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CONTENTS:

METHODOLOGICAL ISSUES IN MEASURING COUNTRIES INFLATION

Vera Karadjova[1], **Aleksandar Trajkov**[2], **Cvetko Andreeski**[3]

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Abstract

The paper intends to analyze the methodological aspects of inflation measurement through comparative analysis of three inflation measures, i.e. the strengths and weaknesses of certain inflation indicators. Besides to unemployment and economic growth, the problem of inflation is one of the three central problems in macroeconomic analysis. Inflation is a complex phenomenon and a serious disturbance of the stability of contemporary financial systems. The causal intertwining of the financial and real sector of the economy makes inflation an even more serious disturbance of the macroeconomic balance, and in that sense imposes the need to manage it as an imperative. But the number of economic categories and other factors that directly or indirectly affect inflation make some difficultiesin its measurement, and imply a number of indicators through which its rate is determined and monitored.

The simplest determination of inflation as a general increase in the price level is anissue of interest for a number of entities and is subject to assessment, measurement and analysis by professional and scientific, but also political and business groups. Starting from the simplest explanation of the phenomenon of inflation as a condition in the economy when monetary(purchasing) funds exceed commodity funds, the key question refers to the indicators used to measure such a condition and their methodological processing. In conditions of strong inflation risk, the paper elaborates the most important methodological issues in measuring inflation in countries around the world (n the example of Macedonia, Serbia, Slovenia and EMU) through several commonly used indicators, including: Consumer Price Index - (CPI) -Consumer prices (annual%), GDP deflator (annual%), Food production index etc. Monitoring the annual changes of these indicators will show their methodological strengths and weaknesses and the need for their combined use.

Keywords: Inflation, Consumer Price Index – (CPI), Consumer Prices (Annual %), GDP Deflator (annual %), Food Production Index

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1. Introduction

Inflation is one of the most complex and complicatedeconomic phenomena. Defined as a general rise in the price level, inflation is one of the basic economic characteristics and problems of the modern world. The issue of inflation is an issue that occupies professional and scientific, but also political and business subjects. In an attempt to determine the complex phenomenon of inflation, the simplest explanation would be that it is a state of the economy when monetary funds exceeds the supply of goods and services, that in itself and according to the basic economic rules of supply and demand causes growth in the general price level. Exploring this rule, if we go back in economic history, Keynes' multiplicative model focused on the impact of changes in aggregate demand on output and unemployment, while the impact of prices was neglected. But it is noticeable that in modern economies prices tend to rise throughout the year, and sometimes very quickly. Each time when nominal GDP rises, the price components raise along with the production components. Inflation occurs whenever the general price level rises, while the inflation rate is defined as the percentage change in the price level.

According to the creators of the quantitative theory of inflation, the amount of money in the economy determines the value of money, and the increase in the amount of money is the main cause of inflation. This is confirmed by monitoring the amount of money in circulation and the inflation rate, as well as the price level, and all categories show almost identical changes. In such circumstances, several essential questions arise: a/. Under what circumstances and for what purpose are surpluses injected into economies?b/. What mechanisms can be used to control the inflationary effect arising from the imbalance of monetary and commodity funds?c/. What is the turning point at which inflation becomes a serious problem for the functioning of the economy? d/. What is the connection of the so-called "Inflation" tax and impoverishment of the population? e/. For what purpose will the excess money be used? This issue is especially important, especially in the context of the claim of some monetarists that controlled inflation can boost economic growth. This, in turn, imposes the need for parallel monitoring of inflation rates and growth rates, as well as examining the long-term correlation of these phenomena. In the context of pursuing such an economic policy, the key point is of course the distinction between production consumption and final consumption. Both consumptions put pressure on the demand side of money, but with completely different macroeconomic effects and pressure on price growth.

The question that is essential for the correctness of the conclusions is always the methodology according to which the obvious phenomena are quantified. Thus, the explanation of the inflation phenomenon is inevitably related to the indicators with which it is measured and the methodology according to which those indicators are calculated. Moreover, despite the harmonization of most indicators, there are still differences in their content, as well as in the methodological procedure of their quantitative expression. These differences certainly exist in a historical context (i.e. some of the indicators have changed,

and new ones have been established as complementary measures to the existing ones), but there are also differences in a geographical context (certain differences in the content or in the weights of some indicators). Some of the differences that cause methodological advantages or disadvantages will be discussed below, and among the indicators that are now used to quantify inflation are: cost of living index, the rise in prices of consumer goods, the rise in prices of agricultural or industrial products, GDP deflator,etc. Thereby, price increases can be tracked through a defined basis or through continuous chain changes.

2. Literature review

There is a large body of literature referring to the inflation as a phenomenon, and to the indicators for its measurement. All contemporary authors start from Friedman's popular definition of "stable and sustainable price growth" (Friedman, 1963, p. 1)[4], which in principle determines the phenomenon, but it is not an operational definition. Analyzing the inflation rate, Mishkin believes that inflation is a major economic and monetary problem. According to him, "Over the past 50 years, the inflation rate has been constantly changing, reaching high values that in some cases were even double digits. This variation in the inflation rate has emerged as the main economic and monetary problem of all economies, i.e. how to find ways to calm down the so-called an inflationary fire that constantly ignites and inflames prices in all economies of the world"(Mishkin, 2004, p. 751).[5] The complexity of inflation as a phenomenon prof. Trpeski determines it through the overall interaction impacts it has on economic processes and categories. Taking into account all these relations and the difficulty to define it, he determines it as follows: "Inflation is defined as a process that is self-sustaining and for various reasons causes price growth, which gradually sooner or later, once the stimulus effects of price growth are used, it leads to a decline in the living standards of the majority of the population, to the exhaustion of national sources of foreign exchange, to the deterioration of the foreign exchange balance and the exchange rate of the national currency and finally to the disruption of the market which complicates the continuous functioning of the economy". (Trpeski, 2003)[6]

Although at first glance it seems that inflation is a modern phenomenon, it has "roots" deep in the past and it's a paradox that, still the highest hyperinflations have occurred before WW2. Looking at the initial measurements that determined the "magnitude" of inflation O'Neill, Ralph and Smith (2017, p. 45 - 67) state that:"The identification of the time period that constitutes the"early history"of inflation measurement is, of course, an arbitrary one. In this book, we have taken the period 1700 - 1879 as a useful division of time to cover for this early

[4]Friedman, M. (1963), *Inflation: Causes and Consequences*, Asia Publishing House, New York.
[5]Mishkin, Frederic S. (2004), *The economics of money, banking, and financial markets*, Seventh editions, Columbia University.
[6]Trpeski,Ljube.(2003),*Money and Banking*, Second Edition, University Textbook, Economy Press, Skopje. (in Macedonian language)

history".[7] In one chapter of the same book, they describe the early developments that laid the foundation for the official development of inflation measurement. If we start from the time period that they refer to as the "early history" of measuring inflation, we are talking about a period of over 300 years in which measuring "instruments" and indicators have gone through a long period of evolution, adaptation and adjustment to other economic categories, processes and movements. This imposes the problem of comparability of data if long time series are followed and the need for analytical knowledge of the content of individual indicators used in different countries and different time periods. Starting from the early development of inflation measurement from the first considerations of a "price level" in 1707, passes a significant period of time to the introduction of the Interim Index of Retail Prices in 1947. According to these authors, the period up to 1880 was dominated by the work of visionary individuals whose insights laid the foundations of both theory and practice. The resources of the state were harnessed to produce the first official inflation measure in 1914 - the Cost of Living Index. The first use of indexation for adjusting wages followed soon after. The Index was subject to political control during the Second World War and did not reflect the public experience of price changes. As a result, it became discredited and a fresh start was needed after the War.[8]

Measuring inflation is especially evident in times of crisis, as the world now faces.The debate on how to measure inflation properly has blown up in the last few years, involvingboth distinguished statisticians and economists, statesEnrico D'Eliain 2004 (D'Elia, 2004, p. 2).[9]His position is even more relevant today in the context of the pronounced rise in prices in almost all countries. In such conditions, the indicators that measure inflation are re-examined, i.e. whether the rise in prices defines a serious problem in the economy or the real problem is the purchasing power of money. No matter what indicators are used to measure inflation, the quantitative sizes that will be obtained, as well as inflation expectations are input data for modeling monetary policy measures.Talking about theBank of Canada, John Murrayconcludes that"consistently aims for low and stable inflation - not for its own sake, but because it enhances the economy's performance. Aiming for an explicit 2 per cent inflation target not only helps stabilize prices, it also helps stabilize real output and employment, allowing the economy to grow at its maximum sustainable rate. Experience has shown that this is the best contribution that monetary policy can make to the economic welfare" (Murray, 2008, p. 1).[10]Emphasizing the fact that this statement is valid for any Central Bank, then the central question remains which indicator to measure inflation will be applied, what methodology for calculating the respective indicator will be applied, the selective criterion for

[7]O'Neill,Robert.,Ralph, Jeff.,and Smith, A. Paul. (2017),*The Origins of Inflation Measurement: 1700 -1879*, In book: *Inflation*, DOI:10.1007/978-3-319-64125-6_3.
[8]Ralph, J., O'Neill, R., Smith, P.A. (2020),*The Early History of Inflation Measurement*. In: *The Retail Prices Index*. Palgrave Pivot, Cham. https://doi.org/10.1007/978-3-030-46563-6_2
[9]D'Elia, Enrico, (2004),*Measuring Inflation* , Romanian Journal of Economic Forecasting, n. 3
[10]Murray,John. (2008),*Measuring Inflation -Methodology and Misconceptions*, Remarks by Mr John Murray, Deputy Governor of the Bank of Canada, to the Certified General Accountants of Ontario, Toronto.

inclusion or exclusion of certain goods and services in the indicator used, the weights that will be used, as well as the fact that the effects of the appropriate measures will not be immediately noticeable, because the monetary policy works with long and variable lags.

3. Basic inflation indicators – methodological characteristics

Given the complexity of the phenomenon of inflation and the numerous ways to determine it, many authors provide definitions of inflation in which they mention some of the causes, and most often many of the consequences that it causes. Common to all is that it means an increase, inflating something (lat. Inflatio), so in this sense the simplest determination is that inflation means increasing or inflating prices. Because price is a monetary counterpart to the value of goods and services, in conditions where nothing has changed in the use value of the goods and in the technology for obtaining them, it simply means that exactly the same goods are exchanged for a higher price. In order to measure this phenomenon (so that it can be monitored, predicted, and even controlled to the extent that it is possible to do so), it is necessary to measure the degree of price change, i.e. to measure the rate at which prices are rising. Although this concept seems very simple and is quite clear to understand, its application in economics is not at all simple.Given that there are almost infinitely many goods and services whose prices not only do not grow at the same pace, but also do not grow at the same time, the first question when measuring inflation is which prices will be monitored. The prices of those goods that statisticians estimate to be a representative "basket" of goods and services consumed by the population are most often followed, and the changes in their prices are followed as a percentage change compared to the previous year.The first methodological challenge is what to put in the "basket".It is in this determination that the differences between different countries appear, despite the harmonization of the indicators that are calculated. In accordance with the change of consumer habits and research surveys conducted for that purpose, the content of the representative basket changes.Some countries change the basket once a year (for example, Britain), some every two years (for example, America), and some for many more years, as America used to change it every ten years.The next important point is the way of weighting the goods that make up the consumer package, according to the importance and according to the functions they have in meeting the needs.On the other hand, the relative representation of individual products purchased by the richer and poorer strata of the population differs significantly. The richer and the poorer have differences in both preferences and shopping habits. Of course, the share of food in the consumer basket of the poor is significantly higher than in the total consumption of the richer strata, and therefore it is logical that in conditions of more pronounced increase in food prices the poor will be more exposed to the impact of inflation.The relative representation of the needs for food, housing, overhead and utilities, etc., is also different in different countries. The different relative importance of individual products in the consumer basket, the interval in which the contents of that product package are changed and the interval in which the relevant product and service basket is restructured can have a serious impact

on the calculated inflation rate, even annually. The already mentioned difficulties in collecting the input elements for calculating inflation indicate that the quantification of this phenomenon is not a serious problem and that the interpretation of the obtained results is a more serious challenge than the calculation itself.

The first problem in measuring inflation and determining the indicators that will be used for that purpose is the very definition of inflation. In reality, there is little agreement on the concept of inflation, which imposes the application of several indicators for its calculation and quantification. Having in mind that the inflation happens every time when the general level of the prices is rising, while the percent of inflation is defined as a percent of the change of prices level (measured though the index of the living expenses, the rise consumer goodsprices, the rise of the agricultural or industrial products prices and etc.). The calculationis done by this simple formula:

$$\textbf{Inflation rate (year t)} = \frac{\textbf{price level (year t)} - \textbf{price level (year t} - \textbf{1)}}{\textbf{price level (year t} - \textbf{1)}} \times \textbf{100} \qquad (1)$$

The inflation measured with this formula shows the average level of the prices growth. Although the prices of some products rise with slower and of other with faster pace, the inflation rate expresses the average level of growth of the prices. The dynamics of the prices movement on other hand is expressed through the index of prices which is an average number of the individual prices (the weight of every consumer price depends on the importance of that product in the economy). As most important price index can be used[11]:

- The Consumer Price Index – (CPI);
- The Index of production prices;
- The GDP deflator.

As a most used inflation measure is the consumer prices index - CPI, which is calculated according the prices of the consumer products that create the consumer basket. The index of production prices can include the prices of the means of production, prices of the materials needed for production, prices of the goods for personal use and etc. A standard restriction while calculating CPI is to limit the definition of inflation to precisely defined goods and services whose growth is monitored, most often goods and services purchased from households "for the purpose of directly meeting the needs of consumers" (EU Council regulationn. 2494, 1995).[12] According to OECD, inflation measured by consumer price index (CPI) is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households. Inflation is measured in terms of the annual growth rate and in index, 2015 base year with a breakdown for food, energy and total excluding food and energy. Inflation measures the erosion of living standards. A consumer price index is estimated as a

[11]Karadjova,Vera., Simončeska,Lidija., *Inflation risk – Conditions, Expectations and Risk Management Strategies*, St. John's University, USA, Global Business Research Symposium, The 7th Annual Conference, June 13-15, 2012, Rome, Italy.

[12] Council Regulation (EC) No 2494/95 of 23 October 1995 concerning harmonized indices of consumer prices, https://eur-lex.europa.eu/legal content/EN/TXT/?uri=CELEX%3A31995R2494

series of summary measures of the period-to-period proportional change in the prices of a fixed set of consumer goods and services of constant quantity and characteristics, acquired, used or paid for by the reference population. Each summary measure is constructed as a weighted average of a large number of elementary aggregate indices. Each of the elementary aggregate indices is estimated using a sample of prices for a defined set of goods and services obtained in, or by residents of, a specific region from a given set of outlets or other sources of consumption goods and services.[13]Taking into account the methodological differences in the structure of the products included inCPI, GDP deflator iscalculated as a ratio between the nominal GDP and the real GDP, that is, the deflator of the GDP is an index for the entire GDP (consumption, investment, expenditures, and net export).

In the very "construction" of a "reasonable" aggregate consumer price index (CPI), and considering its limited concept, a solution can be sought through two almost opposite approaches. One would rely on the concept of "cost of living" and would be strictly related to the economic concept of consumer utility; and the second concept would mean a direct connection with the statistical theory of aggregate indices. In doing so, the most serious debates regarding the measurement of inflation refer to the comparison of the relative advantages and disadvantages of the cost of living indices (COLI) and the cost of goods indexes (COGI).Proponents of the COLI concept explain its justification by eroding the living standard of the population through the rise of prices.Diewert (2000)[14], as well as some other economists and statisticians advocate the concept of"superlative" price indexes, as far as they tend to approximate everywell-conceived COLI under fairly general conditions.However, a pragmatic view on "ideal" CPI should not disregard the fact that, in practice, a CPI must be used in the context of an economic model, even informal.[15]In any case, when analyzing the results obtained, it must be borne in mind that there is no "perfect" CPI and that a combined interpretation of several indices is required.Very often the subjective perception is that inflation is higher than that calculated by the CPI, due to the selection in the formation of the consumer basket and due to the setting of price restrictions in regulated markets, salary allowances and social benefits.But a more accurate calculation of the CPI, which would be a more reliable reflection of "real" inflation, would increase the pressure on pensions and salaries, as well on taxes (taxpayers could pay too much in order to support social spending). The accuracy of the CPI calculation also has a significant impact on monetary policy (which justifies the "underestimation of inflation" using the economic approach to the CPI calculation.Monetary policy based on targeting "real" inflation would increase inflation expectations, and inflation in the end. In this sense, Eurostat

[13]OECD (2022), Inflation (CPI) (indicator). doi: 10.1787/eee82e6e-en (Accessed on 25 June 2022),https://data.oecd.org/price/inflation-cpi.htm

[14]*Diewert, W.E. (2000),* Notes on Producing an Annual Superlative Index Using Monthly Data*,*

Discussion Paper 00-08, Department of Economics, University of British Columbia

[15]D'Elia, Enrico, (2004),*Measuring Inflation* , Romanian Journal of Economic Forecasting, n. 3,p. 2

occasionally changes the structure of the CPI, but still the HCPI theoretical framework remains without a single doctrine, choosing a combination of multiple approaches, giving it an eclectic character and creating theoretical and practical debates about the accuracy of the calculated rate.

4. Inflation indicators – comparative analysis (1992 – 2022)

Having in mind the previous explanation regarding inflation and its measurement, the paper analyzes the official data on three inflation indicators(Inflation, consumer prices (annual %), indicator code: FP.CPI.TOTL.ZG; Food production index (2014-2016 = 100), indicator code: AG.PRD.FOOD.XD; and Inflation, GDP deflator (annual %), indicator code: NY.GDP.DEFL.KD.ZG). Data from World Development Indicators from the World Bank database are used.[16]The analysis was made for Macedonia, Serbia, Slovenia and the European Monetary Union, for a period of 27 years (1992 - 2019). The purpose of the comparative analysis of these three indicators that are most often used to measure inflation is on the example of these countries and EMU to follow the trend of indicators in almost thirty years, to identify possible differences in the tendency of individual indicators (if any), and to put forward theses on the reasons for such tendencies. A deeper analysis of the reasons for the methodological differences far exceeds the scope of paper of this type and scope.

In addition to the data for Macedonia, the analysis also takes data for Serbia as a neighboring country with which we shared identical macroeconomic problems (including the problem of inflation) until 1991; Slovenia, which also belonged to the same country and was subject to the same macroeconomic and monetary policy until the 1990s, and which in terms of territory and population is most similar to Macedonia (but it cannot be said by the level of development), and at the same time Slovenia is also a country belonging to EMU; and data for EMU countries.For the period under processing (1992-2019) chain indices are calculated in order to track the annual changes of the respective index and to more easily note the changes that have occurred (in a positive or negative direction), and at the same time such changes are considered in the same time in EMU, Macedonia, Serbia and Slovenia, in order to detect whether the annual changes in the analyzed indices have the same tendency.The following Fig.1 shows a graphical presentation of the chain indices of the three analyzed inflation indicators in the EMU countries. The data show that throughout the analyzed period the inflation rate measured by CPI was stable, only in 1992 it was just over 5% and over 4% in the next 3 years, as well as 4.075% in 2008. In all other years, the CPI is between 0 and 3.3%. The other two indicators also show inflation stability, but what we are analyzing here are the annual changes in the indicators. In a significant part of the chart, the annual changes do not show significant deviations and oscillate around coefficient 1, but what is striking is that unlike other indicators, the CPI chain index shows a significant increase and sharp

[16]https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG;
https://data.worldbank.org/indicator/AG.PRD.FOOD.XD?locations=IM;
https://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG;(accessed on 25.05.2022)

growth in 2010 compared to 2009 = 4.144951; 2016/2015 = 4.887056 and 2017/2016 = 7.535167, after which it decreased. However, we must take into account the delayed effect of changes in the economy on inflation and some time lag, as well as the data in the series are available until 2019. The changes that have taken place in the last three years are causing serious monetary and overall economic disturbances that will almost certainly show major annual changes in the coming years.

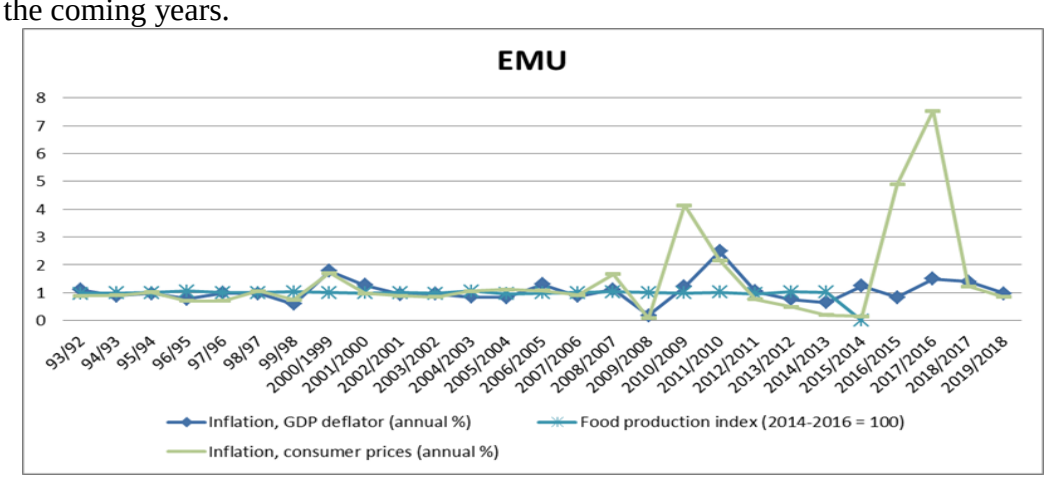

Figure 1. Chain Indicesof CPI, GDP deflator& Food production index in EMU (1992 – 2019)
(own calculations)

The following graphs (Fig. 2, Fig. 3 and Fig. 4) show the annual changes of the three analyzed inflation indicators in Macedonia, Serbia and Slovenia. What is noticeable from the analyzed data, and even more obvious from the graphs, is that there are significant periods in which the three indicators do not show identical changes, there are time lags in the changes in some of the indicators, and even periods in which one of the indicators shows a tendency to increase, and another tendency to decline. The most striking such points in the analyzed period is: the indicator Inflation, GDP deflator 2005/2004 in Macedonia which shows an annual change of -29,4859, while the other 2 indicators in the same year show almost insignificant changes; and in Slovenia the indicator Inflation, Consumer prices (annual%) in 2017 compared to 2016 shows an annual change of -25,984, and the other two indicators have almost insignificant changes, i.e. coefficientabout 1.

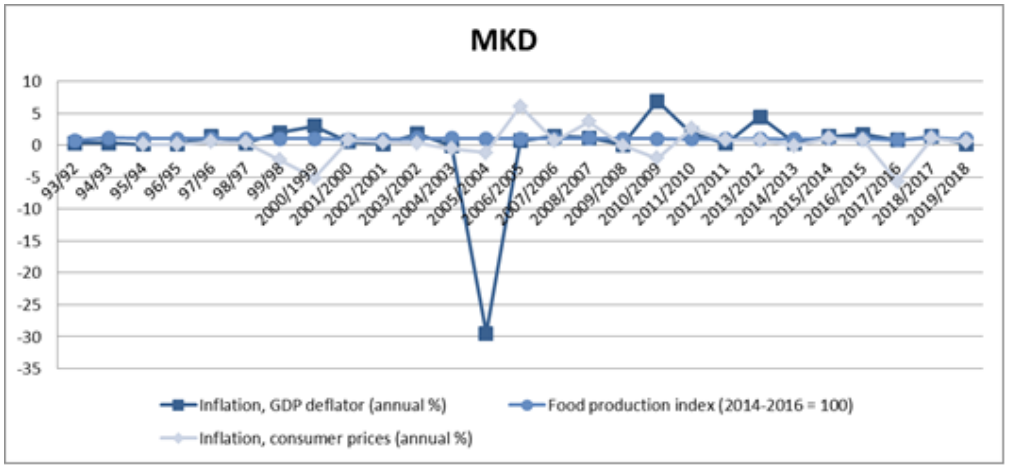

Figure 2. Chain Indicesof CPI, GDP deflator& Food production index in MKD (1992 – 2019)
(own calculations)

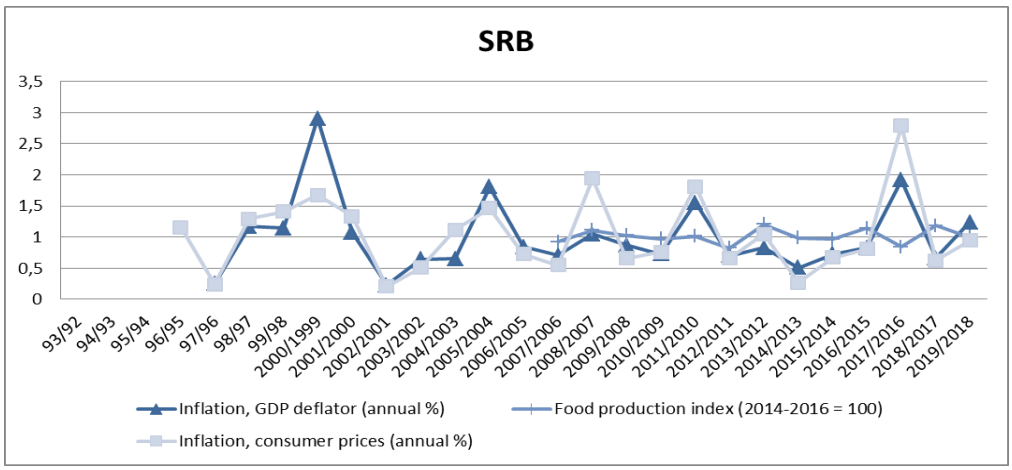

Figure 3. Chain Indicesof CPI, GDP deflator& Food production index in SRB (1992 – 2019)
(own calculations)

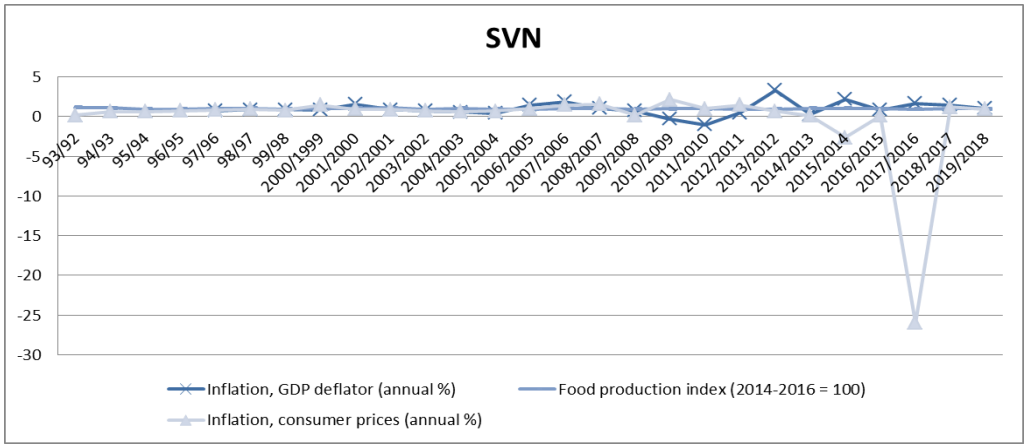

Figure 4. Chain Indicesof CPI, GDP deflator& Food production index in SVN (1992 – 2019)
(own calculations)

The analysis of these examples shows that despite the expectations that the three indicators that measure identical phenomenon (inflation) have an equal trend, i.e. annual changes in the same direction and with the same intensity, however this is not always the case. Not uncommon, the indicators show different intensity of annual change, and even change in the opposite direction, which confirms the methodological dilemmas and theoretical debates with arguments for and against which indicator most reliably expresses the "real" inflation and the need for parallel use of more indicators.

5. Conclusion

Inflation as a serious macroeconomic problem can not be left out of the techniques and strategies for risk analysis and inflation risk management. In order to be able to control and manage inflation, the current situation, the factors that trigger and warm it up, as well as the inflation expectations are important.In that sense, it is important to quantify the phenomenon of inflation, which although it is mathematically and statistically easy to understand and comprehend, methodologically there are a number of views, approaches and indicators that make it difficult to express it realistically.The need for more realistic expression of inflation is important not only for the protection of the population living standard, but also for the projection of the monetary policy. Monetary policy aims at low and stable inflation in order to improve the performance of the economy. Stable and low inflation not only helps to stabilize prices, but also helps to stabilize real production and employment, enabling the economy to grow at a maximum sustainable rate.Although there is no consensus on that which inflation rate would be most appropriate in this regard, almost everyone agrees that it becomes a serious problem once it becomes double-digit, with a serious probability of getting out of control and with a tendency to turn into hyperinflation and stagflation. Therefore, its monitoring and measurement is a serious economic and statistical challenge, and all methodological aspects that

affect the measurement results should be taken into consideration.In doing so, special attention must be paid to several important issues in conceiving the structure of the CPI as a key inflation indicator: the weighting scheme, the impact of changes in relative prices and the occasional change of weights for certain product categories; possible discrepancies between CPI weights and the share of the same components in household expenditures; the scope of households participating in inflation surveys, the amount and categories of their incomes, the structure of the households personal consumption as a whole, as well as the existing differences by different socio-economic categories; the scope of businessmen and experts who take part in inflation expectations surveys and similar issues in this context.

In addition to the methodological problems in calculating the CPI and the need for a combined approach with the use of other indicators, an additional problem may arise from the use of excessive indicators and the inability to draw a consistent conclusion. All these problems and challenges must be taken into consideration before drawing hasty conclusions about the general direction of inflation in the economy.Facing and solving these problems is not at all simple and it seems that inflation will remain a measure in the gray area which is publicly recognized.

References

Council Regulation (EC) No 2494/95 of 23 October 1995 concerning harmonized indices of consumer prices, https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX%3A31995R2494

D'Elia, Enrico, (2004), Measuring Inflation.*Romanian Journal of Economic Forecasting*, n. 3, p. 2 file:///C:/Users/Dell/Downloads/MEASURING_INFLATION.pdf

Diewert, W.E. (2000), Notes on Producing an Annual Superlative Index Using Monthly Data,*Discussion Paper 00-08*, Department of Economics, University of British Columbia

Friedman, M. (1963).*Inflation: Causes and Consequences*, New York:Asia Publishing House

Karadjova, Vera. (2012), Simončeska, Lidija., Inflation risk – Conditions, Expectations and Risk Management Strategies, St. John's University, USA, *Global Business Research Symposium,The 7th Annual Conference*, Rome, Italy

Mishkin, Frederic S. (2004).*The economics of money, banking, and financial markets*, Seventh editions, Columbia University

Murray, John. (2008), Measuring Inflation - Methodology and Misconceptions, *Remarks by Mr John Murray, Deputy Governor of the Bank of Canada, to the Certified General Accountants of Ontario*, Toronto

O'Neill, Robert., Ralph, Jeff., and Smith, A. Paul. (2017), *The Origins of Inflation Measurement: 1700 -1879*, In book: *Inflation*, DOI:10.1007/978-3-319-64125-6_3

OECD (2022), Inflation (CPI) (indicator).doi: 10.1787/eee82e6e-en (Accessed on 25 June 2022), https://data.oecd.org/price/inflation-cpi.htm

Ralph, J., O'Neill, R., Smith, P.A. (2020), *The Early History of Inflation Measurement*, In: *The Retail Prices Index*. Palgrave Pivot, Chamhttps://doi.org/10.1007/978-3-030-46563-6_2

Trpeski, Ljube. (2003), *Money and Banking*, Second Edition, University Textbook, Skopje: Economy Press, (in Macedonian language)

https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG;(accessed on 25.05.2022)

https://data.worldbank.org/indicator/AG.PRD.FOOD.XD?locations=IM;(accessed on 25.05.2022)

https://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG; (accessed on 25.05.2022)