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STOCK PRICE TREND OF SELECTED COMPANIES APPLYING THE PRINCIPLES OF CIRCULAR ECONOMY*

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Abstract. This paper aims to establish whether there is a relationship between applying the circular economy (CE) principles and the stock prices of selected companies. In addition, a market capitalization change of the companies over ten years since the implementation of CE principles. Correlation analysis and comparison methods are used for this study. The results show that the application of CE principles does not adversely impact the selected companies' stock prices. This finding can help companies to determine whether they should implement these sustainability principles into their corporate cultures. Furthermore, it was established that the business development of the selected companies over the ten years since the implementation of CE principles had been positive for all studied entities but varied considerably. However, it needs to be clarified whether the application of CE principles is responsible for this positive trend. It would be useful to extend this research with further studies.

Keywords: stock; stock price; circular economy (CE); market capitalization; trend/development

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1. Introduction

Pressing challenges such as natural resource depletion, environmental pollution and climate change have urged many economies in recent years to seek strategies to balance growth and sustainability (Lehmann et al., 2019; Chehabeddine et al., 2022). One solution that is often pointed out, according to Dvořáková et al. (2021), is the transformation of the current linear economy into a more circular one. The key idea of the circular economy (CE) is to reduce waste and extend the lifetime of materials while preserving their value, for example, by using by-products of certain economic activities as inputs for others (Kovacs, 2021; Kalinová & Kostečková, 2022). As Horák & Katz (2022) states, CE is based on the principle of efficiency and aims to reduce the consumption of raw materials and pollution.

Currently, environmental issues have a significant impact on all economic sectors and affect financial markets (Olah et al., 2021; Stefko et al., 2021, Morea et al., 2022). This is echoed by Blinova et al. (2022), who also noted that environmental issues affect movements and trends in financial markets. As a result, there is a growing awareness of environmental, social and corporate governance (ESG) issues in the financial sector as well as an increasing attention to environmental risk assessment for the development of appropriate strategies can be observed in the industry (Corall-Marfil et al., 2021; Siminionescu et al. 2022; Ahmad et al. 2022). Morea et al. (2022) state that, from this perspective, the concept of circular economy (CE) is significant. As ESG factors are increasingly important in the business sector, investors pay more attention to corporate ESG information (Sun, et al. 2022). Incorporating ESG factors into the investment process has transformed from a niche market to a mainstream activity (Chen & Yang, 2020). This fact is supported by; for example, the last decade has seen a significant increase in ESG investments associated with the active development of the allocation process (Novakova et al., 2022). At the same time, in the last few years, this approach has been supported by regulators and institutions that provide standards and taxonomies on ESG issues (Sauvé et al., 2016; Gavurova et al. 2021).

Esken et al. (2018) note that investors and analysts have access to more information than ever about firm behaviour on environmental, social and corporate governance issues. And whether they like it or not, company managers need to take CSR concerns into account only to improve financial performance and reduce risks (Capelle-Blancard & Petit, 2019). This statement is supported by Engelhardt et al. (2021), who finds that from the viewpoint of both investor and business, CSR engagement during periods of market volatility, such as in the aftermath of the COVID-19 pandemic, pays off significantly in terms of improved stock performance. Businesses with better ESG performance had substantially higher cumulative abnormal returns in early 2020 and showed significantly lower idiosyncratic volatility. Thus, high-quality CSR makes businesses more resilient when market uncertainty is high, and managers should increase their commitment to developing an appropriate CSR strategy (Yu et al., 2022).

In contrast, Demers et al. (2021) argue that ESG did not impact returns during the pandemic crisis. On the other hand, the extent to which a company invests in internally generated intangible assets is more than just highly significant from an economic perspective. Also, public policymakers are trying to improve corporate sustainability performance disclosure, yet businesses challenge whether or to what extent they should engage in sustainability reporting and disclosure (Du et al., 2017). The negative impact of fossil fuels on the environment throughout their life cycle suggests a shift from the cradle-to-grave to the cradle-to-cradle lifecycle perspective. Studies by Hasheminasab et al. (2022) and Guo et al. (2022) utilize the circular economy approach in developing fossil fuels to reduce unsustainable consequences and ensure the resilience of the ecosystem.

Aldieri et al. (2021), in turn, argue that the circular economy strategy can reduce investment risk and yield superior risk-adjusted returns. The author's argument is based on information from analysis conducted on more

than 200 European companies listed at Bocconi University (in 14 industries). The analysis showed that the more circular a company is, the lower its risk of outstanding debt and the higher the risk-adjusted returns on its stock.

As stated by Aboulamer (2018), the impact of a circular economy on financial markets is a highly controversial and topical issue that still needs to be adequately studied. For this reason, there is a need to develop further the literature focusing on this issue.

Although we are starting to see research exploring the differences between sustainable and unsustainable de Dios as mentioned, for example, by Mynhardt et al. (2017), or El Ouadghiri et al. (2021), this topical issue is relatively new to the research being discussed. There still needs to be further research, and more research should be conducted (de Dios-Alija et al., 2021) to compare and consolidate whether the circular economy and sustainability impact companies' value and stock prices.

The aim of this study/paper is to identify the stock price trend of selected companies before and after the application of CE principles. That is, to find out whether CE principles affect selected companies' stock prices. If so, to what extent? This leads to the following research questions:

VO1: What is the impact of the application of circular economy principles on the stock prices of selected companies?

VO2: How has the market capitalization of selected companies changed in the ten years since the implementation of CE principles, and how do these results differ from each other?

2. Literature Review

The stock market is a public market in which a company's stock and derivatives are traded at an approved stock price (Vochozka et al., 2020). Zahedi & Rounaghi (2015) state that this market allows brokers and companies to invest on neutral ground and is one of the leading indicators of a nation's economic health. Vui et al. (2013) present the stock market as a promising financial investment that can generate great wealth. However, as Machova et al. (2020) state, the stock market's volatility makes it a hazardous investment. Celebi & Honig (2019) argues that today we live in a post-truth and highly digitized era characterized by a worldwide flow of (mis)information. It has become a much more complex and impossible task to identify the impact of this information on stock markets and predict stock returns and volatility. According to Su & Zhou (2022), the global financial crisis in 2008 spurred research interest in stock price crash risk. However, the determinants of stock price crash risk still need to be clarified, especially in transition economies. A robust empirical link exists between corporate social responsibility and economic growth (Škare and Golja, 2013; Škare and Golja, 2014).

Raza et al. (2021) used content analysis to present a systematic literature review of 91 published research papers on the impact of corporate social responsibility (CSR) on stock prices between 2014 and 2019. They concluded that the interest in the CSR topic and its effect on firm value in terms of price and stock price increased significantly during this period. Another literature review is offered by Dartey-Baah & Amoako (2021), who provided a review using research studies published on the drivers and implications of global CSR between 2010 and 2020. They point out that the main topics of published research papers on the CSR drivers and implications are internal drivers, external drivers and implications of CSR. Publications on the drivers and impacts of global CSR were dominated by studies that used a quantitative approach and a cross-sectional design. A number of studies also used secondary data sources, most of which were not sensitive to sectorial influences. They revealed that CSR emphasis on actions that demonstrate social responsibility is more strongly linked with the overall corporate financial performance and value when contrasted with CSR ethical statements that are related to poorer corporate financial performance and economic results. For this review, they showed that the level of CSR

engagement and disclosure was associated with higher stock prices, while low levels of CSR disclosure in sensitive industries lead to lower stock prices. In addition, the employee purpose was identified as the critical driver for CSR-related activities. They also identified that businesses engage in CSR due to internal institutional factors such as the code of conduct, corporate culture, and top management commitment. At the same time, the external CSR drivers include socio-political factors, globalization and environmental responsibility.

At a broader level, several studies focus on how the market responds to various events involving ESG-related reflections. Krüger (2015) uses corporate social responsibility (CSR) as a proxy for ESG performance to analyze how stock markets respond to positive and negative CSR-related events. The results show that the response is strongly adverse in the face of negative events and weakly adverse for positive events. Naughton et al. (2019) show that ESG asset announcements generate positive abnormal returns when investors attach a valuation premium to ESG performance. Similarly, according to Flammer (2013), markets respond positively to announcements of initiatives with positive environmental impact.

Numerous studies highlight the positive effect of ESG efforts on corporate financial performance (Ioannou et al., 2015). It should be noted that ESG best practices have different effects depending on the company's business areas (Khan et al., 2016). A study by Eccles et al. (2014) analyzes a sample of 180 US companies and finds the significantly better market performance of companies that meet sustainability criteria. Similar results are identified with respect to the impact of environmental practices (Dimson et al., 2015; Behun et al. 2018).

2.1 Effects of the Application of CE Principles and Capital Markets

"The circular economy is a tool for closing the loop of material flows in the economic system" (Seroka-Stolka & Ociepa-Kubicka, 2019). Seroka-Stolka & Ociepa-Kubicka (2019) described CE in their study, where they focused on the issue of green logistics and CE. The company's transition and the circular economy principles were the focus of Morsetto (2020), who elaborated on the goals CE should achieve. Kristoffersen et al. (2020) discussed the potentials of CE, which mainly focused on improving the efficiency of resources and their subsequent productivity. Taking the CE principles a little further, Sumter et al. (2020) focused on the actual product and service design for the circular economy in their research. Their finding was that companies need more capabilities to create such products, which may become a significant problem in the future. While the CE route is the future for the business development of many companies, it has its detractors. For example, Corvellec et al. (2022) described the significant shortcomings of CE in their paper. They primarily focused on undefined limits and insufficient theoretical foundations to identify the transformation of the very corporate structures as the biggest obstacle to the transition to CE.

Biktimirov & Afego (2022) researched whether investors value environmental sustainability and used regression analysis to analyze stock market responses of companies that were added to / removed from the FTSE Environmental Opportunities 100 (FTSE EO 100) index. Companies added to the FTSE EO 100 index that were not previously classified in the FTSE EO index and companies removed from the FTSE EO index do not show significant changes in stock prices. Conversely, companies that have been added to the FTSE EO 100 index from the FTSE EO index show a sustainable increase in stock prices, while the FTSE EO 100 index returns that remain in the FTSE EO index show a sustainable decrease in stock prices. Using regression analysis for a sample of Chinese A-listed companies over the period 2009-2011, Xu and Liu (2018) studied the role of CSR disclosure in reducing stock market information asymmetry as proxied by stock price volatility and liquidity. They identified that stock price volatility after CSR disclosure is lower than before CSR disclosure. Still, the trend is that it will first decrease to later increase for three months after disclosure. Stock liquidity also improves significantly after CSR publication; however, it will first increase to decrease later.

In her study, Ludzinska (2017) studied the performance of the Warsaw Stock Exchange RESPECT index as well as the performance of all companies included in the RESPECT index over the period 2009-2014 to determine whether the implementation of the CSR concept supports the creation of firm value on the capital market. Using correlation analysis - Pearson correlation coefficient, Ludzinska (2017) confirmed that CSR helps to create firm value in the capital market. The study results show that socially responsible corporations are characterized by higher return on capital investment and higher dividend yield. Havlíková & Kukačka (2021) analyzed the relationship between CSR and stock market performance in the aftermath of the global financial crisis. They used a new measure of social responsibility from Thomson Reuters, called ESG Combined Score. As the novelty of the study, social responsibility engagement is divided into strategic activities closely related to the core businesses of the companies concerned and the remaining secondary activities. The results of the fixed effect regression showed a positive and statistically and economically significant impact of strategic activities on the performance of the companies' stock markets. This impact is nearly 103% higher compared to secondary activities.

The empirical results suggested that companies should strategically choose their socially responsible initiatives if they seek to increase their stock prices through the corporate social responsibility channel. Bae et al. (2021) conducted research using regression analysis to determine whether corporate performance from three measurement perspectives - environmental, social responsibility, and governance ("ESG") - carries on stock price crash risk. They also examined how the relationship between ESG ratings and stock price crash risk is affected by the degree of financial constraint. The empirical results show that ESG ratings reduce the risk of stock price crashes, and this relationship is significantly mitigated for financially constrained firms. The results suggest that a more significant financial constraint suppresses the positive role of corporate social responsibility in mitigating stock price crash risk. Kang et al. (2021) used regression analysis to examine the long-term performance of stocks that appear in the Dow Jones Sustainability Index in North America. They find that sustainability stocks exhibit abnormal returns for 12-30 months after listing a stock market index, while these stocks do not generate any excess returns prior to listing a stock market index.

Moreover, sustainability stocks experience an increase in institutional ownership after listing a stock market index. However, Kang et al. (2021) find no evidence that short sellers increase their position to take advantage of the potential overpricing of sustainability stocks. Overall, the analysis suggests that sustainability efforts translate into a sustained increase in stock demand, leading to higher performance.

Su & Zhou (2022) studied the relationship between CSR and stock price crash risk in the Chinese context. Based on details of listed firms in China between 2010 and 2019, they provided estimates using correlation analysis and multiple regression analysis as well as empirical proof that restricting CSR to bad news accumulation behaviour can reduce the risk of stock price crashes. They also document that internal CSR significantly affects accident risk while external CSR does not. In addition, Su & Zhou (2022) argue that CSR has a reasonably low impact on crash risk in SOEs, businesses with higher internal control quality, or businesses with better regional financial growth. Utz (2018) used regression and correlation analysis to study the relationship between CSR and the distribution of stock returns in an international sample. Generally, high-level CSR companies exhibit higher stock price synchronicity in the European, Japanese and US markets. In particular, he identified optimal CSR levels to minimize idiosyncratic risk for each region.

Moreover, CSR has a mitigating effect on crash risk in Europe and the United States. Conversely, companies in the Asia-Pacific region show CSR overinvestment followed by higher bankruptcy risk. This seems to be a consequence of globalization which forces companies from the Asia-Pacific region to overinvest in CSR to conform to Western standards.

Durand et al. (2019) extended the study by Hawn et al. (2018), which included Dow Jones Sustainability World Index (DJSI) events to measure deviations in a company's CSR activism and examine their impact on a company's

stock price. Durand, Paugam, and Stolowy (2019), in their multivariate and regression analysis, obtained similar results on stock price (i.e. no impact) and trading volumes, as shown in a documented study by Hawn et al. (2018). However, extending the analysis, Durand et al. (2019) find that sustainability events attract more attention from financial analysts and lead to an increase in the stock percentage held by long-term investors, suggesting a trend of professional investors paying more attention to companies visible on CSR. Odeh et al. (2020) used Generalized Method of Moment (GMM) statistical analysis to analyze the relationship between CSR expenditure and market stock price. In a sample of 102 service companies listed on the Amman Stock Exchange (ASE) in the years 2010 to 2017, they identified no significant relationship between CSR expenditure and market stock price (MSP) in any direction. However, the findings confirmed a significant positive effect of company size on CSR expenditure and an adverse effect of leverage on CSR expenditure without any significant effect of ownership on CSR expenditure. Wang & Chen (2017) studied the US capital market's perception of CSR by examining companies that are part of the Dow Jones Sustainability Index (DJSI). They used parametric, nonparametric, and bootstrapping tests to determine whether independent organizations' implementation of CSR policies and verification contributes to a variance in financial performance. They also analyzed various events (i.e. nomination, classification, and valuation) to establish how much importance investors place on CSR. The results show that investors do not highly recognize the US companies included in DJSI. Where CSR becomes a common practice within a specific industry, however, certification by independent third parties regarding CSR policies provides real benefits to company performance.

2.2 Determining the Following Steps

The existing research shows that it needs to be clarified whether or not the application and integration of the circular economy principles into the operating principles of companies and their corporate cultures impact the trend of their stock prices listed on stock exchanges. The above studies indicate that, in some cases, CSR and ESG incorporation may positively or negatively affect stock prices and volatility. In some cases, applying these principles has no effect on stock prices in the capital markets. Due to the ambiguity in this topic, further research will be conducted in this study focusing on the stock prices of the selected companies in the period before and after the application of CE principles. The mathematical and statistical methods - correlation analysis and comparison method will be used to evaluate the data.

3. Data and methods

DJSI World is the most selective sustainability stock index, consisting of top environmental experts chosen from the top 10% of the industry. DJSI is the oldest and most respected sustainability index (Durand, Paugam & Stolowy, 2019). Based on the DJSI World Index, the top 3 companies will be selected from the top 10 companies included in the index and ranked according to the weight of this index.

The selected companies based on the DJSI World Index rankings are Microsoft Corporation in information technology, Google in communications services, and United Health Group in the healthcare sectors. It is very challenging and hardly traceable to determine when a company applied CE principles. Companies often apply them in some form in the early stages of their operations. For this reason, the first significant milestones related to sustainability and CE are determined for these companies.

For Microsoft, this milestone seems to have occurred in 2012 when the company achieved its goal of carbon neutrality. This goal was set by Brad Smith, who joined the company that year with the intent of being completely carbon-neutral by 2030. For Google, the milestone occurred in 2007 when the company became the first major organization to go carbon neutral for its operations. For United Health, 1999 can be considered a milestone for

implementing CE principles. The company has been named to the Dow Jones Sustainability World Index and the Dow Jones North America Index every year since.

VO1: What is the impact of the application of circular economy principles on the stock prices of selected companies?

Data

Data in the form of stock prices of the selected companies applying CE principles traded on the stock exchange will be used for the purpose of this research. Specifically, the so-called Close price after the trading day is closed on the capital markets will be used. Using the document analysis method, these prices will be extracted from historical records on finance.yahoo.com (Yahoo Finance) and recorded as spreadsheet files in MS Excel to be used for further processing. In the effort to obtain the most objective results, data will be selected for the period from 1990 to the end of 2021, and prices will be selected on a weekly and monthly basis to reduce the amount of data.

Methods

To answer the first research question, the data for each company will be broken down into the period before the application of CE principles and the period after the application of CE. The correlation analysis method will be used to process data to determine whether there is a relationship or correlation between the stock price before the period when the company started to implement and follow CE principles to a greater extent and after this turning point. The correlation analysis will be performed in MS Excel using data analysis. This will establish an index of correlation. If the calculation shows that the correlation coefficient = 0, there is no linear relationship between the variables. Then if the correlation coefficient < 0, there is a negative correlation between the variables; if the correlation coefficient > 0, there is a positive correlation between the variables. For positive parameters, there will be a direct linear relationship, and for negative parameters, there will be an indirect linear relationship. The correlation coefficient cannot be > 1 and < -1.

To interpret the strength of correlation, the coefficient will be divided into 3 groups according to value: weak, medium and strong. Weak correlation will be the calculation value of 0.001 to 0.3 and - 0.001 to - 0.3. Medium correlation will be a coefficient value of 0.3 to 0.8 and - 0.3 to - 0.8 and strong correlation will result in a value of 0.8 to 1 and - 0.8 to -1.

VO2: How has the market capitalization of selected companies changed in the 10 years since the year of implementation of CE principles, and how do these results differ from each other?

Data

To answer the second research question, historical data in the form of market capitalization ratios of the selected companies will also be retrieved from companiesmarketcap.com using the Document Analysis method. This data will be processed as a spreadsheet file in MS Excel for better clarity.

Methods

The annual percentage change and the percentage change in the first and last year will be calculated from the available data. Subsequently, the comparative method will be used to compare the results of all 3 companies and a graph will be plotted in MS Excel.

4. Results

For Microsoft, the period from 01/01/1990 to 30/06/2012 and the period from 01/07/2012 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

Table 1. Microsoft correlation result

	Pre-CE	Post-CE
Pre-CE	1	
Post-CE	0.896042	1

Source: own production

The result shows that the correlation coefficient = 0.90 after rounding. For Google, the period from 16/08/2004 to 31/12/2006 and the period from 01/01/2007 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

Table 2. Google correlation result

	Pre-CE	Post-CE
Pre-CE	1	
Post-CE	0.833723545	1

Source: own production

The result shows that the correlation coefficient = 0.83 after rounding. For UnitedHealth, the period from 01/01/1990 to 31/12/1998 and the period from 01/01/1999 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

Table 3. United Health correlation result

	<i>Pre-CE</i>	<i>Post-CE</i>
Pre-CE	1	
Post-CE	0.813686109	1

Source: own production

The result shows that the correlation coefficient = 0.81 after rounding.

For the purpose of the second research question, the following tables will be used to show the market capitalization ratios of the selected companies in the period concerned and the percentage development.

Table 4. Microsoft market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2012	\$223.66 B	-	
2013	\$310.50 B	38.82 %	
2014	\$381.72 B	22.94 %	
2015	\$439.67 B	15.18 %	
2016	\$483.16 B	9.89 %	
2017	\$659.90 B	36.58 %	
2018	\$780.36 B	18.25 %	
2019	\$1.200 T	53.81 %	
2020	\$1.681 T	40.10 %	
2021	\$2.522 T	50.00 %	
2022	\$1.906 T	-24.41 %	852.42 %

Source: data from companiesmarketcap.com under MSFT ticker symbol

Table 4 shows the data from the beginning of the implementation of CE principles over a 10-year period, i.e. from 2012 to 2022. The total percentage change in this period is 852.42%.

Table 5. Google market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2014	\$359.50 B	-	
2015	\$528.16 B	46.92 %	
2016	\$539.06 B	2.06 %	
2017	\$729.45 B	35.32 %	
2018	\$723.55 B	-0.81 %	
2019	\$921.13 B	27.31 %	
2020	\$1.185 T	28.68 %	
2021	\$1.917 T	61.74 %	
2022	\$1.466 T	-23.48 %	407.79 %

Source: data from companiesmarketcap.com under GOOG ticker symbol

Table 5 only shows the data from 2014 to 2022, i.e. an 8-year period. The total percentage change in that period is 407.79%.

Table 6. United Health market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2001	\$21.84 B	-	
2002	\$25.00 B	14.48 %	
2003	\$33.91 B	35.65 %	
2004	\$56.60 B	66.88 %	
2005	\$84.38 B	49.08 %	
2006	\$72.26 B	-14.36 %	
2007	\$72.92 B	0.91 %	
2008	\$32.12 B	-55.94 %	
2009	\$34.96 B	8.82 %	
2010	\$39.21 B	12.17 %	
2011	\$54.02 B	37.77 %	247.34 %

Source: Data from companiesmarketcap.com under UNH ticker symbol

Table 6 shows the data for a 10-year period, from 2001 to 2011. The total percentage change in this period is 247.34%.

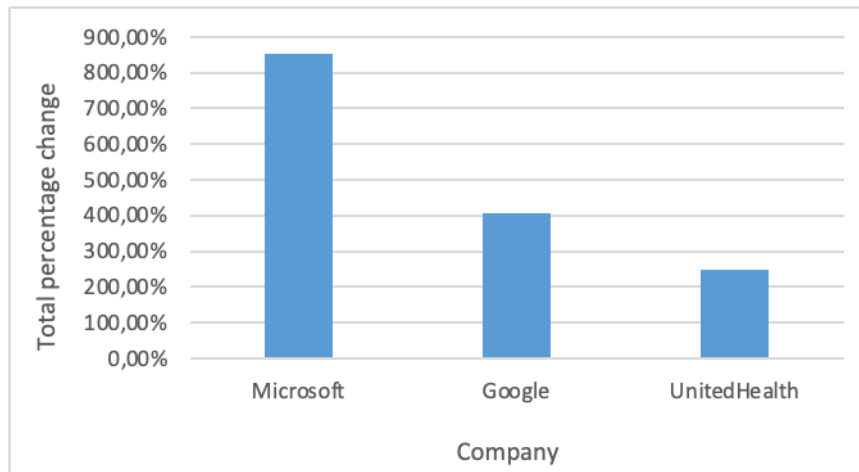


Figure 1. Percentage change of the companies by market capitalization in the specified period

Source: own production

Figure 1 shows a percentage comparison of Microsoft, Google and United Health in the period concerned. Thus, Microsoft grew by 852.42 %, Google grew by 407.79 % and United Health's value by market capitalization grew by 247.34 % compared to its initial value.

5. Discussion of Results

Based on the results of this research, the research questions stated can be answered:

What is the impact of the application of circular economy principles on the stock prices of selected companies?

Using external data of stock prices for the period concerned, correlation analysis determined the relationship between stock prices before and after the application of CE principles. A strong direct linear relationship was identified for Microsoft. This suggests that the company's value is changing steadily; therefore, the circular economy does not adversely affect stock prices. Google was also found to have a relatively strong direct linear relationship. Thus, it can also be concluded that the value of the company is changing steadily, and therefore CE does not adversely affect the company's stock prices. In the case of United Health, the degree of correlation is close to a moderate to a strong direct linear relationship. Still, in this case it also means that the company's value is changing steadily and that CE does not adversely affect the stock prices of this company. Thus, according to the results, the application of CE principles had no adverse impact on stock prices for all three companies.

This research proved that the application of CE principles does not have an adverse impact on the companies' stock prices. Still, a positive relationship between CE and stock prices could be the subject of follow-up research. On the other hand, Ludzinska (2017) used correlation analysis to show that CSR supports the creation of corporate value in the capital market. The results of her research document that socially responsible companies are characterized by higher return on capital investment and higher dividend yield.

How has the market capitalization of selected companies changed in the 10 years since the year of implementation of CE principles and how do these results differ from each other?

The second part of the results shows that over the 10 year period since the implementation of CE principles, the market capitalization percentage of the selected companies varies considerably. Microsoft's market capitalization has increased by a staggering 852.42% in the 10 years since its implementation. Google's market capitalization increased by 407.79%, almost half that of Microsoft, and United Health's market capitalization has increased by "only" 47.34% of its original value compared to the increase of the two previous companies. The data used for Google, however, did not start from 2007, but only from 2014 for a period of 8 years due to the lack of earlier data. There is a similar problem for United Health, i.e. data used only covered the period from 2001 to 2011.

Conclusions

Due to the lack of research and the ambiguity of results in this research field, this research was conducted to determine whether there is a relationship between the application of CE principles and the stock price of listed companies. The study was also extended to determine the change/trend of selected companies by market capitalization over a 10 year period since the implementation of CE principles.

Using correlation analysis, the research of the selected companies showed that the values of the selected companies have been changing steadily and, therefore, the application of CE principles does not have an adverse impact on their stock prices. However, these findings clearly indicate that there is scope for possible follow-up research that would examine in more detail the relationship between the adoption of CE and its subsequent use in the corporate culture and stock prices, and in particular, research focused on the positive effects of the application of CE principles on stock prices.

Furthermore, the conclusion was that all the companies concerned have changed positively in terms of market capitalization after implementing CE principles, and that these results differ significantly from each other. However, it is not clear whether these facts have strictly resulted from the implementation of CE in the corporate

culture of the companies; however, it is a conclusion based on the first topic studied that they have not and other factors affecting the capital and specifically the stock markets had an impact on these facts. Therefore, additional research would be advisable to follow up on this topic and provide further clarification and documentation.

For example, it would be interesting to include small-cap companies in this research to compare them with the large-cap companies included in this research.

Sustainability is a hot topic, and CE principles are increasingly being implemented by companies. Research on this issue is beneficial not only for stock market stakeholders such as investors but also for companies themselves as they can change the value of their company to their advantage by increasing their sustainability efforts and implementing these principles if there is a positive effect of applying CE principles on stock prices.

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