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BUSINESS CYCLES IN BOSNIA AND HERZEGOVINA: CHRONOLOGY, VOLATILITY, AND SYNCHRONIZATION WITH THE BUSINESS CYCLES OF ITS MAJOR TRADING PARTNERS

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Abstract: *This paper examines the chronology, volatility, and synchronization of business cycles in Bosnia and Herzegovina over the period 2000Q1-2025Q1, with a particular focus on their relationship with the cycles of the country's main foreign trade partners. Real gross domestic product is used as the primary indicator of aggregate economic activity. To eliminate seasonal fluctuations, the X13-ARIMA procedure is applied. The cyclical component of output is extracted using two complementary non-parametric filters, the Hodrick-Prescott filter and the Corbae-Ouliaris filter, allowing for robustness in cycle estimation. Business cycle turning points are identified using the Bry-Boschan Quarterly algorithm, which enables the construction of a consistent chronology of expansionary and recessionary phases for this transition economy. Volatility is measured as the standard deviation of the extracted cyclical components, while synchronization with partner economies is assessed using the Harding-Pagan Concordance Index and cross-correlation analysis. The empirical results indicate that business cycles in Bosnia and Herzegovina exhibit moderate volatility, broadly comparable to those observed in its main trading partner economies. Furthermore, the findings provide evidence of statistically meaningful co-movement and procyclicality, with the Bosnian and Herzegovinian business cycle showing moderate to strong synchronization with external cycles. These results suggest a significant degree of macroeconomic interdependence and external sensitivity of the domestic economy within its trade network.*

Keywords: *Bosnia and Herzegovina, business cycle volatility, business cycle synchronization, trading partners*

JEL classification: C29, E32, O4

INTRODUCTION

Although the literature on business cycles encompasses a wide range of conceptualizations and definitional approaches to this economic phenomenon, the formulation proposed by Burns and Mitchell remains the most frequently cited: „Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises...a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximately their own.“

In addition to the two aforementioned American economists, substantial contributions to the existing body of knowledge on business cycles have been made by numerous eminent figures in economic thought, including Marx, Keynes, Schumpeter, Hayek, Friedman, Samuelson, Lucas, etc. The considerable attention these economists devoted to the analysis of business cycles highlights the fundamental importance of this phenomenon for understanding the mechanisms underlying the functioning of an economic system. Cyclical fluctuations in economic activity constitute an inherent feature of the complex and heterogeneous system of the economy and should not be interpreted merely as short-term deviations from a long-run trend, devoid of connections with broader processes such as economic growth and development. As emphasized in standard macroeconomic literature and supported by empirical evidence, a strong causal relationship exists between short-term economic fluctuations and long-term structural transformations, commonly referred to in economic theory as the hysteresis effect.

The fact that business cycles constitute an inherent and indisputable feature of economic reality, and that the duration and intensity of their individual phases are difficult to predict, does not imply that they are beyond influence. Policymakers actively seek to manage different phases of the business cycle, mitigating or amplifying them, through the use of various policy instruments, including monetary, fiscal, macroprudential, and labor market policies. A key conclusion emerging from a substantial body of empirical research is that developed and developing economies exhibit differing institutional responses to macroeconomic instability induced by business cycles, particularly in the choice between procyclical and countercyclical policy approaches. It is therefore evident that a “one-size-fits-all” approach cannot be applied to the regulation of cyclical economic fluctuations. Moreover, it is important to recognize that the adoption of an inappropriate policy stance or the mistiming of implemented measures constitutes an error that economic reality seldom, if ever, forgives: rather than stabilizing the system, such missteps may amplify the volatility of cyclical fluctuations in aggregate output, thereby intensifying hysteresis effects

Cyclical fluctuations in economic activity are not a feature exclusive to market-based system. They are also observed in centrally planned economies, as well as in systems undergoing complex transitions from one socio-economic order to another. Bosnia and Herzegovina belongs precisely to this latter category, as a small open economy in which the transition from a centrally planned system to a market-oriented economy commenced nearly three decades ago.

Although public discourse in Bosnia and Herzegovina often reflects the belief that the country is in a state of permanent economic recession, economic theory does not recognize “permanent recession” as a meaningful analytical category. This raises several important questions: Which phase of the business cycle is Bosnia and Herzegovina currently experiencing? How long did previous expansionary and recessionary periods last, and what internal or external shocks triggered them? To what extent did the long-term effects of the COVID-19 pandemic prolong the recessionary phase, and how have recent geopolitical tensions, armed conflicts, and growing trade barriers affected economic recovery and the return to stable growth? Finally, are business cycles in Bosnia and Herzegovina more volatile than those of its main trading partners, and do expansions and contractions occur simultaneously across the region?

Given that the manifestation of cyclical fluctuations in an economy is considered a key constraint on the effective implementation of a predefined macroeconomic development framework, and bearing in mind that Bosnia and Herzegovina, due to its monetary regime (currency board), is exposed to the influence of the monetary policies of its trading partners within the European Union (EU) and the European Monetary Union (EMU), it becomes evident why addressing these questions is of critical importance for policymakers in this small transition economy. A review of the available academic literature reveals a lack of comprehensive and satisfactory answers to these issues, thereby justifying the need for original scientific research.

BUSINESS CYCLE DATING PROCEDURE AND LITERATURE REVIEW

Whether the aim is to forecast recessions and expansions, analyze volatility, or examine business-cycle synchronization across economies, the first step is to identify (date) business cycles. In cases where reliable secondary data on the chronology of periodic cyclical fluctuations in aggregate economic activity around its trend are unavailable, or when the researcher, for specific reasons, opts to base the analysis on primary data, the “classical” approach to business cycle dating is applied, typically consisting of several fundamental steps:¹

- *selection of a reference series that accurately reflects the dynamics of aggregate economic activity;*
- *filtering of the reference series (seasonal adjustment and detrending); and*
- *identification of turning points in the cyclical component of the reference series.*

The absence of consensus in economic science regarding the most comprehensive measure of aggregate economic activity has resulted in diverse research practic-

¹ With regard to the available “official” business cycle registers, the United States was the first country to establish a specialized institution tasked with identifying phases of economic expansion and contraction according to a clearly defined methodological framework. This refers to the Business Cycle Dating Committee, established within the National Bureau of Economic Research (NBER), which has, since 1978, assessed and publicly announced the timing of transitions in the U.S. economy between recessionary and expansionary phases, and vice versa. Inspired by the U.S. experience in business cycle dating, the Centre for Economic Policy Research (CEPR) established in 2003 the Euro Area Business Cycle Dating Committee (EABCDC), which is widely regarded as the official arbiter in determining the beginning and end of business cycle phases in the member states of the EMU.

es concerning the selection of macroeconomic indicators used to capture the cyclical nature of an economy. The use of composite (synthetic) indicators in business cycle dating traces back to the seminal study by Burns and Mitchell, whose index of leading economic indicators laid the foundation for the development of a wide range of subsequently constructed composite measures for this purpose. The rationale for relying on such “complex” representations of economic dynamics is typically grounded in the argument that simple aggregate measures are insufficient for accurately capturing these temporary and recurrent “events,” compared to indicators whose value incorporates multiple economic aggregates, often combined through weighting schemes, indices, and composite formulas. Nevertheless, the existing body of empirical literature in this field shows a prevailing preference for “core” macroeconomic aggregates, primarily real gross domestic product.

Once a reference series with sufficient observations has been selected, the data must be seasonally adjusted so that the cyclical component can be identified. Seasonal adjustment, which involves eliminating seasonal variations from time series data, has a long tradition in economic analysis, as documented by Hylleberg, Bell and numerous other authors. Although a wide range of statistical techniques for seasonal adjustment has been developed, *TRAMO-SEATS* and *X13-ARIMA* are widely accepted as leading standardized procedures for producing seasonally adjusted data. The extraction of the cyclical component from seasonally adjusted data can be performed using various parametric and non-parametric methods. It is important to note, however, that none of these techniques can be considered statistically superior in terms of the accuracy of cyclical component estimation or methodological neutrality.

The extracted cyclical component is subsequently used to identify recessionary and expansionary phases of economic activity, which represents the final stage of business cycle dating. The essence of this economic phenomenon is characterized by a recurring pattern of “downturn phase-trough-upturn phase-peak.” The identification of this standardized cyclical scheme for a given economy requires the application of parametric or non-parametric statistical methods used to determine upper and lower turning points in aggregate economic activity (i.e., points of transition between the main phases), thereby enabling a precise determination of both the duration and intensity of business cycles.² Among parametric techniques for identifying turning points in economic activity, the Markov-switching model is the most widely used, while the Bry-Boschan algorithm represents the most popular non-parametric method for detecting cyclical periods of economic expansion and contraction within a given system. Since the chronology of business cycles in Bosnia and Herzegovina is not the sole objective of this study, which also examines business-cycle volatility and synchronization in this small transition economy with those of its key foreign trade partners, this section also reviews the results of existing empirical studies relevant to the research question.

The view that the volatile nature of business cycles is determined by the size of an economy is emphasized by Gerlach and Head, whose studies suggest that small

² A recession begins after the economy reaches the peak of the business cycle, marking the end of the expansion phase, and ends at the trough, when a new expansion commences. The duration of the business cycle is defined as the time interval between two successive peaks or two successive troughs, while the difference between the peak and the trough serves as an indicator of the cycle’s intensity and amplitude.

economies tend to exhibit more pronounced cyclical volatility than large economic systems. As a possible explanation for this phenomenon, Gerlach points to differences in the degree of economic diversification and, consequently, varying exposure to external shocks. However, these arguments are not supported by the findings of Darvas and Szapáry, whose analysis of several small economies reveals significantly lower volatility in cyclical fluctuations compared to those observed in large economic players over the same period.

Given that these countries pursued stabilization-oriented economic policies that contributed to currency and inflation stability, Darvas and Szapáry conclude that economic policy, rather than economic size, plays a decisive role in determining cyclical volatility. Business cycle volatility can also be examined through the lens of the level of economic development, where the empirical evidence is considerably more consistent. For instance, Pallege and Robe find that cyclical fluctuations in aggregate economic activity are substantially stronger in developing countries than in developed ones. This finding is further supported by Rand and Tarp, although their results indicate a less pronounced gap, showing that output volatility in developing economies is approximately 15-20% higher than in industrialized countries. In the case of the Bosnia and Herzegovina, Kovačić and Vilotić show that the country belongs to the group of European economies characterized by relatively high business-cycle volatility. Similar conclusions regarding higher volatility in developing economies are reached by Kohn et al. and Casal and Guntin, who attribute these differences to structural disparities in production patterns and foreign trade structures between developed and developing market systems. Regardless of differences in size and level of development, the global chronology of business cycles indicates a clear trend of declining volatility across most countries and regions. According to The International Monetary Fund in its *World Economic Outlook*, this decline is primarily attributed to advances in monetary and fiscal policy frameworks, as well as improvements in overall institutional development.

Foreign trade represents an important determinant of business cycle synchronization. The impact of trade exchange on cyclical comovement may operate in both directions, and the mechanisms underlying this causality have been thoroughly examined by Calderón, Chong, and Stein. In an effort to empirically address this issue regarding the relationship between international trade and business cycle synchronization across different spatial and temporal contexts, a substantial body of literature has emerged. Academic and research interest in the study of business cycle synchronization has further intensified with the establishment and enlargement of the EMU, given that optimal currency area theory explicitly identifies cyclical synchronization as a key prerequisite for the long-term sustainability of a monetary union and as a central criterion in assessing a country's readiness to join such an integrated economic area. This line of research has been adopted, for example, by Filis, Floros, Leon and Beneki, Benčík, Gouveia, and Pentecôte, Poutineau and Rondeau. With respect to studies focusing on the synchronization of business cycles between Western Balkan/Southeastern European countries and the euro area, Hildebrandt and Moder as well as Kovačić and Vilotić have conducted analyses that also include Bosnia and Herzegovina, a monetarily dependent economy in which the effectiveness of domestic monetary policy is largely determined by the policy actions of the EMU itself. Given that Bosnia and Herzegovina, due to its specific monetary regime, imports a significant share

of foreign monetary policy effects, it becomes evident that the synchronization of its business cycles with those of euro area member states warrants considerably greater research attention than it has received thus far.

DATA AND METHODOLOGY

The dating of business cycles in Bosnia and Herzegovina, following the previously described “classical” approach, represents the first step toward addressing the research questions outlined in the introductory section of the paper. For the purposes of analyzing volatility and synchronization, business cycles of the country’s principal trading partners (EU27, EMU, Germany, Italy, Croatia, Slovenia, Austria, Poland, Hungary, Serbia, North Macedonia, and Turkey) are dated using the same methodological framework.³

Real gross domestic product (GDP), expressed as a chain-linked volume index (2010= 100), is employed as the primary indicator of aggregate economic activity for all economies included in the scope of the analysis. The study covers the period from 2000Q1 to 2025Q1.⁴ The seasonal component of the time series is removed using the X13-ARIMA statistical method. The resulting seasonally adjusted quarterly observations are subsequently transformed into logarithmic form.

In the process of extracting the cyclical component from the seasonally adjusted series, a non-parametric approach is applied. It is important to emphasize that the use of different detrending methods for time series implies different estimates of the cyclical component, which in practice often leads to substantial discrepancies in the assessment of an economy’s state at a given point in time. Taking this into account, two filtering techniques are employed to isolate the cyclical component from the selected reference series: the Hodrick-Prescott (HP) filter and the Corbae-Ouliaris (FD) filter. To identify the set of turning points indicating changes in the dynamics of real gross domestic product across the selected economies, and consequently to determine expansionary and recessionary phases of their business cycles, the Bry-Boschan Quarterly (BBQ) algorithm is applied. The algorithm detects turning points in aggregate economic activity, namely peaks and troughs, by identifying local maxima and minima in the selected reference series, subject to a set of predefined constraints (OECD, 2012):

³ According to the most recently available official statistical data on Bosnia and Herzegovina’s foreign trade in goods, the EU economy represents the country’s largest trading partner, followed by the EMU and CEFTA economies. Due to statistical limitations, CEFTA as a distinct economic system is not included within the spatial scope of this study. When observing bilateral trade relations, Bosnia and Herzegovina has developed the most extensive trade linkages with Germany, Italy, Croatia, Slovenia, Austria, Poland, and Hungary among EU member states, as well as with Serbia, Montenegro, and North Macedonia among CEFTA countries. Montenegro, despite being an important trading partner within the CEFTA framework, is also excluded from the analysis due to similar statistical constraints. Among the five leading EU27 trading partners, four countries have adopted the euro as their common currency (Germany, Italy, Slovenia, and Austria), which constitutes the basis for their inclusion in the empirical analysis. In addition, outside the aforementioned regional economic integrations, Bosnia and Herzegovina conducts a significant volume of trade with Turkey, which is therefore also included in the analysis.

⁴ Quarterly, seasonally unadjusted data for the selected reference series are obtained from the Eurostat database, the official statistical office of the EU.

- peaks and troughs must alternate and in cases where peaks and troughs do not appear in an alternating sequence, the algorithm selects the most prominent extreme within the set of potential turning points;
- the first and last turning points must be, in absolute terms, greater/smaller than the first and last observations of the time series;
- each of the two phases of the business cycle (from peak to trough and from trough to peak) must have a minimum duration of at least 2 quarters; and
- a complete cycle (from peak to peak or from trough to trough) cannot be shorter than 5 quarters.

With regard to the second part of the study, which examines business-cycle volatility and synchronization, volatility is measured using the standard deviation, while cyclical synchronization is assessed using the Harding–Pagan Concordance Index and cross-correlation analysis.

The standard deviation is the most commonly used measure of data dispersion. Its value, obtained as the positive square root of variance, indicates the extent to which the values of a data series are concentrated around the arithmetic mean. This statistical indicator also represents the most widely used measure of macroeconomic volatility, which, in the context of business cycles, serves as an indicator of deviations of the cyclical component, obtained through filtering techniques, from its “equilibrium value,” i.e., the trend. A low standard deviation suggests that the values of the cyclical component tend to remain close to the trend, whereas higher values of this indicator signal more pronounced oscillations and fluctuations in the dynamics of aggregate economic activity.

The Harding-Pagan Concordance Index was developed by the Australian econometricians Harding and Pagan with the aim of providing the scientific community with a simple yet effective tool for measuring the degree of synchronization of economic cycles, whether in the form of national business cycles across countries or sectoral cycles within a single economy. The Index takes values in the range from 0 to +1. Although the authors did not propose a universal scale for interpreting the results, unlike the correlation coefficient, empirical research commonly relies on certain interpretative conventions. In particular, values of the Index closer to unity indicate a higher degree of cyclical synchronization, implying that both cycles are in the same phase, either expansion or recession. Conversely, lower values point to a weak degree of co-movement, suggesting that the cycles tend to move in opposite directions. The traditional approach to measuring business cycle synchronization is grounded in the application of *cross-correlation analysis*. The magnitude and direction of the relationship between business cycles are captured by the correlation coefficient, computed for each lag using the Pearson correlation coefficient (r). The assessment of synchronization between the business cycle of a target economy and those of reference economies is commonly based on the sign and statistical significance of the correlation coefficient at zero lag ($t=0$). A positive and statistically significant coefficient indicates procyclical behavior, implying that the business cycles co-move in the same direction. In contrast, a negative and statistically significant coefficient points to countercyclical behavior, whereby the cycles move in opposite directions. If the coefficient at zero lag is statistically insignificant, this is interpreted as evidence of acyclical behavior, suggesting the absence of a systematic relationship between the cyclical dynamics of the

economies under consideration. Furthermore, the determination of whether a business cycle is leading, lagging, or coincident relative to reference economies is based on the examination of the maximum absolute value of the cross-correlation function. This extremum may occur at positive, negative, or zero lags and provides the empirical basis for drawing final inferences regarding the nature of synchronization between the observed business cycles.

RESULTS

In order to obtain a clearer insight into the cyclical nature of the development of the Bosnia and Herzegovina's economy over the period 2000Q1-2025Q1, the results of the extraction of the cyclical component using the HP and FD filtering methods are presented graphically, along with the deviations of the isolated cyclical components from the long-run trend (Figure 1).

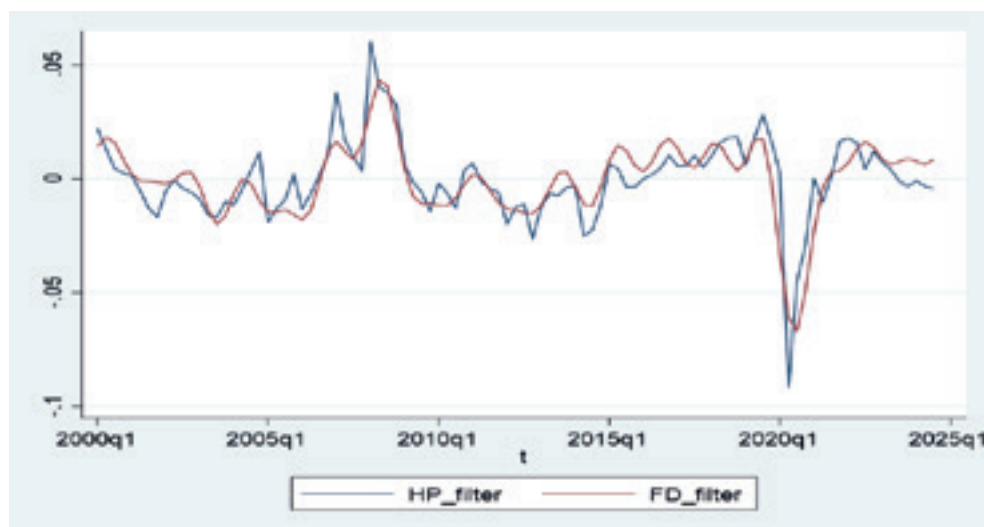


Figure 1. Cyclical Component of Seasonally Adjusted Real GDP of Bosnia and Herzegovina over the Period 2000Q1-2025Q1

Note: Long-run trend=0

Source: Author's illustration; Stata

The graphical representation clearly indicates that the HP and FD filtering methods yield largely convergent, albeit not fully identical, results. These subtle differences in trend deviations reflect the sensitivity of the cyclical component to alternative methodological approaches, which is particularly evident during periods of more pronounced fluctuations in economic activity. Observing periods of significant deviations of the cyclical component of aggregate economic activity from its long-run trend, it is evident that they coincide with episodes of severe disruptions in the global economy, driven by various destabilizing economic and/or non-economic factors. These are “disruptive” periods that have been recorded in modern economic history under the following labels:

- *the global financial crisis*, which began in late 2007 and reached its peak intensity during 2008-2009;

- *the European sovereign debt crisis* (2010-2012), as a secondary wave of financial instability which, following the *Great Recession*, primarily affected euro area countries and further intensified recessionary pressures in the broader regional context; and
- *the COVID-19 pandemic*, as a global public health emergency and an unprecedented economic shock in the modern era.

The National Bureau of Economic Research (2010) officially dated the end of the Great Recession to June 2009, at least with respect to the economy of the United States, from which this global financial crisis originated. Although the recession formally ended in mid-2009 in a technical sense, its economic and broader social consequences persisted considerably longer. This was particularly evident in European countries and emerging economies, including Bosnia and Herzegovina. The graphs also clearly illustrate the depth and persistence of the global financial crisis's impact on the economy of Bosnia and Herzegovina, as well as the slow recovery that followed. The European sovereign debt crisis, which primarily affected EMU member states, also generated negative spillover effects on Bosnia and Herzegovina, further slowing its already fragile post-crisis recovery. In addition, the domestic economy was affected by an internal economic shock in the form of the "centennial floods" of May 2014, which caused severe damage and significantly reduced the country's prospects for faster short- and medium-term economic expansion. The largest recorded percentage deviation from the long-run trend over the observed period is associated with the COVID-19 pandemic. Following the World Health Organization's declaration of COVID-19 as a global pandemic in March 2020, a crisis initially perceived as "China's problem" and subsequently as "Italy's problem" rapidly evolved into a truly global shock. In parallel with the spread of the virus, an acute "economic infection" unfolded, leading to a pronounced deterioration in Bosnia and Herzegovina's macroeconomic performance in the second quarter of 2020. Although a gradual recovery followed during 2021 and 2022, the losses incurred during the "pandemic year" left long-lasting negative effects on the country's growth and development dynamics.

The observed differences in the variations of the cyclical components extracted using the HP and FD filters corroborate previous empirical findings that the choice of the smoothing parameter λ in the HP filtering procedure has important implications for the smoothness and volatility of the identified cyclical fluctuations. In this case, a smoother cyclical component, albeit with more pronounced oscillations, is obtained using the HP filter, whereas the FD filter yields a less volatile cyclical component with attenuated extremes.⁵ In the subsequent step of business cycle dating for Bosnia and Herzegovina, these methodological differences result in distinct sets of turning points in aggregate economic activity.

The BBQ algorithm applied to HP-filtered data identifies 15 turning points over a sufficiently long sample, capturing 7 recessionary and 8 expansionary phases. Recessions last on average just under 5 quarters, with the longest (7 quarters) occurring

⁵ A high correlation between the observed cyclical components ($r = 0.8222$) indicates that the HP and FD filters yield similar cyclical patterns. In contrast, the double application of the HP filter ($\lambda = 10$), as in Kovačić and Vilotić (2017), substantially reduces the correlation ($r = 0.4320$) and produces markedly different macroeconomic signals, with notable changes in the shape, amplitude, and dynamics of the identified cycles.

in 2008Q1-2009Q4 and 2011Q1-2012Q4, while expansions average six quarters. At the beginning of 2023, the economy of Bosnia and Herzegovina reached an upper turning point (peak), marking the onset of a new phase of stagnation. Due to methodological limitations, it is difficult to determine whether the economy is still in a recessionary phase or has already entered a recovery and renewed expansionary trajectory. According to the most recent economic forecasts of the World Bank and the International Monetary Fund, Bosnia and Herzegovina is expected to experience moderate economic growth. However, numerous internal and external challenges should not be overlooked, as they may significantly threaten the sustainability and stability of this growth. Using the FD filter, the BBQ algorithm detects more frequent turning points (12 peaks and 11 troughs), implying a greater number of shorter cycles. Recession phases are slightly shorter, while expansion phases are notably reduced, lasting about half as long on average. The longest contraction (mid-2008 to mid-2010) and the longest expansion (2020Q3-2022Q3) both span two years. Differences in the duration of recessionary and expansionary phases indicate that business cycles in Bosnia and Herzegovina are irregular in their occurrence and non-uniform in length (Table 2).

Table 2. Chronology of Business Cycles in Bosnia and Herzegovina, 2000Q1-2025Q1

HP		FD	
(from peak to peak)	(from trough to trough)	(from peak to peak)	(from trough to trough)
2002q2-2004q2 (8q)* 2004q4-2008q1 (12q)	2001q4-2003q3 (7q) 2003q3-2006q1 (10q)	2002q4-2004q2 (6q) 2004q2-2007q1 (11q)	2002q1-2003q3 (6q) 2003q3-2006q1 (10q)
2008q1-2011q1 (12q) 2011q1-2015q1 (16q)	2006q1-2009q4 (15q) 2009q4-2012q4 (11q)	2007q1-2008q2 (5q) 2008q2-2011q1 (11q)	2006q1-2007q3 (6q) 2007q3-2010q2 (11q)
2015q1-2016q4 (7q) 2016q4-2019q3 (11q) 2019q3-2022q1 (10q) 2022q1-	2012q4-2015q3 (11q) 2015q3-2017q4 (9q) 2017q4-2020q2 (10q) 2020q2-	2011q1-2013q4 (11q) 2013q4-2015q2 (6q) 2016q4-2018q1 (5q) 2018q1-2019q3 (6q) 2019q3-2022q3 (12q) 2022q3-2023q4 (5q) 2023q4-	2010q2-2012q4 (10q) 2014q3-2016q1 (9q) 2016q1-2017q3 (6q) 2017q3-2018q4 (5q) 2018q4-2020q3 (7q) 2020q3-2023q2 (11q) 2023q2-

Note: (tq)= cycle duration in quarters

Source: Author's calculations; Stata

When business cycles are conceptualized as sequences of declines in aggregate economic activity followed by subsequent recoveries, their duration in Bosnia and Herzegovina varies between 7 and 16 quarters under the HP filtering approach, and between 5 and 12 quarters under the FD filtering approach. A comparable temporal

pattern is also observed when cycles are defined as the interval between two consecutive troughs, i.e., between the endpoints of successive contraction phases. On average, the economy of Bosnia and Herzegovina takes approximately 2 years and 9 months to move from one peak to the next under the HP filter, and about 2 years under the FD specification. Similarly, the average duration of cycles measured as the distance between two consecutive troughs amounts to 2 years and 2 quarters using the HP method, and approximately 2 years under the FD filtering approach.

Comparing the estimated cyclical component with the business-cycle chronology shows that cycles in Bosnia and Herzegovina vary not only in duration, but also in amplitude and shape.⁶ Under the HP filter, the most pronounced contraction occurs during 2008Q4-2009Q3, with an amplitude above one, reflecting the global financial crisis, while the strongest overall cycle is observed in 2019Q3-2020Q2, driven by the COVID-19 shock and associated volatility. A further notable downturn appears in mid-2003, linked to structural transition processes, privatization, institutional instability, regional tensions, and weaker global conditions following the dot-com crisis. The FD filter produces highly consistent results, particularly regarding the timing and magnitude of the most severe recessionary phases, confirming the robustness of the findings across different filtering methods and highlighting the multi-dimensional and heterogeneous nature of business-cycle dynamics in Bosnia and Herzegovina.

With regard to the shape of business cycles, there is an increasing number of researches that support the thesis that modern business cycles do not always have a pure sinusoidal wave pattern, as commonly assumed in theoretical frameworks. This is also confirmed for Bosnia and Herzegovina, where cycles identified using both HP and FD filters exhibit asymmetry, abrupt turning points, and irregular dynamics in both recessionary and expansionary phases. Notable examples include:

- the COVID-19 cycle, characterized by a sharp “V-shaped” shock with a deep recession followed by a rapid recovery from the trough;
- the global financial crisis cycle, marked by a severe contraction and a more gradual recovery, resulting in a flatter, “L-shaped” expansion; and
- the 2003-2004 cycle, which exhibits an irregular, flattened structure with no clearly defined peak and a prolonged trough, indicating weak and non-standard recovery dynamics.

In the second part of the research, which includes a comparative analysis of the volatility and synchronization of business cycles in Bosnia and Herzegovina and those of its key trading partners, due to the limited scope of the paper, the results of business cycle dating for the other countries included within the spatial framework of the study are available from the author upon request.

Based on the calculated values of the standard deviation, it can be concluded that business cycles in Bosnia and Herzegovina are moderately volatile, indicating a relatively stable macroeconomic environment despite persistent structural challenges (Table 3).⁷

⁶ The amplitude of the business cycle, defined as the vertical distance between its peak and trough within a given cycle, represents a key indicator of the intensity of cyclical fluctuations. A more pronounced amplitude implies a more intense cycle.

⁷ The above conclusion holds for both filtering methods.

Table 3. Volatility of Business Cycles in Bosnia and Herzegovina and Its Major Trading Partners, 2000Q1-2025Q1

HP		FD	
Country	Standard deviation	Country	Standard deviation
<i>Bosnia and Hercegovina</i>	0.0179754	Bosnia and Hercegovina	0.0166755
EU27	0.0188867	EU27	0.0182216
EMU19	0.0194762	EMU19	0.0187824
Germany	0.0179531	Germany	0.0174731
Italy	0.0245996	Italy	0.0240797
Croatia	0.0279234	Croatia	0.0276056
Slovenia	0.0238338	Slovenia	0.0223085
Austria	0.0213665	Austria	0.0195057
Poland	0.0170460	Poland	0.0146606
Hungary	0.0225979	Hungary	0.0188697
Serbia	0.0203218	Serbia	0.0190820
N. Macedonia	0.0272113	N. Macedonia	0.0237923
Turkey	0.0370946	Turkey	0.0401012

Source: Author's calculations; Stata

There are no substantial differences in the volatility of business cycles between Bosnia and Herzegovina and the EU27 and EMU19 economies, suggesting a degree of synchronization in terms of the intensity of cyclical fluctuations, though not necessarily in the timing of shocks. Within bilateral trade relations, Poland and Germany exhibit the lowest volatility, consistent with their high macroeconomic stability and institutional resilience. With regard to other trading partners within the EU and EMU frameworks, their business cycles can be characterized as moderately to highly volatile, displaying more pronounced deviations from trend compared to those of Bosnia and Herzegovina. Serbia, as the most important trading partner of Bosnia and Herzegovina within the CEFTA framework, exhibits moderately elevated cyclical volatility over the observed period, which is nevertheless higher than that of Bosnia and Herzegovina. Among the ten comparator economies, the largest differences in standard deviations are observed for Turkey, which exhibits more than twice the cyclical volatility. Significant differences are also evident for North Macedonia, further confirming the heterogeneity of cyclical dynamics in the region and highlighting the role of country-specific macroeconomic and institutional factors in shaping business cycles. Finally, the results of this study partially diverge from those reported by Kovačić and Vilotić, whose analysis suggests nearly twice as high volatility of business cycles in Bosnia and Herzegovina relative to both EU and EMU economies (under both filtering methods), as well as higher volatility compared to all EU member states and CEFTA signatories included in their sample.

Due to the limited availability of research on the synchronization of business cycles in Bosnia and Herzegovina with those of its trading partners, and in order to ensure comparability of results within this field of study, this research adopts the meth-

odology developed by Kovačić and Vilotić . The analysis, based on the Harding-Pagan Concordance Index, reveals a relatively high degree of synchronization in the case of the EU and EMU supranational economies. This finding is particularly relevant in the context of Bosnia and Herzegovina's potential accession to European integration structures (Table 4).

Table 4. Business Cycle Synchronization between Bosnia and Herzegovina and Its Major Trading Partners, Based on the Harding-Pagan Concordance Index (2000Q1-2025Q1)

HP		FD	
Country	Harding-Pagan Concordance Index	Country	Harding-Pagan Concordance Index
<i>EU27</i>	0.78787879	<i>EU27</i>	0.78787879
<i>EMU19</i>	0.78787879	<i>EMU19</i>	0.78787879
<i>Germany</i>	0.75757576	<i>Germany</i>	0.6969697
<i>Italy</i>	0.72727273	<i>Italy</i>	0.78787879
<i>Croatia</i>	0.76767677	<i>Croatia</i>	0.85858586
<i>Slovenia</i>	0.80808081	<i>Slovenia</i>	0.82828283
<i>Austria</i>	0.77777778	<i>Austria</i>	0.6969697
<i>Poland</i>	0.74747475	<i>Poland</i>	0.74545455
<i>Hungary</i>	0.66666667	<i>Hungary</i>	0.63636364
<i>Serbia</i>	0.66666667	<i>Serbia</i>	0.62626263
<i>N. Macedonia</i>	0.64646465	<i>N. Macedonia</i>	0.70707071
<i>Turkey</i>	0.65656566	<i>Turkey</i>	0.63636364

Source: Author's calculations; Stata

With the exception of Hungary, the study indicates a relatively high degree of synchronization between the business cycles of Bosnia and Herzegovina and those of most Western European trading partners included in the analysis. Despite stable trade relations with Hungary, cyclical alignment remains only moderate, which may reflect structural and institutional differences between the two economies. Among individual EU/EMU member states, the highest degree of synchronization is recorded with Slovenia, where the index values suggest that the two economies were in the same phase of the business cycle, either expansion or recession, for approximately 80% of the observed period. Outside the "bloc" economies, the indices for Serbia, North Macedonia, and Turkey range between 0.62 and 0.67, indicating a moderate degree of cyclical synchronization. Overall, the results suggest that the economy of Bosnia and Herzegovina is more exposed to the transmission of shocks originating within the common European economic space than to those emanating from outside it.

Following Kovačić and Vilotić , cross-correlations between Bosnia and Herzegovina's business cycles and those of its main trading partners were computed for leads and lags from $t-6$ to $t+6$.⁸ Positive coefficients at zero lag indicate procyclicality, showing that cycles generally move in the same direction as those of key partners. In

⁸ Results are available from the author upon reasonable request.

most cases, the strongest correlations also occur at zero lag, suggesting a high degree of synchronization. Exceptions are found for Germany and Turkey under the FD filter, where the maximum correlation appears at a one-quarter lead, implying that Bosnia and Herzegovina lags behind these economies by one quarter. Overall, results are consistent across filtering methods and align with those obtained using the Harding-Pagan Concordance Index.

The results of the synchronization analysis differ considerably from the findings of Kovačić and Vilotić, both in the segment based on the application of the Harding-Pagan Concordance Index and in the analysis of cross-correlation dynamics between time series. Their study, which relies on the Concordance Index, reports a lack of synchronization between domestic business cycles and those of the EMU and EU economies over the period 2000-2016. At the bilateral level, their analysis similarly identifies weak cyclical co-movement with the business cycles of each member state within these two supranational groupings, with the exception of Austria. The same authors obtain comparable results when examining synchronization with CEFTA member states (Serbia and North Macedonia) as well as Turkey. Furthermore, their cross-correlation analysis confirms the absence of cyclical alignment and identifies a lag of up to six quarters in the business cycles of Bosnia and Herzegovina relative to those of the EU. The divergences between the findings of the present study and those reported by Kovačić and Vilotić may be attributed to several factors: (i) differences in the sample period (after 2016, Bosnia and Herzegovina underwent notable structural transformations, including changes in production structure and trade patterns); (ii) differences in the choice of proxy for aggregate economic activity (Kovačić and Vilotić use the industrial production index for Bosnia and Herzegovina, unlike for other countries in their sample, where broader measures are applied); and (iii) differences in the extraction of the cyclical component (their approach employs a double application of the HP filter with alternative values of the parameter λ).

CONCLUSION

This study had two primary objectives: (i) to identify turning points in economic activity in Bosnia and Herzegovina and construct a chronology of recessionary and expansionary phases over the past 25 years, and (ii) to examine the volatility and synchronization of its business cycles with key trading partners. The business-cycle database for 2000Q1-2025Q1 is constructed using a classical dating framework. Using the Hodrick-Prescott filter, the Bry-Boschan Quarterly algorithm identifies 15 turning points, corresponding to seven recessionary and eight expansionary phases. A peak in early 2023 marks the onset of stagnation, which is further supported by results from the Corbae-Ouliaris filter, where more frequent turning points (12 peaks and 11 troughs) indicate shorter cycles and predominantly adverse macroeconomic developments since late 2023.

Over the past twenty-five years, business cycles in Bosnia and Herzegovina have exhibited substantial variation in duration, intensity, and shape. Periods of pronounced cyclical deviations are closely associated with major global shocks, including the global financial crisis, the European sovereign debt crisis, and the COVID-19 pandemic.

Regarding volatility and synchronization, results indicate that Bosnian and Her-

zegovinian cycles are moderately volatile and broadly comparable to those of EU and EMU economies. In most cases, major trading partners exhibit higher volatility. The findings also reveal a relatively strong degree of cyclical synchronization with EU/EMU economies, particularly Slovenia, while Hungary represents an exception. Outside these blocs, a moderate degree of comovement is still observed.

Overall, Bosnia and Herzegovina's economy appears more strongly influenced by shocks originating within the European economic area than by external sources. These results contribute to a more nuanced understanding of business-cycle dynamics in this transition economy and provide a basis for further research on shock transmission and macroeconomic policy effectiveness across the cycle. They also carry important policy implications for strengthening economic resilience to both external and internal shocks.

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