**Scientific Annals of Economics and Business**
**71 (4), 2024, 625-640**
**DOI: 10.47743/saeb-2024-0030**

# The Determinants of Firm Value: A Panel Data Approach on the S&P 500 Companies

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**Abstract:** Over the last two decades, the US companies have faced a series of challenges caused by the two of the most significant events, namely the global financial crisis and the Covid-19 pandemic crisis. To analyze the influence of these crises along with other factors on the firm value represented by Tobin's Q, there were estimated unbalanced panel data multiple regression models, with cross-section fixed effects, with cross-section and period fixed effects, with cross-section random effects, and with cross-section random effects with period fixed effects, using a sample of 442 non-financial companies included in the Standard & Poor's 500 index, over a period of 20 years, from 2004 to 2023. The independent variables are divided into three categories, namely financial indicators, corporate governance variables, and dummy variables that indicate the crisis periods. The results showed that the financial leverage, asset tangibility, liquidity, firm size, the number of meetings attended by the board members annually, the proportion of the independent members on the board and the Covid-19 pandemic crisis had a positive effect on the company value, while the firm age, CEO duality, the number of the members on the board, the proportion of the females on the board and the global financial crisis exerted a negative impact on the firm value. To better differentiate the determinants of the firm value in the context of the two major events that occurred during the analyzed period, there were estimated other empirical models using interaction variables between each dummy variable showing the crisis and the other factorial variables.

**Keywords:** firm value; financial indicators; corporate governance indicators; US companies; panel data regression.

**JEL classification:** C23; G32; G34; L25; O16.

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**Article history:** Received 11 November 2024 | Accepted 17 December 2024 | Published online 20 December 2024

**To cite this article**: Vintilă, A. I. (2024). The Determinants of Firm Value: A Panel Data Approach on the S&P 500 Companies. *Scientific Annals of Economics and Business*, 71(4), 625-640. https://doi.org/10.47743/saeb-2024-0030.

## 1. INTRODUCTION

The US companies have faced a series of challenges over time due to the emergence of unforeseen unfavorable global events that have affected the companies' operational activity. The global financial crisis and the Covid-19 pandemic crisis represent two of the most significant events of the last two decades that led to the stock market crash and, consequently, to a decline in the companies' value. Considering these events, the purpose of the research is to analyze the determinants of the value of the 442 non-financial companies included in the Standard & Poor's 500 index, over a period of 20 years, from 2004 to 2023, the period that also includes the two major crises.

The research is focused on three directions, which follow (i) the impact of financial variables (financial leverage, asset tangibility, liquidity, firm age, firm size) on company value, (ii) the influence of corporate governance variables (CEO duality, board size, board meetings, board non-executive members, board independence, board gender diversity) on the firm value, and (iii) the effect produced by the global financial crisis and the Covid-19 pandemic crisis on the companies value.

The research begins with a review of previous studies from the international specialized literature that highlight positive or negative effects of the factorial variables on the firm value. There was identified both the positive (Su *et al.*, 2017; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Hutauruk, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024) and negative (Panaretou, 2014; Lee *et al.*, 2015; Sudiyatno *et al.*, 2020; Thakur *et al.*, 2021; Huang & Xiong, 2023; Caixe *et al.*, 2024; Intara *et al.*, 2024; Intara & Suwansin, 2024; Wu & Song, 2024) influence of indebtedness, the positive (Sudiyatno *et al.*, 2020; Sisodia *et al.*, 2021; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara & Suwansin, 2024) and negative (Lee *et al.*, 2015; Su *et al.*, 2017; Silva *et al.*, 2019; Saona *et al.*, 2020; Cho *et al.*, 2021; Thakur *et al.*, 2021; Benjamin *et al.*, 2022; Choi *et al.*, 2022; Cid *et al.*, 2022; Chen & Yoon, 2023; Huang & Xiong, 2023; Intara *et al.*, 2024; Tan *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025) impact of the firm size, the positive (Saona *et al.*, 2020; Huang & Xiong, 2023; Mishra *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025) or negative (Mishra *et al.*, 2024) effect of the board independence on the company value.

To analyze the impact of the influencing factors on the firm value, there were estimated unbalanced panel data multiple regression models, with cross-section fixed effects, with cross-section and period fixed effects, with cross-section random effects, and with cross-section random effects with period fixed effects, the dependent variable used as a proxy for company value being represented by Tobin's Q. At the end of the paper, there are presented the empirical results regarding the factors affecting the company value, the results being interpreted both from a statistical and an economic perspective, with reference to the previous studies from the literature review.

## 2. LITERATURE REVIEW

Over the last years, there has been an important number of studies that investigated the determinants of the firm value. In the international scientific literature, there has been identified a variety of financial factors that can lead to the increase or decrease in the company value, such as: profitability (Panaretou, 2014; Lee *et al.*, 2015; Silva *et al.*, 2019; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Choi *et al.*, 2022; Cid *et al.*, 2022; Huang,

2024; Hutauruk, 2024; Intara *et al.*, 2024; An *et al.*, 2025), leverage (Panaretou, 2014; Lee *et al.*, 2015; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Chen & Yoon, 2023; Huang & Xiong, 2023; Caixe *et al.*, 2024; Hutauruk, 2024; Intara *et al.*, 2024; Intara & Suwansin, 2024; Mishra *et al.*, 2024; An *et al.*, 2025), asset tangibility (Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022), liquidity (Cho *et al.*, 2021; Benjamin *et al.*, 2022; Choi *et al.*, 2022; Huang, 2024; Hutauruk, 2024), sales growth (Sisodia *et al.*, 2021; Chen & Yoon, 2023; Huang & Xiong, 2023; Caixe *et al.*, 2024), firm size (Lee *et al.*, 2015; Silva *et al.*, 2019; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Choi *et al.*, 2022; Cid *et al.*, 2022; Chen & Yoon, 2023; Huang & Xiong, 2023; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara *et al.*, 2024; Intara & Suwansin, 2024; An *et al.*, 2025), firm age (Lee *et al.*, 2015; Silva *et al.*, 2019; Cid *et al.*, 2022; Chen & Yoon, 2023).

In the last period, ESG practices have been increasingly used in modeling the firm value. In this regard, An *et al.* (2025) analyzed the impact of environmental, social, and governance information disclosure on the value of Chinese companies listed on Shanghai and Shenzhen stock exchanges, over the period 2013-2020. The authors found out that ESG disclosure, along with ESG environmental dimension and ESG social dimension have a positive impact on firm value, while the ESG governance dimension proved to be statistically insignificant. However, Mishra *et al.* (2024) identified a negative influence of the ESG score on the value of Indian companies, meaning that companies which have a high level of ESG score obtain a lower firm value due to the overutilization of resources that might be used to substantiate the needs of shareholders. Furthermore, Hardiningsih *et al.* (2024) studied the effects that environmental disclosure, social disclosure, governance disclosure, along with political connection have on firm value. The sample consists of 87 companies listed on Singapore Stock Exchange over the period 2018-2021. The findings of the study indicate that in order to increase the company value, it is important to disclose political relationships, but also environmental and governance performance, the firm value being not affected by the social performance disclosure.

In another scientific paper (Cid *et al.*, 2022) it is analyzed the impact of the founding-family control and ownership concentration on the firm value. The sample is represented by 160 non-financial Chilean companies listed on the Santiago Stock Exchange, over a period of 15 years, from 2005 to 2019. It can be observed that family ownership leads to an increase in the company value until the extreme point is reached, so then the value of the company decreases after the extreme point is exceeded. Moreover, ownership concentration has a significantly negative impact on firm value, as noted also by Saona *et al.* (2020) who studied the relationship between corporate governance, board of directors and the value of companies from Chile and Spain, and identified a U-shaped effect of the ownership concentration on firm value.

Benjamin *et al.* (2022) has an interesting approach, examining the relationship between social media sentiments and company value. The social media sentiments are classified into positive and negative sentiments, but also into specific types of positive and negative sentiments such as joy and sadness. The results showed that positive social media sentiments, joy social media sentiments and advertising expenses lead to an increase in the firm value, no matter whether the company has a high or low ESG score. According to Chen and Yoon (2023), education is an essential resource for both personal growth and a firm's growth, and highly educated people can start successful businesses. Therefore, human capital is a crucial resource bringing excess earning power to the companies. The authors (Chen & Yoon, 2023) examined how education enhance the Chinese firm value, over a period of 10 years, from

2010 to 2019. They found out that graduate degree holders affect firm value more positively than undergraduate degree holders, while the digitalization level further strengthens brain gain's positive effect on company value.

In the specialized literature there are other approaches to firm value from the perspective of the generalized neoclassical model of investment (Belo *et al.*, 2022). The study analyzed the economic determinants of the market value of the US publicly traded companies from 1975 to 2016, incorporating quasi-fixed labor, knowledge capital, and brand capital into the neoclassical model of investment. The conclusions of the research show that non-physical input for company value is substantial and varies across industries, suggesting that knowledge capital accounts for 20% to 43%, physical capital accounts for 30% to 40%, brand capital accounts for 6% to 25% and installed labor force accounts for 14% to 21% of companies' market value across industries.

The main independent variables used by the authors of previous studies are presented in Table no. 1.

**Table no. 1 – Synthesis of the literature review**

| Author(s) | Sample | Period | Main independent variables |
|---|---|---|---|
| An *et al.* (2025) | 703 China's A-share firms listed on China's Shanghai and Shenzhen Stock Exchanges | 2013 – 2020 | ESG score, Firm size, Leverage, Profitability, Board size, Board independence, Board gender diversity, Operating cash flow, R&D expenditures, Institutional ownership |
| Benjamin *et al.* (2022) | Fortune 500 firms | 2010 – 2017 | Positive Social Media Sentiments, Negative Social Media Sentiments, Joy Social Media Sentiments, Sadness Social Media Sentiments, Firm size, Leverage, Profitability, Cash ratio, Asset tangibility, R&D expenditures |
| Caixe *et al.* (2024) | 136 Brazilian companies listed on the Brazilian Stock Exchange | 2009 – 2018 | Foreign institutional ownership, Domestic institutional ownership, Ownership concentration, Firm size, Sales growth, Leverage, Cash ratio, Profitability |
| Chen and Yoon (2023) | China's A-share listed firms | 2010 – 2019 | Brain gains, Digitalization level, Sales growth, Operating cash flow, Capital intensity, Interest-bearing liabilities, Firm age, Board size, State ownership |
| Cho *et al.* (2021) | Firms included in Compustat database | 1992 – 2016 | Investment, Market competition, Firm size, Leverage, Profitability, Cash ratio, Asset tangibility, CEO tenure, CEO gender |
| Choi *et al.* (2022) | Privately owned firms listed on China's Shanghai and Shenzhen Stock Exchanges | 2005 – 2016 | Executives' education, Executives' compensation, Executives' age, Executives' tenure, Executives' gender diversity, Firm size, Leverage, Liquidity, Profitability, R&D expenditures |
| Cid *et al.* (2022) | 160 non-financial Chilean firms listed | 2005 – 2019 | Family ownership, CEO/chairman founder, CEO/chairman family, Pension |

| Author(s) | Sample | Period | Main independent variables |
|---|---|---|---|
| | on the Santiago Stock Exchange | | funds' ownership, Board gender diversity, Ownership concentration, Firm size, Leverage, Firm age, Profitability, Asset tangibility |
| Diantimala *et al.* (2021) | 234 non-financial firms listed on the Indonesia Stock Exchange | 2012 – 2018 | Capital structure, Profitability, Asset tangibility, Liquidity, Firm size |
| Hardiningsih *et al.* (2024) | 87 firms listed on the Singapore Stock Exchange | 2018 – 2021 | Environmental score, Social score, Governance score, Political connection |
| Huang and Xiong (2023) | 3305 Chinese listed firms | 2007 – 2020 | Firm size, Leverage, Investment, Dividend, Sales growth, Board size, Board independence, Ownership concentration, Managerial ability score |
| Huang (2024) | 15813 firms from 116 countries | 1987 – 2023 | Board gender diversity, Board age, Board tenure, Board independence, CEO duality, Leverage, Cash holding, Asset tangibility, Firm size |
| Hutauruk (2024) | Palm oil firms listed on the Indonesia Stock Exchange | 2019 – 2022 | Technology innovation, Firm size, Liquidity, Leverage, Profitability, Asset turnover |
| Intara *et al.* (2024) | 84 firms listed on the Stock Exchange of Thailand | 2014 – 2021 | Earnings quality, Corporate governance, Firm size, Sales growth, Net profit margin, Profitability, Leverage |
| Intara and Suwansin (2024) | 390 firms listed on the Stock Exchange of Thailand | 2012 – 2021 | Intangible assets, R&D expenditures, Board independence, Institutional ownership, CEO duality, Firm size, Leverage |
| Lee *et al.* (2015) | Firms included in Compustat database | 1993 – 2011 | CEO duality, CEO tenure, CEO founder, Leverage, Profitability, Firm size, Firm age, R&D expenditures |
| Liow (2010) | 336 public real estate investment and development firms | 2000 – 2006 | Firm size, Sustainable growth rate, Asset tangibility |
| Mishra *et al.* (2024) | 420 firms listed on the National Stock Exchange of India | 2016 – 2021 | ESG score, Board independence, Board meetings, Board busyness, Board size, R&D expenditures, Leverage, Firm size, Sales growth |
| Panaretou (2014) | FTSE 350 firms | 2003 – 2010 | Leverage, Profitability, Growth opportunity, Dividend, Firm size |
| Saona *et al.* (2020) | Indexed non-financial firms from Chile and Spain | 2007 – 2016 | Board size, Board independence, Board gender diversity, Ownership concentration, Firm size, Profitability, Risk, Asset tangibility |

| Author(s) | Sample | Period | Main independent variables |
|---|---|---|---|
| Silva *et al.* (2019) | 80 publicly traded Brazilian firms listed in the IBrX100 index of the Brazilian Stock Exchange | 2004 – 2013 | Firm size, Leverage, Sales growth, Firm age, Profitability |
| Sisodia *et al.* (2021) | 1862 non-financial firms listed on the National Stock Exchange of India | 2001 – 2019 | Human capital, Firm size, Profitability, Leverage, Cash ratio, Asset tangibility, Dividend, Sales growth, R&D expenditures |
| Su *et al.* (2017) | All firms listed on China's Shanghai and Shenzhen Stock Exchanges | 2003 – 2012 | Corporate risk-taking, Firm size, Leverage, Profitability, Sales growth, Asset tangibility, Firm age |
| Sudiyatno *et al.* (2020) | 184 manufacturing firms listed on the Indonesia Stock Exchange | 2016 – 2018 | Capital structure, Managerial ownership, Firm size, Profitability |
| Tan *et al.* (2024) | 98 China's A-share listed pharmaceutical manufacturing companies | 2012 – 2021 | ESG performance, Technological innovation, Firm size, Leverage, Firm age, Board independence, Growth capacity, Profitability, Cash holding |
| Thakur *et al.* (2021) | 4236 firms from 16 emerging market economies | 2002 – 2015 | Corruption, Cash holding, Leverage, Capital expenditure, Firm size, Asset tangibility, Profitability, Inflation, Economic growth |
| Wu and Song (2024) | A-share firms listed on the Chinese stock market | 2018 – 2022 | Performance of carbon neutrality, Firm size, Leverage, Asset tangibility, Ownership concentration, Board size, Board independence |

*Source:* author's own processing

Based on the authors' results of the previous studies, there are considered 10 research hypotheses:

- **Hypothesis 1**: Financial leverage positively affects the firm value (Su *et al.*, 2017; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Hutauruk, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024).
- **Hypothesis 2**: Asset tangibility has a positive effect on the firm value (Saona *et al.*, 2020; Benjamin *et al.*, 2022).
- **Hypothesis 3**: Liquidity has a positive impact on the firm value (Hutauruk, 2024).
- **Hypothesis 4**: Firm age positively impacts the firm value (Su *et al.*, 2017; Silva *et al.*, 2019; Cid *et al.*, 2022; Chen & Yoon, 2023).
- **Hypothesis 5**: Firm size exerts a positive impact on the firm value (Sudiyatno *et al.*, 2020; Sisodia *et al.*, 2021; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara & Suwansin, 2024).

- **Hypothesis 6**: CEO duality negatively affects the firm value (Lee *et al.*, 2015; Intara & Suwansin, 2024).
- **Hypothesis 7**: Board size has a negative impact on the firm value (Chen & Yoon, 2023; Huang, 2024; Mishra *et al.*, 2024).
- **Hypothesis 8**: Board meetings exert a negative impact on the firm value (Mishra *et al.*, 2024).
- **Hypothesis 9**: Board independence positively influences the firm value (Saona *et al.*, 2020; Huang & Xiong, 2023; Mishra *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025).
- **Hypothesis 10**: Board gender diversity has a positive impact on the firm value (Saona *et al.*, 2020; Huang, 2024).

These hypotheses will be further tested, within the empirical models estimated for the companies included in the S&P 500 index.

## 3. RESEARCH METHODOLOGY

### 3.1 Database

To construct the sample, the data is collected from Eikon platform by Thomson Reuters and consists of 442 non-financial companies included in the Standard & Poor's 500 index, over a period of 20 years, from 2004 to 2023, amassing a total of 8840 statistical observations. Considering that for some companies there wasn't data available for the entire analyzed period, the final sample was reduced to a maximum number of 4263 observations. However, the number of observations differs depending on the estimated empirical model, varying from 3785 to 4263 observations. Moreover, to reduce the impact of outliers on empirical research, a 95% winsorization of the data was applied.

### 3.2 Variables definition

The dependent variable included in the empirical research is represented by Tobin's Q (TQ), used as a proxy for firm value, because it is a forward-looking valuation approach (Mishra *et al.*, 2024). Tobin's Q is defined as the market value of equity plus the book value of debt, all divided by total assets. Regarding the independent variables, they are divided into three categories, namely: financial indicators, corporate governance indicators and dummy variables for crisis periods.

The financial indicators are represented by: financial leverage (LEV) measured as total debt divided by total assets (Lee *et al.*, 2015; Su *et al.*, 2017; Silva *et al.*, 2019; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Thakur *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Huang & Xiong, 2023; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara *et al.*, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024; Wu & Song, 2024), reflecting how much of the firm's assets are financed by debt, asset tangibility (TANG) calculated as net property, plant, and equipment divided by total assets (Su *et al.*, 2017; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Thakur *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Huang, 2024), showing the proportion of fixed assets in total assets, liquidity (LIQ) represented by current ratio which is calculated as current assets to current liabilities (Choi *et al.*, 2022; Hutauruk, 2024), effective tax rate (ETR) used as a proxy for taxation and calculated as tax expenses to earnings before taxes, firm age (FAGE) meaning the years since company public

listing (Lee *et al.*, 2015; Su *et al.*, 2017; Silva *et al.*, 2019; Chen & Yoon, 2023; Tan *et al.*, 2024), natural logarithm of market capitalization (FSIZE) used as a proxy for firm size (Caixe *et al.*, 2024).

Regarding corporate governance, it is analyzed through indicators, such as: CEO duality (CEOD) expressed as a dummy variable which takes value 1 if the CEO is also the chairman, and value 0 otherwise (Lee *et al.*, 2015; Huang, 2024; Intara & Suwansin, 2024), board size (BSIZE) measured as the number of directors on the board (Saona *et al.*, 2020; Chen & Yoon, 2023; Huang & Xiong, 2023; Huang, 2024; Mishra *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025), board meetings (BMEET) calculated as the number of meetings attended by the board members annually (Mishra *et al.*, 2024), board non-executive members (BNEXEC) meaning the proportion of the non-executive members on the board, board independence (BINDEP) showing the proportion of independent members on the board (Saona *et al.*, 2020; Choi *et al.*, 2022; Huang & Xiong, 2023; Huang, 2024; Intara & Suwansin, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025), board gender diversity (BGDIV) expressed as the percentage of female directors on the board (Saona *et al.*, 2020; Cid *et al.*, 2022; Huang, 2024; An *et al.*, 2025).

In the empirical research, four new variables are proposed and used, which have not been identified in the previous studies, namely: effective tax rate (ETR) – to analyze the impact of taxation on firm value, board non-executive members (BNEXEC), and two dummy variables that capture the impact of the global financial crisis (FIN), respectively the Covid-19 pandemic crisis (COVID) on the firm value.

### 3.3 Research models

To examine the determinants of the firm value, there are estimated unbalanced panel data multiple regression models, with cross-section fixed effects, with cross-section and period fixed effects, with cross-section random effects, and with cross-section random effects with period fixed effects, using Stata 18 software, as follows:

$$TQ_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 TANG_{it} + \beta_3 LIQ_{it} + \beta_4 ETR_{it} + \beta_5 FAGE_{it} + \beta_6 FSIZE_{it} + \beta_7 CEOD_{it} + \beta_8 BSIZE_{it} + \beta_9 BMEET_{it} + \beta_{10} BNEXEC_{it} + \beta_{11} BGDIV_{it} + \beta_{12} FIN_{it} + \beta_{13} COVID_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

$$TQ_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 TANG_{it} + \beta_3 LIQ_{it} + \beta_4 ETR_{it} + \beta_5 FAGE_{it} + \beta_6 FSIZE_{it} + \beta_7 CEOD_{it} + \beta_8 BSIZE_{it} + \beta_9 BMEET_{it} + \beta_{10} BINDEP_{it} + \beta_{11} BGDIV_{it} + \beta_{12} FIN_{it} + \beta_{13} COVID_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

where TQ is Tobin's Q, LEV is financial leverage, TANG is asset tangibility, LIQ is liquidity, ETR is effective tax rate, FAGE is firm age, FSIZE is firm size, CEOD is CEO duality, BSIZE is board size, BMEET is board meetings, BNEXEC is board nonexecutive members, BINDEP is board independence, BGDIV is board gender diversity, FIN is a dummy variable for global financial crisis, COVID is a dummy variable for Covid-19 pandemic crisis, $\lambda_i$ shows the unobserved individual effect, $\mu_t$ shows the unobserved time effect, $\varepsilon_{it}$ is the error term.

### 3.4 Descriptive statistics

Table no. 2 shows the descriptive statistics of the variables.

**Table no. 2 – Descriptive statistics**

| Variable | Mean | Median | Min | Max | SD |
|---|---|---|---|---|---|
| TQ | 2.0802 | 1.5700 | .5500 | 7.6300 | 1.5706 |
| LEV | .4212 | .4079 | 0 | 1.1651 | .2673 |
| TANG | .2709 | .1689 | .0192 | .8966 | .2508 |
| LIQ | 1.7913 | 1.4803 | .4956 | 5.3203 | 1.0814 |
| ETR | .2374 | .2527 | -.1680 | .5306 | .1429 |
| FAGE | 33.256 | 23 | 1 | 113 | 29.9262 |
| FSIZE | 23.5585 | 23.5103 | 21.0868 | 26.1535 | 1.2165 |
| CEOD | .5504 | 1 | 0 | 1 | .4975 |
| BSIZE | 10.6815 | 11 | 7 | 15 | 2.0151 |
| BMEET | 7.8130 | 7 | 4 | 16 | 2.9174 |
| BNEXEC | .8583 | .8824 | .6667 | .9333 | .0684 |
| BINDEP | .8240 | .8462 | .5556 | .9333 | .0969 |
| BGDIV | .1930 | .1818 | 0 | .6667 | .1066 |
| FIN | .1500 | 0 | 0 | 1 | .3571 |
| COVID | .1500 | 0 | 0 | 1 | .3571 |

*Source:* author's own computation

The average value of Tobin's Q is 2.08, while the median value is 1.57. Regarding the financial leverage, the companies total debt represents, on average, 42.12% of the total assets. Moreover, the fixed assets of a company represent, on average, 27.09% of its total assets. Additionally, in the S&P 500 index, the oldest company is 113 years old, whereas the youngest firm has only 1 year since public listing. Relative to corporate governance, the number of directors on the board varies from 7 to 15 people, the board of directors meets 4 to 16 times during the year. Furthermore, the average percentage of the female directors on the board represents only 19.30%.

### 3.5 Correlation analysis

Table no. 3 presents the correlation matrix for the variables used in the empirical research.

**Table no. 3 – Correlation matrix**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| (1) TQ | 1.0000 | | | | | | | |
| (2) LEV | -0.0374 | 1.0000 | | | | | | |
| (3) TANG | -0.0295 | 0.0661 | 1.0000 | | | | | |
| (4) LIQ | 0.0979 | -0.4292 | -0.1683 | 1.0000 | | | | |
| (5) ETR | -0.0988 | -0.0530 | 0.1350 | -0.0846 | 1.0000 | | | |
| (6) FAGE | -0.0505 | 0.1134 | 0.0030 | -0.1249 | -0.0362 | 1.0000 | | |
| (7) FSIZE | 0.0867 | 0.0943 | 0.0594 | -0.1662 | -0.1201 | 0.1679 | 1.0000 | |
| (8) CEOD | -0.1346 | 0.0908 | 0.0565 | -0.1529 | 0.0477 | 0.2409 | 0.1162 | 1.0000 |
| (9) BSIZE | -0.0960 | 0.2579 | 0.0777 | -0.2487 | 0.0023 | 0.2591 | 0.3950 | 0.1272 |
| (10) BMEET | -0.0109 | 0.1492 | 0.0039 | -0.1251 | -0.0420 | 0.0511 | 0.0818 | 0.0522 |
| (11) BNEXEC | -0.0586 | 0.2595 | -0.0228 | -0.1477 | -0.0546 | 0.1713 | 0.2113 | 0.2094 |
| (12) BINDEP | 0.0260 | 0.2028 | -0.0390 | -0.1086 | -0.1170 | 0.1615 | 0.1831 | 0.1968 |
| (13) BGDIV | 0.0324 | 0.2102 | -0.0480 | -0.2087 | -0.1720 | 0.1729 | 0.3440 | 0.0766 |
| (14) FIN | -0.1142 | -0.0858 | 0.0444 | -0.0017 | 0.1088 | -0.0308 | -0.1477 | 0.0667 |
| (15) COVID | 0.1533 | 0.0932 | -0.0050 | -0.0687 | -0.2321 | 0.0537 | 0.2353 | -0.0705 |

| Variable | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|
| (9) BSIZE | 1.0000 | | | | | | |
| (10) BMEET | 0.1503 | 1.0000 | | | | | |
| (11) BNEXEC | 0.2322 | 0.0895 | 1.0000 | | | | |
| (12) BINDEP | 0.1017 | 0.0993 | 0.6450 | 1.0000 | | | |
| (13) BGDIV | 0.2020 | 0.0994 | 0.1884 | 0.2335 | 1.0000 | | |
| (14) FIN | -0.0244 | 0.0297 | -0.0301 | -0.0663 | -0.1712 | 1.0000 | |
| (15) COVID | 0.0230 | 0.0486 | 0.0666 | 0.1253 | 0.4239 | -0.1553 | 1.0000 |

*Source:* author's own computation

Moderate and positive correlations are identified between board non-executive members and board independence, so therefore, in order to avoid the phenomenon of multicollinearity of the factors, the two independent variables are included in different regression models.

## 4. EMPIRICAL ANALYSIS AND RESULTS

To analyze the factors affecting the value of the 442 non-financial companies included in the S&P 500 index over the period 2004-2023, there are estimated eight different models, and the empirical results are presented in Table no. 4. There is also conducted the Hausman test to determine which model is more appropriate, and the results indicate that the fixed effects estimator is preferred over the random effects estimator.

**Table no. 4 – Empirical results**

| Variable | Models | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| LEV | .2109* | | .176* | | .2855** | .2148* | | |
| | (.1143) | | (.1055) | | (.1115) | (.11) | | |
| TANG | .571** | | | | .5459* | | | |
| | (.2912) | | | | (.2801) | | | |
| LIQ | .0547** | .0521** | .0579** | .059** | .0499* | .0583** | .0433* | .0588** |
| | (.0271) | (.0255) | (.026) | (.0246) | (.0266) | (.0262) | (.0248) | (.0241) |
| ETR | -.1392 | | -.1679 | | -.0794 | .0628 | -.0833 | |
| | (.1383) | | (.1342) | | (.1359) | (.1345) | (.1318) | |
| FAGE | -.0062 | -.0679*** | -.0036 | -.0054** | -.0225*** | -.0771*** | -.0058** | -.0057** |
| | (.0065) | (.0157) | (.0024) | (.0025) | (.0058) | (.0158) | (.0023) | (.0024) |
| FSIZE | .5957*** | .4486*** | .5075*** | .3778*** | .5956*** | .4528*** | .4753*** | .369*** |
| | (.0381) | (.0357) | (.032) | (.033) | (.0363) | (.0372) | (.0308) | (.0317) |
| CEOD | -.0792* | -.0842** | -.1016** | -.0925** | -.0748* | | -.093** | -.0921** |
| | (.0444) | (.0418) | (.0428) | (.0413) | (.0423) | | (.0409) | (.0394) |
| BSIZE | -.0336*** | -.0247** | -.0388*** | -.0343*** | -.0404*** | -.0259** | -.0434*** | -.0372*** |
| | (.0125) | (.0118) | (.0121) | (.0116) | (.012) | (.0116) | (.0116) | (.0111) |
| BMEET | .0139** | .0123** | .0104 | .0108* | .0137** | | .0105* | .01* |
| | (.0065) | (.0062) | (.0064) | (.0061) | (.0063) | | (.0062) | (.0059) |
| BNEXEC | -.042 | -.1 | -.2509 | -.1331 | | | | |
| | (.2987) | (.2858) | (.2919) | (.2837) | | | | |
| BINDEP | | | | | .3582 | .4047* | .1886 | .2371 |
| | | | | | (.2495) | (.2442) | (.2385) | (.232) |
| BGDIV | -.6953*** | | -.6015*** | -.7775*** | -.4227* | -.5786** | -.4732** | -.5901** |
| | (.2487) | | (.2302) | (.2374) | (.2406) | (.2392) | (.2237) | (.2301) |
| FIN | -.2575*** | -.2133 | -.2874*** | -.5354*** | -.3252*** | | -.3241*** | -.5048*** |
| | (.0577) | (.1707) | (.0545) | (.1591) | (.0545) | | (.0525) | (.1151) |

| Variable | Models | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| COVID | .2059*** | .8194*** | .2449*** | | .2542*** | 1.0369*** | .2559*** | |
| | (.0458) | (.3058) | (.0423) | | (.0449) | (.2952) | (.0423) | |
| C | -11.7065*** | -6.0884*** | -9.2739*** | -6.0403*** | -11.3837*** | -6.2637*** | -8.6871*** | -6.1454*** |
| | (.8645) | (.9525) | (.7835) | (.8039) | (.8057) | (.9654) | (.7208) | (.7501) |
| **Effects** | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects |
| **R-squared** | .1748 | .1981 | .1708 | .1965 | .1623 | .1894 | .1561 | .1846 |
| **Observations** | 3785 | 4051 | 3831 | 4044 | 3992 | 4083 | 4041 | 4263 |

*Note*: Significance level: *** p<.01, ** p<.05, * p<.1. Standard errors are displayed in brackets.
*Source:* author's own computation using Stata 18 software.

The empirical results indicate a positive impact of the financial leverage, asset tangibility and liquidity on the firm value, meaning that the more indebted the company is, the more fixed assets it has, and the more liquidity it is, the more its value increases. The findings are in accordance with the results of the international specialized and lead to the validation of hypothesis 1 (Su *et al.*, 2017; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Hutauruk, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024), hypothesis 2 (Saona *et al.*, 2020; Benjamin *et al.*, 2022) and hypothesis 3 (Hutauruk, 2024). Nevertheless, hypothesis 4 is rejected, because the firm age negatively influences the firm value. Firm size has a positive impact on firm value, and according to Sudiyatno *et al.* (2020), larger companies gain market confidence and the investors are more confident to invest in bigger firms since there is a better guarantee for their investments, which leads to the increase of the firm value. Thus, hypothesis 5 is accepted (Sudiyatno *et al.*, 2020; Sisodia *et al.*, 2021; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara & Suwansin, 2024).

CEO duality and board size negatively affect the company value, validating hypothesis 6 (Lee *et al.*, 2015; Intara & Suwansin, 2024) and hypothesis 7 (Chen & Yoon, 2023; Huang, 2024; Mishra *et al.*, 2024). Therefore, when the company CEO is also the company chairman, the firm value decreases. Moreover, larger boards could complicate the decision-making process, because of the divergent opinions of the members, which could negatively influence the firm value. Board meetings positively influence the firm value, while board gender diversity has a negative effect on the company value, so hypothesis 8 and hypothesis 10 are rejected. Board independence exerts a positive effect on the firm value, going to the validation of hypothesis 9 (Saona *et al.*, 2020; Huang & Xiong, 2023; Mishra *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025). An increase in the number of independent members could ensure an effective strategic leadership which generates an increase in the company value.

Regarding the four new variables proposed, effective tax rate and board non-executive members are statistically insignificant, the global financial crisis had a negative effect on the firm value, contrary to the Covid-19 pandemic crisis which had a positive impact on the company value.

Moreover, to better differentiate the determinants of the firm value in the context of the two major events that occurred during the analyzed period, namely the global financial crisis and the Covid-19 pandemic crisis, there were estimated other empirical models using interaction variables between the dummy variable representing the global financial crisis and the other independent variables (Table no. 5), on the one hand, and the dummy variable capturing the Covid-19 pandemic crisis and the other factorial variables (Table no. 6), on the other hand.

**Table no. 5 – Empirical results on the determinants of firm value during the global financial crisis**

| **Variable** | **Models** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| LEV * FIN | -.5465* | -.2832 | -.5466* | -.2827 | -.577** | -.2226 | -.5759** | -.2214 |
| | (.285) | (.2742) | (.2843) | (.274) | (.2715) | (.2685) | (.2709) | (.2685) |
| TANG * FIN | -.1777 | -.0848 | -.19 | -.0939 | -.1339 | -.0538 | -.1469 | -.0647 |
| | (.2551) | (.2412) | (.2544) | (.2409) | (.2505) | (.2373) | (.2497) | (.2371) |
| LIQ * FIN | -.2212*** | -.1472** | -.2147*** | -.1412** | -.2396*** | -.1583** | -.2341*** | -.1532** |
| | (.0696) | (.069) | (.0695) | (.0689) | (.0665) | (.0666) | (.0663) | (.0666) |
| ETR * FIN | -1.2878*** | -.9757** | -1.2594*** | -.9518** | -1.1732*** | -.8379** | -1.1493*** | -.818** |
| | (.4171) | (.4006) | (.4161) | (.4002) | (.4101) | (.3957) | (.409) | (.3955) |
| FAGE * FIN | .0024 | .0018 | .0022 | .0017 | .0024 | .0017 | .0023 | .0016 |
| | (.0018) | (.0017) | (.0018) | (.0017) | (.0018) | (.0017) | (.0018) | (.0017) |
| FSIZE * FIN | .0332 | .1285*** | .0314 | .1279*** | .0116 | .1217** | .0107 | .1217** |
| | (.0307) | (.0483) | (.0306) | (.0482) | (.0255) | (.0483) | (.0255) | (.0483) |
| CEOD * FIN | -.0199 | -.0194 | -.0256 | -.0247 | -.0561 | -.0574 | -.0605 | -.0615 |
| | (.1273) | (.1195) | (.127) | (.1195) | (.1228) | (.116) | (.1225) | (.116) |
| BSIZE * FIN | .0059 | .0041 | .005 | .0032 | .0035 | .0062 | .0031 | .0057 |
| | (.0313) | (.0294) | (.0312) | (.0294) | (.0308) | (.0291) | (.0307) | (.0291) |
| BMEET * FIN | .0325* | .0339* | .0314 | .0329* | .0138 | .0148 | .0131 | .014 |
| | (.0196) | (.0184) | (.0196) | (.0184) | (.0196) | (.0185) | (.0196) | (.0185) |
| BNEXEC * FIN | -.8833 | .3524 | -.8278 | .4089 | | | | |
| | (.7668) | (.784) | (.765) | (.7835) | | | | |
| BINDEP * FIN | | | | | -.1048 | .7108 | -.0771 | .7332 |
| | | | | | (.5737) | (.5614) | (.5723) | (.5615) |
| BGDIV * FIN | -.6932 | -.8827 | -.6597 | -.8538 | -.3534 | -.4697 | -.3341 | -.453 |
| | (.6767) | (.6379) | (.6753) | (.6375) | (.6308) | (.5982) | (.6293) | (.5983) |
| C | 2.1435*** | 2.134*** | 2.1693*** | 2.1274*** | 2.1297*** | 2.0584*** | 2.1706*** | 2.0672*** |
| | (.0149) | (.1499) | (.0797) | (.1689) | (.0146) | (.0975) | (.0798) | (.1242) |
| **Effects** | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects |
| **R-squared** | .0518 | .1719 | .0518 | .1719 | .0481 | .1591 | .0481 | .1591 |
| **Observations** | 3785 | 3785 | 3785 | 3785 | 3992 | 3992 | 3992 | 3992 |

*Note*: Significance level: *** p<.01, ** p<.05, * p<.1. Standard errors are displayed in brackets.

*Source:* author's own computation using Stata 18 software.

**Table no. 6 – Empirical results on the determinants of firm value during the Covid-19 pandemic crisis**

| Variable | Models | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| LEV * COVID | .2692* | .2048 | .2695* | .21 | .2257 | .1801 | .227 | .1862 |
| | (.154) | (.1467) | (.1527) | (.1457) | (.1538) | (.1467) | (.1526) | (.1459) |
| TANG * COVID | -.2865* | -.2766* | -.2676 | -.2583 | -.3056* | -.3035* | -.2859* | -.2836* |
| | (.1688) | (.1603) | (.1673) | (.1593) | (.169) | (.1608) | (.1675) | (.1599) |
| LIQ * COVID | .1559*** | .1596*** | .1577*** | .1616*** | .1604*** | .1745*** | .1612*** | .1751*** |
| | (.0435) | (.0417) | (.0432) | (.0415) | (.0434) | (.0418) | (.0431) | (.0416) |
| ETR * COVID | -.9274*** | -.6822** | -.9793*** | -.7392*** | -.9434*** | -.6134** | -.9979*** | -.6772** |
| | (.2996) | (.2872) | (.2978) | (.2861) | (.3001) | (.2893) | (.2984) | (.2885) |
| FAGE * COVID | .0015 | .0007 | .0014 | .0007 | .0013 | .0008 | .0012 | .0007 |
| | (.0012) | (.0012) | (.0012) | (.0012) | (.0012) | (.0012) | (.0012) | (.0012) |
| FSIZE * COVID | .1026*** | .2036*** | .1045*** | .2025*** | .0525*** | .2055*** | .0562*** | .2036*** |
| | (.0207) | (.0389) | (.0206) | (.0387) | (.0192) | (.039) | (.0191) | (.0388) |
| CEOD * COVID | -.0917 | -.1283* | -.1015 | -.1368** | -.1071 | -.1691** | -.1149 | -.1747** |
| | (.0722) | (.0694) | (.0717) | (.069) | (.0727) | (.07) | (.0721) | (.0697) |
| BSIZE * COVID | -.0737*** | -.0807*** | -.0751*** | -.0818*** | -.0821*** | -.088*** | -.0836*** | -.0892*** |
| | (.0209) | (.0201) | (.0208) | (.02) | (.0209) | (.02) | (.0208) | (.02) |
| BMEET * | .0482*** | .0481*** | .047*** | .0468*** | .0454*** | .0463*** | .0443*** | .045*** |
| COVID | (.0115) | (.0114) | (.0115) | (.0113) | (.0116) | (.0114) | (.0116) | (.0114) |
| BNEXEC * | -1.6125*** | -.5512 | -1.6282*** | -.5951 | | | | |
| COVID | (.5295) | (.553) | (.5258) | (.5504) | | | | |
| BINDEP * | | | | | .0168 | .9643** | -.0521 | .8682* |
| COVID | | | | | (.4501) | (.4559) | (.447) | (.4542) |
| BGDIV * COVID | -.9594** | -.7347 | -.9562** | -.7362 | -1.1468** | -.9492** | -1.1304** | -.9383** |
| | (.4683) | (.4552) | (.4646) | (.4527) | (.4675) | (.4552) | (.4642) | (.4532) |
| C | 1.9681*** | 2.133*** | 1.9863*** | 2.1288*** | 1.9631*** | 2.0612*** | 1.9935*** | 2.0714*** |
| | (.0159) | (.1489) | (.0799) | (.1676) | (.0155) | (.0967) | (.0795) | (.1231) |
| **Effects** | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects | Cross-section fixed effects | Cross-section and period fixed effects | Cross-section random effects | Cross-section random effects with period fixed effects |
| **R-squared** | .0883 | .1837 | .0883 | .1836 | .0806 | .1735 | .0806 | .1735 |
| **Observations** | 3785 | 3785 | 3785 | 3785 | 3992 | 3992 | 3992 | 3992 |

*Note*: Significance level: *** p<.01, ** p<.05, * p<.1. Standard errors are displayed in brackets.
*Source:* author's own computation using Stata 18 software.

It can be observed that the financial leverage and the liquidity had a negative effect on the S&P 500 companies value during the global financial crisis, contrary to the Covid-19 pandemic period when the impact of the financial leverage and the liquidity on the firm value was positive. The effective tax rate had a negative influence on the companies value both during the financial crisis and the pandemic crisis, whereas asset tangibility, CEO duality, board size, the number of non-executive members on the board and the proportion of the females on the board negatively affected Tobin's Q only during the Covid-19 crisis. Regarding the firm size and the board meetings, these factorial variables positively impacted the firm value during financial and pandemic crises. Moreover, during the pandemic crisis, the board independence had a positive impact on the enterprise value.

## 5. CONCLUSIONS

The study investigated the determinants of the firm value, on a database consisting of 442 non-financial companies included in the Standard & Poor's 500 index, over a period of 20 years, from 2004 to 2023. Given that the analyzed period spans two crises – the global financial crisis and the Covid-19 pandemic crisis – two new factorial variables were proposed to capture the impact each of these crises had on the S&P 500 companies. Reviewing the international specialized literature, several independent variables were identified that could influence the firm value. In addition to the factorial variables proposed by the specialized literature, to enhance the robustness of the research, there were included in the empirical models other new variables considered to have an impact on the company value, such as the effective tax rate and the proportion of the non-executive members on the board. There were estimated unbalanced panel data multiple regression models, with cross-section fixed effects, with cross-section and period fixed effects, with cross-section random effects, and with cross-section random effects with period fixed effects.

The research results indicated a positive or negative impact of the independent variables on the firm value, 7 out of 10 research hypotheses being validated. On the one hand, the company value is positively influenced by the financial leverage (Su *et al.*, 2017; Saona *et al.*, 2020; Cho *et al.*, 2021; Sisodia *et al.*, 2021; Benjamin *et al.*, 2022; Cid *et al.*, 2022; Hutauruk, 2024; Mishra *et al.*, 2024; Tan *et al.*, 2024), asset tangibility (Saona *et al.*, 2020; Benjamin *et al.*, 2022), liquidity (Hutauruk, 2024), firm size (Sudiyatno *et al.*, 2020; Sisodia *et al.*, 2021; Caixe *et al.*, 2024; Huang, 2024; Hutauruk, 2024; Intara & Suwansin, 2024), board meetings, board independence (Saona *et al.*, 2020; Huang & Xiong, 2023; Mishra *et al.*, 2024; Wu & Song, 2024; An *et al.*, 2025), and the Covid-19 pandemic crisis, and, on the other hand, factors such as firm age, CEO duality (Lee *et al.*, 2015; Intara & Suwansin, 2024), board size (Chen & Yoon, 2023; Huang, 2024; Mishra *et al.*, 2024), board gender diversity, and the global financial crisis have a negative impact on the value of the non-financial companies included in the S&P 500 index.

To capture the factors affecting the S&P 500 companies value during the global financial crisis and the Covid-19 pandemic crisis, there were constructed interaction variables between each dummy variable showing the crisis and the other independent variables. The empirical results indicated that to increase the firm value during the global financial crisis, companies had to reduce their debt financing and increase the company size and the number of board meetings. During the Covid-19 pandemic crisis, to increase the enterprise value, companies resorted to debt financing, decreased the proportion of tangible assets in total assets, increased the liquidity and firm size, reduced the number of board members and increased the number of board meetings.

In conclusion, the empirical research results provide substantial information regarding the factors that could positively or negatively affect the company value, but also offer valuable information, both to shareholders and to potential investors who are interested in purchasing shares of the companies that are part of the S&P 500 index.

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