



Short- and medium-term fiscal positions in a high-inflation environment: the case of Croatia

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Article**

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Abstract

This paper analyses the short- and medium-term effects of high inflation on fiscal developments in Croatia. The main analytical novelty is to add inflation shocks to the fiscal reaction function, an approach that was not considered in macro-fiscal research during the long period of moderate inflation. Our results suggest that inflation has a favourable effect on the primary balance in the short term, which can be explained by the positive effect of inflation on nominal tax revenues and an initial lagged adjustment of public expenditure to inflation. In the medium term, however, inflation is likely to have a negative effect on the primary balance by raising government expenditure more than tax revenues.

Keywords: fiscal policy, inflation, tax revenue, public expenditure, debt dynamics, business cycle, breakpoint regression

1 INTRODUCTION

This paper aims to assess the effects of unexpected inflationary shocks on fiscal developments in Croatia. In the short run, one would expect an inflation surprise to have a positive effect on the primary budget balance because of the more or less automatic response of nominal tax revenue bases to higher prices. Over an extended period of elevated inflation, however, the primary balance can be expected to deteriorate, as fiscal policymakers cannot escape adjusting most expenditure items for inflation in order to shield the purchasing power of economic subjects in terms of real wages and pension adjustments. In addition, as monetary policy tightens to contain inflation and economic activity weakens, tax revenue growth is bound to slow down and debt servicing costs to rise, which complicates medium-term fiscal sustainability if public debt is high.

High inflation is only the latest in a series of shocks that fiscal policymakers in Croatia and other European countries have recently had to deal with. Following the unprecedented rise in public spending during the Covid pandemic in 2020–21, Croatia and other EU countries were hit in 2022–23 by a sharp increase in energy prices triggered by Russian aggression in Ukraine. Various income and price measures were implemented at the EU level to mitigate the harmful effects of higher energy prices on business operations and living standards. At the euro area level, these measures added up to almost 2% of GDP in 2022 and could be slightly higher in 2023 (Bankowski et al., 2023). In Croatia, discretionary measures amounted to around 1.5% of GDP in 2022 and were projected to be 1.6% in 2023 (MoF, 2023). If most discretionary measures are unwound as currently planned, they will fall to 0.2% of GDP in 2024.

However, despite an initially planned deficit (2.6% of GDP) for 2022 in late 2021 and the unexpected increase in spending during the year due to energy price measures, Croatia's general government budget recorded a surplus of 0.4% of GDP in 2022. This surprising outturn was due to a combination of buoyant tax revenues, which grew by 13.3% in 2022, and lagging adjustment of expenditure, which

grew by only 6.6% (table 1). In addition, strong nominal GDP growth (14.9%) made the nominal budget balance and general government debt smaller as a ratio of GDP – the latter decreased by around 10 percentage points, to 68.4 % of GDP, from the 2021 level, and by almost 20 points from the 2020 level (graph 1). Compared with averages for the EU, euro area, and Central and Eastern European countries, Croatia recorded larger improvements in overall and primary balances, and in particular, debt to GDP ratios in 2022.

As argued in this paper, inflation played a key role in this positive fiscal outcome. We show that the effect of inflation on the primary balance was positive during the high inflation period from Q3:2021 to Q3:2023, but is projected to turn negative through 2025 as the positive impact of inflation on tax revenues dissipates and public spending catches up with higher prices. In other words, inflation tends to be good for fiscal positions in the short term, but not in the medium term.

TABLE 1

Croatia: Government revenue and expenditure growth in 2022, in %

Total revenue	13.3
Direct tax revenues	37.4
Indirect tax revenues	13.6
Social contributions	12.8
Other current revenue	-14.2
Capital revenue	15.9
Total expenditure	6.6
Social benefits	7.1
Subsidies	-1.1
Interest expenditure	3.5
Compensation of employees	5.6
Intermediate consumption	9.4
Total capital expenditure	9.8
Budget balance (% of GDP)	0.4

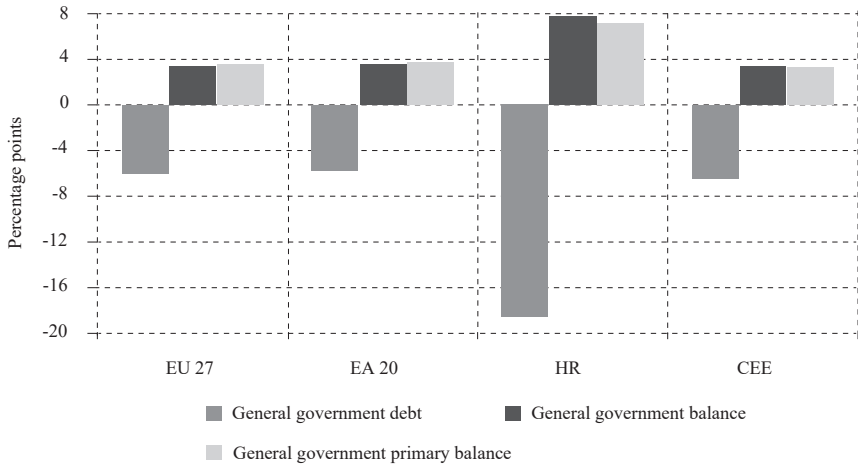
Note: Initial budget planned in 2021 forecast a deficit of - 2.6% of GDP.

Source: MoF (2021), Eurostat (2023).

The remainder of this paper is structured as follows. The literature review (Section 2) surveys findings of recent empirical research on the fiscal reaction function of the United States, the EU, the euro area and Croatia, highlighting the gap in the analysis of the fiscal effects of inflation. In Section 3 we outline our estimating framework for the fiscal reaction function, adding inflation to the regression as a novelty in this line of work. We estimate the fiscal reaction function with OLS and breakpoints, to focus on the fiscal effects of inflation in different inflation environments. Section 4 describes the empirical results, and Section 5 the robustness check. Section 6 concludes.

GRAPH 1

Changes in general government balance, primary balance and public debt, 2020-22



Source: Eurostat (2023), authors' calculations.

2 LITERATURE REVIEW

As the last period of high inflation dates back to the 1970s and 1980s, there is not much recent empirical work on the effects of inflation on fiscal positions. Most macro-fiscal analyses since the Global Financial Crisis (GFC) have estimated fiscal reaction functions, originally developed to assess how expansionary fiscal measures affected economic activity and public debt sustainability in a deflationary environment when policy interest rates were at the zero lower bound and quantitative easing of monetary policy started having consequences for the sustainability of consolidated public finances.

In an early contribution, Bohn (1998) analysed how primary and cyclically adjusted primary balances in the United States reacted to increases in public debt. A positive sign of the public debt coefficient in his framework implied that fiscal policy was sustainable, as primary and cyclically adjusted primary balances improved for a given change in public debt. He found that the US public debt displayed mean reversion if one controlled for wartime spending and for cyclical fluctuations, and that the primary surplus increased with higher public debt. In another early contribution, Golinelli and Momigliano (2008) identified a positive reaction of the cyclically adjusted primary balance to accumulation of public debt, and the countercyclical character of fiscal policies in euro area countries.

More recently, Berti et al. (2016) found that primary balances in EU member states generally responded more strongly to public debt accumulation after the GFC, so that fiscal policies were mostly sustainable at the time. Using non-linear fiscal reaction functions, Medeiros (2012) established “fiscal fatigue” in cases where EU countries' public debt ratios ranged from 90% to 100% of GDP. In a similar exercise for euro area countries, Checherita-Westphal and Žďárek (2017) assessed fiscal

policies as mostly sustainable at the time, but found only weak evidence of fiscal fatigue. Separately, they established a negative and statistically significant effect on the primary balance of a dummy variable for the year when elections were held, which they interpreted as evidence of a fiscal electoral cycle. Similarly, Mačkić and Rusmir (2021) showed that policymakers in 11 new EU member states were undermining the stabilisation function of public finances in electoral periods by allowing the widening of budget deficits – however, only in periods when countries were not under the European Commission's excessive deficit procedure.

For the case of Croatia, Arčabić and Banić (2021) studied how cyclically adjusted primary balances reacted to changes in output gap. They found that in an expansionary regime fiscal policy was countercyclical, while in a recessionary regime the outcomes varied between procyclical and acyclical. Similar results were obtained by Deskar-Škrbić and Grdović Gnip (2020), who estimated both linear and nonlinear fiscal response functions.

The only recent study to our knowledge that directly assessed the impact of inflation shocks on fiscal balances is Staehr et al. (2023). For a panel of 12 euro area countries, they established a positive effect of inflation on both revenue and expenditure, but found no evidence of non-linearities in the impact of inflation on primary balances.

3 ANALYTICAL FRAMEWORK

To assess the effect of inflation on the primary balance, we use the fiscal reaction functions of Bohn (1998) and Arčabić and Banić (2021) and extend them for inflation:

$$pb_t = \alpha + \Omega_1 pb_{t-1} + \beta_1 d_{t-1} + \beta_2 \hat{y}_t + \beta_3 \pi_t + \varepsilon_t \quad (1)$$

where pb_t is the ratio of primary government balance to GDP, d_{t-1} is the ratio of general government debt to GDP, \hat{y}_t is the output gap as a percent of potential GDP, (π_t) is the inflation rate measured by the harmonised consumer price index, and ε_t is the residual. We estimate equation (1) on seasonally-adjusted quarterly data using the OLS with and without breakpoints, testing for autocorrelation and heteroskedasticity.

In the baseline model, we estimate the potential output and output gap from the production function:

$$Y_t = TFP_t \times L_t^\alpha \times K_t^{1-\alpha} \quad (2)$$

where potential output Y_t is determined by labour (L) and capital (K) input and unobservable total factor productivity (TFP). The share of labour is set at 0.65 and of capital at 0.35 as in previous studies on Croatia (Grgurić, Nadoveza Jelić and Pavić, 2021; Jovičić, 2017). The output gap \hat{y}_t is then calculated as a deviation of real from potential GDP in percentage of potential GDP. For robustness check, we

also estimate potential output and output gap with HP filter (see Arčabić and Banić, 2021; Rebić and Arčabić, 2023; Švaljek, Vizek and Mervar, 2009).

All model variables are depicted in appendix graphs A1-A5.

4 EMPIRICAL RESULTS

We first estimate the fiscal reaction function for the period Q2:2002 – Q4:2022. The results in table 2 suggest that in the long run inflation is not a statistically significant determinant of the primary balance. A key reason is probably that, in the long-term, tax revenues are driven more by real growth than by inflation, while public sector wages, pensions and other social transfers, which account for the bulk of government expenditure, are only partly indexed for inflation.

Fiscal policy on the whole appears sustainable in the long term: the fiscal stance has persistent effects as indicated by the positive sign of a lagged primary balance to GDP, which is in line with Arčabić (2018), and increases in public debt are associated with higher primary balances in a statistically significant way, a finding that is consistent with Arčabić and Banić (2021). The primary balance also seems to be statistically significantly sensitive to the business cycle, as indicated by the positive sign of the output gap coefficient. However, given that the dependent variable is the primary balance and not the cyclically adjusted primary balance, we cannot argue confidently that fiscal policy in Croatia had properties normally associated with automatic stabilisers over this period.

TABLE 2

Baseline and sub-period model results with breakpoints (BP)

	OLS	OLS – BP	OLS – BP	OLS – BP	OLS – BP
	Q3:2002 – Q4:2022	Q3:2002 – Q3:2018	Q4:2018 – Q2:2021	Q3:2021 – Q3:2023	Q4:2023 – Q4:2025
Constant	-3.843*** (0.000)	-2.148** (0.045)	3.925 (0.135)	4.588 (0.110)	-92.864* (0.060)
Inflation rate	-0.901 (0.142)	-0.218* (0.098)	-1.946*** (0.000)	0.241*** (0.000)	-1.562*** (0.000)
Output gap (prod. fn.)	0.626*** (0.000)	0.524*** (0.001)	0.985*** (0.000)	1.699*** (0.000)	-2.686 (0.426)
Lagged primary balance/GDP ratio	0.305** (0.020)	0.516*** (0.000)	-0.189*** (0.001)	-0.650*** (0.001)	-0.279 (0.573)
Lagged general govt. debt/GDP ratio	0.050*** (0.000)	0.032** (0.023)	-0.034 (0.337)	-0.122** (0.012)	1.631** (0.046)
R ²	0.732	0.818	0.818	0.818	0.818

Note: The results of the Breusch-Godfrey test indicate that there is no autocorrelation in the models. The results of the Breusch-Pagan-Godfrey test indicate that there is no heteroskedasticity in the models with the usual level of significance.

, **, * indicates statistical significance at 10%, 5% and 1%, respectively.*

Source: Authors' calculations.

To differentiate the impact of inflation on the primary balance in the short- and medium-term, we extended the sample with official projections until 2025 and tested for structural breaks in inflation time series. For the projection horizon we used inflation, real GDP and output gap forecasts of the Croatian National Bank, and primary balance and government debt forecasts of the Ministry of Finance (with quadratic interpolation for quarterly data). The structural breaks tests identified four subperiods in the time series for inflation: Q3:2002 – Q3:2018; Q4:2018 – Q2:2021; Q3:2021 – Q3:2023; and Q4:2023 – Q4:2025. The estimates of equation (2) for these structural breaks are shown in the last four columns of table 2.

The first subperiod from Q3:2002 to Q3:2018 saw both high and low inflation as well as periods of fiscal instability (see e.g. Mihaljek, 2009) and consolidation. The overall results shown in the second column of table 2 are similar to baseline estimates. The negative coefficient for inflation becomes significant at the 10% level, suggesting that over the longer-term inflation tends to have a negative effect on the primary balance. The responsiveness of the primary balance to the output gap and lagged debt to GDP ratio is somewhat smaller than in the full sample; the responsiveness to the lagged primary balance is larger.

The second subperiod from Q4:2018 to Q2:2021 was characterised by low and stable inflation and the pandemic shock in 2020, which had huge macroeconomic and fiscal consequences. The government took large discretionary fiscal measures – tax write-offs, tax deferrals, transfers to compensate households and firms for income and revenue losses due to lockdowns – that led to sharp deterioration in public finances. The low and stable inflation in this period was thus inevitably associated with a large widening of the primary deficit. The primary deficit also increased, almost one-to-one, with the output gap. Fiscal policy was clearly not sustainable, as indicated by negative coefficients on lagged primary balance and debt to GDP ratios. Staehr, Tkacevs and Urke (2023) obtained similar results for 12 euro area countries covering this period.

Most interesting in this paper are estimates for the last two periods. Inflation began to pick up in Q3:2021 and remained elevated through Q3:2023. Our estimates confirm that it had a statistically highly significant positive effect on the primary balance (fourth column in table 2). The primary balance was also highly responsive to the output gap. These results suggest that inflation and strong growth in personal incomes and firms' operating surplus did indeed buoy revenues from direct and indirect taxes and social security contributions, as noted in table 1, while expenditure was slow to catch up with inflation. Regarding fiscal policy sustainability, the negative coefficient on lagged primary balance indicates that fiscal policy did not have persistent effects related to the negative pandemic shock on revenue, expenditure, and nominal GDP. Also, considering the idiosyncratic nature of the shock in 2020, the large financing needs to relieve it, and the sharp drop in nominal GDP, it is not surprising that public debt was not sustainable during that period.

However, as estimates for the projection period from Q4:2023 to Q4:2025 indicate, the positive effect of inflation on the primary balance can be expected to dissipate over the next two years. With inflation expected to converge slowly to target and growth weakening, expenditure growth is projected to pick up and tax revenue growth to slow. That shift is reflected in the negative and statistically highly significant response of the primary balance to inflation shown in the last column of table 2. Persistent inflation over time inevitably leads to adjustment of spending on public sector wages, pensions, transfers to households and all other current and capital spending categories, while tighter monetary policy takes a toll on economic activity and hence tax revenues. The coefficient of public debt is positive in this projection period, partly reflecting the still positive effect of inflation on nominal GDP, which helps reduce the debt to GDP ratio. In contrast to the preceding high inflation period, the coefficients of the output gap and lagged primary balance are no longer statistically significant.

In sum, the above results for Croatia are indicative of the typical response of fiscal outcomes to high inflation: a favourable impact on the primary balance in the short term, but a likely negative one in the medium term. This result is intriguing, taking into account that inflation did not have a statistically significant impact (although, the sign was negative) on primary balance in the baseline model (Q3:2002 – Q4:2022).

5 ROBUSTNESS CHECK

In order to test the robustness of the results in table 2, we re-estimated the output gap by using the HP filter. In the baseline model we obtained very similar estimates: the primary balance does not respond statistically significantly to inflation, but fiscal policy seems sustainable, as debt accumulation is associated with an improvement in the primary balance (table 3, first column). The primary balance also responds positively to an increase in the output gap measured by the HP filter. The size of the estimated coefficient is very similar to that in table 2, where the output gap was estimated using the production function.

The estimates for subperiods are also broadly similar to those with the output gap estimated from the production function. As in table 2, the estimated coefficients of inflation are negative, with the exception of the high inflation period Q3:2021 – Q3:2023. The main difference in this high inflation period is the coefficient on lagged debt to GDP ratio, which is estimated to be positive and statistically significant, suggesting fiscal policy sustainability, whereas in the model with the production function the output gap was negative and statistically significant. This difference most likely arises from substantial changes in macroeconomic and fiscal conditions as the economy recovered from the Covid pandemic and faced the energy crisis, but also a different output gap indicator. However, the public debt coefficient is positive in both models, suggesting fiscal sustainability.

TABLE 3

Robustness check: HP filter instead of production function estimate of output gap

	OLS	OLS – BP	OLS – BP	OLS – BP	OLS – BP
	Q3:2002 – Q4:2022	Q3:2002 – Q3:2018	Q4:2018 – Q2:2021	Q3:2021 – Q3:2023	Q4:2023 – Q4:2025
Constant	-4.071*** (0.000)	-1.926* (0.069)	0.516 (0.904)	-4.493*** (0.000)	-69.026*** (0.000)
Inflation rate	-0.049 (0.384)	-0.187 (0.172)	-2.062*** (0.000)	0.216*** (0.000)	-1.374*** (0.000)
Output gap (HP filter)	0.569*** (0.000)	0.411** (0.012)	0.981*** (0.000)	0.814*** (0.000)	-1.369*** (0.006)
Lagged primary balance/GDP ratio	0.317* (0.054)	0.575*** (0.000)	-0.227** (0.031)	-0.219*** (0.005)	-0.004 (0.979)
Lagged general gvt. debt/GDP ratio	0.053*** (0.000)	0.028** (0.046)	0.014 (0.822)	0.031*** (0.001)	1.233** (0.000)
R ²		0.806	0.806	0.806	0.806

Note: The results of the Breusch-Godfrey test indicate that there is no autocorrelation in the models. The results of the Breusch-Pagan-Godfrey test indicate that there is no heteroskedasticity in the models with the usual level of significance.

*, **, *** indicates statistical significance at 10%, 5% and 1%, respectively.

Source: Authors' calculations.

6 CONCLUSION

In this paper we estimated the effects of high inflation on the primary fiscal balance in Croatia in the short- and medium-term. We extended the standard fiscal reaction function framework with inflation and estimated a model with break-points for inflation to distinguish different inflation environments and study how the primary balance responded to inflation in different periods of low and high inflation.

Our main finding is that in the short term a high inflation surprise has a favourable effect on the primary balance. This can be explained by the high buoyancy of nominal tax bases with respect to inflation on the one hand, and the absence of formal indexation of public spending on the other. In particular, VAT and excises, which account for the bulk of tax revenues in Croatia, expand one for one with inflation, while direct tax revenues and social security contributions expand in line with the gross operating surplus of firms and wages, which are highly correlated with inflation. At the same time, in the absence of formal indexation, expenditure categories other than intermediate consumption and debt service costs adjust to inflation with a time lag, so the increase in public spending in the short term tends to be smaller than that in tax revenues – and smaller than the increase in spending in the medium term, when public sector wages, pensions, social transfers and other current and capital spending adjust more or less fully to inflation.

Another finding in the paper is that fiscal policy in Croatia was on the whole sustainable and sensitive to the business cycle between 2002 to 2022, as the primary balance tended to improve when government debt and the output gap increased.

When it comes to the research limitations, which can serve also as the motivation and roadmap for further analysis, it would be interesting to assess the impact of surprise inflation on the revenue and expenditure side with a disaggregated approach. In this way, fiscal policymakers could more efficiently address the budget redistribution in order to shield the living standard of citizens, as well as continuity of business operations. Further, an extension to this research could be directed towards discretionary fiscal policy reaction to sudden inflation, i.e. to analyse the reaction of the cyclically adjusted primary balance to an increase in inflation. Also, assessing the character of fiscal policy in a period of high inflation is important for Croatia in view of the interaction with ECB monetary policy, aiming for price stability. Thus, it would be possible to adequately assess the policy mix in Croatia and determine whether fiscal is working in tandem with monetary policy or not.

In sum, fiscal policymakers cannot take too much comfort from the current favourable state of public finances. With inflation and policy interest rates expected to stay relatively high for a while, fiscal positions are likely to deteriorate in the medium term.

Disclosure statement

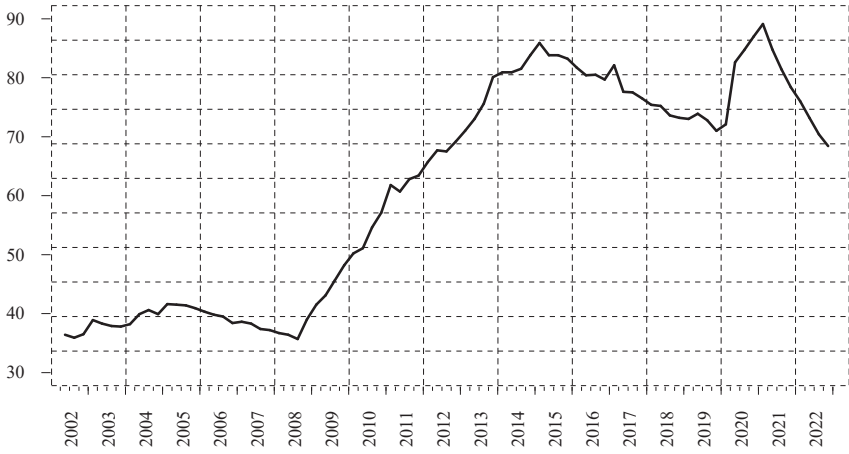
The authors have no potential conflict of interest to report.

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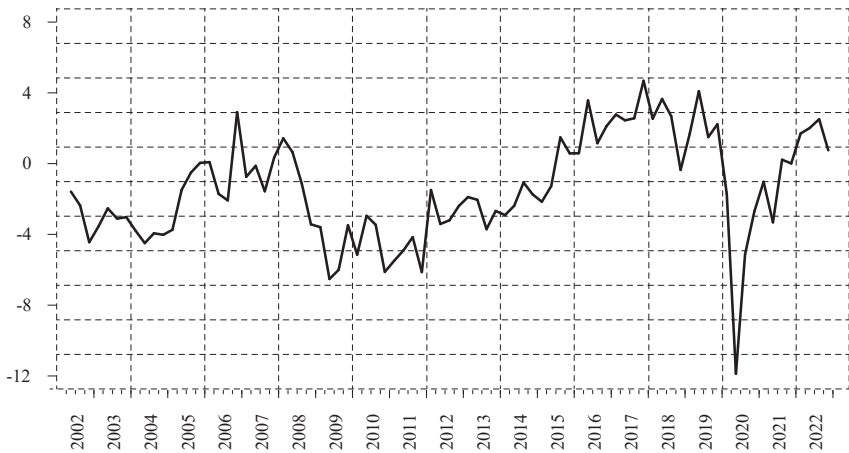
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GRAPH A1
General government debt in Croatia (% of GDP)



Source: Eurostat (2023).

GRAPH A2
General government primary balance in Croatia (% of GDP)



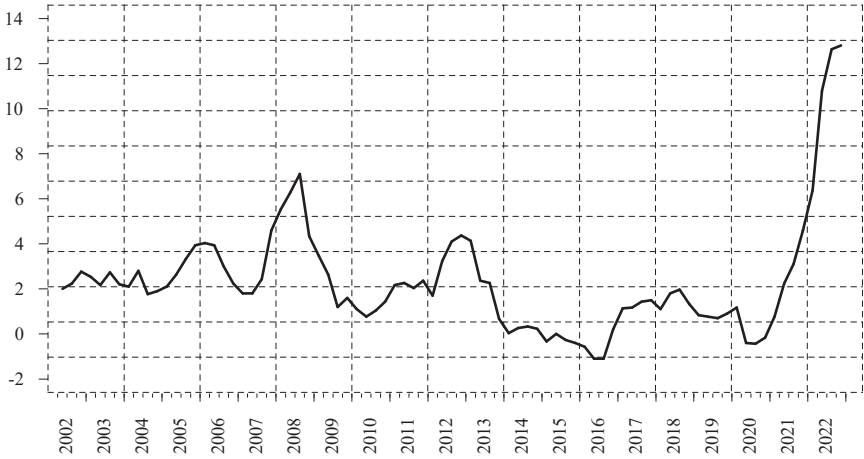
Source: Eurostat (2023).

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FRANE BANIĆ, DOMINIK IVAN PRPURIĆ, PAVE REBIĆ:
SHORT- AND MEDIUM-TERM FISCAL POSITIONS
IN A HIGH-INFLATION ENVIRONMENT: THE CASE OF CROATIA

GRAPH A3

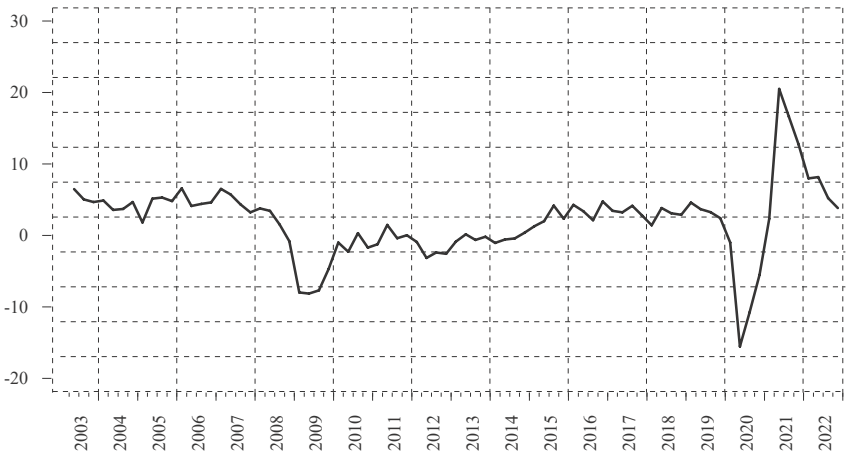
Harmonised index of consumer prices (HICP) in Croatia (YoY %)



Source: Eurostat (2023).

GRAPH A4

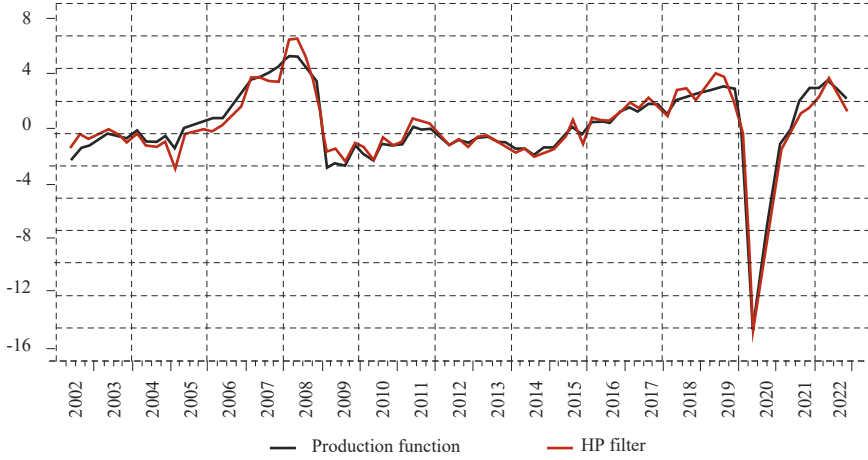
Real GDP in Croatia (YoY %)



Source: Eurostat (2023).

GRAPH A5

Output gap in Croatia: production function and HP filter methods (% of potential GDP)



Source: Eurostat (2023), authors' calculations.