ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES
ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2022 Volume 10 Number 1 (September)
http://doi.org/10.9770/jesi.2022.10.1(19)

Publisher
http://jssidoi.org/esc/home

IMPACT OF SELECTED FACTORS ON DIGITALIZATION OF FINANCIAL SECTOR*

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Received 25 March 2022; accepted 24 August 2022; published 30 September 2022

Abstract. The financial sector is introducing new services to meet consumer needs at a time of information society and rapid technological awareness growth. The study aims to summarize the existing global trends in banking sector digitalization and informatization and assess the impact of selected macroeconomic indicators on them. The World Bank's data were used for the principal analysis. We offer a novel model for evaluating relationships between banking digitalization and macroeconomic processes based on theoretically grounded assumptions. For a detailed study of banking informatization, countries with similar indicators ofResearchers in R&D per million people to Ukraine were selected (Romania, Cyprus, Ukraine, Malta, Croatia, Bulgaria, Latvia, Italy, and Poland). The research results allowed finding how our selected indicatorsaffect the development of digitalization of the financial sector. The obtained results may have practical economic politicy implications.

Keywords: investments; loans; analysis;risk; information; banks; digitalization; informatization; financial sector

Reference to this paper should be made as follows: Khalatur, S., Tvaronavičienė, M., Dovgal, O., Levkovich, O., Vodolazska, O. 2022. Impact of selected factors on digitalization of financial sector. *Entrepreneurship and Sustainability Issues*, 10(1), 358-377. http://doi.org/10.9770/jesi.2022.10.1(19)

JEL classification: C51, E27, G20

The research is partly supported by a project financed by Scientific Council of Lithuania "The impact of Industry 4.0 technological progress on the development and value of the industrial production sector". Agreement No. 09.3.3-LMT-K-712-19-0037

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1. Introduction

In today's world, the primary mechanism for achieving high economic efficiency in any economic sector is the ability to respond to changes in the market and its resource base. At a time of information society and rapid economic and technological awareness growth, the financial sector is introducing new resource bases to meet consumer needs. There is a need for further digitalization and informatization (in our paper, we will use those terms as synonymous). The banking sector of every country with an efficient economy is a centre of innovative products and results of human intellectual activity. The introduction of technologies in countries with economies in transition, including Ukraine, is a rather complex process, as it requires significant financial resources. Given this, the study of current global trends in banking informatization of the financial sector is relevant. A common feature in the technological development of the banking system of Ukraine and Europe is active investment in improving operations, optimizing customer interaction and improving the level of integration of banks with other systems (social networks, online shopping, etc.) (Jankovic, 2020; Mazurek, 2021; Radavičius & Tvaronavičienė, 2022; Nassar & Strielkowski, 2022).

Modern banking systems concentrate on the main financial risks that are associated with the shortcomings of a particular economic system and are cyclical. Therefore, the economic crisis of a country or region causes a problem in the banking system and vice versa. Each country's economic development process is inextricably linked with the functioning mechanism of the efficient financial market infrastructure, at the centre of which is the banking system. The success of market relations, ensuring intensive economic growth, increasing the country's competitiveness on the world market and increasing the population's welfare is determined by how effectively banks can operate in different segments of the banking services market. The need to study banking informatization is growing under the influence of globalization and asymmetry in the development of financial markets and intensification of competition in the global banking space.

The study aims to summarize the existing global trends in banking informatization of the financial sector and assess the impact of selected macroeconomic indicators on them.

2. Theoretical Basis

Many scholars' scientific works are devoted to studying the development of banking in general and banking informatization.

Billio, Getmansky, Lo and Pelizzon (2012) offer several econometric connectivity indicators based on Granger analysis of major components and networks of causation. Benhabib, Liu, and Wang (2016) investigated how friction in financial information can lead to fluctuations in asset prices and self-realization of business cycles due to sentiment.

Eisenbach, Kovner and Lee (2022) modelled how cyberattacks can be amplified through the financial system by focusing on the wholesale payment network. The reverse stress test shows that attacks on groups of small banks can also damage much of the network. Xu, Saunders, Xiao and Li (2020) studied the impact on a firm when it is forced to switch its relationship with a bank. The opacity of firm information mitigates the consequences of losing a relationship. Liao, Chen and Lu (2009) investigate the impact of agency and information asymmetry issues embedded in structural credit models on bank credit risk assessment. Bessler and Nohel (2000) argue that banks face informational externalities in an asymmetric information environment because of their role as intermediaries.

Nevrla (2020) analyzed systemic risk in Europe's financial and energy sectors using the daily time series of CDS spreads. There is a much higher systemic risk in the financial industry compared to the energy sector. Melecky

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and Podpiera (2020) argue that financial sector strategies enable a holistic view of their country's economic development needs. A significant link between the strategy and efficiency has not been confirmed.

Chang and Yang (2022) explored the role of cash reserves during crises and whether a firm with more extensive cash reserves will be able to resume operations quickly after the financial crisis. Chien-Lee and Wang (2021) examine whether geopolitical risks affect firms' cash reserves. Researchers have found that firms tend to accumulate more cash as a precaution when faced with geopolitical risk. Xiao, Zhao and Zhou (2022) study individual and macro-financial factors influencing the convergence of corporate debt.

Schelling and Towbin (2022) studied the transfer of negative interest rates on bank lending around an unexpected political rate, which the National Bank of Switzerland reduced to a resounding negative (-0.75%). Garel, Petit-Romec and Vander Vennet (2022) investigated the relationship between institutional ownership and bank capital. Researchers find supporting evidence that the excellent ability of institutional investors to monitor reduces the seriousness of the agency's costs.

Karakaya, Michalsk and Örsc (2022), using deregulation of interstate banking regulation, create measures for banking integration and industry specialization, which take into account both direct and indirect links created by expanding networks of multibank holding companies. Anagnostopoulos, Husa, and Noikokyris (2022) studied the differences in efficiency between EU and US banks during 2000-2018. European banks lag behind the United States regarding technical efficiency before and after the crisis.

Yuan, Gu, Yuan, Lu and Ni (2022) analyzed the mechanism of banking competition's impact on stability, which will help financial regulators and commercial banks formulate differentiated regulatory policies and business strategies. Ampudia, Skander and Van den Heuvel (2022) study the impact of lower interest rates on the value of European banks' shares - an effect usually positive - has become negative as interest rates in the euro area have reached zero and below.Baik, Han, Joo and Lee (2022) expand the existing literature on the bank's capital structure, applying the model of parameters that change over time to the structure of partial adjustment. Altunbas, Marques-Ibanez, Leuvensteijn, and Zhao (2022) investigated how market power in the 2007-2009 crisis caused banks' systemic risk during the crisis and whether this effect was influenced by two key factors: securitization and bank capital.

Yun and Cho (2022) argue that monetary policy affects business loans more significantly than household loans.Aldasoro, Ehlers and Eren (2022) record significant and persistent price changes between US money market funds and highly rated world banks in secured and unsecured wholesale dollar-denominated markets.Rizwan, Ahmad and Ashraf (2022) assessed the systemic risk of countries with a systemically crucial Islamic banking sector. Their research also identifies determinants of financial institutions' systemic importance (measured by side effect indices).Ornelas, Soaresdade Silva and Nazar Van Doornik (2022) explore the links between credit market competition and bank loan spreads.

Auer, Matyunina, and Ongena (2022) studied structural changes in bank supply, using their differentiated effect on activating the countercyclical capital buffer, which targets banks' mortgage risks. Zou and Wang (2022) studied whether the distance between branches and competition of local banks affect bank lending. Hu, Schclarek, Xu and Yan (2022) argue that developing countries often lack long-term funding.Chen (2022) argues that the interconnectedness of banks exacerbates banks' errors in underestimating risk when making capital decisions. The relationship of banks increases systemic risk.

Beutler, Gubler, Hauri and Sylvia Kaufmann (2021) note that economic uncertainty affects lending in specific periods and compensates for changes in interest rates. Cappelletti, Reghezza, Rodríguez d'Acri, and Spaggiari (2022) studied the impact of capital requirements on bank lending between institutional sectors, focusing on the

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channels of their transmission and interaction with monetary policy. Özlem Dursun-de Neef and Schandlbauer (2022) argue that during the pandemic, households accumulated savings in their deposit accounts due to cost reductions due to limited mobility. This has led to a significant increase in bank deposits.

Georgescua and Jefleab (2015) emphasized the characteristic feature of banking information systems from an integrative point of view by identifying and justifying their place, role, evolution and perspective. Hrabchuk, Kachula, Lysiak, and Zarutska (2021) identified the peculiarities of monetary processes in the crisis period of economic development and directions of monetary policy correction. Khalatur (2015) analyzed the dynamics of the main agricultural development indicators in Ukraine and European countries. Export promotion will incentivize investors to invest in agricultural production, infrastructure and related services. Velychko, Velychko, Butko and Khalatur (2019) considered integrated solutions in the marketing logistics system, which are the main resource for ensuring effective value chain management. Khalatur, Velychko, Pavlenko, Karamushka and Huba (2021) investigated tools for monitoring the impact of VUCA global conditions on the financial stability of banks. Khalatur, Vinichenko and Volovyk (2021) explore the critical features of modern business processes and outsourcing. New forms of cooperation can bring legal relations beyond legal regulation in those countries that do not have time to adapt their legislation to new business strategies. Vasylieva (2019) proposed consistent monitoring and comparison of the dynamics of the development of the agricultural sectors of Ukraine and the USA, which will ensure the desired continuous improvement in the quality and efficiency of management. Velychko, Velychko and Ramanauskas (2016) consider promising ways and conceptual approaches to harmonizing the budget-forming role of agribusiness and the socio-economic role of rural development.

Chen, Lee and Shen (2022) write that a bank with high-income diversification and high liquidity has a high probability of problems in the next period. Corbisiero (2022) shows that liquidity infused into the banks of the affected country can lead to risk financing rather than lending simulation. Igan, Mirzaei, and Moore (2022) argue that the significant reduction in banking risk is primarily due to credit growth limits. Huynh and Dang (2022) analyze how the impact of loan portfolio diversification on a bank's profitability varies depending on the size of the bank and state ownership. Shahhosseini (2022) writes that capital needs are transmitted to the real economy through the bank lending channel. Banks that have passed the stress test are increasing lending, reducing the supply of loans to small and risky borrowers. The research results by Garcia and Meurer (2022) show that an increase in assets negatively affects the profitability of private banks but does not affect the profitability of state-owned banks. Cañón, Cortés and Guerrero (2022) explored the relationship between competition measures at the bank level and the cost of credit for nonfinancial firms. Lee, Wang, and Thinhand Xu (2022) note that the relationship between climate risk and the creation of bank liquidity depends on the characteristics of the bank and the country. Minesso, Mehl and Stracca (2022) studied the implications of the central bank's digital currency for an open economy. Fukuyama, Matousek and Tzeremes (2022) learn the production process of banks with problem loans. Empirical data show that the critical factors in the efficiency of banks are the high level of investment and strategic efficiency of decisions. Tian, Park and Cagas (2021) explore how the development of the bond market affects banks' risk-taking. Researchers have found that larger bond markets are associated with lower liquidity and portfolio risk and more excellent overall bank stability.

Pedrono (2022) writes that the amplitude of leverage pro-cyclicality is heterogeneous between banks and countries. Fiordelisi and Scardozzi (2022) analyze banks' financing strategies after offering assistance. Eurozone countries have recently switched to a new centralized exemption system, removing implicit state guarantees.Adeniran, Jadah and Mohammed 2020 stress the importance of information technology in the strategic management of banks.This study differs from previous ones in that it lacks a link between sentiment and the real economy and does not consider the effect of the relationship between banking informatization and the real economy arising from information friction. The study also highlights the twofold feedback loop between banking informatization and the real economy; it shows that banking informatization can be a source of endogenous signals that generate self-realized fluctuations.

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2. Method

The World Bank's data on macroeconomic and banking informatization indicators were used for the main analysis.The study begins by creating a model for assessing banking informatization and making assumptions about the interaction of banking sector performance and the economic environment. A set of indicators is being selected to be flexible and to explore different scenarios and variations of assumptions that illustrate how results may differ depending on the level of informatization, bank response, policy and economic response (see Fig. 1).

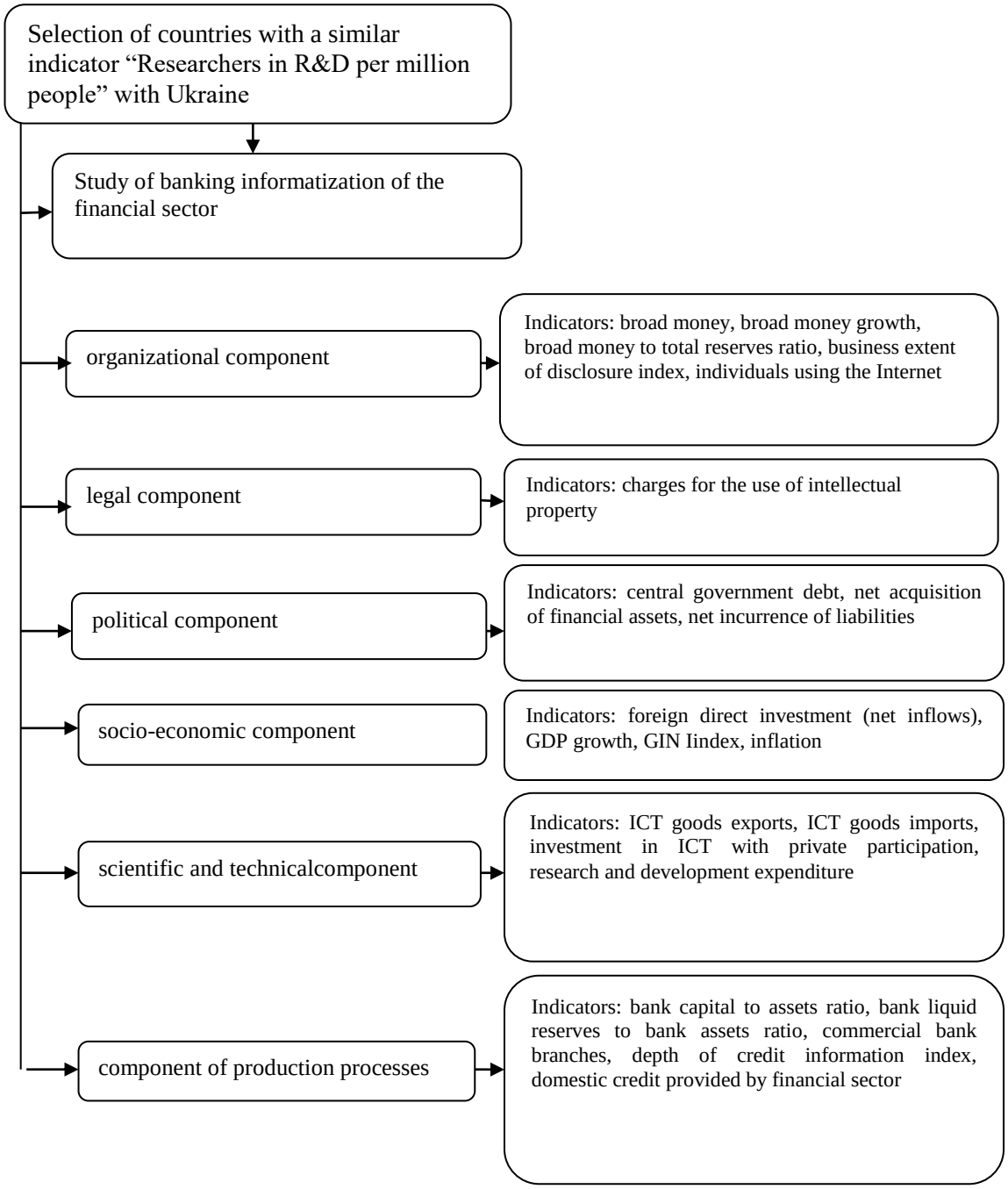

Figure 1. The theoretical framework of the study

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For the purposes of this study of banking informatization of the financial sector in selected European countries, the following indicators were taken for analysis: organizational component - broad money, broad money growth, broad money to total reserves ratio, business extent of disclosure index, individuals using the Internet; legal component - charges for the use of intellectual property; political component - central government debt, net acquisition of financial assets, net incurrence of liabilities; socio-economic component - foreign direct investment(net inflows), GDP growth, GINI index, inflation; scientific and technical component - ICT goods exports, ICT goods imports, investment in ICT with private participation, research and development expenditure; component of production processes - bank capital to assets ratio, bank liquid reserves to bank assets ratio, commercial bank branches, depth of credit information index, domestic credit provided by financial sector and some others.

The indicators of the results of the banking sector informatization will also be analyzed, in particular, a mobile-money-service providerwith the account of ownership at a financial institution, firms using banks to finance investment, firms using banks to finance working capital and others.

4. Results

Banking in current conditions is significantly diversified and is one of the economy's most dynamic sectors. This makes it challenging to define the concept of "banking digitalization/informatization". There is currently no generally accepted definition of banking informatization, so it isn't easy to provide a complete review of the literature in this rapidly evolving research area.

In the article, banking digitalization/informatization means a set of interrelated organizational, legal, political, socio-economic, scientific and technical production processes aimed at creating conditions to meet information needs, a realization of rights of citizens and society through creation, development, use information systems, networks, resources and information technologies based on the use of modern computer and communication innovation in banking.

The financial system has become much more complex in recent years. Although this complexity is an inevitable consequence of competition and economic growth, it is accompanied by specific outcomes, including much greater informatization.

For a detailed study of banking informatization of the financial sector, countries were selected with a similar indicator to Ukraine's Researchers R&D per million people (see Fig. 2).

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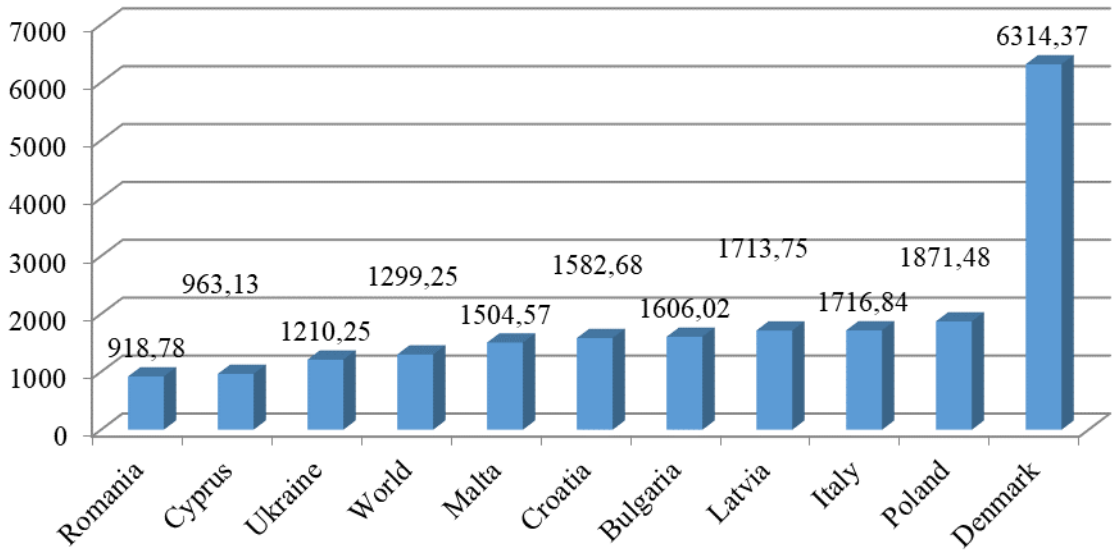

Figure 2. Researchers in R&D by European countries, on average 2001-2020, per million people
Source: compiled by authors based on World Bank data

Thus, Romania, Cyprus, Ukraine, Malta, Croatia, Bulgaria, Latvia, Italy, and Poland were selected for further research. In these countries, the Researchers in R&D indicator is approximately at the level of Ukraine. Denmark is also compared, with the highest rate of this indicator among European countries.Table 1 analyzed the indicators of organizational and legal components of banking informatization on average from 2000-2020.

Table 1. Indicators of the organizational and legal component of banking informatization on average for 2000-2020

Country	Business extent of disclosure index (0=less disclosure to 10=more disclosure)	Individuals using the Internet (% of population)	Charges for the use of intellectual property, payments (BoP, current US$)
Romania	8,93	38,50	491608114,03
Cyprus	6,53	53,51	71831564,88
Ukraine	4,13	25,07	519052631,58
World	5,21	26,65	264463449834,54
Malta	3,00	57,60	598452067,41
Croatia	3,00	50,84	226844635,02
Bulgaria	10,00	41,03	126965329,35
Latvia	5,00	60,79	43050450,42
Italy	7,00	47,76	5369156274,42
Poland	7,00	54,10	2011578947,37
Denmark	7,00	86,20	1378585695,02

Source: compiled by authors based on World Bank data

Money circulation is an important financial and economic process, the characteristics of both the result and the condition for the functioning of the economic system.

According to World Bank data (2022), Broad money in Romania is 35.77% of GDP, in Ukraine - 45.93% of GDP; in the world - 108.26% of GDP; in Croatia - 66.57% of GDP; in Bulgaria - 67.52% of GDP; in Poland -

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54.36% of GDP; in Denmark - 58.70% of GDP. Broad money growth in Romania is 16.38 annual %, in Ukraine - 23.75 annual %; in Croatia - 8.32 annual%; in Bulgaria - 13.29 annual%; in Poland - 9.51 annual%; in Denmark - 4.80% annual. Broad money to total reserves ratio is in Romania - 1.72, in Ukraine - 3.20; in Croatia - 2.68; in Bulgaria - 1.85; in Poland - 3.09; in Denmark - 3.36. In other countries under study, the values of these indicators are missing.According to the peculiarities of the formation of the information and network economy, electronic money is becoming more widespread, particularly in international electronic networks. An intrinsic property of money is dynamism - money is constantly in motion, moving between economic entities of the same and different countries. The dynamism of money ensures its role in shaping the profitability of current financial and economical operations. Therefore the speed of money movement affects the financial stability and balance of the economic system.Table 2 analyzed the indicators of the political component of banking informatization on average from 2000-2020.

Table 2. Indicators of the political component of banking informatization on average for 2000-2020

Country	Net investment in nonfinancial assets (% of GDP)	Net lending (+) / net borrowing (-) (% of GDP)	Government expenditure on education, total (% of GDP)
Romania	2,79	-3,10	3,44
Cyprus	3,51	-3,26	6,29
Ukraine	0,76	-2,38	5,94
World	1,48	-3,00	4,29
Malta	5,12	-4,69	5,88
Croatia	1,76	-3,62	4,10
Bulgaria	2,61	-0,50	3,74
Latvia	3,28	-2,56	5,29
Italy	1,06	-2,82	4,26
Poland	2,05	-3,52	5,03
Denmark	1,69	0,82	8,02

Source: compiled by authors based on World Bank data

According to World Bank data (2022), Central government debt in Ukraine is 41.41% of GDP; net incurrence of liabilities) in Ukraine is 4.39% of GDP; in Malta - 5.82% of GDP. Claims on central government claims in Romania is 0.95 annual growth as% of broad money; in Ukraine - 3.98 annual growth as% of broad money; in Croatia - 1.52 annual growth as% of broad money; in Bulgaria (-0.72) annual growth as% of broad money; in Poland - 1.85 annual growth as% of broad money; Denmark (-0.78) annual growth as% of broad money.So, many problems need to be solved shortly within the limits of modern information technologies to develop the banking system. Currently, among the most urgent problems of informatization of the banking sector are the small amount of equity capital of most banks and its unsatisfactory quality, the imbalance of the structure of assets and liabilities, and low efficiency of management.Table 3analyzed the indicators of the socio-economic component of banking informatization on average from 2000-2020.

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Table 3. Indicators of the socio-economic component of banking informatization on average for 2000-2020

Country	Foreign direct investment, net inflows, % of GDP	GDP growth, annual %	Gini index, World Bank estimate	Inflation, GDP deflator, annual %
Romania	3,74	4,13	36,31	10,40
Cyprus	81,51	2,39	32,56	1,64
Ukraine	3,80	2,43	26,46	15,78
World	2,88	2,84	x	3,85
Malta	97,00	3,88	29,08	2,42
Croatia	3,55	1,98	31,60	2,39
Bulgaria	8,36	3,59	36,93	4,26
Latvia	3,45	3,73	35,83	4,63
Italy	1,22	0,22	34,55	1,74
Poland	3,25	3,79	33,17	2,21
Denmark	0,95	1,34	27,01	1,68

Source: compiled by authors based on World Bank data

The main problems of the financial sector in Ukraine are distrust in the financial system, lack of financial planning and financial literacy of customers, and problems with Internet coverage in the country's regions.To build a strategy for the development of banking informatization of the financial sector, it is necessary to consider the strategy of each bank through the prism of those trends that already exist in the global market. Key internal processes will then be analyzed, strengths and weaknesses identified and compared with leading market practices. It is necessary to assess the opportunities for implementing current trends and be the ones who create trends.Table 4 analyzed the indicators of banking informatization's scientific and technical components on average for 2000-2020.

Table 4. Indicators of the scientific and technical component of banking informatization on average for 2000-2020

Country	ICT goods exports, % of total goods exports	ICT goods imports, % total goods imports	ICT service exports, % of service exports, BoP	Insurance and financial services, % of service exports, BoP	Insurance and financial services, % of service imports, BoP	Research and development expenditure, % of GDP
Romania	4,10	7,24	13,08	2,60	6,28	0,45
Cyprus	6,49	5,18	7,67	20,02	16,54	0,42
Ukraine	0,93	3,39	6,36	1,42	7,47	0,81
World	11,99	12,76	7,99	11,60	8,48	2,05
Malta	32,40	16,92	1,44	28,39	31,18	0,57
Croatia	2,56	5,43	3,78	0,88	8,40	0,85
Bulgaria	2,21	5,39	6,86	3,55	6,85	0,58
Latvia	5,62	7,06	7,25	10,18	7,79	0,55
Italy	2,40	6,01	7,46	6,79	9,99	1,21
Poland	6,44	8,54	5,78	2,42	6,18	0,75
Denmark	4,46	8,73	4,92	1,70	1,81	2,77

Source: compiled by authors based on World Bank data

According to World Bank data (2022), Indicator Investment in ICT with private participation in Romania is 153000000 US $, in Ukraine - 1320000000 US $, in Bulgaria - 280000000 US $, in other countries, there are no data. Further development of FinTech companies is not possible without attracting investments and adapting legislation to new business models. These processes result from large-scale globalization of the economy and the

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natural development of technologies. In today's operating conditions, business is increasingly immersed in digital processes, and traditional economic models are taking a back seat.

Rare events, including financial crises and macroeconomic catastrophes, are challenging to analyze. This analysis informs us of our understanding of data transmission mechanisms and assessing vulnerabilities in the financial sector, as well as highlights potential policy responses that would effectively mitigate reinforcements. From a practical point of view, data on macroeconomic indicators provide detailed information on flows between different financial institutions. This detailed information allows managers to model various scenarios using factual data and investigate the result without too many assumptions (see Table 5).

Table 5. Indicators of the component of production processes of banking informatization on average for 2000-2020

Country	Bank capital to assets ratio (%)	Bank liquid reserves to bank assets ratio (%)	Bank nonperforming loans to total gross loans (%)	Borrowers from commercial banks (per 1,000 adults)	Depositors with commercial banks (per 1,000 adults)	Depth of credit information index (0=low to 8=high)
Romania	8,78	35,44	10,16	225,99	-	7,00
Cyprus	7,69	-	23,19	387,79	1189,57	4,71
Ukraine	12,44	10,18	31,74	-	2467,68	7,00
World	x	16,47	x	152,69	485,16	4,60
Malta	7,63	-	6,23	363,92	1356,94	2,57
Croatia	13,45	21,35	10,68	625,45	1440,94	5,86
Bulgaria	11,08	15,44	11,55	448,44	1571,84	5,00
Latvia	10,02	-	7,73	349,03	1249,22	7,14
Italy	5,41	-	11,32	466,12	679,64	7,00
Poland	8,88	12,02	4,31	465,94	1011,95	8,00
Denmark	6,29	4,24	3,53	-	-	6,00

Source: compiled by authors based on World Bank data

According to World Bank data (2022), deposit interest rate in Romania is 7.18%; in Ukraine - 10.02%; in Croatia - 2.04%; in Bulgaria - 2.39%. No data are available for other studied countries. Domestic credit provided by the financial sector in Ukraine is 83.93% of GDP. In Fig. 3, there are analyzed commercial bank branches and banks' domestic credit to the private sector.

Despite digital technologies rapidly gaining ground, there are no generally accepted and harmonized legal definitions of digitalization and informatization. Digitalization is becoming an essential factor in the economic growth of any country's economy and is a modern development trend.

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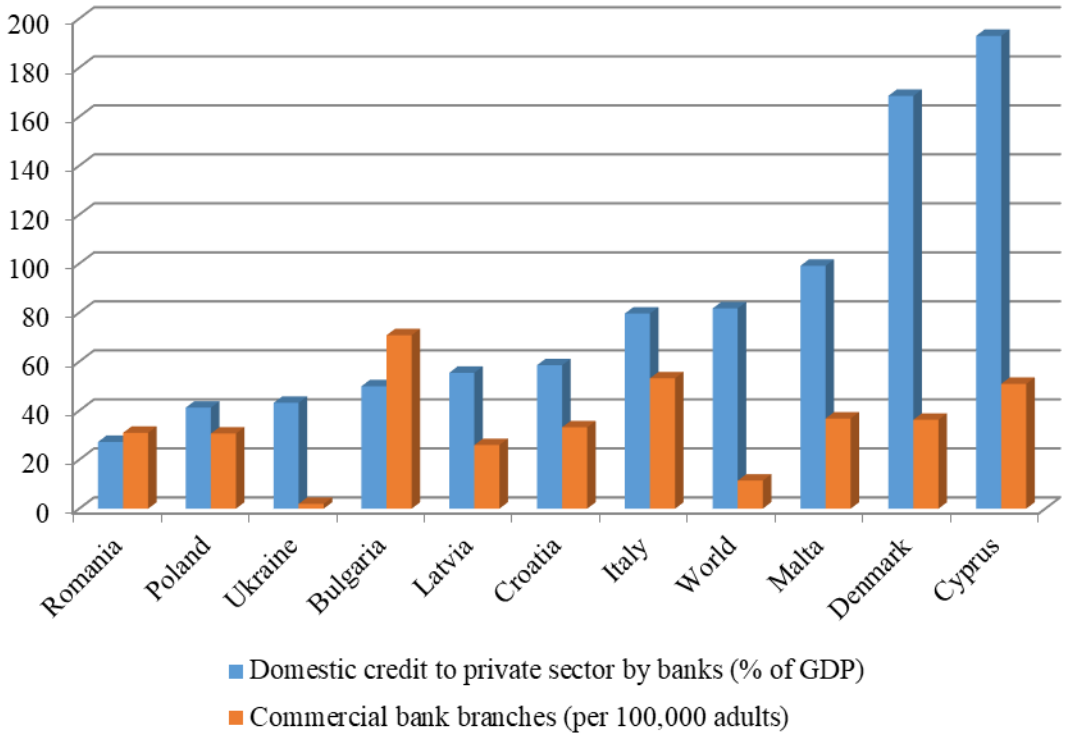

Figure 3. Commercial bank branches (per 100,000 adults) and domestic credit to the private sector by banks (% of GDP), average from 2000-2020.
Source: compiled by authors based on World Bank data

Traditional interconnection research examines the impact on the network of relationships formed by banks through interbank borrowing and other performance indicators. However, banking informatization's opportunities and effects can manifest through connections that are not actively manifested through traditional risk management. Another critical factor is the possibility of feedback and empowerment through economics and politics. Figure 4 analyzed the indicators of the informatization results of the banking sector on average from 2000-2020.

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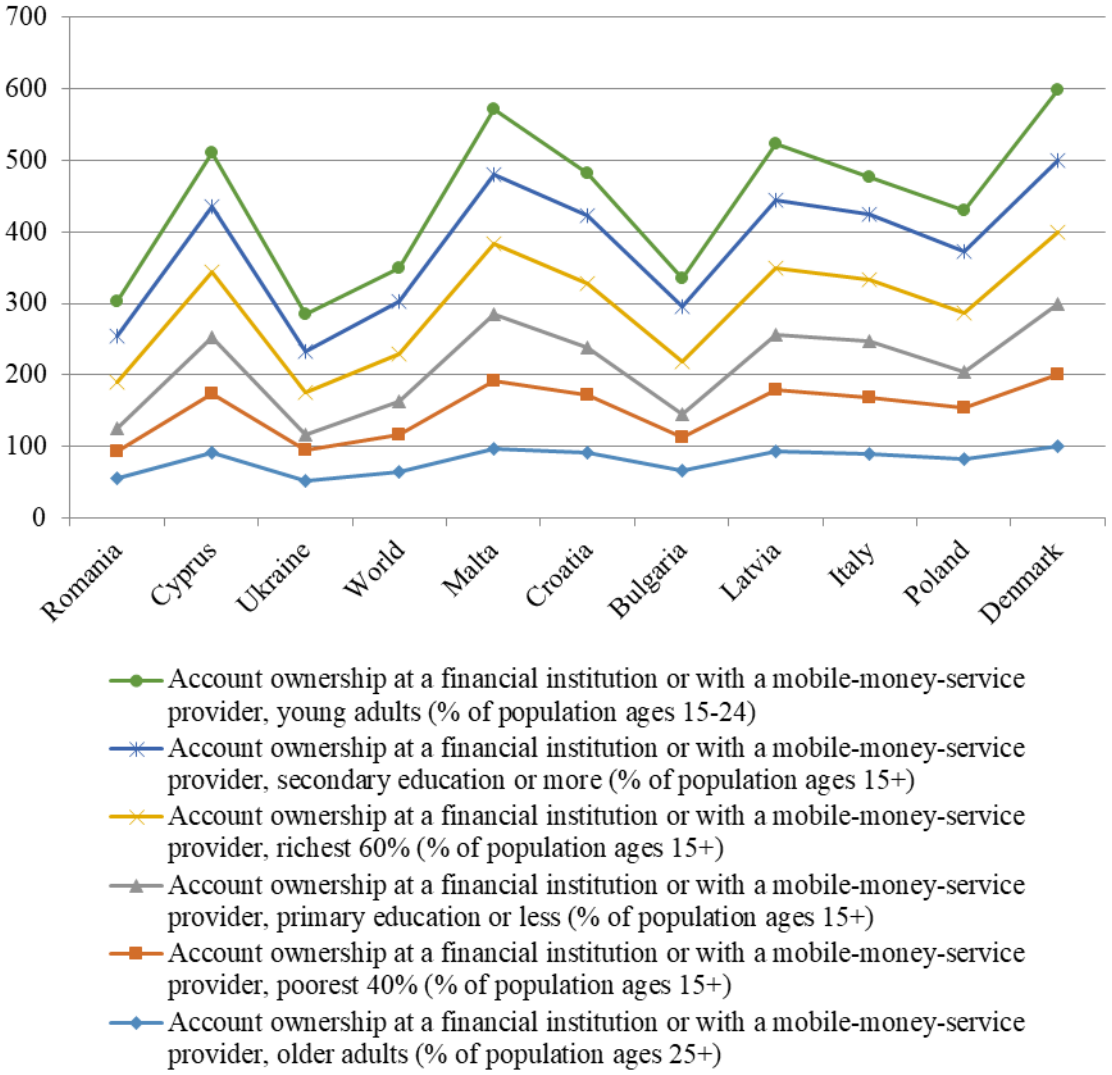

Figure 4. A mobile-money-service provider or account ownership at a financial institution, average from 2000-2020.
Source: compiled by authors based on World Bank data

Banking informatization of the financial sector is associated with projects to transform the IT landscape of banks, introducing new services and personalizing offers to customers.

Analyzing the results of multivariate analysis, the factors proposed above are also considered in more detail. The banking informatization of the financial sector is indirectly reflected in the growth rate of account ownership at a financial institution or with a mobile-money-service provider (Index Mundi https://www.indexmundi.com/facts/indicators/FX.OWN.TOTL.ZS)

However, choosing an indicator that would become a correct indicator of such a process is somewhat problematic. Little attention has been paid to the study of this factor in the scientific literature. Thus, even if it is selected as the correct indicator, the regression analysis based on retrospective data will not provide an adequate assessment of the impact of this indicator on the level of banking informatization of the financial sector in the countries under study.It is not necessary to reject the impact of the country's economic diversification process on Account ownership at a financial institution or with a mobile-money-service provider (Index Mundi

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https://www.indexmundi.com/facts/indicators/FX.OWN.TOTL.ZS). It is believed that this process can impact a more extended period. It is argued that the impact of such a complex multifactorial process should be considered in separate macroeconomic studies.

Business extent of disclosure index, individuals using the Internet, charges for the use of intellectual property; net investment in nonfinancial assets; net lending/net borrowing; foreign direct investment; GDP growth; Gini index; inflation; ICT goods exports; ICT goods imports; ICT service exports; insurance and financial services; insurance and financial services; government spending on education; research and development expenditure; bank capital to assets ratio; bank liquid reserves to bank assets ratio; nonperforming bank loans to total gross loans; borrowers from commercial banks; commercial bank branches; depositors with commercial banks; depth of credit information index; domestic credit to the private sector by banks are indicators that can become important determinants of a mobile-money-service provider or account ownership at a financial institution.In the factors proposed in this study, this indicator of banking informatization of the financial sector is indirectly taken into account. The data sample refers to the period from 2000 to 2020. This period is justified by the relative macroeconomic stability of countries and the availability of statistical data necessary for analysis. Below is table 7 with correlation coefficients between potential determinants and a mobile-money-service provider or the account ownership at a financial institution due to banking informatization of the financial sector (see Table 7).

Table 7. Results of the correlation analysis of the banking informatization factors of the financial sector (based on the indicator "A mobile-money-service provider or account ownership at a financial institution")

Correlation coefficients and their statistical significance					
Group of factors of organizational and legal component banking informatization		Group of factors of political component banking informatization		A group of factors of social and economic components banking informatization	
Business extent of disclosure index	0,871	Net investment in nonfinancial assets	0,811	Foreign direct investment, net inflows	0,297
Individuals using the Internet	0,295	Net lending (+) / net borrowing (-)	0,729	GDP growth	0,756
Charges for the use of intellectual property	0,753	Government expenditure on education, total	-0,701	Gini index	-0,744
Group of factors of scientific and technical component of bank informatization		Group of factors component of production processes of banking informatization			
ICT goods exports	0,846	Bank capital to assets ratio	0,461		
ICT goods imports	0,371	Bank liquid reserves to bank assets ratio	0,867		
Insurance and financial services (% of service exports)	0,653	Borrowers from commercial banks	0,471	Inflation, GDP deflator	0,832
Insurance and financial services (% of service imports)	0,689	Commercial bank branches	0,671		
Research and development expenditure	0,383	Depth of credit information index	0,774		
		Domestic credit to the private sector by banks	0,732		

* statistically significant correlation coefficients ($t_{obs}>t_{crit}$ at a significance level < 5%)

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The selection of the main factors that have the most substantial influence on the function *y* is made since the model, which includes many aspects, is unstable: it does not objectively reflect changes in y with corresponding changes in factors. The selection was made based on the analysis of the values of special statistical characteristics.

However, for further regression analysis, the factors with the highest correlation coefficient values are selected. In the course of further study, a regression model of account ownership at a financial institution or with a mobile-money-service provider was built for the selected factors.

Regression analysis is a method of establishing the analytical expression of the stochastic relationship between the studied features. The regression equation shows how *y* (the dependent variable describing the process to be predicted or understood) changes on average when any of the x_i changes and has the form:

$$y = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + \cdots + \beta_n * x_n + u$$

A multivariate correlation-regression model was built for a mobile-money-service provider or account ownership at a financial institution. In this methodological development, the limitations were as follows: the selection of the main factors that determine the level of a mobile-money-service provider or account ownership at a financial institution and an assessment of the degree of their impact on this indicator. In this study, a mobile-money-service provider or account ownership at a financial institution is the dependent variable *y*.

The impact on Account ownership at a financial institution or with a mobile-money-service provider of the following factors is considered:

X_1 - people using the Internet, % of population;
X_2 - direct foreign investment, net inflows, % of GDP;
X_3- imports of ICT goods, % total goods imports;
X_4 -research and development expenditure, % of GDP;
X_5 -bank capital to assets ratio, %;
X_6 -borrowers from commercial banks, per 1,000 adults;
y - a mobile-money-service provider or account ownership at a financial institution, % of population ages 15+.

In this study, we assume that there is a multiple linear regression; that is, a mobile-money-service provider or account ownership at a financial institution depends linearly on the selected six factors X_1, X_2,...,X_6. The regression equation has the following form: $y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6$, where a_1, a_2 ..., a_6 are the parameters of the regression equation, subject to evaluation.The evaluation of the regression function was performed using the Excel program.
The regression equation looks like this:

$$y = 4{,}274 + 0{,}073x_1 + 0{,}931x_2 + 0{,}251x_3 + 1{,}056x_4 + 0{,}355x_5 + 0{,}904x_6$$

This regression model and the multiple correlation coefficient R = 0,768 indicates a high closeness of the relationship between the selected factors and a mobile-money-service provider or account ownership at a financial institution.

In the course of the correlation-regression analysis, it was revealed that the main factors determining the variation in the level of the indicator Account ownership at a financial institution or with a mobile-money-service provider in the retrospective period are: people using the Internet; foreign direct investment, net inflows; imports of ICT goods; research and development expenditure; bank capital to assets ratio; borrowers from commercial banks.

Thus, when changing the coefficient x_1 (people using the Internet) by 1% a mobile-money-service provider or account ownership at a financial institution increases slightly by 0,073%; when x_2 (foreign direct investment, net

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inflows) increases by 1%, a mobile-money-service provider or account ownership at a financial institution increases by 0,931%; when changing the coefficient x_3 (ICT goods imports) by 1% a mobile-money-service provider or account ownership at a financial institution increases by 0,251%; when the coefficient x_4 (research and development expenditure) is changed by 1%, the resulting indicator increases by 1,056%; when the coefficient x_5 (bank capital to assets ratio) is changed by 1%, the resulting indicator increases by 0,355%; when the coefficient x_6 (borrowers from commercial banks) is changed by 1%, the resulting indicator increases by 0,904%. Thus, in current conditions, the resulting indicator selected for the study of banking informatization of the financial sector, a mobile-money-service provider or account ownership at a financial institution is most influenced by the following indicators: foreign direct investment, net inflows; research and development expenditure; borrowers from commercial banks.

To increase a mobile-money-service provider or account ownership at a financial institution, it should first be paid special attention to foreign direct investment, net inflows, research and development expenditure, borrowers from commercial banks.

In the proposed model, agents form expectations and make investments based on information from the financial sector about the overall state of the economy. Thus, a key feature of the proposed model is that information and macroeconomic indicators are correlated through general sentiment about the overall economy and can create a balance of non-fundamental rational expectations. The analyzed indicators, which reflect the perspective views of most experienced investors, are widely considered a barometer of the aggregate economy.

Discussion

Schelling and Towbin (2022) found that banks that suffered more from negative interest rates offered softer lending terms and provided more than other banks. This result is consistent with risk-taking when a lower policy rate encourages the bank to take risks to maintain profits. Garel, Petit-Romec and Vander Vennet (2022) showed that banks with more significant institutional ownership operate with much higher capital ratios. The results of research by Karakaya, Michalsk and Örsc (2022) show that the channel of banking integration helps shape the country's industrial landscape.

Beutler, Gubler, Hauri and Kaufmann (2021) note that the overall negative impact of changes in interest rates on loan growth is partially muted in periods when uncertainty is extremely low or high. The research of Cappelletti, Reghezza, Rodríguez d'Acri and Spaggiari (2022) shows the interaction between macroprudential and monetary policy, as well as the positive effect of combining two different sets of incentives to maintain banking stability and credit for the real economy. Özlem Dursun-de Neef and Schandlbauer (2022) argue that policies which may affect household spending will lead to changes in the volume of deposits in the banking system, which will affect the supply of credit by banks. Igan, Mirzaei and Moore (2022) argue that pre-crisis capital growth in systemically important financial institutions reduces the profitability of bank shares.

Huynh and Dang (2022) write that the bank's profits increase with the diversification of the loan portfolio in state-owned banks, in contrast to the consequences for private banks. The results of studies by Lee, Wang, Thinh and Xu (2022) show that policymakers should be careful when formulating and implementing climate-related strategies, as they may affect the creation of liquidity, which, in turn, may affect macroeconomic stability.

Thus, this article complements the latest literature, which examines the effect of the relationship between the financial sector and the real side of the economy.

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
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http://doi.org/10.9770/jesi.2022.10.1(19)

Innovative information technologies play an essential role. When creating the bank of the future, information technologies in the banking services field have the strategic effect of increasing the customer base, reducing the cost of banking operations at the optimal level of operational risk and operating costs. The leading global trends in the development of banking informatization are the close relationship of the bank with the client, the integration of the bank into the IT sector, the interaction of banks with social networks and the involvement of new technologies.

The current stage of banking informatization of the financial sector of the economy has identified trends and directions of the development of financial institutions. Coherence of organizational and planned measures for banking informatization will help increase the level of innovation and performance of the banking and financial sector. Further prospects for developing banking informatization in the financial industry aim to improve the legal framework and data protection and find appropriate cooperation between banks and Fintech companies. Thus, the priority areas of banking informatization of the financial sector of the world economy are improvement, the components development of the above processes, means of informatization and information technology, and their integration. The dynamics of global economic growth in banking informatization of the financial sector is essential.

Conclusions

The study aimed to summarize the existing global trends in banking informatization of the financial sector and assess the impact of macroeconomic indicators. Thus, this paper examines how the financial industry can affect the overall real economy through the information channel. Due to the two-way feedback between the financial and real sectors, a slight shock to financial market sentiment could intensify and have a significant impact on the real economy. A multifactor correlation-regression model of account ownership at a financial institution or with a mobile-money-service provider was built. In this methodological development, the limitations were as follows: selection of the main factors determining the level of account ownership at a financial institution or with a mobile-money-service provider and assessment of their impact on this indicator. In this study, a dependent variable is account ownership at a financial institution or with a mobile-money-service provider. Thus, a vital feature of the proposed model is that information and macroeconomic indicators are correlated through general sentiment about the overall economy and can create a balance of non-fundamental rational expectations. The analyzed indicators, which reflect the perspective views of most experienced investors, are widely considered a barometer of the aggregate economy.

Despite the indicated research limitations, to increase "Account ownership at a financial institution or with a mobile-money-service provider", managers should first pay special attention to foreign direct investment, net inflows, research and development expenditure, and borrowers from commercial banks.

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Funding: The research is partly supported by a project financed by Scientific Council of Lithuania "The impact of Industry 4.0 technological progress on the development and value of the industrial production sector". Agreement No. 09.3.3-LMT-K-712-19-0037

Data Availability Statement: More information and data can be obtained from the authors on a resonable request.

Author Contributions: The authors contributed equally. All authors have read and agreed to the published version of the manuscript.

ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES
ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2022 Volume 10 Number 1 (September)
http://doi.org/10.9770/jesi.2022.10.1(19)

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