

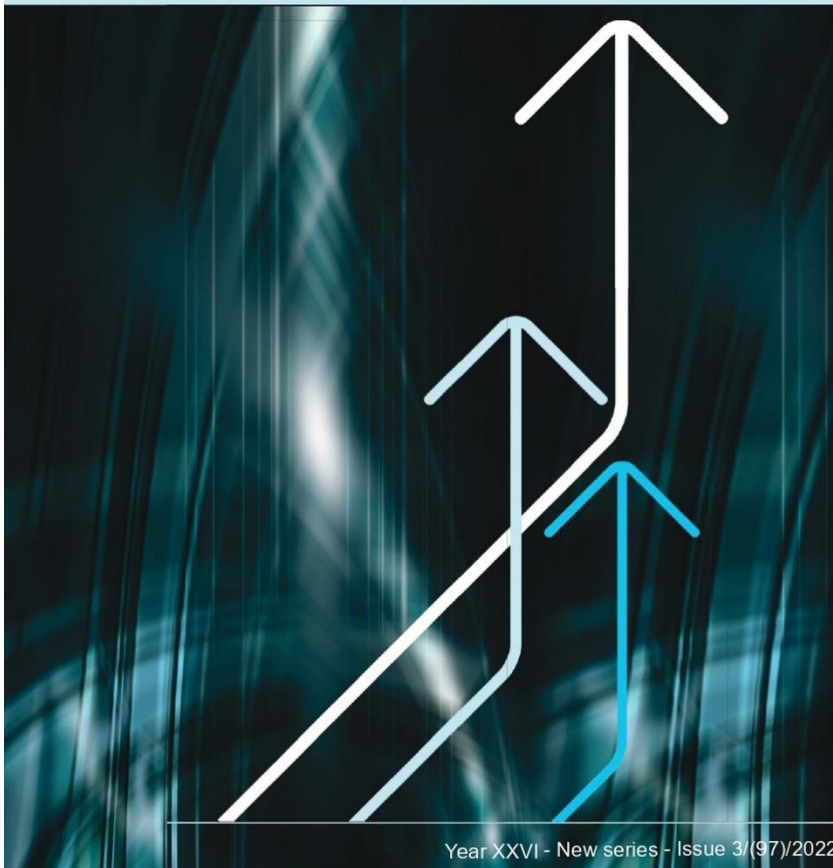


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Year XXVI - New series - Issue 3(97)/2022

“VICTOR SLĂVESCU” CENTRE FOR FINANCIAL
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FINANCIAL STUDIES



ROMANIAN ACADEMY
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ECONOMIC RESEARCH
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Contents

PROBLEMS AND PROSPECTS TO SUSTAINABLE DEVELOPMENT IN COVID-19 “NEW NORMAL”: EVIDENCE FROM WESTERN BALKANS’ STOCK MARKETS.....	6
Julia Stoyancheva STEFANOVA, PhD	
THE ASYMMETRICAL IMPACT OF POLICY RESPONSES ON VOLATILITY OF SOVEREIGN DEFAULT SWAPS	35
Deniz ERER, PhD	
DETERMINANTS OF FINANCIAL STABILITY IN SUB- SAHARAN AFRICA	55
Meshesha Demie JIMA, PhD Student Patricia L. MAKONI, PhD	
CENTRAL BANKS CONTRIBUTIONS IN MANAGING THE PANDEMIC CRISIS. A SUMMARY AT THE EU COUNTRIES LEVEL	76
Adina CRISTE, PhD	

PROBLEMS AND PROSPECTS TO SUSTAINABLE DEVELOPMENT IN COVID-19 “NEW NORMAL”: EVIDENCE FROM WESTERN BALKANS’ STOCK MARKETS

Julia Stoyancheva STEFANOVA, PhD*

Abstract

The paper¹ examines empirically the adaptation of frontier stock markets of selected “capture” states in the Western Balkans in COVID-19 “new normal” realities by identifying the challenges and prospects to these countries and their stock exchanges for sustainable development. It focuses specifically to the deteriorating institutional quality of the business environment in the period 2013 - 2020 with lasting medium to long-term negative impacts on economic, social and environmental sustainability dimensions of the business setting. Peripheral stock exchanges of the Western Balkans would need to respond to various sustainability challenges at macroeconomic level (i.e., eco-innovation requirements, human development, democracy score deterioration etc.) as a condition for credible sustainable financial development in the foreseeable future.

Keywords: sustainable financial development, frontier stock markets, Western Balkans, “capture” states, “facade” democracies, sustainable economic growth

JEL Classification: G20; P34; Q56

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Note: The views expressed in the paper are the sole responsibility of the author and should not be interpreted as reflecting position of Economic Research Institute of the Bulgarian Academy of Sciences.

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1. Introduction

The importance of the topic is associated with the rising challenges in the institutional and macroeconomic setting of the selected “capture” states in the Western Balkans (Bulgaria as a EU member state and the EU applicant countries Serbia and Montenegro) with concomitant negative impacts on sustainability in its various dimensions (economic, social, environmental etc.). In the report, “sustainability” refers to a process of institutional, socio-economic, environmental etc. adjustments of the socio-economic framework as an imperative for economic, human, democratic and financial development in peripheral stock markets (Brinkerhoff and Goldsmith, 2005; Ludwig et al., 1997). The aim of the report is to investigate empirically and in comparative terms the socio-economic, institutional and environmental sustainability of the stock markets in Bulgaria, Serbia and Montenegro as case in point of “capture” states (see Corporate Europe Observatory definition, 2019) with “façade” democracy (Freedomhouse, 2020) and to draw conclusions about existing problems and eventual prospects in view of the ongoing EU integration efforts of the analysed countries.

The process of sustainable adjustment in the outlined dimensions (socio-economic, institutional, eco-efficient) is associated with various challenges and opportunities in the post COVID-19 global realities specifically for frontier stock markets and requires focusing on identified challenges in the business environment and making substantiated juxtapositions among the selected Western Balkan countries in several dimensions:

- a) to focus on various obstacles and challenges in the internal macroeconomic and institutional setting of these “capture” states in the Western Balkans;
- b) to outline specific aspects about stock exchanges in the three analyzed “capture” states (with semi-structured or hybrid democratic regimes) in post COVID-19 pandemic realities;
- c) empirically to test the association between Freedomhouse democracy score, United Nation (UN) human development index, the eco-innovation index and financial development in the the analyzed countries in the Western Balkans and to trace problems and prospects facing frontier stock markets to sustainable financial development in the post COVID-19 “new normal”.

For the realization of the above-stated objectives the paper grounds its analysis on official public sources (i.e. IMF, World Bank, Freedomhouse, EU reports etc.) combining descriptive comparative economic analysis and econometric techniques.

The hypothesis of the paper is that the deterioration of the institutional quality in the business environment in the selected “capture”² state democracies with peripheral stock markets will be an insurmountable challenge in the short-term following the deployment of three-fold crises: sanitary, social and economic ones and invariably impact negatively on the preservation of democratic sustainability and values. For that reason, in mid-term perspective the stock markets of such “facade” democracies would be challenged to provide sustainable financing for the restoration of sustainable economic growth in post COVID-19 “new normal” and would require internal adaptive and transformative macroeconomic and above all institutional changes in social, economic and environmental (i.e. green growth) aspects as a condition for credible financial development in emerging and frontier stock markets. This leads to the actuality of the analysis of the unfolding COVID-19 dynamics in “capture” state democracies in the Western Balkans and provides grounds for formulation of tentative conclusions regarding needed improvements in the institutional and economic setting of peripheral stock markets.

The remainder of the paper is arranged as follows: section “Description of the problem and related work” outlines the treatment of the issue of financial sustainability and the challenges to it specifically

² *Some of the characteristics of “capture state” (The Corporate Europe Observatory, 2019; Think for Europe Network, 2022; Barret, E., 2021; Magyar, B., 2015) include: 1) state is operating mechanisms for furtherance of elite (i.e. captors, oligarchs) interests through systematic corruption and embezzlement at a disadvantage of legitimate civil society interests, undermining democratic foundations of constitutional order of checks and balances and the social contract (i.e. “patronal democracies” or “clan”/ rent-seeking/ kleptocratic/ predatory/ mafia states); 2) development of a specific symbiosis of shared ideology between public and private interest groups or relationship of co-dependence (including links of institutional nomads with organized crime) using favorable media coverage to accumulate unchecked powers; 3) incorporation of corporate interests into public policy agendas and their realization through economic governance tools (i.e. fiscal policy or “budgeted corruption”) and providing material benefits to particular industrial sectors through loopholes in the legislative acts remaining immune of law enforcement and undermining the independence of the judiciary.*

in selected “capture” states of the Western Balkans; followed by a section focusing on analysis of the specific problems facing the economies of the analyzed countries in post-COVID-19 new realities and their stock markets. In the Methodological part and Results section, the paper presents the empirical outcomes at macro and meso-economic level, followed by concluding remarks of the research. Among the limitations of present research are: 1) it does not treat specifically the “green” aspects of sustainable development. 2) research for analyzed Western Balkan “capture” states on attainment of certain sustainable development goals (SDGs) cannot be generalized for all “capture” states with developing status and peripheral stock markets. 3) the paper does not address important alternative forms of sustainable development finance institutional interventions (as SDG bonds etc.).

2. Description of the researched problem and related work

Frontier stock markets in the Western Balkans which are object of analysis in the present paper include the stock market of Bulgaria as a member state of the European Union over 15 years’ full membership, and the stock markets of Serbia and Montenegro as countries aspiring for EU membership in the process of their adaptation and adjustment to the requirements of the future membership status. The process of sustainable financial development is associated with various challenges and opportunities in the post COVID-19 global realities specifically for frontier stock markets in the Western Balkans and requires focusing on the current specific financial situation of these markets in “capture” states with “facade” democratic regimes. Various studies (Faheem et. al, 2020) find evidence that Central and Eastern Europe stock markets depart from the Efficient market hypothesis (EMH) and the reason for this deviation is associated with the limited financial development in the region and inefficiencies with possibility to predict market movements implying increased market risks. The institutional approach to the topic requires factoring in of the institutional aspects of the business environment such as protection of property rights, transparency and effective resolution of problems with asymmetric information, tax issues, accounting standards etc.

At the global level stock exchanges are expected to be leading in introduction of comprehensive methodology for assessment of sustainable development goals (UN 2030 Agenda for Sustainable

Development, 2015) due to their long-term and above-board impacts on socio-economic, financial and environmental systems which deserve to be researched in-depth in the aftermath of the COVID-19 (Ranjbari, M et al., 2021). Research by Alibegovic et al. (2020) has identified that among consequences of COVID-19 are the unfavorable impacts on SDGs related to poverty (World Bank estimations for expected additional 70 million people pushed to poverty status, 2022), quality of education, decent work and economic growth. The sustainability methodology includes standards of sustainable accountability, inclusive and transformative change (Siegel and Bastos, 2020) in the process of corporate social governance. The environmental sustainability dimension includes, among other aspects: introduction of reporting requirements, energy standards, carbon mitigation schemes, national development financing roadmaps with integrated SDG outcomes (i.e., Sustainable Development Investment Country Financing Roadmap Initiative, UN, 2019) etc. to achieve triple bottom line (i.e., 3P “people, planet, prosperity”). The UN in collaboration with Bertelsmann Stiftung and Cambridge University Press have introduced SDG index since 2015 (<https://dashboards.sdgindex.org/rankings>), ranking 163 countries in the world toward the 17 SDGs. In 2022 according to the Sustainable Development Report (Sachs et al., 2022) the SDG rankings of the analyzed Western Balkan countries are as follows: Serbia occupies 35th position (75.89 score), followed by Bulgaria at 42nd position (74.29 score) and Montenegro at 86th position (68.81 score).

Theoretically, among the benefits from enhanced sustainability reporting of stock exchanges are: 1) boosted stakeholder trust and visibility among the investment community; 2) value creation effect and cultivation of sustainable business models (Parrish, 2010); 3) high transparency standards in line with UN Sustainable Stock Exchanges Initiative and World Federation of Exchanges Sustainability Initiative; 4) driving up the process of technological and digital innovations through increased compliance capabilities (see Aviva Roadmap for Sustainable Capital markets, 2015).(see Aviva Roadmap for Sustainable Capital markets, 2015). On the other hand, challenges to sustainability facing stock markets and their stakeholders include, among others: 1) increased costs for compliance with heightened standards for dissemination of information in the 3 dimensions (i.e. economic, social, environmental) and likely impacts; 2) extending the base of indices traded on stock exchanges with inclusion of

environmental and climate related indices and introduction of sustainability financing segments at stock markets as alternative forms of financing; 3) developing active institutional adaptation to triple bottom line requirements at micro, meso and macroeconomic levels.

At a regional level, the post COVID -19 pandemic situation would definitely require comprehensive adaptation of Western Balkans stock markets to overcome the significant negative effects in the social, economic and political frameworks (i.e. SGDs) through rapid digitalization of economic activities, finding effective resolution to rising income polarization through ever increasing role of governments and the need for lifting the quality of public institutions that guarantee inclusive and sustainable social contract. These concomitant changes in the social, political, economic, and financial spheres will pose challenges especially for developing countries like those in the Western Balkans with underdeveloped peripheral stock markets to tackle urgent public health and social needs with limited fiscal space, inadequate transparency, weaknesses in application of practices for effective crisis management, resolution, and resilience build-up.

The adopted Economic and Investment Plan for the Western Balkans (European Commission, 2020) (together with the Just Transition Mechanism and Fund) aims to support the twin transition of the region to green and digital sustainability objectives relating to climate neutrality and circular economy with indicators on sustainability development goals (SGDs) in the EU Resource Efficiency Scoreboard. The adaptation process requires significant institutional and investment efforts to overcome dependence on coal-based power production patterns (over 70 % of total electricity produced in the region). The industrial ecosystem in the region is characterized with extremely low resource productivity, very low recycling rate of waste, modest innovation and digitalization patterns and pose significant challenges in smart specialization strategies to decoupling economic growth from intense resource utilization under conditions of “capture” state, low level of political commitment, lack of financial resources and the general uncertainty of the business environment.

Due to the underdeveloped financial markets in the region and the low possibilities for attracting private investments in post-COVID 19 environment, the EU envisages significant public interventions for the realization of the green and digital agendas for the Western Balkans in the Instrument for Pre-Accession III (up to EUR 9 billion for the period 2021-2027), through the participation of the EIB (i.e. Structural Reform

Support Facility etc.) and various EU level financial instruments (as Green for Growth Fund, Regional Energy Efficiency Program, External Investment Program, Guarantee Facility etc.) toward the creation of Common Regional market in Western Balkans. The importance of institutional intervention measures for resumption of economic restoration (specifically for developing countries) along the path to SDGs has been empirically proven by Yoshino et al. (2020), Ike et al. (2019) etc.

COVID-19 has also impacted negatively the fragile democratization process in the Western Balkans leading to entrenched autocratic interests of the elites and their clientelist networks. A research by Clingendael Institute and Think Network Europe (Zweers et al., 2022) on Western Balkans has focused on the degrading quality of democratic reforms in the region and the formation of “stabilocracies” due to a combination of domestic shortfall of political will and flaws in EU strategies, policies and their implementation (i.e. soft policy and overly technical approach, disregard of civil society voice, democratic decline in EU institutions etc.). Restoring democratic principles and upgrading from status of “state capture” or “stabilocracy” requires adoption of national rules and development of cultural norms guaranteeing full lobbying transparency, parliamentary checks and balances through ex-ante and ex-post accountability mechanisms. This process calls for development of a new model of participatory civil society activism in pre and post legislative implementation at the national level by using the mechanisms of public consultations and impact assessment (European Commission, 2020).

2.1. Specific challenges to selected Western Balkan “capture” states in post COVID-19 new realities

COVID-19 pandemic (a specific “black swan” event in itself, He P. et al, 2020; He Q. et al., 2020) has disruptive effects on “captured” states in the Western Balkans due to rising public debts, deteriorating quality of financial assets, rising investment risks and would require heavy public interventions (at national and EU level) to restore economic growth toward attainment of SDGs in UN 2030 Agenda in the short to mid-term perspective due to the following challenges: 1) Income inequality (relating to SDG 10 Reduced inequalities); 2) Efficiency in public policy measures to mitigate income inequality (relating to SDG 1, SDG 10 and SDG 16); 3) Freedom of expression and media independence (relating to SDG 16 Peace, justice and strong

institutions); 4) Corruption and strength of legal rights (relating to SDG 16 Peace, Justice and strong institutions); 5) Human development prospects (relating to SDG 8 Decent work and economic growth); 6) Specific aspects of stock markets in the Western Balkans.

1) Income inequality (relating to SDG 10 Reduced inequalities)

Table 1
Aspects of income inequality in selected Western Balkan countries

Specific aspect	Bulgaria	Serbia	Montenegro
Income inequality	The income share of the richest 20% (S80/S20) of the population was almost eight times that of the poorest 20%, which is the highest in the EU (2018, EU average 5.17) (European Commission, Country Report 2020)	8,9 % of people at risk of poverty and social exclusion; 7 % living in absolute poverty (BIT, 2020) (S80/S20 income quartile ratio for 2019 at 6,46)	Poverty rate at 20,4 % and people at risk of poverty 24,5 % (World Bank database, 2019)

Source: according to sources cited in the Table

Obvious from the indicators of income inequality in Table 1, the analyzed countries in the Western Balkans face significant challenges relating to structural vulnerabilities of their economies representing an obstacle to their economic convergence and sustainable financial development. Important measures to overcoming the existing economic, social, ecological and digital divides of Western Balkan countries include boosting their competitiveness and labor productivity despite unfavorable business environment and heightened uncertainties in local, regional and global context. Specifically, Bulgaria as a member of the EU continues to show worst performance on Social Development Goal (SDG) “No poverty” (33.6% of the population is at risk of poverty or social exclusion, EU average 21,6 % for 2020), “and deteriorating results on SDG “Reduced inequalities” (22.1 % socially or materially deprived and 9,6 % in-work at risk-of-poverty, 2020). The expectations are through Economic Transformation Program the country to support the “twin” green and digital transition, enhance

research and innovation, stimulate upskilling/reskilling and activate businesses to higher value-added economy trajectory.

2) Efficiency in public policy measures to mitigate income inequality (relating to SDG 1, SDG 10, and SDG 16)

Table 2

Fiscal policy impacts on income distribution

Specific aspect	Bulgaria, Serbia, Montenegro
Fiscal policies impact on income inequality	The capacity of the tax and benefit system to reduce income inequalities is particularly weak in the Western Balkans. For Bulgaria, in particular, measured by the S80/S20 ratio (see Table 1), taxes reduce income inequality by only 4% (13% for the EU) and benefits by 28% (35% in the EU) (European Commission, Country Report 2020)

Source: according to sources cited in the Table

Following the post COVID-19 situation the inadequate fiscal policy measures are associated with inherent weaknesses in the social safety nets, strong regional disparities (economic activities highly concentrated in the capital area, less competition due to concentration of wealth and assets within elites), high labor shortages (due to brain-drain and worsening demographics indicators or the so called “social resource curse”) and many institutional shortcomings in the analyzed Western Balkan countries (i.e. misallocation of resources toward sectors which captor elites can control leading to unequal distribution of economic wellbeing). The sustainability and inclusive policy agenda would require implementation of progressive taxation, raising public debt levels, and undertaking above-board social transformations in a digitalized postindustrial era. Prudential monetary policy guarantees confidence in the stability of the economy. Low and predictable inflation rates are likely to contribute to the development of the stock market.

Attracting foreign portfolio investment requires a rational exchange rate management policy. Low and predictable inflation rates are likely to contribute to stock market developments, according to Yartney & Adjasi (2007). The stability of short-term interest rates increases investor confidence, leads to adequate monetary policy and reduces market volatility. Also important is the conduct of adequate fiscal policy due to the fact that investors are interested in the real post-tax rate of return on investment, and in many countries equity investments are subject to double or triple taxation. In the aftermath of COVID-19 crisis the business environment in the analyzed countries deteriorated and access to alternative forms of finance worsened

(limited equity finance and venture capital investments below 0.5 % of GDP). Other obstacles to investors in Western Balkans include volatile business setting with negative fiscal multipliers and returns on investments (i.e., “white elephant” investments, IMF, 2018), non-transparent regulations and high political risks (European Parliament, 2022).

Table 3
General government debt sustainability

Fiscal stability (averaged 2013- 2020)	Bulgaria	Serbia	Montenegro
	22.82% (IMF)	63.68% (IMF)	79.06 % (IMF)

Source: according to sources cited in the Table

Expectations are for further rise in general government debt levels following post COVID-19 uncertainties and the need for adaptation of the economies to the process of economic, social, environmental, and digital sustainability and convergence to twin green and digital transformations. For Bulgaria, government debt has been projected to further push up from 25.3 % (2022) to around 37 % of GDP by 2032 due to rising budget deficits and the high uncertainties of the business environment.

**3) Freedom of expression and media independence
(relating to SDG 16 Peace, justice, and strong institutions)**

Table 4
Freedom of expression aspect

Specific aspect	Bulgaria	Serbia	Montenegro
Freedom of expression (Reporters without borders)	112 ranking (2021 World press freedom index)	93 ranking (2021 World press freedom index)	104 ranking (2021 World press freedom index)

Source: according to sources cited in the Table

The media environment in post COVID-19 situation is highly politicized and does not reflect adherence to principles of objectivity, transparency, pluralism, and independence. According to European Commission (2020) trust in public institutions has reached bottom low levels due to the extremely restrictive COVID-19 measures to civil and fundamental democratic rights and freedoms (as the freedom of expression, media freedom, freedom of assembly etc.), duly enshrined

in The Charter of Fundamental Rights, the European Charter of Human Rights and respective national Constitutions.

4) Corruption and strength of legal rights (relating to SDG 16 Peace, Justice and strong institutions)

In the aftermath of COVID-19 the political environment in the analyzed “capture” states in the Western Balkans is characterized with rising institutional instabilities, high-level corruption, growth of ethnonationalist polarizations with negative impact on economic and financial development amidst rising public debts, fiscal deficits and deepening social inequalities.

Table 5
Corruption perception and political environment aspects

Specific aspect	Bulgaria	Serbia	Montenegro
Corruption (Transparency International, 2021) (average score for 2013-2020)	48 ¹⁾	46	44
Strength of legal rights index (0 weak to 12 strong)	8 (for 2013-2019, World bank database)	6 (for 2013-2019, World bank database)	12 (for 2013-2019, World bank database)
Political environment (averaged score, Freedomhouse)	60.69 (semi-consolidated democracy for the whole period 2015-2020) ²⁾	69.2 (free 2017-2018, partly free 2019-2020)	65.2 (partly free for the period 2017-2020)

Notes: 1) Bulgaria ranks at the bottom among EU countries; 2) A Resolution on the Rule of Law and Fundamental Rights in Bulgaria (European Parliament 2020) calls for a “...full and unconditional respect” for the values enshrined in EU founding documents.

Source: according to sources cited in the Table

The newly introduced mechanism for annual monitoring of the state of democracy, the rule of law and preservation of fundamental rights at the EU level is expected to be a guarantee for the preservation of the founding values of EU.

5) Human development prospects (relating to SDG 8 Decent work and economic growth)

Western Balkan countries are confronted with problems as deteriorating human development prospects (see Table 6) due to rising income inequalities, unemployment levels, demographic crisis in the

aftermath of COVID-19 in a worsening institutional environment (see Tables 4 and 5 above).

Table 6

Human development aspect			
Specific aspect	Bulgaria	Serbia	Montenegro
Human development index (UN Development Program) 2020	56 rank (of 140 countries)	64 rank	48 rank
GNI per capita PPP (2019) in the respective country (current international \$, World Bank database)	\$ 24,900	\$ 18,440	\$ 24,120
GDP growth rate in the country (average for 2013 - 2020)	-4,2 % (European Commission, 2020) 3.69 % (average, World Bank database)	-1 % (BIT, 2020) 4,25% (average, World Bank database)	-15,2 % (BIT, 2020) 3,64 % (average, World Bank database)

Source: according to sources cited in the Table

6) Specific aspects of stock markets in the Western Balkans

The process of economic, social, environmental, digital etc. sustainability is associated with many challenges and opportunities and requires an in-depth analysis of various indicators on frontier stock markets in the aftermath of the global COVID-19 situations. Specifically, the pandemic has negatively impacted on investors' confidence level and significantly increased market volatility (Liu et al., 2020), dampening stock returns (Singh et.al, 2020).

In particular, these negative consequences require stock markets' application of the advanced 5P approach (i.e. profit-people-planet-peace-prosperity) to restoring sustainability (i.e. "build back better", Jabeen, Sh., 2022) as per UN Development Program (2015) and alignment with UN 2030 Agenda for Sustainable Development. The 5P sustainability approach requires the following adjustments to frontier stock markets in the Western Balkans:

- introducing SDG (i.e. economic, social and governance, ESG) detailed dissemination of information and good practices in line with UN Sustainable Stock Exchanges and World Federation of Exchanges Sustainability Initiatives;

- requiring high level of transparency and better quantification of risks relating to attainment of SDGs (i.e. ESG) goals of investment portfolios;
- driving forward the fast transition to twin green and digital transformation through technological innovation and sustainability development;
- seeking active involvement of all stakeholders in the implementation of the 5P sustainability matrix in meeting UN 2030 Agenda for Sustainable Development.
- development of alternative financing instruments for the realization of SDGs at global, regional and national levels (i.e. environmental “green”, “blue” etc. bonds, SDG-linked bonds) to help companies transition and make measurable progress toward some of the 17 SDGs.

Table 7
Specific aspects of frontier stock markets in the Western Balkans in the pre- and post-COVID-19 realities

Specific indicator	Stock market		
	Bulgaria	Serbia	Montenegro
Asset returns MSCI (average for the period 2013-2019) ¹⁾	10.59 % (max. 97.82 % in 2013; min. - 35.32 % in 2015)	2 % (max. 30.44 % in 2017; min. - 27.78 % in 2015)	Note: not included in the calculation of MSCI
Private equity flows as % of GDP (averaged for the period 2013-2019)	-3.08% (World bank database)	-0.07 % (World bank database)	1.2 % (World bank database)
Stock market capitalization as % of GDP (averaged for the period 2013 -2019)	16.94 % (World bank database)	11.89% (World bank database)	75.13% (World bank database)
Stock index volatility (averaged for the period 2013-2017)	12.89% (Fred Economic Database)	10.95 % (Fred Economic Database)	N/A
Liquidity (latest data)	1.065 % (2019, World bank database)	0.00 % (2021, MSCI)	N/A

Note:1) Annualized returns MSCI frontier markets for the same period stood at average 7.77 % (max. 31.86% in 2017; min. -14.46 % in 2015)

Source: author compilations according to sources cited in the table

The multifold adaptations to 5P approach to sustainability is a particularly topical issue for underdeveloped peripheral stock markets which are traditionally characterized by:

1) structural weaknesses as illiquid and not adequately transparent market activities with high transaction costs. The liquidity of the financial markets and their development is determined by the presence of a diversified base of institutional investors such as mutual funds, pension and insurance companies. They prove to be a stable source of demand for equity and debt financial instruments, thus promoting competitiveness in primary markets and helping to build a stable regulatory and supervisory framework. An important challenge for the pension and insurance market in Bulgaria remains the implementation of the country's commitments arising from EU membership and compliance with established international practices (Nedelchev, 2017). A very important tool in corporate governance is also the observance of the standards for equal treatment of shareholders (Chipev, 2015);

2) low stock market capitalization relative to GDP and significant volatility of the stock market index. A study of Katarzyna Cz. et al., (2020) established that in the aftermath of COVID-19 the stock indexes on Vishegrad emerging stock markets declined in the range of 12 % (Slovakia) to 47 % (Hungary) pointing toward negative unexpected returns due to future volatility;

3) many of the countries in the Western Balkan have been characterized as semi-structured and/or hybrid democratic regimes or “facade” democracies which poses additional challenges to restoration of sustainable economic growth in post COVID-19 “new normal” and delay the prospects for upgrade of their stock markets to emerging market status and their accession efforts to EU in the foreseeable future (see Tables above).

In emerging stock markets, the link between the stock market and its performance, economic growth and the institutional environment is particularly strong (Levine & Zervos, 1998). A modified Calderon-Rossell (1991) model, which includes macroeconomic and institutional factors, highlights the following statistically significant institutional variables for emerging stock markets: law and order (+); good quality bureaucracy (+); effective democratic governance (+) and level of corruption (-). All these components determine the economic effect of political risk and institutional sustainability on the development of the stock market. This contributes to an increase in the level of

savings and their distribution to productive investments. Thus, according to research by McCinnon (2010), financial development preconditioned on good institutional quality leads to the stimulation of economic growth.

The stock exchanges are expected to take a leading position in implementing sound standards and good corporate practices in economic, social and governance sustainability (i.e. SDG and ESG) aspects which are inseparable part of UN 2030 Agenda for Sustainable Development. Progress toward the UN 2030 Agenda is assessed on the basis of a set of social development indicators central to which are real GDP per capita, eco-innovation, R&D expenditure and employment etc. Specifically for Bulgaria, the Recovery and Resilience Plan 2021-2027 with total of EUR 6,3 billion in grants envisages investments and structural policy reforms to provide estimated macroeconomic impact with forecasted rise in GDP by 1.9 % (short-term) to 3 % by 2026. Besides, the Just Transition Fund instruments (EUR 1,298 million) and Common Agricultural Policy funds of EUR 5,7 billion are expected to support the green transition, social, environmental and economic sustainability policy objectives. UNCTAD (2020) has estimated that at global level progress toward SDGs would require investments in the range of \$ 5 - \$ 7 trillion yearly till 2030.

The COVID-19 consequences to peripheral stock markets point to medium term overregulation with concomitant rising costs to market participants and policymakers (Katarzyna Cz. et al., 2020). These costs encompass not only mandatory compliance with the new regulatory framework but also the price for rising volatility generated by the heightened degree of uncertainties in the global environment accelerating trends toward deglobalization/ slow globalization/ localization of economic activities. As COVID-19 pandemic affected both demand conditions and supply value chains, Western Balkan countries with open economies experienced fall of exports, limited production, and consumption, squeeze of employment (short term impacts), rising budget deficit, public debt levels and generally public finance destabilization in the medium to long-term with negative impact on economic, financial, social, environmental sustainability.

3. Methodological aspects

At the macroeconomic level the report focuses on the challenges to sustainable financial development of selected Western

Balkan countries and their economies as the most CO₂ intensive by applying empirical testing of the association between ecological sustainability index (WIPO, 2020) and real GDP per capita at PPP for the period 2013-2020. The ecological sustainability index is an integral part of sub-pillar 3.3 of the Global innovation index (Cornell, INSEAD, WIPO, 2020) and it consists of three indicators: a) GDP per energy use (measuring the efficiency in energy utilization); b) the Environment performance index of Yale and Colombia Universities; c) number of issued certificates conforming to ISO 140001 on environmental management systems. Besides, the report tests the association between Freedomhouse democracy score of the respective three Western Balkan countries and their Human development index for the period 2013-2020. The human development index is calculated by the UN as a summary measure for assessing long-term progress to sustainable human development beyond GDP. It includes population's average longevity, education, income, poverty, inequality and gender gap levels.

Regarding the meso-economic level, the analysis focuses on the practical adaptation of the Western Balkan stock markets to sustainability dimensions (i.e., ESG standards) by empirically investigating the association between Freedomhouse democracy score, UN Human development index, the eco-sustainability index and stock market capitalization ratios on Bulgarian, Serbian and Montenegrin stock exchanges for the period 2013 - 2020.

The hypothesis that the paper aims to test empirically are as follows:

H₁: Sustainability performance (measured by Freedomhouse democracy score, UN human development index and Ecological sustainability index) is positively associated with stock market development (measured by respective stock markets capitalization rates) for the period 2013-2020.

The factor variables tested in this study consisted of:

- 1) Ecological sustainability index (sub-pillar 3.3 of Global Innovation Index) as a synthetic measure of environmental sustainability of the respective economy;
- 2) UN Human development index (UN database Human development reports) as a summary measure of long-term sustainable human development beyond GDP measure;

3) Total democracy score (Freedomhouse database) as a measure of political freedoms and civil liberties in the analyzed countries.

Data for the respective variables used in the empirical test for the period 2013-2020 were taken from the following sources: 1) for Ecological sustainability index (sub-pillar 3.3 of Global innovation index) from Global Innovation Index Database, Cornell, INSEAD & WIPO. 2) For Human development index from UN database Human Development Reports. 3) for GDP growth rate from IMF country reports. 4) for democracy scores from Freedomhouse database. 5) for stock exchange capitalization rates from the Internet sites of the respective stock exchanges.

4. Results

The results of applied empirical analysis by using heteroscedasticity model of ordinary least squares regression, for the period 2013-2020 using the following equation indicates:

$$Y = \beta X_1 + X_2 + X_3 + \varepsilon \quad (1)$$

Where: Y = financial development measured by stock market capitalization rate; X_1 = eco-sustainability index; X_2 = human development index; X_3 = total democracy score; ε = error term.

Table 8
Correlation matrix between tested variables for Bulgaria

	Eco-sustainability Index	Annual GDP growth rate	Market Capitalization as % of GDP	Human development index	Freedomhouse democracy total score
Eco-sustainability index	1,000	0,5812	-0,4606	-0,1652	-0,4100
Annual GDP growth rate		1,000	-0,2859	0,0575	-0,1861
Market capitalization as % of GDP			1,000	0,6970	0,9883
Human development index				1,000	0,7770
Freedomhouse democracy total score					1,000

Source: own calculations of the author

Following from Table 8 above, the eco-sustainability index of Bulgaria is moderately and positively correlated with annual GDP growth rate, proving stylized fact (Hall and Lerner, 2009 etc.) that good environmental performance relates to long-term economic growth. This established fact is firmly grounded in endogenous growth models (Romer, 1986) and is explained with increased total factor productivity levels in the course of technological spillovers of the production processes. According to European Commission Country Report (2022) Bulgaria is showing improved performance on most UN Agenda 2030 Social Development Goals relating to environmental sustainability (i.e. SDGs 2,6,7, 9, 11) yet the country has not yet adopted strategic long-term agenda toward decarbonization and climate neutral economic development.

The market capitalization rate shows moderate correlation (0,6970) with Human development index and strong (0,9883) correlation with Freedomhouse democracy total score proving the importance of institutional and social development for stock market performance in achieving synergistic impact on sustainability performance in its triple dimensions (i.e., socio-economic, institutional and eco-efficient).

Table 9

Simple linear regression model with heteroscedasticity correction. Dependent variable: market capitalization rate for the period 2013-2020 Bulgaria

	Coefficient	Standard error	t-value	p-value	Sig. level
const	-319,516	101,685	-3,142	0,0348	**
Eco sustainability index BG	-0,313817	0,191563	-1,638	0,1767	
Annual GDP growth rate BG	-0,182659	0,201284	-0,9075	0,4155	
Human development index BG	437,440	116,026	3,770	0,0196	**
Freedom house democracy score	9,92000	0,669674	14,81	5,92e-06	***
Sum of squares of residuals	4,742310	Standard error of regression		1,088842	
Simple coefficient of determination	0,978971	Adjusted R-squared		0,963200	
F(3, 4)	62,07206	P-value(F)		0,000823	
Log-likelihood	-9,259839	Akaike criterion		26,51968	
Swarz criterion	26,83745	Hannan-Quinn		24,37647	
rho	0,199788	Durbin-Watson		1,591174	

Source: calculations of the author

The results of the empirical analysis (Table 9 above) show existence of the following statistically significant associations:

- market capitalization rate on the frontier stock exchange of Bulgaria and Human development index (+) (p-value of 0,0196), indicating 1 unit increase in the score of the index is related with a rise in the market capitalization by 437,440 units. This is indicative of the increasing importance of long-term sustainable human development (beyond GDP) and its components (i.e. population's average longevity, education, income etc.) in stimulating financial development and financial sustainability in developing countries in particular. Yet Bulgaria scores low on Digital economy and society index in EU (DESI) human capital dimension (only 1/3 of the population has basic digital skills, lowest level in EU) and the strategic agenda of the country 2021 -2027 envisages measures to increase digital skills of the population, digitalization of public administration services etc.
- stock market capitalization rate and the Freedomhouse democracy total score (+), indicating that 1 p.p. increase in the score is associated with a boost in market capitalization rate by 9,92 p.p.

A result particular for a “capture” status developing country as Bulgaria is the negative albeit statistically insignificant association between stock market capitalization rate and the eco-sustainability index. This can be explained with the following:

- Bulgaria continues to maintain last place in 2020 EU eco-innovation scoreboard (most energy and emissions intensive country in EU with 31 % of power generation dependent on coal, 2020) and its transition to low carbon economy is still distant as compared to leading eco-innovating countries in the EU. The adopted Recovery and Resilience Plan in 2022 envisage approximately 60 % of measures toward attainment of set climate objectives by reductions in greenhouse emissions by 40 % of coal power production and threefold increase in use of renewables and alternative energy sources (share of 23.3 % in 2020 while EU average share for 2020 is 22.09 %);
- The eco-innovation environment is extremely sensitive to presence of established legal framework for protection of intellectual property rights, the range of various tax-based incentives for eco-innovations, competition policies, market structure regulations, depth of financial markets and access to alternative forms of

financing (i.e., venture capital), efficiency of trade and investment etc. The transition of Bulgaria to low carbon economic growth would require significant improvements in the institutional setting, establishment of efficient public policies in environmental protection (government expenditure on environmental protection stood only at 1,75 % of total expenditure by 2020), control of corruption and protection of property rights.

In another study by the author (Stefanova, 2020) it has been established that statistically significant institutional variables for financial development and institutional sustainability in Bulgaria include: 1) democratic accountability assessment (+); 2) political stability and market capitalization (+); 2) corruption and market capitalization (-); 3) low regulatory quality and market capitalization (-). A step toward improving the institutional framework in Bulgaria in the Recovery and Resiliency Plan relates to implementing digitalization and e-government in public administration and the judiciary in particular, increasing public policy transparency in allocation of resources.

Table 10
Correlation matrix between tested variables for Serbia

	Eco-sustainability Index	Annual GDP growth rate	Market Capitalization as % of GDP	Human development index	Freedomhouse democracy total score
Eco-sustainability index	1,000	0,1182	0,4973	-0,361	0,3352
Annual GDP growth rate		1,000	-0,1244	0,0971	0,3181
Market capitalization as % of GDP			1,000	-0,9512	-0,4061
Human development index				1,000	0,468
Freedomhouse democracy total score					1,000

Source: calculations of the author

Table 10 above indicates existence of moderate positive correlation between:

- eco-sustainability index and market capitalization as % of GDP, which is indicative of the increasing importance of environmental performance requirements in reporting the eco-innovation activities of companies in developing countries with peripheral stock markets (as that of Serbia). Eco-efficiency awareness of listed firms would drive up firm value in the long run based on natural resource and instrumental stakeholder theories;

- Human development index and Freedomhouse democracy total score for Serbia for the analyzed period 2013-2020 pointing toward the importance of political freedom and civil society liberties in realization of long-term sustainable human development (beyond GDP) in Serbia.

Table 11
Results of Heteroscedasticity correction model for Serbia, 2013-2020. Dependent variable: Market capitalization

	Coefficient	Standard error	t-value	p-value	
const	221,547	18,5962	11,91	0,0003	***
Eco sustainability index Serbia	0,0970959	0,0399246	2,432	0,0718	*
Annual GDP growth rate Serbia	-0,147035	0,100107	-1,469	0,2158	
Human development index Serbia	-267,694	22,6510	-11,82	0,0003	***
Freedomhouse democracy score	-5,25892	1,58302	-3,322	0,0293	**
Sum of squares of residuals	5,761429	Standard error of regression		1,200149	
Simple coefficient of determination	0,979383	Adjusted R-squared		0,963919	
F(3, 4)	63,33675	P-value(F)		0,000792	
Log-likelihood	-10,03848	Akaike		28,07697	
Scwarz criterion	28,39473	Hannan-Quinn		25,93376	
rho	-0,148214	Durbin-Watson		2,226276	

Source: calculations of the author

The results of the empirical analysis (Table 11 above) show existence of **statistically significant relationships** between:

1) eco-sustainability index of Serbia and the market capitalization rate (+) - thus a 1 unit increase in the score of the index is associated with a rise in the market capitalization rate by 0,10 units. This result is a proof of the importance of eco-innovative practices of listed companies for driving up sustainable financial development in Serbia, speeding up the transition of the country to eco-efficient

technologies in conformity with social, economic and environmental accounting and corporate social responsibility practices;

2) human development index and the market capitalization rate (-) - thus a 1 unit deterioration in the index is related with a decrease in the market capitalization by 267,694 units. This result is indicative of the need for adaptive and transformative institutional changes in Serbia for overcoming the social development weaknesses (social income gaps, demographic negative trend, aftermath of Covid-19 on the wellbeing of the population, need for digital upskilling of workers etc.) and for boosting financial sustainability dimension;

3) Freedomhouse total democracy score and market capitalization rate (-) - in this case a 1-unit deterioration in the index relates to fall in the market capitalization by 5,25892 units. This result also points toward the need for institutional improvements in “capture” state business environment for safeguarding the rule of law, democratic values, fundamental rights and freedoms for attracting investments and driving up sustainable financial development.

The model is valid (p-value (F) 0,000792 and leads to the acceptance of formulated hypothesis proving positive association between ecological sustainability performance in Serbia and financial development (measured by market capitalization rate as % of GDP) for the analyzed period 2013-2020. The empirical results for Serbia also prove the thesis that the deterioration in the institutional sustainability of the business environment in Serbia for the analyzed period under “capture” state situation is a limit to financial development and socio-economic progress in the short to medium-term period. In terms of social sustainability, the Human Development Index for 2019 Serbia ranked lower than all other European countries (except for Albania, Bosnia and Herzegovina, Northern Macedonia and Moldova) (BIT, 2020) and with GDP per capita of \$ 18,440 (or 43 % of EU average) Serbia ranks as one of the poorest countries in Europe (followed by Albania and Bosnia and Herzegovina). Regarding economic sustainability, since the onset of COVID-19, the Serbian economy contracted by about 1,5 %, current account deficit reached 4,3 % of GDP, FDI fell to 6,2 % of GDP in 2020 and the business environment has been characterized by red tape, large informal sector (almost 50 %, BIT, 2020), high corruption. In view of environmental sustainability, the country heavily relies on traditional coal industry and needs to implement more rigorously environmental policy and legislative tools in the field.

Table 12 shows strong negative correlation between eco-sustainability index and the market capitalization rate (-0,7354); weak positive correlation between annual GDP growth rate and Freedomhouse democracy score and weak positive correlation between eco-sustainability index and Freedomhouse democracy score for the analyzed period 2013-2020 in Montenegro.

Table 12
Correlation matrix between tested variables for Montenegro

	Eco-sustainability Index	Annual GDP growth rate	Market Capitalization as % of GDP	Human development index	Freedomhouse democracy total score
Eco-sustainability index	1,000	0,2898	-0,7354	0,2981	0,3666
Annual GDP growth rate		1,000	-0,3882	-0,3398	0,3564
Market capitalization as % of GDP			1,000	-0,6445	-0,3792
Human development index				1,000	0,1115
Freedomhouse democracy total score					1,000

Source: calculations of the author

The results of the empirical analysis for Montenegro (see Table 13) show existence of the following statistically significant relationships regarding Montenegro:

1) eco-sustainability index and market capitalization (-) - the deterioration in the index by 1 unit relates to a fall in market capitalization of Montenegro by 0,671598 units;

2) GDP growth rate and market capitalization rate(-) - the fall of economic growth by 1 unit is associated with a fall in market capitalization by 0,69 units;

3) human development index and the market capitalization rate (-) - the deterioration in the index by 1 unit is related to a fall in market capitalization by 33,4515 units.

Table 13
Results of Heteroscedasticity correction model for Montenegro (MNG), 2013-2020. Dependent variable: Market capitalization

	Coefficient	Standard error	t-value	p-value	
const	747,838	123,171	6,072	0,0037	***
Eco sustainability index MNG	-0,671598	0,149661	-4,487	0,0109	**
Annual GDP growth rate MNG	-0,695741	0,149114	-4,666	0,0095	***
Human development index MNG	-786,567	154,361	-5,096	0,0070	***
Freedomhouse democracy score	-33,4515	17,5127	-1,910	0,1521	
Sum of squares of residuals	5,480750	Standard error of regression		1,170550	
Simple coefficient of determination	0,992147	Adjusted R-squared		0,986257	
F(3, 4)	168,4466	P-value(F)		0,000115	
Log-likelihood	-9,838710	Akaike		27,67742	
Scwarz criterion	27,99519	Hannan-Quinn		25,53421	
rho	-0,178073	Durbin-Watson		2,200786	

Source: calculations of the author

The model is valid (with a p-value (F) 0,000115) leads to rejection of alternative hypothesis due to the following: 1) under conditions of “capture” state environment the transition of Montenegro to low carbon “green” and sustainable economic growth and financial development requires significant adaptation and improvement in the institutional and regulative setting, considerable investments in environmental protection and boosting public policies for human development and protection of the rule of law. 2) Montenegrin economy is characterized with high degree of openness, service based and heavily dependent on trade and foreign investment and the post Covid-19 situation has led to significant negative consequences to the economic, social, financial etc. spheres coupled with weaknesses in the institutional and regulatory framework (BIT, 2022). After strong economic performance till 2019, with the onset of Covid-19 pandemic in 2020 economy contracted by about 12,4 % (IMF, 2020), public deficit rose to 8,6 % of GDP, government debt pushed up to 92,9 % of GDP, fall of FDI (from 16,9 % of GDP 2015) to 7 % of GDP (2019) pointing toward medium-term economic vulnerabilities with negative impact to social, financial, economic etc. sustainability toward SGD and ESG objectives.

In another study of the author (Stefanova, 2019) applied Engle-Granger cointegration model for Montenegro for the period 2006-2017 established: 1) improved rating for regulatory quality and market capitalization rate +); 2) improved estimate of the indicator of government effectiveness and market capitalization rate (+); 3) worsened estimate of the rule of law and market capitalization (-).

5. Concluding remarks

Institutional weaknesses relating to deteriorating democratic values, limitations on political freedoms/fundamental human rights, high-level corruptive practices etc. in the analyzed frontier stock markets of “capture” states in the Western Balkans put a limit to economic, social, environmental and financial sustainability in medium term perspective.

There are structural constraints on the capital markets of the Western Balkans countries analyzed in the report, which are related to the small size and structure of their economies, due to which the peripheral stock markets are unable to provide economies of scale for companies listed on them in conditions of low liquidity, high price volatility and insufficient depth of the stock markets. An eventual project for establishment of Balkan Stock exchange would require significant institutional and market efforts to overcome the challenges posed by “capture” states analyzed in the present paper (and having in mind the unsatisfactory performance of the SEE Link initiative of unified stock exchange trading platform in Southern and Eastern Europe so far). Stock exchanges have a proactive future role in establishing “green” low-carbon investments and developing best practices for high transparency and corporate social responsibility in view of creating trust in these new forms of investments and providing support for the industrial transition to green and digital sustainability of their economies. Against the background of high uncertainties in the business environment globally, overcoming the challenges facing countries with peripheral financial markets such as those in the Western Balkans is providing alternative sources of financing and improving access to bank lending (Taseva, G., 2014)

Given the fifteen-year membership of Bulgaria in the EU, the consequences of the process of integration of the Bulgarian capital market are that it continues to be on the periphery of these processes, and this is due to a number of institutional, structural, demographic,

etc. constraints, which requires an interdisciplinary and synergistic approach to action to solve existing problems and uplift from status of “capture” state with “facade” democratic regime. Obviously, the future points to an increased role of deliberative civic engagement with strong participatory activism of society (i.e., “deliberative democracy”) in the analyzed countries of the Western Balkans as a counterbalance to “facade” and “capture” institutional developments.

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THE ASYMMETRICAL IMPACT OF POLICY RESPONSES ON VOLATILITY OF SOVEREIGN DEFAULT SWAPS

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Abstract

The COVID-19 pandemic has adversely influenced economies around the world through supply and demand channels. The increasing uncertainty and the decreasing demand due to the strict social measures of the government to cushion the spread of the pandemic have transformed COVID-19 from a health crisis into an economic crisis. To moderate the negative economic atmosphere during this period, the governments have implemented expansionary fiscal policy. The purpose of this paper is to investigate the impacts of the social and economic measures taken during COVID-19 on the volatility of sovereign credit default swaps for Turkey, Italy, Spain, the United Kingdom, and the United States. The empirical findings indicate that social distancing measures increase uncertainty, but health and economic policies moderate the negative impacts on the economy of Turkey, Spain, and the United Kingdom. The impact of the policies in question is greater in the high number of case regimes.

Keywords: Credit default swap premium, public policies, threshold regression

JEL Classification: C24; G18; I18

1. Introduction

Fluctuations in fundamental macroeconomic variables may increase the likelihood of sovereign default, especially for countries that generate dollar-denominated export income and pay a foreign debt in dollars, which causes the economic indicators to severely deteriorate (Hilscher and Nosbusch, 2010). Increasing credit risk leads to tremendous losses in hedging costs against potential losses from public debt. Particularly with the European debt crisis, interest in sovereign credit default swaps (CDSs) seems to have increased over

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the past decade due to their speculative nature and the potential to exacerbate the collapse in the credit market and affect borrowing costs. Thus, CDS premiums, which serve as insurance against the risk of failure to repay sovereign debt, have become a key indicator closely followed by international investors (Weistroffer, 2009).

Credit Default Swap (CDS), proposed by JP Morgan Chase in 1995, is acknowledged as an important measure of country risk premium, especially in emerging market economies. CDS gives information about the financial situation and ensures the balance of credit risk (IMF, 2013). In summary, CDS accepted as a popular indicator of a country's risk is an insurance-type credit derivative contract covering the loss to be incurred against the country's insolvency risk. The investor has invested in bonds (Tang ve Yan, 2012). Sovereign risk is an important aspect for investors who want to make portfolio investments or direct investments in emerging markets. Therefore, the CDS market reflecting market participants' perceptions regarding the creditor country's financial health is used as a market-based indicator for sovereign risk (Badaoui et al., 2013; Bouri et al., 2017). Consequently, investors can comment on the risk position and decide on their investments by monitoring CDS premiums.

Uncertainty in economic conditions is the driving factor that affects movements in CDS premiums. If uncertainty increases in the economy, it leads to excessive volatility in CDS premiums. Over the past two decades, uncertainty in the global economy has increased due to spillover effects of the European sovereign debt crisis, The Ebola pandemic, the Brexit withdrawal agreement, the Asian conflicts, the trade war between China and the United States, etc. The final wave of uncertainty stemmed from the COVID-19 pandemic, which has turned into an economic crisis in addition to a health crisis (Liu, 2020).

COVID-19, which emerged in Wuhan China, in December 2019, turned into a global outbreak in the early months of 2020. Public health and social measures such as quarantine applications, travel restrictions, factory closures or reduction in production, and significant reduction of many activities in the service sector, which are taken by many countries to control the spread of the COVID-19 pandemic, have led to unprecedented disruption of economic and social life. Similarly, many workplaces have implemented a home-office application. Congresses, organizations, and sports activities were delayed and postponed later (Ayittey et al., 2020). These measures taken against the COVID-19 pandemic have caused important consequences from

the labor market to the tourism sector, from the financial markets to the service sector. This health crisis, unlike the previous crisis, has emerged as a supply and demand shock. Many governments implemented financial support packages for businesses and workers to reduce the adverse effect of the COVID-19 pandemic on economies (Williams and Kayaoglu, 2020). While the number of cases, which continues to increase daily, feeds the uncertain environment, the so-called uncertainty brings along risk and fear. It harms the economy.

It is uncertain how long it will take to keep the health crisis under control. In case the violence of the COVID-19 pandemic deteriorates more than expected, or developments in treatments or testing don't actualize, the decline in economic activity may be sharper. With the increase in the second wave case number and start, the stringent social distancing measures will come back to decrease in new cases per day—the WHO has announced the minimum required conditions so that the governments can safely loosen the social distancing measures.

In light of this information, this study investigates the effects of governments' responses to the COVID-19 pandemic on the volatility of sovereign CDS premiums for Turkey, Italy, Spain, the United Kingdom, and the United States. It is rather difficult to foresee the economic effect of COVID-19 because it is not clear how long the outbreak in question takes. A longer duration of COVID-19 will lead to a deep recession in the economy. Therefore, governments have had to take stringent measures to support economic recovery and delimit the spread of the pandemic. In this context, we take into account the policy indices: the overall government response index, stringency index, containment, and health index, and economic support index generated to measure the extent of the government response to the COVID-19 pandemic. So, our objective is to assess the impacts of the measures taken against COVID-19 on sovereign risk. Empirical evidence offers a clear view that strict social distancing measures and health policies lead CDS premiums to increase by creating high uncertainty in the periods of a greater number of cases. Loosening of the so-called measures due to a decrease in the number of cases supports economic recovery, which reduces the movements in the volatility of sovereign CDS premiums.

Especially after the 2008 global financial crisis, the studies on CDS Premium have shown an increase (Alexander and Kaeck, 2008; Fender et al., 2012; Oliveria and Santos, 2014, Pires et al., 2015, Blommestein et al., 2016, Oh and Patton, 2018; Chen and Chen, 2018;

Yang et al., 2018; Chuffart and Hooper, 2019; Sabkha et al., 2019; David-Pur, L. et al., 2020;). Similarly, many studies in the literature focused on the economic impacts of COVID-19 (Baker et al., 2020; Kristoufek, 2020; McKibbin and Fernando, 2020; Zhang et al., 2020; Ramelli and Wagner, 2020; Sharif et al., 2020, etc.). However, these studies did not consider government response policies to COVID-19. The number of studies reviewing the impacts of the policies in question on economic activity (Ozili and Arun, 2020; Kuckertz et al., 2020; Oruonye and Ahmed, 2020; Zhang et al., 2020; Ozili, 2020; Leduc and Liu, 2020) is rather limited. These studies indicate that the social and economic policies, such as the number of days of lockdown and international travel restrictions, influenced the stock markets and economic activities in many countries by creating an unprecedented level of risk and increasing uncertainty through various supply and demand channels. They also specified that the restriction on internal movement and monetary and fiscal policy decisions positively affected the level of economic activities. However, we did not meet any study investigating the effect of COVID-19 on CDS volatility. This study assesses the impacts of the social, health, and economic policies taken against COVID-19 on sovereign CDS by using the threshold regression model. In other words, we present evidence of the asymmetrical impacts of governments' responses to the COVID-19 pandemic on the credit market by using a nonlinear econometric model.

The study contributes to the literature in several ways:

1. We contribute to the literature in question by assessing how socio-economic policies, such as social distancing, health policies, and economic support policies, impact sovereign risk, a subject not to have been investigated in the existing literature.
2. This study empirically focuses on the economic effect of COVID-19 by means of its impact on uncertainty and the response to socio-economic policies.
3. This study uses a nonlinear threshold regression model in to analyse the effects in question.

The study provides policymakers with strategies for the economic advantage of the so-called policy responses.

The rest of the paper is designed as follows. Section 2 describes the methodology used in the study. Section 3 shows the

empirical results of the model on the impacts of socio-economic policies on sovereign risk. Section 4 concludes the study.

2. Model

The effect of social, health, and economic policies taken against COVID-19 on sovereign CDS volatility is analysed using a two-step process: 1) Univariate EGARCH volatility model is used to obtain conditional volatility of each CDS premium. 2) The threshold regression model, which is one of the nonlinear time series models, is used to find asymmetric effects of the policies regarding conditional volatility.

Step 1) One of the main characteristic features of the financial time series is the volatility cluster, known as heteroscedasticity. To overcome the so-called problem, firstly, the ARCH model was proposed by Engle (1982). Bollerslev (1986) developed the GARCH model by including lagged values of conditional variance in the ARCH model. Then, alternative models (EGARCH (Nelson, 1991), TARCH (Zakoian, 1994), and APARCH (Ding et.al., 1993)) were suggested to consider asymmetric effects. In this study, we used the EGARCH model to obtain the conditional volatility of CDS premiums. This model assumes that negative shocks have a greater effect on conditional volatility than positive shocks.

To model the CDS premiums, they are supposed to pursue an AR(1) process as follows:

$$y_t = \phi_0 + \phi_1 y_{t-1} + \varepsilon_t \quad (1)$$

where $y_t = \ln(CDS_t) - \ln(CDS_{t-1})$, ϕ_0 is a constant, $|\phi_1| < 1$ and $\varepsilon_t = e_t \sigma_t$, e_t generates white noise with $E(e_{t-1}^2) = 1$.

The EGARCH model proposed by Nelson (1991) is as follows:

$$\log(\sigma_t^2) = \omega + \sum_{j=1}^q \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^p \alpha_i \left| \frac{\varepsilon_{t-i}}{\sigma_{t-i}} \right| + \sum_{k=1}^r \gamma_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}} \quad (2)$$

The presence of leverage effects can be tested by the hypothesis that $\gamma_i < 0$. If $\gamma_i \neq 0$, there is an asymmetric effect.

Step 2) Threshold regression models are non-linear, in which the relationships between dependent and independent variables vary depending upon a threshold variable. In these models, time-series data are separated into regimes by a threshold parameter, also called the

change point. The so-called models allow coefficients to differ across regimes defined by a threshold variable above or below a threshold value.

Threshold regression models have improved rapidly since Tong and Lim (1980) and Tong (1983) studies. Common threshold models involve the threshold autoregression model, such as the smooth transition threshold model proposed by Chen and Tsay (1993), the threshold autoregressive heteroscedastic model proposed by Li and Lam (1995), and Li and Li (1996), and the self-exciting threshold model. Hansen (2011) and Tong (2011) evaluated the threshold autoregression model's improvement in time series. In the threshold autoregression model, the dependent variable is a function of its lagged values, while in the self-exciting threshold model, its lagged values are considered threshold variables.

A threshold regression model with two regimes identified by a threshold as follows:

$$y_t = x_t\beta + z_t\delta_1 + \varepsilon_t \quad \text{if} \quad -\infty < w_t \leq \gamma \quad (3)$$

$$y_t = x_t\beta + z_t\delta_2 + \varepsilon_t \quad \text{if} \quad \gamma < w_t < \infty \quad (4)$$

In the above equations y_t is a dependent variable, x_t is a $1 \times k$ vector of covariates possibly containing lagged values of y_t , β is a $k \times 1$ vector of regime-invariant parameters, z_t is a vector of exogenous variables with regime-specific coefficient vectors δ_1 , δ_2 and w_t and γ are respectively a threshold variable and threshold value.

Regime 1 (equation 3) is identified as the subset of the observations that the value of w_t is lower than the threshold value γ while Regime 2 (equation 4) is identified as the subset of the observations that the value of w_t is higher than the threshold value γ (Hansen, 1997, 2000).

In our paper, y_t indicates CDS premium for Turkey, Italy, Spain, the United Kingdom (UK), and the United States (US) while z_t indicates government response index, stringency index, containment, and health index, and economic support index. w_t is the logarithm of the number of cases.

3. Data

This study is aimed to investigate the impacts of responses of governments to the COVID-19 pandemic on the volatility of Credit

Default Swaps (CDS) for Turkey, Italy, Spain, the UK, and the US. CDS is one of the important indicators indicating country risk and reflects adverse conditions and uncertainty in the economy. The stringency index, overall government response index, containment and health index and economic support index are used to measure the stringency of the policies implemented by governments. The stringency index consists of workplace, school closings, closed public events cancelation, restrictions on gathering size, stay-at-home requirements, closed public transport, restrictions on internal movement, restrictions on international travel, and public information campaigns. The containment and health index consists of school closing, workplace closing, cancelling public events, restrictions on gathering size, closing public transport, stay at home requirements, restrictions on internal movement, restrictions on international travel, public information campaign, testing policy, and contact tracking. The government response index consists of school closing, workplace closing, cancel public events, restrictions on gathering size, closing public transport, stay at home requirements, restrictions on internal movement, restrictions on international travel, public information campaign, testing policy, contact tracing, income support, and debt/contract relief for households. The economic support index consists of income support and debt/contract relief for households. They are obtained from the Oxford Covid-19 Government Response Tracker (OXCGRT). (Hale et.al., 2020). Each index takes a value between 0 and 100.

These indices should not be evaluated as a measure of the effectiveness of the response of a government (Hale et.al., 2020). CDS premiums in all countries have increased since the period in which the COVID-19 pandemic began to reveal itself in the countries in question. Therefore, it can be stated that the CDS premiums follow a way parallel to the increase in the number of cases. However, containment and health measures are taken to slow the spread of the COVID-19 pandemic. The economic support policies implemented to reduce the negative effects on the economy led to a decrease in CDS premiums. In Turkey and Italy, although economic support policies lagged behind closure and containment and health policies by June 2020, since this date, the economic support index was above other indices due to the decrease in measures with normalization steps. Although the economic support index was above the other ones in Spain and the United Kingdom, it was below other policy indices in the United States.

Table 1 (in the Appendix) shows descriptive statistics for Turkey, Italy, Spain, the United Kingdom, and the United States. The analysis period for each country began when the first of COVID-19 cases were revealed in the countries in question.

As seen in Table 1 (in the Appendix), Turkey has the highest mean CDS premium and the highest CDS premium variability according to standard deviation. The government response index, the stringency index, and the containment and health index have the highest mean values in Turkey. In contrast, the country has the highest mean value economic support index in Spain. In Turkey, Italy, and the United States, the mean containment and health measures taken to control the spread of the COVID-19 pandemic are above economic support measures. In Spain and the United Kingdom, economic support measures are greater than containment and health measures.

4. Empirical results

The return series for CDS premiums were generated using the formula of $\ln(CDS_t/CDS_{t-1})$. Then, non-linearity and stationarity of the returns of CDS premiums are tested. We used Teraesvirta's neural network test, White neural network test, Keenan's one-degree test for nonlinearity, and Tsay's test for nonlinearity. The null hypothesis of Teraesvirta and White's tests is linearity, while the null hypothesis of Keenan's and Tsay's tests indicates that the time series follows some AR process. The results are given in Table 2. According to the results in Table 2, CDS premiums for all countries exhibit a nonlinear structure.

Table 2

The results of non-linearity tests

	Teraesvirta	White	Keenan	Tsay
CDS_{TURKEY}	10.816*** (0.004)	9.483*** (0.008)	9.993*** (0.002)	7.152*** (0.000)
CDS_{ITALY}	3.701 (0.157)	4.020 (0.133)	0.072 (0.787)	4.005*** (0.000)
CDS_{SPAIN}	12.582*** (0.001)	14.664*** (0.000)	3.944** (0.049)	5.570*** (0.000)
$CDS_{UNITEDKINGDOM}$	6.757** (0.034)	8.216** (0.016)	5.555** (0.019)	1.188 (0.264)
$CDS_{UNITEDSTATES}$	8.749** (0.012)	11.525*** (0.003)	15.532*** (0.000)	11.446*** (0.000)

Note: ***, **, * indicate significance at %1, %5 and %10 levels, respectively

Source: author's calculations

The stationarity of the variables in question was tested by using KSS (Kapetanious, Shin, and Snell, 2003) and Kruse's (2011) nonlinear unit root tests. The results are given in Table 3. KSS (2003) and Kruse (2011) nonlinear unit root tests are based on the nonlinear ESTAR (Exponential Smooth Transition Autoregressive) process. The null hypothesis of a unit roots against the alternative hypothesis of the globally stationary ESTAR process. In these tests, the deterministic elements do not include the auxiliary regression model.

Alternatively, three different alternatives are used: 1) raw data, 2) demeaned data, and 3) detrended data.

According to the results of the KSS and Kruse nonlinear unit root test results, the return series of CDS premiums for all countries show a globally stationary ESTAR process at significance level of 5%.

Table 3

The results of nonlinear unit root tests

	Raw Data	Demeaned Data	Data Detrended
KSS Non-linear Unit Root Test			
CDS_{TURKEY}	-3.973***	-4.078***	-4.256***
CDS_{ITALY}	-4.167***	-4.245***	-4.323***
CDS_{SPAIN}	-4.347***	-4.480***	-4.859***
$CDS_{UNITEDKINGDOM}$	-3.868***	-3.884***	-3.858**
$CDS_{UNITEDSTATES}$	-2.636**	-2.979**	-2.704
Kruse Non-linear Unit Root Test			
CDS_{TURKEY}	26.203***	26.427***	26.720***
CDS_{ITALY}	22.072***	22.176***	21.687***
CDS_{SPAIN}	31.067***	31.398***	32.102***
$CDS_{UNITEDKINGDOM}$	34.738***	34.843***	33.470***
$CDS_{UNITEDSTATES}$	31.593***	31.871***	31.979***

Note: ***, **, * indicate significance at %1, %5 and %10 levels, respectively

Source: author's calculations

We also applied TAR unit root test proposed by Caner and Hansen (2001) for CDS return series in Turkey, Italy, Spain, the United Kingdom, and United States. Firstly, we examine whether TAR models are suitable. So, we estimate the TAR model constant for five series. The results are given in Table 4. The threshold values are respectively -0.0173, -0.0183, 0.03003, 0.0060 and 0.0085 for Turkey, Italy, Spain, United Kingdom, and United States. The observations are in first regime if CDS returns increase less than so-called values, otherwise in second regime.

Table 4

Estimation results for TAR models

Turkey					
$\hat{\nu} = -0.0173$	First Regime $Z_{t-1} < \hat{\nu}$			Second Regime $Z_{t-1} \geq \hat{\nu}$	
	Estimate	Standard Error	Estimate	Standard Error	
Constant	-0.0190	0.0038	-0.0005	0.0010	
CDS(t-1)	-1.1788	0.1390	-1.0805	0.1146	
DCDS(t-1)	-0.5329	0.1261	0.1402	0.0977	
DCDS(t-2)	-0.0841	0.0671	0.1032	0.0655	
Italy					
$\hat{\nu} = -0.0183$	$Z_{t-1} < \hat{\nu}$			$Z_{t-1} \geq \hat{\nu}$	
	Estimate	Standard Error	Estimate	Standard Error	
Constant	-0.0135	0.0046	-0.0015	0.0011	
CDS(t-1)	-0.6143	0.1778	-1.0758	0.1102	
DCDS(t-1)	-0.8914	0.1604	-0.0434	0.0917	
DCDS(t-2)	-0.4961	0.1011	-0.0605	0.0538	
Spain					
$\hat{\nu} = 0.03003$	$Z_{t-1} < \hat{\nu}$			$Z_{t-1} \geq \hat{\nu}$	
	Estimate	Standard Error	Estimate	Standard Error	
Constant	-0.0011	0.0012	-0.0031	0.0042	
CDS(t-1)	-2.3498	0.1680	-3.2771	0.2120	
DCDS(t-1)	0.5406	0.1284	1.2149	0.1573	
DCDS(t-2)	0.1448	0.0670	0.2899	0.0677	
United Kingdom					
$\hat{\nu} = -0.0060$	$Z_{t-1} < \hat{\nu}$			$Z_{t-1} \geq \hat{\nu}$	
	Estimate	Standard Error	Estimate	Standard Error	
Constant	0.0042	0.0032	-0.0023	0.0013	
CDS(t-1)	-2.8918	0.2214	-2.5455	0.1787	
DCDS(t-1)	1.0164	0.1772	0.6875	0.1254	
DCDS(t-2)	0.3628	0.0956	0.0948	0.0565	
United States					
$\hat{\nu} = 0.0085$	$Z_{t-1} < \hat{\nu}$			$Z_{t-1} \geq \hat{\nu}$	
	Estimate	Standard Error	Estimate	Standard Error	
Constant	0.0000051	0.0014	0.01068	0.00484	
CDS(t-1)	-2.134	0.1393	-4.574	0.2584	
DCDS(t-1)	0.4325	0.1033	2.429	0.2088	
DCDS(t-2)	0.1125	0.0463	1.345	0.1231	

Source: author's calculations

Table 5 shows the results of non-linear unit root test of TAR. The delay parameter m is chosen as 1 by minimum SSE value. The lag parameter p is detected by the AIC information criteria. The results of the Wald test based on the bootstrap threshold test investigating the threshold effect in a series indicate the presence of threshold effect for all countries. Therefore, the null hypothesis of linearity is rejected at

the 0.05 significance level. Then, we evaluated R_1 and R_2 tests statistics. R_2 test is tested the null hypothesis of $H_0 = \rho_1 = \rho_2 = 0$ against the alternative hypothesis of $H_0 = \rho_1 \neq \rho_2 \neq 0$. R_1 test is tested the null hypothesis of $H_0 = \rho_1 = \rho_2 = 0$ against the alternative hypothesis of $H_0 = \rho_1 < 0, \rho_2 < 0$.

Table 5
Caner and Hansen (2001) unit root test results

	Wald statistics	Boot p-value	Asymp. p value
Turkey			
Bootstrap Threshold Test	66.01	0.000	0.000
Two-way Wald Test R_2	161	0.000	0.000
One-way Wald Test R_1	161	0.000	0.000
t_1 test	85	0.000	0.000
t_2 test	9.426	0.000	0.000
Italy			
Bootstrap Threshold Test	29.09	0.000	0.000
Two-way Wald Test R_2	107	0.000	0.000
One-way Wald Test R_1	107	0.000	0.000
t_1 test	3.453	0.030	0.031
t_2 test	9.756	0.000	0.000
Spain			
Bootstrap Threshold Test	20.251	0.010	0.025
Two-way Wald Test R_2	435	0.000	0.000
One-way Wald Test R_1	435	0.000	0.000
t_1 test	14	0.000	0.000
t_2 test	15.459	0.000	0.000
United Kingdom			
Bootstrap Threshold Test	14.99	0.07	0.09
Two-way Wald Test R_2	373	0.000	0.000
One-way Wald Test R_1	373	0.000	0.000
t_1 test	13.1	0.000	0.000
t_2 test	14.24	0.000	0.000
United States			
Bootstrap Threshold Test	90.61	0.000	0.010
Two-way Wald Test R_2	548	0.000	0.000
One-way Wald Test R_1	548	0.000	0.000
t_1 test	15.3	0.000	0.000
t_2 test	17.7	0.000	0.000

Source: author's calculations

According to the results in Table 5, the null hypothesis is rejected at 0.05 significance level for all countries. The stationarity for each regime is tested by t_1 and t_2 tests. From the results of t_1 and t_2 tests, it is inferred that CDS returns are stationary for each regime.

We estimate the AR(1)-EGARCH(1,1) model to obtain the conditional variance of CDS premiums due to our purpose, which is to determine the impacts of the measures against COVID-19 on the volatility of CDS premiums. Then, we estimated the threshold regression model. Table 6 (in the Appendix) consists of three parts, which are Panel A, Panel B, and Panel C. Panel A, Panel B, and Panel C, respectively, indicates the estimation results for linear model, low regime, and high regime.

The linear model results given by Panel A can be summarized as follows: Government response index lead volatility in CDS premiums to increase for only Italy and Spain with the highest number of cases and mortality rates. Similarly, stringency index, containment, and health index increase the volatility in CDS premiums for Turkey, Italy, and Spain while economic support index has reducing impact on the so-called volatility only for Turkey.

As examined by panel B, during the period in which daily cases are lower than the endogenously determined threshold value by the model, the overall government response index statistically significantly decreases volatility in the CDS premium for Turkey, while it enhances the volatility CDS premiums for Italy and the United Kingdom. The stringency index statistically significantly negatively affects volatility in the CDS premium for Turkey while positively affecting Italy, Spain, and the United Kingdom. The containment and health index reduces volatility in CDS premiums for Turkey, although it enhances volatility in CDS premiums for Italy, Spain, and the United Kingdom. The economic support index has a statistically significant and decreasing effect on volatility in only Turkey. However, there is no statistically significant effect in Italy, Spain, the United Kingdom, and the United States.

According to the results given by Panel C, during the period in which daily cases are higher than the threshold value, the government response index has a decreasing effect on volatility in CDS premiums for Turkey and the United Kingdom, and it has an increasing effect in Italy, Spain, and the United States. The stringency index improves the volatility of CDS premiums for Turkey, Italy, and Spain while it reduces in the United Kingdom. The containment and health index diminish the volatility in question for Turkey and the United Kingdom while enhancing it for Italy and Spain. The economic support index decreases the so-called volatility in Turkey, Spain, and the United Kingdom, while increasing in the United States.

5. Conclusion

The COVID-19 pandemic is an unprecedented disaster that adversely affects the global economy through the supply and demand chains. This pandemic led to an economic crisis as well as a health crisis in terms of its social and economic impacts on society. Governments worldwide have taken some measures against this health crisis, including social distancing measures, health policy, and economic support policy, to temper its negative impacts on the economy. However, uncertainty from the strict measures taken to stop an increase in the number of cases has led to the deterioration of macroeconomic stability, reflected in sovereign CDS premiums.

This paper focuses on how social distancing, containment, and health measures taken to slow the spread of the COVID-19 pandemic and economic support policies implemented to decrease its negative effects on the economy affect movements in sovereign CDS premiums in different regimes in which the daily number of cases is above or below a given threshold. The empirical results indicate that in the context of the global economy and integrated cross-border supply chains, social distancing, and containment measures implemented to decrease the spread of COVID-19, such as lockdown and international travel bans, have brought the global economy to a sharp stop, and as a result of which, the so-called measures have created an increasing effect on the volatility of sovereign CDS for Turkey, Italy, and Spain. However, economic support policies by the governments around the world to help households and businesses to recover rapidly have enabled the volatility of sovereign CDS premiums for Turkey to decrease. When we consider the United States, none of the so-called policies creates a significant impact on CDS premiums. However, the results differ in terms of the regimes.

In low regime, government response index, stringency index, containment and health index create a mitigating effect on CDS for Turkey, but an enhancing effect for Italy, Spain, and United Kingdom. Economic support index has a significant and decreasing effect on it for only Turkey. The reason of so-called discrepancy is that the uncertainty among investors multiplies due to the suddenly increased number of incidence and death in Italy, Spain and United Kingdom in spite of a quite restricted increase in Turkey. None of the policies in question have a significant impact on CDS for the United States due to the quite low levels of these policies.

In a high regime, the government response index and the containment and health index cushion the effect on CDS for Turkey and the United Kingdom but compound it for Italy and Spain. The collapse of the health systems of Italy and Spain due to having a rather high rate of case and death from COVID-19 and therefore the implementation of very strict stringency and lockdown policies to diminish the increase rate of case and death have caused the uncertainty to increase, which creates a pressure on CDS premium. In spite of that, the success of the health policies in reducing of the growth rate of cases and death due to COVID-19 and having a strong health system of Turkey as a emerging economy have led to more flexible stringency and partial lockdown policies, which allows the negative effects of COVID-19 on the economy to mitigate. Economic support policies help adverse economic situation from COVID-19 to recovery for Turkey, Italy and Spain. The results show that the support policies are swift and adequately implemented in the so-called countries. For the United States, government response index and economic support index increase the volatility of CDS premiums. The reason for this result can be attributed to the failure to make timely decisions on economic support packages and stringency policies and the insufficient amount of economic support packages in United States.

The results of the threshold regression model show that the effects of the so-called policies to control the spread of COVID-19 and to reduce its economic effect on the volatility of CDS premiums are higher in the high regime.

As a conclusion, excessive lockdown precautions and string stringency policies to prevent spread of the so-called virus in the initial periods of the COVID-19 have led economic activity to decelerate by disrupting supply and demand channels. Therefore, countries have experienced substantial losses and the higher CDS premiums. Therefore, the composition of the policies of stringency, containment and health and economic support contributes to reducing the adverse effects on the volatility of CDS premiums due to COVID-19. In particular, the power of the health system enhances the effectiveness of stringency and lockdown policies by helping to control the number of cases and deaths. In the event of inadequate fiscal capacity, CDS premiums give more reaction to an exogenous shock. Thus, ensuring that the amount of economic support packages is at the required level and in time is of importance in terms of increasing the effectiveness of the policy.

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**Appendix
Table 1**

Descriptive Statistics

TURKEY (12.3.2020-14.8.2020)						ITALY (30.1.2020-14.8.2020)					
	CDS	Government Response	Stringency	Containment Health	Economic Support		CDS	Government Response	Stringency	Containment Health	Economic Support
Mean	531.8993	66.55161	64.76705	67.04402	63.83929	Mean	171.6838	62.73141	62.21049	65.56127	47.18310
Median	534.4900	70.51000	63.89000	67.42000	62.50000	Median	163.8950	64.10000	60.64500	64.77500	50.00000
Maximum	651.9100	75.00000	75.93000	77.27000	87.50000	Maximum	260.0100	85.26000	93.52000	91.67000	75.00000
Minimum	414.7900	25.00000	23.15000	29.55000	0.000000	Minimum	97.54000	5.770000	8.330000	6.820000	0.000000
Std. Dev.	60.54095	9.676342	12.26641	10.04911	31.04583	Std. Dev.	43.03560	17.56103	22.48748	19.33178	28.72877
Skewness	-0.076792	-1.798.127	-1.134.528	-1.270.937	-1.218.094	Skewness	0.095044	-1.043.100	-0.307809	-0.496674	-0.693468
Kurtosis	2.094965	7.289273	3.924743	4.826972	3.112897	Kurtosis	2.308619	4.011427	2.505177	2.906071	2.054689
Jarque-Bera	3.932488	146.2109***	28.01759***	45.72843***	27.75621***	Jarque-Bera	3.042004	31.80337***	3.691024	5.890411**	16.66845***
Observation	112	112	112	112	112	Observation	142	142	142	142	142
SPAIN (31.1.2020-14.8.2020)						UNITED KINGDOM (20.1.2020-14.8.2020)					
	CDS	Government Response	Stringency	Containment Health	Economic Support		CDS	Government Response	Stringency	Containment Health	Economic Support
Mean	83.19839	59.84773	57.24348	56.52021	78.28014	Mean	16.54209	55.17940	52.28447	52.29120	71.00000
Median	77.85000	66.99000	64.35000	63.26000	87.50000	Median	14.82000	70.51000	67.59000	65.15000	100.0000
Maximum	148.7300	81.41000	85.19000	80.30000	87.50000	Maximum	27.97000	78.85000	75.93000	75.00000	100.0000
Minimum	34.11000	21.79000	11.11000	16.67000	50.00000	Minimum	10.80000	2.560000	0.000000	3.030000	0.000000
Std. Dev.	30.82160	19.39019	25.71215	20.52685	15.85688	Std. Dev.	5.195291	26.95279	28.49920	23.93065	44.73824
Skewness	0.184427	-0.933916	-0.780062	-0.839485	-1.197.091	Skewness	0.661600	-0.902545	-0.856948	-0.911890	-0.930447
Kurtosis	2.126104	2.493264	2.315858	2.383195	2.486531	Kurtosis	2.078863	1.972618	1.875695	2.088146	1.894801
Jarque-Bera	5.286019	22.00526	17.04947	18.79641	35.22506	Jarque-Bera	16.24596	26.96163	26.25940	25.98534	29.27746
Observation	141	141	141	141	141	Observation	150	150	150	150	150
UNITED STATES (21.1.2020-14.8..2020)											
	CDS	Government Response	Stringency	Containment Health	Economic Support						
Mean	11.01435	53.59282	54.16242	55.95940	42.36577						
Median	10.20000	68.91000	68.98000	70.08000	62.50000						
Maximum	16.61000	71.47000	72.69000	73.11000	62.50000						
Minimum	8.860000	3.850000	0.000000	4.550000	0.000000						
Std. Dev.	1.356623	26.28075	28.09265	26.47196	29.30470						
Skewness	0.592833	-1.083.868	-1.115.973	-1.144.648	-0.761193						
Kurtosis	3.509483	2.316738	2.355211	2.430050	1.579414						
Jarque-Bera	10.33921	32.07180	33.50845	34.55383	26.91760						
Observation	149	149	149	149	149						

Source: author's calculations

Table 6

The estimation results of threshold regression

	TURKEY				ITALY				SPAIN			
	Model 1	Model 2	Model3	Model 4	Model 1	Model 2	Model3	Model 4	Model 1	Model 2	Model3	Model 4
Panel A: Linear Model												
Constant	0.0042* (0.0022)	-0.0086** (0.0037)	-0.0063* (0.0035)	0.0029*** (0.0006)	-0.0064*** (0.0015)	-0.0066*** (0.0010)	-0.0084*** (0.0020)	0.0010*** (0.0001)	-0.0167*** (0.0040)	-0.0085*** (0.0018)	-0.0144*** (0.0032)	0.0021 (0.0149)
Government Response Stringency	-0.0016 (0.0012)	-	-	-	0.0043*** (0.0009)	-	-	-	0.0134*** (0.0024)	-	-	-
Containment Health	-	0.0023** (0.0009)	-	-	-	0.0044*** (0.0006)	-	-	-	0.0090*** (0.0013)	-	-
Economic Support	-	-	0.0042** (0.0020)	-	-	-	0.0053*** (0.0011)	-	-	-	0.0123*** (0.0021)	-
	-	-	-	-0.0010*** (0.0003)	-	-	-	0.00015 (0.00012)	-	-	-	0.0024 (0.0078)
Panel B: Low Regime												
$w_t \leq \gamma$	3116	1542	1704	3116	2091	2091	2091	2091	2114	2114	2114	921
Constant	0.0038 (0.0103)	0.0019** (0.0008)	0.0032*** (0.0010)	0.0022*** (0.0004)	-0.0011*** (0.0003)	-0.0014*** (0.0003)	-0.0018*** (0.0006)	0.0006*** (0.0001)	0.0007 (0.0024)	-0.0001 (0.0011)	-0.0002 (0.0019)	0.0010 (0.0038)
Government Response Stringency	-0.0052*** (0.0018)	-	-	-	0.0009*** (0.0002)	-	-	-	0.0017 (0.0013)	-	-	-
Containment Health	-	-0.0033*** (0.0002)	-	-	-	0.0011*** (0.0002)	-	-	-	0.0024*** (0.0008)	-	-
Economic Support	-	-	-0.0014** (0.0005)	-	-	-	0.0013*** (0.0003)	-	-	-	0.0024** (0.0012)	-
	-	-	-	-0.0009*** (0.0002)	-	-	-	-0.00009 (0.00007)	-	-	-	0.0007 (0.0020)
Panel C: High Regime												
$w_t > \gamma$	3116	1542	1704	3116	2091	2091	2091	2091	2114	2114	2114	921
Constant	0.1590*** (0.0433)	-0.0569*** (0.0147)	0.4048*** (0.0597)	0.0116*** (0.0006)	-0.0224 (0.0141)	-0.0433** (0.0217)	-0.0530** (0.0262)	0.0031*** (0.0004)	-0.3176*** (0.0637)	-0.2482*** (0.0246)	-0.2833*** (0.04004)	0.1511 (0.0200)
Government Response Stringency	-0.0830*** (0.0234)	-	-	-	0.0137* (0.0074)	-	-	-	0.1777*** (0.0340)	-	-	-
Containment Health	-	0.0138*** (0.0035)	-	-	-	0.0240** (0.0111)	-	-	-	0.1397*** (0.0132)	-	-
Economic Support	-	-	-0.2140*** (0.0316)	-	-	-	0.0290** (0.0135)	-	-	-	0.1607*** (0.0218)	-
	-	-	-	-0.0037* (0.0022)	-	-	-	0.00038 (0.0003)	-	-	-	-0.0726** (0.0105)
LM-test	15.2939***	21.5753***	17.4001***	47.4907***	55.3989***	62.5266***	63.0517***	55.6697***	33.7924	37.8369***	35.2393***	35.0361***

Note: ***, **, * indicate significance at %1, %5 and %10 levels, respectively. The values in the parentheses are standard errors

Table 6 (contin.)

	UNITED KINGDOM				UNITED STATES			
	Model 1	Model 2	Model3	Model 4	Model 1	Model 2	Model3	Model 4
Panel A: Linear Model								
Constant	0.0006*** (0.0001)	0.0006*** (0.0001)	0.0006*** (0.0001)	0.0007*** (0.0008)	0.0016 (0.0011)	0.0023*** (0.0006)	0.0014 (0.0012)	0.0035*** (0.0005)
Government Response	0.00007 (0.0008)	-	-	-	0.0016 (0.0010)	-	-	-
Stringency	-	0.00009* (0.0005)	-	-	-	0.0012 (0.0007)	-	-
Containment Health	-	-	0.00006 (0.0009)	-	-	-	0.0016* (0.0010)	-
Economic Support	-	-	-	0.00003 (0.0004)	-	-	-	0.0005 (0.0006)
Panel B: Low Regime								
$w_t \leq \gamma$	56	56	56	70	57525	34720	34720	18665
Constant	0.0003*** (0.0005)	0.0004*** (0.0003)	0.0003*** (0.0005)	0.0005*** (0.0006)	0.0013 (0.0047)	0.0029 (0.0006)	0.0029*** (0.0008)	0.0035*** (0.0005)
Government Response	0.00012*** (0.0004)	-	-	-	-0.0009 (0.0008)	-	-	-
Stringency	-	0.00008*** (0.0003)	-	-	-	-0.0005 (0.0006)	-	-
Containment Health	-	-	0.00012*** (0.0004)	-	-	-	0.00002 (0.0004)	-
Economic Support	-	-	-	0.00004 (0.0003)	-	-	-	-0.0001 (0.0003)
Panel C: High Regime								
$w_t > \gamma$	56	56	56	70	57525	34720	34720	18665
Constant	0.0040*** (0.0004)	0.0037*** (0.0003)	0.0042*** (0.0004)	0.0020*** (0.0002)	-0.7032** (0.3379)	0.4543 (0.2318)	0.5624* (0.2873)	0.0643*** (0.0069)
Government Response	-0.0017*** (0.0002)	-	-	-	0.3918** (0.1877)	-	-	-
Stringency	-	-0.0016*** (0.0001)	-	-	-	-0.2427 (0.1245)	-	-
Containment Health	-	-	-0.0019*** (0.0002)	-	-	-	-0.3004* (0.1541)	-
Economic Support	-	-	-	-0.0006*** (0.0001)	-	-	-	0.0176*** (0.0058)
LM-test	14.6267***	13.8868***	16.2315***	14.8365***	30.2321***	13.4069**	13.9994**	38.2333***

Note: ***, **, * indicate significance at %1, %5 and %10 levels, respectively. The values in the parentheses are standard errors.

Source: author's calculations

DETERMINANTS OF FINANCIAL STABILITY IN SUB-SAHARAN AFRICA

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Abstract

Several factors determine the stability of a financial system. The main objective of this study is, thus, to empirically examine the key drivers of financial stability in the Sub-Saharan African (SSA) economies for the period of 2000 to 2019 using a dynamic panel Generalised Method of Moments (GMM). As financial inclusion and institutional quality broadly comprise of multiple individual measures, we constructed a composite index to proxy and represent each variable, respectively, which was then used later in the regression model to assess their effect on financial stability in the sampled economies. The findings of the study indicated that the lag effect and financial inclusion are the major positive drivers of financial stability in the SSA economies. Institutional quality, financial technology adoption and global financial crises also reflected a negative impact on the stability of a financial system in the region. Other variables seem to have no impact in the region. These findings underpin the need for policy makers and regulators to formulate and adopt macroeconomic policies that include more people in the financial system and markets, so that risks are spread over a greater populous, thereby sustaining financial stability. In addition, our scholarly contribution is that we highlight the possibilities of a trade-off between financial regulation, inclusion and digitalisation versus financial stability, which is an under-researched phenomena in financial studies.

Keywords: financial stability, financial inclusion, institutional quality, Sub-Saharan Africa (SSA)

JEL Classification: C33; C38; E44

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1. Introduction

Stable and inclusive financial system plays important roles in realizing a sustainable economic growth. Financial stability refers to a situation in which the financial system withstands internal and external shocks without disruption in the financial intermediations (European Central Bank, 2012). Financial stability is a condition in which the market mechanisms of pricing, resource allocation, and risk management are functioning well enough to contribute to the smooth performance of an economy. In this case, a financial system is believed to be stable when it circumvents current volatility and systemic risks. A systemic risk is one that disturbs the functioning of a financial system and the economy (Górska and Krzemińska, 2019). Ahmed (2018) averred that a stable financial system was one that manages financial risks, allocates resources efficiently and eliminates undesirable price volatilities of real or financial assets.

Since the global financial crisis of 2008, an inclusive financial system has become a strategic priority and policy direction for stability and sustainable growth (Asongu, 2015). Scholars argue that stability of the banking sector can be realised through financial inclusion, as it affects the composition of financial transactions, the type of customers and the structure of financial institutions in a market (Ngonyani, 2022; Kinyua and Omagwa, 2020). Such market dynamisms may also raise competition, instability, and lead to a risk of financial crises (Mostak and Sushanta, 2015). As a result, there is no consensus between financial access and financial stability, indicating a policy trade-off between financial inclusion and financial stability (Alvi, Rafique and Shehzad, 2020). Instability in the financial system can lead to a sudden collapse of financial institutions, which subsequently causes economic crises and further deterioration of the financial markets (Nxumalo and Makoni, 2021).

Various macroeconomic and microeconomic factors account for financial stability. Scholars identified inflation, economic growth, lending rate, return on equity, capital adequacy and money supply, external debt, liquidity risk, bank size, market concentration, bank capital regulation, and others as a key driver of financial stability (Al-Salamat and Al-Kharouf, 2021; Vo et al., 2019; Pham, Dao and Nguyen, 2021; Temesgen, Wondafarahu and Badassa, 2022). However, there is no consensus among researchers on the key factors that limit financial stability across regions and nations due to country

and sector specific characteristics and variations in methodological approaches, indicating that the topic still needs further research. It is, therefore, necessary to assess the determinants of financial stability in the context of the SSA countries. The overall aim of this paper is, thus, to assess the key determinants of financial stability in the selected SSA countries, and thereby contribute to the ongoing debate on suitable and sustainable strategies and policy directions to adopt that can remedy financial exclusion of vulnerable groups, without causing instability of the financial markets, particularly the banking sector.

2. Literature review

2.1. Theoretical foundation - financial stability

Financial stability is linked to the potential of a financial system to absorb shocks and limit their consequences (Creel, Hubert, and Labondance, 2015). Since the global financial crisis of 2007/08, an inclusive and stable financial system has become a strategic priority and policy direction for a stable economic growth (Asongu, 2015). Financial instability is hence one of the causes of uncertainties and misallocation of resources, which may lead to market failure. Information asymmetry, irrational behavior, psychology, competition and other market imperfections are the main causes of financial instability (Minsky, 1977). Financial instability usually arises due to price fluctuations and investors become greedy for additional return (Minsky, 1977; Kindleberger, 1978). Classical economists did not relate financial instability with resource allocation, and rather gave emphasis on the forces that lead to equilibrium and attributed financial instability to external shock and abnormal behaviour (Kindleberger, 1978; Minsky, 1992).

Unlike the cyclic thought, the monetarists argued that financial instability arises due to disruption in the money supply and linked the main causes of financial instability with mistakes in the monetary policy. Schwartz (1986) expressed the disturbances that are not linked with a decline in the quantity of money as “pseudo-financial crises”. In this case, it is found important to differentiate between monetary and financial stability. Monetary stability refers to stability in the general price level or the absence of inflation or deflation. Financial stability refers to the smooth functioning of the financial system. Financial instability is therefore a situation in which economic performance is weakened due to price fluctuations in the financial assets or inability of

financial intermediaries to meet their contractual obligations (Cukierman, 2013).

Nonetheless, neither cyclic nor monetarist theories are sufficient to address the issues of financial stability (Gertler, 1988). Consequently, other theories have been emerged to complement the above theories and address issues of financial instability. Some of these theories are the theory of competition-fragility and competition-stability. Financial stability manifests itself either in the fragility of financial intermediaries or excessive volatility. High competition erodes the market power of financial institutions, decreases profit margins, and reduces contract value, which encourages firms to take more risk so as to increase their returns (Keeley, 1990; Carletti and Hartmann, 2003). Such an intense competition has a negative influence on market power and profit margins (Hellmann, Murdock, and Stiglitz, 2000; Koetter, Kolari, Spierdijk, 2012). Financial instability demonstrates itself either in financial sector fragility or excessive price volatility of financial assets. Such an incidence may lead financial regulators to develop policies that help preserve stability. However, financial instability is not the same as a crisis, but a number of scholars gave emphasised on the extreme cases of financial markets disruption (Kindleberger, 1978).

The competition-stability theory assumes a positive relationship between bank competition and stability, and argues that less competition results in high interest rates. High interest rates, in turn, lead to adverse selection and a moral hazard problem by increasing the non-performing loan ratio of banks (Koetter et al., 2012). On the basis of this theory, market power may raise financial risk as a rise in interest rates reduces loan repayment and results in adverse selection problems (Boyd and De Nicolo, 2005). However, although market power may lead to a risky loan portfolio, the overall risks of financial institutions may not increase if these institutions protect their market values by raising additional equity and engage in other risk-mitigating techniques.

2.2. Empirical literature

Empirical studies that examined the factors that affect financial stability have shown various results. Over the past two decades, the institutional structure has been evolving as a major factor to alleviate the problem of asymmetric information and financial system difficulties. Norris *et al.* (2015) argued that lowering monitoring costs, relaxing

collateral requirements and increasing access to credit could raise non-performing loans, entailing a trade-off with stability. Ahamed and Mallick (2017) averred that financial inclusion improves bank volatility through reducing the volatility of banks' returns on assets and increasing the z-scores. Han and Malecky (2013) found that financial inclusion through a broader access and use of deposits can significantly mitigate deposit withdrawals during times of financial stress. One of the limitations of this study is that it gave emphasis on the dynamics of bank deposit in the events of financial crisis. In addition, access to finance is broader and financial stability extends beyond deposits. Al-Smadi (2018) confirmed a significant positive impact of financial inclusion on financial stability.

Siddik, Alam and Kabiraj (2018) argued that low-income customers maintain constant depositing and borrowing behavior, even in the period of financial crises, leading to a stable financial transaction. Morgan and Pontines (2014) concurred that financial inclusion has a positive impact on financial stability. Stability of banks can be assessed by profitability and liquidity, which indicates the structure of assets and liabilities (Klaas and Vagizova, 2014). Instability of banks in the medium term arises from insufficient capital, assets and liabilities, and associated credit policy that increases credit risk and probability of losses. Size of a capital determines the ability of banks to maintain stability during a crisis (Klaas and Vagizova, 2014). Gómez (2015), as well as Marozva and Makoni (2021), averred that financial instability arises due to insufficient liquidity and quality of resources, as liquid funds take the vital share in the structure of bank resources, and help to meet the immediate needs of individuals and enterprises. Instability of banks can also be connected with undercapitalization, poor quality credit portfolio, credit policy and insufficiently stable resource base.

Empirical literature related to the determinants of financial stability shows that there are various factors that drive financial stability due to a difference in the nature of the economy, i.e. country and sector specific characteristics, and a difference in the methodology. Although there are indicators that have a strong positive relationship with financial stability, there exists other factors that have a negative effect on financial stability, or which the operations of formal financial institutions.

3. Methodology

3.1. Research approach, data and data sources

A quantitative approach is common to examine and identify the key drivers of financial stability (Al-Smadi, 2018; Ali and Pua, 2019; Vo, et al., 2019; Pham et al., 2021). Consequently, this study applied a quantitative method to assess the key drivers of financial stability in the SSA countries. Consistent with the research approach, secondary data was collected from international organisations such as the World Bank (WB), International Monetary Fund (IMF), and the United Nation (UN) for twenty six (26) selected Sub-Saharan African countries with adequate dataset for the period of 2000 to 2019. In order to capture disparities across the region, the study considered a mix of upper, middle and lower-class economies from all corners of the region.

Several financial stability indicators, including financial soundness, stress testing and financial sector development are used in literatures (Geršl and Heřmánek, 2006; Adusei, 2015; Ali and Tomoe, 2019). However, cross-country data for most of these variables is scarce, and hence this research used a financial distress (bank Z-score) as a proxy indicator of financial stability. In its essence, the bank z-score compares bank capitalisation and returns against the volatility of returns. It is inversely related to solvency, and the higher the bank z-score is, the lower the risk of bankruptcy.

Other control variables that are used to augment the explanatory power of the descriptive variables include financial inclusion index, which is a proxy of financial inclusion constructed from six individual financial inclusion indicators (the number of bank account per 1,000 populations, the number of bank branches and ATMs per 100,000 populations and the number of branches and ATMs per 1000 Km² and the volume of private domestic credit to GDP) are used to develop a composite financial inclusion indicator), using a two stage principal component analysis (PCA). Economic growth (GDP per capita), which is one of the major determinants of financial stability (FS) (Morgan and Pontines, 2014; Siddik et al., 2018; Ozili, 2018). Liquidity position (LP), which is measured by liquid assets to deposits, is important to reduce vulnerability. Real interest rate (RIR), and deposit interest rate (DIR) (Geršl and Heřmánek, 2006; Siddik et al., 2018; Ozili, 2018).

Financial technology adoption such as the number of mobile phone (MU) subscriptions per 100 people is used as a proxy for

technology infrastructure (Geršl and Heřmánek, 2006; Siddik, et al., 2018; Ozili, 2018). Institutional quality (IQI) is a composite index of the six World Bank Governance Indicators (voice and accountability, political instability and violence, government effectiveness, regulatory quality, rule of law, and control of corruption). A net interest margin, which measures profitability (NIM), and bank credit to bank deposit are used in the model.

3.2. Principal Component Analysis

In this study, a financial inclusion index was constructed using a principal component analysis (PCA), which is a parametric approach that minimizes subjectivity, and served as a proxy for financial inclusion. Similar to the financial inclusion, a composite index was constructed for institutional quality using the PCA approach. In order to develop the two indices, the data collected for the individual indicators was first normalised using a min-max approach. The min-max approach helps to smooth-out the variation within the data and make the trend appropriate for index development. Accordingly, the study used the formula stated below.

$$F_{i,t} = \frac{P_{i,t} - Min_{i,t}}{Max_{i,t} - Min_{i,t}} \quad (1)$$

Where: $F_{i,t}$ - represents a normalized indicator i at time t , and $P_{i,t}$ individual financial inclusion indicator, $Max_{i,t}$ is the maximum and $Min_{i,t}$ is the Minimum values of each indicator, respectively.

Subsequently, the study applied a PCA to calculate the Eigen values of the variance matrix for the indicators and develop the composite indices. In this case, the study employed the equations below to construct the composite index for financial inclusion and an institutional quality of the selected SSA economies.

$$FI_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \dots + W_{in}X_n \quad (2)$$

$$IQI_i = W_{i1}P_1 + W_{i2}P_2 + W_{i3}P_3 + \dots + W_{in}P_n \quad (3)$$

Where: Fli = estimate of the i th factor of financial inclusion; IQI_i = estimate of the i th factor of governance indicators; W_i = weight on the factor of score coefficient; X_i = variable of interest; n = number of variables.

3.3. Panel Unit Root and Serial Correlation Tests

Panel unit root tests ascertain that the variables are stationary and prevent a spurious regression (Levin, Lin and Chu, 2002; Breitung and Pesaran, 2005). There are two generations Panel root tests, i.e. first and second generations. A dynamic panel approach is effective irrespective of the nature of the regressors, exogenous or endogenous, or whether the variables are integrated at I(0) or I(1). However, none of the variables should be a second difference (I(2)) (Pesaran and Smith, 1995). In this study, both the first generation (Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS) and Breitung) and a second generation (CIPS, Pesaran (2007)) panel unit root tests were applied to identify the stationarity of the series using the model specified below.

$$\Delta Y_{it} = \alpha_i + \delta Y_{i,t-1} + \sum_{j=1}^n \rho_j \Delta Y_{i,t-j} + z_t^i \gamma + u_{it} \quad (4)$$

Where Δ is the first difference operator is the series of observation for country i for $t=1 \dots, n$ periods. The panel unit root test has the following null hypothesis $H_0: \delta_i = \delta = 0$ for all i , which presumes that all series are stationary.

3.4. Econometric Model Specification

Empirical analysis is used to quantitatively examine and identify the factors that affect financial stability. Specifically, a dynamic panel Generalized Method of Moments (GMM) is applied to assess the key determinants of financial stability in Sub-Saharan African. Some of the empirical models with similar specification include Siddik *et al.*, (2018), Morgan and Pontines, (2014), Han and Malecky (2013). In line with these studies, the model is specified as follow.

$$Y_{it} = \alpha Y_{it-1} + \beta X_{it} + \varepsilon_{it} \quad (5)$$

Where: α denotes a constant term. $Y_{i,t}$ represents financial stability in country i at time t ; $Y_{i,t-1}$ represents the lag of dependent variables; vector $X_{i,t}$ represents a matrix of control variables in country i at time t ; $\varepsilon_{i,t}$ is the random error term.

3.5. Econometric Estimation Techniques

In macro panels, not accounting for country-specific variables can cause misspecifications (Baltagi, 2005). In order to assess the determinants of financial stability, it is possible to use either the difference GMM (Anderson and Hsiao, 1981); Arellano and Bond,

1991) or system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998). However, system GMM is advantageous over difference GMM as it considers the values of lagged dependence and explanatory variables as instruments to attain a robust and consistent result.

A panel dynamic GMM approach addresses country-specific effects, tackles measurement errors and controls for the unobserved heterogeneity. It also takes care of omitted variable biases and removes any correlation between the disturbance term and the explanatory variables, and in the process re-establishes orthogonality of the explanatory variables. By applying the panel dynamic GMM approach, we solve the problems of heteroscedasticity, autocorrelation errors, and simultaneity bias, which are associated with such data. The panel dynamic GMM also remains steady when the instrumental variables are adequately lagged to the model. Therefore, in order to examine the key drivers of financial stability in our selected Sub-Saharan African countries, this research employed the equation below.

$$FS_{it} = \alpha + \beta_1 FS_{i,t-1} + \beta_2 FI_{i,t} + \beta_3 EG_{i,t} + \beta_4 \sum_{n=1}^i X_{i,t} + \varepsilon_{i,t} \quad (6)$$

Where: $FS_{i,t}$ represent the dependent variable of financial stability into country i for time t (proxied by bank z-score), $FI_{i,t}$ represent financial inclusion (proxied by the composite index, six individual financial inclusion indicators). $FS_{i,t-1}$ represents the lag of financial stability; $EG_{i,t}$ represents economic growth; $X_{i,t}$ stands for control variables that have direct and indirect influence financial inclusion and ε_{it} is the error term. In addition, the subscript i refers to country and t refers to the year.

4. Data analysis and discussion

4.1. Summary of the descriptive statistics

As per the earlier reviewed literature, it emerged that there are several macroeconomic and microeconomic factors cited as key drivers of financial stability, depending on the level of development of a country's economy, as well as its financial markets. In this section, descriptive statistical analysis was made on the major factors that are used in the econometric analysis of the study. A summary of the statistical analysis for the major indicators are presented in table 1 below.

Table 1

Summary of the Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FI	520	0.200	0.234	0.014	0.824
ZScore	520	11.137	6.014	2.204	47.341
LP	520	40.504	22.966	5.445	240.614
BCBD	520	73.827	23.859	13.754	137.331
GDPPc	520	2317.993	3403.413	111.927	22942.583
DIR	520	9.700	7.785	2.433	56.167
RIR	520	5.552	8.969	-60.781	38.976
NIM	520	7.337	3.593	0.000	39.210
IU	520	9.833	13.295	0.006	68.200
MU	520	45.299	42.148	0.018	165.600
GINI	520	0.590	0.037	0.488	0.852
IQI	520	-1.416	1.509	-4.680	2.132

Source: Authors' own computations

Over the past two decades, there was poor performances in the level of financial inclusion across Sub-Saharan Africa (SSA) countries due to various socioeconomic, political and legal reasons (Makoni, 2014; Norris, et al., 2015; Zins and Weill, 2016; Asuming, et al., 2018). The statistical analysis results above show that financial stability, measured by financial distress (ZScore), shows no significant variation, indicating that the financial system of the SSA countries does not show strong volatility. Other macroeconomic indicators, such as GDP per capita, shows quite a significant variation across the observations. However, income inequality between these countries is still low, indicating similarity in the standard of living. In addition, real interest rate and deposit interest rate show variation across the SSA countries. The level of digital financial services expansion is still low in the region. Similarly, the level of institutional quality across the SSA countries shows a slight variation. Other financial sector indicators such as liquidity position (LP), bank credit to bank deposit (BCBD), and profitability (NIM) show a slight variation across the region.

Based on the above descriptive statistical analysis, it is possible to conclude that there are slight variations across observations of the different indicators that affects financial stability across the selected SSA countries. These observations are helpful to provide insight on the determinants of financial stability in the sampled countries and to further confirm the impact of macro-and micro-economic factors on financial stability of the sampled SSA countries in this study.

4.2. Panel Unit Root and Serial Correlation Tests

In a dynamic panel data analysis, a panel unit root test is important to verify that no variables is integrated of order I(2). In order to validate the order of integration, the study conducted both the first- and second-generation panel unit root tests. Consistent with the features of the datasets, the study applied the generic panel root test equation below.

$$\Delta Y_{i,t} = \rho_i Y_{i,t-1} + Z_{i,t} \gamma + U_{i,t} \quad (7)$$

Where: $i = 1, 2, \dots, N$ is the individual, for each individual $t = 1, 2, \dots, T$, time series observations are available, $Z_{i,t}$ is the deterministic component and $U_{i,t}$ is a stationary process. $Z_{i,t}$ could be zero, one, the fixed effects (μ_i), or fixed effect as well as a time trend (t).

As can be derived from the regression results of the three first generation panel unit root tests, namely LLC, IPS and Breitung, and the second-generation panel unit root test, this study demonstrated the stationarity properties of the secondary data series. The regression results of the panel unit root tests revealed mixed order integration. Table 2 below depicts the various panel unit root test results of the variables used in the study.

Table 2

Results of the various Unit Root Tests

Variables	Levin Lin Chu (LLC)		Im Pesaran Shin (IPS)		Breitung		Pesaran (2007) (CIPS)	
	Statistic	Order	Statistic	Order	Statistic	Order	Statistic	Order
Zscore	-3.8917***	I(0)	-5.4304***	I(0)	-3.094**	I(0)	-5.902***	I(0)
L.Zscore	-3.9347***	I(0)	-2.9092***	I(0)	-2.275***	I(0)	-4.805***	I(0)
FI	-1.370*	I(0)	-6.465***	I(1)	-5.123***	I(1)	-3.980***	I(1)
LP	-3.527***	I(0)	-2.973***	I(0)	-1.391*	I(0)	-2.908***	I(0)
BCBD	-5.483***	I(0)	-7.211***	I(1)	-2.089**	I(0)	-3.140***	I(1)
LnGDPPc	-7.260***	I(0)	-8.195***	I(1)	-5.772***	I(1)	-4.147***	I(0)
DIR	-4.343***	I(0)	-9.228***	I(1)	-4.836***	I(1)	-2.161***	I(0)
RIR	-7.118***	I(0)	-8.698***	I(0)	-3.625***	I(0)	-3.427***	I(0)
NIM	-6.690***	I(0)	-8.249***	I(0)	-1.775**	I(0)	-10.431***	I(0)
GINI	-7.7301***	I(0)	-2.676***	I(0)	-5.941*	I(0)	-3.095***	I(1)
MU	-2.044***	I(0)	-7.179***	I(1)	-6.767***	I(1)	-4.327***	I(0)
IQI	-2.787***	I(0)	-11.204***	I(1)	-5.663***	I(1)	-4.212***	I(1)

Note: Robust standard errors in parenthesis (***), (**), (*) indicates the level of significance at 1%, 5% and 10%, respectively.

Source: Authors' own computations

Based on the results stated above, it is possible to conclude that the variables are statistically significant at the 1% and 5%, levels of significance, respectively. In addition, the panel unit root test indicated that the variables have a mixed order of integration, and hence the test results are not consistent within and across the various unit root tests. However, the results of the tests show that none of the variables is integrated of order I(2). It is, thus, possible to safely begin the dynamic panel data estimation.

4.3. Determinants of Financial Stability

On the basis of the arguments stated above, and similar to the recent work of Mamadou Asngar, Ongo Nkoa and Wirajing (2022), the Z-Score is considered to be the dependent variable, and the explanatory variables used in the study include twelve macroeconomic and microeconomic variables, including the lag of financial stability (I.ZScore). In order to assess the major drivers of financial stability, the relationship of the variables is specified below.

$$FS_{i,t} = \alpha + \beta_1 FS_{i,t-1} + \beta_2 FI_{i,t} + \beta_3 EG_{i,t} + \beta_4 \sum_{n=1}^i X_{i,t} + \varepsilon_{i,t} \quad (8)$$

Where: $FS_{i,t}$ – financial stability (proxied by ZScore), $FS_{i,t-1}$ – lag of the financial stability, $FI_{i,t}$ – Financial inclusion, $EG_{i,t}$ – Economic growth (represented by GDP per capita), $X_{i,t}$ – explanatory variables stated above.

In this dynamic system GMM estimation, it is found that the lag of financial stability (I.ZScore) has a positive and significant impact on its current financial stability, indicating a catch-up effect. In addition, the lagged coefficient of financial stability is found between zero and one, implying a partial catch-up, suggesting that countries with a stable financial system in the past have the possibility to become a stable in the current and future periods and vice versa. A summary of the regression results of the model is provided in Table 3 below.

Table 3

Major drivers of financial stability in the selected SSA economies

Variables	(Financial Stability)	(Financial Stability)
	1 Step System GMM	2 Step System GMM
L.ZScore	0.4243** (0.1524)	0.3937*** (0.1343)
FI	19.0614*** (6.2081)	18.4573*** (6.5709)
LnGDPPc	-1.1370 (1.8117)	-0.6109 (1.4285)
GINI	25.1319 (24.7922)	19.7795 (25.0367)
IQI	-1.5346* (0.8381)	-1.4096* (0.7991)
MU	-0.0381** (0.0181)	-0.0358 (0.0229)
DIR	-0.0176 (0.1125)	-0.0189 (0.1164)
LP	-0.0446 (0.0349)	-0.0324 (0.0318)
NIM	0.1729 (0.3384)	0.2218 (0.3394)
BCBD	0.0268 (0.0360)	0.0258 (0.0440)
RIR	-0.0102 (0.1071)	-0.0051 (0.0674)
GFC	-1.3320* (0.6548)	-1.0312* (0.5280)
Constant	-3.0738 (15.5946)	-3.9743 (11.3515)
Observations	494	494
Number of countries/ instruments	26	26
AR(1)	0.0749	0.126
AR(2)	0.557	0.652
Hansen	0.199	0.199
Sargan	0.0147	0.0147

*Notes: Robust standard errors in parentheses (***) signifies variable significant at 1%; (**) significance at 5%; (*) significance at 10%.*

Source: Authors' own computations

Financial services expansion, low deposit volatility, good monetary policy transmission reduces financial risks and enhances financial stability (Morgan and Pontines, 2014; Dienillah and Anggraeni, 2016; Al-Smadi, 2018; Ahamed and Mallick, 2019; Anarfo, Abor and Osei, 2020; Vo et al., 2021). In contrast, financial inclusion erodes credit quality and institutional standards due to weak financial sector regulation, and hence reduces financial stability unless proper supervision is in place (Cihak, Mare and Melecky, 2016; Khan, 2011). Consistent with the findings of Morgan and Pontines (2014), Ahamed and Mallick (2019) and Anarfo, Abor and Osei (2020), this study found a significant positive impact of financial inclusion on financial stability, indicating that the more the inclusiveness of the financial system, the higher its stability. Despite the low supervisory capacity, weak regulation, low per-capita and low literacy rate of the region, financial inclusion significantly improves resilience of the overall financial system and thus financial stability in the SSA economies.

Although strict financial regulation may adversely impact credit growth, and it forces banks to reduce their lending; likewise, stringent supervision may improve financial system stability, while negatively affecting financial inclusion (Fratzcher, Lo Duca and Straub, 2016). Consistent with the above argument, the regression results of this study confirmed that institutional quality has a significant negative effect on financial stability, implying that high institutional quality enhances financial stability in the SSA countries. In addition, mobile subscriptions and credit expansion through technology may lead to credit default, and hence affects financial system stability unless proper regulation is in place. Consistent with the above views, this study found that expansion in mobile subscriptions has a negative and significant effect on financial stability, implying that financial service expansion through technology needs proper supervision and regulation so as to ensure stability in the sector. While the adoption and use of fintech can expand the financial services sectors' reach and thereby enhance financial inclusion, it can also expose the financial institutions to criminal activity such as the hacking of bank systems, fraud and money laundering.

In this study, the impact of the global financial crisis of 2007 and 2008 was analysed to identify its impact on stability. Accordingly, the study found that the global financial crises have a significant negative effect on financial stability in the SSA economies. The result is in line with the empirical findings of other scholars that concluded a significant

negative relationship between the global financial crisis and financial stability (Noman, Gee and Isa, 2017; Siddik et. al., 2018). In addition, the financial crisis of the 2007/2008 was a good indicator that financial regulation alone is not sufficient to promote financial stability and therefore, it is necessary to cumulatively use measures such as financial inclusion to address similar problems (Atellu, Muriu and Sule, 2021).

Other explanatory variables such as economic growth, deposit interest rate, liquidity position, profitability, credit to deposit ratio and the real interest rate seem less significant in impacting financial stability in the region. However, different scholars advocate the importance of these indicators in affecting the level of financial stability (Han and Malecky, 2013; Morgan and Pontines, 2014; Siddik et al., 2018). Some of these argued that greater liquidity contributes to a low probability of default and leads to a stable financial system (Han and Malecky 2013). Sanogo and Moussa (2017) found that interest rate has a positive impact on financial stability. However, this study found that interest rates did not seem to have an effect on financial stability, indicating the importance of country specific research on the areas.

5. Conclusion and recommendations

Since the global financial crisis of 2007/ 2008, financial stability has become increasingly important to realise sustainable economic growth by ensuring that countries remain in control of the efficient functioning of their financial markets and institutions. However, there remains great variation across scholars on the key drivers of financial stability. Given this, our study examined the key determinants of financial stability across the selected SSA countries using secondary panel data collected for the period of 2000 to 2019. A composite index was developed to capture the multidimensional nature of both financial inclusion and institutional quality using the principal component analysis (PCA) technique.

From our results, it is possible to conclude that there are various factors that influence financial stability. Specifically, the regression results indicated that the one-year lag of financial stability and financial inclusion are the major positive drivers of financial stability in the SSA countries. However, institutional quality, technology adoption and global financial crises exert a negative impact on financial stability of the region. Our study contributes to the scholarly debate on the

sustenance of financial stability, as a complementary enhancement to financial inclusion in developing countries. In addition, the adoption of financial technologies and regulations should not trade-off with financial stability in the region, but rather serve a complementary purpose in enhancement of financial inclusivity, in pursuit of the attainment of the United Nations' SDGs. It is, therefore, critical for policy makers and financial sector regulators to consider the expansion of financial products and services as one important factor to ensure financial stability. Macroeconomic policies which govern the functioning and regulation of financial systems should embrace the good that technology brings about insofar as a bigger footprint of financial services to include the poor and low income earners is concerned, while also protecting the integrity and stability of financial markets and institutions. A limitation of our study is that the scope was restricted to one geographical location due to our personal interest in this cluster of developing countries. Future studies should undertake a comparative analysis of the nexus between financial stability and financial inclusion across different economic blocs such as BRICS, SSA, SADC and MENA countries, to ascertain whether there are any commonalities with regard to these variables.

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CENTRAL BANKS CONTRIBUTIONS IN MANAGING THE PANDEMIC CRISIS. A SUMMARY AT THE EU COUNTRIES LEVEL

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Abstract

The concerns of macroeconomic policymakers regarding the management of the COVID-19 crisis are reflected by the major, unbending, and brisk interventions they have had, including monetary authorities. The present paper aims at identifying central banks' contributions in managing the pandemic crisis. The approach is based on a comparative analysis at the level of some central banks in the European Union, regarding the measures adopted and the instruments used since the outbreak of the crisis. The results reveal that the central bank's policy stance has switched from an accommodative and preventive one, for strengthen the resilience of the financial sector, to an active and dynamic one, centred on maintaining the financial intermediation. Central bank activism is expected to intensify in the near future, especially through "unconventional" monetary policy, given the rise in inflationary pressures worldwide.

Keywords: monetary policy, macroprudential instruments, COVID-19 crisis, European central banks

JEL Classification: E52; E58; F45

1. Introduction

The last two decades have been marked by a succession of crises and major events worldwide, starting with the global financial crisis, which have put pressure on decision-makers to find solutions to counteract the adverse effects generated.

The COVID-19 crisis is an exogenous crisis to the financial system, being induced by the political decision, adopted at country level worldwide, to "lockdown" the economy, due to the pandemic, but it has deep implications in economic, financial, and social terms, which

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generated firm, rapid interventions, and major decision-makers at the macroeconomic level.

The central bank is usually the main authority for solving financial crisis (Criste, 2014), but it is also an important agent in managing the pandemic crisis. Although monetary policy is the prerogative of central banks, after the onset of the global financial crisis, macroprudential policy became an important component within these institutions. Monetary policy is essential in terms of ensuring liquidity in the financial system, but also in supporting lending activity. The role of macroprudential policy complements that of monetary policy, pursuing the stability of the financial system through measures to ensure the solvency and smoothness functioning of banks. In addition, it can help in supporting the lending activity.

The article aims to highlight the contribution of EU central banks in the management of the pandemic crisis, by identifying the measures adopted and the tools used since the outbreak of the COVID-19 crisis. Central banks with multiple responsibilities, i.e., those that also have an important role in the field of macroprudential policy, are considered being in close connection with the objective of financial stability.

The remainder of the paper is structured as follows. Section 2 is dedicated to the literature review regarding the measures adopted by authorities. In the next section the methodology is described, and the results are displayed in Section 4. The conclusions of the paper are provided in the final section (Section 5).

2. Literature review

The macroeconomic policy measures applied during the pandemic crisis are analysed under multiple aspects. There is quite a large literature for such a short time. For the interest of this research, the literature in the field can be ranged into three categories: studies that create, develop and update databases regarding policy responses to the COVID-19 crisis, works that address the authorities' response to the pandemic crisis according to certain macroeconomic characteristics, as well as studies that focus on estimating the effects of the adopted measures.

Studies that focus on databases creation and maintenance contribute to the systematization of measures, to the identification of classes of measures according to certain criteria, being at the same time an important source of documentation for applied analysis.

As shown in Table 1, there are studies that take into account a wide range of interventions, both monetary and prudential policy measures, as well as fiscal measures (FMI Policy Tracker, COVID-19 Financial Response Tracker (CFRT), or OCDE Country Policy Tracker), while others focus exclusively on prudential regulatory measures (COVID-19 Regulatory Measures) or on monetary policy measures adopted by central banks such as the one developed by Cantú et al. (2021).

Table 1
Databases on the COVID-19 policy measures

Database	Institution	Type of policies	Source
FMI Policy Tracker	IMF	monetary, macroprudential, and fiscal policies	https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19 .
COVID-19 Financial Response Tracker (CFRT)	Yale School of Management, Program on Financial Stability		https://som.yale.edu/faculty-research-centers/centers-initiatives/program-on-financial-stability/covid-19-tracker .
OCDE Country Policy Tracker	OCDE		https://www.oecd.org/coronavirus/country-policy-tracker
COVID-19 Regulatory Measures	Institute of International Finance	macroprudential policy	https://www.iif.com/Portals/0/Files/Databases/COVID-19_regulatory_measures.pdf?ver=2021-02-05-140736-500
A global database on central banks' monetary responses to COVID-19	BIS	monetary policy	Cantú et al. (2021).
COVID-19 Finance Sector Related Policy Responses	World Bank	measures taken by authorities for supporting the financial sector	https://datacatalog.worldbank.org/dataset/COVID-19-finance-sector-related-policy-responses

Source: processing by author

These databases give a brief description of the decisions announced or adopted, the date of the policy action and the institution that implemented the measure. Feyen et al. (2021) make some observations on the response of authorities in countries with emerging and developing economies, using the World Bank database (Table 1).

Analysing a large sample of countries, Feyen et al. (2021) showed that macroeconomic policy authorities were much more active in wealthier and larger countries (by population), adopting a greater number of measures. Countries belonging to a currency area have also been faster and more active in introducing new measures. Liquidity and funding measures in the banking sector were adopted earlier in countries with high levels of private debt. The authors also show that fewer measures have been applied in countries with high private debt-to-GDP ratios, as well as in countries that have already adopted Basel III reforms.

Benmelech & Tzur-Ilan (2020) observed that countries with advanced economies announced much larger fiscal measures compared to less developed ones. They also concluded that the level of credit risk (credit rating) is the most important factor regarding fiscal expenses during the pandemic. High-income countries entered the crisis with low levels of interest rates and are more inclined to resort to unconventional monetary policy tools.

Casanova et al. (2021) emphasize that the outbreak of the COVID-19 crisis required the firm intervention of the macroeconomic policy authorities in supporting the banking system through two complementary mechanisms: on the one hand, increasing the banks' ability to grant loans, based on the adoption of measures to increase capital and consolidating their liquidity position, and on the other hand, through measures to stimulate the use of this capacity, improving the ratio between risks and gains with the granting of new credits.

Based on a classification of the measures adopted by central banks during the pandemic, Mosser (2020) notes that those belonging to the macroprudential sphere are much more extensive than those specific to monetary policy. Eller et al. (2021) show that authorities in EU member states in Central, Eastern and South-Eastern Europe quickly adjusted their macroprudential policies in response to the COVID-19 crisis, mostly by relaxing capital buffers and liquidity requirements. Analysing the effects of applying the measures taken Hartley et al. (2021) showed that quantitative easing had a positive

effect by reducing government bond yields in both advanced and emerging countries.

Aldasoro et al. (2020) argue that stabilization measures applied to the banking sector favoured banks that already had high levels of profit and healthy balance sheets but did not help the less profitable ones.

Measures to ensure liquidity, financial support for borrowers and monetary easing have moderated the negative impact of the pandemic on bank share prices (Demirgüç-Kunt et al., 2021), but the results differ both between banks and between countries. Banks that were already thinly capitalized or operating in countries where fiscal space is restricted were adversely affected by macroprudential measures.

Although limited to the situation of the Irish banking system, the study by Bergant & Kockero (2020) show that no other macroprudential or monetary measures (suspension of debt payments, extension of loan maturities, lowering of interest rates, etc.) would have significantly reduced the likelihood of long-term debt default, but that the most common measure adopted by banks, namely the reduction of limits on credit lines, had positive results in the short term. However, the results are interpretable, not generally valid, especially when several countries are analysed.

Hardy (2021) shows that the announcement on the restriction of dividend payments, a measure applied in many countries, although it reduced the price of bank shares, had a positive effect on the risk of default - it either decreased or was not affected in the face of the economic recession. Increases in bank capitalization were observed in countries where this measure was applied, supporting institutional and system-wide stability. Muñoz (2020) suggests that the dividend restriction measure can improve the effectiveness of the release of the countercyclical capital buffer, while ensuring the supply of credit to the private sector. Also, the estimates made by Gambacorta et al. (2021) on a sample of 271 listed banks from 30 developed countries show that the complete suspension of dividend payments in the year 2020 would have increased their lending capacity by 800 to 1,100 billion dollars.

By recommending that banks use some of their capital reserves, but also by restricting the payment of dividends and other capital resources, policymakers sent a strong signal about their determination to reduce the economic consequences of the crisis pandemics. But, according to Drehmann et al. (2020), they will have

positive effects on lending to the real economy (as a targeted objective), only if banks have the capacity and willingness to respond to the prudential measures. However, such conditions can only be ensured with the support of political decision-makers.

The information from the literature, especially that provided by the databases, represents a solid basis for conducting research on the role of the monetary authorities in the EU in managing the effects of the COVID-19 crisis.

3. Methodology and data

The research is based on a comparative analysis of central banks in the EU regarding their role in managing the COVID-19 crisis. Those that have an important role in macroprudential policy are also considered, either as a macroprudential authority or as a member of the Financial Stability Committee (Criste & Lupu, 2021). The group of selected central banks includes the European Central Bank (ECB), as the monetary authority of the Euro Area; central banks of the euro area countries, those that have the main involvement in macroprudential policy; the central banks of the eurozone candidate countries (see Table 2, in the Appendix).

The instruments, displayed in Table 3, in the Appendix, are classified according to the type of policy to which they belong - monetary or macroprudential. Those tools announced and dedicated to managing crisis-induced problems were selected.

- Monetary instruments are classified according to the one proposed by Cantú et al. (2021);

- Macroprudential measures are those announced by central banks, as well as those formulated as recommendations by specialized supranational institutions or with powers in this field, namely, European Systemic Risk Board (ESRB), and European Banking Authority (EBA). They are classified by category, grouped based on their nature. In this sense, the grouping used by Eller et al. (2020) is a benchmark for this study. In the category of macroprudential measures are included both classical ones and those that have a macroprudential feature, such as certain instruments specific to the microprudential policy. The inclusion of the latter in the category of macroprudential ones is based on the hypothesis that, in special (crisis) conditions, the measures of a microprudential nature become essential for the functioning of the

financial system. Moreover, Restoy (2020) mentions that microprudential actions always also have a systemic dimension, and this connection is all the more relevant in crisis conditions.

The monetary policy of the euro area countries is implemented by the ECB, but for macroprudential policy the national central banks also have an important role, regardless of whether they are designated as single macroprudential authorities or are part of a financial stability committee.

The analysis is carried out for the period March 2020 - November 2021, based on monthly data and according to their availability. The sources of information used are the databases of both international bodies (IMF, World Bank, BIS) and central banks selected.

The comparative analysis at the level of central banks regarding the intensity of the use of instruments is highlighted by summing up measures from a certain category adopted/announced during the selected period.

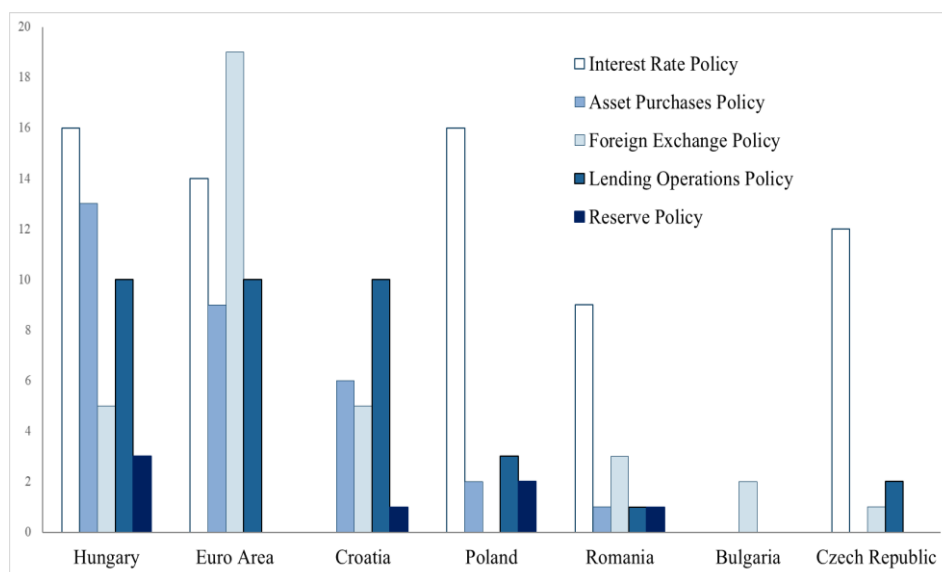
4. Results and discussion

Overall, the reaction of the monetary authorities to the pandemic crisis meant the adoption of easing policies.

4.1. Monetary policy

As shown in Figure 1, the National Bank of Hungary played a very active role in the use of monetary policy instruments, both in terms of variety and intensity (frequency) of the measures applied. Only the ECB exceeds it in terms of the frequency of applied measures, but central bank of Hungary used all five categories of monetary instruments (see Figure 1).

Figure 1
Categories of monetary policy measures adopted by the selected central banks, during March 2020 - October 2021 (cumulative measures)



Source: data extracted from Cantú et al. (2021), and from central banks official websites

As a first reaction to the crisis, central banks that had room for manoeuvre on interest rate reduced their monetary policy interest rates. The ECB, which had reduced this level to zero, resorted to unconventional measures, already entered the tradition of the last years, after the global financial crisis, regarding the monetary policy: the forward guidance policy for interest rate and the quantitative easing policy, based on assets purchases programs (government, corporate bonds). Lending refinancing programs were added and expanded to boost lending to the private sector (firms and households) by providing low-cost funds to banks (access conditional on the use of funds), being a support provided by the central bank to the real economy, through the banking system.

The ECB used the forward guidance policy to give a firm signal to the markets, and the persistence of its use compensated for the lack of interest rate change policy. The central banks of the Czech Republic, Hungary, Poland, and Romania were able to further manoeuvre the

monetary policy interest rate. In addition, some central banks, except those of the Czech Republic and Bulgaria, have applied reserve requirements to manage liquidity in the banking system.

Unlike the ECB, which through its securities purchase programs has conducted a general policy of quantitative easing, the central banks of the selected non-euro area countries have initiated such programs for specific objectives, to solve local problems, from the national (see Table 4)

Table 4

The central banks' asset purchases policy and objectives pursued

Asset purchases policy	Central bank	Objective(s) pursued
APP (Asset Purchase Programme)	European Central Bank	- easing monetary condition (Cantú et al., 2021)
PEPP (Pandemic Emergency Purchase Programme)		
BFGS (Bond Funding for Growth Scheme) GSPP (Government Security Purchase Programme) MBPP (Mortgage Bond Purchase Programme)	Hungarian National Bank	- providing adequate liquidity to ensure price and financial system stability - increasing the flexibility of the money market interest rates - strengthening the central bank's ability to influence the long-term yields
Government Securities purchases	National Bank of Romania	- consolidating structural liquidity in the banking system
Government Securities purchases	National Bank of Poland	- ensuring liquidity in the secondary market - strengthening the monetary transmission mechanism - structural change in long-term liquidity in the banking system
Government Securities purchases	Croatian National Bank	- maintaining exchange rate stability - increasing domestic liquidity to ensure bank lending at low interest rates - supporting the stability of the government securities market

Source: author's compilation based on the Arena et al., (2021)

According to the data from Arena et al. (2021), until June 2021, the expenses incurred by the ECB for the purchase of assets, as percent of GDP, represented 12%. At a great distance from this is the central banks of Hungary (7.2%), Poland (5.9%), and Croatia (5.5%). The lowest level is recorded by the National Bank of Romania, with 0.4% of GDP.

Regarding foreign exchange policy, through spot interventions, the central banks of the Czech Republic, Romania and Croatia aimed to prevent excessive exchange rate fluctuations and the stability of the national currency. In addition, in April 2020, central banks from Croatia and Bulgaria each entered into a precautionary foreign exchange agreement (swap lines) with the ECB to provide liquidity in euros to ensure the stability of their national currencies. In June and July 2020, the National Bank of Romania, respectively, National Bank of Hungary entered into repo agreements in euros.

In terms of exchange rate policy, the ECB has a dual role. On the one hand, as the central bank of the euro area countries, the ECB considers the monetary union needs, and on the other hand, as a central bank of global importance, it is involved in the global financial system. From this perspective, its actions during the pandemic were best reflected by the interventions on the foreign exchange market and the cooperation agreements established with the other global central banks or with central banks of some European countries, outside the euro area. During the analysed period, the ECB concluded foreign exchange agreements in euros (swap and repo lines) with central banks of EU countries and outside the euro area (central banks of Romania, Croatia, Bulgaria, Hungary, and Denmark). In December 2020 the ECB decided to extend all these euro supply agreements.

Furthermore, central banks have provided support to the banking system in order to increase lending activity, based on repo operations (Czech National Bank, Croatian National Bank, National Bank of Romania, and National Bank of Poland), and some central banks have adopted credit programs aimed at certain segments of the real economy (companies). Namely, the Hungarian National Bank initiated several special programs for financing of the companies, expanded eligible collaterals, and the National Bank of Poland introduced discount loans to allow the refinancing of credit granted to companies, a measure similar to that introduced by the ECB (i.e., Targeted Longer-Term Refinancing Operation).

4.2. Macroprudential policy

Regarding the macroprudential policy, the authorities sought, on the one hand, to maintain lending capacity by adopting measures to ease the prudential requirements and recommending the release of capital and liquidity reserves, and on the other hand, improving the expectations of economic agents and mitigating macroeconomic uncertainty, through a firm and proactive conduct, intensifying the communication policy with the market and the public, and also the recommendations made by EU authorities (ESRB and EBA).

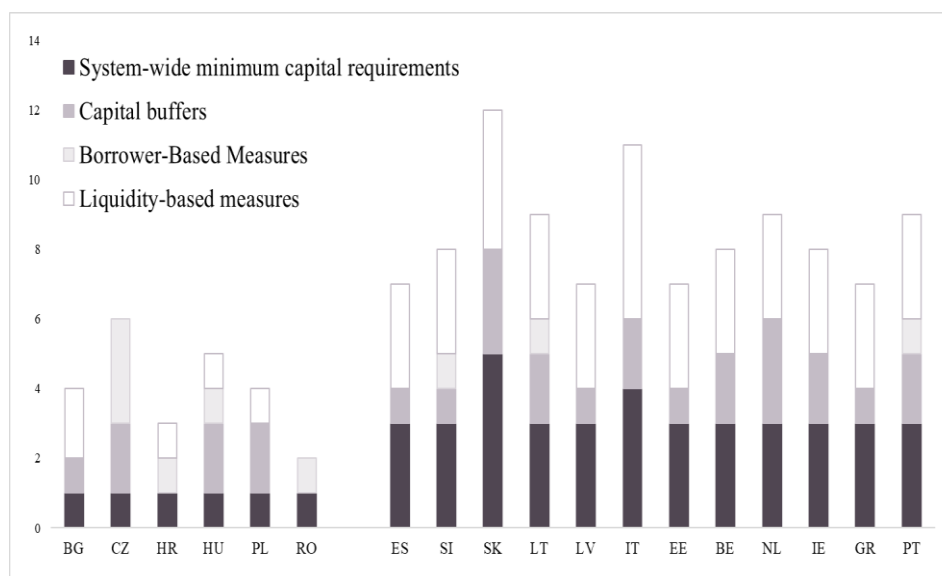
Macroprudential instruments quickly implemented since the beginning of the crisis have provided banks with capital and liquidity to strengthen their ability to absorb losses and maintain credit flow, thus supporting the easing of monetary conditions.

The ECB, as a regulatory authority, has carried not only in supporting the euro area countries, but also the EU countries outside the euro area (Feyen et al., 2020). It allowed banks to temporarily operate below the level and quality of capital required under "Pillar 2" and to make credit classification and loan provision more flexible. The intensity of the macroprudential policy used by ECB is reflected by the increased number and wide range of recommendations, formulated in close collaboration with national central banks, the European Systemic Risk Board and the European Banking Authority.

Figure 2 confirms that the national central banks of the euro area countries, supported by the ECB and the prudential authorities at the EU level, have been intensively involved in the management of the COVID-19 crisis by adopting macroprudential measures. In this regard, Slovakia, Italy, and Portugal stand out by applying the most measures in the category of minimum requirements, capital buffers and liquidity requirements.

Easing the borrower-based measures due to the COVID-19 crisis is taken into account especially by central banks in the Central and Eastern Europe countries, i.e., Czech Republic, Hungary, Croatia, Slovenia, and Romania. Among all analysed central banks, only those of Hungary, Slovenia, Lithuania, and Portugal apply prudential instruments from all four categories of standard instruments (see Figure 2).

Figure 2
Categories of standard macroprudential policy measures adopted during March 2020 - October 2021 (cumulative measures)



Notes BG - Bulgaria; CZ - Czech Republic HR - Croatia; HU - Hungary; PL - Poland; RO - Romania; ES - Spain; SI - Slovenia; SK - Slovakia; LT - Lithuania; LV - Latvia; IT - Italy; EE - Estonia; BE - Belgium; NL - Netherlands; IE - Ireland; GR - Greece; PT - Portugal.

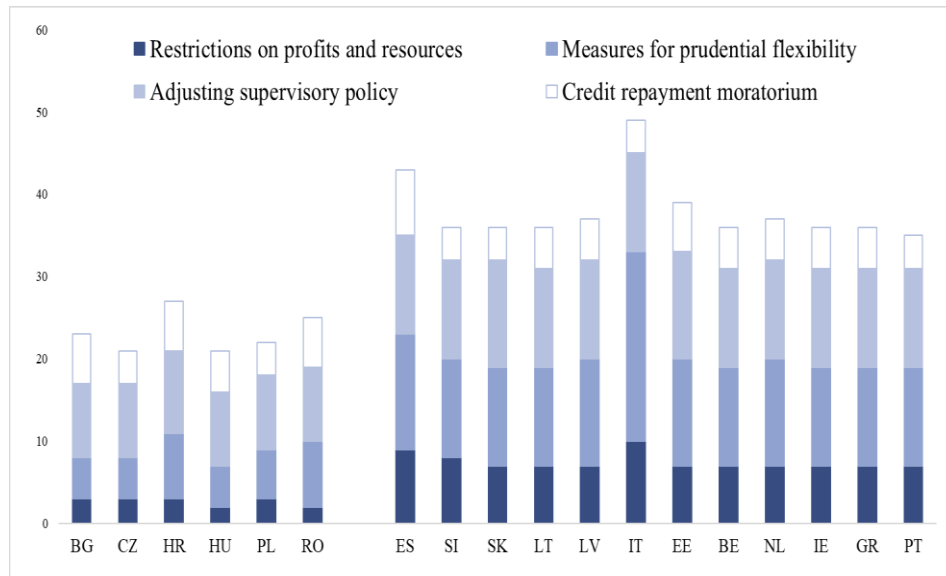
Source: data extracted from World Bank (2022)

In addition to the standard prudential measures adopted following the outbreak of the pandemic crisis, the national central banks initiated a series of measures to supplement the usual ones. They have a temporary nature and are intended to ensure operational continuity in the banking system, during the pandemic crisis, allowing a more flexible interpretation of the prudential regulations and a relaxation of the supervisory policy (see Table 3, in the Appendix). In this regard, restrictions on the payment of dividends and measures to relax prudential and supervisory regulations are applied with the aim of maintaining the flow of credits and strengthening the banks' ability to absorb losses.

As illustrated in Figure 3, all analysed central banks, supported by EU regulatory and supervisory authorities, have applied such

special measures extensively, but again a more intensive use of them is observed across the area euro countries.

Figure 3
Categories of special macroprudential policy measures adopted during March 2020 - October 2021 (cumulative measures)



Notes: BG - Bulgaria; CZ - Czech Republic; HR - Croatia; HU - Hungary; PL - Poland; RO - Romania; ES - Spain; SI - Slovenia; SK - Slovakia; LT - Lithuania; LV - Latvia; IT - Italy; EE - Estonia; BE - Belgium; NL - Netherlands; IE - Ireland; GR - Greece; PT - Portugal.

Source: data extracted from World Bank (2022)

The macroprudential policy measures adopted as a result of the COVID-19 crisis unfolding were contrary to the usual pattern, not being intended to encourage banks to strengthen their balance sheets, as in a crisis situation, but to induce them to partially reduce the capital reserves accumulated after financial crisis to maintain the flow of credit. Macroprudential authorities have used the available flexibility both to loosen certain requirements (those regarding capital, liquidity, classification of non-performing loans, regulation of provisions, etc.) and to impose restrictions on the distribution of profits and resources (dividends).

Overall, the results show a more intensive use of prudential measures, including those of a special nature, at the level of the central

banks of the euro area countries, considering not only the high number of common measures implemented at the recommendation of the ECB and supranational institutions in the field macroprudential regulations and supervision (ESRB and EBA), but especially the application of locally adjusted macroprudential measures.

Considering the monetary integration process, this observation makes plausible the hypothesis of an increase in the role of the national macroprudential policy at the local (national) level, with the accession to a monetary union, especially one formed by countries with heterogeneous economies, such as the euro area. It becomes, together with the fiscal policy, an essential additional tool of the local (national) macroeconomic mechanism, compensating to some extent the loss of flexibility previously offered by the national monetary policy.

5. Conclusion

The pandemic crisis caused a major change in the macroeconomic and financial system, from a relatively stable state, with low inflation, moderate economic growth, and less risk-averse financial markets, to one of deep uncertainty. Therefore, the central bank's policy has also changed profoundly. Its stance has switched from an accommodative (regarding the monetary policy), and preventive one, for strengthen the resilience of the financial sector (regarding the macroprudential policy), to an active and crisis one, centred on maintaining the financial intermediation.

It is important to note that, according to the processed data, the ECB's response to the pandemic crisis was quick and dynamic, in contrast to its behaviour during the global financial crisis or that of sovereign debt. This disproves the hypothesis that, under uncertainty conditions, the central bank of a monetary union answers more slowly than a national central bank if the monetary union is composed by fiscally sovereign states. It is supposed that the learning process after experiencing a major shock is more complex for the central bank of a monetary union and therefore the reaction to shocks would be slower.

Making a comparative analysis between the global financial crisis, with its occurrence in Europe, and the COVID-19 crisis, Morelli & Seghezza (2021) argue that for the ECB, the financial crisis was a learning exercise in this respect because it gave it the opportunity to adapt to shock by increasing reaction speed. In other words, the central bank of a monetary union can also react quickly if it experiences a

series of shocks from which, through the learning process, it acquires knowledge and increases its arsenal of tools. This is fall out from the second half of 2021, against the background of several factors action (the increase in the price of raw materials, including the oil price, the increase in international transport costs, the disruptions on the part of the supply generated by pandemic), and is further maintained and aggravated by the global geopolitical crisis (induced by the war in Ukraine, by the crisis of energy resources).

Such a circumstance augments the challenges that central banks have in terms of conducting monetary policy, and the problem of finding a balance between measures to ease monetary conditions and stimulate lending, and those to keep inflation under control is becoming more and more critical.

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The sample of central banks considered for the analysis

Jurisdiction	Abbreviation	Central Bank
Euro Area	EA	European Central Bank (ECB)
Euro area countries		
Belgium	BE	National Bank of Belgium
Netherlands	NL	De Nederlandsche Bank
Spain	ES	Bank of Spain
Italy	IT	Bank of Italy
Portugal	PT	Banco de Portugal
Greece	GR	Central Bank of Greece
Ireland	IE	Central Bank of Ireland
Lithuania	LT	Bank of Lithuania
Latvia	LV	Bank of Latvia
Estonia	EE	Bank of Estonia
Slovakia	SK	National Bank of Slovakia
Slovenia	SI	Bank of Slovenia
Euro area candidate countries		
Bulgaria	BG	Bulgarian National Bank
Czech Republic	CZ	Czech National Bank
Croatia	HR	Croatian National Bank
Poland	PL	National Bank of Poland
Romania	RO	National Bank of Romania
Hungary	HU	Hungarian National Bank

Source: processing by author

Table 3

Central banks' policy instruments

Monetary policy				
Asset purchases policy	Interest rate policy	Exchange rate policy	Lending operations policy	Reserve policy
- Asset purchases programmes	- Changes in the interest rate level - Forward guidance	- FX interventions - FX swaps - Swap lines - Repo lines (EUR)	- Liquidity provisions - Targeted refinancing (lending)	- Requirement ratio - Remuneration
Macroprudential policy				
System-wide minimum capital requirements	Capital-based measures	Borrower-based measures	Liquidity-based measures	Special macroprudential measures
- Capital adequacy ratio - Tier 1	- Capital buffers (conservation, counter-cyclical, systemic) - Risk weights	- Loan-to-value ratio - Loan-to-income ratio - Debt-service-to-income ratio - Loan maturity	- Liquidity requirements - Exposure limits - Foreign currency mismatch limits	- Prudential flexibility - Adjusting supervisory policy - Ensure public risk disclosures by banks - Mandatory credit repayment moratorium - Restrictions on use of profits and resources

Source: author's compilation after Cantú et al. (2021), Eller et al. (2020), and World Bank (2021)

Financial Studies

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