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Methodological analysis of the relationship between key corporate financial indicators and stock returns

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Abstract: The developed capital market is of particular importance in market economies. The efficient functioning of a stock exchange is a prerequisite for a well-functioning economy, as it provides a trading venue for transactions between market participants and thereby realises a large volume of safe capital flows between economic agents. As a secondary market, the stock exchange is an excellent venue for ensuring the liquidity of securities. There are a number of analytical methods available, whether fundamental or technical, to forecast the future changes in returns. In the current research, we use statistical methods to investigate the relationship between the financial performance of firms in the S&P 500 Index and stock returns. The objective of our study is to identify corporate financial indicators that may have a statistically significant impact on the average corporate stock returns achieved. The central database of the study is the 505-component dataset of the S&P 500 Index, from which we aim to identify homogeneous groups whose financial performance can be related to stock performance through cluster analysis. The relationships between financial ratios and stock returns were examined using bivariate and multivariate statistical methods on the basis of 28 financial ratios of the 505 firms included in the analysis. The period evaluated in the analysis covers the period between 2015 and 2019. Factor analysis was used as a basis for cluster analysis to aggregate financial indicators that are more highly correlated. It was hypothesized that stocks of firms with strong return on equity and EPS growth rate would generate above average returns, and stocks of firms with stronger operating and free cash flow would generate above average returns.

Keywords: analysis, EPS, capital, liquidity



1 Introduction

There are several definitions for the stock exchange in the literature. All of them try to convey the most important features of the functioning of the capital market. The Exchange is 'a basic institution of trade, a specially organised form of open market, operating under strict rules, which concentrates the supply and demand for the items listed and traded on the exchange.' (BAKONYI et al. 2004. p. 42)

The definition expresses that a stock exchange is a publicly operating market regulated by external laws and internal regulations, thus providing a trading venue for specified persons to trade instruments listed on the exchange at specified times. The main functions of stock exchanges are to provide all market participants with public, transparent information and make the efficient operation of the technical infrastructure possible. The exchange trading venue ensures the free flow of capital between market participants and the execution of trading processes. An important role of the Exchange is to ensure that listed shares are traded on the secondary market. Due to this, changes in ownership can be easily traced down by selling or buying shares; in other respects, the stock exchange allows corporate profits to be distributed among shareholders according to the extent of their ownership share (CORPORATEFINANCEINSTITUTE.COM 2021).

The stock exchange provides the opportunity to trade shares, bonds and other financial instruments. A share is an ownership security that represents an interest in a company. A share confers property and membership rights, under which shareholders are entitled to dividends on company profits and a liquidation dividend. The liability of shareholders is limited, as the worst that can happen in the event of a company's liquidation is that they lose the capital they have invested, but they are not liable for the company with their own assets. It is important to note that not all shares carry voting rights, but all shares issued carry property rights. In addition to shares, bonds also play a prominent role in the markets. Bonds are debt securities that can be issued by governments and corporations, but the use of debt is generally used for different purposes in the activities of governments and corporations. (BAKONYI et al. 2004)

The price of the bonds is expressed as a percentage of their nominal value, and a rational investment decision can be made on the basis of a proper valuation of the bonds, based on a comparison of the theoretical and market price. The theoretical rate can be defined as the present value of the future cash flows expected from the bond, while the market rate represents the price as a function of supply and demand. (VINCZE 2013)

In recent years, exchange-traded index funds have become increasingly popular as a way to track the performance of different stock market indices, markets and industries. ETFs are passively managed investment funds whose portfolios are weighted in such a proportion that the portfolio can adequately represent the



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movements of the market index being tracked. The function of equity indices is to provide a transparent picture of the performance of the equity market, and they are therefore also used as benchmarks, for example by mutual fund managers to determine their own performance. The S&P 500 Index is the main indicator of the performance of the US stock market and its performance has, in our view, an impact on stock market sentiment around the world. The index comprises the stocks of the 505 largest capitalisation companies in the US, with the weighting of each component depending on the market value of the stock and is therefore called a market value weighted index. (ZVI BODIE et al. 2005, GABE 2021)

For long-term fundamental-based investment decisions, investors can choose from a variety of stock valuation models. The purpose of the investment determines which model is appropriate to use to estimate the value of a stock. (DAMODARAN, 2006) highlights three main valuation approaches in the field of valuation, discounted cash flow based, asset based and relative valuation models. The fundamental value of a stock can be estimated using cash flow based and relative valuation, but the effectiveness of the chosen method depends on the investor's preference. Value-based investors expect their returns to come primarily from dividends from the stock, while growth-oriented investors buy growth stocks in the hope of higher price returns. (BREALEY - MYERS, 2005) The DCF-based models often used in practice are an appropriate way for both dividend-oriented and growth-oriented investors to determine the value of shares. The value of shares in companies with a stable growth rate and dividend payments should be determined using Gordon's dividend discount model. The Gordon growth model can be applied effectively to mature companies with stable growth rates and predictable dividend policies. For growth stage companies and companies in cyclical industries, where expected dividends are difficult to predict, it is advisable to use a two-stage or three-stage dividend discount model, whereby the analyst distinguishes between a period of faster growth and a subsequent transitional and stable growth period and determines the value of the shares by adding the present values of the estimated cash flows in the three different stages (DAMODARAN 2006).

A dividend valuation model can be considered rational if it is consistent with the growth characteristics of the company under consideration, which is most determined by the stage of development of the company.

2 Material and method

The analysis required financial data for the S&P 500 Index components for the period 2015 - 2019 and stock price data for the period 2016 - 2020, which were collected from publicly available data sources. Financial and stock price data for the components of the S&P 500 Index were compiled from data published on the most



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popular stock market websites. The list of components of the S&P 500 Index was compiled from the suredividend.com website based on data available as of 11 July 2020, which included the names and ticker codes of all 505 components. Based on this data, for each company, we downloaded financial data for the period 2015 - 2019 from the morningstar.com website, which included key financial indicators. This data included financial data from the balance sheet, income statement and cash flow statement published in the annual financial reports of the companies, which are displayed on the Morningstar website. The database included 2483 items per column and 28 financial indicators. The detailed listing of the 28 selected indicators is beyond the scope of this paper due to the constraints of length- They involve the assessment of the wealth, financial situation and profitability of the enterprises under review, providing a basis for testing our hypotheses. After collecting and sorting the data, data cleaning was performed to exclude outliers from the analysis in order to filter out distorting effects. After proper data preparation, the database created in Excel was imported into the SPSS statistical program. The relationships between the financial performance and stock returns of the components of the S&P 500 Index were investigated, typically using bivariate and multivariate statistical procedures. Before performing the multivariate analyses, we examined the descriptive statistics for each variable to gain insight into the typical properties of the data structure under study. (SAJTOS AND MITEV 2007) In the multivariate analyses, factor and cluster analyses were performed, while in the bivariate analyses, the relationship between financial indicators and stock returns was examined using Pearson's correlation matrix, one- and multi-step analysis of variance. (CSISZÁRIK et al. 2021)

3 Results

Figure 1 shows the average and quartile values of stock returns based on the cleaned database. By defining the quartiles, the values in the sample can be divided into four phases in ascending order, giving an overall picture of the sample distribution of the indicators under review.



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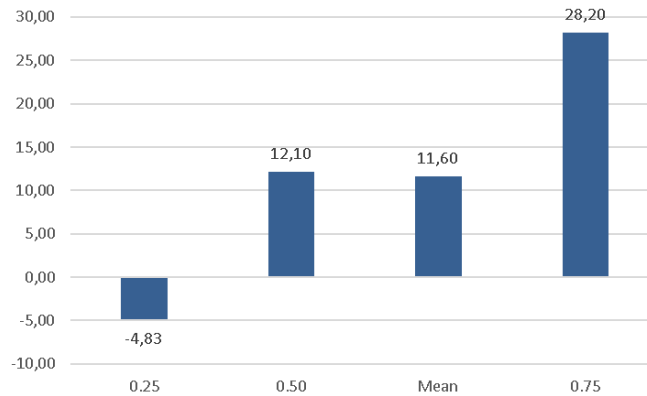


Figure 1 Average and quartile stock returns (%)
Source: authors' own editing based on database data

Figure 2 shows that the median revenue of the companies surveyed was approximately \$7.5 billion over the period, with the highest revenue firms having revenues above \$13.87 billion, as shown by the 0.75th percentile.

The EBIT figures show the operating profit, and the median (0.5 percentile) shows that half of the companies in the figure had an EBIT below USD 1.08 billion, while the other half had an EBIT above USD 1.08 billion. Firms with the highest results typically generated an operating profit above USD 1.99 billion.

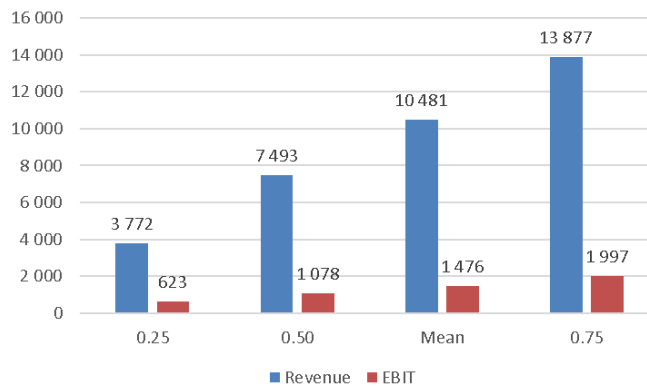


Figure 2 Average and quartile values of revenues and EBIT for S&P 500 Index companies (millions of dollars)
Source: authors' own editing based on database data



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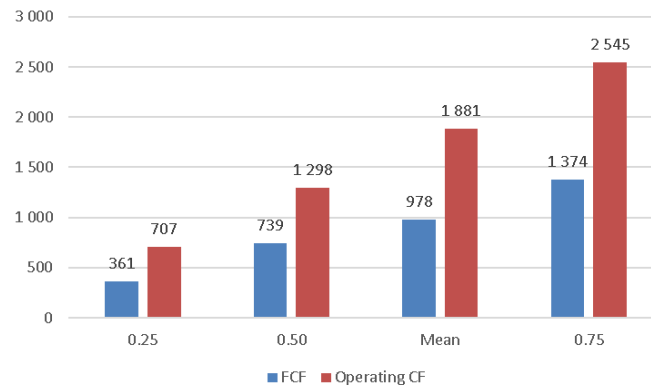


Figure 3 Average and quartile free cash flow and operating cash flow (million USD)

Source: authors' own editing based on database data

The value of shares is mostly determined by the cash flow that companies can generate for shareholders. Operating cash flow is the balance of cash receipts and cash payments actually made in the business. Free cash flow (FCF) expresses the excess cash flow available to creditors and investors, i.e., the part of cash flow that remains after investment and development expenditure from the operating cash flow generated.

Figure 4 shows that 50% of the companies generated more than \$1.3 billion in operating cash flow and more than \$739 million in free cash flow during the period under review. Based on the 0.75th percentile, we can see that 1/4 of the firms surveyed had operating cash flows over \$2.5 billion and free cash flows over \$1.3 billion.

Return ratios measure the returns that firms are able to achieve on the assets they use in their operations and the capital they invest. The average and quartile values of return ratios are shown in Figure 4. Half of the firms surveyed achieved a return on equity of over 15% and a return on equity of over 10% over the time horizon examined. For 1/4 of the indicators, ROE above 24% and ROIC above 15.8% can be identified based on the 0.75th percentile.

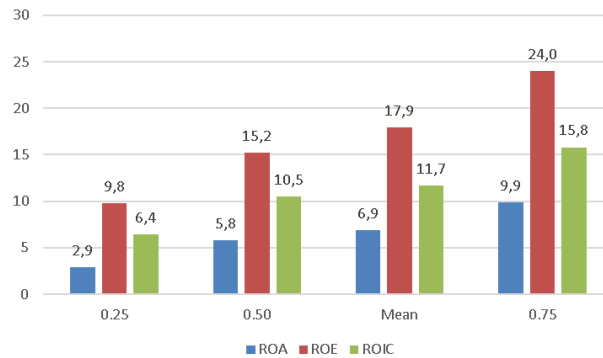


Figure 4 Average and quartile return on assets and return on equity for S&P 500 companies (%)

Source: authors' own editing based on database data

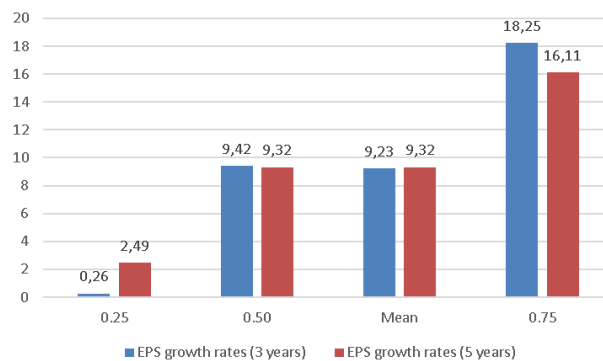


Figure 5 Average and quartile EPS growth rates of S&P 500 companies over 3 and 5 years (%)

Source: authors' own editing based on database data

In Figure 5 the blue column shows the quartile and average EPS growth rates over the 3-year time horizon, while the green column shows the quartile and average EPS growth rates over the 5-year time horizon. There is a large variation in EPS growth rates across the sample firms, which is obviously due to activity, size, firm and sector specific characteristics. The figure shows that a subset of the sampled firms (1/4) had particularly strong average growth rates, for example, the segment with strong growth had an average growth rate of more than 16.11% over the five-year period. Firms in the weakest growth segment had an average growth rate of less than 2.49% over a 5-year period. The median and average growth rates for the components of the S&P 500 Index were around 9.4% and 9.3% for the 3 and 5-year timeframe data, respectively. These data indicate that S&P 500 companies typically showed strong profit growth over the period under review. The objective of factor analysis was to summarise the information content of the correlated financial indicators into a single variable in order to facilitate the interpretation of background



information and explore the interrelationships between financial indicators. The correlation between the variables under review is a prerequisite for factor analysis, and the fulfilment of these conditions was tested by examining the correlation matrix and the results of the KMO and Bartlett's test.

Table 1 Assessment of the suitability of factor analysis based on KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,637
Bartlett's Test of Sphericity	Approx. Chi-Square	10008,805
	df	378
	Sig.	0,000

Source: authors' own editing based on database data

The table above shows the results of the KMO and Bartlett's test, which confirmed that the variables included in the analysis are suitable for factor analysis as the variables are well correlated. The significance level in the bottom row of the table shows that the calculated correlation coefficients are within the 5% significance level, as this value is well below 1%, which indicates that there is an acceptable level of correlation between the variables at 95% and 99% probability level, respectively. Factor analysis was performed on 28 selected corporate financial indicators. Relatively high communality scores were obtained for the financial indicators analysed, confirming that the factors will adequately represent the variance squared of the original variables. (SZÉKELYI AND BARNÁ 2002) According to the model under consideration, the factors would have a meaningful explanatory power for a maximum of 9 factors, since for a factor number above this, the eigenvalue would already fall below the value of 1, which would result in a significant reduction of the information content of the original variables in the factor solution.

Table 2 Pearson correlation coefficients between factors and stock returns

Factor	Correlation between factor and yield	Significance level
return on equity	-0.057	0.268
cash flow	0.041	0.433
liquidity	0.112	0.031
profit margin	0.085	0.099
growth rate	0.060	0.245
leverage	-0.063	0.221
market interest	-0.015	0.766
dividend payment	-0.079	0.129

Source: authors' calculations in SPSS based on database data



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The Pearson correlation coefficient values between the factors shown in the table and the average stock return, as well as the corresponding significance levels, are displayed. Based on the correlation calculation, only the Liquidity ratio was found to have a significant effect on stock returns, as the relationship between the two indicators is within the 5% significance level. Thus, the liquidity position of firms plays an important role in investors' decisions. It can be seen that the cash flow, profit margin and growth rate factors also have a positive effect, but no statistically significant relationship can be found between these factors and stock returns. Table 3 shows that, within these factors, the financial indicators with the highest weighting can be identified as having a significant impact on the performance of the US equity market during the period under review.

Table 3 Pearson correlation coefficients between the largest factor-weighted financial indicators and stock returns

Financial indicator	Correlation between financial indicator and stock returns	Level of significance
ROIC	0.094	0.000
ROE	0.055	0.016
Liquidity ratio	0.021	0.365
Liquidity quick ratio	0.051	0.026
Net profit margin	0.045	0.038
EBIT	-0.039	0.098
EBIT growth rate (5 years)	0.104	0.000
Forward P / E	0.023	0.299
EV / EBITDA	0.054	0.019

Source: authors calculations in SPSS based on database data

The table above shows that for companies, return on invested capital, net profit margin, liquidity quick ratio, EBIT growth rate and EV/EBITDA ratio had the largest impact on equity returns. Of these indicators, the impact of ROIC and EPS growth rate was the most significant, as it can be seen that the correlation coefficients associated with these indicators are within the 1% significance level.

It is important to note, however, that the correlation relationships are weak, i.e., in addition to these financial indicators, a number of other factors have also played a role in the evolution of stock prices, which is a natural feature of stock market behaviour. However, if we approach the question of how the financial performance of companies influences investment decisions from a fundamental point of view, the correlation relationships show that the return on capital employed, liquidity, growth rate and the value of the company relative to operating cash flow were the most valued by investors over the period under review. Among the components of the S&P 500 Index, stocks in Clusters 1 to 3 generated the highest returns over the



period 2016- 2020. The average returns of stocks in each cluster are shown in Figure 6.

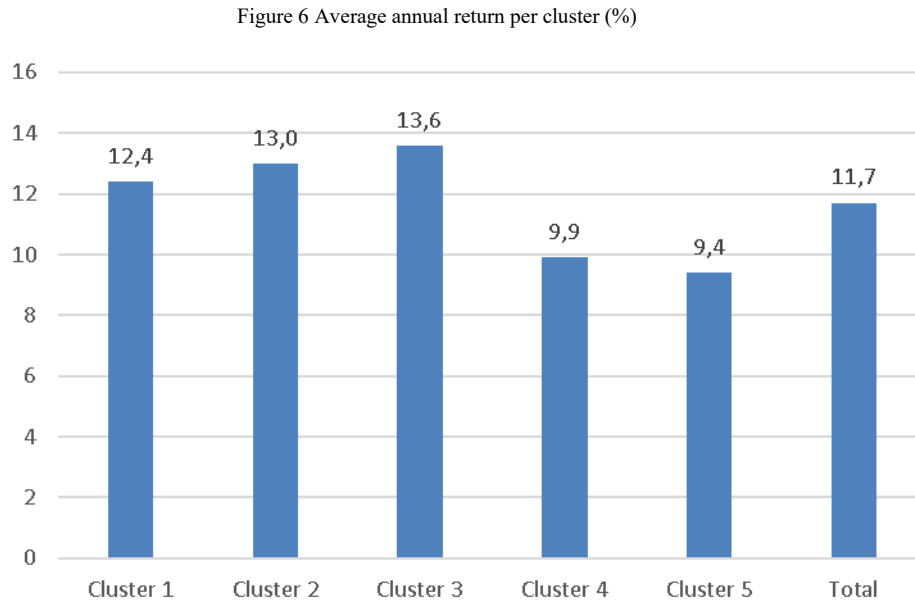


Figure 6 Average annual return per cluster (%)

Source: authors' calculation in SPSS based on database data

The figure shows that the US equity market has delivered average annual returns of 11.7% over the period, as shown in the last column. It can be seen that above average returns were achieved with stocks in Cluster 1 to 3, with Cluster 2 and 3 performing the best. Although the segments in Cluster 4 and 5 performed below average, these stocks also generated average returns of close to 10% per annum. As shown in Figure 7, Cluster 2 and 3 were also the best performers in terms of return on assets and return on equity, but Cluster 5 also had above average ROA and ROIC ratios and average ROE returns.

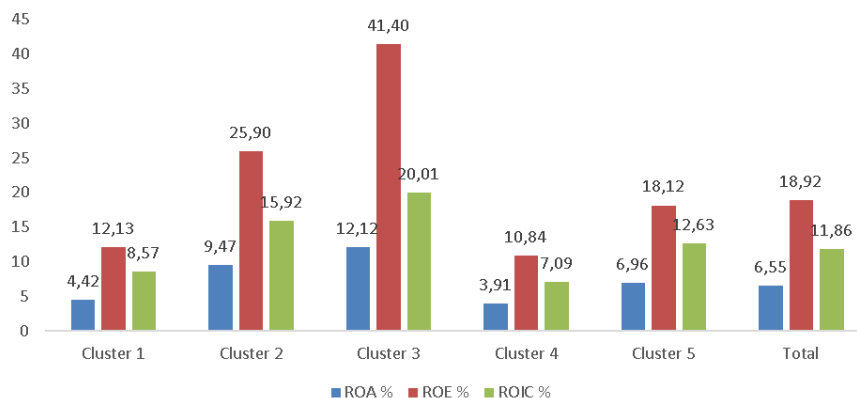


Figure 7 Average return on assets and return on equity per cluster (%)

Source: authors' calculation in SPSS based on database data

Conclusions

The analysis examined the relationship between the financial indicators of S&P 500 companies for the period 2015-2019 and stock returns for the period 2016-2020 so that the impact of the year following the financial reports on the results can be reflected. Among the financial indicators with the highest factor weighting identified in the factor analysis, we found a significant relationship between ROIC, ROE, quick ratio of liquidity, net profit margin, EBIT growth rate, and EV/EBITDA indicators and stock returns based on the values of Pearson correlation coefficients. Based on the correlation tests, we found a weak positive correlation between the listed financial indicators and stock returns. Cluster analysis identified two clusters whose strong financial performance was associated with higher stock returns. Members of Cluster 2 and 3 have above average scores on all key financial indicators, as these two groups have the strongest free cash flow and return on assets, equity and return on equity ratios, and also appear to be attractive segments in terms of EPS growth rates.

In the case of Cluster 2 and 3, it can be seen that investors valued strong financial performance in these segments, with the shares of these groups achieving an average annual return of 13% and 13.6%, respectively, while the combined average return of the shares of all clusters was 11.7%.

Cluster 5 has been identified as having an EPS growth rate of 24.42% over a five-year time horizon and is also a strong performer in terms of return on equity and profit margins but has shown below average results in terms of operating and free cash flow generation. The stocks in Cluster 5 showed an average annual return of 9.4%, which corresponds to below average performance. The extra high EPS growth rate and strong return on equity for this cluster did not translate into above average returns, which from a financial perspective can be explained by weaker



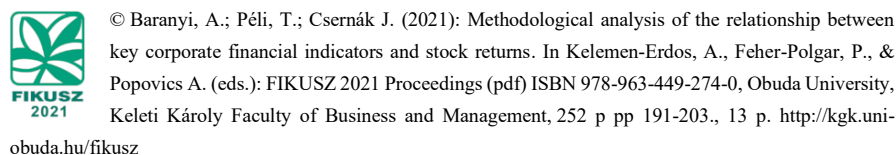
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cash flow generation and uncertainties around the future growth outlook, which is sector and industry specific. Clusters 2 and 3 stood out from the other clusters in terms of all key financial indicators, as reflected in their equity performance, as these two clusters showed above average returns. At the individual stock level, among the members of Cluster 2, Target stock was the standout performer, with its share price rising 93% in 2019, while Raytheon and Honeywell's 14.7% and 13.5% share price appreciation in 2016, respectively, was much more modest compared to Target stock, but these stocks also achieved above-average share price appreciation. Cluster 3 has the strongest financial performance of all key financial indicators. In this segment, Apple shares have shown the most outstanding performance, with a share price increase of 10% in 2016 and 46% in 2017, followed by a correction of -8% in 2018 and an 86% share price increase in 2019. Apple's outstanding performance was observed in several financial years during the period under review. Among the strongest Top 6 financial performers in Cluster 3, Texas Instrument shares returned 42% in 2017, while Caterpillar shares returned 21% in 2020. Based on the results of the sector analysis, it can be seen that the financial performance of companies was evaluated differently by investors across sectors, with some sectors showing stronger share price appreciation relative to the average return of all sectors. The largest impact of corporate free cash flow and return on assets and return on equity was observed in the technology, industrials, healthcare, financials, communications and materials sectors, as stocks in these sectors showed the highest returns. Forward P/E also shows that investors set different prices within the sectors. On the basis of forward P/E, real estate stocks were overvalued relative to the average stock valuation, which is probably the reason why stocks in this sector did not generate a significant increase in returns. The main limitation of this research is that we can only continue the analysis with the use of the constantly updated database. Furthermore, it is also challenging to collect the necessary data from multiple databases for a comprehensive analysis. The future aim of the research is to create a continuously updated database that will allow further analyses to be carried out.

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