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STUDIA UNIVERSITATIS  
BABEȘ-BOLYAI



# OECONOMICA

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## ROLE OF ROMANIAN HIGHER EDUCATION INSTITUTIONS IN ACHIEVING THE SDG 4 TARGETS THROUGH THE GREENMETRIC 2023 RANKING

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**Abstract:** This paper examines the alignment of Romanian higher education institutions with SDG 4. Using a Green Metric sustainability ranking, it explores the potential for implementing SDG 4. The study focuses on teaching and research and considers the position, scores, size, and geopolitical context of each university. The results revealed that the alignment of the ranked universities with SDG 4 is influenced by university size, sustainability policies, and resources. The originality of this research lies in conducting this type of analysis of Romanian universities' system in terms of sustainability and evaluating its contribution to the SDGs' broader context.

**JEL classification:** I2, Q51, O44

**Keywords:** higher education, Romania, SDG 4, green measure, sustainability ranking, quality education.

### 1. Introduction

In response to societal (Noth & Tonzer, 2022) and policy concerns (Franco et al., 2019), an increasing number of higher education institutions are integrating sustainability into their key functions (Veidemane, 2022). In 2023, 1447 higher education institutions participated in the Green Metric sustainability rankings to reveal their contributions to the Sustainable Development Goals<sup>1</sup>, which shows that universities are sensitive to the needs in society and are open to make an effort to embed sustainability.

Higher education establishments have the potential to advance sustainability by engaging in research, delivering education, and facilitating the sharing of knowledge, or through formal agreements. For example, documents such as the Talloires Declaration, the Halifax Declaration, the ODD Accord, and the Abuja Declaration are all designed to

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<sup>1</sup> <https://greenmetric.ui.ac.id/rankings/rankings-overview>

encourage sustainable development and education that supports sustainability. The issues regarding sustainability can be tackled by pledging to put it into practice (Lorenzo et al., 2015).

Achieving sustainability in higher education requires a unified strategy covering all aspects and areas of the sector. The focus of this article is on an area of high societal interest - education, and in particular education for quality SDG4 in the Romanian university system, using data from the Green Metric sustainability rankings for 2023.

Particular elements affecting the integration of sustainability in universities (Cuesta-Claros et al., 2022) are: university purpose and mission; national/European / international legislation and policies; the research-education-science nexus; regional culture; and, last but not least, global standards. Although some factors are not included in the category of specific factors affecting HEIs: the size of HEIs, limited funding, and competing demands from stakeholders, they have an impact on the adoption of sustainability in HEIs (Sepsi et al., 2018; De Iorio et al., 2022).

Approaches used in these rankings have been reviewed in a handful of articles (Lauder et al., 2015; Galleli et al., 2021; Ragazzi & Ghidini, 2017), but none of the studies covers Romanian universities, on the education and research component.

The presence of Romanian universities in the Green Metric rankings from the first edition (2010) to 2023 has registered a steady increase (from 1 university in 2011 to 11 universities in 2023), indicating the interest of Romanian universities in maintaining this ranking and, implicitly, aligning themselves with sustainability goals, implicitly SDG 4. Universities are implementing practices to promote SDG4 by developing curriculum, introducing sustainability-based topics, and participating in programs that can aid their communities in realizing the Sustainable Development Goals and play a role in creating a more sustainable future.

This research aims to analyze and investigate the following: I. Interpretation of educational and research components; analysis of worldwide and national geopolitical context of the ranked universities, as well as prospects for implementation of SDG 4 - Quality Education at the universities included in the Green Metric ranking, 2023; II. Status of the initiatives of the Romanian government for the implementation of the SDGs, especially SDG 4 in a university environment.

The uniqueness and innovative aspect of this research lie in the examination conducted to grasp the initiatives taken by Romanian universities regarding sustainability. It also explores a particular element recognized as a non-specific influencer on sustainability—the size of these universities—to determine its effect on the adoption of sustainability practices within the public universities of Romania and to pinpoint opportunities for enhancement. The study further investigates how Romanian universities contribute to the Sustainable Development Goals, as highlighted in the Green Metric 2023 rankings, and their role in promoting sustainable growth. By utilizing data from the Green Metric rankings, this research seeks to address the existing gap concerning the alignment of Romanian universities with sustainability objectives.

The conclusions reveal that Romanian universities are making efforts to maintain and steadily increase the implementation of Agenda 30, including SDG 4, as evidenced by the participation of many Romanian universities from the emergence of this ranking until 2023. The implementation of sustainable development in universities is also conditioned by their size (the larger the university, the higher the degree of implementation of sustainable development), by political factors, and by the resources

available to the university (since participating in the ranking is voluntary and the university has to make a financial effort to be able to secure its access to the ranking).

The article is structured as follows: introduction, review of the literature on the SDGs with a focus on SDG 4, presentation of sustainability goals, relevance of SDG 4 for universities, summary of relevant SDGs, presentation of government initiatives in Romania, data collection using the Green Metric (2023) ranking to assess the sustainability of universities, analysis of the geopolitical positioning of universities and interpretation of data on the education and research components of Romanian universities in the 2023 ranking. The paper concludes with results, discussions, limitations, and future research directions.

## **2.Theoretical framework**

There is a consensus in the literature on the need for universities to follow the direction towards sustainability (Ferguson & Roofe, 2020;Sepsi et al., 2018; De Iorio et al., 2022; Adhikari & Shah, 2021; Sugiarto et al., 2022; Lazarov & Semenescu, 2022; Zanellato & Tiron-Tudor, 2021; Stoian et al., 2021).

Measurement and evaluation of sustainability in HEIs should include the following elements (Lorenzo et al., 2013; Lorenzo et al., 2015):

(i) Addressing and highlighting the appropriate aspects of sustainability at the HEI level;

(ii) when defining assessment indicators, HEIs should not limit themselves to eco-efficiency aspects, but should also consider economic and social aspects in their assessment;

(iii) the indicators need to be quantifiable and adaptable enough for organizations to utilize the same category of tool or metric;

iv) strategies in the sustainability process should be clear, and processes should be comprehensive.

In sustainability practice, we find a variety of global rankings (Orduna-Malea & Perez, 2021) designed to be able to measure the dimensions of universities, such as THE-WUR, OS-WUR and ARWU (Hazelkorn, 2015), but these have been criticised for their biases and limitations. These rankings take no notice of current societal issues, such as sustainability, diversity, and open science initiatives, which makes them difficult to use widely (Saf on, 2019). This is the main reason why we chose Green Metric Ranking as the assessment tool for this article.

This study aims, on the one hand, to analyze and evaluate the Green Metric methodology, in line with other studies in the literature that have focused on the analysis and evaluation of university ranking methodologies (Galleli et al., 2022; Saf on, 2019), including the coverage and scores specifically attributed to the teaching and research component. Instead, this study complements and actively responds to the needs identified in the literature (Chankseliani & McCowan, 2020), where there is a major gap in terms of deeper knowledge of sustainability and its implementation at the university level, especially for emerging countries (such as Romania).

## **Sustainable Development Goals – SDG4 Overview**

The Sustainable Development Goals involve advancing sustainable progress by promoting well-being, fostering economic advancement, enacting sustainability laws, and encouraging educational improvement (Saini et al., 2022). In 2015, all UN member states embraced these 17 Sustainable Development Goals, which were formulated to address a diverse array of challenges pertaining to economic, societal, environmental, technological, and legal development. These goals are meant for every nation globally, not exclusively for those that are considered developing or emerging, as seen in the case of Romania (Chankseliani & McCowan, 2020; Alawne et al., 2021).

The Sustainable Development Goals, or SDGs, play an essential role in advancing sustainable development that is impactful and enduring (Mensah, 2019). In contrast to their earlier counterparts, the Millennium Development Goals established in 2000 (Battersby, 2017), the current SDGs introduced in 2015 are more effective and thorough, embodying a comprehensive and interconnected strategy for sustainable development that encompasses a diverse array of social, economic, and environmental aspects. SDG 4, which focuses on Quality Education, is one of the 17 Sustainable Development Goals, emphasizing the importance of providing inclusive and equitable quality education along with opportunities for lifelong learning (UN, 2015; Saini et al., 2022). This goal consists of several points or targets (7 in total), complemented by three means of implementation (Ferguson et al., 2018; McKay 2018) (see Table 1 and Figure 1).

**Table 1. SDG 4 targets and implementation means**

<b>Outcome objectives</b>	
4.1	By the year 2030, it is essential to guarantee that every girl and boy has access to free, fair, and high-quality education at both the primary and secondary levels, resulting in meaningful and successful learning achievements.
4.2	By the year 2030, guarantee that every girl and boy can receive high-quality early development, care, and preschool education to ensure they are ready for primary schooling.
4.3	By the year 2030, it is essential to guarantee that all individuals, regardless of gender, have equitable access to quality and affordable education at the technical, vocational, and higher education levels, which encompasses university education.
4.4	By the year 2030, there will be a significant rise in the population of youth and adults possessing essential abilities, such as technical and vocational competencies, necessary for employment, job opportunities, and entrepreneurship.
4.5	By the year 2030, eradicate all differences between genders in education and guarantee equal opportunities for everyone to access all educational tiers and job training, particularly for marginalized groups such as individuals with disabilities, indigenous communities, and children facing challenging circumstances.
4.6	By the year 2030, make certain that every young individual and a significant percentage of the adult population, regardless of gender, possess literacy and numerical skills.
4.7	By the year 2030, guarantee that every student obtains the essential knowledge and abilities to encourage sustainable growth. This includes, among other strategies, education that fosters sustainable practices and ways of living, the protection of human rights, the advancement of gender equality, the encouragement of a peaceful and nonviolent culture, global citizenship, and recognition of cultural diversity as well as the role of culture in achieving sustainable development.

Means of Implementation	
4.a	Construct and update educational spaces that are welcoming to children, considerate of gender, and accommodating for disabilities, ensuring a secure, non-violent, inclusive, and productive environment for every learner.
4.b	By the year 2020, there will be a considerable rise in the scholarships offered to small island developing nations and African nations aimed at facilitating enrollment in higher education. This includes vocational training, as well as programs focused on technical, engineering, and scientific information and communication technology, in both advanced and emerging countries.
4.c	significantly enhance the availability of skilled educators by the year 2030, which includes collaboration with other nations for the training of teachers in lesser-developed countries.

(source: Incheon Declaration and Action Framework to Implement Sustainable Development Goal 4)

The successful implementation of SDG 4 depends mainly on higher education institutions (Franco et al., 2019). Strengthening the competencies and skills of educational stakeholders is important for increasing teachers' ability to deliver quality and inclusive learning programmes. Higher education institutions can undertake several actions in the form of (Ferguson et al., 2018):

- create research that is pertinent to policy (implementation research) with the objective of supporting the attainment of set objectives and providing knowledge regarding education in a format that is accessible to decision-makers;
- developing sustainable capacities at the micro and macronational levels for qualitative and quantitative research;
- play a role in emphasizing advancements, suggesting alternatives or remedies, and recognizing effective methods that can be adapted, creative, and capable of expansion (Incheon Declaration and Framework for Action for the Implementation of Sustainable Development);

Three levels for fulfilling the objectives of Sustainable Development Goal 4, as noted by Boeren and colleagues in 2019, consist of the micro level involving individuals like parents, children, young people, and adult learners, the mezzo level concerning educational settings, and the macro level related to national standards and laws. At the micro level, the emphasis is placed on the value of vocational training and the development of skills. It is essential for parents to acknowledge the advantages of education, such as greater autonomy, which corresponds with SDG 4.1 and Goal 4.2, promoting free access to primary and secondary education as well as quality early childhood education. Bourdieu (2009) found that the middle class has a greater capacity for literacy and collaboration with educational institutions, supporting Goal 4 for building inclusive and safe schools. Trust in the education system is vital, especially for those who face exclusion, aligning with Goal 4.5 to eliminate discrimination in education. Furthermore, offering higher education scholarships and ensuring that qualified teachers in developing countries can improve their education systems, in line with according to objectives 4.b and 4.c, which focus on expanding scholarships and increasing the number of qualified teachers.

Mezzo levels in all SDG 4 targets can only be attained if education and training are accessible and of high quality. Educational institutions must provide quality education, attract qualified teaching staff, manage finances effectively, and build strong community

relationships for all levels of education. Higher education should diversify its offerings to include vocational and technical skills to support the goals of sustainable development. Nations with minimal engagement in adult education frequently offer restricted course options, resulting in a continuous pattern of low involvement (Boeren et al., 2017).

At the macro level, education is shaped by regulations that vary by country. Access to primary education is significantly higher in Western Europe (almost 100%) than in developing countries, which have much lower rates (UNESCO, 2017b), and to improve access where participation is low, governments need to legislate accordingly.

In countries with low educational achievement, governments must enact legislation to enhance access to education, aligning with Goal 4.1: Free primary and secondary education. Efficient financing through investment in education is essential to achieve all the goals of SDG 4. To align with target 4.4. increase the number of people with skills relevant to economic success, governments should invest in job creation and the development of competitive markets. Developed countries must recognise investments made to help other countries externally (align with goals 4.b Expand higher education scholarships for developing countries and 4.c Increase the number of qualified teachers in developing countries). This macrolevel could also be extended to active labour market policies that could influence the provision of training programmes.

Economic, social, and environmental dimensions of existence are regarded in the 2030 Agenda as a chance to unify them. The Sustainable Development Goals focus on creating balance among these three dimensions by ensuring high-quality, inclusive, and fair education and ongoing learning opportunities for everyone, regardless of their background, through realizing 10 specific objectives. Hence, this research seeks to assess and examine the methods employed in analyzing green metrics, the indicators utilized, the percentages given, and how SDG 4 will be executed within the Romanian public universities included in this ranking for the year 2023.

## **2. Research framework**

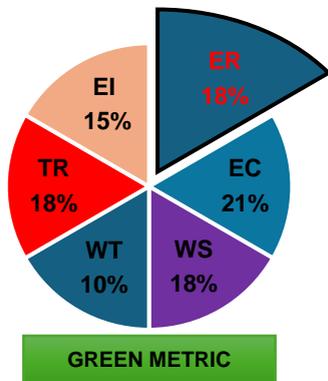
### ***GreenMetric Ranking: A Methodological Approach***

The necessity for examining the ecological consequences of universities has resulted in the creation of various metrics to measure this factor. Among these are the Green League launched in 2007 and the Environmental Social Responsibility Index introduced in 2009. Nevertheless, these measures fell short of achieving their intended outcomes, which led to the establishment of the Green Metric, an global ranking that correlates university performance with sustainability efforts. The Green Metric was initially introduced in 2010 by an institution in Indonesia, aiming to foster sustainability within higher education. This ranking encompasses an assessment of academic reputation and research, taking into account sustainability and environmental considerations, serving as a means to gauge the sustainability of university operations. The elements of this ranking are based on the three pillars of sustainability: environmental protection, economic viability, and social equity, reflecting the institution's actions regarding its influence on the environment.

Methodologically, ranking is based on specific sustainability indicators that measure the impact of universities on the environment, society, and economy. The ultimate aim of the Green University Ranking is to assess the commitment of universities to sustainability (Țimbaliuc & Gusuvati, 2021). The scores for each criterion are represented by a series

of responses given on a scale specific to the ranking. Each criterion is classified into a general information class, which in the final calculation transforms the raw scores into weighted scores to obtain the final score (see Figure 1).

**Figure 1.** GreenMetric Ranking Criteria and Weightings (Alawne et al., 2021)



**The Education and Research (ER)** criterion provides information on universities' efforts to create and support new generation concerns and sustainability issues.

**The Environment and Infrastructure (EI)** criterion offers details regarding the university's stance on ecological matters, encompassing green areas and actions aimed at environmental conservation along with strategies for sustainable advancement. (source: own elaboration).

**The Energy and Climate Change (EC)** criterion provides information on how universities choose to pay attention to energy use and climate change issues, with the expectation that universities will increase energy efficiency efforts on buildings used nature and resources.

**The Waste (WS)** criterion provides information on waste management and recycling programmes, which are considered key factors in creating a sustainable environment, and universities need to closely monitor not only their own waste generation, but also recycling/reuse and recycling patterns.

**The Water/Water Criterion (WT)** provides information on universities' water consumption and water conservation and freshwater and habitat protection programs. The aim is to reduce water consumption and increase conservation programmes and habitat protection;

**The Transportation/Transportation (TR)** criterion provides information on university policies to limit the number of vehicles on campus, the use of campus buses, and bicycles. The aim is to promote healthy lifestyles and reduce carbon emissions.

The evaluation includes six key factors: the reputation of the academic institution, the perception from employers, citations of faculty work, the ratio of faculty to students, the ratio of international students, and the ratio of international faculty. By the year 2023, the QS Ranking plans to incorporate two additional categories that will assess how educational institutions contribute to sustainable development: social influence and ecological impact.

Regarding the explanations of the Sustainable Development Goals and the aspects of social influence and ecological effect, the category will be outlined as shown in Table 2.

**Table 2.** SDGs included in the 2023 GreenMetric ranking

<b>Social Aspects</b>	
Gender Equality	Reduced Inequalities
	
<b>Environmental aspects</b>	
Affordable and Clean Energy	Climate action
	
Sustainable Cities	Life below Water
	
Responsible Consumption and Production	Life on land
	

source: (Mejia-Manzano, 2023)

Table 3 displays the classifications and measurement metrics of the SGDs within the Green Metric rankings, organized into six major categories: campus environment (infrastructure and surroundings); electricity usage (energy and climate impact), waste handling, water preservation, sustainable public transport, and education on sustainability.

**Table 3.** The Specific GreenMetric Indicators and Categories

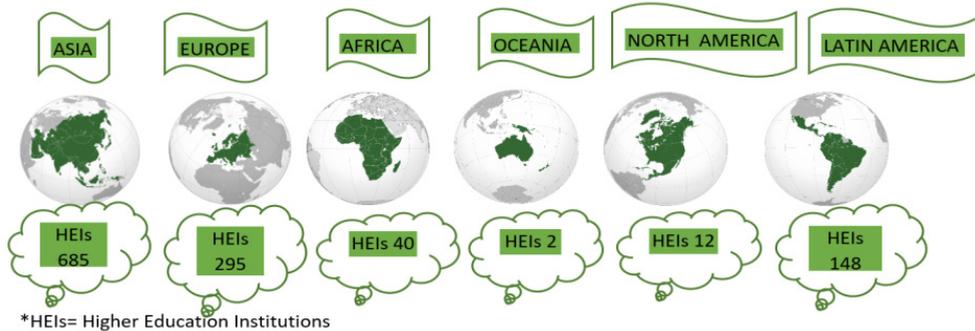
<b>Category</b>	<b>Indicator</b>
Setting and Infrastructure (SI)	<ul style="list-style-type: none"> <li>-the ratio of open space area to total area;</li> <li>-area on campus covered in forest;</li> <li>-area on campus covered in planted vegetation;</li> <li>-area on campus for water absorbance;</li> <li>-the ratio of open space area divided campus population;</li> <li>-university budget for sustainability effort.</li> </ul>
Energy and Climate Change (EC)	<ul style="list-style-type: none"> <li>-use of energy-efficient appliances;</li> <li>- implementation of the smart building programme implementation;</li> </ul>

Category	Indicator
	<ul style="list-style-type: none"> <li>-number of renewable energy production toward total energy usage per year;</li> <li>-element of green building implementation;</li> <li>-greenhouse gas emission reduction programme;</li> <li>-the ratio of total carbon footprint divided by campus population.</li> </ul>
Waste (WS)	<ul style="list-style-type: none"> <li>-recycling programme for university waste;</li> <li>-program to reduce the use of paper and plastic in campus;</li> <li>-organic waste treatment;</li> <li>Inorganic Waste Treatment;</li> <li>-toxic waste treatment;</li> <li>-sewerage disposal.</li> </ul>
Water (WR)	<ul style="list-style-type: none"> <li>-water conservation programme;</li> <li>-water recycling programme;</li> <li>-the use of water-efficient appliances;</li> <li>-piped water consumed.</li> </ul>
Transport Administration (TR)	<ul style="list-style-type: none"> <li>-the ratio of total vehicles (cars and motorcycles) divided by total campus population;</li> <li>-shuttle services;</li> <li>-zero emission vehicles policy on campus;</li> <li>-TR 6 Transportation Programme designed to limit or decrease the ratio of zero-emission vehicles divided by total campus population;</li> <li>- ratio of parking area to total campus area</li> <li>- transportation programme designed to limit or decrease the parking area on campus for the last 3 years</li> <li>-number of transportation initiatives to decrease private vehicles on campus</li> <li>-Pedestrian policy on campus</li> </ul>
Education (ER)	<ul style="list-style-type: none"> <li>-quantifying student organisations' sustainability-related activities;</li> <li>- community sustainability services;</li> <li>- share of sustainability funding in total research funding;</li> <li>- number of sustainability-related start-ups;</li> <li>- number of sustainability-related events;</li> <li>-number of sustainability-related academic publications;</li> <li>- sustainability report;</li> <li>-ratio of sustainability courses to total number of courses/subjects</li> <li>Sustainability Report</li> <li>-sustainability website</li> </ul>

(source: Alawne et al., 2021)

The GreenMetric 2023 ranking shows the global distribution of the participating universities (1182 participating institutions): Asia has the largest number of institutions, with 685 higher education institutions, representing more than half, and the number of educational institutions present (57.95%), followed by Europe with 295 HEIs, representing 24.95% of all HEIs present, Latin America with 145 HEIs, representing 12.26% of all HEIs present, North America with 12 HE Is, representing a share of only 0.66%, and Oceania with 2 HEIs, representing a share of only 0.11% of all HEIs present.

**Figure 2.** The global university ranking part of GreenMetric 2023 ranking



(source: own elaboration, data from <https://greenmetric.ui.ac.id/rankings/ranking-by-region-2023>)

The methodology for this ranking is based on general criteria accepted by universities interested in sustainability, such as education and research; collecting general information about universities (size and specificity); proportion of green space owned by universities; information on electricity consumption; information related to transport, water consumption, waste management, location and infrastructure, energy and climate change. The rankings are simple numerical counts broken down by each criterion/indicator, and at the end, the raw scores are weighted to arrive at the final score. It is also interesting to follow the distribution of the SDGs by continent (De Iorio et al., 2022), and thus we have:

**Table 4.** Implementation of SDGs implementation by continent

SDGs	AFRICA	ASIA	EUROPE	NORTH AMERICA	OCEANIA	SOUTH AMERICA
SDGs 1	44.203	47.598	52.983	76.611	71.118	54.69
SDGs 2	41.936	48.272	49.079	74.373	72.138	55.336
SDGs 3	49.986	53.032	60.036	72.49	87.396	58.302
SDGs 4	47.057	49.406	56.192	60.498	74.805	50.904
SDGs 5	40.189	42.47	54.842	65.888	78.443	49.615
SDGs 6	34.970	43.821	46.584	70.294	77.662	48.165
SDGs 7	49.514	54.859	61.193	71.042	81.647	56.01
SDGs 8	47.375	57.914	67.936	72.7	84.085	61.828
SDGs 9	40.507	52.381	56.796	74.76	70.938	38.635
SDGs10	41.228	44.057	60.789	70.685	80.223	41.233
SDGs11	45.775	52.286	59.989	81.252	83.532	48.635
SDGs12	37.295	48.48	59.387	78.679	79.873	47.124
SDGs13	40.438	38.975	52.836	65.455	72.173	42.822
SDGs14	33.221	40.951	51.441	75.765	75.700	47.816
SDGs15	32.722	44.227	55.246	77.725	83/106	47.776
SDGs16	48.319	50.000	65.917	81.362	84.363	54.492
SDGs17	48.186	47.737	54.886	69.797	86.152	48.956
<b>GENERAL</b>	<b>45.589</b>	<b>48.651</b>	<b>57.194</b>	<b>66.818</b>	<b>80.491</b>	<b>49.944</b>

(source: De Iorio et al., 2022)

As illustrated in the table above, Oceania ranks as the region exhibiting the most significant transparency in ODD, achieving an overall score of 80.491. Following Oceania are North America with a score of 66.818, and Europe at 57.194. In terms of the Quality Education aspect (SDG 4), Oceania once again leads with the highest disclosure level at 74.805, with North America next at 60.498, and Europe trailing at 56.192. The areas experiencing the least transparency regarding the SDGs consist mainly of developing nations, indicating that geographic factors significantly influence both the attainment and visibility of the SDGs, largely due to the economic conditions of various countries (De Iorio et al., 2022).

The other SDG related to SDG 4 (ie, SDG3 Health and well-being) have the highest disclosure in Oceania (87.396) and the lowest in North America (72.49). SDG5 (Gender equality) has the highest disclosure in South America (78.443) and the lowest in Asia (42.47). SDG 8: Oceania has the highest disclosure (84.085), and North America the lowest (72.49). SDG 12: Oceania has the highest disclosure (79.873), and Asia the lowest (48.48). SDG13: Mitigation of climate change. The highest level of disclosure in Oceania (72,173) and the lowest in Asia (38,975).

### **3. Methodology and database development**

We utilize both summative and descriptive content analysis to fulfill the aims of this research project. This approach entails examining documents and texts in order to measure the content according to established categories in a methodical and replicable manner (Fuchs et al., 2023; Chankseliani & McCowan, 2023). Additionally, another piece of literature includes the work of Galleli et al., (2022) and Veidemane (2022), which assesses global university sustainability rankings through the lens of the Berlin Principles framework. The researchers evaluated two specific rankings, the UI Green Metric WUR and THE-WUR, noting that both possess certain shortcomings and potential for enhancement.

In particular, the methodology of the Green Metric Ranking 2023 was utilized to identify and analyze indicators concerning education and research. Descriptive statistical techniques were employed to outline the characteristics of the data set obtained. Specifically, the data available from the Green Metric 2023 was taken into account. All information was gathered directly from the official website in February 2024. Descriptive statistics were again applied to extract and examine the university name, the university region (country), and scores relating to performance, research, and education for each institution.

In 2010, the Green Metric ranking began with 95 universities around the world. In 2018, this number had grown to 719. The UI Green Metric World University Ranking for 2023 included 949 universities from 84 countries, with 230 new participants since 2018. This increase reflects a greater awareness of sustainability in higher education. Romanian universities are represented by 11 institutions in the 2023 ranking:

1. "Babeş-Bolyai" University, Cluj-Napoca;
2. "Lucian Blaga" University of Sibiu;
3. University of Medicine and Pharmacy Grigore T. Popa-Iasi;
4. Danube University of Galati;
5. University of Oradea;

6. Technical University of Cluj;
7. Petroleum – Gas University of Ploiesti;
8. University of Medicine, Pharmacy, Science and Technology of Targu-Mures;
9. Valahia University of Targoviste;
10. West University of Timișoara;
11. “Ion Mincu University of Architecture and Urbanism”, Bucharest.

Romania, through the Ministry of Education, has developed a series of national programmes for the period 2016-2023 to support sustainability in the university environment <sup>2</sup>:

- Ø **Social programmes** for graduates from rural areas include special places, scholarships, subsidised accommodation and meals, and partial transport costs. For 2022-23, 200 places have been allocated to graduates from rural areas (1,207 have been filled). 5,000 bachelor's and 4,500 master's places have been allocated for the development of Romania's priority areas. Places have been allocated for bachelor's (312), master's (64) and doctoral studies (6).
- Ø **The ROSE programme**, created to encourage secondary school graduates to continue their studies, in the form of a university scholarship scheme, has reached the maximum number of scholarships allowed under the competitive Student Support Scheme;
- Ø **StudyinRomania**, a promotion tool for higher education, will be launched in 2022 as a phone application for 18-30 Romanians and foreigners interested in studying in Romanian universities. The VR application 'StudyinRomania Journey' will also be implemented. Promotes public universities through 46 videos, including a Trivia game about Romania, an exploration of Romanian cities, and a VR video promoting the application;
- Ø **The Educated Romania project**, embraced by the Romanian government, brings together strategic directives and outlines the vision for higher education aimed at 2030. It encompasses the National Strategic Framework for Education and Training across all tiers, which has received approval from the European Union via the European Commission, to meet the financial commitments of Europe for the years 2021-2027. The overarching aims include: involvement in higher education and continuous learning, global integration of the Romanian education framework, oversight of national policies, independence of universities, doctoral education, and promoting an ethical atmosphere within the education sector. Action and monitoring plans have been developed for the effective implementation of this project;
- Ø **Support for Ukraine** is one of the measures related to the academic years of pandemic (2021-2022; 2022-2023). This includes facilitating academic mobility and providing scholarships to those choosing to study in the Romanian university system. Teaching in Romanian or English, with 525 Ukrainian students enrolled (1436 international students were enrolled at Babeș-Bolyai University, Cluj-Napoca in the 2021-2022 academic year)<sup>3</sup>.

<sup>2</sup> file:///C:/Users/dell/Downloads/Reforme%20na%C8%9Bionale%20%C3%AE%20domiu%20%C3%AE%20C4%83%C8%9B%C4%83m%C3%A2ntului%20superior%20.pdf

<sup>3</sup> [https://www.ubbcluj.ro/ro/infoubb/documente\\_publice/files/raport-rector/Raportul\\_Rectorului\\_2022.pdf?v=23](https://www.ubbcluj.ro/ro/infoubb/documente_publice/files/raport-rector/Raportul_Rectorului_2022.pdf?v=23)

## 4. Results

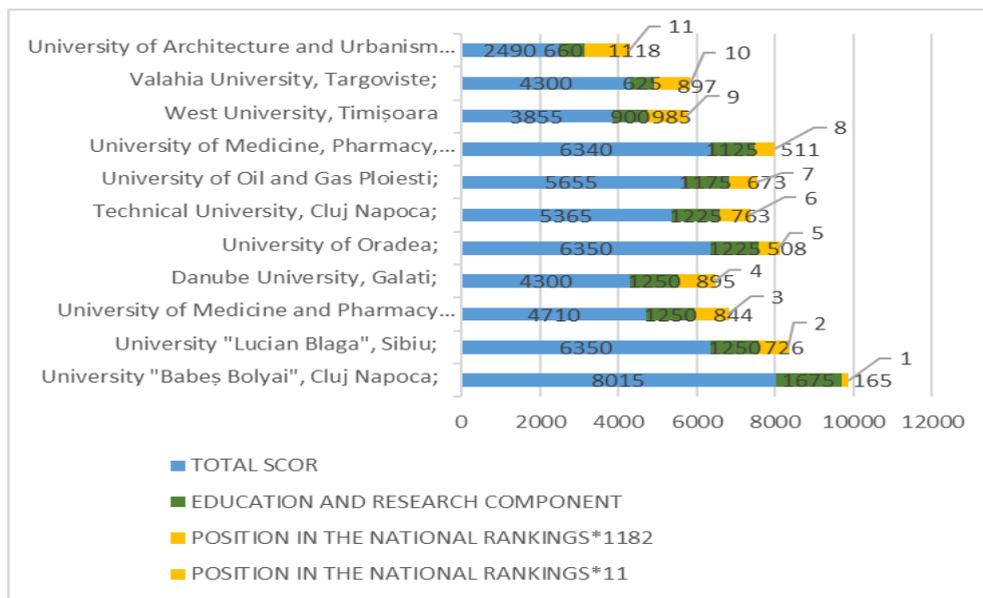
### GreenMetric Geopolitical Analysis 2023

At the national level, we can see where the public universities included in the ranking are (see Figures 3 and 4). They are spread over eight counties out of 41 in Romania. The county of Cluj-Napoca is in the ranking with two nationally and internationally recognized universities. The Babeş-Bolyai University of Cluj-Napoca is at the top of the national rankings, with an overall score of 8.015. In the Education/Research component, it has a score of 1675, which puts it 165th out of 1182 universities worldwide. The Technical University, another university in Cluj-Napoca County, is ranked 6th out of 11 universities nationally and 7th out of 1182 worldwide, with an overall score of 5365 and a score of 1225 for education/research.

The University "Lucian Blaga" in Sibiu holds the second place in the ranking, sitting at 726th out of 1,182 universities, with a total score of 5,355 and 1,250 points in the education and research component. Third is the University of Medicine and Pharmacy "Grigore T. Popa" in Iași, ranked 844th overall, with a total score of 4,710 and the same score of 1,250 in education and research.

The University of the Danube, Galati is in fourth place in the ranking of the 11 national universities. It is ranked 895 out of 1182 universities, with an overall score of 4330 and a score of 1250 for teaching and research. The University of Oradea, the county town of Bihor, is ranked 508 out of 1182 universities, with an overall score of 6350 and a score of 1225 for education/research.

**Figure 3.** GreenMetric 2023 Romanian university ranking



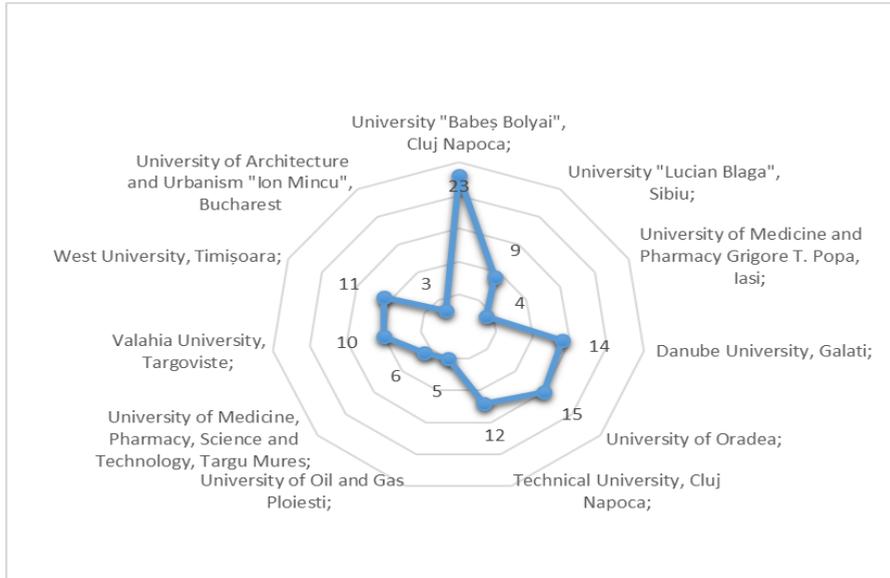
(source: eventual own elaboration based on data UI Green Metric World University rankings. Welcome to UI Green Metric. Available online at <https://greenmetric.ui.ac.id/rankings/ranking-by-region-2023>)



Jos” University, Galati follow at a distance with the same score (1250). The next with a score of 1225 are the Universities of Oradea and the Technical University of Cluj-Napoca.

We analyzed the size of each university to see if the number of faculties influences the implementation of sustainability (alignment with the SDGs, implicitly SDG 4 - quality education).

**Figure 5.** Dimensions of universities in the Green Metric 2023 Ranking



(source: own elaboration).

## 5. Discussion

Universities are becoming more sustainable because they are focusing on environmental issues (Brandli et al., 2020; Pires & Pereira, 2023). Reputation, teaching and research are no longer the only things that world-class universities are judged on. Many are also now participating in sustainability rankings. Various studies, mainly in the Global North, have examined university performance on these platforms (Filho et al., 2021; Parvez & Agrawal, 2019). Romania is a leader in adopting a sustainability agenda, but there are few studies on the participation of Romanian universities in sustainability rankings. We investigated how Romanian universities performed on Green Metric 2023, a complex global university sustainability ranking.

The university sector is changing, with new strategic orientations, key values and modes of operation. This has led to restructuring and reorientation. The trend of universities operating like corporations is a concerning issue stemming from reduced government support, the significance of academic rankings, a focus on management practices, and globalization. This shift indicates that universities prioritize their own needs over those of the community, making performance evaluation frameworks critical.

The 17 Sustainable Development Goals from the UN's Agenda 2030 present universities with the chance to generate public value and illustrate their engagement in sustainable growth. It is essential for universities to incorporate the Global Agenda into their core operations, melding the three SD missions into their frameworks and fostering a cultural shift towards objectives beyond financial gain.

While the Green Metrics Ranking is focused on evaluating sustainability concerns, this research aims to clarify the approaches, scope, and geopolitical elements (by nation/area) associated with this emerging ranking, which also aligns with the Sustainable Development Goals.

The minimal involvement of other areas such as Oceania, Africa, and North America can be attributed to the voluntary nature of participation in this ranking, along with insufficient motivation and financial support.

The environment is a pressing issue. It has put universities around the world in a complicated position. They must lead the sustainable development agenda (Pires & Pereira, 2023). Reducing the environmental impact of university activities is essential to achieve university sustainability. International rankings can provide important information. They can help universities assess their individual environmental policies.

The dimensions of an institution play a crucial role in its ranking on the Green Metric 2023 list (refer to Figure 5). Babeş-Bolyai University Cluj-Napoca leads the rankings, featuring 23 departments that provide a variety of specialties and respond to the evolving demands of the local labor market in Cluj-Napoca. This indicates that the scale of the university significantly affects its approach to sustainability. The university's top ranking is due to several factors, including its presence in international and national rankings, which attracts the best students and professors, thus ensuring a high-quality education. The university's focus on innovation, on attracting funds, on developing and training the workforce to meet societal needs, its diverse academic offerings, and the city's attractiveness for students seeking a high-quality, diversified education.

Second is the University of Oradea with 15 faculties. Several factors, such as the diversity of academic programs (social sciences, humanities, engineering, medicine), high degree of Internationalization, the modern infrastructure and facilities, and the strong focus on research, contributed to this university's second place.

Third is the Danube University of Galati with a total of 14 faculties. Several factors, such as the diversity of the university's academic programs (social sciences, humanities, engineering, medicine), the acceleration of partnerships through which the university contributes significantly to the local economy, and the quality of the teaching staff, contributed to this university's third place in the ranking.

The involvement of universities in the UI GreenMetric 2023 ranking has important political consequences: they become key players in implementing environmental and educational policies, helping to achieve national and international sustainability goals (Kirylyuk et al., 2024). To be in line with GreenMetric, institutions must use clear strategies, follow the rules of green governance, and work with both central and local authorities (Stoian, et al., 2021). At the same time, performance in the rankings is used as a political and image tool, legitimizing both university leadership and public policies on education and sustainable development (Kirylyuk et al., 2024).

## 6. Conclusions

This study demonstrates that academic institutions are going through a structural change, with sustainability emerging as a key component alongside reputation, teaching, and research. The findings demonstrate that Romanian universities are following the global trend of incorporating the Sustainable Development Goals of the UN, especially SDG 4-Quality Education, into their institutional strategies. Despite positioning itself as a proponent of the sustainability agenda, Romania's universities' overall participation in the UI GreenMetric Ranking 2023 is still low, primarily because of a lack of funding and resources.

The analysis emphasizes that, as demonstrated by Babeş-Bolyai University, University of Oradea, and Danube University of Galaţi, institutional size and program diversity are critical factors in sustainability performance. Academic diversification, internationalization, research capability, modern infrastructure, and responsiveness to labor market demands are all factors that contribute to their high rankings. These results show that universities that are bigger and more diverse have an advantage when it comes to supporting sustainability objectives.

However, the study also highlights the regional and geopolitical differences in GreenMetric participation: Oceania, Africa, and North America are marginally represented, while Asia, Europe, and Latin America are heavily represented. This illustrates the ranking's voluntary nature as well as some regions' dearth of institutional support. Increasing the number of Romanian universities participating in these rankings could improve sustainability's overall integration into higher education policies as well as its visibility and credibility.

The study's final conclusion is that global rankings like GreenMetric are useful resources for evaluating social and environmental responsibility in higher education. Universities can enhance their international standing and make a significant contribution to long-term sustainable development and public value creation by implementing sustainability-based performance evaluation frameworks.

Our research is restricted to the data that is presently accessible on university webpages as of 2024. The way in which websites present information can significantly impact the study findings. We chose to collect the information disseminated by the universities because this is the main information channel considered in other studies. Another limitation of the methodology used in this study is that only data from the 2023 rankings were used. Future studies could consider adding new sources of information and extending the analysis period. This would lead to a more complex presentation and analysis that would involve more sources of information.

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## HERDING BEHAVIOUR UNDER EXTREME MARKET CONDITIONS. NEW EVIDENCE IN DEVELOPED CAPITAL MARKETS

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**Abstract:** This paper aims at analyzing the presence of gregarious behavior within the main developed equity markets, namely the US, European and Asian markets, taking as proxy the absolute deviation of stock returns from markets' (CSAD) for the companies composing the S&P500, STOXX600 and NIKKEI225 indices. The period used for daily stock prices starts from 12/31/2004 to 06/30/2023. Thus, we proposed several regression versions targeting investors' behavior in relation to market direction in various volatility scenarios starting from Chang's (2000) analysis model. The sentiment specific side was quantified by means of the RSI index, therefore having a complete analysis of this social bias. Furthermore, using the three- and five-factor Fama-French models, we were able to delineate herding behavior as fundamental or non-fundamental depending on the information underlying investors' decisions. In order to better isolate the phenomenon based on the sample, we used the quantile-based QREG method in addition to the OLS method. Following the synthesis of the empirical study, the results obtained emphasize the presence of the herding bias in the analyzed markets under different economic hypostases.

**JEL Classification:** G14, G15, G40, G41

**Keywords:** behavioral finance, herding, volatility, market scenarios, risk premia, cross-sectional absolute deviation of returns

### 1. Introduction

Behavioral finance initially emerged as a response to the shortcomings of traditional financial theory. The latter's main hypothesis is the existence of informational efficiency in capital markets, an idea advocated by Eugene Fama and Paul Samuelson. A stock price must therefore fully incorporate all the information available in that market in order to be considered efficient and leading to rational predictions by investors about

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future prices. However, such an assumption does not capture potential behavioral anomalies and biases in the market that directly influence the transactions concluded and imprint volatility on the price of financial assets in the form of random walk. Thus, the new side of finance, further promoted by De Bondt and Thaler (1985) and Shiller (2003) respectively, proposes to facilitate a more detailed approach to the market mechanism and the decision-making process by the investors concerned, by translating the behavioral factors into classical models, also taking into account the moments when rational behavior is antiquated. With the integration of these factors, new more complex regression-based models are created, which we will detail later.

Mainly determined by the different perception of capital market information, the decision-making process takes the form of herding behavior when inexperienced investors, also known as "noise traders", who are considering that they do not have a sufficiently broad information horizon or the necessary skills, will replicate the strategies of other participants ignoring their own forecasts, unlike experienced investors who rely on their own active, technical or fundamental analysis principles. Indian economist Abhijit Banerjee points out that this gregarious/imitation effect directly affects the informational efficiency of the market by reducing the significance of private information of investors following the strategies of others. Hence, recalling the function of capital markets in valuing financial assets, this is, in turn, impacted by the deviation of asset values from their fundamental values, thereby inducing additional volatility and establishing new equilibrium prices through the random walk phenomenon.

## **2. Literature review**

The causes of herding behavior include imperfectly distributed information, compensation structures, managers' lack of confidence in their own abilities, reputational concerns and the assumption that other market players own more information, such as inside information, or have more optimal investment strategies. In addition, the subjective expectations of return and risk that underlie this bias can lead to destabilization of financial markets and crises by creating speculative bubbles through over-buying or stock market crashes through massive selling, both driven by feelings of greed or fear of the crowd. Such bubbles appeared in the US real estate market in the 1970s and 1980s, or more recently in 2008.

Devenow and Welch (1996) argue for the division of behavior as rational and irrational, the latter being based on the instinct to naively follow the initiative of others, while the former reveals mimetic behavior involving an expected utility maximizing analysis before making the actual decision, similar to passive/indicative management of a portfolio of financial assets replicating a particular index. Researchers Avery and Zemsky (1998) state that the emergence of mimetic behavior and speculative bubbles may be generated by complicated information structures in the financial market.

The concepts of spurious behavior and intentional herd behavior were introduced in the literature by Bikhchandani and Sharma (2000). The first classification refers to the coincidences that occur between investors who encounter a similar set of data, guided by fundamentals, and make decisions in a similar context, thus giving the false appearance of herding behavior. On the other hand, investors who lucidly and intentionally follow the strategy of others also denote a phenomenon that is considered

rational, which has 3 major underlying causes. A first source is given by the information asymmetry between individuals and the inevitable imitation of the actions of those who possess a surplus of information. Another cause marks the managers' obsession with reputation and implicitly relieving themselves of the responsibilities of poor performance by copying the decisions of other managers and questioning their own professional skills. The last cause refers to the compensation structures specific to fund managers, who get a reward scheme in addition to their salary against a benchmark and have a habit of replicating it.

Another important classification of studies emphasizes empirical papers dealing with the herding phenomenon of institutional investors and analysts under the synthesis of Lakonishok, Shleifer and Vishny (1992), which uses the LSV model in identifying the presence of bias, but also papers that use market aggregates and note the collectivism of investors with respect to market direction, e.g. Christie and Huang (1995) - CSSD model, Chang, Cheng and Khorana (2000) - CSAD model, Hwang and Salmon (2004) - state space model.

Christie and Huang analyze the herding phenomenon based on how stock returns cluster around the average market return at times of high volatility. To test this hypothesis, they use the cross-sectional standard deviation (CSSD), reflecting that the value of the CSSD will be lower in high volatility conditions rather than in normal conditions, contrary to classical asset pricing models. Chang, Cheng and Khorana propose a new approach using the cross-sectional absolute standard deviation (CSAD), which represents an improvement of the CSSD. In their study of the US and Asian markets, namely Japan, Hong Kong, South Korea and Taiwan, they find the presence of herding behavior during periods of high volatility only in the emerging markets, South Korea and Taiwan, most likely due to the slower incorporation of existing information into the price. Hwang and Salmon introduce a new model to determine herding behavior, specifically by calculating deviations of asset prices from their long-run equilibrium value, computed using the CAPM valuation relationship. Applied to the US and South Korean markets, it identifies evidence of herding in both countries irrespective of the market trend - bull/bear or macroeconomic coordinates. A particular feature emerges with the Asian and Russian crisis when the herding effect is diminished and prices return to equilibrium.

Another seminal study is the one by Galariotis et al. (2014) dividing investors' response according to fundamental and non-fundamental information under the influence of decomposing dispersion of returns by Fama-French and Carhart factors, respectively. Thus, spurious herding behavior in the US and UK markets was driven by fundamental macroeconomic announcements, while intentional behavior is conditioned on the residuals of the Fama-French multifactor model. Therefore, the results are mixed as they capture spurious herding behavior during the Asian and Russian crisis for both countries, but also intentional behavior only in the US market during the subprime crisis. At the same time Emilios Galariotis (2016) observes the link between highly liquid equities and the herding effect in five main global markets, namely France, Germany, England, the US and Japan, due to low risk diversification potential of a portfolio for highly liquid equities as they have a coefficient of determination  $R^2$  high, therefore the total risk being largely determined by market risk, the share price being in line with the market.

Using the same analytical model, Duygun (2021) investigates the gregarious phenomenon in the Eurozone as well as in the US markets, focusing on the European

and global crisis, and infers its emergence to a more significant extent in the higher quantiles under the impact of tumultuous market conditions, financial crises and not least asymmetric volatility. Based on Galariotis's model he identified the characteristics of false and intentional behaviors, isolating them by OLS and QREG method. This investor sentiment leading to the emergence of the two gregarious typologies was defined by Baker and Wurgler in 2007 as beliefs about future cash flows - cash flows and investment risks that are not supported by information available in the market.

Stock market sentiment as a determinant of herding behavior can be measured by various techniques and indicators that are quantified in the form of direct and indirect methods. While direct methods use questionnaires to analyze investors' forecasts of market developments with ESI - Economic Sentiment Indicator, MCSI - Michigan Consumer Sentiment Index or II - Investor Intelligence Index as indices, indirect methods use market variables to reflect liquidity, average returns or the number of initial public offerings (IPOs) through indices such as RSI, ARMS or CCI - Consumer Confidence Index. In the following I will detail a number of empirical studies that analyze the relationship between investor sentiment and different stock market variables – market liquidity, stock returns, trading volume and volatility.

Last but not least, a recent study by Huynh, N., De Mello, L., Li, K. (2025), which targeted 1274 publications from the Web of Science database between 1991-2023, uses bibliographic mapping techniques to confirm the relationship between sentiment, asset returns, volatilities, stock market bubbles and market anomalies. The authors emphasize the need for further refinement in measurement techniques in terms of methodological variations and the limited nature of the data that contributed to inconsistencies and overlaps compared to benchmark sentiment indicators that have considerably improved their explanatory power.

Synthesizing the studies reported above we deduce a certain tendency of transitivity among the factors influencing gregarious behavior. Several analyzed studies expose the relationship between stock returns and market sentiment, while the herding phenomenon is also quantified in relation to returns, thus establishing the direct relationship between market sentiment and perceived behavioral bias.

### 3. Methodology

The econometric model used to highlight the global gregarious behavior on the main developed capital markets is the one of Chang et al. created in 2000, which is based on the relationship between the absolute deviations of security returns from market returns (CSAD):

$$CSAD_t = \frac{1}{N} \sum_1^N |R_{i,t} - M_t| \quad (1)$$

#### 3.1. Empirical study of the herding phenomenon

Chang et al. (2000) proposed the following nonlinear regression model to assess herding behavior:

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * M_t^2 + \varepsilon_t \quad (2)$$

The above model is developed from the CAPM (Capital Asset Pricing Model) hypothesis, which argues that CSAD is in a linear relationship with market returns if investors would act according to decision rationality. Therefore, an increase in the size of market movements leads to a rise in the mean squared deviation under the classical theory, the regression coefficient  $\beta_2$  is positive and statistically significant in the absence of the gregarious phenomenon, when it has negative values.

For a better explanation of the CSAD we have added to the econometric regression several variables that will isolate the synthesis carried out according to different market hypostases/trends, implicitly improving the model. The newly constructed regressions based on the literature are initially guided by Yao's model, previously mentioned, in order to reduce multicollinearity by introducing the variable  $\bar{M}$  - arithmetic mean of the market, the creation of a centered variable, and at the same time, in order to increase the significance and correct the autocorrelation of the residuals, by using the past moment  $CSAD_{t-1}$ . Thus, the obtained model becomes autoregressive and the explanatory power of the variables is also given by the positive change in the coefficient of determination  $R^2$  - price synchronicity. The estimated regression is also based on the Newey West (1997) model for handling heteroskedasticity.

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * CSAD_{t-1} + \varepsilon_t \quad (3)$$

### **3.2. Influence of market trends**

The quantification of the upward or downward trends was performed by introducing in the regression dummy – dichotomous variables, calculated in relation to the moving average of the market returns over the last 31 days, as follows:

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^{UP} * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (4)$$

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^{DOWN} * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (5)$$

### **3.3. Influence of market volatility**

Two other dummies will summarize the effect of market volatility, by referring to the arithmetic moving average of the arithmetic mean squared deviations of the market returns over the last month, as follows:

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^{HVOL} * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (6)$$

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^{LVOL} * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (7)$$

### **3.4. Influence of extreme investors' sentiment**

Taking as a proxy Baker and Wugler's study suggesting the psychological influence of sentiment on the herding phenomenon, we evaluate this impact by using the Relative Strength Index (RSI) sentiment index. Developed by former American engineer J.W. Wilder Jr. in 1978, the RSI is a technical gut instinct indicator that captures the amplitude of recent price changes. In addition, the interpretation of this index is segmented into two percentage thresholds, a value above 70% indicates strong demand for the security, leading to optimism and an overvaluation of the

stock, while below 30% indicates an increase in supply and, therefore, pessimism and an undervaluation of the financial asset.

Based on the RSI formula, formed beforehand by determining the RS, and the aforementioned thresholds reflecting opposing sentiments, two dummies will model the regression as follows:

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^O * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (8)$$

$$CSAD_t = \beta_0 + \beta_1 * |M_t| + \beta_2 * (M_t - \bar{M})^2 + \beta_3 * D^P * (M_t - \bar{M})^2 + \beta_4 * CSAD_{t-1} + \varepsilon_t \quad (9)$$

### 3.5. The Fama-French model as an analysis factor

By examining Galariotis' model, together with the contribution of Bikhchandani and Sharma that the gregarious phenomenon is divided into spurious and intentional, we observe the impact of fundamental information on the spurious herding and non-fundamental sides in determining intentional herding behavior. The three economists have detailed this hypothesis by conditioning the CSAD on the Fama-French and Carhart factors, respectively, to provide superior explanatory power to the original model (Chang) by tracking important fundamental information that may alter investors' investment decisions, while non-fundamental/subjective information is captured in the residuals of the regression. The estimated model based on the Fama-French factors takes the form:

$$CSAD_t = \beta_0 + \beta_1 * (M_t - RF_t) + \beta_2 * HML_t + \beta_3 * SMB_t + \varepsilon_t \quad (10)$$

Starting from the above relation, we have divided the CSAD into its two informational forms, namely fundamental and non-fundamental:

$$CSAD_{non-fundamental,t} = \varepsilon_t$$

$$CSAD_{fundamental,t} = \beta_0 + \beta_1 * (M_t - RF_t) + \beta_2 * HML_t + \beta_3 * SMB_t$$

By replacing the simple CSAD, in the basic relation, with the above two variations we obtained two regressions that we then used in the construction of the tables:

$$CSAD_{fundamental,t} = \beta_0 + \beta_1 * |M_t| + \beta_2 * M_t^2 + \varepsilon_t \quad (11)$$

$$CSAD_{non-fundamental,t} = \beta_0 + \beta_1 * |M_t| + \beta_2 * M_t^2 + \varepsilon_t \quad (12)$$

Nonetheless, a coefficient  $\beta_2$  negative and statistically significant, will give us the certainty of the existence of a false gregarious behavior in the market in question, so that investors adopt decisions according to the classical theory, based on the fundamental analysis, that is, an intentional behavior where decisions are predominantly instinctual.

## 4. Database and variables

The empirical study was carried out on the main developed stock markets, namely the European, American and Asian-Japanese markets. The computed returns are based on the quotes of the indices S&P500, STOXX600, respectively NIKKEI225 to synthesize the market as a whole, as well as on the share prices of each company

in order to determine the deviations from the market average and implicitly their specific herd behavior. The analyzed interval covers almost 19 years, 31.12.2004 - 30.06.2023 and includes a total of 4826 observations. The Fama-French factors used in the models were retrieved from Kenneth French's online data library and synchronized with the returns for the same period.

Table 1 provides the variables used in the empirical analysis and their computation method.

**Table 1. Variables overview**

Variable	Description
<b>M</b>	Daily log return of the market index used as proxy - $M_t = \ln(P_t/P_{t-1})$
<b>MRP</b>	Market risk premium - $MRP_t = M_t - RF_t$
<b>MC</b>	Centered second-order moment of the (market) index return - $MC_t = (M_t - \bar{M})^2$
<b>RF</b>	Risk-free asset rate
<b>CSADF</b>	CSAD determined by fundamental information $CSADF_t = CSAD_t - \varepsilon_t$ , where
<b>CSADNF</b>	CSAD driven by non-fundamental information $CSADNF_t = \varepsilon_t$
<b>RSI</b>	Relative Strength Index $RSI = \frac{RS}{1+RS} * 100$ , where $RS = \frac{\sum_1^{16} \max(P_t - P_{t-1}, 0)}{\sum_1^{16} \max(P_{t-1} - P_t, 0)}$
<b>SMB</b>	Small minus big factor
<b>HML</b>	High minus low factor
<b>RMW</b>	Robust minus weak factor
<b>CMA</b>	Conservative minus aggressive factor
<b>MOM</b>	Momentum factor
<b>DO</b>	Dichotomous variable for optimism, takes value 1 when $RSI > 60\%$ and 0 otherwise
<b>DP</b>	Dichotomous variable for pessimism, takes the value 1 when $RSI < 40\%$ and 0 otherwise
<b>DUP</b>	Dummy that quantifies the upward trend of the market by taking the value 1 when the market return exceeds the average of the last month and 0 otherwise
<b>DDOWN</b>	Dummy denoting the market's downtrend, taking the value 1 when the index return is below the moving average of the last 31 days
<b>DHVOL</b>	Dummy variable that takes the value 1 in conditions of high volatility and 0 otherwise
<b>DLVOL</b>	Dummy variable that takes the value 1 under low volatility conditions and 0 otherwise

*Source: Author's Computation*

In addition, table 2 emphasizes the main descriptive statistics related to the variables included in the regressions, such as the mean, the standard deviation and the ADF test that proves the stationarity of the time series.

**Table 2. Descriptive statistics**

Variable	Average	Mean squared deviation	ADF test
<b>USA</b>			
CSAD	0,010746	0,005322	-7,831889***
CSADF	0,011138	0,000841	-40,06036***
CSADNF	$0,000264 \cdot 10^{-5}$	0,004928	-6,993502***
CSR	55,556975	16,151751	-10,22413***
SMB	0,001016	0,623229	-69,10841***
HML	-0,00448	0,811817	-39,81745***
RMW	0,015532	0,448206	-65,20694***
CMA	0,003203	0,376628	-65,30685***
MOM	0,004129	1,072289	-39,81425***
<b>Europe</b>			
CSAD	0,011707	0,004752	-6,836676***
CSADF	0,011707	0,000743	-28,30825***
CSADNF	$-0,000064 \cdot 10^{-4}$	0,004693	-6,698284***
CSR	52,994813	16,421858	-9,796612***
SMB	0,000655	0,497706	-36,06483***
HML	-0,00205	0,524671	-62,84324***
RMW	0,016292	0,309106	-64,56525***
CMA	-0,00021	0,307312	-64,20259***
MOM	0,032502	0,794383	-47,41177***
<b>Japan</b>			
CSAD	0,011117	0,004911	-7,830825***
CSADF	$0,552953 \cdot 10^{-8}$	0,004901	-59,15998***
CSADNF	0,011117	0,000301	-7,849160***
CSR	52,298121	14,401806	-10,12828***
SMB	0,002833	0,578195	-42,95076***
HML	0,008319	0,617024	-65,23571***
RMW	0,001697	0,354668	-66,29430***
CMA	0,006294	0,400256	-61,79180***
MOM	-0,002275	0,735392	-40,98233***

Note: The Augmented Dickey-Fuller(ADF) test aims to detect the presence of unit root when applied on time series. In our case, we reject the null hypothesis  $H_0$  - the series has a unit root for a confidence threshold of 99%(\*\*\*).

## 5. Empirical results and discussions

### 5.1. Analysis of gregarious behavior in developed markets

We observe that  $\beta_2$  is positive for both the US and the European markets, which does not provide evidence of herding behavior and confirms previous studies by Chang et al. (2000) - USA and Duygun et al. (2021) - Europe. This may happen due to the periodicity of the herding phenomenon in relation to the extended period of analysis, and its tendency to be present in specific market hypostases. For the Asian market we observe a negative value of the coefficient  $\beta_2$  in the first quantile but not statistically significant.

**Table 3 Model (2) estimation**

Estimation method	Europe		USA		Japan	
	$\beta_2$ (t-stat)	R <sup>2</sup> adj.	$\beta_2$ (t-stat)	R <sup>2</sup> adj.	$\beta_2$ (t-stat)	R <sup>2</sup> adj.
<b>OLS</b>	0,4583*** (2,904)	0,3838	0,4109** (2,202)	0,3979	0,9033*** (4,081)	0,2146
<b><math>\tau = 10\%</math></b>	0,4243*** (6,971)	0,1213	0,1833 (0,076)	0,1152	-1,2684 (-1,292)	0,0675
<b><math>\tau = 25\%</math></b>	1,5660*** (12,083)	0,1417	1,4794*** (17,916)	0,1258	1,0589*** (10,305)	0,0626
<b><math>\tau = 50\%</math></b>	1,9676*** (7,322)	0,1786	1,8471*** (10,041)	0,1641	1,9355*** (9,0861)	0,0767
<b><math>\tau = 75\%</math></b>	2,0455* (1,836)	0,2262	2,6794*** (4,951)	0,2132	1,8379 (1,145)	0,1097
<b><math>\tau = 90\%</math></b>	0,5037 (1,624)	0,2836	0,7893 (0,2906)	0,2878	4,3443*** (4,883)	0,1491

Note: \*\*\* statistical significance at 1% level; \*\*statistical significance at 5% level; \*statistical significance at 10% level.

### 5.2. Impact of market trends on investors' behavior

The periods of economic growth show a mimetic effect only in the US market, mainly through OLS analysis, which can be explained by the significance of the mean and the absence of outliers, the other two markets recording isolated negative values of the coefficient  $\beta_3$  and statistically insignificant. On the contrary, the periods of decline reflect the presence of herding behavior particularly in the Japanese market, with the coefficient having a risk threshold of 10%, while the other markets do not provide concrete evidence of herding.

### 5.3. Impact of volatility on the behavior of the risk-takers

The US market is profoundly affected by asymmetric periods of volatility, thus herding behavior is found in the context of high volatility, with a predilection in the upper quantiles, an effect also confirmed by the literature, Christie and Huang(1995). While the Asian market does not provide significant evidence, in Europe we observe the presence of social bias in the third quantile during periods of high volatility, the coefficient  $\beta_3$  is negative and has a 90% confidence interval.

### 5.4. Impact of investors' sentiment

Analyzing the results in Table 4 we deduce a restricted presence of the herd effect impacted by investors' optimism, more precisely it makes its influence felt only on the Asian market in the last quantile with an estimated coefficient of -2.2844. At the same time, the results provide a robust picture of the heavy behavior on the US and European markets in relation to participants' pessimism, which can also be

demonstrated by the distinct cultural factor characterizing the Asian market. At the same time, the determination coefficient  $R^2$  higher coefficient of determinacy characterizing Europe and the USA gives a better explanatory power to the variables, and hence to the model in relation to Japan.

**Table 4. Models (4),(5),(6),(7),(8),(9) estimation**

Europe						
Estimation method	DUP	DDOWN	DHVOL	DLVOL	DO	DP
OLS	0,0136 (0,119)	-0,0136 (-0,119)	-0,1178 (-0,831)	0,1178 (0,831)	0,8161*** (3,209)	-0,8466*** (-6,669)
$\tau = 10\%$	0,1124 (0,164)	-0,1124 (-0,164)	-0,1772 (-1,215)	0,1772 (1,215)	0,4905 (0,887)	-0,3969*** (-8,083)
$\tau = 25\%$	0,1663 (1,211)	-0,1663 (-1,211)	-0,2676 (-1,301)	0,2676 (1,301)	0,8906*** (3,198)	-0,4693 (-1,432)
$\tau = 50\%$	-0,0679 (-0,223)	0,0679 (0,223)	-0,2003* (-1,863)	0,2003* (1,863)	0,5778* (1,705)	-0,7126*** (-2,587)
$\tau = 75\%$	0,2033 (0,193)	-0,2033 (-0,193)	-0,2107 (-0,194)	0,2107 (0,194)	1,0023 (1,361)	-1,1657*** (-2,628)
$\tau = 90\%$	0,1815 (0,324)	-0,1815 (-0,324)	-0,7105 (-0,723)	0,7105 (0,723)	0,8709 (1,048)	-0,7608 (-0,579)
USA						
Estimation method	DUP	DDOWN	DHVOL	DLVOL	DO	DP
OLS	-0,5332*** (-3,355)	0,5332*** (3,355)	-1,1174*** (-4,607)	1,1174*** (4,607)	0,4863 (1,378)	-0,7695*** (-4,164)
$\tau = 10\%$	-0,3031 (-0,397)	0,3031 (0,397)	-0,0817 (-0,122)	0,0817 (0,122)	0,7192 (1,495)	-0,9922 (-1,217)
$\tau = 25\%$	-0,6149 (-1,356)	0,6149 (1,356)	-0,6971 (-1,437)	0,6971 (1,437)	0,3907 (1,595)	-0,7337 (-1,599)
$\tau = 50\%$	-0,2941 (-0,312)	0,2941 (0,312)	-1,0492*** (-14,775)	1,0492*** (14,775)	1,3802*** (9,324)	-1,0585*** (-18,085)
$\tau = 75\%$	-0,4657 (-0,701)	0,4657 (0,701)	-2,4642** (-2,567)	2,4642** (2,567)	2,4596** (2,095)	-1,4011 (-1,418)
$\tau = 90\%$	-0,1115 (-0,088)	0,1115 (0,088)	-2,7144*** (-3,542)	2,7144*** (3,542)	1,8448** (2,001)	-0,3212 (-0,303)

Japan						
Estimation method	DUP	DDOWN	DHVOL	DLVOL	DO	DP
OLS	0,3402* (1,695)	-0,3402* (-1,695)	0,0125 (0,044)	-0,0125 (-0,044)	-0,5462 (-1,411)	-0,1283 (-0,557)
$\tau = 10\%$	-0,0301 (-0,067)	0,0301 (0,067)	0,0523 (0,127)	-0,0523 (-0,127)	0,0372 (0,074)	0,0446 (0,079)
$\tau = 25\%$	0,2363 (0,216)	-0,2363 (-0,216)	-0,2112 (-0,490)	0,2112 (0,490)	-0,1243 (-0,391)	-0,3629 (-0,699)
$\tau = 50\%$	0,3311 (0,650)	-0,3311 (-0,650)	-0,1581 (-0,656)	0,1581 (0,656)	-0,201 (-0,602)	-0,0926 (-0,727)
$\tau = 75\%$	0,4489 (0,755)	-0,4489 (-0,755)	-0,6066 (-0,743)	0,6066 (0,743)	-0,5017 (-1,105)	-0,7681 (-0,670)
$\tau = 90\%$	0,6419 (0,289)	-0,6419 (-0,289)	0,5106 (0,231)	-0,5106 (-0,231)	-2,2844*** (-3,868)	0,1424 (0,159)

Note: \*\*\* statistical significance at 1% level; \*\*statistical significance at 5% level; \*statistical significance at 10% level.

### 5.5. Intentional and false gregarious behavior

Table 5 shows that the spurious herd effect is present only in the USA and Japan in the fourth quantile by estimating a regression coefficient  $\beta_3$  negative and significant with a 99% confidence interval. As for the manifestation of intentional behavior guided by non-fundamental information, it is not supported by conclusive evidence in the US and European markets, while in Japan the specific coefficient takes a single negative value in the first quantile, but with a risk threshold above 10%. Last but not least, we note that this model is strongly influenced by the adjustment brought by the QREG method which considers the flexibility of herd behavior by reducing the assumptions on the distribution of endogenous variables and the resistance to the impact of extreme values – outliers.

Table 5. Model (11) estimation

CSADF Europe					
Coefficients	$\beta_0$ (t-stat)	$\beta_1$ (t-stat)	$\beta_2$ (t-stat)	R <sup>2</sup>	R <sup>2</sup> adj.
OLS	0,0116*** (695,481)	0,0071*** (3,729)	0,1081*** (3,496)	0,0323	0,0319
$\tau = 10\%$	0,0110*** (278,588)	-0,0167* (-1,873)	0,1717 (0,577)	0,0093	0,0089
$\tau = 25\%$	0,0113*** (477,737)	-0,0102* (-1,958)	0,2047 (1,286)	0,0019	0,0015

$\tau = 50\%$	0,0116*** (740,163)	0,0007 (0,289)	0,2042*** (3,916)	0,0074	0,0070
$\tau = 75\%$	0,0119*** (628,617)	0,0183*** (5,672)	0,1149** (2,415)	0,0379	0,0375
$\tau = 90\%$	0,0122*** (492,012)	0,0373*** (9,958)	-0,0628 (-0,829)	0,0940	0,0936

#### CSADF USA

Coefficients	$\beta_0$ (t-stat)	$\beta_1$ (t-stat)	$\beta_2$ (t-stat)	R <sup>2</sup>	R <sup>2</sup> adj.
OLS	0,0111*** (592,039)	0,0059** (2,516)	0,0157 (0,411)	0,0059	0,0054
$\tau = 10\%$	0,0105*** (280,327)	-0,0377*** (-3,654)	0,0784 (0,226)	0,0595	0,0591
$\tau = 25\%$	0,0107*** (533,172)	-0,0151*** (- 4,413)	-0,0581 (-1,420)	0,0128	0,0123
$\tau = 50\%$	0,0111*** (700,762)	0,0014 (0,423)	0,1542** (2,424)	0,0026	0,0021
$\tau = 75\%$	0,0113*** (403,522)	0,0326*** (3,824)	-0,0786*** (- 0,278)	0,0435	0,0431
$\tau = 90\%$	0,0116*** (403,064)	0,0473*** (10,580)	0,0166 (0,501)	0,0907	0,0903

#### CSADF Japan

Coefficients	$\beta_0$ (t-stat)	$\beta_1$ (t-stat)	$\beta_2$ (t-stat)	R <sup>2</sup>	R <sup>2</sup> adj.
OLS	0,0111*** (1521,825)	0,0031*** (3,641)	-0,0416*** (- 2,728)	0,0028	0,0024
$\tau = 10\%$	0,0108*** (884,111)	-0,0044*** (-3,239)	0,0297** (2,552)	0,0051	0,0047
$\tau = 25\%$	0,0109*** (1464,096)	-0,0016* (-1,875)	-0,0059 (-0,665)	0,0023	0,0019
$\tau = 50\%$	0,0111*** (2293,978)	0,0006 (0,932)	-0,0185* (-1,775)	0,0002	-0,0001
$\tau = 75\%$	0,0112*** (1363,663)	0,0081*** (8,476)	-0,0931*** (-8,549)	0,0127	0,0123
$\tau = 90\%$	0,0113*** (656,869)	0,0128*** (3,596)	-0,1356 (- 1,282)	0,0238	0,0234

Note: \*\*\* statistical significance at 1% level; \*\*statistical significance at 5% level; \*statistical significance at 10% level.

Table 6 does not provide significant evidence of herding behavior due to the positive  $\beta_2$  coefficient or its statistical insignificance, a result also confirmed by a recent study, Wang and Zhang (2024), which attests to the presence of herding behavior for a period of only 5 months out of 48 analyzed between 2019-2022, more precisely in 2020, thus there is no relevant evidence at the level of the entire sample on the S&P500 index.

**Table 6. Model (12) estimation**

<b>CSADNF Europe</b>					
<b>Coefficients</b>	<b><math>\beta_0</math> (t-stat)</b>	<b><math>\beta_1</math> (t-stat)</b>	<b><math>\beta_2</math> (t-stat)</b>	<b>R<sup>2</sup></b>	<b>R<sup>2</sup> adj.</b>
<b>OLS</b>	-0,0024*** (-28,269)	0,2617*** (26,528)	0,3501** (2,202)	0,3596	0,3593
<b><math>\tau = 10\%</math></b>	-0,0046*** (-48,687)	0,1616*** (18,293)	0,2595*** (4,290)	0,1033	0,1030
<b><math>\tau = 25\%</math></b>	-0,0034*** (-58,260)	0,1346*** (17,661)	1,2222*** (9,115)	0,1264	0,1260
<b><math>\tau = 50\%</math></b>	-0,0023*** (-33,338)	0,1468*** (11,785)	1,9531*** (6,461)	0,1618	0,1615
<b><math>\tau = 75\%</math></b>	-0,0011*** (-8,613)	0,2332*** (7,668)	1,5577* (1,765)	0,2113	0,2110
<b><math>\tau = 90\%</math></b>	0,0003** (2,219)	0,3948*** (17,992)	0,0878 (0,296)	0,2691	0,2688
<b>CSADNF USA</b>					
<b>Coefficients</b>	<b><math>\beta_0</math> (t-stat)</b>	<b><math>\beta_1</math> (t-stat)</b>	<b><math>\beta_2</math> (t-stat)</b>	<b>R<sup>2</sup></b>	<b>R<sup>2</sup> adj.</b>
<b>OLS</b>	-0,0022*** (-26,322)	0,2632*** (24,348)	1,1322*** (6,455)	0,3930	0,3927
<b><math>\tau = 10\%</math></b>	-0,0044*** (-63,997)	0,1015*** (10,912)	1,6271*** (22,431)	0,0909	0,0905
<b><math>\tau = 25\%</math></b>	-0,0035*** (-60,780)	0,1251*** (13,351)	1,8046*** (12,118)	0,1141	0,1137
<b><math>\tau = 50\%</math></b>	-0,0025*** (-22,781)	0,1804*** (5,053)	2,0455 (1,325)	0,1603	0,1599
<b><math>\tau = 75\%</math></b>	-0,0010*** (-9,031)	0,2266*** (8,463)	3,5758*** (5,501)	0,2162	0,2158
<b><math>\tau = 90\%</math></b>	0,0006** (2,188)	0,4303*** (4,426)	1,5619 (0,556)	0,2868	0,2865

CSADNF Japan					
Coefficients	$\beta_0$ (t-stat)	$\beta_1$ (t-stat)	$\beta_2$ (t-stat)	R <sup>2</sup>	R <sup>2</sup> adj.
OLS	-0,0020*** (-19,012)	0,1905*** (15,716)	0,9449*** (4,274)	0,2139	0,2136
$\tau = 10\%$	-0,0061*** (-9,916)	0,2359*** (4,147)	-1,3700 (-1,196)	0,0671	0,0667
$\tau = 25\%$	-0,0032*** (-38,788)	0,1060*** (12,334)	1,0866*** (10,549)	0,0617	0,0613
$\tau = 50\%$	-0,0016*** (-18,195)	0,0965*** (7,797)	1,9969*** (9,165)	0,0751	0,0747
$\tau = 75\%$	0,0003 (1,585)	0,1494*** (3,354)	1,9828 (1,219)	0,1081	0,1077
$\tau = 90\%$	0,0028*** (12,109)	0,1222*** (3,474)	4,5221*** (6,221)	0,1495	0,1492

Note: \*\*\* statistical significance at 1% level; \*\*statistical significance at 5% level; \*statistical significance at 10% level.

## 6. Conclusions

In the above paper we investigated the emergence of herding behavior in developed stock markets of Europe, the US and Japan starting from the econometric model of Chang, Cheng and Khorana, and then forming various versions based on it according to the hypostases of the markets. Therefore, three key influencing criteria were market trends, volatility fluctuations, and investor sentiment towards the market. In addition to these, we detailed herding behavior according to the underlying information, in fact, the fundamental information that characterizes spurious behavior and the non-fundamental information that drives intentional behavior, using the multifactor model developed by Eugene Fama and Kenneth French in 1992, which was subsequently used in his study and by Galariotis et al. in 2015. The OLS method confirmed the presence of the gregarious effect in all three markets through the estimated results, but under different market circumstances. We also used the QREG method for each case for a better distribution of the dependent variable CSAD and increased robustness of the relationship between the variables, hence the explanatory power.

As its main repercussions, the herd effect gives rise to systematic risk, threatening market stability, and should be a primary responsibility for financial authorities and policy makers. By detailing the process, it increases market volatility and undermines informational efficiency, resulting in so-called informational cascades, whereby investors ignoring their own forecasts diminish the information content embedded in security prices through active portfolio management. Individual investors therefore tend to be vulnerable to specific risk because they do not diversify

their portfolio efficiently enough. As time passes, the presence of this behavioral bias shifts the share price away from its fundamental value, causing disruptions to business cycles through speculative bubbles. Among the historical financial events caused by this phenomenon we mention the dot-com speculative bubble in the 1990s - investors stormed the technology stock market and then suffered massive losses in 2000 as a result of the accelerated price increases, the global financial crisis in 2008 - participants massively sold risky assets amid pessimism, increasing panic and causing the market to fall, and the emergence of the cryptocurrency Bitcoin in 2017 - the herding effect caused its price to soar on the back of investor optimism.

In conclusion, proper regulation and assessment of the anomalies produced, through policies that limit the spread of herding behavior and maintain financial stability in the markets, by financial supervisors with expert academic support, enhance investment decisions towards the superior outcomes proliferated by classical, deeply rational financial theory. Future research can extend the present study towards the detailed relationship between idiosyncratic volatility, herding and liquidity by extending the empirical framework proposed by Lof (2023) which reveals the influence of asymmetric information between investors on the distribution of transaction volume – volume coefficient of variation.

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## MODELING THE IMPACT OF PERSONALIZED SOCIAL MEDIA ADVERTISEMENTS ON ONLINE IMPULSE BUYING INTENTION

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**Abstract:** This study aims to investigate how personalized social media advertisements influence consumers' propensity for online impulse buying, using structural equation modeling. A quantitative research design was employed, analyzing the responses of 291 social media users in Romania through the PLS-SEM technique. The findings confirm that personalized advertising has a positive effect on perceived relevance, novelty, and advertising value, which in turn strongly influence consumers' online impulse buying intentions through their attitudes toward the advertisement. This research offers both theoretical and practical contributions to the fields of online advertising and consumer behavior, advancing our understanding of the mechanisms through which personalized advertising shapes impulsive purchasing behavior in online environments.

**JEL classification:** M30, M31, M37

**Keywords:** personalized advertising, social media advertising, online impulse buying, consumer behavior, structural equation modeling

### 1. Introduction

The global social media advertising market exceeded USD 228 billion in 2024 and is projected to reach USD 256.5 billion by 2025, with forecasts indicating potential growth to as much as USD 412 billion by 2033, driven by continuous digital and mobile-based advertising expansion (The Business Research Company, 2025; Verified Market Reports, 2025). Personalized, data-driven campaigns increasingly fuel this growth, as consumers tend to respond more positively to advertisements that are relevant and tailored to their individual preferences (The Business Research Company, 2025). This strong growth highlights the increasing importance of personalized, data-driven advertising strategies in effectively engaging consumers.

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According to Epsilon Marketing (2018), 80% of consumers are more likely to purchase from brands that offer personalized experiences, based on a survey of 1,000 U.S. adults conducted through an online questionnaire. Similarly, McKinsey's global analysis highlights the business value of personalization, showing that effective personalization can reduce customer acquisition costs by up to 50%, increase revenues by 5–15%, and improve marketing ROI by 10–30%, drawing on multiple case studies from various industries (McKinsey, 2021). Accenture's international survey, involving thousands of consumers across the U.S. and Europe, found that 91% prefer brands that recognize and treat them personally. However, the study also revealed a gap between consumer expectations and the reality of personalization efforts (Accenture, 2018). Deloitte's Global Marketing Trends 2022 report, based on responses from 11,500 consumers and 1,099 executives across 19 countries, emphasizes that while consumers view personalized messages as helpful, they also consider excessive data collection and geo-targeting intrusive, highlighting the need for both technological precision and ethical responsibility in personalization strategies (Deloitte Insights, 2022). The effectiveness of personalization is closely tied to the variety of social media advertising formats, which enable the creative delivery of targeted messages.

Social media advertising includes strategies like display ads, sponsored content, influencer marketing, and video ads, each tailored to platform-specific features to boost engagement (Hamouda, 2018; Nizam et al., 2024). Display ads appear as banners or feed posts to track impressions and clicks, while sponsored content blends with user posts for a more organic feel. Influencer marketing leverages trusted social media figures to promote products, enhancing credibility and reach (Aydin et al., 2021; Chen et al., 2023; Hani et al., 2024). These methods highlight a dynamic digital landscape where businesses use diverse content formats to connect with consumers (He et al., 2023; Lee et al., 2018). Personalized advertising, a subset of social media advertising, is defined as the practice of tailoring content to individual users based on their behaviors, preferences, and demographic profiles (Carah et al., 2023). This approach utilizes algorithms to analyze user data and craft messages that resonate with their specific interests, thereby enhancing user engagement and conversion potential (Efendioğlu & Durmaz, 2022; Novianti & Erdiana, 2020).

Beyond its benefits, personalized advertising raises significant ethical and legal concerns regarding consumer privacy and data protection, as the extensive data collection required to personalize ads can lead to legal implications under regulations such as the EU's General Data Protection Regulation (GDPR, 2016/679, came into effect in 2018) and California Consumer Privacy Act (CCPA, 2018) impose strict rules on how user data can be collected, processed, and used for targeted advertising. Research indicates that a lack of transparency and misuse of personal data can result in consumer distrust and ad avoidance (Parfeniuk, 2024). Ethical challenges include the risk of manipulation, discrimination through algorithmic targeting, and "creepy" advertising experiences when users perceive ads as overly intrusive or predictive (Herder & Zhang, 2019). As a result, advertisers are under increasing pressure to balance personalization with user autonomy, emphasizing consent-based targeting and transparent data practices to maintain trust and legal compliance.

Recent research extensively examines how personalized social media ads influence consumers: Aslam et al. (2021) linked personalized ads' relevance and novelty to heightened impulse-buying intentions; Setyani et al. (2019) identified perceived

novelty and relevance as mediators between ad personalization and impulse purchases; Li et al. (2023) found affective and cognitive responses to ad value boost impulse purchases; Syaputra & Azhar (2025) demonstrated that personalized ads deepen emotional attachment and engagement; and Nyrhinen et al. (2024) confirmed social media ads increase impulse-buying behavior; De Keyzer et al. (2024) found that perceived personalization boosts brand engagement but also induces creepiness, leading to ad avoidance; Aguirre et al. (2015) confirmed the personalization-privacy paradox, showing that covert data use heightens privacy worries and reduces click intentions unless moderated by trust; Christian et al. (2021) further linked high personalization to adverse affective reactions and psychological reactance.

Previous research has examined various factors linking personalized social media advertising to online impulse buying. Still, few studies have simultaneously addressed both positive (e.g., relevance, advertising value) and negative (e.g., privacy concerns, creepiness) effects within one model (Aslam et al., 2021; Christian et al., 2021; Doodoo & Wu, 2019). While Christian et al. (2021) explored similar constructs, their study focused solely on Indonesian millennials, leaving a gap regarding how these dynamics manifest in Eastern European contexts, where empirical research remains scarce. To address this theoretical gap, our study adopts the Stimulus-Organism-Response (S-O-R) paradigm to conceptualize how personalized social media ads (stimulus) influence cognitive and emotional evaluations (organism) and, ultimately, online impulse buying tendencies (response).

A quantitative research design was employed, utilizing a self-administered online questionnaire distributed via Facebook and Instagram, which yielded 291 valid responses from Romanian social media users. The proposed model and hypotheses were tested through Partial Least Squares Structural Equation Modeling (PLS-SEM), a method well-suited for analyzing complex relationships between latent constructs and providing robust insights into consumer behavior in digital environments.

The paper is structured to provide a clear and logical flow from theory to empirical analysis. First, the literature review outlines the theoretical foundations of advertising, with a particular focus on personalized social media advertising and online impulse buying and introduces the S-O-R framework as the basis for the conceptual model and hypotheses. This is followed by the methodology and data analysis section, which presents the research design, sampling approach, and the results of the PLS-SEM analysis. The paper concludes with a discussion of the theoretical and managerial implications, highlights the study's limitations, and offers suggestions for future research directions.

## **2. Literature Review**

This chapter provides an overview of the key theoretical foundations and research areas relevant to this study, focusing on advertising, the Stimulus-Organism-Response (S-O-R) model, personalized advertising on social media, and online impulse buying. It introduces the essential concepts, theoretical frameworks, and empirical findings that form the basis of the research, highlighting the links between advertising personalization and impulsive consumer behavior.

## **2.1. Theoretical background of advertising**

Advertising is a key element of marketing communication, designed to influence consumer perceptions, attitudes, and purchase intentions. Defined as a paid, non-personal form of communication (Kotler & Keller, 2016), it operates at the intersection of psychology, economics, and communication theory, using both rational and emotional appeals (Belch & Belch, 2021). Foundational models such as AIDA (Attention, Interest, Desire, Action) and the Hierarchy of Effects (Lavidge & Steiner, 1961) describe advertising as a stepwise process that moves consumers from awareness to purchase. Persuasion theories like the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986) suggest that messages are processed through central routes (logical evaluation) or peripheral routes (visuals or endorsements), depending on consumer involvement.

Behavioral frameworks, particularly the Stimulus-Organism-Response (S-O-R) model, highlight how advertising stimuli trigger internal emotional or cognitive reactions that shape behavior (Mehrabian & Russell, 1974). Modern interpretations emphasize emotional engagement, storytelling (Edson Escalas, 2004), and personalization as critical factors for effectiveness (Chandra et al., 2022). In the digital era, data-driven and interactive formats, such as social media and programmatic ads, have transformed advertising dynamics, making consumer engagement more personalized and measurable (De Keyser et al., 2024).

## **2.2. Importance of Stimulus-Organism-Response (S-O-R) model**

The Stimulus-Organism-Response (S-O-R) model, developed by Mehrabian and Russell, (1974), describes how external stimuli (S) influence internal psychological processes (O), which in turn lead to behavioral responses (R). Bagozzi (1986) refined the framework by defining stimuli as external factors such as marketing mix elements or environmental cues, while the organism represents internal states, perceptions, emotions, and thoughts that mediate the stimulus–response relationship. In advertising, stimuli refer to marketing communications or brand messages that evoke cognitive and emotional reactions, ultimately influencing responses such as purchase intention or brand loyalty (Donovan & Rossiter, 1982).

Studies have highlighted that advertising effectiveness depends mainly on the ability of stimuli (e.g., ad design, personalization, interactivity) to elicit favorable organismic states like trust, positive affect, and perceived value (Eroglu et al., 2001; Lee & Jeong, 2014).

This framework is relevant to the current study, as it has been successfully applied in research on online consumer behavior. For example, Parboteeah et al. (2009) explored how website design influences impulse buying. Wang et al. (2011) examined how online store features affect consumer responses. More recently, Wang et al. (2022) studied how perceived risk drives avoidance of targeted advertising.

## **2.3. Personalized Advertising on Social Media**

Personalized advertising in social media has fundamentally changed how brands interact with consumers (Xu et al., 2011). By analyzing user data, such as interests, preferences, and past behavior, marketers can create tailored content that feels more relevant and engaging (Chandra et al., 2022). These customized messages are more likely to prompt desired reactions, including purchase intent (Pavlou & Stewart, 2000).

Studies have repeatedly shown that personalization can improve advertising effectiveness by increasing user involvement (Kaspar et al., 2019; Pavlou & Stewart, 2000; Tucker, 2014; Yuan & Tsao, 2003). At the same time, researchers have noted potential drawbacks. When consumers perceive that their personal data is being used without adequate transparency, it may lead to discomfort or resistance (Kim et al., 2022; Li & Huang, 2016; Maslowska et al., 2016; Sheehan & Gleason, 2001).

This form of advertising relies on the collection of user data from multiple sources, including web searches, social media activity, and user interactions such as likes, shares, and posts (Snapchat, 2023). Platforms like Meta go further, collecting information on device use, location, transactions, and even messages, as outlined in their data policies (Curran et al., 2011; Meta, 2022; Xiphcyber, 2022).

Advances in data science have made this process even more precise. Technologies like machine learning and natural language processing allow platforms to analyze conversations and emotional reactions, helping brands fine-tune their targeting strategies (ElBermawy, 2022; Gu et al., 2018; Lee et al., 2017). These tools also support real-time responses to user behavior, increasing the likelihood of impulse purchases (Setyani et al., 2019).

Ultimately, personalized social media ads play a significant role in shaping consumer perceptions and intentions (Alalwan, 2018; Sriram. et al., 2021). However, their influence depends not only on the ad content but also on individual differences among users and the specifics of each campaign. The impact is shaped by a complex interplay of marketing strategy, brand identity, and user psychology (Mehta & Udita, 2020).

#### **2.4. Consumers' Online Impulse Buying**

Consumers' online impulse buying has become an increasingly common behavior in digital commerce, reflecting a key aspect of modern consumer behavior. This type of purchase is characterized by unplanned, spontaneous decisions made in online environments and influenced by various psychological and contextual factors (Zhang et al., 2014). These decisions are typically made quickly and are often driven by emotions, without careful evaluation of the product's necessity or the consequences of the purchase (Parboteeah et al., 2009; Verhagen & van Dolen, 2011). Emotional drivers tend to outweigh rational thought, resulting in a largely automatic action–reaction process (Törőcsik, 2016).

Although still limited in number, several empirical studies have shown that personalization can significantly influence online impulse buying (Aslam et al., 2021; Christian et al., 2021; Dadoo & Wu, 2019). These studies suggest that personalized content in social media advertisements can trigger emotional responses that facilitate impulsive purchasing.

A broader review of the literature reveals a multi-layered connection between personalized advertising and impulse buying, as illustrated in Table 1. Personalization has consistently been shown to enhance perceived ad relevance (Kim & Huh, 2017), novelty, and advertising value (Kim & Han, 2014), which in turn increases consumers' willingness to make impulsive purchases (Lina & Ahluwalia, 2021). However, the effect is not one-dimensional. Factors such as perceived intrusiveness and privacy concerns also play a significant role (Segijn et al., 2021; Zhu & Chang, 2016), shaping consumer responses in nuanced ways (Segal & Podoshen, 2013; Tifferet & Herstein,

2012). Interestingly, while personalization tends to boost impulse buying, its influence may be moderated by users' privacy concerns or negative emotional reactions, potentially reducing its overall impact (Table 1). Taken together, prior research points to a fundamental tension in the effects of personalized social media advertising. While personalization is frequently framed as a tool that facilitates decision-making and enhances advertising effectiveness, several studies indicate that the same mechanism can heighten consumers' awareness of being targeted or monitored, triggering discomfort and resistance (Aguirre et al., 2015; Herder & Zhang, 2019; Ur et al., 2012).

This contradiction suggests that personalization operates as an ambivalent stimulus rather than a uniformly persuasive one, with its impact depending on consumers' perceptions of intent, transparency, and control (Morimoto, 2021; Youn & Kim, 2019). Recent work further supports this view by showing that personalization can simultaneously enhance relevance while undermining consumer well-being through creepiness-related responses (De Keyzer et al., 2024).

**Table 1:** Summary of relevant studies regarding social media personalized advertising

<b>Authors</b>	<b>Theory</b>	<b>Methodology</b>	<b>Independent variables</b>	<b>Dependent variables</b>
Khokhar, A., Qureshi, P., Murtaza, F., & Kazi, A.G. (2019)	Social influence theory	Survey with 196 respondents from Pakistan.	Social Network Marketing Electronic Word-of-Mouth Hedonic Motivation Trust	Impulse Buying Behavior
Setyani, V., Zhu, Y.Q., Hidayanto, A.N., Sandhyaduhita, P.I., & Hsiao, B. (2019)	S.O.R., Uses and Gratifications Theory, Hedonic and utilitarian consumption theory	Survey with 862 respondents from Indonesia.	Personalization of advertisements Perceived advertising value constructs (Informativeness, Credibility, Creativity, Entertainment) Click-through motivations (Utilitarian click-through motivation, Hedonic click-through motivation)	Urge to Buy Impulsively
Dodoo, N.A. & Wu, L. (2019)	-	Survey with 249 undergraduate students from USA.	Perceived personalization of social media ads Perceived relevance Perceived novelty Perceived advertising value Privacy concern	Online impulse buying tendency
Aslam, H., Rashid, M., & Chaudhary, N. (2021)	-	Survey with 250 respondents from Pakistan.	Perceived Personalized Advertisement Perceived Novelty Perceived Relevance Online Payment Facility Privacy Concerns	Online Impulse Buying Behavior

Authors	Theory	Methodology	Independent variables	Dependent variables
Christian, J., Karissa, F., Handoyo, B., & Antonio, F. (2021)	Theory of interpersonal behavior	Survey with millennial social media users from Indonesia.	Perceived Novelty Privacy Concern Advertising Value Perceived Relevance Creepiness Affective Reactance Attitudes Toward Ads Purchase Frequency	Online Impulse Buying Tendency

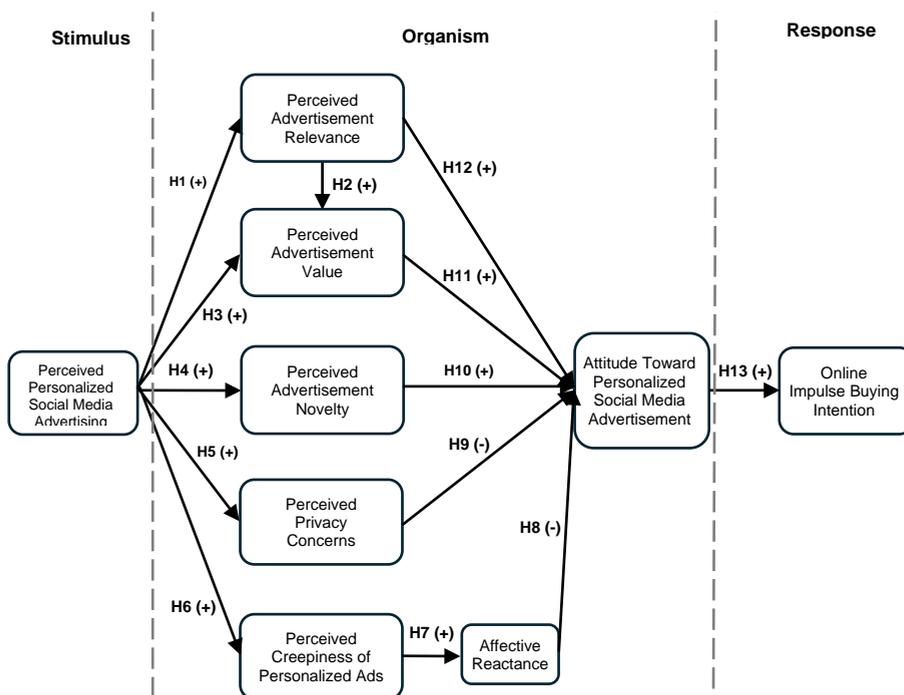
Source: Author's own compilation

### 3. Conceptual framework and Hypotheses development

This chapter presents the variables identified through the literature review, as well as the relationships to be examined among them. Based on prior research findings, a set of hypotheses is developed and integrated into a conceptual model grounded in the S-O-R framework.

The proposed model outlines the key constructs and their hypothesized connections, as illustrated in Figure 1. In this model, personalized advertising serves as the stimulus (S), while the organism (O) includes perceived novelty, relevance, ad value, privacy concerns, creepiness, affective response, and attitude toward the ad. The response (R) is defined as the consumer's online impulse buying intention.

Figure 1: Conceptual framework



Source: Author's own compilation

### **3.1. The Influence of Personalized Social Media Advertising on Key Constructs**

When consumers encounter advertisements, their perception of how closely the content aligns with their needs and values plays a critical role in shaping their attitudes (Tran, 2017). Perceived relevance refers to the mental process by which individuals assess the meaning of an ad concerning their personal goals (Celsi & Olson, 1988; Xia & Bechwati, 2008). Ads perceived as highly relevant tend to attract more attention, elicit more favorable attitudes, and increase purchase intention for the promoted products or services (Jung, 2017; Nasir et al., 2021). Dodoo and Wu (2019) found that perceived personalization in social media advertising significantly enhances relevance, which in turn predicts online impulse buying. Similarly, De Keyser et al. (2015) showed that ad personalization improves consumer responses to Facebook ads by increasing relevance. Aslam et al. (2021) also reported that when an advertisement reflects aspects of a consumer's self-concept, the likelihood of engagement rises, linking relevance to higher online impulse buying behavior. Based on these findings, the following hypotheses are proposed:

H1: Perceived personalized social media advertising positively influences perceived advertisement relevance.

H2: Perceived advertisement relevance positively influences perceived advertisement value.

Ad value is a multidimensional concept reflecting how consumers perceive, interpret, and evaluate advertisements based on their informativeness, entertainment value, and potential to irritate (Ducoffe, 1995). This evaluation is shaped by how well the ad content meets or exceeds consumer expectations (Ducoffe & Curlo, 2000). Lina and Ahluwalia (2021) found that personalized advertising enhances ad value, which can lead to increased impulse buying, especially among users who are highly engaged with social media. Similarly, Aydin (2018), using Ducoffe's ad value model, confirmed that personalization significantly influences ad value, which in turn shapes attitudes toward social media ads. Furthermore, Van-Tien Dao et al. (2014) argue that informative content, entertainment, and interactivity strongly enhance the perceived value of advertisements, which in turn positively influences users' attitudes and purchase intentions. The following hypothesis is therefore proposed:

H3: Perceived personalized social media advertising positively influences perceived advertisement value.

Perceived novelty refers to how original, unique, or unexpected an advertisement appears to consumers (Mercanti-Guérin, 2008; Sheinin et al., 2011). It involves introducing fresh elements that deviate from typical advertising patterns. Ads that are both novel and relevant tend to generate more favorable consumer responses (Ang et al., 2014). Christian et al. (2021) found that perceived personalization positively influences novelty, which in turn enhances attitudes toward the ad and increases impulse buying intention. Therefore, the following hypothesis is proposed:

H4: Perceived personalized social media advertising positively influences perceived advertisement novelty.

In the context of personalized advertising, privacy concerns refer to consumers' discomfort or anxiety about the potential misuse or unauthorized access to their personal data (Girona & Korgaonkar, 2018; Mican et al., 2022). While personalization can increase purchase intention by offering relevant content, high levels of privacy concern may diminish these benefits (Smit et al., 2014). Tucker (2014) found that higher perceived control over personal data nearly doubled the likelihood of users clicking on personalized ads. Jung et al. (2016) also found that privacy concerns significantly reduce both attitudes and behavioral intentions toward Facebook ads, especially when perceived intrusiveness is high. Furthermore, according to Morimoto (2021), higher levels of privacy concerns negatively affect the acceptance of personalized advertisements. The sense of information control reduces these concerns, while persuasion knowledge strengthens consumers' critical perspective toward ads. Hence:

H5: Perceived personalized social media advertising positively influences perceived privacy concerns.

Highly personalized social media ads, especially those based on behavioral data, can evoke a sense of being watched or tracked, leading to what users often describe as a "creepy" feeling (Nyheim et al., 2015; Ur et al., 2012). In response, consumers may experience negative emotions such as irritation, anger, or discomfort, resulting in resistance to the ad, lower evaluations, and reduced purchase intent (Fachryto & Achyar, 2018). Groot (2022) explored the personalization paradox and found that while personalization may enhance brand perception through relevance, this effect weakens when the ad is perceived as intrusive. Herder and Zhang (2019) also noted that unexpected data use, vague justifications, or repetitive targeting can trigger anxiety and mistrust, reinforcing feelings of creepiness and emotional resistance. In addition, Youn and Kim (2019) state that the intrusiveness of advertisements, concerns about personal data, and the adverse emotional effects of ads all contribute to an increase in psychological reactance, which directly influences ad avoidance behavior. Therefore:

H6: Perceived personalized social media advertising positively influences perceived creepiness of personalized ads.

H7: Perceived creepiness of personalized social media advertising positively influences affective reactance.

### **3.2. The Impact of Key Constructs on Attitude Toward the Advertisement**

Previous studies (Aslam et al., 2021; De Keyzer et al., 2015; Dodoo & Wu, 2019; Xu, 2006) indicate that perceived relevance, novelty, ad value, and privacy concerns strongly influence the formation of consumer attitudes toward advertisements. Aydin (2018) and Lina and Ahluwalia (2021) highlighted that ad value is a crucial determinant of positive ad evaluations, while Jung et al. (2016) and Tucker (2014) confirmed that privacy concerns can reduce favorable assessments. Additionally, Groot (2022) and Fachryto and Achyar (2018) observed that negative affective responses, stemming from feelings of creepiness, may lower ad acceptance. These findings lead to the following hypotheses:

H8: Affective reactance negatively influences attitude toward personalized social media advertisement.

H9: Perceived privacy concerns negatively influence attitude toward personalized social media advertisement.

H10: Perceived advertisement novelty positively influences attitude toward personalized social media advertisement.

H11: Perceived advertisement value positively influences attitude toward personalized social media advertisement.

H12: Perceived advertisement relevance positively influences attitude toward personalized social media advertisement.

### ***3.3. The Effect of Attitude Toward the Advertisement on Online Impulse Buying***

Attitude toward the advertisement refers to the audience's behavioral and emotional response to a given ad (Birmingham, 1969). Kotler (2000) describes attitude as a learned predisposition that reflects a person's evaluation, emotional connection, and behavioral tendency toward an object or idea. In advertising contexts, this translates into consumers' favorable or unfavorable reactions to a specific ad (MacKenzie & Lutz, 1989; Wells et al., 2011). Additionally, Koay et al. (2021) highlighted that interactivity, entertainment, and relevant content have a significant positive impact on consumers' tendency toward impulse buying. According to Mehta (2000), attitude toward an ad is a key indicator of advertising effectiveness, as it reflects the consumer's cognitive and emotional responses, which in turn shape their evaluation of the ad. Aslam et al. (2021) confirmed that attitudes toward personalized ads, particularly those shaped by relevance and novelty, significantly influence purchase intentions and predict the likelihood of online impulse buying. Therefore:

H13: Attitude toward personalized social media advertisement positively influences online impulse buying intention.

## **4. Research methodology and Data collection**

This study follows a quantitative, descriptive research design. Data were collected via a self-administered online questionnaire created in Microsoft Forms, available in both Hungarian and Romanian. The survey was distributed primarily through Facebook and Instagram, where participants were also encouraged to share the questionnaire with others, following a snowball sampling method. This approach proved effective in reaching individuals outside the initial sampling frame who could still provide relevant insights. Data collection took place over ten days, between April 3 and April 12, 2024.

Facebook and Instagram were chosen intentionally, as they are among the most widely used social platforms in Romania: 88.7% of internet users aged 16–64 use Facebook, while 64.8% use Instagram (Statista Research Department, 2025). Although WhatsApp and Messenger are even more popular, their messaging-based nature makes them less suitable for wide-scale survey distribution. Therefore, Facebook and Instagram were deemed the most effective channels.

The questionnaire began with an instructional introduction aimed at ensuring participants had a clear understanding of personalized advertising. To this end, respondents were asked to watch a two-minute educational video illustrating three forms of ad personalization, based on prior search history, location targeting, and interest-based categorization, on social media platforms. Following the video, screening

questions were included to ensure only relevant participants were retained. First, a yes/no question asked whether the respondent had viewed the video; those who answered “no” were excluded. Second, another yes/no item assessed whether the respondent had ever encountered personalized ads on social media; again, “no” responses led to exclusion. Additionally, only individuals aged 18 or older were eligible to complete the survey.

The questionnaire included established 7-point Likert scales adapted from prior studies to measure the constructs of interest (see Table 2). Perceived personalization of ads (Tran, 2017; Xu et al., 2011) was treated as the independent variable. Mediator constructs included perceived novelty (Mercanti-Guérin, 2008; Sheinin et al., 2011), relevance (Alalwan, 2018; Nasir et al., 2021), ad value (Ducoffe, 1995; Van-Tien Dao et al., 2014), privacy concerns (Gironda & Korgaonkar, 2018; Morimoto, 2021), creepiness (De Keyzer et al., 2024), affective response (Nyheim et al., 2015; Youn & Kim, 2019), and attitude toward the ad (Xu, 2006). The dependent variable, online impulse buying intention, was measured using scales from Koay et al. (2021) and Wells et al. (2011). Demographic variables, including gender, age, place of residence, income level, and educational attainment, were also recorded to provide further insight into the sample composition.

**Table 2:** Measurement model constructs

<b>PA</b>	<b>Perceived Personalized Social Media Advertising</b> (Tran, 2017; Xu et al., 2011) Personalized ads on social media...
PA1	provide shopping recommendations that match my needs.
PA2	allow me to order products I'm genuinely interested in.
PA3	are tailored to my specific situation.
PA4	are customized to my preferences.
PA5	offer recommendations aligned with my interests.
PA6	provide promotional information adjusted to my preferences.
<b>PN</b>	<b>Perceived Advertisement Novelty</b> (Mercanti-Guérin, 2008; Sheinin et al., 2011) Personalized ads on social media...
PN1	are original.
PN2	are visually interesting.
PN3	grab my attention.
PN4	are imaginative.
PN5*	are different from usual.
<b>PR</b>	<b>Perceived Advertisement Relevance</b> (Alalwan, 2018; Nasir et al., 2021) Personalized ads on social media...
PR1	appeal to me.
PR2	are a good fit for me.
PR3	match my lifestyle.
<b>AV</b>	<b>Perceived Advertisement Value</b> (Ducoffe, 1995; Van-Tien Dao et al., 2014) Personalized ads on social media...
AV1	are valuable to me.
AV2	are useful to me.
AV3	are effective.

<b>PC</b>	<b>Perceived Privacy Concerns</b> ( <i>Gironda &amp; Korgaonkar, 2018; Morimoto, 2021</i> ) I am concerned that personalized ads on social media...
PC1	collect too much information about me.
PC2	do not store my data securely.
PC3*	may misuse my personal information.
PC4	pose a serious risk to my privacy through data access.
<b>CR</b>	<b>Perceived Creepiness of Personalized Ads</b> ( <i>De Keyzer et al., 2024</i> ) Personalized ads on social media...
CR1	are disturbing.
CR2*	are frightening.
CR3	are irritating.
CR4	are strange.
<b>AR</b>	<b>Affective Reactance</b> ( <i>Nyheim et al., 2015; Youn &amp; Kim, 2019</i> ) I... personalized ads on social media
AR1	ignore them.
AR2*	pay no attention to them.
AR3	would prefer if they didn't exist.
<b>ATA</b>	<b>Attitude Toward Personalized Social Media Advertisement</b> ( <i>Xu, 2006</i> ) Personalized ads on social media...
ATA1	seem like a good idea to me.
ATA2*	I consider their use to be a good idea.
ATA3	are believable.
ATA4	are interesting.
<b>OIB</b>	<b>Online Impulse Buying Intention</b> ( <i>Koay et al., 2021; Wells et al., 2011</i> ) As a result of personalized ads on social media...
OIB1	I feel the urge to buy products/services outside of my original intentions.
OIB2*	I want to buy items unrelated to my initial shopping goals.
OIB3	I feel inclined to buy products/services not connected to my planned purchases.

\* were removed from the final model

Source: Author's own compilation

Given the number of variables and relationships involved, this study applies a complex model that requires a multivariate analysis approach, where multiple variables may simultaneously influence others (Hair et al., 2016). To test the conceptual model, structural equation modeling (SEM) was employed, as this technique is well-suited for analyzing models with a large number of indicators and latent constructs (Magno et al., 2022). Specifically, the study used Partial Least Squares Structural Equation Modeling (PLS-SEM), a method capable of providing reliable results even with smaller sample sizes or non-normally distributed data. PLS-SEM is particularly appropriate for estimating complex, hierarchical theoretical models (Hair et al., 2016).

## 5. Data analysis

This chapter presents the analysis of the data collected through the questionnaire. After data cleaning, a total of 291 valid responses were retained for analysis. The section begins with a description of the sample characteristics, followed by

the testing of hypothesized relationships using structural equation modeling. To examine the proposed model, PLS-SEM was applied using SmartPLS version 4.1.0.2, which is suitable for analyzing complex variable relationships. Descriptive statistics of the sample were generated using IBM SPSS version 22.

### 5.1. Sample characteristics

An analysis of the demographic profile reveals that the majority of respondents (63.9%) completed the survey in Hungarian, while 36.1% responded in Romanian. Participants were drawn from 27 counties across Romania, with the highest representation from Mureş (25.8%), Cluj (20.6%), Covasna (11%), Harghita (10.3%), and Braşov (6.5%) counties.

Regarding gender, the sample was predominantly female (75.6%), with male respondents accounting for 24.4%. In terms of age, the largest group consisted of individuals aged 18–25, making up more than half the sample (52.2%), while other age groups were represented to a much smaller extent. As for educational background, the largest segment held a high school diploma (37.1%), followed by those with a bachelor's degree (34.7%). Respondents with a master's degree accounted for 15.1%, while 13.1% reported having completed vocational or technical school. In terms of income, most participants fell into the lower-middle income categories. Specifically, 17.2% reported a monthly income between 2,001 and 3,000 RON, while 22.7% fell in the 3,001–4,000 RON range. The lowest income group (under 1,000 RON) represented 9.6% of the sample, whereas the highest income group (above 8,000 RON) accounted for 5.2% (see Table 3).

**Table 3:** Demographic characteristics of the sample

Demographic variable		Frequency	Percentage (%)
Survey language	Hungarian	186	63.9
	Romanian	105	36.1
Place of residence	Mureş	75	25.8
	Cluj	60	20.6
	Covasna	32	11
	Harghita	30	10.3
	Braşov	19	6.5
	Bucharest – Ilfov	16	5.5
	Bihor	15	5.2
	Other	44	15.1
Gender	Male	71	24.4
	Female	220	75.6
Age group	18–25	152	52.2
	26–35	55	18.9
	36–45	38	13.1
	46–55	36	12.4
	56–65	10	3.4
Education level	High School	108	37.1
	Vocational School	38	13.1
	Bachelor's Degree	101	34.7
	Master's Degree	44	15.1
Income level	Below 1000 RON	28	9.6

Demographic variable	Frequency	Percentage (%)
1000 – 2000 RON	53	18.2
2001 – 3000 RON	50	17.2
3001 – 4000 RON	66	22.7
4001 – 5000 RON	37	12.7
5001 – 6000 RON	23	7.9
6001 – 7000 RON	12	4.1
7001 – 8000 RON	7	2.4
Above 8000 RON	15	5.2

Source: Author's own compilation

## 5.2. Structural Equation Modeling

### 5.2.1. Measurement model assessment

The evaluation of the measurement model was conducted in several steps. First, we examined potential collinearity among the measurement indicators (see Table 4, 5). Next, we assessed internal consistency using Cronbach's alpha and composite reliability (rho\_A) values (see Table 6) (Hair et al., 2016). Discriminant validity was then tested using the Heterotrait–Monotrait (HTMT) ratio, which captures the degree of similarity between latent constructs (Henseler et al., 2015) (see Table 7). Finally, we included model fit indices in the overall assessment.

The path coefficients of the structural model, which describe relationships between latent constructs, were estimated through a series of regression equations. As point estimates and standard errors can be distorted by high intercorrelations among predictor indicators (Sarstedt & Mooi, 2019), we also tested for multicollinearity. VIF (Variance Inflation Factor) values above 5 indicate problematic collinearity (Becker et al., 2014). Our analysis showed that PC2, PC3, AR1, AR2, ATA1, ATA2, OIB2, and OIB3 had VIF values exceeding this threshold and were therefore they need to be corrected.

**Table 4:** Collinearity diagnostics of indicators

Variable	Indicator	VIF	Result
Perceived Personalized Social Media Advertising	PA1	2.607	none
	PA2	2.341	none
	PA3	4.102	moderate
	PA4	4.809	moderate
	PA5	2.697	none
	PA6	2.755	none
Perceived Advertisement Novelty	PN1	1.962	none
	PN2	2.859	none
	PN3	3.198	moderate
	PN4	2.453	none
	PN5	1.391	none
Perceived Advertisement Relevance	PR1	2.539	none
	PR2	3.791	moderate
	PR3	2.595	none

Variable	Indicator	VIF	Result
Perceived Advertisement Value	AV1	2.572	none
	AV2	4.505	moderate
	AV3	3.638	none
Perceived Privacy Concerns	PC1	3.478	moderate
	PC2	6.206	strong
	PC3	7.456	strong
	PC4	3.673	moderate
Perceived Creepiness of Personalized Ads	CR1	3.312	moderate
	CR2	1.714	none
	CR3	3.670	moderate
	CR4	2.461	none
Affective reactance	AR1	6.178	strong
	AR2	6.221	strong
	AR3	2.145	none
Attitude Toward Personalized Social Media Advertisement	ATA1	5.341	strong
	ATA2	6.364	strong
	ATA3	3.301	moderate
	ATA4	3.402	moderate
Online Impulse Buying Intention	OIB1	3.025	moderate
	OIB2	5.564	strong
	OIB3	5.446	strong

Source: Author's own compilation

To eliminate multicollinearity, indicators with high VIF values were removed from the model, as addressing such issues can enhance the accuracy of estimated correlations between latent variables (Grewal et al., 2004). We removed the indicators one by one, starting with those showing the highest VIF values. It was not necessary to eliminate all eight indicators; removing PC3, AR2, ATA2 and OIB2 was sufficient to resolve the multicollinearity issue (see Table 5).

**Table 5:** Results after removing indicators with high collinearity

Variable	Indicator	VIF	Result
Perceived Privacy Concerns	PC1	3.285	moderate
	PC2	4.367	moderate
	PC4	2.816	none
Affective Reactance	AR1	2.034	none
	AR3	2.034	none
Attitude Toward Personalized Social Media Advertisement	ATA1	2.550	none
	ATA3	3.135	moderate
	ATA4	3.244	moderate
Online Impulse Buying Intention	OIB1	2.702	none
	OIB3	2.702	none

Source: Author's own compilation

All variables and their indicators included in the analysis exhibit high factor loadings (see Table 6), generally exceeding 0.8. This indicates that the indicators effectively represent their associated latent constructs and significantly contribute to

their definition. The indicators CR2 and PN5 were excluded from the model due to factor loadings below the acceptable threshold of 0.7, specifically, 0.696 and 0.674, respectively.

The values for Cronbach's alpha, composite reliability ( $\rho_A$ ), and average variance extracted (AVE) are also high across all constructs. Both Cronbach's alpha and  $\rho_A$  mostly exceed 0.8, indicating excellent internal consistency (Henseler et al., 2015). The high composite reliability values further reinforce that the constructs are reliably measured using the corresponding indicators. Moreover, all AVE values surpass the 0.5 threshold, and in fact, exceed 0.7 in all cases, demonstrating strong convergent validity, as the indicators explain a substantial portion of the variance in each construct (Tabachnick & Fidell, 2007).

These results collectively indicate that the measurement model is robust and provides a solid foundation for further structural analysis and interpretation.

**Table 6:** Assessment of internal and external reliability

Variable	Indicator	Factor loadings	Cronbach's Alpha	Composite reliability ( $\rho_A$ )	Average variance extracted (AVE)	Result
Perceived	PA1	0.844	0.931	0.935	0.744	reliable
Personalized	PA2	0.828				reliable
Social Media	PA3	0.891				reliable
Advertising	PA4	0.915				reliable
	PA5	0.840				reliable
	PA6	0.854				reliable
Perceived	PN1	0.742	0.883	0.886	0.740	reliable
Advertisement	PN2	0.873				reliable
Novelty	PN3	0.881				reliable
	PN4	0.825				reliable
Perceived	PR1	0.896	0.893	0.895	0.823	reliable
Advertisement	PR2	0.940				reliable
Relevance	PR3	0.885				reliable
Perceived	PR1	0.893	0.913	0.916	0.852	reliable
Advertisement	PR2	0.950				reliable
Value	PR3	0.926				reliable
Perceived	PC1	0.901	0.914	0.938	0.852	reliable
Privacy Concerns	PC2	0.944				reliable
	PC4	0.924				reliable
Perceived	CR1	0.911	0.884	0.921	0.811	reliable
Creepiness of	CR3	0.694				reliable
Personalized Ads	CR4	0.923				reliable
Affective	AR1	0.908				0.832
reactance	AR3	0.941	reliable			
Attitude Toward	ATA1	0.899	0.904	0.905	0.839	
Personalized	ATA3	0.920				reliable
Social Media	ATA4	0.928				reliable
Advertisement						
Online Impulse	OIB1	0.960	0.885	0.925	0.895	reliable
Buying Intention	OIB3	0.933				reliable

Source: Author's own compilation

The HTMT ratios represent one of the modern and reliable indicators of discriminant validity, reflecting the correlations between the different variables. Generally, values below 0.90 suggest that the constructs are adequately distinct from one another (Henseler et al., 2015). Overall, the variables demonstrate satisfactory discriminant validity, as the HTMT values fall below the 0.90 threshold. This indicates that the constructs are well differentiated and accurately capture the phenomena they are intended to represent within the model.

**Table 7:** Heterotrait-Monotrait (HTMT) ratios of the variables

	Perceived Privacy Concerns	Affective Reactance	Perceived Advertisement Relevance	Perceived Advertisement Novelty	Perceived Creepiness of Personalized Ads	Online Impulse Buying Intention	Perceived Advertisement Value	Attitude Toward Personalized Social Media Advertisement
Affective Reactance	0.461							
Perceived Advertisement Relevance	0.096	0.467						
Perceived Advertisement Novelty	0.049	0.406	0.779					
Perceived Creepiness of Personalized Ads	0.629	0.832	0.399	0.351				
Online Impulse Buying Intention	0.136	0.422	0.471	0.442	0.276			
Perceived Advertisement Value	0.181	0.604	0.816	0.710	0.464	0.507		
Attitude Toward Personalized Social Media Advertisement	0.254	0.560	0.749	0.647	0.492	0.533	0.801	
Perceived Personalized Social Media Advertising	0.060	0.275	0.756	0.644	0.197	0.298	0.612	0.563

Source: Author's own compilation

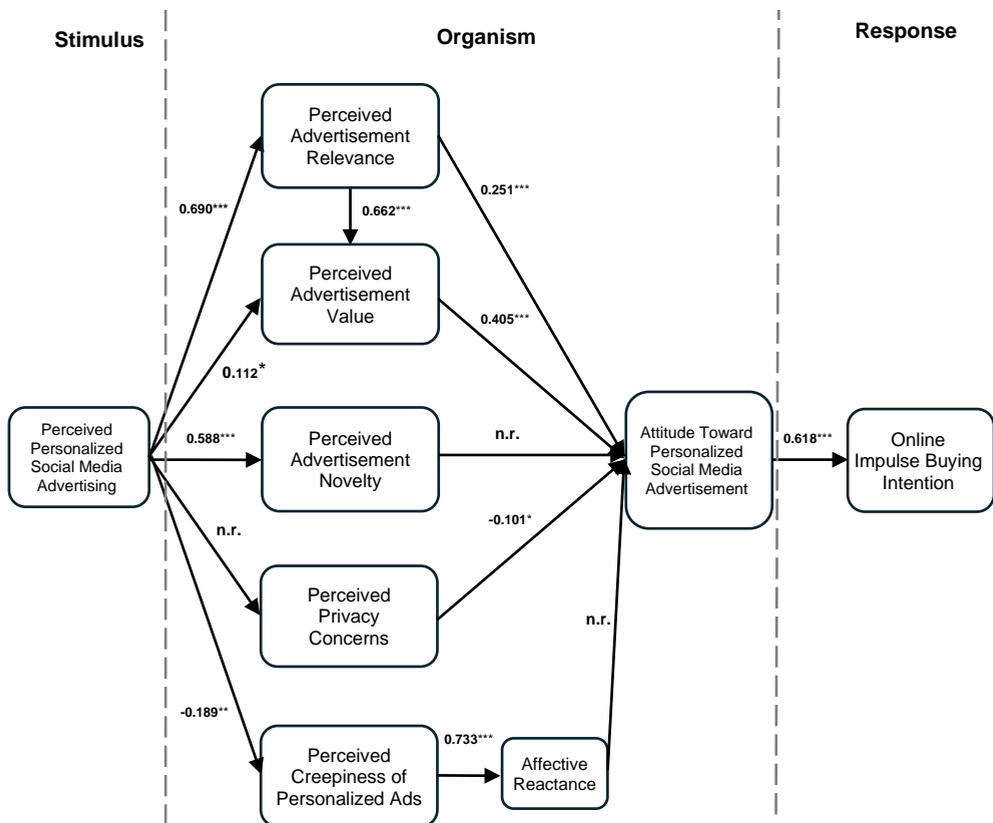
To assess the goodness-of-fit of the structural equation model, the SRMR (Standardized Root Mean Square Residual) and NFI (Normed Fit Index) indices were used. SRMR represents the square root of the difference between the observed and predicted covariance matrices. SRMR values range between 0 and 1, with values below 0.05 indicating a good fit (Byrne, 1998; Diamantopoulos & Siguaw, 2000), though values up to 0.08 are considered acceptable (Hu & Bentler, 1999). The NFI takes model complexity into account by comparing the chi-square value of the proposed model to that of the null model, which assumes that all observed variables are uncorrelated. NFI values also range from 0 to 1, with Bentler and Bonett (1980) recommending a threshold of 0.90 for good model fit.

In the present study, the SRMR was 0.051, meeting the accepted threshold. However, the NFI value was 0.826, which falls slightly short of the recommended cut-off. Based on these indicators, the model demonstrates moderate fit.

### 5.2.2. Hypothesis testing

To examine the direction and strength of the hypothesized relationships, standardized beta coefficients were used. These values range between  $-1$  and  $1$ , where coefficients between  $0.1$  and  $0.3$  indicate weak relationships,  $0.3$  to  $0.5$  indicate moderate relationships, and values above  $0.5$  suggest strong relationships. To assess statistical significance, both t-values and p-values were considered. A relationship is deemed significant if the absolute value of the t-statistic exceeds  $1.96$ , based on a  $95\%$  confidence interval. For p-values, three levels of significance were used:  $p < 0.001$ ,  $p < 0.01$ , and  $p < 0.05$  (Figure 2) (Kline, 2016).

**Figure 2:** Diagram of the relationships between constructs



n.r. – no relationship

Source: Author's own compilation

The results indicate (see Table 8) that Perceived Personalized Social Media Advertising has a significant, positive, and strong effect on Perceived Advertisement Relevance ( $\beta = 0.690$ ;  $t = 20.368$ ;  $p < 0.001$ ), thus supporting H1. Perceived Advertisement Relevance also has a significant, positive, and strong effect on Perceived Advertisement Value ( $\beta = 0.662$ ;  $t = 12.885$ ;  $p < 0.001$ ), confirming H2. The impact of Perceived Personalized Social Media Advertising on Perceived Advertisement Value is significant, positive, but weak ( $\beta = 0.112$ ;  $t = 2.073$ ;  $p = 0.038$ ), supporting H3, and its impact on Perceived Advertisement Novelty is significant, positive, and strong ( $\beta = 0.588$ ;  $t = 14.178$ ;  $p < 0.001$ ), confirming H4. However, Perceived Personalized Social Media Advertising shows no significant effect on Perceived Privacy Concerns ( $t = 0.333$ ;  $p = 0.739$ ), leading to the rejection of H5, while its impact on Perceived Creepiness of Personalized Ads is significant, negative, but weak ( $\beta = -0.189$ ;  $t = 2.729$ ;  $p = 0.006$ ). Despite the significance, H6 is rejected because the relationship is negative, contrary to the hypothesized positive direction.

Perceived Creepiness of Personalized Ads has a significant, positive, and strong effect on Affective Reactance ( $\beta = 0.733$ ;  $t = 24.863$ ;  $p < 0.001$ ), confirming H7. The impact of Affective Reactance on Attitude Toward Personalized Social Media Advertisement is not significant ( $t = 1.731$ ;  $p = 0.084$ ), resulting in the rejection of H8. In contrast, Perceived Privacy Concerns have a significant, negative, but weak impact on Attitude Toward Personalized Social Media Advertisement ( $\beta = -0.101$ ;  $t = 2.390$ ;  $p = 0.017$ ), supporting H9. Perceived Advertisement Novelty does not significantly influence Attitude Toward Personalized Social Media Advertisement ( $t = 1.631$ ;  $p = 0.103$ ), leading to the rejection of H10.

On the other hand, both Perceived Advertisement Value ( $\beta = 0.405$ ;  $t = 5.247$ ;  $p < 0.001$ ) and Perceived Advertisement Relevance ( $\beta = 0.251$ ;  $t = 3.241$ ;  $p = 0.001$ ) have significant, positive effects on Attitude Toward Personalized Social Media Advertisement, confirming H11 and H12. Finally, Attitude Toward Personalized Social Media Advertisement has a significant, positive, and strong effect on Online Impulse Buying Intention ( $\beta = 0.618$ ;  $t = 7.030$ ;  $p < 0.001$ ), supporting H13.

**Table 8:** Summary of hypothesis testing results

Hypothesis	$\beta$	Standard Deviation	t-value	p-value	Result
H1 PA $\rightarrow$ PR	0.690	0.034	20.368	0.000***	supported
H2 PR $\rightarrow$ AV	0.662	0.051	12.885	0.000***	supported
H3 PA $\rightarrow$ AV	0.112	0.054	2.073	0.038*	supported
H4 PA $\rightarrow$ PN	0.588	0.041	14.178	0.000***	supported
H5 PA $\rightarrow$ PC	- 0.024	0.073	0.333	0.739	not supported
H6 PA $\rightarrow$ CR	- 0.189	0.069	2.729	0.006**	not supported
H7 CR $\rightarrow$ AR	0.733	0.029	24.863	0.000***	supported
H8 AR $\rightarrow$ ATA (-)	- 0.095	0.055	1.731	0.084	not supported
H9 PC $\rightarrow$ ATA (-)	- 0.101	0.042	2.390	0.017*	supported
H10 PN $\rightarrow$ ATA	0.110	0.068	1.631	0.103	not supported
H11 AV $\rightarrow$ ATA	0.405	0.077	5.247	0.000***	supported
H12 PR $\rightarrow$ ATA	0.251	0.078	3.241	0.001***	supported
H13 ATA $\rightarrow$ OIB	0.618	0.088	7.030	0.000***	supported

\*\*\*  $p < 0,001$ ; \*\*  $p < 0,01$ ; \*  $p < 0,05$ ; (-) hypothesized negative relationship

Source: Author's own compilation

## 6. Discussion and conclusions

With the growing popularity of personalized advertisements on social media, it is crucial to understand how these ads affect users and how they relate to purchasing intentions. This study aimed to explore the psychological mechanisms and underlying structures that shape users' responses to personalized advertisements by developing a conceptual model and testing it using structural equation modeling (SEM).

The results indicate that personalized advertising, by deviating from ordinary or typical patterns, significantly influences perceived novelty, in line with the findings of Ang et al. (2014). However, contrary to Christian et al. (2021), no significant relationship was found between perceived novelty and attitude toward the advertisement. Furthermore, consistent with the conclusion of Doodoo and Wu (2019), advertisements have a strong impact on perceived relevance by aligning with users' needs and values. This relevance influences perceived advertising value and predicts attitudes toward the ad, as also highlighted by Aslam et al. (2021) and De Keyzer et al. (2015). In addition, advertising value, defined as the user's evaluation of the ad, was found to be positively associated with advertising attitude, supporting Aydin's (2018) findings. Although Tucker (2014) reported that personalized advertising positively affects privacy concerns, no significant relationship between these two variables was found in the present sample. However, similar to the conclusion of Jung et al. (2016), the intrusive nature of ads and fear of data misuse had a negative impact on advertising attitude. Although a positive relationship between personalized ads and the feeling of creepiness was expected, consistent with Groot (2022), this hypothesis was not confirmed. In this sample, the relationship turned out to be negative, though still statistically significant. One possible explanation is that the personalized ads they encountered were mostly based on their previous searches, thus they were perceived as less creepy, as the content aligned with products they had consciously looked for. By contrast, the positive association between creepiness and affective response, as demonstrated by Herder and Zhang (2019), was confirmed in this study. However, no significant link was found between affective response and attitude toward the advertisement. The study's key hypothesis, that personalized social media ads influence online impulse buying tendencies through advertising attitude, was supported, consistent with the findings of Aslam et al. (2021) and Christian et al. (2021).

The findings of this study may hold significant implications for companies advertising on social media, as well as for professionals managing these campaigns. As users spend increasing amounts of time on these platforms, businesses understandably invest substantial resources to reach and convert them. However, it is crucial to understand what strategies truly work and how immediate purchases can be effectively encouraged. The results highlight the importance of delivering advertisements that meet or exceed user expectations. In this study, perceived ad value had the strongest impact on advertising attitudes, suggesting that ads offering accurate and personally relevant information, both about the user and the product, can enhance both perceived value and user attitudes. Moreover, this research contributes to the underdeveloped literature on personalized social media marketing and online impulse buying, offering insights into consumer behavior through the lens of psychological mechanisms.

Several limitations should be noted. First, the lack of consistent literature required reliance on sources outside the context of social media or digital personalization.

Second, the data were collected through cross-sectional, self-reported surveys using snowball sampling, thus not capturing actual purchasing behavior. Future research could address this with longitudinal designs and real transaction data to better establish causal links between personalization and impulse buying. The sample was also skewed toward women and younger users; future studies may improve generalizability through stratified or quota sampling. Finally, the unexpected negative link between personalization and perceived creepiness suggests the value of categorizing ad types (e.g., based on previous searches, geolocation, or interests) to obtain a more nuanced understanding of user responses.

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## ACCOUNTING CONSERVATISM AND CORPORATE PERFORMANCE DURING THE COVID-19 PANDEMIC

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**Abstract:** This paper examines the extent to which Algerian companies practised accounting conservatism during the COVID-19 pandemic and whether this practice impacted their performance. The study included 323 observations across 65 non-financial Algerian companies from 2018 to 2022. Accounting conservatism was measured by negative (non-operating) accounting accruals, and corporate performance was measured by the return on equity. The COVID-19 pandemic period was introduced as an interactive dummy variable. The results showed increased levels of accounting conservatism during the pandemic, which negatively affected corporate performance. Additionally, leverage had a negative impact on performance during the same period, while company size had a positive effect on financial performance. Therefore, the study recommends adopting flexible accounting policies that allow adaptation to economic changes without significant impacts on performance.

**JEL Classification:** G01, I15, L31, M41

**Keywords:** Accounting conservatism, Corporate performance, COVID-19 pandemic, Non-operating accruals, Return on equity, Algerian companies.

### 1. Introduction

The spread of the Coronavirus has widely impacted companies and all related matters. The most important is the process of preparing and certifying financial statements, as it has become necessary to provide useful information under the conditions of uncertainty that accompany this crisis regarding the future of companies.

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The situation of uncertainty during times of crisis makes investors more risk-averse and more dependent on fundamental information because they consider other information confusing and conflicting (Lang, 2011). Therefore, accounting information and related disclosures are more useful to the market and investors (Cui et al., 2021).

The closures due to the pandemic caused huge economic losses, leading to a collapse of stock markets and a decline in GDP, which created high uncertainty about the effects of the pandemic on companies that suffer from significant declines in sales and increasing layoffs to reduce expenses and avoid bankruptcy. The COVID-19 pandemic has had significant impacts on stock markets, leading companies to face a liquidity crisis and increasing default risks (Al-Qudah, 2022). This reality has prompted companies to adopt more conservative accounting policies when preparing their financial statements to avoid excessive expectations and ensure that assets and liabilities reflect their true values (Berendsen, 2011).

Accounting conservatism represents a cautious reaction to the uncertainties and risks inherent in business situations that must be taken into account in order to exercise pertinent judgements (Givoly & Hyan, 2000). For example, when the company faces uncertainty regarding gains, managers should delay their recognition. Conversely, when the company experiences uncertainty regarding losses, managers are required to record them immediately (Nurzi & Yuanita, 2016). Also, conservatism includes the selection of specific accounting methods that result in a reduction in the value of net assets (Berendsen, 2011).

Managers have an important role in selecting accounting policies and therefore have a significant impact on accounting conservatism (Hung, 2021). Given the differences in accounting practices and policies among companies and the need for managers to faithfully present the financial statements of their companies, they tend to select and apply conservative accounting policies in situations of doubt and uncertainty when facing multiple methods of measurement. It is worth noting that the adoption of a conservative view can fundamentally affect the financial statements of the company (Al-Fasfus et al., 2022).

Although it has been criticised and opposed by many researchers and practitioners due to its negative impact on the quality of financial reporting, accounting conservatism still plays an important role in enhancing the reliability of financial reporting, especially in times of crises, which is positively reflected in investors and market confidence (Abed & Khudair, 2022). During periods of recession, investors become more risk-averse, rely more on fundamental information, and view other information as worrying and speculative, with increased market risk and uncertainty. For that, more conservative financial statements have become increasingly important (Al-Qudah et al., 2022).

Within these challenges, accounting conservatism, as a principle and the cornerstone of accounting practice, became a tool for providing a faithful representation of companies' performance. This can be achieved by constraining excessive optimism when recognising income (gains) and expenses (losses). Accounting conservatism seeks to reduce risks, increase investor confidence, and comply with legal and regulatory requirements, in addition to improving future financial planning. In general, accounting conservatism enhances the reliability of financial reports and ensures the sustainability of financial performance.

Financial performance represents an assessment of the variation in the company's financial position during the period to determine whether the assets are

effectively used to generate profits (Rudi, Kurniasih & Tubagus, 2020). Since financial statements are the main source of data necessary to assess corporate performance and make many decisions, the accuracy of the decisions depends primarily on the accuracy and integrity of the financial information, which is the final product for selecting and applying accounting policies.

This study explores the effect of accounting conservatism on corporate performance during the COVID-19 period. The study included 323 observations for 65 Algerian companies during the period 2018-2022, where accounting conservatism was measured by non-operating (negative) accruals, and financial performance was measured by the return on equity ratio. The COVID-19 pandemic was expressed as a dummy variable. The results indicate that Algerian companies practised a certain level of accounting conservatism during the COVID-19 period, which negatively affected their financial performance. The results suggest excessive caution by Algerian companies during the COVID-19 period as a means to maintain capital and adapt to the crisis, in addition to mitigating the negative influence of the crisis.

This study not only examines the direct relationship between accounting conservatism and corporate performance but also explores that relationship during the COVID-19 pandemic and introduces the pandemic period as an intermediate variable. This approach provides an accurate understanding of how severe crisis circumstances affect fundamental accounting practices. Although the empirical study included a sample of Algerian companies, the results offer important insights for other emerging markets facing similar economic conditions, contributing to the international literature on financial reporting in times of crisis. Thus, the study fills a research gap related to the interactive impact of global crises on accounting practices and disclosure.

The remainder of this paper was divided into the following sections: first, we provide an overview of the literature about accounting conservatism and corporate performance; then we present the study's methodology; and then we present and discuss the results.

## **2. Literature review**

The American Financial Accounting Standards Board defines conservatism as the use of less optimistic estimates when assessing amounts that will be received or paid in the future (Zhang, 2008). It is a rational response to ensure that uncertainties and potential risks inherent in business activities are taken into account (Ruch & Taylor, 2015). The International Accounting Standards Board (IASB) also addressed conservatism as a component of the qualitative characteristics of accounting information (Nguyen et al., 2022). The IASB emphasises the necessity of adopting a degree of caution when making the required judgements and estimates under conditions of doubt and uncertainty (Wang, 2009). Conservatism is a guarantee to avoid the overvaluation of assets and income or the undervaluation of liabilities and expenses (Leune, 2014), which can help managers achieve neutrality in selecting accounting policies and thus the reliability of financial reports (Kimouche, 2021).

The literature distinguishes two forms of accounting conservatism: conditional and unconditional. Conditional conservatism represents a subsequent conservatism and relies on economic news (Beaver & Ryan, 2005). It refers to the adoption of different

levels of verification regarding the recognition of revenues and expenses in response to the occurrence of economic news (Watts, 2003). In other words, conditional conservatism expresses the idea that bad news is timely recorded in earnings, while the recognition of good news should be delayed (Basu, 1997). On the other hand, unconditional conservatism, which is called prior conservatism or news-independent conservatism, requires the recognition of losses before the appearance of economic news (Beaver & Ryan, 2005).

The demand for accounting conservatism can be attributed to several factors. First, contractual motivations are among the known explanations for accounting conservatism, which is considered an essential tool for concluding contracts. Debtors try to prevent excessive dividends to maintain net asset value and protect their loans. Gains need more stringent verification standards than losses, which results in the deferral of their recognition. This reduces the possibility of inflating assets and earnings and limits the risk of violating contracts or reducing the value of the company (Shaalan, 2019). According to Balakrishnan et al. (2016), companies with more conservative financial statements have more opportunities to obtain loans and perform debt contracts with better terms.

Second, accounting conservatism can be used as a means of tax evasion by reducing the amount of tax paid, which leads to a reduced tax burden incurred and improves the company's reputation (Zarai & Abderrahim, 2009). Third, the exaggeration in reporting earnings and net assets can lead to litigation risks, so accounting conservatism is a means to mitigate litigation costs (Watts, 2003). Finally, regulatory motivation is also among the determinants of the demand for accounting conservatism, which relates to the structure of the profession and how accounting standards are developed (Leune, 2014). Companies can adopt certain levels of accounting conservatism as a response to new legislation or regulations.

Performance refers to a set of measures, indicators, or standards used to assess the efficiency and effectiveness of company operations and their exposure to risks, which summarise the ability of the company to allocate available resources and generate earnings (Oluwagbade, 2023). It is also considered a tool for measuring the evolution of the financial position of a company by analysing financial ratios for specific periods in the face of changing environmental conditions (Ananda, 2023; Azizah, 2023).

Corporate performance is influenced by several factors that can be categorised into external and internal. External factors encompass some variables and constraints outside the company, which can be classified into economic, social and cultural, political and legal, and technological factors. Economic factors affect financial performance through surrounding economic conditions, whether positive or negative, such as increased demand or price deterioration. Social and cultural factors consist of the intellectual and moral values within society, which can provide useful information or pose challenges to performance improvement.

Companies are also influenced by political and legal factors through international relations and state foreign policies, which can enhance performance. Technological factors include advancements that help to reduce costs and increase revenues (Melhem, 2019). On the other hand, internal factors are those under the control of companies, including company size, activity level, company age, liquidity ratio, financial leverage, industry, governance system, internal control, etc. (Abdulrahman & Al-Shuraimi, 2020).

The impact of accounting conservatism on corporate performance during crisis periods is a complex and multidimensional topic. Conservatism plays a pivotal role in mitigating information asymmetry and building trust between stakeholders and management, as well as enhancing transparency and credibility, which helps companies navigate economic downturns with minimal damage. However, conservatism can also be employed to manipulate earnings in ways that may be illegitimate or misleading, highlighting the need for strong and effective governance to ensure its proper use.

Previous studies have shown mixed results on this topic; the study by Al-Fasfus et al. (2022) indicated that the effect of accounting conservatism on financial performance is insignificant. This aligns with the study by Bouzid & Benlamoudi (2023), who revealed no relationship between accounting conservatism and corporate performance, attributing this result to the environmental differences and specificities of Algerian companies since the majority of them are family- or state-owned and focus more on social objectives. This contradicts the studies by Al-Bawab (2023) and Fariz et al. (2020), which found a positive impact of accounting conservatism on corporate performance.

The study by Al-Qudah et al. (2022) showed a significant positive effect of the COVID-19 pandemic on accounting conservatism in Jordanian banks. This is attributed to the higher level of uncertainty within the banking system, accompanied by rising inflation rates and political issues in neighbouring countries, such as Syria and Iraq. This aligns with the study by Yassir et al. (2023), which found a positive impact of accounting conservatism on corporate performance during the pre-pandemic period; this impact was increased during the pandemic, indicating a market need for conservative accounting policies.

The study by Cui et al. (2021) examined the relationship between the financial reporting characteristics of companies and stock returns during the COVID-19 pandemic and found that Chinese companies listed on the Shanghai Stock Exchange that applied more conservative accounting policies experienced smaller declines in stock returns during the market collapse caused by the pandemic. Moreover, the positive relationship between conditional conservatism and stock returns during the pandemic was only evident when companies faced greater uncertainty.

In conclusion, the literature review highlights a wide range of results concerning the relationship between accounting conservatism and corporate performance in different situations. This fact can be attributed to the differences between studies regarding methodological procedures, especially variable measurements and control variables used. Overall, previous studies did not employ the COVID-19 pandemic as a mediating variable between accounting conservatism and corporate performance. Therefore, we formulated the following hypothesis:

**Hypothesis:** There is an effect of accounting conservatism on financial performance during the COVID-19 pandemic in Algerian companies.

### 3. Methodology

This section presents the method and materials, including the sample, model specification, and measurement of variables.

#### 3.1. Sample selection

The study population consists of non-financial Algerian companies, which belong to five different sectors: services, food industries, energy, public works and construction, and pharmaceutical and semi-pharmaceutical industries. A random sample of 65 companies was selected due to the availability of the financial data required to conduct the study. The study included a period extending from 2018 to 2022, for a total of 323 observations. The financial data was collected from the online portal of the National Centre for Commercial Register (CNRC) [<https://sidjilcom.cnrc.dz/en/web/sidjilcom/>].

#### 3.2. Model specification

To clearly describe the problem of the study, we formulated a model that takes the form of a multiple linear regression. The model measures the effect of the independent variable, which is accounting conservatism, on the dependent variable, which is corporate performance. The study model can be expressed by the following equation:

$$Perf_{it} = \alpha_0 + \alpha_1 Cons NA_{it} + \alpha_2 Lev_{it} + \alpha_3 Size_{it} + \alpha_4 Covid_t + \alpha_5 (Covid * Cons NA)_{it} + \alpha_6 (Covid * Lev)_{it} + \alpha_7 (Covid * Size)_{it} + \varepsilon_{it}$$

Where:

**Perf<sub>it</sub>**: is the company's performance;

**Cons NA<sub>it</sub>**: is the level of accounting conservatism;

**Lev<sub>it</sub>**: is the level of financial leverage;

**Size<sub>it</sub>**: is the company size;

**Covid<sub>t</sub>**: is the Coronavirus pandemic period;

**(Covid\*Cons NA)<sub>it</sub>**: is an interactive variable between the Coronavirus pandemic and accounting conservatism;

**(Covid\*Lev)<sub>it</sub>**: is an interactive variable between the Coronavirus pandemic and the level of financial leverage;

**(Covid\*Size)<sub>it</sub>**: is an interactive variable between the Coronavirus pandemic and company size;

**α<sub>0</sub>**: is a constant;

**α<sub>1</sub> α<sub>2</sub> α<sub>3</sub> α<sub>4</sub> α<sub>5</sub> α<sub>6</sub> α<sub>7</sub>**: are the regression coefficients of the model;

**ε<sub>it</sub>**: is the error term.

#### 3.3. Variables' measurement

Most previous studies have used four measures for accounting conservatism. The first is the model by Basu (1997), which was excluded because it relies on the efficient financial market hypothesis, which does not correspond with emerging markets like Algeria, and it focuses only on conditional conservatism. The second is the book-to-market value model, which was also excluded due to the unavailability

of market data in Algeria and the significant influence of economic fluctuations on the companies' market values. The third is the model of "hidden reserves", which is characterised by many practical difficulties in estimating the hidden reserves, so it was excluded. Consequently, the study used the negative (non-operating) accruals model to express accounting conservatism. According to Givoly & Hayn (2000), under conservative practices, the recognition of gains is postponed and the recognition of losses is accelerated, so repeating this process period after period results in negative non-operating accruals. To measure conservatism according to this proxy, we used the following equation:

$$\text{Cons NA} = \text{TACC} - \text{OPACC}$$

Where:

**Cons NA:** is the non-operating accruals calculated as the difference between total accounting accruals (TACC) and operating accruals (OPACC).

**TACC:** is the total accounting accruals, which are calculated as follows:

TACC = net income + depreciation – cash flows from operations.

**OPACC:** is the operating accruals calculated as follows:

OPACC = change in inventories + change in debtors + change in other current assets – change in creditors – change in other current liabilities.

The items of the equation are divided by the total assets to avoid dispersion when estimating the model.

The performance of companies is expressed through an accounting-based measure, which is the return on equity ratio. The company size was measured by the logarithm of total assets, while the financial leverage was measured by dividing total debts by total liabilities. Finally, the Coronavirus pandemic period was measured as a dummy variable, taking the value 1 during the COVID-19 period (2019, 2020, and 2021), otherwise 0.

## 4. Data analysis and results

### 4.1. Descriptive statistics

To clarify the characteristics of the data used to estimate the study model, some descriptive statistics for 323 observations are shown in Table 1. These statistics provide an overview of the data distribution and help better understand the characteristics of the variables.

The results indicate that non-operating accruals reached -5.11% of total assets on average, indicating the existence of conservatism practices in Algerian companies. The standard deviation reached 0.1861 and suggested a medium dispersion, where non-operating accruals varied from 0.4413 as the maximum value to -3.1655 as the minimum value. For corporate performance as measured by the return on equity ratio, it reached 6.67% on average, indicating that the studied companies achieved a positive return for shareholders, with a standard deviation of 0.1671, suggesting a high dispersion when taking into account the maximum value (0.7914) and the minimum value (-0.9464).

The financial leverage ratio indicates that total debts represented 58.79% of total liabilities during the period on average, with a standard deviation of 0.2375, which suggests a medium dispersion when considering the upper and lower values that reached 0.9847 and 0.0112, respectively. The company size, as the logarithm of total assets, reached 9.6945 with a medium dispersion, where the standard deviation reached 1.1940 and the range was confined between 6.7984 and 13.225. Finally, the Jarque-Bera statistic was significant at the 1% level for all variables, except for the company size, which was insignificant. Therefore, excluding the company size, all variables are not normally distributed.

**Table 1:** Descriptive statistics results

	PERF	Cons NA	LEV	SIZE	COVID	(COVID* Cons NA)	(COVID* LEV)	(COVID* SIZE)
<b>Mean</b>	0.0667	-0.0511	0.5879	9.6945	-	-0.0338	0.3495	5.7973
<b>Median</b>	0.0596	-0.0339	0.6111	9.7318	-	-0.0068	0.3202	8.5534
<b>Maximum</b>	0.7914	0.4413	0.9847	13.225	1	0.1088	0.9818	13.225
<b>Minimum</b>	-0.9464	-3.1655	0.0112	6.7984	0	-3.1655	0.0000	0.0000
<b>Std. Dev.</b>	0.1671	0.1861	0.2375	1.1940	0.4912	0.1797	0.3415	4.8550
<b>Jarque-Bera</b>	852.090	796647	14.171	0.9662	54.170	11015	33.279	46.703
<b>Probability</b>	0.0000	0.0000	0.0008	0.6169	0.0000	0.0000	0.0000	0.0000
<b>Observations</b>	323	323	323	323	323	323	323	323

Source: Based on Eviews 13

#### 4.2. Correlation analysis

Table 2 shows the correlation matrix between the study variables during the period 2018-2022 to test the relationship between the variables. Table 2 shows negative and weak correlations of financial performance with accounting conservatism and financial leverage during the whole period of study, which are significant at the 1% level. However, the correlation of financial performance with company size is insignificant.

When taking into account only the COVID-19 period, the correlation between financial performance and accounting conservatism became insignificant. The correlation between financial performance and financial leverage has known little change regarding its value, which increased from 0.217 to 0.254 with a negative value in both cases. However, the correlation between financial performance and company size became significant at the 1% level and negative, but it was weak. Furthermore, the results show a significant correlation between financial performance and the COVID-19 period, which is negative and medium. These results provide indications of the influence of accounting conservatism on financial performance, which was affected by the COVID-19 pandemic.

**Table 2:** Correlation matrix

Correlation Probability	PERF	Cons NA	LEV	SIZE	COVID	(COVID* Cons NA)	(COVID *LEV)	(COVID* SIZE)
<b>Cons NA</b>	-0.183 0.001	1.000 -----						
<b>LEV</b>	-0.217 0.0001	0.177 0.001	1.000 -----					
<b>SIZE</b>	0.007 0.902	0.023 0.683	-0.341 0.000	1.000 -----				
<b>COVID</b>	-0.161 0.004	0.031 0.584	-0.032 0.562	0.002 0.972	1.000 -----			
<b>(COVID*Cons NA)</b>	0.004 0.949	0.450 0.000	0.094 0.090	-0.026 0.641	-0.720 0.000	1.000 -----		
<b>(COVID*LEV)</b>	-0.254 0.0000	0.083 0.135	0.339 0.000	-0.126 0.024	0.879 0.000	-0.589 0.000	1.000 -----	
<b>(COVID*SIZE)</b>	-0.136 0.014	0.025 0.651	-0.156 0.005	0.373 0.000	0.879 0.000	-0.648 0.000	0.695 0.000	1.000 -----

Source: Based on Eviews 13

#### 4.3. Stationary test

Before using the cross-sectional time series to estimate the study model, we need to ensure that the data used is stationary. Non-stationary cross-sectional time series (that contain unit roots) indicate a constant trend or fluctuations over time, which may affect the model results and imply resorting to dynamic models. To test the unit root, we used Levin, Lin & Chu t as shown in Table 3.

**Table 3:** Stationary study

Method		Individual intercept	Individual intercept and trend	None
<b>PERF</b>	<b>Statistic</b>	-26.1026	-31.7632	-7.35100
	<b>Prob.</b>	0.0000	0.0000	0.0000
<b>Cons NA</b>	<b>Statistic</b>	-378.215	-144.480	-121.628
	<b>Prob.</b>	0.0000	0.0000	0.0000
<b>LEV</b>	<b>Statistic</b>	-40.7741	-67.4942	-1.83228
	<b>Prob.</b>	0.0000	0.0000	0.0335
<b>SIZE</b>	<b>Statistic</b>	-33.8722	-272.344	2.75834
	<b>Prob.</b>	0.0000	0.0000	0.9971
<b>COVID</b>	<b>Statistic</b>	-9.14043	12.2638	-0.03293
	<b>Prob.</b>	0.0000	0.0000	0.4869
<b>(COVID*Cons NA)</b>	<b>Statistic</b>	-8.34256	-6.53822	0.55747
	<b>Prob.</b>	0.0000	0.0000	0.7114
<b>(COVID *LEV)</b>	<b>Statistic</b>	-9.29921	-12.1617	-0.81900
	<b>Prob.</b>	0.0000	0.0000	0.2064
<b>(COVID*SIZE)</b>	<b>Statistic</b>	-8.99953	-12.4238	0.07806
	<b>Prob.</b>	0.0000	0.0000	0.5311

Source: Based on Eviews 13

It is clear from Table 3 that all variables are stationary at level I (0) since the test is significant at the 1% level, except for financial leverage without individual intercept and trend, which is significant at the 5% level, in addition to the company size and the variables that interacted with the COVID-19 period, which are insignificant. Overall, these results indicate that all variables are stationary at level I(0) and do not contain unit roots.

#### 4.4. Model estimation results

To estimate the study model, the three main approaches of panel data were employed, including the Pooled Regression Model, the Fixed Effects Model, and the Random Effects Model. Then, a comparison between the three models was made, and the appropriate model was chosen and analysed.

According to the Likelihood Ratio test summarised in Table 4, it appears that the significance level of the test is less than 1%, so the null hypothesis must be rejected and the alternative hypothesis must be accepted, which means that the Fixed Effects Model is more valid when compared to the Pooled Regression Model.

**Table 4:** The Likelihood Ratio test

Effects Test	Statistic	d.f	Prob.
<b>Cross-section F</b>	9.835749	(64,251)	0.0000

Source: Based on Eviews 13

After validating the Fixed Effects Model, it is necessary to compare it with the Random Effects Model through the Hausman test. The results summarised in Table 5 indicate that the Fixed Effects Model is also more valid when compared with the Random Effects Model, as the Hausman test is significant at the 1% level.

**Table 5:** The Hausman test

Test Summary	Chi-Sq Statistic	Chi. Sq. d.f	Prob.
<b>Cross-section random</b>	24.842210	7	0.0008

Source: Based on Eviews 13

The results in Table 6 confirm the results of validity tests in Tables 4 and 5, since the model is significant at the 1% level only in the case of the Fixed Effects Model, and the adjusted determination coefficient of the Fixed Effects Model is very high when compared to those of the Pooled Regression Model and Random Effects Model, which are negative. According to the Fixed Effects Model, the independent variables explain 66.30% of the variations in the financial performance of the studied Algerian companies. The Durbin-Watson statistic reached 2.10 and was very close to the value 2, which means that the model's residuals are not autocorrelated.

The results of the Fixed Effects Model indicate that during the whole period of study, only company size affects financial performance, where its parameter is significant at the 1% level, suggesting a positive impact of company size on corporate performance. However, the parameters of other independent variables were insignificant during the whole period of the study. Contrarily, during the COVID-19 period, all independent variables were significant at the 1% level (COVID-19 and company size) or at the 5% level (accounting conservatism and financial leverage). The results show the negative effects of accounting conservatism, COVID-19, and financial leverage on financial performance. However, the effect of company size remains positive.

Companies exaggerated with caution during the COVID-19 period, leading to a reduction in disclosed earnings and maintaining capital, and thus, a decrease in financial performance, in addition to the decrease due to the recession caused by the crisis. This situation constrains the necessary investments for growth and limits the ability of companies to adapt to the crisis. This, in turn, sent negative signals to the market about the stability of companies, which led to a decline in investor confidence and difficulty in obtaining the necessary financing. As a result, companies' ability to ensure business continuity has decreased. Starting from the previous results, we can accept the hypothesis of the study, and therefore, accounting conservatism affected financial performance during the COVID-19 pandemic in Algerian companies.

**Table 6:** Model estimation results using the methods of panel data

Variables		Pooled Regression Model	Fixed Effects Model	Random Effects Model
Constant	Coefficient t-Statistic	0.415012 (0.886875)	-3.961076 (-5.710429)*	0.415012 (0.868813)
Cons NA	Coefficient t-Statistic	0.195184 (0.309475)	0.112252 (1.321631)	0.195184 (0.303172)
LEV	Coefficient t-Statistic	0.002001 (0.021458)	0.025058 (1.632801)	0.002001 (0.021021)
SIZE	Coefficient t-Statistic	-0.028787 (-0.626848)	0.418125 (5.823666)*	-0.028787 (-0.614082)
COVID	Coefficient t-Statistic	-0.445345 (-0.757328)	-0.204640 (-4.868788)*	-0.445345 (-0.741904)
(COVID*Cons NA)	Coefficient t-Statistic	-0.340710 (-0.517159)	-0.173301 (-1.729851)**	-0.340710 (-0.506626)
COVID*LEV	Coefficient t-Statistic	-0.005870 (-0.062855)	-0.026508 (-1.729172)**	-0.005870 (-0.061575)
COVID*SIZE	Coefficient t-Statistic	0.032838 (0.560015)	0.014466 (-5.710429)*	0.032838 (0.548610)
R <sup>2</sup>		0.012084	0.737324	0.012084
Adj. R <sup>2</sup>		-0.009870	0.663022	-0.009870
Durbin-Watson		2.088489	2.102721	2.088489
F-Statistic		0.550411	9.923252	0.550411
Prob.		0.795777	0.000000	0.795777
observations		323	323	323

\* significant at 1%

\*\* significant at 5%

Source: Based on Eviews 13

## 5. Conclusion

The results of this study suggested that Algerian companies practised a certain level of accounting conservatism during the COVID-19 period, which negatively affected the level of financial performance. The results indicated an excessive caution by Algerian companies during the COVID-19 period, which led to reducing earnings to maintain capital and adapt to the crisis, in addition to mitigating the negative influence of the crisis.

The results also showed a negative impact of COVID-19 on the financial performance of Algerian companies. This can be explained by the fact that the restrictions and closures led to a decrease in demand and the disruption of supply chains, which negatively impacted the companies' financial performance. The level of financial leverage also has a negative impact on the financial performance of companies during the COVID-19 period because highly indebted companies face higher financing costs and are more affected than companies with low leverage. Highly indebted companies need fixed payment obligations under the decline in sales and revenues during the pandemic, which increased their financial risks that reflected negatively on their financial performance.

For the company size, the results showed a positive impact of company size on financial performance during the COVID-19 period, which means that large Algerian companies are highly efficient in their performance and less affected by the pandemic because they have sufficient capabilities to adapt to the changes that occur in the market, in addition to their experience in managing crises faster and more effectively with their high ability to reach financing, which allows them to overcome the financial challenges that faced during the pandemic.

The results of this study require companies to cling to conservative accounting practices without exaggeration and benefit from their advantages regarding the faithful representation of financial statements, and maintain capital by avoiding overstatement of income and earnings. The need for accounting conservatism increases during crisis periods to mitigate the negative influences of downturn situations. Managers do not deal negatively with accounting conservatism due to its negative effect on the financial performance of companies, since this effect will be positive in the long term.

Like any scientific research, this study had some limitations that serve as a starting point for future research. The most prominent limitation lies in the small size of the sample, which included 65 non-financial companies in the Algerian context, potentially restricting the generalisability of the results to other sectors or economies. The dependence on a single measure of accounting conservatism raises questions about the possibility of obtaining different results using alternative measures. Furthermore, the study's focus on the pandemic period allows for the exploration of long-term effects in the post-pandemic period. These limitations open broad prospects for future research, where comparative studies can be conducted between emerging and developed markets to understand corporate responses to accounting conservatism during crises according to the degree of market development. It is also recommended to conduct an in-depth analysis to detect the differences between the various economic sectors that may have been affected differently by the pandemic.

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## THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM 27 EUROPEAN UNION COUNTRIES

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**Abstract:** The present study focuses on the relationship between financial development and economic expansion in the European Union (EU) countries. We compare three different periods: the years before the financial crisis, the years affected by the crisis, and the post-crisis period. Using the System Generalized Method of Moments estimator alongside Granger causality tests, the results reveal a bidirectional causality between finance and growth before the financial crisis. During and after the crisis, financial development Granger causes economic growth only unidirectionally. The strongest positive impact of financial development on growth is observed after the crisis.

**JEL classification:** E44; F43

**Keywords:** economic growth; financial development; Generalized Method of Moments; Granger causality

### 1. Introduction

The European Union is a complex economic and financial framework consisting currently of 27 member states. It includes one of the world's largest monetary unions, the Eurozone (European Commission, 2023). From all the categories of monetary financial institutions that were available in European Union countries in 2023, the largest was the category of credit institutions (banks), according to Statista (2023). However, the total number of banks has been decreasing in the last few years. In 2024, there were a total of 4,886 banks operating in the European Union, and Germany led with almost 1,000 more banks than any other European country; the banking industry had here total assets worth more than 10.8 trillion euros in 2023 (Statista, 2024).

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The European regulations promoted after the 2007-2008 financial crisis demand improved risk management. Many economic agents, analysts, policymakers, and researchers understood the risk of over-reliance on traditional banking and, at the same time, the importance of financial diversification. As a result, currently, there is a greater focus on the complementary role of capital markets in the European economies. Additionally, consumers' behaviour has been shaped lately by digitalisation. Technological adaptation has become critical for financial institutions, and the demand for traditional bank branches is decreasing.

Even more, following the 2007-2008 financial crisis, the necessity for greater integration of the banking sector was recognised, and the so-called 'Banking Union' was established (European Commission, 2024a). It currently consists of 21 countries, involving a Single Resolution Mechanism (SRM) and a Single Supervisory Mechanism (SSM) for banks. As described by the European Commission (2024a), when a bank is failing or likely to fail, the resolution mechanism imposes the reorganisation of the bank by a resolution authority. This process guarantees that a bank failure won't result in financial instability or damage to the overall economy. At the same time, the European Central Bank (ECB) is the primary prudential regulator of financial institutions covered by the SSM. While national supervisors continue to keep an eye on the smaller banks, the ECB looks for the largest banks.

A different initiative called the 'Capital Markets Union' (CMU) seeks to establish a single capital market so that businesses, investors, and consumers can profit from savings and investments moving throughout the European Union (European Commission, 2024b). European Commission argues that the European Union capital markets are still fragmented, despite the fact that there has been improvement since the CMU effort was started in 2015. As a response, in September 2020, the Commission approved a revised CMU action plan following three main objectives: construct a genuine single market through integrating national capital markets, make long-term investing and saving in the European Union even safer, and encourage a resilient and environmentally friendly economic rebound.

The comprehensive European financial sector is extremely dynamic. The changes are even more impactful for some of the European Union member countries, which were formerly under communist regimes. Adapting the supranational regulations in order to develop their market-oriented financial systems, while constantly looking for sustainable economic growth, might be considered a one-way road. The present paper seeks empirical evidence that financial development positively impacts economic growth in the European Union countries. Even though the finance-growth nexus has been the focus of a considerable amount of the specific literature already, measuring financial development while simultaneously evaluating the intermediate functions of financial markets and financial institutions remains a major challenge. Moreover, observing the differences in terms of sign and strength of the causality among various time periods, whether they occur during economic recovery or during crisis periods, is an additional critical topic. This paper examines the changes that occur in the relationship between financial development and economic growth in 27 European Union countries, across different time spans, by employing the System Generalized Method of Moments methodology with Granger causality tests, and by using the recently developed Financial Development Index from the International Monetary Fund (Svirydzenka, 2016).

## 2. Literature review

The importance of the financial system was acknowledged a long time ago, and since then, researchers have been paying attention to the relationship between finance and economic growth. Bagehot (1962, pp. 37-49) described particularly the important and multiple roles played by England's financial system. Through this work, the author started to shape the need for policymakers' responses during financial crises in preventing systemic collapses. When looking at emerging and undeveloped countries, Patrick (1966) emphasised the significance of the financial system as a whole, financial institutions, and the unique role of financial innovation.

In the empirical research field on economic growth, a new methodology - the panel data technique - began to gain popularity in the 1980s and 1990s. According to some well-known authors (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998), early explanations and pieces of evidence regarding the advantages of employing the panel method can be identified. It was agreed on the importance of using efficient and strong instruments through a Generalized Method of Moments estimation, especially a relevant method when having a large number of observations (N) for a short period of time (T) (Bond et al., 2001). Both the Difference Generalized Method of Moments and the System Generalized Method of Moments were applied to a sample of 74 countries for the period 1960-1995 (Levine et al., 2000). Evidence suggests a positive correlation between economic growth and the exogenous components of financial intermediary development. While the authors demonstrate the role of finance on economic growth using traditional banking indicators such as credit to the private sector or credit by deposit money banks, we take further their work by employing the broader IMF Financial Development Index as a measure for finance. Additionally, their study is limited to the 1960-1995 period, and our work fills this gap by analysing a more recent time span.

Rioja & Valev (2004a, 2004b) argued that finance has a strong positive influence on growth primarily in more developed economies, while in less developed economies the effect of finance on output growth occurs primarily through capital accumulation. The authors used the Difference Generalized Method of Moments and System Generalized Method of Moments methodologies. Again, the authors focused in their study only on the period 1960-1995. Later, for the same analysed period (1960-1995), Henderson et al. (2013) showed that the finance-growth relationship was significantly positive for middle- and high-income countries, while for the low-income countries it was non-existent or to a smaller extent. Financial development became a key determinant of growth in later stages of development, perhaps because market imperfections became less severe and institutions imposed fewer constraints. Even more, in the case of 10 European Union countries, for a period of 14 years, from 1994 to 2007, Caporale et al. showed limited evidence of a finance-growth positive relationship (2015). The research focuses only on national economies that had a period of transition: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The System Generalized Method of Moments estimator was employed, using as instrumental variables the lagged endogenous and explanatory variables. Gross Domestic Product (GDP) per capita was used as a measure of growth. The final results show a small yet favourable impact of some indicators of financial development on economic growth. The current work extends the sample to all European Union countries.

Ferreira (2017) recognised the importance of the banking industry in the development of 28 European economies, arguing that banking institutions that can guarantee high levels of operational efficiency support economic growth. Through this work carried out for the period 1998-2012, the author examines the differences between pre-crisis and post-crisis years. By employing the Generalized Method of Moments methodology, the empirical results indicate that the Gross Domestic Product (GDP) growth rate may be adversely affected by the decline in the quality of bank assets. We take further the author's work and contribute to the specific literature, firstly, by taking into consideration the comprehensive financial sector, both in terms of financial institutions and financial markets. Secondly, by comparing the effects of financial development on economic growth before, during, and after the crisis, this study makes a contribution to the field. Additionally, the article offers new evidence about the causal relationship between finance and growth, specifically in the context of the European Union's distinctive financial architecture.

Later, in a study on 25 Sub-Saharan African countries, Tadesse and Abebaw (2021) showed using the System Generalized Method of Moments methodology that financial sector depth, access, and efficiency have a positive effect on these countries' economic growth. The empirical study is limited to a short period, from 2010 to 2017. In the same year, Sarwar et al. (2021) presented a one-directional positive effect between financial development and economic growth, with human capital as an interaction term, for 83 emerging economies, between 2002 and 2017. Even more, the authors (Asteriou et al., 2024) tested unidirectionally the impact of finance on growth in 26 European Union countries. Similar to our findings, they assess that financial development supports growth predominantly during normal periods, while its impact weakens during times of economic stress. In the current study, we are extending the objectives by looking for the presence of bidirectional causality between finance and growth.

Abbas et al. (2022) employed various methodologies, including Granger Causality tests within a Vector-Error Correction framework, to examine the causal relationship between finance and growth bidirectionally. The sample of 44 middle-income countries for the period 1995-2018 includes some European countries, like Bulgaria. Our work might add depth by focusing exclusively on the 27 European Union countries, offering a more targeted perspective.

### **3. Methodology**

This paper hypothesises that economic growth in 27 European Union countries is in a positive relationship with financial development over the studied period of 30 years (1990-2019) and that there is presence of Granger causality between finance and growth. We are focusing on the countries that are part of the European Union as of 2025: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, The Netherlands, Slovak Republic, Slovenia, Spain, and Sweden. The empirical analysis is conducted through the System Generalized Method of Moments (GMM) methodology and Granger causality tests, applied to three subperiods.

### 3.1. Data collection

Our model's dependent variable, gross domestic product per capita growth (annual percentage), was gathered from the World Development Indicators Database and serves as an indicator for economic growth (World Bank, 2023). The model also takes into account the Gross Domestic Product (GDP) growth rate from the previous year in order to reflect the dynamic nature of economic growth. Financial development is represented by the Financial Development Index, which was gathered from the Financial Development Index Database (International Monetary Fund, 2024). We motivate our decision to measure financial development by using this specific index because it takes into consideration variables for depth, access, and efficiency of the financial institutions and financial markets as well. The following steps are applied as a methodology of construction: all variables are normalised (these can be found in Table 1), then they are aggregated into sub-indices that reflect functional dimensions of the financial system and finally, the sub-indices are aggregated into the final index (see for a more detailed description Svirydzhenka, 2016). Therefore, a total of nine indices are constructed from 20 indicators, the ninth index representing the comprehensive Financial Development Index (Figure 1):

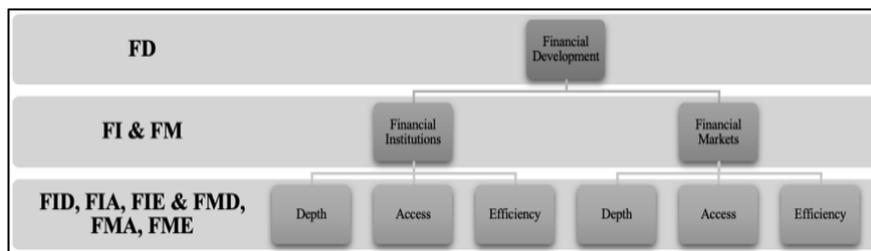
- § Financial Institutions Depth (FID), Financial Institutions Access (FIA), Financial Institutions Efficiency (FIE), all used together to construct the Financial Institutions Index (FI);
- § Financial Markets Depth (FMD), Financial Markets Access (FMA), and Financial Markets Efficiency (FME), all used together to construct the Financial Markets Index (FMI);
- § Financial Development Index (FD), built as a combination of the Financial Institutions Index (FI) and the Financial Markets Index (FM).

**Table 1.** Variables used to construct the Financial Development Index

Category	Indicator
Financial Institutions, Depth	Private-sector credit to GDP
Financial Institutions, Depth	Pension fund assets to GDP
Financial Institutions, Depth	Mutual fund assets to GDP
Financial Institutions, Depth	Insurance premiums, life and non-life to GDP
Financial Institutions, Access	Bank branches per 100,000 adults
Financial Institutions, Access	ATMs per 100,000 adults
Financial Institutions, Efficiency	Net interest margin
Financial Institutions, Efficiency	Lending-deposits spread
Financial Institutions, Efficiency	Non-interest income to total income
Financial Institutions, Efficiency	Overhead costs to total assets
Financial Institutions, Efficiency	Return on assets
Financial Institutions, Efficiency	Return on equity
Financial Markets, Depth	Stock market capitalization to GDP
Financial Markets, Depth	Stocks traded to GDP
Financial Markets, Depth	International debt securities of government to GDP
Financial Markets, Depth	Total debt securities of financial corporations to GDP
Financial Markets, Depth	Total debt securities of nonfinancial corporations to GDP
Financial Markets, Access	Percent of market capitalization outside of top 10 largest companies
Financial Markets, Access	Total number of issuers of debt (domestic and external, non-financial and financial corp.)
Financial Markets, Efficiency	Stock market turnover ratio (stocks traded to capitalization)

Source: Reprinted from "Introducing a new broad-based index of financial development", by Svirydzhenka, K., 2016, IMF Working Paper, p. 8

**Figure 1.** Indices used to construct the Financial Development Index



Source: Author's own representation, based on the methodology described by [Sviryzdenka, 2016](#)

When necessary, the series of the financial proxy has been transformed into natural logarithms to ensure that the data distribution is normal. The model incorporates trade openness as a measure for economic growth, and data is collected from the World Bank (2023). As the European Union promotes a single internal market without borders, we consider that trade might have a positive impact on economic growth in the member states.

The following lagged variables are employed as instruments to control endogeneity: the one-year lagged financial development index, the one-year lagged trade openness variable, and the one-year lagged GDP per capita growth for the crisis years and the two-year lagged GDP per capita growth for the remaining years.

### 3.2. Data analysis

Considering a broad timeframe of 30 years, which includes the Great Recession or the Global Financial Crisis that began as a subprime mortgage crisis in 2007, we think it is essential to give the crisis-affected years more weight for a panel study. Asteriou and Spanos (2019) argued that the sign and strength of the financial-growth link are significantly more vulnerable to change during a crisis. Therefore, three sub-panels are constructed: the pre-crisis years (1990-2007), the crisis-affected years (2008-2014), and the post-crisis years (2015-2019).

The growth literature increasingly consists of sophisticated methods of estimation, particularly in panel data estimation, which is seen as being a good approach under the present circumstances. As long as the GMM estimator is effective and the instruments employed are robust (Bond et al., 2001), it is a viable method for unbalanced panels with short time periods and a higher number of observations (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). The methodology relies on the moment conditions, which are statistical equations that capture relationships between parameters, instrumental variables, and overall observed data (Caporale et al., 2015). To model the hypothesis, the relationship between economic growth and financial development using the Generalized Method of Moments (GMM) estimation is initially stated as follows (1):

$$GDP_{it} = \alpha GDP_{i,t-1} + \beta FD_{i,t} + \delta Trade_{i,t} + \mu_i + \epsilon_{it}, \quad (1)$$

Where  $GDP_{it}$  is the dependent variable, the economic growth rate of country  $i$  at time  $t$ ,  $GDP_{i,t-1}$  is the lagged dependent variable,  $FD_{i,t}$  is the independent variable, Financial Development Index,  $Trade_{i,t}$  is the trade openness variable,  $\mu_i$  is the unobserved

country-specific effect,  $\epsilon_{it}$  is the error term for country  $i$  at time  $t$ , and  $\alpha$ ,  $\beta$ ,  $\delta$  are coefficients to be estimated.

In order to choose between different methodologies, we use the rule of thumb approach (Bond et al., 2001), which requires applying the Pooled Ordinary Least Squares (POLS) estimation with Fixed Effects (FE), then the Difference Generalized Method of Moments (DGMM). In order to conclude whether the Difference GMM is appropriate, we need to compare the  $\alpha$  coefficients of  $GDP_{(t-1)}$  obtained in the previous estimations. If  $\alpha_{DGMM} > \alpha_{FE}$ , then we stop at the Difference GMM estimator; if  $\alpha_{DGMM} \leq \alpha_{FE}$ , then the System Generalized Method of Moments estimation needs to be applied further, as Difference GMM has a downward bias due to weak instrumentation (the results are shown in Table 2).

**Table 2.** Comparing different methods of estimation

Estimation	Period	GDP(-1) Coefficient	Total panel observations	Implication*
POLS, Fixed Effects	1990-2007	0.270124	418	Not efficient
POLS, Fixed Effects	2008-2014	-0.153036	162	Not efficient
POLS, Fixed Effects	2015-2019	-0.285757	108	Not efficient
Difference GMM	1990-2007	0.242645	390	Not efficient
Difference GMM	2008-2014	-0.234430	135	Not efficient
Difference GMM	2015-2019	-0.449292	81	Not efficient
System GMM	1990-2007	-1.511529	755	Efficient
System GMM	2008-2014	-13.12159	243	Efficient
System GMM	2015-2019	17.31308	135	Efficient

\* If [GDP(-1) Coefficient DGMM] greater than [GDP(-1) Coefficient FE], Difference GMM Estimation to be performed  
 \* If [GDP(-1) Coefficient DGMM] lower or equal than [GDP(-1) Coefficient FE], System GMM Estimation to be performed  
 Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

By comparing different methods, we determined that the System Generalized Method of Moments methodology should be used. The first-difference equation, which is expressed using the  $\Delta$  difference operator (2), is added to equation (1):

$$GDP_{it} = \alpha GDP_{i,t-1} + \beta FD_{i,t} + \delta Trade_{i,t} + \mu_i + \epsilon_{it}, (1)$$

$$\Delta GDP_{it} = \alpha \Delta GDP_{i,t-1} + \beta \Delta FD_{i,t} + \delta \Delta Trade_{i,t} + \Delta \epsilon_{it}, (2).$$

Orthogonal Deviations transformation is employed as it can control unobserved heterogeneity, and, as it has already been shown, the transformation is a good alternative „regardless of whether  $N$  is large, or  $T$  is large, or both are large” (Phillips, 2022). Orthogonal Deviations GMM estimation addresses endogeneity by orthogonalizing the used instruments. Moreover, White Period transformation improves the efficiency of the GMM estimator, as it can correct heteroskedasticity over time. The J-statistic test is applied to assess the overall validity of the model. The null hypothesis is that the restrictions (moment conditions) are valid, so the used instrumental variables are correctly specified in the GMM estimation. A probability of J-statistic greater than the 0.1 threshold (significance level of 10%) suggests that there is insufficient evidence

to reject the null hypothesis, meaning that the used instruments are considered valid. In this case, the model's output could be confidently accepted.

Furthermore, the causal relationship between financial development and economic growth is evaluated using pairwise Granger causality tests (Granger, 1988). Because it captures the average influence of one variable's predictability on another, over the entire panel, the panel-level Granger causality technique is mostly employed in the related research. Therefore, in the current study, the Granger tests results provide an overview of the causality between financial development and economic growth in the European Union countries. The null hypothesis ( $H_0$ ) states that financial development does not Granger-cause economic growth and vice versa, as the relationship is tested bidirectionally.

#### 4. Results

The results sustain our initial hypothesis, that there is a positive relationship between finance and growth in all 27 European Union countries, over the analysed period of 30 years, by taking into consideration the development of both financial sectors: the development of financial institutions and the development of financial markets. The empirical results by employing the System Generalized Method of Moments methodology, including the J-Statistic Test, can be found in Table 3 for the period 1990-2007, in Table 5 for 2008-2014, and in Table 7 for 2015-2019. We consider the results relevant since if the financial development is high, the macroeconomic stabilisation is enhanced, and there is a positive effect on economic growth. Additionally, Table 4, Table 6, and Table 8 present the results for the Granger causality tests for each analysed subperiod.

The empirical findings show that the lagged dependent variable, which represents the historical GDP per capita growth, had a favourable impact on economic growth for the pre-crisis period (1990–2007). Moreover, trade openness and the financial proxy had considerable effects on economic growth (Table 3).

**Table 3.** System GMM results for the pre-crisis years, 1990-2007

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP (-1)	0.246453	0.005344	46.11471	0.0000***
FD	0.768662	0.181409	4.237179	0.0003***
T	0.029033	0.001519	19.11903	0.0000***
J-Statistic	24.57407			
Prob (J-Statistic)*	0.429193			

\*\*\*  $p < 1\%$ , \*\*  $p < 5\%$ , \*  $p < 10\%$

Total panel (unbalanced) observations: 390

Method: Panel System Generalized Method of Moments

Transformations: Orthogonal Deviations, White Period

Instrument Specification: @DYN(GDP, -2), FD(-1), T(-1)

Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

Although the financial development coefficient is smaller in pre-crisis years than in the other periods under study, it is still statistically significant at 1%. The J-statistic coefficient and its probability assure the efficiency of our model, supporting its robustness. The results, in our opinion, perfectly represent the economic situation in Eastern European nations following the dissolution of communism: Poland, Hungary, the Czech Republic, the Slovak Republic, East Germany, Bulgaria, Romania, Slovenia, Croatia, Estonia, Latvia, and Lithuania. After transitioning from centrally planned to market-oriented economies, these economies made an effort to align their policies with the requirements and norms of the European Union. They started their journey toward economic systems based on the free market, democracy, and important social values promoted in the European Union membership. It is possible that the necessary infrastructure for a significant financial impact on growth did not come into place until later. This, together with the fact that most European economies had only modest capital market activity at the beginning of the 2000s and that the banking industry was still in the beginning stages, are reasons that may support our findings even more. Also, we identified evidence of a two-way Granger causal relationship between economic growth and financial development (Table 4).

**Table 4.** Pairwise Granger causality test, 1990-2007

Null Hypothesis	Obs	F-statistic	Prob.*
FD does not Granger Cause GDP	367	7.96099	4.E-05
GDP does not Granger Cause FD	367	2.54778	0.0557
T does not Granger Cause GDP	363	2.10623	0.0991
GDP does not Granger Cause T	363	2.18472	0.0895

\*Significance threshold: 10%  
Sample: 1990-2007  
Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

As anticipated, the results during the period 2008–2014, representing the years affected by the crisis, show that there is a negative influence from the GDP per capita growth rate from the prior year, but the development of the financial sector had a favourable impact on economic growth (Table 5). Additionally, there is evidence of a positive impact of trade openness on growth.

**Table 5.** System GMM results for the years affected by crisis, 2008-2014

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP (-1)	-0.302937	0.008566	-35.36627	0.0000***
FD	5.116583	1.745137	2.931909	0.0069*
T	0.299601	0.013623	21.99300	0.0000***
J-Statistic	23.41678			
Prob (J-Statistic)*	0.219483			

\*\* \*p < 1%, \*\* p < 5%, \*p < 10%  
Total panel (unbalanced) observations: 135  
Method: Panel System Generalized Method of Moments  
Transformations: Orthogonal Deviations, White Period  
Instrument Specification: @DYN(GDP, -1), FD(-1), T(-1)  
Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

There are many variables that may influence how quickly a nation transitions to a stable state of economic growth during a crisis, including the nature and severity of the crisis, the nation's economic structure, the policies adopted by the government during the crisis, and the country's links to the global economy. As the economy adjusts to decreased levels of production, the lagged dependent variable, which reflects historical levels of economic growth, has a negative impact on current economic growth. Reduced investment and consumption, but also the lowered general economic activity, might be the result of a set of pessimistic predictions about the future economy. Moreover, the efficiency of the policy responses in order to mitigate the effects of economic crises certainly has an impact on the relationship between historical and actual values of growth. Governments, central banks, and, in our case, the European Central Bank are all addressed here. Once more, the probability and J-statistic coefficient ensure our model's effectiveness. Granger causality between financial development and economic growth has been confirmed, although only unidirectionally (Table 6).

**Table 6.** Pairwise Granger causality test, 2008-2014

Null Hypothesis	Obs	F-statistic	Prob.*
FD does not Granger Cause GDP	135	15.7304	8.E-07
GDP does not Granger Cause FD	135	0.93319	0.3959
T does not Granger Cause GDP	135	10.6918	5.E-05
GDP does not Granger Cause T	135	22.2227	5.E-09

\*Significance threshold: 10%  
Sample: 2008-2014  
Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

Even more, the findings for the post-crisis years (2015–2019) demonstrate that while financial development has a positive, statistically significant impact on growth, the previous GDP per capita growth rate continues to have a negative effect, and trade does not have a significant impact on growth (Table 7). The weaker global demand and some protectionist policies after the crisis might be the reason for this. However, when compared to the other periods, the financial development coefficient is the highest. Governments and central banks implemented a variety of policy initiatives to lessen the impact of the financial crisis and encourage economic recovery. These policies (such as banking sector reforms and fiscal stimulus) might have affected the connection between financial development and economic expansion. The adjustments in terms of financial supervision and regulation initiated by European Union policy helped to stabilise the financial industry and, eventually, encouraged growth. The J-statistic coefficient and probability support the robustness of the model. We also found evidence for the presence of Granger causality between finance and growth (Table 8). However, it is only unidirectional, as financial development and trade Granger-cause economic growth, but the reversal is not applicable.

**Table 7.** System GMM results for the post-crisis years, 2015-2019

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP (-1)	-0.442408	0.068565	-6.452408	0.0000***
FD	17.31043	7.850243	2.205082	0.0365**
T	0.051803	0.071187	0.727700	0.4733
J-Statistic	7.406335			
Prob (J-Statistic)*	0.192132			

\*\*\* $p < 1%$ , \*\* $p < 5%$ , \* $p < 10%$

Total panel (unbalanced) observations: 81

Method: Panel System Generalized Method of Moments

Transformations: Orthogonal Deviations, White Period

Instrument Specification: @DYN(GDP, -2), FD(-1), T(-1)

Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

**Table 8.** Pairwise Granger causality test, 2015-2019

Null Hypothesis	Obs	F-statistic	Prob.*
FD does not Granger Cause GDP	54	4.04426	0.0123
GDP does not Granger Cause FD	54	0.79280	0.5040
T does not Granger Cause GDP	54	2.96090	0.0417
GDP does not Granger Cause T	54	0.26145	0.8528

\*Significance threshold: 10%

Sample: 2015-2019

Source: Author's estimation results performed in EViews econometric program, using data from the World Bank Database & International Monetary Fund Database

## 5. Discussion

The findings of the current paper, by employing the System Generalized Method of Moments estimator as well as Granger causality tests, underline once again the importance of existing policies that increase the financial sector resilience. By prioritising the strengthening of the financial system for resilience, EU policymakers might support the positive impact of finance on growth even during stress times. This condition could be even more enhanced by focusing on countercyclical fiscal and monetary policies. During downturns, like the previous Global Financial Crisis, maintaining credit flows could stabilise demand, while stricter regulations must be implemented during booms to avoid excessive financial risk-taking. Additionally, as the results were obtained by using the comprehensive Financial Development Index as a measure for the financial sector, with a focus on both financial institutions and financial markets, we consider that a balance between banking and capital markets might reduce the risks of over-reliance on banks. Given the obtained results that provide evidence that there is a positive impact of financial development on growth, such policies might support further economic growth.

## 6. Conclusions

Although we found some differences in terms of magnitude during the studied time spans, the empirical findings support the hypothesis that between financial development and economic growth there is a positive causal relationship in the European Union countries. The presence of Granger causality between finance and growth is also acknowledged, sometimes even bidirectional (for the pre-crisis period). The highest financial development coefficient in the employed System Generalized Method of Moments estimation occurred between 2015 and 2019, the post-crisis years. As a result, the impact of financial development on growth differs depending on the overall economic environment. The policymakers in the European Union may consider continuing to encourage the development of the financial sector as a whole, including banking, capital markets, and insurance institutions, while also facilitating access to a variety of financial products. We consider it absolutely necessary for policymakers to sustain initiatives that promote financial inclusion, initiatives that can reduce the borrowers' dependence on banks, and even more initiatives that promote diversification of the financial sources. All these measures together could help in sustaining economic growth in an unfavourable context, as there is empirical evidence that access, depth, and efficiency of the financial institutions and financial markets positively Granger-cause economic growth. The results of the current study raise an additional challenge, as we intend to employ a threshold dynamic panel technique in our future research, in order to look deeper into the level of financial development that contributes to the economic growth, not only across the European Union, but in high-income economies, in general.

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