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CAPITAL STRUCTURE OF COMPANIES LISTED AT THE WARSAW STOCK EXCHANGE AND THE COVID-19 PANDEMIC EFFECT ON THEIR RISK

Jerzy Gajdka*, Marek Szymański**

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Abstract

Subject: The financial management of companies is examined in the context of the COVID-19 pandemic. Specifically, the relationship between their capital structure and risk changes during the pandemic is scrutinised.
The purpose of the article: To determine how companies' total, systematic and idiosyncratic risks changed during the COVID-19 pandemic depending on their capital structure based on a sample of organisations listed at the Warsaw Stock Exchange.
Methodology: The study involves the use of a panel data regression model.
Results of the research: The COVID-19 pandemic had an impact on the risk of overleveraged companies and underleveraged ones alike. Its influence on their total risk was weaker among the underleveraged organisations. Regarding systematic risk, its levels did not generally change significantly in the wake of the pandemic, but idiosyncratic risk, only in the case of the overleveraged companies increased statistically significantly.

Keywords: capital structure, COVID-19, company risk, capital market, stock exchange.

JEL Class: G10, G32, G33, I10.

* Professor, Faculty of Economics and Sociology, University of Lodz, e-mail: jerzy.gajdka@uni.lodz.pl
https://orcid.org/0000-0003-1870-3129
** M.A., Faculty of Economics and Sociology, University of Lodz, e-mail: marek.szymanski@uni.lodz.pl
https://orcid.org/0000-0001-5762-4840

INTRODUCTION

The COVID-19 pandemic's profound effect on various forms of business activity, including financial markets, prompted an increase in studies looking at how the markets responded to pandemic-related phenomena. Researchers concentrated on such issues as the reactions of stock exchange indexes (e.g. Liu et al., 2020; Ashraf, 2020; Croce et al., 2020; Chodnicka-Jaworska and Jaworski, 2020; Gajdka and Szymański, 2020; Murawska, 2020; Jaworski, 2021), industries' behaviour in the stock markets (e.g. Iyke, 2020; Reilly, 2020; Saadat et al., 2020), as well as analysing returns on stocks of companies by their size, concentration of ownership, etc. (e.g. Yan, 2020). A relatively comprehensive description of studies into financial markets' response to the pandemic can be found, inter alia, in the work by Chodnicka-Jaworska and Jaworski (2020).

The majority of studies examining financial markets in the context of the COVID-19 pandemic focused on stock returns and stock price volatility. Their findings are inconclusive because of the volatility of circumstances that brought changes painful for investors or worked to their advantage, and had a different course depending on the geographical area, industry and a period of time. The way the situation developed led Dr. Marek Dietl, the president of the Warsaw Stock Exchange (WSE), to conclude that the coronavirus pandemic not only showed that capital markets were resistant to unexpected shocks, but also, however controversial it may sound, that it was salutary for them (*„Zbawienny" wpływ*…, 2021).

There is, however, absence of research on financial management in companies suddenly faced with a completely new business situation caused by the pandemic, which in most cases made operations riskier and their outcomes more uncertain. According to one widespread approach, there are three fundamental questions that organisations need to answer when making financial decisions: 1) what assets should the available funds be invested in; 2) what sources of funding can be used to finance ongoing projects; and 3) how surplus profits should be allocated (see e.g. Damodaran, 2001). This article focuses on the second problem, giving special attention to the relationship between companies' capital structure and changes in their risk during the pandemic. The available studies on this subject concern US companies (see e.g. Huang and Ye, 2021); in Poland, the topic still awaits for researchers to take interest in it. So, the main goal of the paper is to determine how companies' total, systematic and idiosyncratic risks changed during the COVID-19 pandemic, depending on their capital structure based on a sample of organisations listed at the Warsaw Stock Exchange. Based on the trade-off capital structure theory and previous studies, the major hypothesis has been formulated as follows: „the COVID-19 pandemic causes relatively greater

changes in the risk of overleveraged companies compared with underleveraged companies".

The paper uses the sample of companies listed at the WSE to analyse three main types of corporate risk, namely, total risk, systematic risk, and idiosyncratic risk. Giving an insight into the use by companies of financing policy during the pandemic to manage their risks, the study may be of great importance for business practice.

1. CAPITAL STRUCTURE AND COMPANIES' RISKS

Modern theory of corporate capital structure, deemed one of the biggest challenges faced by corporate finance, offers several main approaches to explain it. The earliest of them was created by Modigliani and Miller (MM) in 1958, according to whom the capital structure of companies operating in a perfect market does not have an effect on their value. However, in the economy with taxes, due to tax shield benefits, company value increases with the amount of debt (Modigliani and Miller, 1963).

The trade-off approach builds on the assumption that increasing debt offers companies benefits (due to the tax shield, etc.) raising their market value, but also has costs (e.g. potential bankruptcy costs or agency costs) that reduce it. Therefore, the company's market value is maximised when its capital structure is optimal, i.e. when the marginal benefits of debt and the marginal cost of debt are equal (see, for instance, Kraus and Litzenberger, 1973).

The third approach, known as the pecking order theory, omits the problem of optimal capital structure, concentrating instead on the order of funding sources used to finance new projects (Myers, 1984; Myers and Majluf, 1984). The order is the following: internal funding (profits, depreciation, etc.), debt, convertible debt, and, lastly, external equity (new stock issues, etc.).

The last of the approaches, called the market-timing approach (see Baker and Wurgler, 2002), maintains that the main criterion that companies use to choose a source of funding is the situation in the financial markets. When stock prices are relatively high, they are more inclined to raise capital through new stock issues; when the debt instruments are priced higher than other options, they turn to debt issues. According to this approach, the capital structure of companies is primarily influenced by fluctuations in capital markets affecting the prices of financial instruments, which are sources of companies' financing.

All four approaches are related to some extent to company's risk analysis. For instance, the MM approach posits that in a perfect market increasing debt level has no impact on a company's total risk; therefore, its weighted average cost of capital remains unchanged despite a change in the cost of equity capital. However,

in the economy with a tax system, increasing debt level reduces a company's weighted average cost of capital while raising its cost of equity capital. The pecking order theory holds that companies choosing sources of finance take into account difficulties and uncertainty connected with security pricing. Thus, internal funds that are easiest to price are used first, then bonds, and, finally, stocks whose prices are the least certain.

According to the trade-off approach, a company's market value is maximised when the capital structure is optimal. A debt level greater than optimal involves, inter alia, a higher risk of bankruptcy by reducing the company's market value and increasing asset risk and the weighted average cost of capital. However, if the level of debt is below optimal, borrowing more increases the company's value because the tax shield benefits outweigh the cost of potential bankruptcy. Asset risk and the weighted average cost of capital are falling too. In other words, companies with a less-than-optimal debt level are in a better position to use debt to finance their projects (Machcica and Mura, 2010) and to shield themselves against the loss of financial liquidity and security in the case of falling cash flows.

However, some authors, for instance, Jensen (1986), have observed that a low level of debt may involve higher agency costs because not having to make interest and principal repayments, managers may use the available funds in a way conflicting with shareholders' interests. In Kesten's opinion (2010), the problem disappears in the face of an economic crisis, when managers become, for their own good, less inclined to put company's funds at risk and make their best to protect operations in the demanding environment. Therefore, a thesis that can be formulated, states that a crisis diminishes the significance of agency costs.

It is noteworthy, however, that crises such as the COVID-19 pandemic increase corporate demand for external funding, as organisations need to make up for revenues falling as a result of decreasing business volumes. Suddenly realising that their business is grinding to a halt, organisations need to find cash to maintain financial liquidity. Halling et al. (2020) have observed that the eruption of the COVID-19 pandemic spurred the activity of the bond market, while Li et al. (2020) and Acharya and Steffen (2020) have noted that the lending activity of banks increased with the pandemic. However, the benefits from this situation are not evenly distributed among companies, as they have different capacity to borrow in capital markets or from banks. For instance, organisations with relatively low debt levels can borrow more to finance new projects (Marchica and Mura, 2010; Huang and Ye, 2021). Keeping low debt levels comes therefore with a greater capacity to service debt and acquire new funds, which is sometimes called 'increased financial flexibility'. This approach proves especially beneficial when the economy is slowing down. Fahlenbrach et al. (2020) have estimated that the market value of companies with high financial flexibility decreased less in the COVID-19 pandemic than that of the other organisations.

Summing up, more indebted companies (overleveraged) are more at risk than less indebted ones (underleveraged), because financial leverage tends to be significantly and positively correlated with fluctuations in stock returns (see Black, 1976; Christie, 1982; Schwert, 1989; Huang and Ye, 2021).

Based on the trade-off theory and the cited studies, the following hypothesis can be formulated: „The COVID-19 pandemic causes relatively greater changes in the risk of overleveraged companies compared with underleveraged companies". The hypothesis is tested below using a sample of companies listed at the Warsaw Stock Exchange.

2. METHOD

2.1. Sample

The sample consisted of 123 companies included in WSE indexes WIG20, mWIG40 and sWIG80 as of March 2020, sourced from the Refinitiv database. In screening for companies, the financial sector organisations and those for which complete information was not available were omitted.

The time sample spanned two years, from the beginning of 2019 to the end of 2020, which corresponds to one full year before the pandemic and the first year of the pandemic, respectively. However, the values of some variables come from the years 2016–2018. All data was sourced from the Refinitiv Eikon database.

2.2. Measures of risk

The total, systematic and idiosyncratic risks of companies were assessed using their stock returns. In keeping with Favara (2016) and Huang and Ye (2021), total risk was measured with the standard deviation of 36 rolling monthly share returns, and systematic risk with the beta coefficient estimated from the beta parameter (β_i) of the Sharpe model (Sharpe, 1964) written as:

$$r_{it} = \alpha_i + \beta_i r_{mt} + \epsilon_{it}$$

where:
r_{it} – the excess return on the stock i in period t (the difference between the rate of stock return and the risk free rate in period t),
r_{mt} – the market risk premium in period t (the difference between the return on the market and the risk-free rate in period t),
ε_{it} – a random term (residual).
The beta estimation is performed on 36 monthly rates of return.

Lastly, idiosyncratic risk was taken to be represented by the standard deviation of Sharpe model residuals.

2.3. Capital structure

The selected companies were divided into two subsamples, one containing overleveraged companies and the other underleveraged ones. The criterion for the division was optimal capital structure understood, as explained above, as such proportions of debt and equity capital for which the company's market value reaches its maximum level (Gordon, 1962; Solomon, 1963; Brennan and Schwartz, 1978). The literature offers at least several methods with which the optimal capital structure can be determined. One of them recommends the historical average debt-to-equity (D/E) ratio (Rudnicki, 2017), which is frequently used for testing capital structure theory. The approach has been described by authors such as Shyam-Sunder and Myers (1999), who concluded that as the optimal (target) structure of capital is not observable, it has to be determined. According to their approach, the optimal debt level is found by calculating a company's average capital structure ratio and multiplying it by its total capital.

While other, more sophisticated methods are also available, the approach was selected for this study. The optimal capital structure of the companies was determined using a debt ratio (long-term debt/assets) calculated based on its values from 2016, 2017 and 2018. Excess leverage was defined as the difference between the actual and optimal debt ratio. Companies with a positive difference were classified as overleveraged and those with a negative difference as underleveraged.

2.4. Control variables

In keeping with other research on companies' capital structure during the pandemic, e.g. Huang and Ye (2021), this study also used control variables such as the company's size (Size), the market-to-book value ratio (MTB), and the return on assets (ROA), as well as taking account of the optimal leverage (Optimal) and the surplus of the actual leverage (Excess) over the optimal leverage. The COVID-19 pandemic was represented by a dummy variable taking a value of 1 for 2020 (the year of the pandemic) and 0 for 2019.

2.5. Model and variables

The following model (1) was estimated:

$$Risk_{it} = \beta_0 + \beta_1 * COVID + \beta_2 * Excess_{it-1} + \beta_3 * Optimal_{it-1} + \beta_4 * Size_{it-1} + \beta_5 * ROA_{it-1} + \beta_6 * MTB_{it-1} + \varepsilon_{it}$$

In order to determine the impact of the COVID-19 pandemic on the sampled companies' risk, model 1 parameters were estimated with data spanning the period from the beginning of 2019 to the end of 2020, which corresponds to one full year before the pandemic and its first year. To estimate the companies' optimal capital structure data from years 2016 to 2018 was used. Model 1 variables are described in Table 1.

Table 1. Model variables

Variable	Description
Panel A: independent variables	
Total risk (Risk)	The standard deviation of 36 rolling monthly rates of return
Systematic risk (Risk)	A beta coefficient calculated using the Sharpe model and 36 rolling monthly rates of return.
Idiosyncratic risk (Risk)	The standard deviation of Sharpe model residuals (calculated with 36 rolling monthly rates of return).
Panel: B independent variables	
COVID	A dummy variable taking a value of 1 for the pandemic year and 0 for the previous year
Excess	The difference between the actual and optimal debt ratio
Optimal	Optimal debt ratio calculated as an average for years 2016–2018 with the following formula: $\frac{LONG-TERM\ LIABILITIES}{ASSETS}$
Size	The natural logarithm of total assets
ROA	Return on assets represented by the net profit to asset ratio
MTB	The market value to book value ratio

Source: the authors' elaboration.

The VIF test showed that the independent variables were not collinear, while the Hausman test pointed out that the fixed-effects model was better for analysing panel data regressions than the random-effects model.

Given the purpose of the study, the most important goal in interpreting the study results was the estimate of parameter β_1 on COVID variable because its statistical significance indicated that a given type of risk was affected by the COVID-19 pandemic.

3. RESULTS

The results presented in Tables 2–4 concern the entire sample. In all tables, statistical significance at 0.001, 0.01, and 0.05 is denoted by ***, **, and *, respectively.

Table 2. Total risk (the standard deviation of stock returns), all companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.0956361	0.0235853	4.055	<0.0001	***
COVID	0.0135118	0.00140754	9.600	<0.0001	***
Excess	0.0549357	0.0176285	3.116	0.0019	**
Optimal	0.162372	0.0374461	4.336	<0.0001	***
Size	−0.00183216	0.00160149	−1.144	0.2530	
ROA	−0.0203098	0.0112545	−1.805	0.0716	
MTB	1.88384e-05	3.90015e-05	0.4830	0.6292	

Source: the authors' elaboration.

Table 3. Systematic risk (β coefficient), all companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	1.09376	0.344174	3.178	0.0016	***
COVID	0.00854522	0.0205398	0.4160	0.6775	
Excess	0.180601	0.257247	0.7021	0.4829	
Optimal	−0.844818	0.546440	−1.546	0.1226	
Size	−0.0602340	0.0233701	−2.577	0.0102	**
ROA	−0.0338195	0.164234	−0.2059	0.8369	
MTB	−0.000394890	0.000569138	−0.6938	0.4880	

Source: the authors' elaboration.

Table 4. Idiosyncratic risk (the standard deviation of Sharpe model residuals), all companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.0819819	0.0227443	3.605	0.0003	***
COVID	0.0104721	0.00135735	7.715	<0.0001	***
Excess	0.0492194	0.0169998	2.895	0.0039	**
Optimal	0.165556	0.0361107	4.585	<0.0001	***
Size	−0.00102730	0.00154438	−0.6652	0.5062	
ROA	−0.0222154	0.0108531	−2.047	0.0411	*
MTB	3.37063e-05	3.76107e-05	0.8962	0.3705	

Source: the authors' elaboration.

The data in the tables shows that the pandemic affected the companies' total risk and idiosyncratic risk, without influencing their systematic risk. The sign of the parameter on COVID variable indicates increases in both types of risk. An interesting question is why the pandemic did not influence the systematic risk. One plausible explanation is that the pandemic increased risk across the whole economy. In such a case, although companies' risk measured by the volatility of their stock returns can be higher, its increase in relation to the market risk is not significant. A similar observation on the US market can be found in Huang and Ye (2021).

The pandemic-induced increase in total risk in the sample does not mean that the risk of overleveraged and underleveraged organisations changed in the same way. The differences between them are illustrated with the data in Tables 5–10.

Table 5. Total risk, overleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.0516064	0.129139	0.3996	0.6896	
COVID	0.0117857	0.00211522	5.572	<0.0001	***
Excess	0.0606974	0.0208203	2.915	0.0038	**
Optimal	0.274922	0.0510529	5.385	<0.0001	***
Size	−0.000279212	0.00883830	−0.03159	0.9748	
ROA	−0.0114422	0.0157980	−0.7243	0.4693	
MTB	7.61625e-06	8.43307e-05	0.09031	0.9281	

Source: the authors' elaboration.

Table 6. Total risk, underleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.156325	0.0250139	6.250	<0.0001	***
COVID	0.00645303	0.00244022	2.644	0.0087	**
Excess	−0.0343517	0.0358284	−0.9588	0.3387	
Optimal	−0.203528	0.0793831	−2.564	0.0110	*
Size	−0.000942282	0.00161020	−0.5852	0.5590	
ROA	−0.0264371	0.0240393	−1.100	0.2726	
MTB	3.84498e-05	4.33324e-05	0.8873	0.3758	

Source: the authors' elaboration.

Table 7. Systematic risk, overleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	−1.00906	1.85119	−0.5451	0.5860	
COVID	−0.00115308	0.0303215	−0.03803	0.9697	
Excess	0.211088	0.298457	0.7073	0.4798	
Optimal	−0.504423	0.731839	−0.6893	0.4911	
Size	0.0800817	0.126696	0.6321	0.5277	
ROA	−0.484423	0.226462	−2.139	0.0330	**
MTB	−0.000322938	0.00120887	−0.2671	0.7895	

Source: the authors' elaboration.

Table 8. Systematic risk, underleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	1.45686	0.381761	3.816	0.0002	***
COVID	−0.0240152	0.0372425	−0.6448	0.5197	
Excess	−0.0877181	0.546810	−0.1604	0.8727	
Optimal	−4.00490	1.21154	−3.306	0.0011	**
Size	−0.0489302	0.0245748	−1.991	0.0476	*
ROA	1.25104	0.366886	3.410	0.0008	***
MTB	−7.74682e-05	0.000661336	−0.1171	0.9069	

Source: the authors' elaboration.

Table 9. Idiosyncratic risk, overleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.125261	0.123624	1.013	0.3116	
COVID	0.00935808	0.00202489	4.622	<0.0001	***
Excess	0.0564002	0.0199312	2.830	0.0049	**
Optimal	0.259943	0.0488727	5.319	<0.0001	***
Size	−0.00526910	0.00846086	−0.6228	0.5338	
ROA	−0.00561446	0.0151233	−0.3712	0.7107	
MTB	1.91711e-05	8.07293e-05	0.2375	0.8124	

Source: the authors' elaboration.

Table 10. Idiosyncratic risk, underleveraged companies

Variable	Regression coefficient	Standard error	Student t statistics	p-value	
Const	0.131334	0.0247003	5.317	<0.0001	***
COVID	0.00421605	0.00240963	1.750	0.0815	
Excess	−0.0396123	0.0353792	−1.120	0.2640	
Optimal	−0.134663	0.0783878	−1.718	0.0871	
Size	−0.000160023	0.00159001	−0.1006	0.9199	
ROA	−0.0403782	0.0237379	−1.701	0.0903	
MTB	5.06355e-05	4.27891e-05	1.183	0.2379	

Source: the authors' elaboration.

The data in the tables indicate that the pandemic had an influence on the total risk of both overleveraged and underleveraged companies; however, a lower value of the coefficient on COVID variable and the difference in significance level of the regression coefficient estimates show that it was weaker among the underleveraged organisations.

The level of the systematic risk did not change significantly in either group, probably for the same reason as given above with regard to the entire sample: as the market risk was rising, increases in the risk of individual companies were not sufficient to increase the β coefficient.

As for the idiosyncratic risk, a statistically significant increase in its level due to the COVID-19 pandemic only occurred among the overleveraged companies. Regarding the underleveraged organisations, the sign of the regression coefficient on COVID variable shows that the relationship between the pandemic and this risk was positive but not significant. In other words, the pandemic influenced these companies' idiosyncratic risk, but its impact was weaker than in the other group.

The regression analysis has revealed interesting relationships between companies' risk and Excess variable representing the difference between their actual and optimal capital structure. In the case of the overleveraged companies, the relationship was positive and statistically significant, which implies an association between more-than-optimal debt and increases in total risk and idiosyncratic risk. This conclusion appears correct both intuitively, and from the perspective of capital structure theory.

A similar relationship was not observed for the underleveraged companies. In their case, the estimate of the parameter on Exces variable is not statistically significant and the parameter's sign is negative for each of the three risks. Thus, the risk of an underleveraged company that chooses to take out more debt however, below the optimal structure level, does not go up; on the contrary, it is more likely that its risk will diminish although evidence in support of this relationship was not statistically significant.

CONCLUSION

The analysis has shown that the COVID-19 pandemic had an effect on the risks faced by Polish companies and that its strength depended on whether they were overleveraged or underleveraged. The findings confirm, as hypothesised, that during pandemic the risk of the overleveraged organisations changed more than underleveraged ones. In case of the former group, both their total risk and idiosyncratic risk increased.

The findings also show that in case of overleveraged companies increase in debt level causing a greater distance from the optimal capital structure is followed by increases in total and idiosyncratic risks. The pandemic's impact on the risk of underleveraged companies was limited, because only their total risk increased during that period. Also, raising the share of debt of these companies toward the level below optimal capital structure did not increase their risk.

These findings are generally consistent with the results reported by Huang and Ye (2021), according to which the underleveraged companies were less at risk during the COVID-19 pandemic than the overleveraged ones, especially those operating low standards of corporate social responsibility. According to these authors, companies' risk was mitigated by the availability of debt financing and the tax shield. They have also noticed that higher financial flexibility providing more opportunities to borrow, etc., may reduce the bankruptcy risk of companies whose cash flows are collapsing as a result of slackening business activity. Huang and Ye's observation that increasing debt level reduces the risk of underleveraged companies and increases the risk of overleveraged ones, partly accords with our findings.

An interesting result of our study is that the pandemic did not change the systematic risk of the sampled companies. Because in the Capital Asset Pricing Model, which is one of the most popular tools using for estimation of companies' cost of equity, the cost depends on the systematic risk measured by the beta coefficient, this result means that changes in companies' systematic risk did not affect that cost, even though it may have changed for other reasons, such as fluctuations in the risk-free rate.

The results of this study need to be viewed with great caution mainly because the method used to determine the optimal capital structure of the sampled companies may raise some doubts. However, every method seeking to quantify what is not directly observable can be questioned. Even though the target level of debt derived from its average levels in a past period may not be seen as the best indicator of the optimal capital structure, it still is a legitimate criterion for sorting companies into overleveraged and underleveraged organisations. That approach, which has also been used by other authors, can be easily replaced in future research by another one to test the robustness of the results of this study.

It seems advisable that a future analysis of factors capable of inducing changes in companies' risk during the pandemic also addresses aspects other than those included in this study. One of these is the aforementioned corporate social responsibility, which is believed to be able to improve the borrowing capacity and thereby reduce the risk of bankruptcy during the pandemic of even overleveraged companies.

Despite its limitations, this study, showing how an unexpected crisis changes the risk of overleveraged or underleveraged companies, underscores the significance of a financial policy as a tool that companies can use to reduce risks resulting from a sudden deterioration in business conditions.

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