INNOVATIVE, ECONOMIC AND MARKETING DETERMINANTS OF FINANCIAL SECURITY AND SUSTAINABILITY OF BUSINESS

Introduction. Permanent economic transformations and aggravation of the crisis in the economy raise the issue of ensuring the stable functioning of the business. At the same time, a significant number of companies face financial problems and the inability to finance their current needs and programs of simple and extended reproduction. According to the Bank of International Settlements, the level of bankruptcy of enterprises in developed economies increased by 19-55% in 2020, by 20% – in 2021. The need to create conditions for sustainable business development and financial conditions for its operation leads to increasing the role of financial, innovative, and marketing components of financial security and studying their relationship in the systems of financial and economic relations in the country.

Literature Review. According to the analysis of publications on business financial security, 2294 publications were selected in the Scopus database and in 2004 in the Web of Science (WoS) database. The dynamic of publishing activity (Fig. 1) shows a gradual increase in the interest of scientists in these issues. Even though the first article was published in 1933 (in the Scopus database) and 1990 (in the WoS database), their number has increased significantly over the last 10 and 6 years, respectively. From 2015 to 2021, 67% of all papers were published in the WoS database and 68% – in the Scopus database. These
tendencies are partly related to the aggravation of global financial problems, the growth of the number of bankrupt enterprises, the growth of financial crime globally, etc. These studies were conducted in more than 100 areas of research. More than 70% of publications belong to one of the research areas: business economics, social sciences, geography, environmental sciences ecology, urban studies, and public administration. The authors of 82 countries researched the marketing of territories. Scientists from the USA and England have published most studies. Also, more than 50 studies have been published by scientists from Italy, Canada, the Netherlands, Germany, Australia, and France.

The study of these issues took place within 147 areas of research based on WOS and 22 based on Scopus. A significant number of publications were made in high-ranking journals included in Q1-Q4.

| Source                                           | Number of articles | Scopus | WoS | Quartile |
|--------------------------------------------------|--------------------|--------|-----|----------|
| Network Security                                 | 22                 |        |     | Q4       |
| Computers Security                               | 21                 | 11     | Q1  |          |
| Sustainability Switzerland                       | 21                 | 22     | Q1  |          |
| Economic Annals XXI                              | 18                 |        | Q3  |          |
| Computer Fraud and Security                      | 16                 |        | Q2  |          |
| Review of Pacific Basin Financial Markets and Policies | 14             |        | Q3  |          |
| Journal of Advanced Research in Dynamical and Control Systems | 12             |        | -   |          |
| Espacios                                         | 11                 |        |     |          |
| IEEE Access                                      | 11                 | 10     | Q1  |          |
| Journal of Financial and Quantitative Analysis   | 11                 |        | Q1  |          |
| Financial and Credit Activity Problems of Theory and Practice | 34             |        | -   |          |
| Baltic Journal of Economic Studies               | 20                 |        | -   |          |
| Journal of Business Ethics                       | 13                 |        | Q1  |          |
| Marketing and Management of Innovations          | 13                 |        | -   |          |
| Entrepreneurship and Sustainability Issues        | 12                 |        | -   |          |
| International Journal of Computer Science and Network Security | 11             |        | -   |          |
| Decision Support Systems                         |                    |        | Q1  |          |

Sources: developed by the authors based on the Scopus and Web of Science database.

The bibliometric analysis results conducted by VOSviewer tools show the connection between business financial security with a significant number of economic categories (Fig. 2). Thus, based on the results of bibliometric analysis, it could be concluded that scientists from different countries widely study
the issues of financial security of business (Azarenkova et al., 2018; Britchenko et al., 2018; Dokiienko, 2021; Avanesova and Chuprin, 2017).

Thus, Delasa et al. (2015) considered the financial security of business as the main element of the national security of any country, which directly impacts the number of tax revenues to the budget and the conditions of the labor market. Comparing people and companies in Maslow's needs ranking, the authors emphasize that the need for a secure business is at the second level of Maslow's needs hierarchy and is the basis for meeting higher-level needs. Raczkowski and Schneider (2013) viewed the enterprise's financial security as a result of risk management, which acts as a driver of strategic decision-making and uncertainty in the organization. In general, the authors consider financial security as an integral part of ensuring the systemic activities of the organization. Wiese (2014), examining the financial stability of the business and the factors of its occurrence, concluded that volatile profits, lack of experience, low quality of services provided, and poor cooperation between employees negatively affect the financial stability of small and medium-sized businesses.

**Methodology and research methods.** The business's financial security is a complex indicator, the level of which depends on several indicators of the economic and market environment of its operation (Yilmaz, 2007; Shynkar et al., 2020; Turgaeva et al., 2020; Ganushchak, 2017). At the same time, according to the analysis results, the impact of these indicators is different in strength and nature (Melnichenko, 2020; Sourav, 2019; Vatamanyuk-Zelinska and Melnichenko, 2020). For determining the most influential component of the formation of a business's financial security, this study analyzes its main drivers in terms of economic, marketing, and innovation components. The dependence of financial security of the business on drivers could be formalized using the following function:

\[
F_{SBt} = f(E_{comt}, M_{arkt}, I_{novt})
\]

where \(F_{SBt}\) – financial security of business in period \(t\); \(E_{comt}\) – economic determinants in period \(t\); \(M_{arkt}\) – marketing determinants in period \(t\); \(I_{novt}\) – innovation determinants in period \(t\).
The basis for the formalization of the components of the business financial security level is its integrated assessment by the formulas:

\[ F_{BS_A} = \sum_{i=1}^{n} a_i F_{BS_i}^A, \quad F_{BS_M} = \sum_{i=1}^{n} (F_{BS_i}^M) a_i \]  

(2)

where \( F_{BS_A} \) and \( F_{BS_M} \) – partial indicators (for additive and multiplicative form) of the i-th component of financial security of business; \( n \) - the number of components; \( a_i \) – weights for which the following condition is met:

\[ \sum_{i=1}^{n} a_i = 1, \quad a_i \geq 0, \quad i = 1, n \]  

(3)

Assessment of the level of financial security of business will be carried out in the context of the following indicators:

1) Economic component:
   - Business Sophistication;
   - Business extent of disclosure index;
   - Total business density.

2) Innovative component:
   - CT services imports, % total trade;
   - ICT access;
   - ICT use;
   - Software spending, % GDP;
   - High-tech manufacturing, %;
   - High-tech exports, % total trade;
   - ICT services exports, % total trade;
   - Online creativity;
   - Firms that spend on R&D, % of firms.

3) Marketing component:
   - Market capitalization of listed domestic companies (% of GDP);
   - S&P Global Equity Indices (annual % change).

The study of the impact of the whole set of factors on the level of financial security of business would be conducted using VAR modeling using the following equation:

\[
\begin{bmatrix}
D(FBS_t) \\
D(\text{inf}_t) \\
D(TB_t) \\
D(SE_t) \\
D(GII_t)
\end{bmatrix}
= \begin{bmatrix}
\text{CointEq}^{FBS} \\
\text{CointEq}^{\text{inf}} \\
\text{CointEq}^{TB} \\
\text{CointEq}^{SE} \\
\text{CointEq}^{GII}
\end{bmatrix}
\begin{bmatrix}
a_0^{FBS} \\
a_0^{\text{inf}} \\
a_0^{TB} \\
a_0^{SE} \\
a_0^{GII}
\end{bmatrix}
+ \begin{bmatrix}
a_p^{FBS}(L) \\
a_p^{\text{inf}}(L) \\
a_p^{TB}(L) \\
a_p^{SE}(L) \\
a_p^{GII}(L)
\end{bmatrix}
\begin{bmatrix}
D(FBS_{t-p}) \\
D(\text{inf}_{t-p}) \\
D(TB_{t-p}) \\
D(SE_{t-p}) \\
D(GII_{t-p})
\end{bmatrix}
+ \begin{bmatrix}
\varepsilon_t^{FBS} \\
\varepsilon_t^{\text{inf}} \\
\varepsilon_t^{TB} \\
\varepsilon_t^{SE} \\
\varepsilon_t^{GII}
\end{bmatrix}
\]  

(4)

where \( D(FBS_t) \) – the first differences in the level of financial security of business; \( D(\text{inf}_t) \) – the first differences in inflation; \( D(TB_t) \) – the first differences in tax burden; \( D(SE_t) \) – the first differences in the level of shadow economy; \( D(GII_t) \) – the first differences in the Global Innovation Index; \( \text{CointEq}^i \) – a member of regression residue correction; \( a_0^i \) – zero coefficient; \( a_p^i(L) \) – a polynomial of the lag operator; \( p \) – the order of the model; \( \varepsilon_t^i \) – vector of random variables.
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Results. In the first stage, this study assessed the financial security level of business in 10 countries from 2015 to 2020. The assessment results (Table 2) show significant differences in the level of financial security of businesses in some countries. Austria, Italy, Poland, Croatia, and Romania have the highest levels of financial security. At the same time, businesses in Ukraine, Azerbaijan, and Bulgaria have the lowest levels of financial security.

Table 2. The results of assessing the level of financial security of business

| Country   | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|-----------|------|------|------|------|------|------|
| Austria   | 0.84 | 0.86 | 0.83 | 0.85 | 0.85 | 0.84 |
| Azerbaijan| 0.66 | 0.65 | 0.66 | 0.67 | 0.69 | 0.68 |
| Bulgaria  | 0.64 | 0.63 | 0.63 | 0.62 | 0.64 | 0.65 |
| Georgia   | 0.71 | 0.70 | 0.71 | 0.72 | 0.73 | 0.72 |
| Spain     | 0.68 | 0.69 | 0.69 | 0.68 | 0.70 | 0.70 |
| Italy     | 0.74 | 0.76 | 0.76 | 0.79 | 0.80 | 0.83 |
| Poland    | 0.71 | 0.73 | 0.74 | 0.74 | 0.76 | 0.75 |
| Croatia   | 0.69 | 0.71 | 0.72 | 0.73 | 0.75 | 0.76 |
| Romania   | 0.69 | 0.72 | 0.73 | 0.74 | 0.74 | 0.76 |
| Ukraine   | 0.55 | 0.57 | 0.59 | 0.57 | 0.56 | 0.54 |

Sources: developed by authors based on World Data Bank data.

These features are due to several economic and political reasons that determine the nature of the business environment in the country and affect the performance of economic entities. To consider the impact of these factors on the level of financial security of business, we will conduct an econometric analysis of the relationship between these indicators. Among the economic drivers of the formation of the business’s financial security, the level of the tax burden on business, the level of shadowing of the economy, and the level of inflation are considered. As part of the study of the impact of the innovation component on the business’s financial security, its dependence on the level of innovative development of the country, on the example of the Global Innovation Index, is analyzed. This study tests the identified hypotheses by evaluating the parameters of the models of end-to-end regression, regression with fixed individual effects, and regression with random individual effects. The formalization of the established interdependencies was carried out with the help of one of the models. According to the model’s pairwise comparison of the parameters, it most fully describes the relationships between indicators. In the first stage, using the Wald test, the regression model parameters with fixed individual effects were compared (Table 3).

Table 3. The results of the Wald test

| Country   | F test | Prob > F | Country   | F test | Prob > F |
|-----------|--------|----------|-----------|--------|----------|
| Austria   | 41.22  | 0.0000   | Italy     | 44.26  | 0.0000   |
| Azerbaijan| 52.17  | 0.0000   | Poland    | 43.29  | 0.0000   |
| Bulgaria  | 59.15  | 0.0000   | Croatia   | 51.36  | 0.0000   |
| Georgia   | 49.74  | 0.0000   | Romania   | 59.53  | 0.0000   |
| Spain     | 25.26  | 0.0000   | Ukraine   | 57.36  | 0.0000   |

Sources: developed by authors.

Critical values of less than 10% were obtained for all analyzed indicators. It suggests that the regression model with fixed effects better describes the relationship between indicators than a simple regression model. The results of calculating the relationship between the analyzed indicators using the Broysch-Pagan test (Table 4) indicate the feasibility of using a model with combined regression to formalize the dependences we analyzed. For Australia, Georgia, Italy, and Poland, p-level values are less critical (10%), which indicates a lack of relationship between the analyzed indicators.
The obtained results allow building an equation of dependence of the level of financial security of business on the level of shadowing of the economy in the country. The obtained equations have the following form:

\[ FBS_{AST} = -2.0216 - 0.5407SE_{t-1} \]
\[ FBS_{AZB} = -6.4231 - 0.1172SE_{t-2} \]
\[ FBS_{BUL} = -3.6402 - 0.2705SE_{t-1} \]
\[ FBS_{GRG} = -0.8750 - 0.1834SE_{t-1} \]
\[ FBS_{SPN} = -3.9027 - 0.2122SE_{t-2} \]
\[ FBS_{PL} = -1.7374 - 0.2784SE_{t-1} \]
\[ FBS_{POL} = -1.3033 - 0.3526SE_{t-1} \]
\[ FBS_{CRT} = -3.621 - 0.0250SE_{t-1} \]
\[ FBS_{ROM} = -5.6230 - 0.0117SE_{t-1} \]
\[ FBS_{UKR} = -3.8289 - 0.6907SE_{t-1} \]
Thus, the results show the impact of the shadow economy on the level of the business's financial security for all analyzed countries. In all the analyzed countries, the shadowing of the economy has a negative impact on the financial security of the business. In Ukraine, a shadowing economy rise of 1% led to the business's financial security decrease by 0.6907%, in Azerbaijan by 0.5407%, in Bulgaria by 2.705%. The study results of the impact of other drivers on the level of financial security of business showed a significant positive impact of the Global Innovation Index and the negative relationship of financial security of business with the levels of tax burden and inflation. One of the advantages of using this method is the ability to consider the dual nature of the relationship between the studied indicators. In the system of economic relations, each analyzed factor is both an object and a subject of influence. In addition, the use of some data for a certain time necessitates the need to consider both the natural nature of changes in the analyzed indicators and the leveling of the random component.

In the first stage, this study conducted a regression analysis of the relationship between the businesses' financial security and the country's economic and innovative development indicators. Table 6 shows the fragment of calculations. It confirms the close relationship between the indicators (the presence of a constant was rejected in the evaluation process).

Table 6. Parameters of the regression equation between drivers of the level of financial security of business on the example of Australia

|         | Coef.   | Std. Err. | T     | p > |t|l | [95% Conf. Interval] |
|---------|---------|-----------|-------|-----|---|---------------------|
| **FBS** |         |           |       |     |   |                     |
| inf     | 1.364589| 0.007126  | 183.60| 0   |   | 1.348469 1.380707   |
| TB      | 1.274013| 0.006428  | 190.01| 0   |   | 1.259471 1.288553   |
| SE      | 7.782006| 0.214944  | 34.70 | 0   |   | 7.295769 8.268242   |
| GII     | 3.016057| 0.018     | 160.64| 0   |   | 2.975338 3.056777   |

Sources: developed by authors.

Similar results were obtained for the other analyzed countries. At the same time, these results (despite the high level of statistical significance (0.99) do not consider the presence of indirect influence of factor characteristics on the resulting indicator and other factor characteristics in the middle of the system). To eliminate this shortcoming, we will analyze the presence of multiple influences between indicators using VAR modeling. In the first stage, this study used the Dickie-Fuller test to test the series of data analyzed by us for stationarity (Table 7). The calculations show the non-stationarity of the analyzed data series. In contrast, the analysis of the first differences in the logarithmic series allows assuming their possible cointegration.

Table 7. The results of the Dickie-Fuller test on the example of Australia

|         | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---------|----------------|-------------------|------------------|-------------------|
| Z(t)    | -1.190         | -3.750            | -3.000           | -2.630            |
| D.FBS   | Coef.          | Std. Err.         | t                | p > |t|l | [95% Conf. Interval] |
| FBS     |                |                   |                  |                   |
| L1.     | -0.24467       | 0.20566           | -1.02            | 0.27              | -0.899180 0.409842 |
| LD      | -0.04097       | 0.40662           | -0.09            | 0.79              | -1.334999 1.253062 |
| L2D     | 0.01846        | 0.68147           | 0.03             | 0.84              | -2.150281 2.187210 |
| _cons   | 2.966929       | 0.68147           | 1.00             | 0.28              | -5.080223 11.014985 |

Sources: developed by authors.

The next stage determines the duration of the time lag due to which the impact of each indicator is the largest. Table 8 shows that for most indicators, the time lag is insignificant.
Table 8. The results of calculating the time lag of the impact of factor indicators on the resulting financial security for the analyzed countries

| Country      | inf | TB | SE | GII |
|--------------|-----|----|----|-----|
| Austria      | 1   | 1  | 1  | 2   |
| Azerbaijan   | 1   | 1  | 1  | 2   |
| Bulgaria     | 2   | 1  | 1  | 1   |
| Georgia      | 1   | 2  | 1  | 1   |
| Spain        | 2   | 1  | 1  | 1   |
| Italy        | 1   | 1  | 1  | 1   |
| Poland       | 2   | 1  | 1  | 2   |
| Croatia      | 1   | 2  | 1  | 1   |
| Romania      | 1   | 1  | 1  | 1   |
| Ukraine      | 2   | 1  | 1  | 1   |

Sources: developed by authors.

Confirmation of the non-stationary and cointegration of data series allows concluding that it is appropriate to formalize the relationship between the level of financial security of the business and the drivers of its format. Table 9 shows the fragment of VEC modeling. It allows constructing the equation of the dependence of the business's financial security on inflation, shadowing of the economy, tax burden, and innovation development index.

Table 9. VEC model parameters on the example of Australia

| Coef. | Std. Err. | t  | p>|t| | [95% Conf. Interval] |
|-------|-----------|----|-----|-------------------|
| inf   | -2.4835   | 0.2673 | -8.89 | 0.0000 | -3.0075 | -1.9596 |
| TB    | -0.6032   | 0.2579 | 2.22  | 0.0182 | 0.0977  | 1.1087  |
| SE    | -7.1341   | 0.5654 | -12.08| 0.0000 | -8.2423 | -6.0260 |
| GII   | 1.1562    | 0.5267 | 2.11  | 0.0268 | 0.1259  | 2.1905  |

Sources: developed by authors.

The co-integration VEC model of the dependence of financial security of business on economic and innovative determinants of the country’s development for Australia will be as follows:

\[
\begin{align*}
FBS_{t}^{SE} & = -2.4835 \ln inf_{t-1} - 0.6032 \ln TB_{t-1} - 7.1341 \ln SE_{t-1} + 1.1562 \ln GII_{t-1} \\
FBS_{t}^{AEB} & = -2.1478 \ln inf_{t-1} - 0.7896 \ln TB_{t-1} - 5.5478 \ln SE_{t-1} + 1.2364 \ln GII_{t-1} \\
FBS_{t}^{BOL} & = -2.0325 \ln inf_{t-2} - 0.8547 \ln TB_{t-2} - 4.6325 \ln SE_{t-1} + 1.1751 \ln GII_{t-1} \\
FBS_{t}^{RD} & = -1.9856 \ln inf_{t-1} - 0.7254 \ln TB_{t-2} - 5.2504 \ln SE_{t-1} + 1.3015 \ln GII_{t-1} \\
FBS_{t}^{SPN} & = -2.3625 \ln inf_{t-2} - 0.5804 \ln TB_{t-1} - 4.2365 \ln SE_{t-1} + 1.2451 \ln GII_{t-1} \\
FBS_{t}^{TCL} & = -2.2012 \ln inf_{t-1} - 0.6012 \ln TB_{t-1} - 3.2458 \ln SE_{t-1} + 1.1302 \ln GII_{t-1} \\
FBS_{t}^{PLO} & = -2.0124 \ln inf_{t-2} - 0.5470 \ln TB_{t-1} - 4.0324 \ln SE_{t-1} + 1.0364 \ln GII_{t-1} \\
FBS_{t}^{CRT} & = -2.0365 \ln inf_{t-1} - 0.6125 \ln TB_{t-2} - 7.2452 \ln SE_{t-1} + 0.7245 \ln GII_{t-1} \\
FBS_{t}^{ROM} & = -2.1023 \ln inf_{t-1} - 0.7165 \ln TB_{t-1} - 6.2356 \ln SE_{t-1} + 0.6045 \ln GII_{t-1} \\
FBS_{t}^{UKR} & = -1.8065 \ln inf_{t-2} - 0.6852 \ln TB_{t-1} - 5.2415 \ln SE_{t-1} + 1.0312 \ln GII_{t-1} \\
\end{align*}
\]

Conclusions. Thus, the analysis results conclude about the average level of business’s financial security in most of the analyzed countries. These results confirm the need to implement measures to increase the financial potential of companies and increase their level of financial security. One of the most
effective tools in this area is the management of the main drivers of financial security. To this end, the impact of economic and innovative drivers on the level of financial security of business was formalized. The significant negative impact of inflation, tax burden, and shadow economy on a business’s financial security has been proved. At the same time, the country’s innovative development creates a favorable environment for the safe operation of the business.

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Yilmaz, D. (2007, June). Financial Security and Stability, Measuring and Fostering the Progress of Societies. In Paper presented by The OECD World Forum on Statistics, Knowledge and Policy (p. 9).
роботі висуно гіпотезу про наявність статистично значущого впливу економічних, інноваційних та маркетингових детермінант на рівень фінансової безпеки бізнесу. Для перевірки гіпотези використано тести Дікі-Фулера та Йохансена. Достовірність отриманих результатів та характер взаємозв'язку між показниками перевірено шляхом побудови рівняння наскрізної регресії (тест Вальда), регресії з фіксованими індивідуальними ефектами (тест Бруша-Пегана) та регресії з випадковими індивідуальними ефектами (тест Хаусмана). За результатами дослідження запропоновані заходи підвищення рівня фінансової безпеки бізнесу та мінімізації негативного впливу окремих детермінант.

Ключові слова: фінансова безпека, маркетингові детермінанти, стабільність бізнесу, економічний розвиток.