation in euro area 1997-2020 (HICP, annual rate of change)

Source: own research according to data from Eurostat, 2021b

The inflation chart in the euro area countries shown above shows the economic shocks that have been recorded. Between 1997 and 1998, it was an Asian crisis that was more or less local. In 2008, we can observe an increase in inflation. This is the year of the beginning of the economic financial crisis, which broke out in the USA and affected economic events in the euro area countries as well. Subsequently, inflation fell in the euro area countries in 2009. In the following years, the economy recovered, which was outweighed by the growth of inflation in 2010 to 2011. Subsequently, economic growth accelerated. In 2014, inflation in the euro area countries fell to the level of deflation (Worke, 2009). According to Morvay et al. (2015), the following can be identified as important determinants of such a development:

- Collapse of the price of oil - at the beginning of 2014 the price of oil was at the level of 106 USD / barrel, at the end of the year only 52 USD / barrel. This was partly reflected in fuel prices.
- Decline in prices of regulated industries - the stagnation of the price level was supported by a decline in prices of regulated industries.
- Decline in food prices.
- Weakening of the EUR / USD exchange rate - the gradual depreciation of the EUR / USD currency pair had a positive effect on inflation. The exchange rate weakened from the original 1.35 EUR / USD to 1.12 EUR / USD at the end of the year, which represents a decrease of 17%.

In 2019, headline inflation fell in all 19 euro area countries.

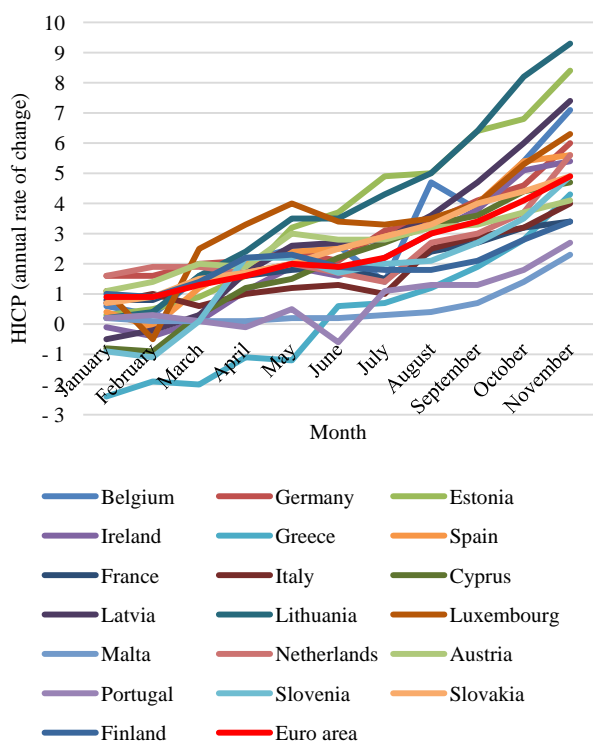


Figure 2 Development of inflation in euro area 01/2021 – 11/2021 (HICP, annual rate of change)  
Source: own research according to data from Eurostat, 2021c

At the end of 2019, the COVID-19 virus was recorded in the Chinese city of Wuhan. The WHO declared a coronavirus pandemic on March 11, 2020. The chart above (Figure 2) shows the development of inflation in 2021, specifically in the months of January to November. This is a period of coronavirus pandemic. We see inflation rates rising in all euro area countries.

According to the TASR (2021), inflation in the euro area continued to accelerate. In September, it reached its highest level in 13 years, with energy prices remaining the „engine“ of rising inflation. In September 2021, annual inflation rose to 3.4%, with economists estimating an increase of 3.3%. The growth rate of consumer prices in the euro area is well above the European Central Bank's 2% inflation target. The pace of price growth in September was the highest since September 2008, and the chart (Figure 2) shows that the year-on-year inflation rate rose again in October and November.

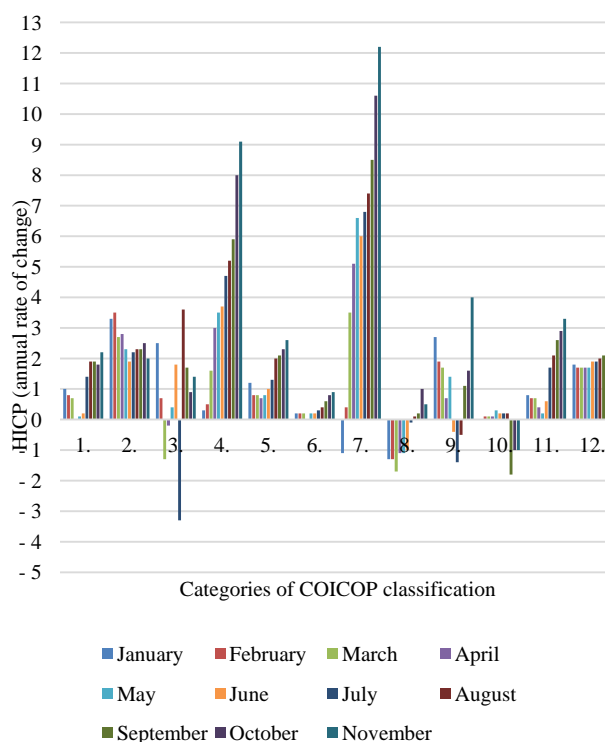


Figure 3 Annual rate of change of HICP – 12 categories of COICOP classification in 01/2021 – 11/2021 in euro area countries  
Source: own research according to data from Eurostat, 2021c

Figure 3 shows the annual inflation rate according to the 12 categories of the COICOP classification in the euro area between January and November 2021. We see that inflation has risen in all categories. The highest price growth is in the area of transport. The transport category includes: purchase of vehicles, operation of personal transport equipment, transport services. According to TASR (2021), energy remains the engine of accelerating consumer price inflation in the euro area. In the graph, the energy category is indicated as the fourth category. This is a category that includes: actual rentals for housing, regular maintenance and repair of the dwelling, other services relating to the dwelling, electricity, gas and other fuels.

### 3. PREDICTION OF THE INFLATION

In this part of our paper, we will compare inflation forecasts for the years 2021 to 2023.

Table 2 shows the inflation forecasts of the various institutions. We have added to this table our inflation forecast for 2021, 2022, 2023 and 2024. Our forecast of HICP was made on the basis of past HICP data, ex post analysis. The table also shows a comparison of inflation forecasts from different time periods. These are mostly predictions of individual institutions published at the beginning (January, February and March) and at the end (October, November, December) of 2021. We see that the March 2021 projection is significantly higher, probably due to the latest oil price rise and January 2021 outcome. For the rest of the period under review, the March 2021 projection is broadly in line with other forecasts. Our inflation forecasts are approaching the inflation forecasts of early 2021.

Due to the different deadlines, these forecasts cannot be directly compared and are likely to come from different assumptions about

the future development of the COVID-19 pandemic. Different institutions also use different methods to estimate inflation. However, if we look at the table, we see that the Eurosystem staff projection is significantly higher than the other institutions' projections for 2022, 2023 and 2024. The December 2021 projection for 2022 is higher than in the other forecasts. This can be largely explained by the inclusion of HICP data from November 2021 and the higher expected inflation of the more volatile components. Differences from other 2024 forecasts are limited in both HICP growth and inflation.

Table 2 Predictions of inflation for 2021 – 2024 (annual rate of change)

	2021	2022	2023	2024
Our prediction	0.981	0.929	0.877	0.825
Eurosystem - December 2021	2.6	3.2	1.8	1.8
ECB - March 2021	1.5	1.2	1.4	
OECD - March 2021 / December 2020 - December 2021	0.7 2.4	1.0 2.7	- 1.8	-
Eurozone Barometer - February 2021 - November 2021	1.1 2.3	1.2 2.0	1.4 1.6	1.7
Consensus Economics - February 2021 - December 2021	1.2 2.5	1.2 2.6	1.5 1.5	1.7
European Commission - February 2021 - November 2021	1.4 2.4	1.3 2.2	- 1.4	-
International Monetary Fund - January 2021 - October 2021	0.9 2.2	1.1 1.7	- 1.4	1.5
Survey of professional forecasters - January 2021 - October 2021	0.9 2.3	1.3 1.9	1.5 1.7	-

Source: own research according to data from ECB, 2021b; ECB, 2021c

Table 3 Three scenarios of development HICP (in annual rate of change)

Inflation HICP (Projection of December 2020)								
Mild scenario			Baseline scenario			Severe scenario		
2021	2022	2023	2021	2022	2023	2021	2022	2023
1.1	1.3	1.5	1	1.1	1.4	0.7	0.6	0.8
Inflation HICP (Projection of March 2021)								
Mild scenario			Baseline scenario			Severe scenario		
2021	2022	2023	2021	2022	2023	2021	2022	2023
1.6	1.5	1.7	1.5	1.2	1.4	1.5	1	1.1

Source: own research according to data from ECB, 2021b

Table 3 shows the December 2020 and March 2021 inflation forecasts (HICP) divided into three scenarios: a mild scenario, a baseline scenario and a severe scenario. These scenarios have been prepared by ECB experts in view of the continuing significant uncertainty surrounding the future evolution of the COVID-19

pandemic and the extent of its economic consequences. The mild and severe scenario illustrate the extent of the potential effects of the COVID-19 pandemic on the euro area economy.

The mild scenario envisages a resolution of the health crisis by the end of 2021 and a smaller range of longer-term economic consequences, while the severe scenario assumes a longer-lasting crisis and permanent losses of economic potential. Compared to the baseline scenario, the mild scenario envisages faster vaccine availability, higher public acceptance and higher vaccine efficacy against new virus mutations, which will allow more rapid action against the spread of the disease as well as more effective decisions by authorities and operators, which will further alleviate the economic costs of measures against the spread of the disease. On the contrary, the severe scenario envisages an intensification of the pandemic in the coming months and the occurrence of virus mutations, which also lead to a reduction in vaccine efficacy, and the maintenance of very strict measures in the short term, albeit with limited results. Measures against the spread of the disease continue to significantly hamper activity in individual sectors of the economy until the successful implementation of a medical solution, which according to a mild scenario should occur by the end of 2021 and according to a severe scenario by early 2022, with some measures lasting until mid-2023. Compared to the baseline scenario, the severe scenario envisages longer-lasting adverse economic consequences of measures against the spread of the disease. This development is multiplied by increased insolvency, which causes credit tensions, with an adverse effect on the credit costs of households and businesses. At the same time, even in a severe scenario, monetary, budgetary and prudential policies are assumed to suppress very severe financial amplification effects.

HICP inflation is expected to recover in the short term in both scenarios. Later, there are larger differences between the scenarios due to the different balance between supply and demand. This development reflects the fact that the key factors for raising inflation in the baseline scenario in the short term (specific oil price assumptions, base effects within the energy component and the impact of the temporary VAT reduction in Germany) also apply to the alternative scenarios. In the longer term, the dampening demand and growth supply effects on inflation are expected to be greater than in the mild scenario, but the oversupply should be higher than in the mild scenario, which hampers inflation. However, compared to the December 2020 projections, the differences between the two scenarios are now significantly smaller, as the severe scenario includes a less pessimistic outlook.

Due to the considerable uncertainty about the future development of the pandemic and its economic consequences, which is highlighted by the new Omikron variant, the ECB drew up new projections of the HICP scenarios in December 2021. The ECB used the ECB-BASE and ECB-BASIR models. Table 4 shows these scenarios.

Compared to the baseline scenario, the mild scenario assumes a faster end to the pandemic during 2022 - especially in emerging market economies due to the expected higher vaccination rates. Under this scenario, the numbers would be lower, the effectiveness of the vaccines would be higher, and the risks of reinfection would be lower. This would accelerate the easing of restrictions, which would have strong positive effects on confidence and lead to very limited economic losses. The severe scenario, on the other hand, assumes a long-term health crisis characterized by recurring waves of the pandemic (with new variants of the virus, the risk of which has been highlighted by the onset of the new Omikron variant) and a lower share of effectively protected populations. A subsequent sharp increase in infections and hospitalizations would lead to a tightening of restrictions on mobility and thus on economic activity in early

2022, albeit to a lesser extent than in early 2021. The health crisis would continue until mid-2023, dampening economic activity, and would lead to negative economic consequences multiplied by increased insolvency.

Table 4 Three scenarios of development HICP (in annual rate of change), projection of December 2021

Mild scenario			
2021	2022	2023	2024
2.6	3.4	2.1	2.0
Baseline scenario			
2021	2022	2023	2024
2.6	3.2	1.8	1.8
Severe scenario			
2021	2022	2023	2024
2.6	3.1	1.4	1.3

Source: own research according to data from ECB, 2021c

#### 4. CONCLUSION

In our research, we focused on defining inflation, the indices by which inflation in euro area countries is measured. In the literature review, we listed authors who examined inflation as such, also in relation to economic development, and authors who focused on prediction methods. The graphs show inflation developments as a year-on-year percentage change in the HICP in the 19 euro area countries and the euro area as a whole. In the last part of our research, we pointed to inflation forecasts made by experts from various institutions. We compared the forecasts with our inflation forecast, which was based on past HICP data in euro area countries. In addition to the baseline inflation scenario, ECB experts also published a mild and severe inflation scenario, which takes into account the COVID-19 pandemic.

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