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DOPRINOSI VELIKIH ČLANICA EUROZONE MONETARNIM AGREGATIMA I DINAMIKA HARMONIZIRANOG INDEKSA POTROŠAČKIH CIJENA

LARGE EUROZONE MEMBER STATES' CONTRIBUTIONS TO MONETARY AGGREGATES AND THE DYNAMICS OF THE HARMONIZED INDEX OF CONSUMER PRICES (HICP)

SAŽETAK: Ovo istraživanje analizira utjecaj rasta monetarnih agregata na kretanje inflacije u članicama Eurosustava, s osobitim naglaskom na razlike između velikih (Njemačka, Francuska, Italija i Španjolska) i malih (Slovenija i Hrvatska) članica Eurosustava. Cilj je bio utvrditi postoji li statistički značajna veza između stopa rasta ponude novca (M1 i M3) i harmoniziranog indeksa potrošačkih cijena (HICP) u razdoblju 2015. – 2024., kao i moguće prelijevanje inflacijskih pritisaka iz velikih članica na manje članice. Rezultati pokazuju da učinak monetarne ponude na inflaciju nije jednoznačan te varira među državama, pri čemu Njemačka i Francuska pokazuju statistički značajne veze, dok u Italiji i Španjolskoj takvi učinci nisu potvrđeni. Nadalje, nije pronađen jasan dokaz sustavnog prelijevanja inflacije iz većih u manje članice, osim u odnosu Njemačka – Slovenija. Ovi nalazi upućuju na složenost inflacijskih dinamika u eurozoni te potrebu za daljnjim istraživanjima koja uključuju širi spektar varijabli o asimetriji doprinosa monetarnim agregatima te stopama inflacije među članicama eurozone.

ABSTRACT: This research analyzes the impact of monetary aggregates growth on inflation trends in Eurosystem members, with particular emphasis on the differences between large (Germany, France, Italy and Spain) and small (Slovenia and Croatia) Eurosystem members states. The aim was to determine whether there is a statistically significant link between money supply growth rates (M1 and M3) and the Harmonized Index of Consumer Prices (HICP) in the period 2015-2024, as well as the possible spillover of inflationary pressures from large to smaller member states. The results show that the effect of monetary supply on inflation is not unambiguous and varies among countries, with Germany and France showing statistically significant links, while in Italy and Spain such effects have not been confirmed. Furthermore, there was no clear evidence of systematic inflation spillovers from larger to smaller member states, except in the Germany-Slovenia relationship. These findings point to the complexity of inflation dynamics in the euro area and the need for further research involving a wider range of variables on the

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KLJUČNE RIJEČI: članice eurozone, monetarni agregati, HICP, prelijevanje inflacije

asymmetry of contributions to monetary aggregates and inflation rates among Eurozone member states.

KEY WORDS: Eurozone member states, monetary aggregates, HICP, inflation spillover

UVOD

Velike članice eurozone, poput Njemačke, Francuske, Italije i Španjolske, ključne su za oblikovanje monetarne politike i dinamiku ponude novca mjerene kretanjem monetarnih agregata na razini eurozone. Njihovi doprinosi kretanju monetarnih agregata, poput M1, M2 i M3, ovise o veličini gospodarstva, fiskalnim politikama i nacionalnim kreditnim tržištima. U praksi monetarne statistike, monetarni agregati predstavljaju novčane obveze monetarnih financijskih institucija (banaka) prema ostalim rezidentima, isključujući središnju državu (HNB, 2025). Hrvatska narodna banka započela je s objavom monetarnih agregata prema definiciji Europske središnje banke – ECB (serija podataka od prosinca 2010.), koji se redovito objavljuju u Biltenu HNB-a u Tablici A1 – Monetarni i kreditni agregati (HNB, 2025). Među analitičarima monetarnih kretanja vrijedi pravilo da se monetarni agregat M1 povezuje s kretanjem BDP-a uslijed kreditne aktivnosti banaka te da se agregat M3 povezuje s kretanjem razine inflacije jer uključuje sav financijski potencijal privatnog sektora koji može poslužiti rastu potražnje i pritisku na cijene. U procesu praćenja statističkih veza između kretanja monetarnih agregata i gospodarskog rasta te inflacije mijenjali su se pristupi i zaključci analitičara o njihovoj važnosti, od stajališta da su važnije pojedine komponente negoli ukupni agregati M1 i M3 (Carstensen, 2004; Gerlach i dr., 2004; Neumann i Greiber, 2004; Greiber i Lemke, 2005), do tvrdnji da su monetarni agregati ponovno postali bitni uslijed bujanja inflacije uz povećanje ponude novca

INTRODUCTION

Large Eurozone member states, such as Germany, France, Italy and Spain, are crucial for the shaping of monetary policy and the dynamics of money supply measured by the monetary aggregate trends in the Eurozone. Their contributions to the monetary aggregate movements, such as M1, M2 and M3, depend on economy size, fiscal policies and national credit markets. In monetary statistics practice, monetary aggregates represent monetary financial institutions' (banks') financial liabilities to other residents, excluding the central government (CNB, 2025). The Croatian National Bank has started publishing monetary aggregates according to the definition of the European Central Bank – ECB (data series from December 2010), which are regularly published in the CNB Bulletin in Table A1 – Monetary and credit aggregates (CNB, 2025). Among monetary movement analysts, the rule is that the M1 monetary aggregate is associated with GDP developments due to the lending activity of banks and that the M3 aggregate is associated with developments in the level of inflation, as it includes all the financial potential of the private sector that can serve the growth of demand and price pressure. In the process of monitoring the statistical links between the movements of monetary aggregates and economic growth and inflation, analysts' approaches and conclusions about their importance have changed, starting from the standpoint that individual components are more important than the total aggregates M1 and M3 (Carstensen, 2004; Gerlach et al., 2004; Neumann and Greiber, 2004; Greiber and Lemke, 2005), to the claims that monetary aggregates have become relevant again due to the

(Congdon, 2022; King, 2021; Borio et al., 2021, 2023). Time monetarni agregati pomažu u istraživanju signalnih vrijednosti inflacije. U svojem istraživanju u BIS-u, Borio (2023) naglašava da doista postoje dokazi da su rast novca i inflacija nedavno bili usko povezani. Dodatno, istraživanja u okviru BIS-a pružaju snažne dokaze da monetarna politika može smanjiti utjecaj globalne inflacije na inflacijska očekivanja u kratkom i dugom roku, kao i na disperziju između predviđanja analitičara. To sugerira da središnje banke, osobito u manje razvijenim ekonomijama, imaju određeni prostor za upravljanje inflacijskim očekivanjima, čak i kada su globalni čimbenici primarni izvor inflacije (Aguilar i dr., 2024). Primjetno je da se između analitičara BIS-a i ECB-a mogu uočiti razlike u pristupu značenju monetarnih agregata. ECB (2025) dosljedan je u redovitoj objavi važne statistike monetarnih agregata u eurozoni, kao i članice pojedinačno u svojim objavama kretanja doprinosa monetarnim agregatima (Deutsche Bank, 2025). Stoga se čini teorijski i praktično opravdanim istražiti utjecaj i interakciju monetarnih agregata na inflaciju u najvećim članicama eurozone, kao i postojanje mogućeg prelijevanja inflacije na druge članice. To se osobito odnosi na male i periferne članice eurozone, koje su trgovinski i financijski otvorene prema velikim članicama. Njemačka, kao najveće gospodarstvo, često prednjači u rastu depozita (agregata), dok su ostale članice podložnije volatilnosti zbog unutarnjih ekonomskih izazova. Europska središnja banka (ECB) koristi harmonizirani indeks potrošačkih cijena (HICP) kao osnovnu mjeru inflacije u eurozoni, osiguravajući usporedivost među članicama. Dinamika HICP-a odražava specifične čimbenike pojedinih članica, poput kretanja cijena energije, usluga i hrane, što je osobito izraženo tijekom globalnih šokova ili promjena u vanjskotrgovinskim uvjetima. Uloga velikih članica ključna je u oblikovanju ukupne stope inflacije, s obzirom na njihovu gospodarsku težinu, a njihovi specifični doprinosi često zahtijevaju prilagodbe u zajedničkoj monetarnoj politici ECB-a. Praćenje

surging inflation along with money supply increase (Congdon, 2022; King, 2021; Borio et al., 2021, 2023). By doing so, monetary aggregates help to investigate the signal values of inflation. In his research in BIS (Bank for International Settlements), Borio (2023) emphasizes that there is indeed evidence that money growth and inflation have been closely linked in the recent past. In addition, BIS research provides strong evidence that monetary policy can diminish the impact of global inflation on inflation expectations both in the short and long term, as well as on the analysts' predictions dispersion. This suggests that central banks, especially in less developed economies, have scope to manage inflation expectations, even when global factors are the primary source of inflation (Aguilar et al., 2024). It is noticeable that there are between BIS's and ECB's analysts in the approach to the meaning of monetary aggregates and their interpretation. The ECB (2025) consistently publishes important statistics on monetary aggregates in the euro area. So do the member states individually in their announcements of developments in contributions to monetary aggregates (Deutsche Bank, 2025). Therefore, it seems theoretically and practically justified to investigate the impact and interaction of monetary aggregates on inflation in the largest member states of the Eurozone, as well as the existence of possible inflation spillovers to other member states. This is especially true for small and peripheral members of the Eurozone, which are open to large member states both commercially and financially. Germany, as the largest economy, often leads the growth of deposits (aggregates), while other members are more susceptible to volatility due to internal economic challenges. The European Central Bank (ECB) applies the Harmonized Index of Consumer Prices (HICP) as a baseline measure of inflation in the Eurozone, providing comparability among member states. The HICP dynamics reflect the specific factors of individual member states, such as the trends in prices of energy, services and food, which is particularly accentuated during global shocks or changes in foreign trade conditions. The role of

tih prilagodbi (najčešće kamatnom politikom) neophodno je za razumijevanje monetarne stabilnosti i gospodarskog razvitka eurozone. Jedna od ključnih kritika harmoniziranog indeksa potrošačkih cijena (HICP) i pristupa Europske središnje banke (ECB) u vođenju monetarne politike jest ta da harmonizirani indeks odražava prosječnu inflaciju u eurozoni, ali ne prikazuje nužno razlike u inflacijskim pritiscima među pojedinim članicama. Budući da velike članice, poput Njemačke, Francuske, Italije i Španjolske, imaju najveći gospodarski udio i najveći doprinos ukupnom HICP-u, njihovi podaci imaju veći utjecaj na odluke ECB-a. Problem proizlazi iz činjenice da eurozona obuhvaća dvadeset članica s vrlo različitim gospodarskim strukturama, stopama rasta i inflacijskim dinamikama. Primjerice, periferne članice eurozone mogu se suočavati s višim inflacijskim pritiscima zbog strukturnih problema, poput slabijeg tržišta rada ili visokih troškova energije, ali njihov relativno manji udio u HICP-u može značiti da ti problemi nisu dovoljno zastupljeni u ukupnom prosjeku. S druge strane, velike članice (npr. Njemačka ili Francuska) imaju stabilnija gospodarstva s nižom i predvidljivijom inflacijom, no zbog njihova većeg utjecaja na ukupni indeks odluke ECB-a često su usmjerene prema njihovim potrebama. Rezultat navedenog jest da ECB može donositi mjere, poput povećanja ili smanjenja ključnih kamatnih stopa, koje su primarno prikladne za najveće ekonomije, ali mogu biti preoštre za manje i slabije ekonomije. Primjerice, povećanje kamatnih stopa može dodatno usporiti gospodarski rast na periferiji eurozone, koja se već suočava s visokim razinama duga ili niskim stopama investicija, dok istodobno djeluje kao primjerena mjera za kontrolu inflacije u središnjim članicama. Ova asimetrija u učincima monetarne politike ističe izazov vođenja jedinstvene politike u monetarnoj uniji s raznolikim gospodarstvima te naglašava potrebu za dodatnim mehanizmima koji bi omogućili bolje uravnoteženje učinaka na sve članice. Službena monetarna politika ECB-a može se svesti na sljedeće: a) glavni cilj ECB-a jest održavanje

large member states is crucial in shaping the overall inflation rate, given their economic weight, and their specific contributions often require adjustments to the ECB's common monetary policy. Monitoring these adjustments (usually with interest rate policy) is necessary to understand monetary stability and the economic development of the euro area. One of the key criticisms of the Harmonized Index of Consumer Prices (HICP) and the European Central Bank's (ECB's) approach to conducting monetary policy is that the harmonized index reflects average inflation in the euro area, but does not necessarily reflect differences in inflationary pressures among individual member states. Since large member states, such as Germany, France, Italy and Spain, have the largest economic share and the largest contribution to the overall HICP, their data have a greater impact on the ECB's decisions. The problem stems from the fact that the euro area comprises twenty members with very different economic structures, growth rates and inflation dynamics. For example, peripheral members of the euro area may face higher inflationary pressures due to their structural problems, such as weaker labour markets or high energy costs, but their relatively lower share in the HICP may mean that these problems are not sufficiently represented in the overall average. On the other hand, large members (e.g. Germany or France) have more stable economies with lower and more predictable inflation, but due to their greater impact on the overall index, ECB's decisions are often geared to their needs. As a result, the ECB may adopt measures, such as increases or decreases in key interest rates, that are primarily appropriate for the largest economies, but may seem too harsh for smaller and weaker economies. For example, an increase in interest rates can additionally slow down economic growth on the periphery of the euro area, which is already facing high debts or low investment rates, while at the same time acting as an appropriate measure to control inflation in central member states. This asymmetry in monetary policy effects highlights the challenge of pursuing a single policy in a monetary union with diverse economies and also highlights the need to implement additional

stabilnosti cijena, a kako bi se to postiglo, ciljana stopa inflacije iznosi 2 % u srednjoročnom razdoblju; b) referenca ECB-a za mjerenje inflacije jest harmonizirani indeks potrošačkih cijena (HICP), koji sastavljaju Eurostat (2025), statistički ured Europske unije i nacionalni statistički zavodi država članica EU-a, koristeći istu metodologiju (DZS, 2025). ECB još od 2003. godine koristi strategiju monetarne politike koja se zasniva na „dva stupa" – ekonomskoj i monetarnoj analizi. Da bi se procijenili srednjoročni i dugoročni inflacijski pritisci, monetarna analiza uključuje praćenje kretanja monetarnih agregata poput M3. Međutim, činjenica je da detaljne analize i istraživanja doprinosa monetarnim agregatima pojedinih članica nisu dostupni u izvješćima na razini eurozone. S tim u vezi, u vrijeme snažne ekspanzivne monetarne politike 2015. – 2022., s izrazito niskim stopama inflacije, izostali su uvriježeni stavovi o vezi između rasta ponude novca i inflacije. Štoviše, neka istraživanja pokazala su da je veza između rasta ponude novca (agregata) i inflacije jaka u razdoblju kada je inflacija visoka, a slaba u razdoblju kada je inflacija niska (De Grauwe i Polan, 2005; Sargent i Surico, 2011; Gertler i Hofmann, 2018; Borio, 2023). Dakle, kad se inflacija pojavila svom svojom silinom od kraja prvog tromjesečja 2022. godine, i to na različitim razinama u pojedinim članicama eurozone, ECB (2024) je dao službeno objašnjenje da su tome uzrok tri čimbenika: a) Zemlje se mogu nalaziti u različitim fazama gospodarskog ciklusa. Ekonomski ciklus utječe na inflaciju. Tijekom gospodarske krize stopa inflacije opada jer je potražnja manja. Padom prihoda kućanstva troše manje, što dovodi do pada cijena proizvoda kao odgovora na smanjenu potražnju. Suprotno tome, inflacija raste tijekom gospodarskog uspona. b) Zemlje imaju različite razine općeg dohotka. To može imati neizravan utjecaj na inflaciju putem različitih obrazaca potrošnje. Primjerice, u pojedinim zemljama veći postotak potrošnje odlazi na hranu, što može dovesti do viših stopa inflacije. To posljedično rezultira ukupno višim stopama inflacije u tim zemljama, budući da hrana ima

mechanisms which would help balance the effects on all members. The official monetary policy of the ECB can be reduced to the following: a) the main objective of the ECB is to maintain price stability, and in order to achieve this, the inflation target is 2% over the medium term; b) the ECB reference for measuring inflation is the Harmonized Index of Consumer Prices (HICP), compiled by Eurostat (2025), the Statistical Office of the European Union and the national statistical institutes of the EU Member States, using the same methodology (CBS, 2025). Since 2003, the ECB has been using a monetary policy strategy based on "two pillars" – economic and monetary analysis. To assess medium- and long-term inflationary pressures, the monetary analysis includes the monitoring of developments in monetary aggregates such as M3. However, the fact is that detailed analyses and surveys of contributions to the monetary aggregates of individual member states are not available in reports at the euro area level. In this regard, at a time of strong expansionary monetary policy in the period between 2015-2022, with extremely low inflation rates, there were no established views on the link between money supply growth and inflation. Moreover, some research has shown that the link between money supply growth (aggregates) and inflation is strong in a period when inflation is high and weak in a period when inflation is low (De Grauwe and Polan, 2005; Sargent and Surico, 2011; Gertler and Hofmann, 2018; Borio, 2023). So, when inflation has emerged with all its might since the end of the first quarter of 2022, at different levels in individual Eurozone members, the ECB (2024) has provided the official explanation of three factors being the cause: a) Countries can be at different stages of their economic cycle. The economic cycle affects inflation. During the economic crisis, the inflation rate declines because demand is lower. Having reduced income, people tend to spend less, which consequently leads to a decline in product prices in response to reduced demand. Conversely, inflation rises during an economic upswing. b) Countries have different general income levels. This can have an indirect impact on inflation through different spending

veliku „težinu" u njihovim potrošačkim košaricama. c) Postoje i „administrativni" razlozi zbog kojih se stope inflacije mogu razlikovati među zemljama. Neke cijene određuju ili reguliraju vlade ili lokalne vlasti pa promjene u tim „kontroliranim cijenama" – ili u porezima na dodanu vrijednost – mogu imati privremeni utjecaj na inflaciju. Kako bilo, objašnjenja kretanja razine inflacije u eurozoni sežu od tumačenja inflacije kao čistog monetarnog fenomena povezanog s ponudom novca pa sve do tzv. drugih specifičnih čimbenika koji čine razliku među zemljama članicama, premda se u dezinflacijskom postupku ECB služi jedinstvenim kamatnim stopama, neovisno o veličini članice, njezinim doprinosima ukupnim monetarnim agregatima i drugim specifičnostima pojedine članice. Stoga je predmet ovoga istraživanja utjecaj stopa monetarnih agregata na nacionalne razine inflacije mjeren HICP-om, kao i moguće prelijevanje inflacije iz velikih u male članice Eurosustava. Cilj istraživanja jest utvrditi značajnost, intenzitet i smjer statističkih veza među promatranim pojavama u razdoblju od 2015. do 2024. godine. U vezi s predmetom i ciljem istraživanja, u radu su postavljena dva istraživačka pitanja (IP):

IP1: Utječu li stope rasta ponude novca – monetarnih agregata – članica Eurosustava na harmonizirani indeks potrošačkih cijena (HICP)?

IP2: Postoji li prelijevanje inflacije velikih članica Eurosustava na inflaciju u malim članicama?

Rad je podijeljen u šest dijelova. Nakon uvoda s pregledom dosadašnjih rezultata istraživanja, u drugom dijelu daje se analiza kretanja doprinosa velikih članica eurozone ukupnim monetarnim agregatima, dok se u trećem dijelu analizira kretanje doprinosa Slovenije i Hrvatske monetarnim agregatima. U četvrtom dijelu rada definirana je metodologija istraživanja i prikazani su rezultati, a u petom dijelu slijedi kratka rasprava o rezultatima istraživanja u odnosu na postavljena pitanja. U zaključku rada donosi se sažetak istraživanja s rezultatima, ograničenjima i preporukama.

patterns. For example, in some countries, a higher consumption percentage is spent on food, which can lead to higher inflation rates. This consequently results in overall higher inflation rates in these countries, since food"weighs" a lot in their consumer baskets. c) There are also "administrative" reasons why inflation rates may vary among countries. Some prices are set or regulated by governments or local authorities, so changes in these "price controls" – or in value added taxes – may have a temporary impact on inflation. However, explanations of developments in the level of inflation in the euro area range from the interpretation of inflation as a pure monetary phenomenon related to the money supply to the so-called other specific factors that make the difference among member states, although in the disinflation process the ECB uses uniform interest rates, regardless of the size of the member state, its contributions to the total monetary aggregates and other specifics. Therefore, the subject of this research is the impact of monetary aggregate rates on national inflation levels as measured by the HICP, as well as the possible spillover of inflation from large to small Eurosystem members. The aim of the research is to determine the significance, intensity and direction of statistical links between the observed phenomena in the period from 2015 to 2024. Regarding the subject and purpose of the research, the paper poses two research questions (RQ):

RQ1: Do the growth rates of money supply – monetary aggregates – of Eurosystem member states affect the Harmonized Index of Consumer Prices (HICP)?

RQ2: Is there an inflation spillover of large Eurosystem member states s to the inflation in small member states?

The paper is divided into six parts. After the introduction with an overview of the previous research results, the second part provides an analysis of the movement of contributions of large euro area members to total monetary aggregates, while the third part analyzes the movement of contributions of

NAJVEĆE ČLANICE EUROZONE I DOPRINOSI MONETARNIM AGREGATIMA

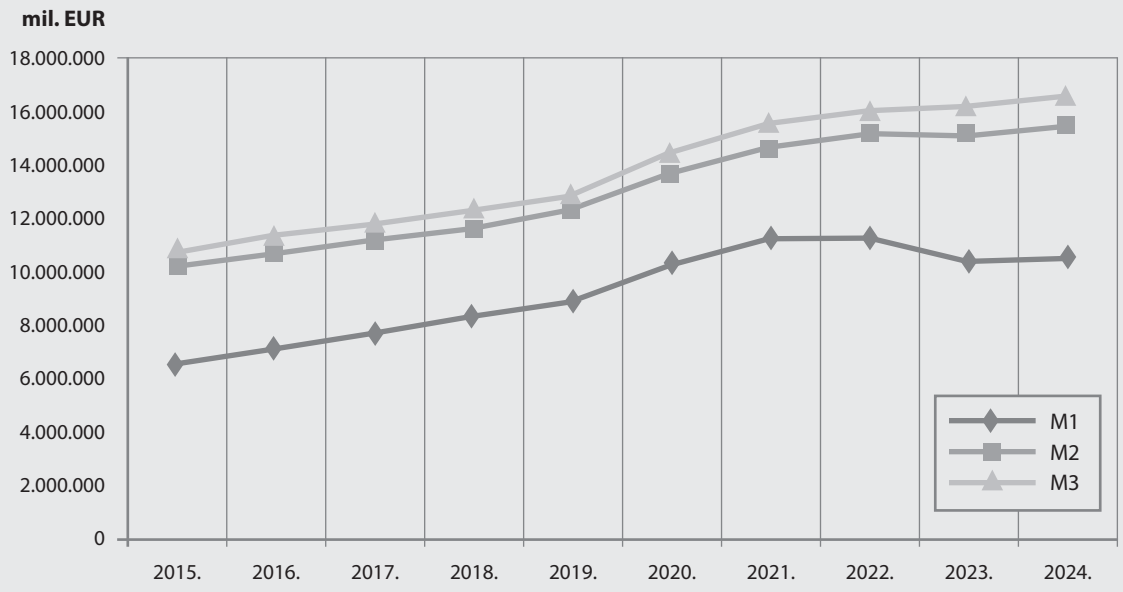
Monetarni agregati država članica eurozone prikazuju se tzv. doprinosima monetarnim agregatima u obliku doprinosa M1, M2 i M3. Države članice iste monetarne unije ne pridonose jednako monetarnim agregatima. Niz je razloga za tu nejednakost, poput veličine gospodarstava članica, pri čemu članice s jačim gospodarstvom, poput Njemačke, agregatima pridonose više od slabije gospodarski razvijenih članica, poput Hrvatske. Razlike u doprinosima monetarnim agregatima eurozone najbolje oslikava činjenica da četiri države članice sudjeluju s čak 67 % u monetarnom agregatu M1 i 66 % u monetarnom agregatu M3, dok ostalih šesnaest članica zajedno

Slovenia and Croatia to monetary aggregates. The fourth part of the paper defines the methodology of the research and presents the results, and the fifth part follows a short discussion of the research results in relation to the questions asked. The conclusion of the paper provides a summary of the research with the results, limitations and recommendations.

THE LARGEST MEMBER STATES OF THE EUROZONE AND THEIR CONTRIBUTIONS TO MONETARY AGGREGATES

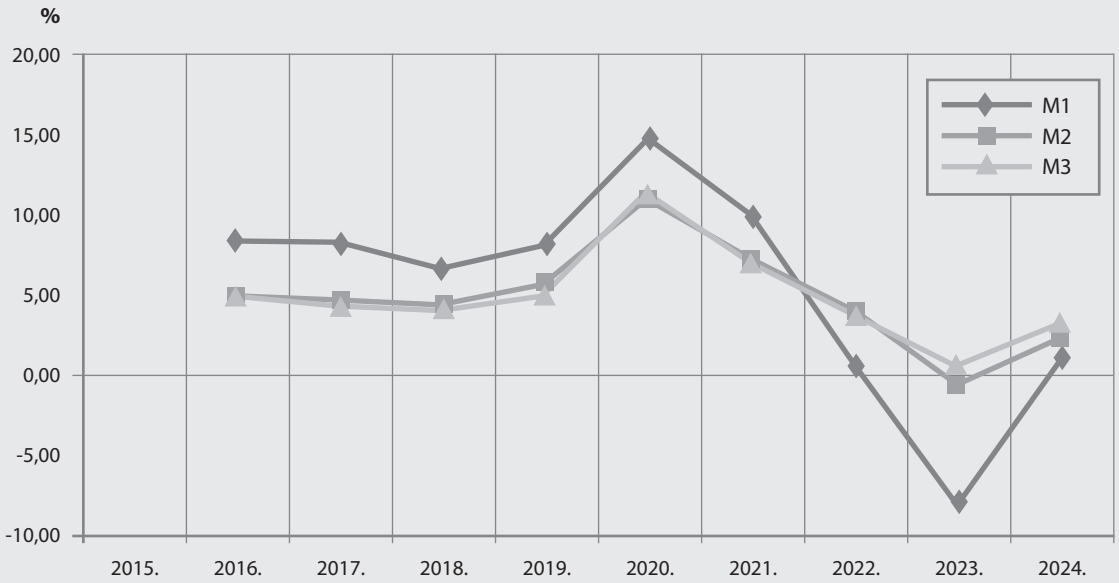
Monetary aggregates of thr Eurozone member states are represented through the so-called contributions to monetary aggregates in the form of contributions to M1, M2 and M3. Member States of the same

GRAFIKON 1. MONETARNI AGREGATI EUROZONE 2015. – 2024. (U MILIJUNIMA EUR)
GRAPH 1. EURO AREA MONETARY AGGREGATES 2015-2024 (EUR MILLION)



Izvor: Obrada autora prema podacima s https://www.euro-area-statistics.org/ (pristupljeno 20. 2. 2025.)
Source: Created by the author according to data from https://www.euro-area-statistics.org/ (accessed on Feb 20, 2025)

GRAFIKON 2. GODIŠNJE STOPE RASTA MONETARNIH AGREGATA EUROZONE 2015. – 2024. (U %)
GRAPH 2. ANNUAL GROWTH RATES OF EURO AREA MONETARY AGGREGATES 2015-2024 (IN %)



Izvor: Obrada autora / Source: Created by the author

sudjeluju sa samo jednom trećinom u svakom agregatu u eurozoni. Četiri su najutjecajnije države Njemačka, Francuska, Italija i Španjolska. U nastavku se prikazuje nominalno i relativno kretanje monetarnih agregata na razini eurozone te u četirima najvećim članicama u razdoblju od 2015. do 2024. godine. Tijekom tog razdoblja ukupna novčana masa M1 u eurozoni povećala se sa 6,631 milijarde na 10,572 milijarde eura, odnosno za 60 %. Istodobno, najširi monetarni agregat M3 povećao se s 10,873 milijarde eura na 16,726 milijardi, što predstavlja povećanje od 54 % (Grafikon 1).

Iako je kumulativna stopa rasta novčane mase M1 u razdoblju 2015. – 2024. (Grafikon 2) iznosila 50 %, a najšireg agregata M3 45 %, dinamika godišnjih stopa rasta monetarnih agregata u eurozoni zrcali zapravo ekspanzivnu i restriktivnu

monetary union do not contribute equally to monetary aggregates. There are a number of reasons for this inequality, such as the size of member state economies, where stronger economies, such as Germany, contribute more to aggregates than less economically developed members, such as Croatia. The differences in contributions to the monetary aggregates of the Euro area are best illustrated by the fact that four member states participate with as much as 67% in the monetary aggregate M1 and 66% in the monetary aggregate M3, while the other sixteen members together participate with only one third in each aggregate in the Euro area. The four most influential countries are Germany, France, Italy and Spain. The following shows the nominal and relative movements of monetary aggregates in Euro area and in the four largest member states in the period from 2015 to 2024. During this period, the total monetary supply of M1 in the Euro area

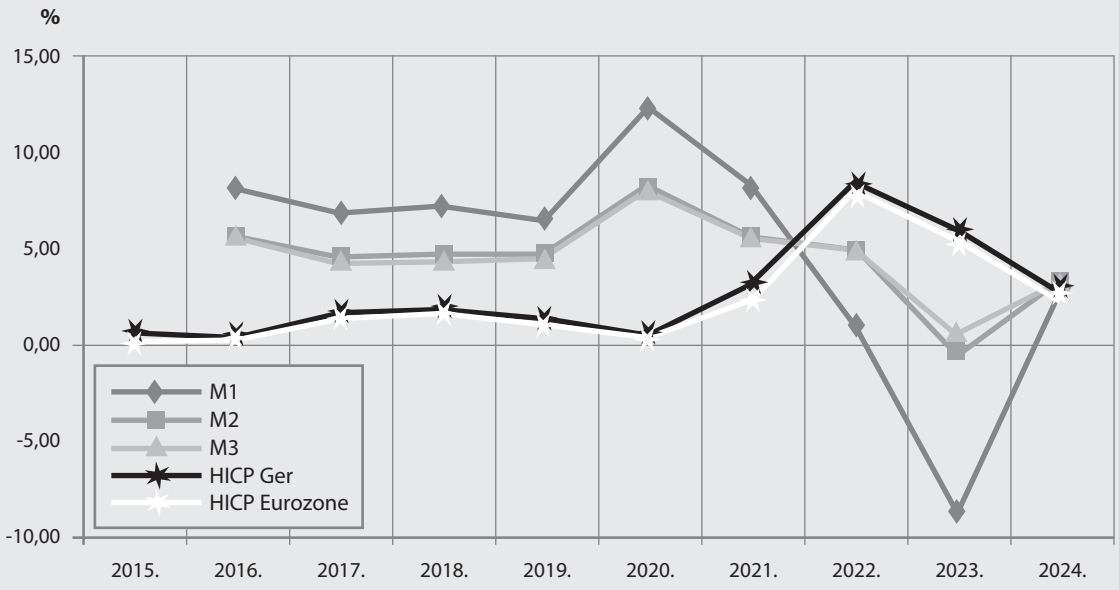
monetarnu politiku. Ekspanzija M1 traje do kraja 2021., dok se stope rasta M3 kontinuirano zadržavaju u pozitivnom području. Jasno je da su usporavanje i pad stope rasta novčane mase M1 povezani s procesom dezinflacije i podizanjem ključnih kamatnih stopa ECB-a.

S obzirom na predmet i cilj rada, u nastavku se analitički za četiri najveće članice eurozone prikazuje kretanje relativnih promjena doprinosa monetarnim agregatima te ga se povezuje s njihovim nacionalnim harmoniziranim indeksom potrošačkih cijena (HICP) i harmoniziranim indeksom potrošačkih cijena eurozone (HICP).

increased from EUR 6.631 billion to EUR 10.572 billion, i.e. by 60%. At the same time, the broadest monetary aggregate M3 increased from EUR 10.873 billion to EUR 16.726 billion, which is an increase of 54% (Graph 1).

Although the cumulative growth rate of the M1 money supply in the period 2015-2024 (Graph 2) amounted to 50%, and of the broadest aggregate M3 to 45%, the dynamics of annual growth rates of monetary aggregates in the Euro area actually reflects an expansive and restrictive monetary policy. The expansion of M1 lasts until the end of 2021, while the growth rates of M3 are continuously maintained in a positive area. Clearly, the slowdown

GRAFIKON 3. NJEMAČKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 3. GERMAN CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima Deutsche Bundesbank, https://www.bundesbank.de/en/statistics/overview-of-the-statistical-series/-/a-german-contribution-to-the-monetary-aggregate-m3-and-its-components-in-the-euro-area-808646 (pristupljeno 20. 2. 2025.)
Source: Created by the author according to the data of the Deutsche Bundesbank, https://www.bundesbank.de/en/statistics/overview-of-the-statistical-series/-/a-german-contribution-to-the-monetary-aggregate-m3-and-its-components-in-the-euro-area-808646 (accessed on Feb 20, 2025)

Njemačka na kraju 2024. godine sa svojim doprinosom M1 sudjeluje s 26 % u ukupnom agregatu M1 eurozone, dok s doprinosom M3 sudjeluje s 24 %. Na Grafikonu 3 vidi se dinamika godišnjih stopa M1–M3, kao i nacionalni HICP i HICP eurozone. Kumulativni rast M1 iznosio je 45 %, a M3 42 %. Lako se uočava da se njemački HICP, nešto viši, i HICP eurozone kreću gotovo identično, kao i da se od 2022. godine razilaze s kretanjem stopa promjena monetarnih agregata M1–M3.

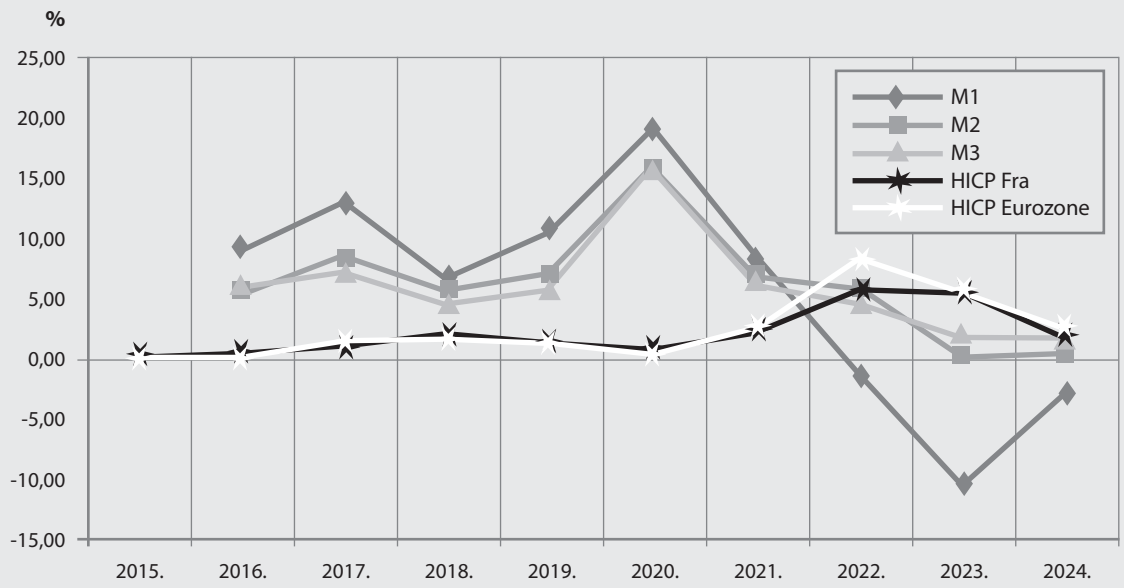
Francuska je na kraju 2024. godine s doprinosom M1 u ukupnom agregatu M1 eurozone sudjelovala s 15%, a s doprinosom M3 s 22 %. Grafikon 4 prikazuje dinamiku godišnjih stopa M1–M3, kao i nacionalni HICP i HICP eurozone. Kumulativni

and decline in the M1 money supply growth rate is linked to the disinflation process and the raising of key ECB interest rates.

Given the subject and aim of the paper, the following shows the analysis of the movement of relative changes in contributions to monetary aggregates for the four largest members of the Euro area and links it to their national harmonized index of consumer prices (HICP) and the harmonized index of consumer prices of the Euro area (HICP).

At the end of 2024, Germany participates with its M1 contribution with 26% in the total M1 Euro area aggregate, while it participates with 24% with its M3 contribution. Graph 3. shows the dynamics of annual rates of M1–M3, as well as the national

GRAFIKON 4. FRANCUSKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 4. FRENCH CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima Banque de France, https://webstat.banque-france.fr/en/#/home (pristupljeno 20. 2. 2025.)
Source: Created by the author according to the data of the Banque de France, https://webstat.banque-france.fr/en/#/home (accessed on Feb 20, 2025)

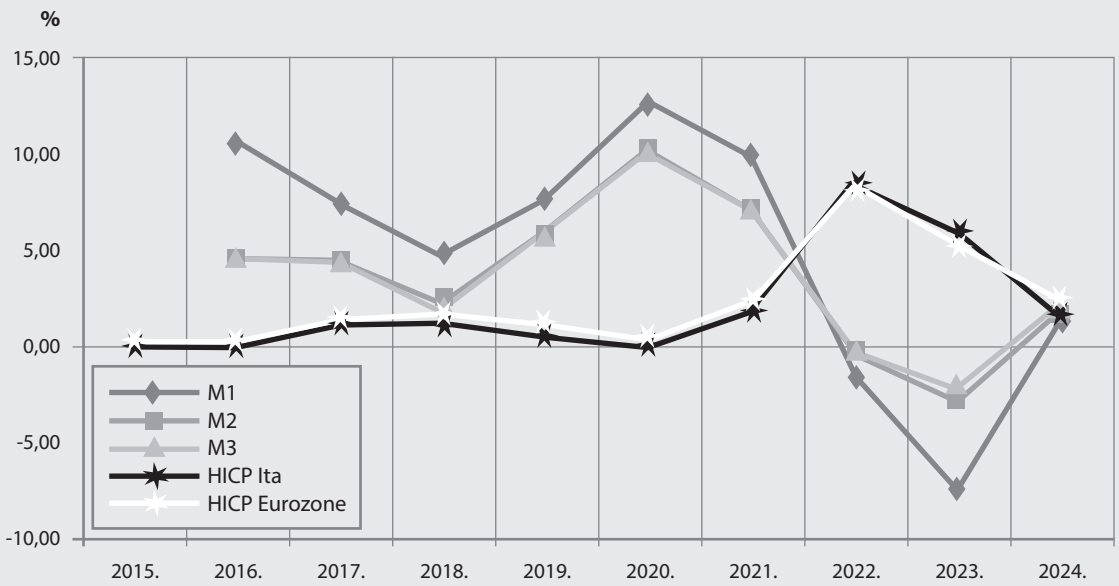
rast M1 u Francuskoj iznosio je 53 %, a M3 54 %. Također, uočava se da se francuski, nešto niži, HICP i HICP eurozone ne kreću identično i da odstupanje stopa rasta M3 od stopa inflacije nije izraženo kao u slučaju Njemačke.

Italija je na kraju 2024. godine s doprinosom M1 sudjelovala u ukupnom agregatu M1 eurozone s 14 %, a s doprinosom M3 s 12 %. Na Grafikonu 5 prikazana je dinamika godišnjih stopa M1–M3 te nacionalni HICP, koji je niži od HICP-a eurozone. Kumulativni rast M1 iznosio je 46 %, a M3 34 %. Uočava se da se talijanski HICP i HICP eurozone međusobno isprepliću na sličnoj razini i da je odstupanje stopa rasta M3 od stopa inflacije izraženo kao i u slučaju Njemačke.

HICP and the Eurozone HICP. Cumulative growth of M1 and M3 was 45% and 42%, respectively. It is easy to see that the German HICP, slightly higher, and the Eurozone HICP move almost identically, as well as that from 2022 they diverge with the movement of M1–M3 change rates.

France participated with 15% at the end of 2024 with the contribution of M1 in the total M1 Euro area aggregate, and with the contribution of M3 with 22%. Graph 4. shows the dynamics of annual rates of M1–M3, as well as the national HICP and the Eurozone HICP. Cumulative growth of M1 in France was 53% and of M3 54%. It is also noted that the French, slightly lower, HICP and the Eurozone HICP are not moving identically and

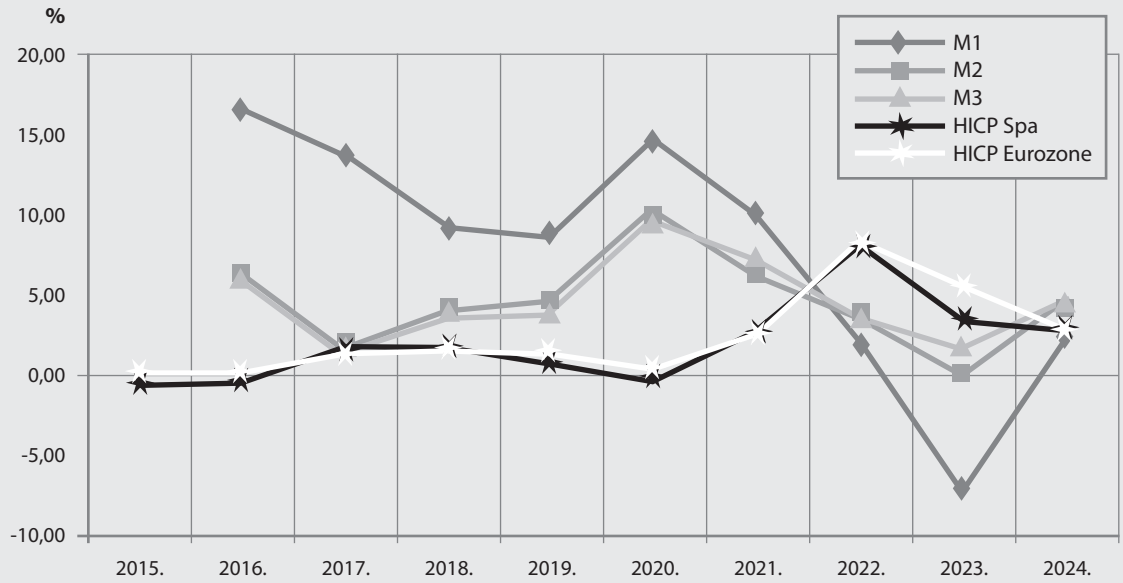
GRAFIKON 5. TALIJANSKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 5. ITALIAN CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima središnje banke Italije, https://www.bancaditalia.it/pubblicazioni/moneta-banche/index.html?com.dotmarketing.htmlpage.language=1 (pristupljeno 20. 2. 2025.)

Source: Created by the author according to the data of the Bank of Italy, https://www.bancaditalia.it/pubblicazioni/moneta-banche/index.html?com.dotmarketing.htmlpage.language=1 (accessed on Feb 20, 2025)

GRAFIKON 6. ŠPANJOLSKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 6. SPANISH CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima središnje banke Španjolske, https://www.bde.es/webbe/en/estadisticas/otras-clasificaciones/publicaciones/boletin-estadistico/capitulo-1.html (pristupljeno 20. 2. 2025.)
Source: Created by the author according to the data of the Central Bank of Spain, https://www.bde.es/webbe/en/estadisticas/otras-clasificaciones/publicaciones/boletin-estadistico/capitulo-1.html (accessed on Feb 20, 2025)

Španjolska je na kraju 2024. godine s doprinosom M1 sudjelovala u ukupnom agregatu M1 eurozone s 12,5 %, a s doprinosom M3 10 %. Grafikon 6 prikazuje dinamiku godišnjih stopa M1–M3 te nacionalni HICP i HICP eurozone. Kumulativni rast M1 iznosio je 70,5 %, a M3 43 %. Španjolski HICP i HICP eurozone nakon 2022. ne kreću se posve jednako, a odstupanje stopa M3 od stopa inflacije manje je izraženo u odnosu na Njemačku.

that the deviation of M3 growth rates from inflation rates is not as expressed as in the case of Germany.

At the end of 2024, Italy participated in the total aggregate of the M1 euro area with 14%, and with the contribution of M3 with 12%. Graph 5. shows the dynamics of annual rates of M1–M3 and the national HICP, which is lower than the Eurozone HICP. Cumulative growth of M1 was 46% and of M3 was 34%. It is noted that the Italian HICP and the Eurozone HICP are intertwined at a similar level and that the deviation of M3 growth rates from inflation rates is as pronounced as in the case of Germany.

At the end of 2024, with the contribution of M1, Spain participated in the total aggregate of the M1 Euro area with 12.5%, and with the contribution

MALE ČLANICE EUROZONE I DOPRINOSI MONETARNIM AGREGATIMA

Kao primjer malih perifernih članica eurozone uzete su Slovenija, članica eurozone od 2007. godine, i Hrvatska, koja joj se pridružila početkom 2023. Nijedna od tih članica svojim udjelom u ukupnom pojedinom monetarnom agregatu (M1–M3) ne prelazi pola postotnog boda. U skladu s istraživačkim pitanjima, sastavljena je analiza stopa promjena monetarnih agregata i stopa nacionalnog HICP-a u usporedbi s HICP-om eurozone.

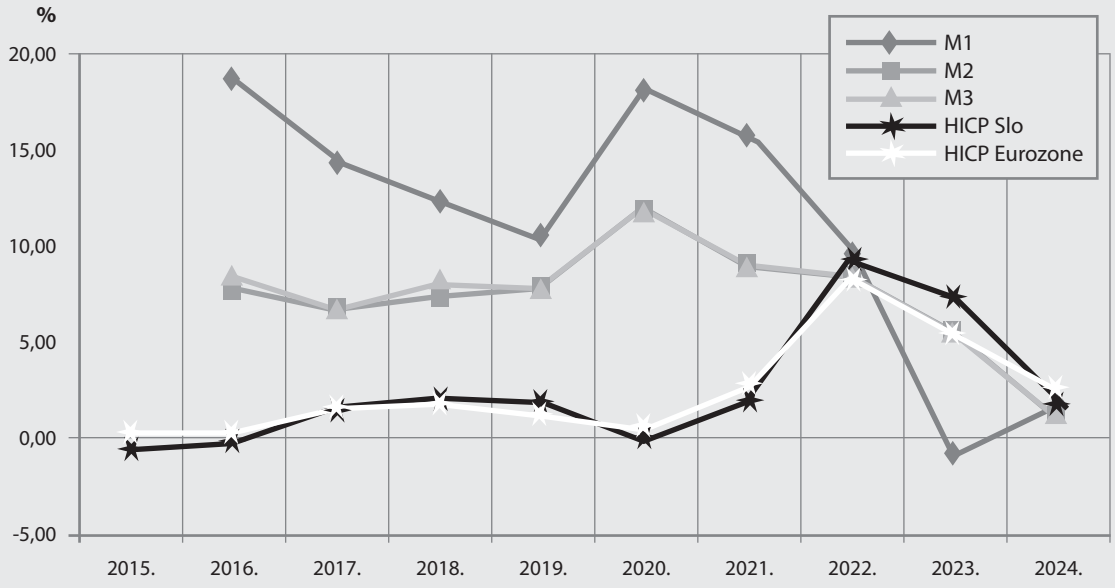
Slovenija je na kraju 2024. godine s doprinosom M1 sudjelovala u ukupnom agregatu M1 eurozone

of M3 with 10%. Graph 4. shows the dynamics of annual rates of M1–M3, as well as the national HICP and the Eurozone HICP. Cumulative growth of M1 was 70.5% and of M3 43%. Spain's HICP and the Eurozone's HICP after 2022 are not moving exactly the same, and the deviation of M3 rates from inflation rates is less pronounced compared to Germany.

THE SMALL MEMBER STATES OF THE EUROZONE AND THEIR CONTRIBUTIONS TO MONETARY AGGREGATES

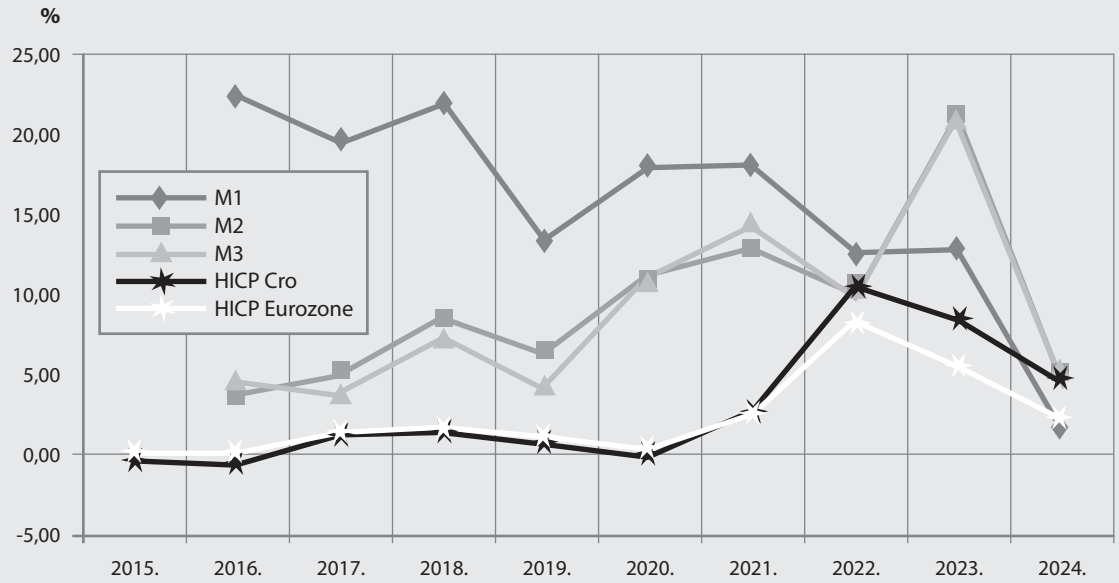
Slovenia, a member state of the Eurozone since 2007, and Croatia, which joined in early 2023,

GRAFIKON 7. SLOVENSKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 7. SLOVENIAN CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima Banke Slovenije, https://px.bsi.si/pxweb/sl/serije_slo/serije_slo__10_denar_mfi__10_denarni_agregati/?tablelist=true; https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/0400607S.px
Source: Created by the author according to the data of the Bank of Slovenia, https://px.bsi.si/pxweb/sl/serije_slo/serije_slo__10_denar_mfi__10_denarni_agregati/?tablelist=true; https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/0400607S.px

GRAFIKON 8. HRVATSKI DOPRINOS MONETARNIM AGREGATIMA S KRETANJEM HICP-A (U %)
GRAPH 8. CROATIAN CONTRIBUTION TO MONETARY AGGREGATES WITH HICP MOVEMENTS (IN %)



Izvor: Obrada autora prema podacima HNB-a, https://www.hnb.hr/statistika/statisticki-podaci/financijski-sektor/doprinos-republike-hrvatske-monetarnim-agregatima-europodrucja; https://www.hnb.hr/statistika/statisticki-podaci/odabrane-nefinancijske-statistike/indeksi-cijena

Source: Created by the author according to the CNB data, https://www.hnb.hr/statistika/statisticki-podaci/financijski-sektor/doprinos-republike-hrvatske-monetarnim-agregatima-europodrucja; https://www.hnb.hr/statistika/statisticki-podaci/odabrane-nefinancijske-statistike/indeksi-cijena

sa samo 0,3 %, a s doprinosom M3 s 0,2 %. Grafikon 7 prikazuje dinamiku godišnjih stopa M1–M3, kao i nacionalni HICP i HICP eurozone. Kumulativni rast M1 iznosio je 100 %, a M3 67 %. Uočava se da je slovenski HICP iznad HICP-a eurozone, da se ne kreću se slično i da je odstupanje M3 od stopa inflacije manje izraženo nego u Njemačkoj.

Hrvatska na kraju 2024. godine s doprinosom M1 sudjeluje u ukupnom agregatu M1 eurozone s 0,5%, a s doprinosom M3 s 0,4%. Grafikon 8 prikazuje dinamiku godišnjih stopa M1–M3 te nacionalnog HICP-a i HICP-a eurozone. Kumulativni rast M1 iznosio je 141 %, a M3 83

were taken as examples of small peripheral member states of the Eurozone. Neither of these members exceeds half a percentage point with their share in the total individual monetary aggregate (M1–M3). In line with research questions, an analysis of the rates of change of monetary aggregates and rates of the national HICP compared to the Eurozone HICP was compiled.

At the end of 2024, with the contribution of M1, Slovenia participated in the total aggregate of the M1 euro area with only 0.3%, and with the contribution of M3 with 0.2%. Graph 4. shows the dynamics of annual rates of M1–M3, as well as the national HICP and the Eurozone HICP. Cumulative growth

%. Uočava se da je hrvatski HICP znatno iznad HICP-a eurozone i da su stope rasta M1–M3 prilično iznad obaju HICP-ova. Uvođenje eura 1. siječnja 2023. ovdje je učinilo razliku u odnosu na ostale promatrane zemlje članice.

METODOLOGIJA I REZULTATI ISTRAŽIVANJA

U okviru prvog istraživačkog pitanja („Utječu li stope rasta ponude novca – monetarnih agregata – članica Eurosustava na harmonizirani indeks potrošačkih cijena (HICP)?"), s ciljem dobivanja rezultata o utjecaju monetarnih agregata na razinu HICP-a svake zemlje pojedinačno, primijenjeni su modeli višestruke regresijske analize korištenjem metode OLS.

Na temelju prethodne analize kretanja stopa rasta monetarnih agregata (M1–M3) za svaku članicu eurozone u razdoblju 2015. – 2024. te harmoniziranih indeksa potrošačkih cijena (HICP), sastavljeni su višestruki regresijski modeli za svaku zemlju s ciljem utvrđivanja utjecaja novčane mase (M1) i ukupnog financijskog potencijala (M3) u zemlji na kretanje inflacije, mjerene pomoću HICP-a. Opći linearni regresijski model (Šošić, 2004) osnovnog skupa za n vrijednosti glasi:

$$Y_i = a + b_1 x_1 + b_2 x_2 + e,$$

gdje su: Y – zavisna (endogena) varijabla koja predstavlja HICP po zemljama, x – nezavisne (egzogene) varijable koje predstavljaju monetarne agregate M1 i M3, a – nepoznati parametar, dok je e slučajna varijabla (greška relacije).

Sukladno prethodnom, specifikacije pojedinačnih modela kojima se utvrđuje utjecaj rasta ponude novca, mjerenog stopama monetarnih agregata, na stope inflacije po svakoj članici eurozone glase ovako:

$$\text{Ger}_{\text{HICP}} = a + b_1\,\text{M1} + b_2\,\text{M3} + e$$

$$\text{Fra}_{\text{HICP}} = a + b_1\,\text{M1} + b_2\,\text{M3} + e$$

of M1 and M3 was 100% and 67%, respectively. It is noted that the Slovenian HICP is above the Eurozone HICP, that they are not moving similarly and that the deviation of M3 from inflation rates is less pronounced than in Germany.

At the end of 2024, with the contribution of M1, Croatia participates in the total aggregate of the M1 Euro area with 0.5%, and with the contribution of M3 with 0.4%. Graph 8. shows the dynamics of annual rates of M1–M3 and the national HICP and the Eurozone HICP. Cumulative growth of M1 was 141% and of M3 83%. It is noted that the Croatian HICP is well above the Eurozone HICP and that the growth rates of M1–M3 are well above both HICPs. The adoption of Euro on 1 January 2023 made a difference here compared to the other observed member states.

METHODOLOGY AND RESEARCH RESULTS

Within the first research question (Do the growth rates of money supply – monetary aggregates – of Eurosystem member states affect the Harmonized Index of Consumer Prices (HICP)?) and with the aim of obtaining results on the impact of monetary aggregates on the level of HICP of each country individually, multiple regression analysis models were applied using the OLS (Ordinary Least Squares) method.

Based on the previous analysis of monetary aggregate growth rates (M1–M3) for each Euro area member state in the period 2015-2024 and the Harmonized Index of Consumer Prices (HICP), multiple regression models were compiled for each country with the aim of determining the impact of money supply (M1) and total financial potential (M3) in the country on inflation developments, measured using the HICP. The general linear regression model (Šošić, 2004) of the basic set for n values is as follows:

$$Y_i = a + b_1 x_1 + b_2 x_2 + e,$$

where: Y – dependent (endogenous) variable representing HICP by country, x – independent

⋮

$Cro_{HICP} = a + b_1 M1 + b_2 M3 + e$

Numeričkom obradom podataka pomoću programske podrške, metodom OLS u šest modela višestruke regresijske analize dobiveni su rezultati iz Tablice 1.

Rezultati modela pokazali su da je u samo trima zemljama, Njemačkoj, Francuskoj i Sloveniji, za stopu inflacije značajna samo varijabla M1 (novčana masa) (p-vrijednost < 0,05), dok varijabla M3 (najširi monetarni agregat) nije statistički značajna (p-vrijednost > 0,05). U ostalim zemljama ni M1 ni M3 kao monetarni agregati, odnosno ponuda novca, nisu značajni za kretanje stopa inflacije mjerenih HICP-om. Također, sudeći prema R^2, regresijski modeli u Njemačkoj i

(exogenous) variables representing monetary aggregates M1 and M3, *a* – unknown parameter, while *e* is a random variable (relation error).

In accordance with the foregoing, the specifications of individual models that determine the impact of money supply growth, measured by monetary aggregate rates, on inflation rates per each member of the Euro area are as follows:

$Ger_{HICP} = a + b_1 M1 + b_2 M3 + e$

$Fra_{HICP} = a + b_1 M1 + b_2 M3 + e$

⋮

$Cro_{HICP} = a + b_1 M1 + b_2 M3 + e$

By numerical data processing using software, the OLS method in six models of multiple regression analysis obtained the results from Table 1.

TABLICA 1. REZULTATI UTJECAJA PONUDE NOVCA NA KRETANJA INFLACIJE
TABLE 1. RESULTS OF THE IMPACT OF MONEY SUPPLY ON INFLATION MOVEMENTS

ČLANICA MEMBER STATE	ZAVISNA VARIJABLA (*Y*) DEPENDENT VARIABLE (*Y*)	NEZAVISNE VARIJABLE (x_1; x_2) INDEPENDENT VARIABLES (x_1; x_2)	PARAMETRI PARAMETERS	p-VRIJEDNOST p-VALUE	SD	F-TEST	R^2	VIF
Njemačka / Germany	HICP	M1	–0.7274	0.01133	0.2019	8.818	0.7462	4.7798
		M3	+1.312	**0.06856**	0.5918			4.7798
Francuska / France	HICP	M1	–0.2801	0.01893	0.08791	7.832	0.723	3.2820
		M3	+0.248	**0.2224**	0.1823			3.2820
Italija / Italy	HICP	M1	–0.3807	**0.2522**	0.3005	5.239	0.6359	7.2302
		M3	+0.03519	**0.9479**	0.5162			7.2302
Španjolska / Spain	HICP	M1	–0.198	**0.1676**	0.1261	2.069	0.4081	1.3691
		M3	–0.1013	**0.7809**	0.3482			1.3691
Slovenija / Slovenia	HICP	M1	–0.5267	0.03956	0.201	3.655	0.5492	2.4105
		M3	+0.7221	**0.1661**	0.4582			2.4105
Hrvatska / Croatia	HICP	M1	–0.2995	**0.12**	0.1653	3.502	0.5386	1.0000
		M3	+0.3417	**0.1045**	0.1788			1.0000

Izvor: Obrada autora / Source: Created by the author

Francuskoj dobro objašnjavaju varijacije inflacije, dok su u Sloveniji i Hrvatskoj vrijednosti R^2 srednje visoke (0,5492 i 0,5386), što upućuje na postojanje dodatnih čimbenika koji utječu na inflaciju. U slučaju Španjolske, koja ima najniži R^2 (0,4081), očigledno je da ponuda novca (M1 i M3) nije glavni čimbenik inflacije u zemlji.

Drugim riječima, samo u slučaju Njemačke, Francuske i Slovenije pokazalo se da na inflaciju ima utjecaj isključivo porast agregata M1, i to uz negativan predznak, dok M3 nije statistički značajan, što je suprotno teorijskim i empirijskim očekivanjima. Naime, pokazalo se da je u relativno kratkom razdoblju od 2015. do 2024. porast monetarnog agregata M1 (teorijski povezan s gospodarskim rastom koji proizlazi iz depozitno-kreditne aktivnosti banaka) utjecao na pad stope inflacije. Primjerice, u Njemačkoj je svako povećanje M1 za 1 postotni bod u prosjeku utjecalo na pad inflacije za 0,73 postotna boda, što može ukazivati na štednju ili restriktivnu monetarnu politiku koja se nije realizirala osim kao depozit u banci. Isto bi se moglo zaključiti i za francuski i slovenski monetarni agregat M1, odnosno da je u tim zemljama došlo do monetarne kontrakcije ili povećane štednje koja smanjuje potražnju.

U ostalim zemljama, kao što se može zaključiti, ponuda novca mjerena monetarnim agregatom M1 i M3 nije bila u statističkoj vezi s kretanjem inflacije, pa uzroke inflacije treba tražiti u drugim varijablama, kao što su energetski šokovi ili ugrađena očekivanja proizvođača i trgovaca, koja su se ipak dijelom realizirala iz obilne ponude novca.

U sklopu drugog istraživačkog pitanja („Postoji li prelijevanje inflacije velikih članica Eurosustava na inflaciju u malim članicama?"), s ciljem dobivanja rezultata utjecaja monetarnih agregata na razinu HICP-a svake zemlje pojedinačno, koristi se višekriterijska analiza, koja uključuje Grangeov test uzročnosti, korelaciju i višestruku regresijsku analizu (Tablica 2).

The results of the model showed that in only three countries, Germany, France and Slovenia, only the variable M1 (money supply) (p-value < 0.05) is significant for the inflation rate, while the variable M3 (broadest monetary aggregate) is not statistically significant (p-value > 0.05). In other countries, neither M1 nor M3 as monetary aggregates, i.e. money supply, are significant for the movement of inflation rates measured by the HICP. Also, judging by R^2, regression models in Germany and France explain inflation variations well, while in Slovenia and Croatia R^2 values are medium-high (0.5492 and 0.5386), suggesting the existence of additional factors influencing inflation. In the case of Spain, which has the lowest R^2 (0.4081), it is obvious that the money supply (M1 and M3) is not the main factor of inflation in the country.

In other words, only in the case of Germany, France and Slovenia has it been shown that inflation is influenced exclusively by the increase in M1 aggregates, with a negative value, while M3 is not statistically significant, which is contrary to theoretical and empirical expectations. Namely, it turned out that in a relatively short period from 2015 to 2024, the growth of the M1 monetary aggregate (theoretically related to the economic growth arising from the deposit-lending bank activity) influenced the decline in the inflation rate. For example, in Germany, each 1 percentage point increase in M1 affected inflation by an average of 0.73 percentage points, which may indicate savings or a restrictive monetary policy that was not drawn upon except as a bank deposit. The same could be concluded for the French and Slovenian monetary aggregate M1, i.e. that there has been a monetary contraction or increased demand-reducing savings in these countries.

In other countries, as can be concluded, the money supply measured by monetary aggregates M1 and M3 was not statistically related to the movement of inflation, so the causes of inflation should be looked for in other variables, such as energy shocks or built-in expectations of producers and traders, which were nevertheless partly drawn upon from the abundant money supply.

TABLICA 2. VIŠEKRITERIJSKA ANALIZA UČINAKA PRELIJEVANJA INFLACIJE IZ VELIKIH ČLANICA EUROSUSTAVA U MALE ČLANICE
TABLE 2. MULTI-CRITERIA ANALYSIS OF THE EFFECTS OF INFLATION SPILLOVERS FROM LARGE EUROSYSTEM MEMBER STATES TO SMALL MEMBER STATES

MALE ČLANICE EUROZONE (Y) SMALL EUROZONE MEMBERS (Y)	VELIKE ČLANICE EUROZONE (X) LARGE EUROZONE MEMBERS (X)	GRANGEOV TEST UZROČNOSTI GRANGE CAUSALITY TEST			KORELACIJA CORRELATION		VIŠESTRUKA REGRESIJA MULTIPLE REGRESSION
		Y = f(X)	p-VRIJEDNOST p-VALUE	F-TEST	PEARSON	p-VRIJEDNOST p-VALUE	p-VRIJEDNOST p-VALUE
Slovenija Slovenia	Njemačka (X1) / Germany	DA	0.0009	48.0540	0.982	0,00	0.6578
	Francuska (X2) / France	**NE**	0.9488	0.0045	0.984	0,00	0.1589
	Italija (X3) / Italy	**NE**/DA	0.0962	4.1816	0.99	0,00	0.1461
	Španjolska (X4) / Spain	**NE**	0.3768	0.9400	0.904	0,00	0.6146
Hrvatska Croatia	Njemačka (X1) / Germany	**NE**	0.1645	2.6490	0.982	0,00	0.2552
	Francuska (X2) / France	**NE**	0.3870	0.8972	0.964	0,00	0.799
	Italija (X3) / Italy	**NE**	0.9326	0.0079	0.967	0,00	0.5006
	Španjolska (X4) / Spain	**NE**	0.7646	0.0999	0.915	0,00	0.6898

Izvor: Obrada autora / Source: Created by the author

Prema dobivenim rezultatima, utjecaj inflacije velikih europskih zemalja na Sloveniju i Hrvatsku prilično je diferenciran. Ovo su ključna opažanja:

1. Grangeov test uzročnosti:

a) Slovenija – Njemačka ima statistički značajan kauzalni učinak na slovenski HICP (p = 0,0009), dok Italija granično pokazuje određenu kauzalnost (p = 0,0962). Francuska i Španjolska nemaju utjecaja.

b) Hrvatska – Nijedna od velikih ekonomija ne pokazuje statistički značajan uzročan utjecaj na hrvatski HICP.

2. Korelacija (Pearsonov koeficijent):

Sve velike članice eurozone imaju visoke koeficijente korelacije sa Slovenijom i Hrvatskom (iznad 0,9), što sugerira snažnu povezanost između njihovih inflacijskih kretanja. Ipak, sama korelacija ne znači nužno uzročnost, što potvrđuju rezultati Grangeova testa.

As part of the second research question (Is there an inflation spillover of large Eurosystem member states s to the inflation in small member states?) in order to obtain the results of the impact of monetary aggregates on the level of the HICP of each country individually, a multi-criteria analysis is used, which includes the Granger causality test, correlation and multiple regression analysis (Table 2).

According to the obtained results, the impact of inflation of large European countries on Slovenia and Croatia is quite differentiated. Here are the key observations:

1. Granger causality test

a) Slovenia – Germany has a statistically significant causal effect on the Slovenian HICP (p = 0.0009), while Italy marginally shows some causality (p = 0.0962). France and Spain have no influence.

b) Croatia – None of the major economies show a statistically significant causal impact on the Croatian HICP.

3. Višestruka regresija (F-test i p-vrijednost):

a) Za Sloveniju – Njemačka pokazuje vrlo snažan statistički značajan utjecaj (p = 0,0009, F = 48,05), dok ostale zemlje nisu značajne.

b) Za Hrvatsku – nijedna od velikih ekonomija ne pokazuje značajan utjecaj u višestrukoj regresiji.

Sukladno dobivenim rezultatima, moglo bi se zaključiti da u slučaju Slovenije postoji snažna uzročna veza s Njemačkom i potencijalno Italijom, pa bi se inflacija iz tih ekonomija mogla prelijevati prema Sloveniji. U slučaju Hrvatske nema dokaza izravnog prelijevanja inflacije iz velikih članica Eurosustava, iako visoka korelacija sugerira da su inflacijski trendovi slični, ali nisu nužno uzročno povezani.

DISKUSIJA

U većini zemalja M1 ima negativan utjecaj na inflaciju, što može ukazivati na to da veći rast uskog monetarnog agregata (uslijed povećane kreditne aktivnosti banaka) ne dovodi nužno do povećanja inflacije. S druge strane, M3 u većini slučajeva ima pozitivan učinak, ali rijetko statistički značajan, što sugerira da ukupna monetarna ponuda može igrati ulogu u dugoročnim inflatornim kretanjima, ali ne uvijek u kratkom roku. Razlike među zemljama ukazuju na to da monetarna politika i transmisijski mehanizmi nisu jednaki u svim članicama Eurosustava. Općenito, ovi rezultati upućuju na potrebu za dodatnim istraživanjem, koje uključuje strukturne razlike u gospodarstvima i moguće učinke drugih makroekonomskih čimbenika na inflaciju. Ako se razmotre mogući kanali prijenosa inflacije iz velikih članica eurozone na manje ekonomije poput Slovenije i Hrvatske, moglo bi ih se podijeliti u nekoliko ključnih kategorija: a) trgovinski kanal (uvoz inflacije), b) cjenovna konvergencija i tržište rada, c) monetarna politika i tečajni kanal, d) energetski kanal. U kontekstu trgovinskog kanala (uvoz inflacije), Slovenija ima snažne trgovinske veze s Njemačkom, posebice

2. Correlation (Pearson coefficient):

All major Euro area member states have high correlation coefficients with Slovenia and Croatia (above 0.9), suggesting a strong correlation between their inflation developments. Nevertheless, the correlation itself does not necessarily mean causality, as confirmed by the Granger test results.

3. Multiple regression (F-test and p-value):

a) For Slovenia – Germany shows a very strong statistically significant impact (p = 0.0009, F = 48.05), while other countries are not significant.

b) For Croatia – none of the major economies show a significant impact in the multiple regression.

In accordance with the results obtained, it could be concluded that in the case of Slovenia there is a strong causal link with Germany and potentially Italy, so inflation from these economies could spill over to Slovenia. In the case of Croatia, there is no evidence of a direct spillover of inflation from large Eurosystem members, although the high correlation suggests that inflation trends are similar but not necessarily causally related.

DISCUSSION

In most countries, M1 has a negative impact on inflation, which may indicate that higher growth of narrow monetary aggregate (due to increased lending activity of banks) does not necessarily lead to an increase in inflation. On the other hand, M3 has a positive effect in most cases, but that positive effect is rarely statistically significant, which suggests that the overall monetary supply may play a role in long-term inflation developments, but not always in the short term. Differences among countries indicate that monetary policy and transmission mechanisms are not equal in all Eurosystem members. In general, these results are indicating the need for additional research, which includes structural differences in economies and the possible effects of other macroeconomic factors on inflation. If we take into account possible

putem industrijskih lanaca opskrbe (automobilska i prerađivačka industrija). Ako inflacija u Njemačkoj raste zbog viših troškova proizvodnje, to se može preliti na slovenske proizvođače i potrošače. S druge strane, Hrvatska uvozi velik dio dobara iz Njemačke i Italije, ali je trgovinska struktura više orijentirana na sektor usluga i turizam. To može objasniti slabiju uzročnost – inflacija u Njemačkoj prenosi se na uvoznu robu, ali manje na ukupni indeks potrošačkih cijena. Moglo bi se reći da trgovinski kanal jače utječe na Sloveniju zbog veće uključenosti u industrijske lance eurozone dok Hrvatska više uvozi finalne proizvode, gdje inflacija uvoza nije uvijek presudna za ukupnu inflaciju. S obzirom na cjenovnu konvergenciju i tržište rada, Slovenija kao članica eurozone s industrijskom bazom i većim udjelom radne snage u proizvodnim sektorima osjetljivija je na rast cijena sirovina i međufaznih proizvoda. Usto, viši troškovi rada u Njemačkoj mogu povećati troškove proizvodnje u Sloveniji zbog sličnih modela plaća. U Hrvatskoj je tržište rada više segmentirano, s naglaskom na turizam i uslužni sektor, koji su manje izravno povezani s inflacijom u Njemačkoj i Francuskoj. Turizam također stvara sezonske oscilacije, koje mogu prikriti izravan učinak uvoznih cijena pa bi se moglo reći da je Slovenija jače povezana s cjenovnom konvergencijom eurozone, dok je Hrvatska, zbog strukture gospodarstva, otpornija na ovaj kanal. Nadalje, što se tiče monetarne politike i tečajnog kanala, obje su zemlje u eurozoni pa se primjenjuje jedinstvena monetarna politika ECB-a. No Hrvatska je tek nedavno ušla u eurozonu (2023.), dok je Slovenija njezina članica od 2007. godine, što može upućivati na to da se prijenos inflacije monetarnim mehanizmima u Hrvatskoj još uvijek nije u potpunosti stabilizirao. Slovenija je dulje u eurozoni i stoga stabilnije integrirana u monetarne tokove, dok u Hrvatskoj još mogu postojati kašnjenja u prijenosu inflacije zbog ranijeg korištenja kune i njezina strogo kontroliranog tečaja. Konačno, gledajući energetski kanal, inflacija u eurozoni često je povezana s cijenama energije (nafta, plin, struja). U tom smislu,

channels of transfer of inflation from large Euro area members to smaller economies such as Slovenia and Croatia, they could be divided into several key categories :a) trade channel (inflation import), b) price convergence and labour market, c) monetary policy and exchange rate channel, d) energy channel. In the context of the trade channel (inflation imports), Slovenia has strong trade links with Germany, in particular through industrial supply chains (automotive and manufacturing industries). If inflation in Germany rises due to higher production costs, this can spill over to Slovenian producers and consumers. On the other hand, Croatia largely imports its goods from Germany and Italy, but the trade structure is more oriented towards the services sector and tourism. This may explain the weaker causality – inflation in Germany is passed on to imported goods, but less to the overall consumer price index. It could be said that the trade channel has a stronger impact on Slovenia due to greater involvement in the industrial chains of the Eurozone while Croatia imports more final products, where import inflation is not always crucial for overall inflation. Given the price convergence and the labour market, Slovenia, as a member of the Eurozone with an industrial base and a higher share of the labour force in manufacturing sectors, is more sensitive to the increase in prices of raw materials and intermediate products. In addition, higher labour costs in Germany can increase production costs in Slovenia due to similar wage models. In Croatia, the labour market is more segmented, with an emphasis on tourism and the service sector, which are less directly related to inflation in Germany and France. Tourism also creates seasonal fluctuations, which can disguise the direct effect of import prices, so it could be said that Slovenia is more closely linked to the price convergence of the Euro area, while Croatia, due to the structure of its economy, is more resistant to this channel. Furthermore, in terms of monetary policy and the exchange rate channel, both countries are members of the Euro area, so the ECB's single monetary policy applies. However, Croatia has

Slovenija ima veću industrijsku potrošnju energije, što znači da poskupljenja energenata u Njemačkoj i Italiji imaju jači utjecaj na slovensku inflaciju. S druge strane, Hrvatska ima veću ovisnost o turizmu, gdje energenti čine manji udio troškova u odnosu na ukupnu potrošnju, pa je prelijevanje inflacije iz energetskog sektora vjerojatno jače u Sloveniji nego u Hrvatskoj.

ZAKLJUČAK

U ovom istraživanju postavljena su dva istraživačka pitanja u skladu s predmetom i ciljem rada. Prvo pitanje glasi: Utječu li stope rasta ponude novca – monetarnih agregata – članica Eurosustava na harmonizirani indeks potrošačkih cijena (HICP)? Rezultati istraživanja pokazali su da utjecaj monetarnih agregata na inflaciju unutar Eurosustava nije jednoznačan i da varira među državama članicama. Dok je u nekim zemljama, poput Njemačke i Francuske, zabilježena statistički značajna veza između rasta monetarne ponude i inflacije, u drugim slučajevima taj odnos nije potvrđen. Drugo istraživačko pitanje bilo je: Postoji li prelijevanje inflacije velikih članica Eurosustava na inflaciju u malim članicama? Rezultati upućuju na to da ne postoji posve jasan dokaz sustavnog prelijevanja inflacije iz velikih članica u manje članice Eurosustava, osim u relaciji između Njemačke i Slovenije.

Ovi nalazi upućuju na to da su inflacijski procesi u eurozoni složeni i pod utjecajem šireg spektra ekonomskih čimbenika, što zahtijeva daljnja istraživanja i šire metodološke pristupe. Također, ovakvi divergentni rezultati istraživanja utjecaja i povezanosti ponude novca (monetarnih agregata) i inflacije u pojedinim članicama Eurosustava podudaraju se s dosadašnjim istraživanjima koja ističu signalnu vrijednost monetarnih agregata za inflaciju (Borio, 2023), dok neki autori naglašavaju veću potrebu za istraživanjem utjecaja komponenata agregata nego zbirnog agregata na inflaciju (Greiber i Lemke, 2005). Dodatno,

only recently joined the Eurozone (2023), while Slovenia has been a member since 2007, which may indicate that the transmission of inflation through monetary mechanisms in Croatia has not yet been fully stabilized. Slovenia has been in the Euro area for a longer period of time and is therefore more stable in monetary flows, while in Croatia there may still be delays in the transmission of inflation due to the earlier use of kuna currency and its strictly controlled exchange rate. Finally, observing the energy channel, inflation in the Euro area is often linked to energy prices (oil, gas, electricity). In this sense, Slovenia has a higher industrial energy consumption, which means that increased energy prices in Germany and Italy have a stronger impact on Slovenian inflation. On the other hand, Croatia is largely dependent on tourism, where energy products account for a smaller share of costs compared to total consumption, so the inflation spillover from the energy sector is probably stronger in Slovenia than in Croatia.

CONCLUSION

In this research, two research questions were asked in accordance with the subject and purpose of the paper. RQ1: Do the growth rates of money supply – monetary aggregates – of Eurosystem member states affect the Harmonized Index of Consumer Prices (HICP)? The results of the research showed that the impact of monetary aggregates on inflation within the Eurosystem is not unambiguous and it varies among member states. While in some countries, such as Germany and France, there has been a statistically significant link between monetary supply growth and inflation, in other cases this relationship has not been confirmed. The second research question was: Is there a spillover of inflation of large Eurosystem member states to inflation in small member states? The results indicate that there is no clear evidence of a systematic spillover of inflation from large members to smaller members of the Eurosystem, except in the relation between Germany and Slovenia.

ovakvim rezultatima pridonose i zaključci istraživanja Gertlera i Hofmanna (2018) te Boria i dr. (2023), koja su pokazala da je veza između rasta ponude novca i inflacije jaka u razdoblju kada je inflacija visoka, a slaba u razdoblju kada je inflacija niska – što bi upućivalo na potrebu dekompozicije godišnje stope na kvartalne, osobito u tromjesečjima 2022. i 2023. godine. Doprinosom istraživanja novim spoznajama o odnosu ponude novca i stopa inflacije mogu se smatrati smjer i jačina veza, kao i značajnost monetarnih agregata za harmonizirani indeks potrošačkih cijena po zemljama članicama koje dominiraju eurosustavom. Drugi doprinos istraživanja odnosi se na spoznaju slabog prelijevanja stopa inflacije iz velikih članica na manje članice (Slovenija i Hrvatska) pa stope inflacije, primjerice u Hrvatskoj, treba tražiti u drugim varijablama, kao što su struktura gospodarstva, ekonomski ciklusi ili administrativni propisi. Vremenski niz podataka predstavlja objektivno ograničenje istraživanja, kao i neuravnoteženo kretanje stopa inflacije tijekom samo dviju godina (2022. i 2023.). Unatoč tome, istraživanje pruža okvir za izvođenje zaključaka i podlogu za daljnja istraživanja na ovu temu, koja se mogu usmjeriti na sastavnice (komponente) monetarnih agregata prema ročnosti u pasivi banaka ili na uključivanje dinamičnog kretanja inflacijskih stopa na mjesečnoj ili tromjesečnoj razini. Čini se neupitnim da slijede nova istraživanja o koheziji inflacije (visoke korelacije inflacije članica s HICP-om eurozone) i asimetriji inflacije (niže korelacije za određene zemlje), s ciljem pronalaženja prilagođenijih mjera unutar zajedničkog okvira monetarne politike radi odgovora na specifične nacionalne potrebe monetarne i financijske stabilnosti te gospodarskog rasta.

These findings suggest that inflation processes in the Euro area are complex and are influenced by a wider range of economic factors, which requires further research and broader methodological approaches. Also, such divergent results of research on the impact and connection between the supply of money (monetary aggregates) and inflation in some members of the Eurosystem coincide with previous research that highlights the signal value of monetary aggregates for inflation (Borio, 2023), while some authors emphasize the greater need to investigate the impact of aggregate components rather than of joint aggregates on inflation (Greiber and Lemke, 2005). In addition, the conclusions of research conducted by Gertler and Hofmann (2018) and Boria et al. (2023) contribute to these results, showing that the link between money supply growth and inflation is strong in a period when inflation is high and weak in a period when inflation is low – which would indicate the need to decompose the annual rate to quarterly, especially in the quarters of 2022 and 2023. A contribution of the research to new insights into the relationship between money supply and inflation rates is the direction and strength of correlations, as well as the significance of monetary aggregates for the harmonized index of consumer prices by member states that dominate the Eurosystem. The second contribution of the research relates to the fact that it has indicated that tere is the weak spillover of inflation rates from large members to smaller members (Slovenia and Croatia), so inflation rates, for example in Croatia, should be looked for in other variables, such as the economic structure, economic cycles or administrative regulations. The time course of data represents an objective limitation of the research, and so does an unbalanced movement of inflation rates over only two years (2022 and 2023). In spite of that, the survey provides a framework for drawing conclusions and creating a basis for further research on this subject, which can focus on the components of monetary aggregates according to maturity in banks' liabilities or on the inclusion

of the dynamic movement of inflation rates on a monthly or quarterly basis. New research on inflation cohesion (high inflation correlations of member states with the Eurozone HICP) and inflation asymmetry (lower correlations for certain countries) will unquestionably follow, with the aim of finding more tailored measures within the common monetary policy framework to respond to specific national needs of monetary and financial stability and economic growth.

LITERATURA / LITERATURE

AGUILAR, A., GUERRA, R., & MARTINEZ, B. (2024). Global inflation, inflation expectations and central banks in emerging markets. *BIS Working Papers*, No. 1217, October 2024.

BANCA D'ITALIA (2025). Banks and Money: National Data. Retrieved February 20, 2025, from https://www.bancaditalia.it/pubblicazioni/moneta-banche/index.html?com.dotmarketing.htmlpage.language=1

BANCO DE ESPAÑA (2025). Main economic indicators of the euro area. *Statistical Bulletin*. Retrieved February 20, 2025, from https://www.bde.es/webbe/en/estadisticas/otras-clasificaciones/publicaciones/boletin-estadistico/capitulo-1.html

BANKA SLOVENIJE, Evrosistem (2025). Bilten, Februar 2025. https://www.bsi.si/sl/publikacije?q[type]=15https://bankaslovenije.blob.core.windows.net/publication-files/bil2023_06.pdf

BANKA SLOVENIJE, Evrosistem (2025). Podatkovne serije Banke Slovenije. Denarni agregati. https://px.bsi.si/pxweb/sl/serije_slo/serije_slo__10_denar_mfi__10_denarni_agregati/?tablelist=true

BANQUE DE FRANCE. Webstat: Banque de France's Statistical Portal. Retrieved February 20, 2025, from https://webstat.banque-france.fr/en/#/home

BORIO, C. & LOWE, P. (2004). Securing sustainable price stability: Should credit come back from the wilderness? *BIS Working Papers*, No. 157, 02 July 2004.

BORIO, C., DISYATAT, P., XIA, D., & ZAKRAJŠEK, E. (2021). Monetary policy, relative prices and inflation control: flexibility born out of success. B*IS Quarterly Review*, September, 15–29.

BORIO, C., HOFMANN, B., & ZAKRAJŠEK, E. (2023). Does money growth help explain the recent inflation surge? *BIS Bulletin*, No. 67, 26 January 2023.

BORIO, C., LOMBARDI, M., YETMAN, J., & ZAKRAJŠEK, E. (2023). The two-regime view of inflation. *BIS Papers*, No. 133.

BRILL, M. C., NAUTZ, D., & SIECKMANN, L. (2020). Divisia monetary aggregates for a heterogeneous euro area. *Empirica*, *48*(1), 247–278.

CADAMURO, L. & PAPADIA, F. (2021). Does money growth tell us anything about inflation? *Bruegel Working Paper*, No. 11/2021.

CARSTENSEN, K. (2004). Is European money demand still stable? *Kiel Working Papers*, No. 1179. Kiel Institute for the World Economy.

DEUTSCHE BUNDESBANK (2025). German contribution to the monetary aggregate M3 and its components in the euro area. Retrieved February 20, 2025, from https://www.bundesbank.de/en/statistics/overview-of-the-statistical-series/-/a-german-contribution-to-the-monetary-aggregate-m3-and-its-components-in-the-euro-area-808646

DZS (2025). https://podaci.dzs.hr/

ECB (2021). An Overview of the ECB's Monetary Policy Strategy. July 2021. https://www.ecb.europa.eu/home/search/review/pdf/ecb.strategyreview_monpol_strategy_overview.en.pdf

ECB (2025). Monetary agregates. Money, credit and banking. *ECB Data Portal*. https://data.ecb.europa.eu/publications/money-credit-and-banking/3031796

ECB (2025). Statistical Data Warehouse. *ECB Data Portal*. https://data.ecb.europa.eu/

EUROSTAT (2025). Harmonised Indices of Consumer Prices (HICP). https://ec.europa.eu/eurostat/web/hicp

GERLACH, S., BROWNE, F., & HONOHAN, P. (2004). The two pillars of the European Central Bank. *Economic Policy*, *19*(40), 389–439.

GERTLER, P. & HOFMANN, B. (2018). Monetary facts revisited. *Journal of International Money and Finance*, *86*(C), 154–70.

GREIBER, C. & LEMKE, W. (2005). Money demand and macroeconomic uncertainty. *Deutsche Bundesbank Discussion Paper*, *Series 1: Economic studies*, 26/2005.

HNB Eurosustav (2025). *Bilten 296*. Godina XXXI, Veljača 2025. Hrvatska narodna banka. https://www.hnb.hr/c/document_library/get_file?uuid=af0145b1-8ce7-0f9e-4278-fe183c679941&groupId=20182&p_auth=1eVceTDw

HNB Eurosustav (2025). Doprinos Republike Hrvatske monetarnim agregatima europodručja. https://www.hnb.hr/statistika/statisticki-podaci/financijski-sektor/doprinos-republike-hrvatske-monetarnim-agregatima-europodrucja

HNB Eurosustav (2025). Indeksi cijena. https://www.hnb.hr/statistika/statisticki-podaci/odabrane-nefinancijske-statistike/indeksi-cijena

HNB Eurosustav (2025). Tablica A1 – Monetarni i kreditni agregati. https://www.hnb.hr/-/tablica-a1-monetarni-i-kreditni-agregati

IBM SPSS Statistics

KING, M. (2021). Monetary policy in a world of radical uncertainty. *IIMR Conference Papers Series*, November.

MEHTAJ, M. A. & RUMPF, M. (2024, November 20). Why inflation differs across countries. European Central Bank. https://data.ecb.europa.eu/blog/blog-posts/why-inflation-differs-across-countries#:~:text=Several%20factors%20may%20contribute%20to,of%20the%20HICP%20consumption%20basket

NEUMANN, M. J. M. & GREIBER, C. (2004). Inflation and core money growth in the euro area. *Deutsche Bundesbank Discussion Paper*, *Series 1: Studies of the Economic Research Centre*, 36/2004.

SARGENT, T. J. & SURICO, P. (2011). Two illustrations of the quantity theory of money: Breakdowns and revivals. *American Economic Review*, *101*(1), 109–28.

SCHNABEL, I. (2023). Money and inflation. Speech. Thünen Lecture by Isabel Schnabel, Member of the Executive Board of the ECB, at the annual conference of the Verein für Socialpolitik. Regensburg, 25 September 2023. https://www.ecb.europa.eu/press/key/date/2023/html/ecb.sp230925_1~7ad8ef22e2.en.html

STATISTIČNI URAD REPUBLIKE SLOVENIJE. Harmonized index of consumer prices at constant tax rates by ECOICOP classification, Slovenia, monthly. *SiStat Database*. https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/0400607S.px

ŠOŠIĆ, I. (2004). *Primijenjena statistika*. Školska knjiga.