





“Analysis of idiosyncratic risks of listed companies in the V4 countries in 2010–2020”

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ANALYSIS OF IDIOSYNCRATIC RISKS OF LISTED COMPANIES IN THE V4 COUNTRIES IN 2010–2020

Abstract

The paper aims to examine and thereby understand the development of idiosyncratic risks using financial ratios. To achieve this, the study would like to explain the company-specific risks defined in the classic equilibrium model using indicators derived from a company's balance sheet and profit and loss statements. The objects of this empirical research are the listed companies of the Visegrád countries. Data were sourced from the Orbis database. The total number of companies included in the analysis was 35, as only these had complete data available for the years examined. Multivariate regression analysis and panel analysis (fixed and random effects) were used in the evaluation. According to the results, the market risk of equities is influenced by all the assessed solvency ratios (debt-to-capital ratio, stability ratio, debt-to-sales revenue, and net indebtedness) examined. The degree of market risk of companies is also influenced by the EBIT-to-sales ratio (profitability ratio). The results of the fixed-effect model showed that solvency ratios such as debt-to-capital ratio, stability ratio, and debt-to-sales revenue, and profitability ratios (ROS and ROE) affect the degree of idiosyncratic risks.

Keywords

financial risks, idiosyncratic risks, listed companies, financial ratios, V4 countries

JEL Classification

G11, G30, G32

INTRODUCTION

The outcome of an investor's financial decisions is characterized by a series of uncertain events, since the probability of a capital allocation decision cannot be fully predicted (Jenčová et al., 2023). Investment opportunities are shrouded in mystery, as the question of what opportunities and threats a security presents can never be answered definitively. Empirical studies over the years have confirmed that there is a one-way movement between the return on an investment and the risk incurred during the return (Cornell, 2021; Lacko et al., 2023). This finding reflects the fact that, in general, investors construct their portfolio of assets with the aim of making it traceable and analyzable. One important aspect to bear in mind when structuring a portfolio is that the examination of assets alone is not sufficient to provide the investor with a complete and meaningful picture. It is also necessary to analyze the capital market itself where the asset is traded. The second aspect is to ensure that the investor's portfolio is organized in an optimal way. In this context, it is necessary to identify the variants that provide the most favorable risk-return alternatives. Although the high return-low risk approach is the most ideal for the investor, risks are present in all investments. The most obvious method to support and ensure risk reduction is the investor's portfolio diversification (Korcsmaros et al., 2019; Prislupčáková, 2022). This is because, as the investor makes decisions on a number of instruments that are significantly different from each other, the overall value of the instruments is less volatile through

diversification. If there is a contrast in the way asset values move, the instability of a diversified portfolio can be effectively reduced. The concept of risk itself, from this approach, means that an event can be assumed to have more than one output under plausible assumptions. In light of the fact that investments are concentrated in one security, the probability of a negative change in the value of that asset is greatly increased. Price movements, interest rate fluctuations, political decisions, and recessions are considered to be significant risks. It is important to note, however, that it is not only the market risks that need to be taken into account, but also the internal risks associated with the management of the company. In the course of a company's operations, there are many financial decisions and events that affect the value of assets (Mieseigha & Okewale, 2021; Belas et al., 2023). In addition to market factors, the resulting exchange rate movements are also influenced by corporate factors, which vary from company to company, depending on the circumstances of the asset. The structure of our paper is based on this line of thought, and is concerned with a deeper understanding of idiosyncratic risks.

No previous research aimed to explain the idiosyncratic risks defined in the classic equilibrium model with the help of indicators calculated on the basis of the company's balance sheet and profit and loss statements. Based on this, our study can be considered unique within the field of financial studies.

1. LITERATURE REVIEW AND HYPOTHESES

The first author to use the definition of "risk" was Knight (1921), who dealt with the interpretation of uncertainty and risk. In his study, he focused on the difference between the two concepts, namely the probability of occurrence. He believed that when the probability of an event occurring is known, it is a risk; when the probability of an event occurring is not known, it is an uncertainty. Bélyácz (2011) sees the outbreak of the global financial crisis as a failure caused by decision-makers and investors rather than a lack of information. Nevertheless, Nádas (2011) argues that risks in themselves do not pose a major threat, provided that companies are aware of their presence in time and apply the right risk management techniques. The terms refer to areas of economics that are most explicit about the two factors and the relationship between them. In mathematics and statistics, risk can be defined as the magnitude of the damage incurred multiplied by the probability of its occurrence. This relationship is nowadays less taken into account by risk professionals, who attach greater importance to modern risk management techniques, which are mainly applied in the financial sector. Its quantification deserves particular attention, as it plays an important role in risk management (Demirović et al., 2021; Donovan et al., 2023).

Risk researchers have addressed not only the importance of the risks revealed by the choice

alternatives in corporate decision making, but also the existence of external and internal risks that affect companies. The works of Kupsch (1995), Frame (2003) and Michalski (2022) are also of particular importance in this area. They have distinguished between risks to companies that originate from within the company and, possibly, from the company's external environment. This division was further extended by Kupsch by grouping the internal risks of a company according to the class of risk. Such risks are financial, procurement, sales and production risks. Another classification is that of Coenen (2004), who distinguished between risks based on the practical aspects of company life. These are:

- Environmental risks – political, legal risks,
- Operational risks – the factors that affect or "hinder" the operation of a company,
- Market risks – related to the competitive environment, they exist due to changing market conditions,
- Financial risks – arise from changes in prices, exchange rates, and interest rates,
- Other risks – e.g., communication breakdown in the corporate structure, risk of lack of information, etc. (Coenen, 2004; Szemere et al., 2021).

When analyzing risks in the financial field, the studies by Beja (1972), Hardy (2003), and Wang et al. (2024) are of particular importance; they outlined and distinguished between diversified (non-systematic) and non-diversified (systematic) risks. The difference is that while diversified risks are risks of a company that can be reduced by effective action, systematic risks arise from the effects of economic events over which the company has no control and therefore cannot be eliminated.

Risk is one of the most complex areas of the financial market, and risk decisions are made in an environment that cannot be predicted in advance, regardless of the factors that influence them (Dvorsky et al., 2023). During our research, the predictability of events is overshadowed by the fact that neither individuals nor companies can prepare in time for the problems that may arise. The epidemic situation, the war, the resulting political and economic measures, austerity measures, and the ever-higher inflation are all intended to map the risk management propensity of individuals (investors) and companies. It follows that investors and companies need to be aware that the output of their decisions may not only result in positive expectations. At the same time, risks can also mean gains and losses, depending on the context in which they are evaluated. Our study focuses on a particular set of overall risks, with a deeper analysis of idiosyncratic risks.

Idiosyncratic risk (also known as specific risk) is particular to an industry or a company, but can also be characterized as uncertainty inherent in corporate or industrial investments. It can be caused by a new competitor in the market, an economic policy decision, or even a change in leadership (Souza et al., 2017). Although investors may be able to anticipate some sources of non-systematic risk, it is not possible to assess all the influencing factors. Amorim et al. (2014) point out that idiosyncratic risk is the part of the total risk minus the systematic part. Michelacci and Schivardi (2013) also show, among other things, that idiosyncratic risk can be eliminated by sufficiently diversifying the portfolio. However, in their view, this is not a relevant result. Townsend (1978) and Holmstrom (1987) also provided a counter-proposal in relation to idiosyncratic risk, as they thought that diversifying an entire portfolio would be costly. Several

theoretical studies (Meh & Quadrini, 2006; Jiang & Feng, 2021; Li & Xiao, 2023) have also concluded that the consequences of market frictions prevent diversification, which may restrain aggregate productivity, output, and capital accumulation.

Marinho et al. (2013) confirmed that rational investors adopt an objective attitude, i.e., they focus mainly on the profit and the beta parameter. In this respect, market risk is as important as the sensitivity of a stock or portfolio to economic changes (Amorim et al., 2014). According to Markowitz's (1952) portfolio theory, idiosyncratic risk is the specific risk of a company that investors can avoid. However, there are investors who do not diversify their portfolios, with the direct consequence that their stocks are exposed to full risk (Sexauer & Siegel, 2024). Therefore, as investors take on high risk, they expect high yield and additional yield in return (Kolari et al., 2023). Companies with lower risk stocks provide a favorable environment for new equity issuance, which leads to a strengthening of the stock market (Santos et al., 2023).

Determining whether idiosyncratic risk affects the return on individual assets has received considerable attention in the literature. Modern financial theory suggests that investors hold a portfolio of stocks to eliminate idiosyncratic risks. This is the reason why only systematic risk is included in the equilibrium model. Merton (1987) assumes a positive relationship between idiosyncratic risk and expected return if the investor does not diversify their equity portfolio (Soliman & Saout, 2024). Shleifer and Vishny (1997), in their research on financial behavior, discuss idiosyncratic risks. They argue that these risks are negligible, insignificant for diversified investors, and costly for investors who see an arbitrage opportunity in an investment. Moreover, Pontiff (2006) points out that risk-averse arbitrageurs assign lower portfolio weights to stocks with high idiosyncratic risk. Wei and Zhang (2007), Cao and Han (2016), Chen et al. (2024), and Köstlmeier (2024) take a similar approach. They argue that specific risks allow arbitrage to be prevented. This means that specific risks decrease for overvalued stocks and increase for undervalued stocks.

As a research area, we choose a topic that is economically relevant, of a decisive nature, and which is novel in terms of its frequency and processing.

There is a wealth of useful and untapped potential in the field of finance that is worth considering from a research perspective. From this area, we have selected the idiosyncratic risks that are company-specific. These risks, together with systemic risks, constitute the total risk. Idiosyncratic risks can vary from company to company, from sector to sector, from industry to industry, unlike systematic risks, which affect the economy as a whole. Idiosyncratic risks can be eliminated by investors through portfolio composition. In their case, the key question is how much and in what composition a given portfolio basket contains securities. They aim to have as many diverse combinations of securities as possible, where possible, to reduce idiosyncratic risks through diversification.

In the asset pricing model, in addition to the indicator α , a valuable factor for investors, β , which measures the market risk of stocks, is also included. This indicator is more important than α , as its value indicates how risky a stock is relative to the market. When investors buy shares, they first consider the sensitivity factor of the stock, which is understandable since the expected return depends on it. The market factor is a measure of a company's sensitivity to the risks of the market as a whole. However, it should not be forgotten that the market players are, on the one hand, the companies themselves. Can this market risk be captured by indicators derived from, or formed from, financial statements? Is it possible to predict it by quantifying certain financial indicators? Accordingly, we have defined our first hypothesis:

H1: The market risk of equities is influenced by capital structure ratios.

The total variance (risk) can be broken down into systematic and non-systematic risks using a regression procedure. This study used both cross-sectional and time-series data and then performed a panel analysis, or more precisely, a panel regression, on the data. Although the two analysis methods appear similar, they focus on determining the relationship between dependent and independent variables. The difference lies in the fact that the panel takes into account the time factor and, in this respect, is able to create a model that is valid for all the data (cross-sectional

and time-series) in the panel. Hence, the difference between the variables defined in multivariate regression and those defined in panel regression. What is the relationship between the results of the two analytical techniques? Are there any indicators that influence the degree of idiosyncratic risk in both analyses? An adequate answer to these research questions leads us to the second hypothesis:

H2: Idiosyncratic risks in multivariate regression analysis and panel analysis are explained by financial ratios.

2. METHODOLOGY

The sample was selected from individuals, in our case, listed companies in the Visegrad countries. Data collection was essential to be able to decide whether to accept or reject the hypotheses we formulated. To make the data available and to carry out our research, we needed a database that would allow us to download the financial data of the companies under study.

This study used the Orbis Europe database, which is a "product" of Bureau Van Dijk. The search format of the database allowed us to search for companies in the V4 countries. The next filtering criterion for the sourced company data set was the stock market index, giving us a total of 46 companies. Accounting statement results were not available for some companies. These companies were banks, insurance companies, and pharmaceutical companies. The total number of companies included in the analysis was 35. As the database contained some missing data, the set of indicators had to be narrowed down to make the calculations analyzable and meaningful. For the 35 companies included in the group of companies under examination, the indicators used were those that could be calculated for at least half of the companies. Among the types of indicators, we have chosen profitability, capital structure and efficiency indicators, as these are the indicators that provide the best evidence of the overall performance of the company. Next, we looked for the accounting data - balance sheets, profit and loss accounts - that were needed to quantify the financial variables¹.

¹ The values of all ratios for all of the 35 companies are available at <https://zenodo.org/records/17590533>

The following ratios were calculated:

Days sales in inventory (DSI)

$$DSI = \frac{\text{average inventory}}{\text{net credit sales}} \cdot 365. \quad (1)$$

Average collection period (ACP)

$$ACP = \frac{\text{average accounts receivables}}{\text{net credit sales}} \cdot 365. \quad (2)$$

Days payable outstanding (DPO)

$$DPO = \frac{\text{average accounts payable}}{\text{cost of goods sold}} \cdot 365 \quad (3)$$

Operating cycle (OC)

$$OC = \text{Inventory Period} + \text{Accounts Receivable Period}. \quad (4)$$

Debt-to-capital ratio

$$D / C \text{ ratio} = \frac{\text{equity}}{\text{total capital}}. \quad (5)$$

Stability ratio

$$\text{Stability ratio} = \frac{\text{equity} + \text{long-term liabilities}}{\text{current assets}}. \quad (6)$$

Debt-to-sales revenue

$$D / R \text{ ratio} = \frac{\text{Liabilities} - (\text{Cash} + \text{Securities})}{\text{Net credit sales}}. \quad (7)$$

Net indebtedness

$$\text{Net indebtedness} = \frac{\text{Liabilities} - \text{Receivables}}{\text{Equity}}. \quad (8)$$

Profit margin

$$PM = \frac{\text{Net sales} - \text{Direct costs}}{\text{Net sales}}. \quad (9)$$

EBIT-to-sales

$$EBIT - to - sales = \frac{\text{Profit}}{\text{Net Sales} + \text{Other income}}. \quad (10)$$

Return on Sales (ROS)

$$ROS = \frac{\text{Operating Profit}}{\text{Net Sales}}. \quad (11)$$

Return on Equity (ROE)

$$ROE = \frac{\text{Net income}}{\text{Average shareholders' equity}}. \quad (12)$$

The period considered was defined as January 2010 to December 2020. Thus, the effects of COVID-19 and the Russian-Ukrainian armed conflict were eliminated. Our financial data were then downloaded, and from the data we defined several types of indicators. Given that only through periodic observation can proper conclusions be drawn from the analysis and interpretation of financial indicators, we also focused on the year-on-year variation of indicators. In this light, we have calculated an index of evolution of the financial indicators.

To proceed further, it was necessary to determine the exchange rates of the companies under investigation. This data was obtained via the internet. The data reflect the evolution of the exchange rates daily over the entire period under review. The stock price data were then used to calculate the returns, which brought us closer to the value of the risks. One of the most important measures for investors is beta. To estimate, manage, and analyze this parameter, it was a priority to analyze the capital market asset pricing model. Following the classical approach of the CAPM model, Fama and French's extended three-factor and five-factor versions were considered. This was important in order to determine and compare the changes in the factors of the factor models when company-specific risks are also calculated. The two factors in the three-factor model are firm size and value impact. These data were downloaded from a website created by French². In 2015, additional factors were added to the model to eliminate certain investment anomalies. The five-factor model factors are profitability and investment, which data can also be found on the website described above. Statistical analyses were carried out using the returns determined from the stock prices and the data from the asset pricing model and its three- and five-factor models. Results were presented

2 https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

for systematic, non-systematic risks, and excess returns. At the data analysis stage, we linked the two areas – indicators and risks – which were used to conduct further statistical tests. At the same time, a decision was taken to accept or reject the hypotheses formulated.

To make the right decision on the choice of statistical methods, it was necessary to identify the level of measurement of the variables used. In all cases, the dependent and independent variables of the hypotheses formulated are metric, so a regression analysis was carried out. The regression calculation involves one dependent variable and one or more independent variables. On this basis, we distinguish between bivariate and multivariate linear regression. This analysis investigates the extent to which the variable under investigation depends on one or more explanatory variables (Bollen & Brand, 2010). This study performed a multivariate regression analysis. Data were collected in a time-series and cross-sectional format. Time-series data are observed within a consecutive time period, tracking the evolution of a given variable, while cross-sectional data are observed over a number of items at a given point in time. Time series and cross-sectional data were used to create panel data. The essence and significance of a panel study, also known as a longitudinal survey, is that we conduct an observational study using the data and variables in the sample (Wooldridge, 2023). One of the simplest forms of panel analysis is Pooled OLS. OLS (Least Squares) differs from traditional linear regression in that the model minimizes the squared deviations from the linear regression line. The Pooled OLS regression model is a variant of this model, which is specifically designed for the analysis of panel data. Its essence is that the model does not include cross-sectional and time effects (Bollen & Brand, 2010).

$$y_{it} = \beta_{yxt} X_{it} + \beta_{yzt} Z_i + \lambda_t \eta_i + \varepsilon_{it} \quad (13)$$

where y_{it} = value of the dependent variable for the i th case; x_{it} = vector of time-varying covariates for the i th case at the t th time period; β_{yxt} = row vector of coefficients that give the impact of x_{it} on y_{it} at time t ; z_i = vector of observed time-invariant covariates for the i th case; β_{yzt} = row vector of coefficients at time t that give the impact of z_i on y_{it} ; η_i = scalar of all other latent time-invariant vari-

ables that influence y_{it} ; λ_t = coefficient of the latent time-invariant variable (η_i) at time t ; ε_{it} = random disturbance for the i th case at the t th time period.

The types of models for unobserved effects are fixed and random effects models (Wooldridge, 2023). To decide which model would be appropriate for testing the data in a panel analysis, the unobserved and explanatory variables need to be examined. If there is no relationship between the two variables, the unobserved variable is a factor that affects the dependent variable (y) but does not affect the independent variable (x). This is the random effect. If we assume from the previous formula (13) that time-invariant variables do not change over time, then $\beta_{yxt} = \beta_{yx}$, $\beta_{yzt} = \beta_{yz}$, $\lambda t = 1$, it changes as follows (Bollen & Brand, 2010; Bliese et al., 2020):

$$y_{it} = \beta_{yx} X_{it} + \beta_{yz} Z_i + \eta_i + \varepsilon_{it}. \quad (14)$$

In the case where the two variables are correlated, the fixed effects model is used (Bollen & Brand, 2010; Bliese et al., 2020):

$$y_{it} = \beta_{yx} X_{it} + \eta_i + \varepsilon_{it}, \quad (15)$$

where N = the number of individuals, cross section; T = the number of time periods; y_{it} = the dependent variable (i = entity, t = time); X_{it} = represents one independent variable; β = coefficient; α_i = the unknown intercept for each entity; u_{it} = the error term.

If it is not clear which of the models outlined is suitable for panel data analysis, different tests need to be carried out. The first is the Chow test. Its significance lies in its ability to detect the identity of the coefficients determined in two separate regression analyses. Its application in econometrics is to observe whether there is any kind of break in the variance of the data points at a particular point in time. If there is, the values of the regression coefficients are different, and two regression lines for the data points represent that the distribution of the data is different before and after the breakpoint. The null hypothesis for the test is that there is no breakpoint; the alternative hypothesis is that there is a breakpoint between the data. The point of using it in panel analysis is to help decide whether the fixed effect or Pooled OLS model is appropri-

ate for estimating the data. The null hypothesis of the test (H_0) is that the Pooled OLS regression is appropriate, and the alternative hypothesis (H_1) is that the fixed effects model is appropriate. If $p > 0.05$, the null hypothesis is accepted, and the alternative hypothesis is accepted for $p < 0.05$ (Chow, 1960; Sun & Wang, 2022).

$$CHOW = \frac{(RSS_p - (RSS_1 + RSS_2)) / k}{(RSS_1 + RSS_2) / (N_1 + N_2 - 2k)}, \quad (16)$$

where RSS_p = pooled (combined) regression line; RSS_1 = regression line before break; RSS_2 = regression line after break; N_1, N_2 = the number of observations in each group; k = the number of parameters.

The second is the Breusch-Pagan test, which is based on the principle of Lagrange multipliers (a method for determining conditional extreme values). The test also reveals the existence of heteroskedasticity. Its essence in relation to the analysis of panel data is that it offers a choice between whether the random effect or the Pooled OLS model is suitable for panel analysis. The null hypothesis of the test (H_0) is that Pooled OLS regression is appropriate, and the alternative hypothesis (H_1) is that the random effects model is appropriate. If $p > 0.05$, the null hypothesis is accepted, and the alternative hypothesis is accepted for $p < 0.05$ (Uyanto, 2022).

$$B - P(LM) = n \cdot R^2, \quad (17)$$

where n = the sample size; R^2 = the coefficient of determination from the regression of the squared residuals on the independent variables.

The third is the Hausman test. Its essence is that it can predict the predictor (endogenous) variables that are found in the regression analysis when the test is performed. In the case where the test detects these variables, the conditions for OLS are not met, which are to assume that the error term and the predictor variable are not correlated. In the analysis of panel data, it helps to decide whether the fixed effect or the random effect model is appropriate for estimation by performing a test. The null hypothesis of the test (H_0) is that the random effect is appropriate, and the alternative hypothesis (H_1) is that the fixed effect model is appropriate.

ate. If $p > 0.05$, the null hypothesis is accepted, and the alternative hypothesis is accepted for $p < 0.05$ (Wooldridge, 2023).

$$H = \frac{n(SSE_{REM} - SSE_{Aug})}{SS_{Aug}} \sim \chi^2(k), \quad (18)$$

where: n = the sample size; k = the number of independent variables; SSE = sum of squares for the error term (residuals); Aug = augmented regression model (independent variables from REM and FEM, and dependent variable from REM) (Cottrell & Luchetti, 2024).

3. RESULTS

As mentioned above, two hypotheses were formulated, the first of which was the following:

H1: The market risk of equities is influenced by capital structure ratios.

In testing the first hypothesis, we wanted to assess whether financial ratios, including capital structure ratios, have an impact on the sensitivity factor in the capital market asset pricing model. To perform this analysis, it was necessary to examine each of the financial ratios in order to draw a firm conclusion on the capital structure ratios. The panel analysis, which includes both cross-sectional and time-series data, allowed us to identify the relationships between market risk and financial ratios. As in the previous analysis, a Pooled OLS multivariate regression analysis was performed, where the dependent variable was the value of market risk and the independent variables were the ratios. The results are summarized in Table 1.

The results of the regression showed that the p significance value is met only for net indebtedness ($p < 0.05$), i.e. one indicator has an impact on the market risk of stocks. The variable in the Pooled OLS regression analysis, net indebtedness, is a good fit to an estimated model. Nevertheless, it is important to note that the sampling is not independent as the same companies were observed during the period under study. In order to obtain a more accurate picture of the relationships between the parameters, both fixed and random effects models were carried out. The results of the fixed effects model are summarized in Table 2.

Table 1. Pooled OLS model – Relationship between market risk and financial ratios – *H1*

Financial indicator	Coefficient	Std. Error	t-ratio	p-value	R2
Constant	-0.744	1.287	-0.579	0.564	0.189
Days sales in inventory	0.056	0.122	0.455	0.650	
Average collection period	-0.140	0.146	-0.957	0.340	
Days payable outstanding	0.047	0.121	0.385	0.701	
Operating cycle	-0.117	0.332	-0.354	0.724	
Debt-to-capital ratio	-0.101	0.773	-0.131	0.896	
Stability ratio	0.068	0.488	0.140	0.889	
Debt-to-sales revenue	-0.743	0.474	-1.568	0.119	
Net indebtedness	0.328	0.149	2.196	0.030**	
Profit margin	-0.292	0.235	-1.240	0.217	
EBIT-to-sales	0.070	0.170	0.412	0.681	
ROS	0.808	0.468	1.726	0.087*	
ROE	-0.826	0.460	-1.798	0.075*	

Note: * significance at the 10 percent level; ** significance at the 5 percent level.

Table 2. Panel regression – Fixed effects model for market risk and financial indicators – *H1*

Financial indicator	Coefficient	Std. Error	t-ratio	p-value
Constant	-3.137	2.168	-1.447	0.151
Days sales in inventory	0.131	0.177	0.743	0.459
Average collection period	-0.226	0.400	-0.566	0.573
Days payable outstanding	0.051	0.235	0.217	0.829
Operating cycle	0.101	0.685	0.147	0.883
Debt-to-capital ratio	-2.428	1.104	-2.200	0.030**
Stability ratio	2.042	0.756	2.701	0.008***
Debt-to-sales revenue	-1.287	0.635	-2.028	0.045**
Net indebtedness	0.385	0.181	2.129	0.036**
Profit margin	1.255	0.719	1.746	0.084*
EBIT-to-sales	-0.459	0.232	-1.984	0.050**
ROS	0.751	0.680	1.105	0.272
ROE	-0.551	0.665	-0.828	0.410

Note: * significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

The fixed effects model requires that the explanatory variable is correlated with the unobserved variable. The results show that financial indicators with a p-value marked with asterisks affect the sensitivity coefficient. To decide which model – fixed effect or Pooled OLS – is suitable for testing the data, we performed the Chow test.

Table 3. Chow test results – *H1*

Chow test (F)	p-value
2.920	8.13511e-005

The result of the Chow test indicates that the p-value is lower than 0.05. This value is lower than the significance level ($p = 0.05$) determined in the

research, and therefore, the null hypothesis is rejected, i.e., the fixed effect model is more significant. The panel data analysis also included a random effects model, the results of which are summarized in Table 4.

Unlike the fixed effect model, the random effect requires that the explanatory variable is uncorrelated with the unobserved variable. The impact of the indicators in the cells marked with asterisks (Debt-to-sales revenue, net indebtedness, ROS, ROE) on market risk is not the result of a random event. To decide which model – random effect or Pooled OLS – is suitable to test the data, we performed the Breusch-Pagan test.

Table 4. Panel regression – Random effects model for market risk and financial indicators – H1

Financial indicator	Coefficient	Std. Error	t-ratio	p-value
Constant	-1.090	1.378	-0.791	0.430
Days sales in inventory	0.067	0.128	0.524	0.602
Average collection period	-0.120	0.164	-0.734	0.465
Days payable outstanding	0.042	0.139	0.301	0.764
Operating cycle	-0.152	0.353	-0.431	0.667
Debt-to-capital ratio	-0.568	0.817	-0.695	0.489
Stability ratio	0.214	0.515	0.415	0.679
Debt-to-sales revenue	-0.916	0.498	-1.840	0.068*
Net indebtedness	0.327	0.152	2.146	0.034**
Profit margin	-0.195	0.267	-0.731	0.466
EBIT-to-sales	-0.008	0.176	-0.044	0.965
ROS	0.997	0.493	2.020	0.046**
ROE	-0.979	0.486	-2.016	0.046**

Note: * significance at the 10 percent level; ** significance at the 5 percent level.

Table 5. Breusch-Pagan test result – H1

B-P (LM)	p-value
1.328	0.249

The test results show (Table 5) that the p-value is higher than the significance level we chose ($p = 0.05$). The consequence of this is that we cannot reject the null hypothesis, i.e., in this case, the OLS model is more suitable for testing the data. The test results obtained suggest that in panel data analysis, the fixed effects model yields significantly better results than the random effects model. To corroborate the results of the tests, the Hausman test was also performed.

Table 6. Hausman test results – H1

H	p-value
46.592	5.4852e-006

The result of the test indicates that the p-value (5.4852e-006) is lower than the given significance level ($p = 0.05$) (Table 6), which means that we reject the null hypothesis and accept the alternative hypothesis that the fixed effects model is better suited to interpret the data. Comparing the results, we conclude that hypothesis 1, that market risk of equities is influenced by capital structure ratios, is accepted.

Hypothesis 2 was the following:

H2: *Idiosyncratic risks in multivariate regression analysis and panel analysis are explained by financial ratios.*

While testing hypothesis 2, we sought to find out whether the idiosyncratic risk of listed companies in the V4 countries is explained by any financial indicators (efficiency, profitability, capital structure). The analysis required the identification of specific risks. A cross-tabulation was made using the data for the two parameters. As the database provides sufficient information to explore the relationships between the variables, cross-sectional regression analysis was carried out. The Gretl program was used for the analysis. Pooled OLS was used in the regression analysis to explore the relationship between the parameters. According to this approach, the dependent variable was specific risk, and the predictor variable was indicators. The results are summarized in Table 7.

The results of the regression show that the p significance value is met ($p < 0.05$) for the financial ratios of average collection period, operating cycle, debt-to-capital ratio, debt-to-sales revenue, profit margin, ROS, and ROE, i.e., these indicators have an impact on the specific risk of the stock. The regression table (Table 7) shows that the majority of the variables fit an estimated model adequately. Nevertheless, it is important to note that the sampling is not independent, as the same companies were observed during the period under study. In order to obtain a more accurate picture of the relationships between the parameters, both fixed and random effects models were carried out. The results of the fixed effects model are summarized in Table 8.

Table 7. Pooled OLS model – relationship between market risk and financial ratios – H2

Financial indicator	Coefficient	Std. Error	t-ratio	p-value	R2
Constant	-1.167	0.553	-2.112	0.036**	
Days sales in inventory	-0.001	0.050	-0.014	0.989	
Average collection period	-0.195	0.066	-2.966	0.004***	
Days payable outstanding	0.016	0.055	0.299	0.765	
Operating cycle	0.339	0.139	2.448	0.016**	
Debt-to-capital ratio	-0.925	0.332	-2.786	0.006***	
Stability ratio	-0.371	0.208	-1.779	0.077*	0.262
Debt-to-sales revenue	-0.561	0.202	-2.776	0.006***	
Net indebtedness	0.037	0.066	0.568	0.571	
Profit margin	-0.398	0.099	-4.008	9.80e-05***	
EBIT-to-sales	0.077	0.074	1.038	0.301	
ROS	0.699	0.204	3.430	0.001***	
ROE	-0.702	0.202	-3.478	0.001***	

Note: * significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

Table 8. Panel regression – Fixed effects model for market risk and financial indicators – H2

Financial indicator	Coefficient	Std. Error	t-ratio	p-value
Constant	0.126	0.662	0.191	0.849
Days sales in inventory	0.053	0.058	0.910	0.365
Average collection period	0.226	0.128	1.771	0.079*
Days payable outstanding	0.057	0.077	0.742	0.459
Operating cycle	-0.389	0.208	-1.870	0.064*
Debt-to-capital ratio	-1.095	0.357	-3.066	0.003***
Stability ratio	-0.518	0.207	-2.502	0.014**
Debt-to-sales revenue	-0.534	0.206	-2.592	0.011**
Net indebtedness	0.030	0.062	0.489	0.626
Profit margin	-0.239	0.238	-1.001	0.319
EBIT-to-sales	0.132	0.073	1.812	0.073*
ROS	0.477	0.218	2.186	0.031**
ROE	-0.529	0.217	-2.436	0.016**

Note: * significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

The fixed effect model requires that the explanatory variable be correlated with the error term. The results show that the financial indicators associated with the p-value marked with asterisks have an impact on the existence of non-systematic risks. To decide which model – fixed effect or Pooled OLS – is suitable for testing the data, we performed the Chow test.

Table 9. Chow test results – H2

Chow test (F)	p-value
9.301	1.0894e-017

The result of the Chow test indicates that the p-value is lower than 0.05. This value is lower than the significance level ($p = 0.05$) determined in the research, and therefore the null hypothesis is rejected, i.e., the fixed effect model is more significant.

The panel data analysis also included a random effects model, the results of which are summarized in Table 10.

Unlike the fixed effect model, the random effect requires that the explanatory variable be uncorrelated with the error term. The results obtained suggest that the significance levels are lower than before. This implies that the effect on risk of the indicators in the cells marked with asterisks (debt-to-capital ratio, stability ratio, debt-to-sales revenue, EBIT-to-Sales, ROS, ROE) is not the result of a random event. As the significance levels are lower, the model was extended to include an indicator with a p-value that showed a 1-2% higher result in the fixed effect. To decide which model – random effect or Pooled OLS – is suitable to test the data, the Breusch-Pagan test was performed.

Table 10. Panel regression – Random effects model for market risk and financial indicators – *H2*

Financial indicator	Coefficient	Std. Error	t-ratio	p-value
Constant	-0.353	0.584	-0.605	0.546
Days sales in inventory	0.049	0.054	0.908	0.365
Average collection period	0.032	0.099	0.322	0.748
Days payable outstanding	0.002	0.069	0.036	0.972
Operating cycle	-0.007	0.168	-0.390	0.698
Debt-to-capital ratio	-1.092	0.331	-3.294	0.001***
Stability ratio	-0.519	0.197	-2.630	0.010***
Debt-to-sales revenue	-0.577	0.195	-2.965	0.004***
Net indebtedness	0.034	0.059	0.584	0.560
Profit margin	-0.300	0.164	-1.832	0.069*
EBIT-to-sales	0.133	0.067	1.974	0.050*
ROS	0.589	0.201	2.938	0.004***
ROE	-0.629	0.200	-3.145	0.002***

Note: * significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

Table 11. Breusch-Pagan test result – *H2*

B-P (LM)	p-value
30.549	3.25552e-008

The test results show that the p-value is lower than the significance level we chose ($p = 0.05$). The consequence of this is that we reject the null hypothesis, i.e., the random effects model is more suitable for data analysis. During the panel data analysis, both random and fixed-effect models were used. To decide which model is more appropriate, the Hausman test was performed in Gretl.

Table 12. Hausman test results – *H2*

H	p-value
20.853	0.053

The result of the test is 20.853. The p-value obtained is slightly higher (0.053) than the significance level we set ($p = 0.05$). This means that we reject the alternative hypothesis and accept the null hypothesis of the Hausman test. This means that the random effects model is better suited to interpret the data. By comparing the analyses, hypothesis 2 can be accepted, that the idiosyncratic risks in the multivariate regression analysis and the panel analysis are, in fact, explained by the financial ratios.

4. DISCUSSION

The results indicate that the market risk of stocks is influenced by financial factors, including capital structure ratios (*H1*). To the best of our knowledge,

no previous studies have directly investigated this specific relationship.

Based on the results obtained, hypothesis 1 was accepted, meaning. Market sensitivity measures the combined movement of asset/portfolio returns and market returns. Taking into account the capital structure and the ownership value (Modigliani & Miller Theorem II), the expected return to shareholders depends on the level of corporate tax liability (Modigliani & Miller, 1958). Hence, the expected return to shareholders of a leveraged company can be defined as the sum of the expected return to shareholders of an equity-financed company plus a premium. In other words, market risk affects the expected return to shareholders of a leveraged company (Modigliani & Miller, 1963). The final results of our statistical analyses show that all the capital structure ratios examined (debt-to-capital ratio, stability ratio, debt-to-sales revenue, net indebtedness) and one profitability ratio (EBIT-to-sales) affect the degree of market risk. This means that Modigliani and Miller's theorem II applies equally to listed companies in the V4 countries.

Based on the results, idiosyncratic risks in multivariate regression analysis and panel analysis are explained by financial ratios. To the best of our knowledge, no prior studies have directly addressed this topic. This highlights the originality of the present research and its contribution to the literature. The evolution of idiosyncratic risks varies from one company to another, as both external and internal factors influence their ex-

tent (Vozlyublennaia, 2013; Li et al., 2024). Risks affect, among other things, the company's products (Benkraiem et al., 2022) and its financial position (Vo, 2023), the value of which may be negatively affected by a change in the share price. In the practical part, we have outlined a number of cases of the companies under study that, in practice, affect the share price and, consequently, the returns. The results showed that some of the solvency ratios (debt-to-capital ratio, stability ratio, debt-to-sales revenue), and profitability ratios (ROS and ROE) considered have an impact on the degree of idiosyncratic risk. This leads to the conclusion: Financial ratios explain the specific risks identified in regression analyses.

that the level of risks included in the equilibrium model is influenced by the financial indicators of listed companies. Since the indicators are available and usable for all companies, they are suitable for providing information about the level of individual risks for non-listed companies, too.

CONCLUSION

The main objective of this empirical study was to obtain a comprehensive picture of the evolution of idiosyncratic risks in the traditional equilibrium model. Summarizing the results obtained, the following can be stated:

- Choosing the right strategy and business policy decisions. Although individual risks cannot be completely eliminated, companies have the opportunity to optimize these risks. One possible method is diversification, or the application of a risk management strategy that is consistent with corporate goals while maximizing shareholder value. This is related to Leland's (1998) theory that if a company adapts to a designated risk management policy, it can also increase its corporate value.
- Leverage. The optimal capital structure varies from company to company, but it is almost impossible to choose a generally accepted capital structure that applies to all companies. Companies with high leverage also take on high risks. However, based on the results of the current study, these risks can be monitored using corporate financial indicators. High leverage reduces a company's tax liability, which in turn increases shareholder returns.
- Time factor. All corporate events that give rise to idiosyncratic risks are usually the result of internal decisions made by owners. Therefore, time management can be an important factor, as continuous control and monitoring can be a driving force behind the development of risks.
- Financial management. Companies should not only emphasize the importance of financial planning for the sake of analyzing their financial situation and profitability. The data necessary for financial analysis is provided by accounting, which can be used to identify the company's "position." The results of using accounting data are the balance sheet, income statement, and cash flow statement. Since each plan is worked out in detail during the planning process, it would be worthwhile to prepare a separate plan for changes in financial indicators.

Overall, companies have a wide range of options to optimize the uncertainties arising from idiosyncratic risks. The value of financial indicators may vary depending on how the company shapes and approaches the value of each indicator. If, for example, the company does not take into account the amount of equity capital when calculating the ROE indicator, it will be undercapitalized on the one hand, and on the other hand, it will correct the value of the indicator. This applies not only to the profitability of equity capital, but to any indicator. What may be important for companies, and what has been confirmed by this research, is that it is not the specific value of the financial indicator that should be emphasized, but rather the content behind the indicators, which carries essential information that can be used to identify idiosyncratic risks.

This empirical study has some limitations. Since the number of companies in the study is small, which is understandable, since not all of the companies in the V4 countries are listed on the stock exchange, the number of elements had to be further reduced by deleting accounting data of companies with significantly different balance sheet items (e.g., financial institutions and insurance companies). In addition, we would like to highlight the problems encountered during the renewal of the database. Our original research plan included 20 years in the period under study, but at the start of our research, only 10 years of data were available in the Orbis database. The time constraint also played a significant role in the relevance of our research results.

Our future objectives include extending the research to other regions (e.g., the USA), with data from past decades. We also plan to carry out further research, analyzing in more depth the factors of the asset pricing model as a function of idiosyncratic risks.

AUTHOR CONTRIBUTIONS

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REFERENCES

1. Amorim, A. L. G. C., Lima, I. S., & Murcia, F. D. R. (2014). Informação contábil e beta de mercado [Accounting Information and Market Beta]. *Revista Universo Contábil – Accounting Universe Magazine*, 10(4), 128-143. (In Portuguese). Retrieved from <https://www.redalyc.org/pdf/1170/117033502007.pdf>
2. Beja, A. (1972). On Systematic and unsystematic components of financial risk. *The Journal of Finance*, 27(1), 37-45. <https://doi.org/10.1111/j.1540-6261.1972.tb00617.x>
3. Belas, J., Gavurova, B., Kubák, M., & Novotna, A. (2023). Risk management level determinants in Visegrad countries – Sectoral analysis. *Technological and Economic Development of Economy*, 29(1), 307-325. <https://doi.org/10.3846/tede.2023.18415>
4. Bélyácz, I. (2011). Kockázat, bizonytalanság, valószínűség [Risk, uncertainty, probability]. *Hitelintézet Szemle – Credit Institution Review*, 10(4), 289-313. (In Hungarian). <https://doi.org/10.3846/tede.2023.18415>
5. Benkraiem, R., Galariotis, E., Guizani, A., & Lakhal, F. (2022). Product market competition and stock price crash risk: Exploring the role of managerial ownership. *Research in International Business and Finance*, 63, 101786. <https://doi.org/10.1016/j.ribaf.2022.101786>
6. Bliese, P. D., Schepker, D. J., Es-sman, S. M., & Ployhart, R. E. (2020). Bridging methodological divides between macro-and microresearch: Endogeneity and methods for panel data. *Journal of Management*, 46(1), 70-99. <https://doi.org/10.1177/0149206319868>

7. Bollen, K. A., & Brand, J. E. (2010). A General Panel Model with Random and Fixed Effects: A Structural Equations Approach. *Social Forces*, 89(1), 1-34. <https://doi.org/10.1353/sof.2010.0072>
8. Cao, J., & Han, B. (2016). Idiosyncratic risk, costly arbitrage, and the cross-section of stock returns. *Journal of Banking & Finance*, 73, 1-15. <https://doi.org/10.1016/j.jbankfin.2016.08.004>
9. Chen, C., He, F., & Lin, L. (2024). Anchoring effect, prospect value and stock return. *International Review of Economics & Finance*, 89, 1539-1556. <https://doi.org/10.1016/j.iref.2023.09.008>
10. Chow, G. C. (1960). Tests of Equality between Sets of Coefficients in Two Linear Regressions. *Econometrica*, 28(3), 591-605. <https://doi.org/10.2307/1910133>
11. Cornell, B. (2021). ESG preferences, risk and return. *European Financial Management*, 27(1), 12-19. <https://doi.org/10.1111/eufm.12295>
12. Cottrell, A., & Lucchetti, R. (2024). *Gretl user's guide*. Retrieved from <https://gretl.sourceforge.net/gretl-help/gretl-guide.pdf>
13. Demirović, L., Isaković-Kaplan, Š., & Proho, M. (2021). Internal Audit Risk Assessment in the Function of Fraud Detection. *Journal of Forensic Accounting Profession*, 1(1) 35-49. <https://doi.org/10.2478/jfap-2021-0003>
14. Donovan, A., Morin, J., & Walshe, R. (2023). Interdisciplinary research in hazards and disaster risk. *Progress in Environmental Geography*, 2(3), 202-222. <https://doi.org/10.1177/27539687231183448>
15. Dvorsky, J., Petrakova, Z., Hudakova, M. & Bednarz, J. (2023). National support and legislative change in the business environment of V4 countries: Business sectors view. *Journal of Business Sectors*, 1(1), 42-52. <https://doi.org/10.62222/EQDP3972>
16. Frame, J. D. (2003). *Managing risk in organizations - A guide for managers*. San Francisco: Jossey Bass.
17. Hardy, M. (2003). *Investment guarantees - Modeling and Risk Management for Equity-linked Life Insurance*. Hoboken: Wiley.
18. Holmstrom, B., & Milgrom, P. (1987). Aggregation and linearity in the provision of intertemporal incentives. *Econometrica*, 55(2), 303-328. <https://doi.org/10.2307/1913238>
19. Jenčová, S., Petruška, I., Gavura, Š., Miškuřová, M., & Bačík, R. (2023). Relationship between financial indicators in the Slovak engineering industry: A panel regression approach. *Journal of International Studies*, 16(4), 52-65. <https://doi.org/10.14254/2071-8330.2023/16-4/4>
20. Jiang, J., & Feng, Y. (2021). The interaction of risk management tools: Financial hedging, corporate diversification and liquidity. *International Journal of Finance & Economics*, 26(2), 2396-2413. <https://doi.org/10.1002/ijfe.1913>
21. Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Boston: Houghton Mifflin Company.
22. Kolari, J. W., Liu, W., & Pynnönen, S. (2023). *Professional Investment Portfolio Management*. Cham: Palgrave Macmillan. <https://doi.org/10.1007/978-3-031-48169-7>
23. Korcsmaros, E., Seben, Z., Machova, R., & Feher, L. (2019). Promotion of Euro Introduction in Slovakia: Financial Literacy of Generation X and Y. *Marketing & Management of Innovations*, 10(3), 11-21. <https://doi.org/10.21272/mmi.2019.3-01>
24. Köstlmeier, S. (2024). Pricing and mispricing of accounting fundamentals: Global evidence. *The Quarterly Review of Economics and Finance*, 94, 71-87. <https://doi.org/10.1016/j.qref.2023.12.011>
25. Kupsch, P. (1995). Risikomanagement [Risk management]. In Corsten, H. & Reiss, M. (Eds.), *Handbuch der Unternehmensführung - Konzepte, Instrumente, Schnittstellen* [Handbook of Corporate Management - Concepts, Tools, Interfaces] (pp. 529-548). Betriebswirtschaftlicher Verlag Dr. Th. Gabler GmbH. (In German). Retrieved from <https://link.springer.com/book/9783322889805>
26. Lacko, R., Hajduova, Z., Mura, L., & Dzogan, M. (2023). The Attractiveness of Foreign Direct Investments for Business: The Case of the Selected European Union Members. *Transformations in Business & Economics*, 22(2), 31-44. Retrieved from <https://www.transformations.knf.vu.lt/59/rp59.pdf>
27. Leland, H. E. (1998). Agency costs, risk management, and capital structure. *Journal of Finance*, 53(4), 1213-1243. <https://doi.org/10.1111/0022-1082.00051>
28. Li, M., & Xiao, C. (2023). Income sources, cyclical behaviors of fiscal policy, and welfare conflict. *Macroeconomic Dynamics*, 27(8), 2137-2164. <https://doi.org/10.1017/S1365100522000621>
29. Li, Y., Ren, X., & Meng, S. (2024). The performance of companies under environmental regulation stress: a perspective from idiosyncratic risk. *Applied Economics*, 56(57), 8058-8073. <https://doi.org/10.1080/00036846.2023.2289924>
30. Marinho, K. B. A., Menezes, T. A., Lagioia, U. C. T., Carlos, F. F., & Lemos, L. V. (2013). Indicadores financeiros e contábeis que influenciam a tomada de decisão do investidor na detailoração de uma carteira de ações e na determinação do nível de risco [Financial and accounting indicators that influence investor decision-making in detailing a stock portfolio and determining the level of risk]. *Revista Evidenciação Contábil & Finanças - Accounting & Finance Disclosure Journal*, 1(2), 52-68. (In Portuguese). Retrieved from <https://dialnet.unirioja.es/servlet/articulo?codigo=4864943>
31. Markowitz, H. M. (1952). Portfolio Selection. *The Journal of Finance*, 7(1), 77-91. <https://doi.org/10.2307/2975974>
32. Meh, C., & Quadrini, V. (2006). Endogenous market incompleteness with investment risks. *Journal of Economic Dynamics and Control*, 30(11), 2143-2165. <https://doi.org/10.1016/j.jedc.2005.02.008>
33. Merton, R. C. (1987). Presidential address: A simple model of capital market equilibrium with

- incomplete information. *Journal of Finance*, 42(3), 483-510. <https://doi.org/10.1111/j.1540-6261.1987.tb04565.x>
34. Michalski, P. B. (2020). Expeditionary Risk Management Concept. In Soliman, S. K. (Ed.), *Education Excellence and Innovation Management: A 2025 Vision to Sustain Economic Development during Global Challenges* (pp. 10478-1482). International Business Information Management Association (IBIMA). Retrieved from <https://wir.ue.wroc.pl/docs-tore/download.seam?entityType=article&entityId=WUTefed1acad9ae4346aa7498d1e118474a&fileId=UEWRd43ed836e9ff46aabec5d69d431190d0>
 35. Michelacci, C., & Schivardi, F. (2013). Does Idiosyncratic Business Risk Matter for Growth? *Journal of the European Economic Association*, 11(2), 343-368. <https://doi.org/10.1111/jeea.12007>
 36. Mieseigha, E. G., & Okewale, J. A. (2021). TAX aggressiveness and firm value: Evidence from industrial goods companies on the Nigerian exchange group. *Acta Oeconomica Universitatis Selye*, 10(2), 59-69. Retrieved from <https://www.ceeol.com/search/article-detail?id=1043295>
 37. Modigliani, F., & Miller, M. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review*, 48(3), 261-297. Retrieved from <https://www.jstor.org/stable/1809766>
 38. Modigliani, F., & Miller, M. (1963). Corporate income taxes and the cost of capital: a correction. *American Economic Review*, 53(3), 433-443. Retrieved from <https://www.jstor.org/stable/1809167>
 39. Nádasi, L. (2011). Válság, következmények és feladatok. Földobott kő? – Tények és tendenciák a 21. Században [Crisis, consequences and tasks A stone thrown to the ground? – Facts and trends in the 21st century]. *Közgazdasági Szemle – Economic Review*, 58(6), 565-569. (In Hungarian). Retrieved from https://epa.oszk.hu/00000/00017/00182/pdf/06_nadasi.pdf
 40. Pontiff, J. (2006). Costly arbitrage and the myth of idiosyncratic risk. *Journal of Accounting and Economics*, 42(1-2), 35-52. <https://doi.org/10.1016/j.jacceco.2006.04.002>
 41. Prislupčáková, I. (2022). Correlation of the returns of selected stablecoins with bitcoin and ethereum. *Acta Oeconomica Universitatis Selye*, 11(2), 96-105. Retrieved from <https://www.ceeol.com/search/article-detail?id=1128542>
 42. Santos, D. P. N., Olivo, R. L. de F., Sales, G. A. W., & Silva, F. L. da. (2023). The corporate governance impact on brazilian stock exchange during the covid-19 crisis. *Concilium*, 23(2), 31-51. Retrieved from <https://discovery.researcher.life/article/the-corporate-governance-impact-on-brazilian-stock-exchange-during-the-covid-19-crisis/5301e2e0153b35f59d-2d678030a09668>
 43. Sexauer, S. C., & Siegel, L. B. (2024). Harry Markowitz and the philosopher's stone. *Financial Analysts Journal*, 80(1), 1-11. <https://doi.org/10.1080/0015198X.2023.2285218>
 44. Shleifer, A., & Vishny, R. (1997). The limits of arbitrage. *Journal of Finance*, 52(1), 35-55. <https://doi.org/10.2307/2329555>
 45. Soliman, A., & Le Saout, E. (2024). The impact of the war in Ukraine on the idiosyncratic risk and the market risk. *Finance Research Letters*, 60, 104895. <https://doi.org/10.1016/j.frl.2023.104895>
 46. Souza, L. C., Massardi, W. O., & Pires, V. A. V. (2017). Otimização de carteira de investimentos: Um estudo com ativos do Ibovespa [Optimization Of Investment Portfolio: A Study With Ibovespa Assets]. *Revista de Gestão, Finanças e Contabilidade – Journal of Management, Finance and Accounting*, 7(3), 201-213. Retrieved from <https://dialnet.unirioja.es/descarga/articulo/10187009.pdf>
 47. Sun, Y., & Wang, X. (2022). An asymptotically F-distributed Chow test in the presence of heteroscedasticity and autocorrelation. *Econometric Reviews*, 41(2), 177-206. <https://doi.org/10.1080/07474938.2021.1874703>
 48. Szemere, T. P., Garai-Fodor, M., & Csiszárík-Kocsir, Á. (2021). Risk approach – Risk hierarchy or construction investment risks in the light of interim empiric primary research conclusions. *Risks*, 9(5), 84. <https://doi.org/10.3390/risks9050084>
 49. Townsend, R. M. (1978). Intermediation with costly bilateral exchange. *Review of Economic Studies*, 45(3), 417-425. <https://doi.org/10.2307/2297244>
 50. Uyanto, S. S. (2022). Monte Carlo power comparison of seven most commonly used heteroscedasticity tests. *Communications in Statistics-Simulation and Computation*, 51(4), 2065-2082. <https://doi.org/10.1080/03610918.2019.1692031>
 51. Vo, D. H. (2023). Market risk, financial distress and firm performance in Vietnam. *PLoS one*, 18(7), e0288621. <https://doi.org/10.1371/journal.pone.0288621>
 52. Vozlyublennai, N. (2013). Do firm characteristics matter for the dynamics of idiosyncratic risk? *Journal of International Financial Markets, Institutions and Money*, 27, 35-46. <https://doi.org/10.1016/j.intfin.2013.07.006>
 53. Wang, H., Jiao, S., & Sun, G. (2024). Investor interaction and the valuation of listed companies. *Research in International Business and Finance*, 67(B), 102144. <https://doi.org/10.1016/j.ribaf.2023.102144>
 54. Wei, J. K. C., & Zhang, J. (2007). *Arbitrage risk and arbitrage returns: Evidence from the fundamental value-to-price anomaly: working paper*. <https://dx.doi.org/10.2139/ssrn.1108868>
 55. Wooldridge, J. M. (2023). Simple approaches to nonlinear difference-in-differences with panel data. *The Econometrics Journal*, 26(3), C31-C66. <https://doi.org/10.1093/ectj/utad016>