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HAVE COVID-19 AND THE WAR IN UKRAINE CAUSED A DECLINE IN THE VALUE RELEVANCE OF ACCOUNTING INFORMATION? EVIDENCE FROM POLAND

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Abstract

Research background: Within the research area of value relevance (VR), the impact of macroeconomic changes is usually analysed. The influence of economic crises, such as the Asian financial crisis, global financial crisis, and COVID-19, on VR was, however, inconclusive. Moreover, it differs between individual markets.
Purpose: The aim of the paper was to analyse the impact of COVID-19 and the war in Ukraine on the value relevance with the example of Polish listed companies. VR of earnings, book values, and cash flows was taken into account in this regard.
Research methodology: Panel data models (fixed effects) were used. The focus was especially on interactions between earnings per share (EPS), book values per share (BVPS), cash flows per share (CFO), and binary variables referring to periods of COVID-19 and the war in Ukraine.
Results: VR of earnings, book values, and cash flows noted the positive impact of COVID-19. However, the war affected book values and cash flows negatively. The results obtained highlight the specificity of different crises and various markets, with the findings being only partially in line with the results of previous studies.
Novelty: So far, the impact of the war in Ukraine on VR has not been analysed. Moreover, the influence of COVID-19 on VR on the Polish market has also not been studied.

Keywords: value relevance, COVID-19, war in Ukraine, economic crisis

JEL classification: G10, M40, M41

Introduction

Recently, economic crises have been described more in the economic literature due to the outbreak of the COVID-19 pandemic and its consequences for the global economy. It is a common view (for instance Ali, Alam, Rizvi, 2020; Zhang, Hu, Ji, 2020; Albulescu, 2021), that such events significantly affected financial markets, similarly as a result of the global financial crisis (GFC) that started in 2007 (and other, smaller-scale crises, such as the Asian crisis or the Mexican currency crisis). Moreover, especially with regard to European countries, the impact of the war in Ukraine on financial markets has also recently been considered (for instance Guénette, Kenworthy, Wheeler, 2022; Lo, Marcelin, Bassène, Sène, 2022; Izzeldin, Muradoğlu, Pappas, Petropoulou, Sivaprasad, 2023).

Although the drivers of financial crises and crises resulting from pandemics or wars are different, they impact the financial market similarly – after the outbreak of such events, share prices usually sharply decline and market volatility significantly increases (Izzeldin, et al., 2023). Among the consequences of such events, there are increasing sovereign borrowing costs and the substantial losses of financial institutions (Guénette et al., 2022). Generally, the impact of a given crisis on financial markets is higher when associated with the greater influence of such crisis on the economy or society – for instance, the reaction of individual stock markets was associated with the severity of the COVID-19 pandemic (Zhang et al., 2020), while the impact of war in Ukraine was stronger for developed countries, noticeably dependent on Russian fuel commodities (Lo et al., 2022). Particularly, European countries are mostly affected by the recent significant crises:

- As a result of the GFC that started in 2007, regional volatility increased in Europe more than in East Asia (Johansson, 2011),
- COVID-19 spread especially acutely in Europe and the United States (Zhang et al., 2020),
- The impact of the war in Ukraine noticeably concerns European countries due to the historical trade connections – inter alia significant exports from Ukraine and Russia to Europe (Mbah, Wasum, 2022).

The GFC affected European countries mostly due to the financial interdependencies between individual countries (Burzala, 2016). On the other hand, the impact of COVID-19 on financial markets was mainly driven by contagion effects (Iwanicz-Drozdowska, Rogowicz, Kurowski, Smaga, 2021). The reaction of investors to the outbreak of war in Ukraine was more prompt in comparison to the GFC and COVID-19 outbreaks. However, in the view of Izzeldin

et al., (2023) the impact of such an event was predicted to strongly affect economic growth and inflation in the full 2023 year, similarly as a result of the GFC or COVID-19 outbreak.

Economic crises driven by different events similarly affect financial markets initially after the crisis outbreak. However, the strength and duration of such influence noticeably differ due to the crisis drivers and geographical context. Therefore, it is purposeful to analyse the impact of recent crises on financial markets in this regard. The aim of the paper is to verify the impact of COVID-19 and the war in Ukraine on the VR of Polish entities. No studies focusing on verification of the impact of the war in Ukraine on VR were identified. Moreover, to the author's best knowledge, there has been no research conducted on the verification of COVID-19's impact on VR of accounting information in Polish companies.

To analyse the impact of COVID-19 and the war in Ukraine on VR, panel data models (fixed effects) were employed. Separate models were built for earnings, book values, and cash flows as well as models including variables referring to earnings and book values or book values and cash flows. Quarterly data for 2017–2023 (third quarter 2017 to second quarter 2023), obtained from Orbis BvD Info database, were used in the study. The research sample concerned Polish listed companies.

The first section concerns a literature review on VR research with a particular focus on VR changes resulting from economic crises' occurrence. In the next part of the paper, research methods are described and the sample is specified. The third section comprises the results of empirical research conducted and their comparison with the findings of other authors, while the last section includes conclusions, implications from the research, and limitations of the study.

1. Literature review

1.1. General overview of value relevance research

VR refers to the usefulness of accounting data in investing. It assumes that there are links between accounting variables and market values, such as share price or rate of return (Barth, Beaver, Landsman, 2001) – changes in the accounting actuals are reflected in market values (future-oriented). According to the generally accepted and commonly used (even since the 19th century) discounted cash flows model, the market value of a given company could be expressed as the present value of future cash flows for its owners (Brackenborough, McLean, Oldroyd, 2001). Hence, the valuation at the t moment assumes a specified income to be generated by the company in the following years. For instance, while the actual income for the $t + 1$ period is

lower than previously expected, the market value might decline. In empirical studies within VR, market values are used as dependent variables, while explanatory variables are accounting numbers (Beisland, 2009). Such analyses concern mainly: (i) VR of earnings (that are the approximation for the income for shareholders) and book values (capturing not only the level of equity but also its changes e.g. due to the income generated in a given period), (ii) VR of alternative accounting measures, (iii) changes in VR over time, (iv) the impact of accounting regulations, such as the implementation of International Financial Reporting Standards (IFRS) or local standards on VR, (v) the impact of economic events on VR (Beisland, 2009; Barth, Li, McClure, 2023). The research focusing on the impact of economic crises on VR is part of the (v) area.

VR of earnings, book values and cash flows (a significant relationship between actual earnings, book values or cash flows and the changes in share price/rate of return in the following period) have already been identified for different markets and periods (e.g. Chen, Chen, Su, 2001; Dontoh, Radhakrishnan, Ronen, 2004; Witkowska, 2006; Filip, Raffournier, 2010; Ebaid, 2011; Kimouche, Rouabi, 2016; Ji, 2017; Almujamed, Alfraih, 2020; Ertugrul, 2021; Mustun, Abdul Wahab, 2023). However, there is a view on the decline in VR over the last few decades, inter alia as a result of a shift to a more service-based economy (Balachandran, Mohanram, 2011; Khanna, 2014; Barth et al., 2023). On the other hand, Keener (2011) and Barth et al. (2023) found no empirical support for such opinions. Moreover, they stated that some evidence regarding the increase in VR was identified. For instance, a decline in VR of earnings is often compensated by a higher VR of equity, or inversely (Devalle et al., 2010; Navdal, 2010; Srivastava, Muharam, 2021).

The research on VR were focused also on the Polish market. In this example, Gornik-Tomaszewski and Jermakowicz (2001) as well as Witkowska (2006) confirmed a significant VR of earnings and book values. However, according to R. Bilicz (Gruszczyński et al., 2016)[1], VR was not robust for the different phases of the business cycle (recovery and recession). Furthermore, the implementation of IFRS did not positively affect VR in Poland (Dobija, Klimczak, 2010; Klimczak, 2011).

Generally, VR research is still a current subject in the economic literature, moreover, interest in which is recently growing[2]. New research areas, concerning for instance the

[1] The paper of Gruszczyński et al. (2016) is a summary of several papers concerning VR, including the one written by R. Bilicz.

[2] According to the Scopus database, searching articles by "value relevance" term in "Business, Management and Accounting" and "Economics, Econometrics and Finance" areas gave: 443 results until 2010, 801 until 2015 (+358 from 5 years), 1,289 until 2020 (+488 from 5 years), and 1,606 until in 2023 (+317 from 3 years).

implementation of IFRS, Environmental, Social and Governance (ESG) disclosures, or economic crises, have recently emerged within it. Hence, studies focusing on the associations between macroeconomic phenomena, such as economic crises, and VR are purposeful.

1.2. VR and economic crises

Economic crises significantly differ with regard to their source – for instance, financial bubbles' burst (the Internet bubble, the GFC that started in 2007), foreign exchange fluctuations (Mexican and Asian crises), or other non-economic shocks (the Egyptian revolution, COVID-19). However, economic crises usually affect financial markets as a result of growing uncertainty and behavioural factors (Hoffmann, Post, Pennings, 2013). Therefore, a comparison of the impact of economic crises caused by different drivers on the VR of accounting information might be considered useful. A literature review was conducted in this regard. Its results are presented in Appendix 1. For the literature review, there were selected only papers: (i) thematically relevant, (ii) written in English, (iii) focused on non-financial companies, (iv) with access to full-text.

Different crises and the value relevance

The impact of economic crises on VR was usually analysed with regard to the GFC that started in 2007. Among the markets taken into account, there were both developed and emerging economies. For emerging markets, there were mostly inconclusive results obtained – it applies to Brasil, Malaysia, South Korea, or Greece. Persakis and Iatridis (2015) found a significant decline in VR for 2 clusters, while in the third ("outsider economies with strong outsider protection and legal enforcement and clusters") – VR noticeably increased. As accounting information is generally less value-relevant in emerging markets, stock exchanges did not note significant declines in VR due to the GFC.

The impact of the GFC on VR was also analysed with regard to:

a) Macroeconomic indicators – indices such as inflation rate and central bank deposit rate partially lost VR during the crisis (Bilgic et al., 2018),
b) Investments in human capital – the crisis increased their VR (Garciía-Zambrano et al., 2018),
c) Multinationality of companies – a significant association with companies' valuation was not interrupted by the crisis (Lee et al., 2015).

Apart from the GFC, other economic crises were also the subject of VR research. Davis-Friday and Gordon (2002) identified an increase in the VR of book values during the Mexican currency crisis, but a decline for earnings. D'Mello and Gruskin (2013) found a positive impact

of the Internet bubble burst on VR (which concerned especially NASDAQ entities), but an opposite direction for the GFC. In the view of Demers and Lev (2002), web traffic metrics were value-relevant. Moreover, they remained significant in Internet companies' valuation after the Internet bubble burst. Morris and Alam (2012) found that despite the general decline in the degree of VR, there was no such impact identified for low-tech companies. Referring to the Egyptian revolution crisis of 2011, there was indicated a significant increase in the VR of discretionary earnings, but no noticeable changes were identified for non-discretionary accruals (Abdallah, 2019).

According to Belesis et al. (2022) and Liu and Sun (2022), as a result of the COVID-19 pandemic, financial statements became less value-relevant, which was mainly driven by a decreasing VR of earnings. Shawn, Choi, Kang and Choi (2021) argued that COVID-19 negatively affected the VR of net assets i.e. liquidation value, while the decrease in VR of earnings was mainly driven by the negative impact of accruals. Ali (2023) stated that accounting earnings remained value-relevant even during the COVID-19 period. Such results concerned the total analysed sample, however, there was a significant differentiation for individual industries taken into account. Răpan (2021) identified the negative impact of COVID-19 on the VR with regard to other comprehensive income and its components, while it was not true for general comprehensive income. Another view on changes in VR resulting from COVID-19 was provided by Hamid et al. (2022). It was found that earnings were value-relevant after the implementation of new business reporting standards. Simultaneously, COVID-19 accelerated the usage of digital reporting which positively affected the application of such standards.

Referring to the papers that were subject to the analysis, no evidence for the positive impact of the Asian crisis on VR as well as for the negative impact of the Internet bubble burst was found. For the GFC and COVID-19, the results obtained also differ significantly. There were found 8 papers indicating the negative impact of the GFC on VR and 6 studies pointing out a positive influence (without counting studies with inconclusive results or no significant impact identified). Regarding COVID-19, it was 5 and 3, respectively. The negative impact of such crises on VR might be explained by a general increase in market uncertainty that causes the sale of shares of companies regarded as financially sound, without significant economic reasons. On the other hand, the positive influence of crises might be a result of a larger focus of investors on traditional, accrual-based measures, considered to be more stable and predictable, in making investment decisions.

Economic crises and value relevance of earnings, book values and cash flows

Generally, it is a common view that during crisis periods, earnings lose their VR. As a company is in financial distress, book values are more relevant for investors – they are more focused on abandonment values (Collins, Maydew, Weiss, 1997). Empirical confirmation for the decrease in VR of earnings under the impact of a crisis was provided for instance by Graham et al. (2000), Davis-Friday and Gordon (2002), Navdal (2010), Hail (2013), Mion et al. (2014), or Almujamed and Alfraih (2019). However, Bepari et al. (2013) and Kousenidis et al. (2013) identified an increase in the VR of earnings as a result of the GFC, while Belesis et al. (2019) – found no significant changes in this regard. Such different results might be affected inter alia by the lower extent of earnings management during crises (Kousenidis et al., 2013). According to Sahlian et al. (2023), in periods of crises (based on the GFC and COVID-19 pandemic) and recoveries, a significantly greater focus of investors is on accounting measures, i.e. earnings and book values. As a result, ESG disclosures, more subjective measures, were more value-relevant only before the crisis periods. The results obtained by Dos Santos and Tavares (2023) supported the significant VR of ESG measures in both crisis and recovery periods, however.

Although the focus of VR research is mainly on earnings and book values (equity), cash flows were also taken into account in some research. Operating cash flows became less value-relevant as a result of the GFC occurrence in the view of Bepari et al. (2013), Tahat (2017) and Choi et al. (2022). On the contrary were findings concerning the Asian financial crisis – Ho et al. (2001) and Gurarda et al. (2016) identified a positive impact of the crisis on the VR of cash flows. Moreover, different were the results obtained by Choi et al. (2011) and Eugenio et al. (2019), who pointed out no noticeable changes resulting from the outbreak of a crisis with regard to cash flows. According to Al-Hares et al. (2012), dividends were not significantly value-relevant mixed with earnings. However, in crisis periods, dividends could substitute earnings in terms of VR. After the outbreak of a crisis, cash flows might be to some extent managed – it results in larger cash inflows in the crisis period at the expense of the next year (Bepari et al., 2013). On the other hand, crisis periods are usually associated with higher bankruptcy risk. Therefore, investors mostly focus on the ability of a given company to repay debt which is reflected in cash flows (Ho et al., 2001).

Crises and the value relevance of alternative accounting measures

There were some research focusing on the impact of a given crisis on the VR of specific accounting measures, other than those usually used in VR research, such as the mentioned

ESG disclosures. Badenhorst and Ferreira (2016) analysed the impact of the crisis on the VR of deferred tax assets. Referring to the results obtained, they stated that such assets were comparably value-relevant in the United Kingdom and in Australia. However, a negative impact of the crisis concerned only Australian companies, mainly due to the tax regulations. Pechlivanidis et al. (2022) proved the significant VR of goodwill. Moreover, it became more value-relevant as a result of the occurrence of the crisis. Kwon (2013) analysed the VR of donation and advertising expenditures. His results showed that donations are more value-relevant than advertising expenses in non-crisis times, however, advertising expenditures outperform donations in terms of VR during crisis periods.

Mitrione et al. (2014) identified the significant VR of capitalised research and development (R&D) expenses during the financial crisis, while such a situation was not observed before its outbreak. On the other hand, current R&D expenses (costs of the period) did not noticeably change their VR as a result of the GFC. According to Kalantonis et al. (2020), the crisis did not significantly affect VR – it concerned companies that disclose R&D information in their financial statements.

Liao, Kang and Morris (2021) found a greater VR of accounting measures based on fair value over items based on historical cost during the financial crisis. However, there was no such advantage of fair value before the crisis. Adwan et al. (2020) found that the extent of VR changes driven by the outbreak of the financial crisis was lower for companies more extensively using fair value accounting.

As described above, the results regarding the impact of economic crises on VR are different. It differs between individual crises, different stock markets, and accounting measures (earnings, book values, cash flows as well as alternative indices). Therefore, the results of the analysis focusing on Poland, an emerging market, seem to be useful from the investors' perspective as it can be different than expected based on the evidence from other European developed markets.

2. Research design

2.1. Hypotheses and models

The main research hypotheses (H1 and H2) refer to the total impact of COVID-19 and the war in Ukraine on VR. Supplementary hypotheses (H1a–H1c, H2a–H2c) concern the impact of economic crises on the VR of earnings, book values (equity), and cash flows. Hypotheses were developed assuming a negative impact of economic crises on VR, which is supported for

instance by Iatridis and Dimitras (2013), Eugenio et al. (2019), Belesis et al. (2022) and Liu and Sun (2022). They are as follows:

(H1): COVID-19 negatively affected the value relevance.

(H1a): COVID-19 negatively affected the value relevance of earnings.

(H1b): COVID-19 negatively affected the value relevance of book values.

(H1c): COVID-19 negatively affected the value relevance of cash flows.

(H2): War in Ukraine negatively affected the value relevance.

(H2a): War in Ukraine negatively affected the value relevance of earnings.

(H2b): War in Ukraine negatively affected the value relevance of book values.

(H2c): War in Ukraine negatively affected the value relevance of cash flows.

Variables used in the research are pointed out below in Table 1.

Table 1. Set of variables used in the research

Variable	Source (examples)	Formula
Dependent variable		
Share price	(Hail, 2013; Kwon, 2013; Răpan, 2021; Belesis et al., 2022; Liu, Sun, 2022)	P = share price at the end of a given period
Independent variables		
Earnings per share	(Graham et al., 2000; Bilgic et al., 2018; Al-Refiay, 2023; Sahlian et al., 2023)	$EPS = \frac{\text{Net profit}}{\text{Number of shares}^*}$
Book value per share	(Keener, 2011; da Costa et al., 2012; Almujamed, Alfraih, 2018)	$BVPS = \frac{\text{Shareholder's equity}}{\text{Number of shares}}$
Operating cash flows per share	(Ho et al., 2001; Bepari et al., 2013; Tahat, 2017; Choi et al., 2022)	$CFO = \frac{\text{Net operating cash flows}}{\text{Number of shares}}$
Economic crisis	(Davis-Friday et al., 2006; Choi et al., 2011; Al-Hares et al., 2012; Kane et al., 2015; Aljawaheri et al., 2021)	$COV = \begin{cases} 1 \text{ for COVID-19 period} \\ 0 \text{ otherwise} \end{cases}$ $WAR = \begin{cases} 1 \text{ for war in Ukraine period} \\ 0 \text{ otherwise} \end{cases}$

* Number of shares at the beginning of the period – it applies to EPS, BVPS, and CFO.

Source: author's own elaboration.

In the research, panel data models (fixed effects) were used. Initially, the following benchmark models were estimated:

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \varepsilon_{i_t} \quad (1)$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \varepsilon_{i_t} \tag{2}$$

$$P_{i_t} = \beta_0 + \beta_1 \times CFO_{i_t} + \varepsilon_{i_t} \tag{3}$$

To test hypotheses, models 1-3 were further extended by adding variables referring to the impact of economic crises:

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times COV_t + \beta_3 \times EPS_{i_t} \times COV_t + \varepsilon_{i_t} \tag{4}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times COV_t + \beta_3 \times BVPS_{i_t} \times COV_t + \varepsilon_{i_t} \tag{5}$$

$$P_{i_t} = \beta_0 + \beta_1 \times CFO_{i_t} + \beta_2 \times COV_t + \beta_3 \times CFO_{i_t} \times COV_t + \varepsilon_{i_t} \tag{6}$$

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times WAR_t + \beta_3 \times EPS_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{7}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times WAR_t + \beta_3 \times BVPS_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{8}$$

$$P_{i_t} = \beta_0 + \beta_1 \times CFO_{i_t} + \beta_2 \times WAR_t + \beta_3 \times CFO_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{9}$$

In the next step, combined models for earnings and book values as well as cash flows and book values were built. Earnings and cash flows were not mixed in one model to avoid collinearity issues as the information value of these categories is often at least partially consistent (Dechow, Kothari, Watts, 1998). One interaction between COV or WAR and the independent variable was added for each model to avoid the multicollinearity issue. Therefore, the following models, considered final, were built:

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times BVPS_{i_t} + \beta_3 \times COV_t + \beta_4 \times EPS_{i_t} \times COV_t + \varepsilon_{i_t} \tag{10}$$

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times BVPS_{i_t} + \beta_3 \times COV_t + \beta_4 \times BVPS_{i_t} \times COV_t + \varepsilon_{i_t} \tag{11}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times CFO_{i_t} + \beta_3 \times COV_t + \beta_4 \times BVPS_{i_t} \times COV_t + \varepsilon_{i_t} \tag{12}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times CFO_{i_t} + \beta_3 \times COV_t + \beta_4 \times CFO_{i_t} \times COV_t + \varepsilon_{i_t} \tag{13}$$

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times BVPS_{i_t} + \beta_3 \times WAR_t + \beta_4 \times EPS_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{14}$$

$$P_{i_t} = \beta_0 + \beta_1 \times EPS_{i_t} + \beta_2 \times BVPS_{i_t} + \beta_3 \times WAR_t + \beta_4 \times BVPS_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{15}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times CFO_{i_t} + \beta_3 \times WAR_t + \beta_4 \times BVPS_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{16}$$

$$P_{i_t} = \beta_0 + \beta_1 \times BVPS_{i_t} + \beta_2 \times CFO_{i_t} + \beta_3 \times WAR_t + \beta_4 \times CFO_{i_t} \times WAR_t + \varepsilon_{i_t} \tag{17}$$

2.2. Sample

Industries were set in line with the NACE Rev. 2 classification. Companies from sector F (financial and insurance activities) were excluded from the sample. The breakdown of the sample by industry is presented in Table 2.

Table 2. Sample breakdown by industry

Industry according to NACE Rev. 2 classification	Number of companies	Share (%)
C – Manufacturing	224	34.8
G – Wholesale and retail trade; repair of motor vehicles and motorcycles	95	14.8
J – Information and communication	91	14.2
M – Professional, scientific and technical activities	67	10.4
F – Construction	42	6.5
D – Electricity, gas, steam and air conditioning supply	20	3.1
L – Real estate activities	18	2.8
Q – Human health and social work activities	17	2.6
N – Administrative and support service activities	16	2.5
H – Transportation and storage	12	1.9
O – Public administration and defence; compulsory social security	11	1.7
S – Other service activities	10	1.6
Other industries	20	3.1
Total	643	100.0

Source: author's own elaboration based on the data from Orbis BvD Info database.

Despite the significant share of companies from the first few sectors, industry dummies were not included in the models due to the collinearity issues.

In the study, quarterly financial data was used. Outliers (1% highest and 1% lowest values of each explanatory variable) were removed from the sample. The period included in the study is the third quarter of 2017 (3q17) to the second quarter of 2023 (2q23). 1q20–1q22 was considered as the COVID period (COV), while 1q22–2q23 – as the period related to the war in Ukraine (WAR). In 1q20, COVID-19 spread across Europe and individual governments carried out the first measures to prevent it from spreading. In the middle of 2q22, the World Health Organization announced the end of the pandemic – it occurred after several weeks of lower numbers of COVID cases (World Health Organization, 2023). Hence, 1q22 was considered as the end of the COV period. An outbreak of war in Ukraine took place in 1q22. Since the conflict is ongoing, the latest available quarterly data was taken as the end of the WAR period.

3. Findings and discussions

3.1. Descriptive statistics

At first, descriptive statistics were calculated to provide some initial insight into the data. The results are shown below in Table 3. Statistics were presented for the whole analysis period and for individual subperiods based on the periods taken into account as COV and WAR ones.

Table 3. Descriptive statistics for continuous variables

Variable	Mean	St. dev.	Var. c.	Min	1Q	2Q	3Q	Max
Total period (3q17–2q23)								
P	41.13	418.04	10.16	0.02	1.04	4.15	16.45	17,113.15
EPS	0.36	2.21	6.07	–10.83	–0.08	0.02	0.39	18.81
BVPS	12.34	24.40	1.98	–4.90	0.58	3.28	12.13	206.99
CFO	0.63	3.24	5.16	–13.61	–0.12	0.01	0.61	27.68
COV = 0 (3q17–4q19 and 2q22–2q23)								
P	39.61	402.22	10.15	0.02	0.91	3.93	15.40	14,621.25
EPS	0.34	2.20	6.55	–10.83	–0.09	0.01	0.38	18.81
BVPS	12.23	23.84	1.95	–4.90	0.61	3.28	12.02	206.99
CFO	0.62	3.26	5.26	–13.61	–0.12	0.02	0.64	27.68
COV = 1 (1q20–1q22)								
P	43.54	441.98	10.15	0.02	1.29	4.48	18.06	17,113.15
EPS	0.41	2.23	5.48	–10.64	–0.07	0.02	0.41	18.70
BVPS	12.50	25.22	2.02	–4.88	0.54	3.28	12.26	205.06
CFO	0.64	3.21	5.02	–13.19	–0.11	0.01	0.57	27.60
WAR = 0 (3q17–4q21)								
P	39.99	408.06	10.20	0.02	0.97	3.84	15.19	17,113.15
EPS	0.34	2.14	6.36	–10.83	–0.09	0.02	0.38	18.81
BVPS	12.07	23.74	1.97	–4.88	0.57	3.20	11.88	206.99
CFO	0.64	3.21	5.01	–13.61	–0.11	0.02	0.63	27.68
WAR = 1 (1q22–2q23)								
P	44.09	443.05	10.05	0.02	1.28	5.42	19.46	14,621.25
EPS	0.44	2.41	5.45	–10.58	–0.07	0.02	0.42	18.56
BVPS	13.09	26.11	2.00	–4.90	0.60	3.50	12.76	202.54
CFO	0.59	3.33	5.62	–13.13	–0.17	0.01	0.56	27.42

Where St. dev. – standard deviation, Var. c. – variance coefficient, 1Q, 2Q, 3Q – 1st, 2nd, 3rd quartile, respectively.

Source: author's calculations.

The distribution of share prices was strongly differentiated as it is to some extent determined by a given company choice from the moment of share issuance. Mean and median share prices were higher in periods of COV and WAR in comparison to the periods considered not to be affected by these situations. After the outbreak of COVID-19 and the war in Ukraine, share prices significantly declined, but they recovered in the next months, achieving even higher levels than before the occurrence of COV and WAR. An increase in average share prices during COVID-19 was also driven by the valuation of companies from the medical and IT industry, due to the growing demand for medical supplies and tech solutions enabling remote work as well as a boom in the gaming market (for instance, CD Projekt SA became the most valuable company on the Warsaw Stock Exchange in terms of capitalisation for a few weeks during the COVID-19 pandemic). Increases in average market valuation during the war in Ukraine were determined for instance by the growing demand for Polish products from Ukrainian citizens who came to Poland after the outbreak of war and the increasing employment of Ukrainian workers that enabled some companies to grow.

Earnings per share were on average higher in the periods of COV and WAR, similar to book values. On the other hand, cash flows per share were negatively affected by the occurrence of war, as they were lower on average then. Generally, it seems that there was no significant negative impact of COVID-19 and the war in Ukraine on VR of earnings and book values, as means and medians for P, EPS, and BVPS increased. However, further evidence is necessary to confirm or reject these preliminary findings.

3.2. Impact of economic crises on value relevance in Poland

Firstly, the association of independent variables with share prices was analysed. The results of the estimation of benchmark models, to which associations between EPS, BVPS, CFO, and P are further compared, are presented in Table 4.

Models (1–3) are statistically significant. There are significant positive dependencies between EPS, BVPS, CFO and share price, which is consistent inter alia with the findings of Mion et al. (2014), Bepari (2015), and Belesis et al. (2019), Davis-Friday et al. (2006), Eugenio et al. (2019), and Pervan and Bartulović (2022), Ho et al. (2001), Choi et al. (2011) and Tahat (2017), respectively. Higher earnings indicate the ability of a company to provide economic benefits to the owners, which is considered one of the main purposes of business activity. Higher equity (book value) decreases the company's financial risk, while cash flows determine the entity's development in the short-term (Dechow et al., 1998; Stępień, 2005).

Table 4. Estimated benchmark models

Model	Variable	Coefficient	Standard error	P-value
1	constant EPS	20.6702 2.2293	0.2352 0.1206	0.0000 0.0000
2	constant BVPS	5.6680 1.3670	0.4694 0.0326	0.0000 0.0000
3	constant CFO	20.6951 0.8395	0.2555 0.0889	0.0000 0.0000
Model	LSDV R^2	Within R^2	P-value	n
1	0.9292	0.0290	0.0000	12,085
2	0.8580	0.1331	0.0000	12,097
3	0.9210	0.0078	0.0000	11,946

Source: author's calculations.

As earnings, book values, and cash flows are considered stimulants (their higher relative values are favourable from the company's view), the obtained results are in line with the expected ones. Hence, further models were built to analyse the impact of economic crises on value relevance. In Table 5., models focusing on the impact of COVID-19 on VR are presented.

In models (4–6) and (10–12), all variables are significant and positively associated with share price, which means that the occurrence of the pandemic positively affected the VR of earnings, book values, and cash flows (which is crucial from the perspective of this research). It is likely that after the outbreak of the pandemic, investors focused more on the main accounting measures considered more stable than indices which were more sophisticated, but more sensitive to economic changes. The positive impact of economic crises such as COVID-19 on VR of earnings and book values was supported by Bepari et al. (2013), Kousenidis et al. (2013), and Sahlian et al. (2023), who identified greater investors' focus on accounting measures such as earnings and book values during the GFC and COVID-19. These findings, however, do not support the results of Navdal (2010), Hail (2013), Mion et al. (2014), or Almujamed and Alfraih (2019) concerning the GFC. As these economic crises were driven by different causes, their impact on VR of earnings is also significantly differentiated. The obtained results with regard to cash flows are in line with those concerning the Asian financial crisis, as pointed out by Ho et al. (2001) and Gurarda et al. (2016), but are contrary to the findings of Tahat (2017) or Choi et al. (2022) regarding the GFC, similarly as for earnings. It seems that in the investors' view companies that were able to generate relative earnings and positive operating cash flows during COVID-19 are entities with strong economic foundations. They are perceived to be still successfully conducting business activities after the crisis event – therefore, it was purposeful

Table 5. Estimated models concerning the impact of COVID-19 on value relevance

Model	Variable	Coefficient	Standard error	P-value
4	constant	19.6440	0.3011	0.0000
	EPS	1.3180	0.1471	0.0000
	COV	2.4897	0.4809	0.0000
	EPS × COV	2.2720	0.2165	0.0000
5	constant	5.1440	0.5163	0.0000
	BVPS	1.2648	0.0338	0.0000
	COV	2.0496	0.5602	0.0003
	BVPS × COV	0.1950	0.0204	0.0000
6	constant	19.1825	0.3280	0.0000
	CFO	0.5251	0.1077	0.0000
	COV	3.7806	0.5224	0.0000
	CFO × COV	0.8112	0.1600	0.0000
10	constant	2.4818	0.4267	0.0000
	EPS	0.4822	0.1318	0.0003
	BVPS	1.3845	0.0309	0.0000
	COV	2.1781	0.4105	0.0000
	EPS × COV	2.3563	0.1940	0.0000
11	constant	2.1736	0.4407	0.0000
	EPS	1.4173	0.1071	0.0000
	BVPS	1.3865	0.0325	0.0000
	COV	2.5150	0.4589	0.0000
	BVPS × COV	0.0453	0.0187	0.0157
12	constant	2.5004	0.4856	0.0000
	BVPS	1.3847	0.0352	0.0000
	CFO	0.3500	0.0817	0.0000
	COV	1.8980	0.5194	0.0003
	BVPS × COV	0.1847	0.0211	0.0000
13	constant	1.7652	0.4737	0.0002
	BVPS	1.4750	0.0338	0.0000
	CFO	–0.1353	0.0997	0.1747
	COV	3.2230	0.4691	0.0000
	CFO × COV	1.2623	0.1475	0.0000
Model	LSDV R^2	Within R^2	P-value	n
4	0.9302	0.0425	0.0000	12,085
5	0.8601	0.1459	0.0000	12,097
6	0.9217	0.0162	0.0000	11,946
10	0.8599	0.1928	0.0000	11,929
11	0.8581	0.1826	0.0000	11,929
12	0.8386	0.1630	0.0000	11,795
13	0.8386	0.1627	0.0000	11,795

Source: author's calculations.

to invest in them during the pandemic, especially as prices dropped briefly after its outbreak in Europe, creating such an opportunity. The findings resulting from models (10–12) are in line with the above-mentioned, but they differ for model (13), in which cash flows became non-significant. However, it does not change the general conclusions of the impact of COVID-19 on VR.

The results regarding the impact of COVID-19 on VR on the Polish market were partially in line with the findings for previous economic crises, such as the Asian crisis or the GFC. However, they might also differ from the results concerning the war in Ukraine. In Table 6., estimated models focusing on the impact of war on VR are presented.

According to models (7–9), the impact of the war in Ukraine on VR of earnings was positive, similar to the case of COVID-19. On the other hand, the war negatively influenced VR of book values and cash flows. Such results are confirmed in models (15–16). However, in models (14) and (17), changes in the sign for the WAR variable (in comparison to models (7–8) and (8–9), respectively) occurred. Therefore, conclusions were not drawn based on these models.

The VR of earnings increased under the war's influence. The generation of positive financial results in times of rapidly growing prices of materials after the outbreak of the war was considered to provide comprehensive information about the company's ability to adapt to market disruptions in the investors' view. Therefore, they still consider earnings value-relevant during the war in Ukraine, even more than before the outbreak of the war, which might be caused also by investors' sentiment.

The decline in VR of book values and cash flows in the WAR period differs from the findings concerning COVID-19. The decrease in VR of book values was supported e.g. by Aljawaheri et al. (2021), but contrary to Belesis et al. (2022). Since there are usually no share issuance or capital contributions during economic crises, changes in equity are mostly driven by financial results. Hence, in investors' view, there might be no need to focus on book values as earnings already provide sufficient information about changes in the company's financial situation caused by the war. Regarding operating cash flows, they are able to be managed in the short term, for instance, due to changes in payment terms or excessive stock purchases/sales. Hence, investors might treat cash flows as temporarily disrupted and, therefore, not containing general information regarding the company's performance, which supports the findings of Bepari et al. (2013), Tahat (2017) or Choi et al. (2022), but is in contrary to Sahlian et al. (2023).

Table 6. Estimated models concerning the impact of the war in Ukraine on value relevance

Model	Variable	Coefficient	Standard error	P-value
7	constant	20.3308	0.2761	0.0000
	EPS	1.7354	0.1410	0.0000
	WAR	1.2942	0.5556	0.0198
	EPS × WAR	1.4915	0.2316	0.0000
8	constant	2.7412	0.5475	0.0000
	BVPS	1.6875	0.0411	0.0000
	WAR	0.0585	0.6457	0.9279
	BVPS × WAR	–0.2979	0.0255	0.0000
9	constant	20.0978	0.3009	0.0000
	CFO	0.8505	0.1011	0.0000
	WAR	2.2564	0.6005	0.0002
	CFO × WAR	–0.0556	0.1759	0.7519
14	constant	2.8782	0.4136	0.0000
	EPS	1.7297	0.1247	0.0000
	BVPS	1.4902	0.0326	0.0000
	WAR	–2.6006	0.4837	0.0000
	EPS × WAR	–0.9341	0.2127	0.0000
15	constant	0.0555	0.4734	0.9067
	EPS	1.4771	0.1064	0.0000
	BVPS	1.7627	0.0395	0.0000
	WAR	–0.0320	0.5260	0.9515
	BVPS × WAR	–0.3065	0.0240	0.0000
16	constant	–1.2885	0.5231	0.0138
	BVPS	1.9606	0.0434	0.0000
	CFO	0.3367	0.0811	0.0000
	WAR	0.8856	0.5945	0.1363
	BVPS × WAR	–0.4367	0.0264	0.0000
17	constant	2.2557	0.4583	0.0000
	BVPS	1.6050	0.0356	0.0000
	CFO	0.7685	0.0919	0.0000
	WAR	–2.5400	0.5476	0.0000
	CFO × WAR	–1.6664	0.1678	0.0000
Model	LSDV R^2	Within R^2	P-value	n
7	0.9295	0.0336	0.0000	12,085
8	0.8600	0.1453	0.0000	12,097
9	0.9211	0.0091	0.0000	11,946
14	0.8581	0.1821	0.0000	11,929
15	0.8598	0.1925	0.0000	11,929
16	0.8409	0.1745	0.0000	11,795
17	0.8384	0.1617	0.0000	11,795

Source: author's calculations.

Conclusions

Value relevance is an area of research with a focus on the association of accounting numbers and market values (i.e. share prices and their changes). There are different findings regarding VR of earnings, book values, and cash flows, the most frequently used accounting measures in VR area. Moreover, there are various views (and empirical results) on the impact of economic crises, that increased in importance recently due to their occurrence, on the VR of these categories. Therefore, the analysis focused on the identification of the impact of COVID-19 and the war in Ukraine, with recently occurring events, on VR was carried out. The research sample concerned Polish listed companies and was based on quarterly data from 2017 (the third quarter) to 2023 (the second one).

The main hypotheses regarding the negative impact of COVID-19 (H1) and the war in Ukraine (H2) on the VR of accounting information were not empirically confirmed, similarly as most supporting hypotheses (H1a, H1b, H1c, and H2a), referring to changes in the VR of earnings, book values, and cash flows. The value relevance of earnings increased in both COVID-19 and the war in Ukraine periods. The VR of book values and cash flows also grew during the pandemic, but they declined in the times of war.

The results from the research are valuable not only for investors making investment decisions during economic crises but also for the owners and management of companies listed on the stock exchange, as they would like to find out about the drivers of market value in turbulent times. It is also a relevant conclusion that the results obtained were at least partially different than for instance in the United States or Western Europe, which highlights the specificity of individual stock exchanges, despite high globalisation and inter-country connections.

The limitations of the study concern mainly the assumptions regarding COV and WAR periods that are fully subjective and could noticeably affect the obtained results. Moreover, they refer to the differentiated sample comprised of entities from both the Main Market of the Warsaw Stock Exchange and NewConnect, where different entities (in terms of size and market share as well as trading volume and liquidity) are listed.

Future research could include analyses based on different time frames – a valuable approach would consider the comparison of, for instance, quarterly, semi-annual, and annual data in this regard. It can also focus on the financial industry.

Appendix

1. Research focusing on the impact of financial crises on value relevance

Source	Database	Market/-s	Period	Impact
1	2	3	4	5
Mexican currency crisis 1994–1995				
Davis-Friday, Gordon (2002)	Google Scholar	Mexico	1992–1997	i
Asian financial crisis 1997–1998				
Graham, King, Bailes (2000)	Scopus	Thailand	1992–1998	–
Ho, Liu, Sohn (2001)	Scopus	Korea	1995–1998	–
Davis-Friday, Eng, Liu (2006)	Scopus	Indonesia, South Korea, Malaysia, Thailand	1996–1997	i
Choi, Kim, Lee (2011)	Scopus	Hong Kong, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand	1995–2000	i
The Internet bubble burst 2000–2001				
Demers, Lev (2000)	Google Scholar	United States of America	1999–2000	i
Morris, Alam (2012)	Google Scholar	United States of America	1989–2006	i
D'Mello, Gruskin (2013)	Scopus	United States of America	1975–2008	+
GFC 2007–2008				
Navdal (2010)	Google Scholar	Norway	2005–2008	+
da Costa, dos Reis, Teixeira (2012)	Google Scholar	Brazil	1997–2010	i
Devalle (2012)	Google Scholar	Germany, France, Italy, Spain	2006–2009	+
Mion, Georgakopoulos, Kalantonis, Eriotis (2014)	Google Scholar	the Netherlands	2003–2011	–
Belesis, Sorros, Karagiorgos (2019)	Google Scholar	United States of America	2002–2014	–
Morris, Pham, Gray (2011)	Scopus	Malaysia	1996–2001	i
Al-Hares, Abu-Ghazaleh, Haddad (2012)	Scopus	Kuwait	2003–2009	–
Bepari, Rahman, Mollik (2013)	Scopus	Australia	2004–2009	i
D'Mello, Gruskin (2013)	Scopus	United States of America	1975–2008	–
Hail (2013)	Scopus	Several dozen markets	1981–2008	i
Iatridis, Dimitrias (2013)	Scopus	Portugal, Ireland, Italy, Greece, Spain	2005–2011	–
Kousenidis, Ladas, Negakis (2013)	Scopus	Spain, Greece, Ireland, Italy, Portugal	2008–2011	+
Kwon (2013)	Scopus	South Korea	2004–2011	i
Mitrione, Tanewski, Birt (2014)	Scopus	Australia	2003–2009	i
Bepari (2015)	Scopus	Australia	2004–2011	i

1	2	3	4	5
Kane, Leece, Richardson, Veluri (2015)	Scopus	United States of America	1970–2012	i
Lee, Kim, Davidson (2015)	Scopus	South Korea	2003–2009	i
Persakis, Iatridis (2015)	Scopus	Advanced economies	2005–2012	i
Badenhorst, Ferreira (2016)	Scopus	Australia, the United Kingdom	2005–2011	i
Gurarda, Durak, Kasman (2016)	Google Scholar	Turkey	2006–2011	i
Lin, Martinez, Wang, Yang (2016)	Scopus	United States of America	2000–2012	i
Tahat (2017)	Scopus	the United Kingdom	2000–2015	i
Bilgic, Ho, Hodgson, Xiong (2018)	Scopus	Turkey	1997–2012	–
Garciía-Zambrano, Rodriíguez--Castellanos, Garciía-Merino (2018)	Scopus	Spain	2006–2011	+
Almujamed, Alfraih (2019)	Scopus	Kuwait	1994–2016	–
Eugenio, Parel, Reyes, Yu, Cudia (2019)	Scopus	Asian countries	2000–2016	–
Adwan, Alhaj-Ismail, Girardone (2020)	Scopus	European countries	2005–2011	i
Kalantonis, Schoina, Missiakoulis, Zopounidis (2020)	Scopus	Greece	2006–2017	i
Djaballah, Fortin (2021)	Scopus	Canada	2008–2016	i
Pechlivanidis, Ginoglou, Barmpoutis (2022)	Scopus	Greece	2007–2018	+
Al-Refiay, Al-Shaikh, Abdulhussein (2023)	Scopus	Germany, France, the United Kingdom	2000–2015	+
Egyptian revolution crisis 2011				
Abdallah (2019)	Scopus	Egypt	2007–2015	i
COVID-19				
Aljawaheri, Ojah, Machi, Almagtome (2021)	Google Scholar	Iraq	2018–2020	–
Răpan (2021)	Google Scholar	Germany	2019–2020	+
Belesis, Kampouris, Karagiorgos (2022)	Scopus	France, Germany, Italy, the Netherlands, Spain, the United Kingdom	2010–2020	–
Choi, Kang, Choi (2022)	Scopus	South Korea	1999–2000	–
Hamid, Angel Lorita, Ria Panggabean, Rusgowanto (2022)	Scopus	Indonesia	2015–2020	+
Liu, Sun (2022)	Scopus	United States of America	2017–2020	–
Pervan, Bartulović (2022)	Google Scholar	Croatia	2016–2020	–
Ali (2023)	Scopus	United States of America	2020	i
Dos Santos, Tavares (2023)	Google Scholar	Argentina, Brazil, Chile, Colombia, Mexico, Peru	2010–2021	i
Sahlian, Popa, Banţa, Răpan, Chiriac (2023)	Scopus	Italy, Spain, Germany, France	2003–2021	+

Where impact – the impact of a given crisis on the value relevance of accounting information.
+, –, i mean positive impact, negative impact, no significant impact or inconclusive result, respectively.

Source: author's own elaboration.

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