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**THE IMPACT OF THE CORONAVIRUS (COVID-19) OUTBREAK ON THE
VALUE AND STOCK PRICES OF PUBLICLY LISTED COMPANIES**

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Annotation

This thesis points out the effects of the COVID-19 pandemic on the economy, people, governments, enterprises, and other participants of the economy, digs deeper into valuations and stock prices of chosen publicly listed companies across three different sectors. The health crisis caused financial difficulties worldwide and this thesis aims to untangle the economic impact on sector-specific valuations of certain companies picked to represent the Information and Communication Technology (ICT), Travel Tourism and Transport (TTT), and Consumer Staples (CS) sectors. Using quantitative methodologies of regression and discounted cash flow analyses, the thesis evaluates the pandemic's impact on the companies' valuations and their stock prices to see how the financials would have gone using the trends and patterns of the historical financial statements for two scenarios, namely the pre-pandemic scenario as if no one knew that the pandemic is coming impacting the financials and margins, and the post-pandemic taking the first two pandemic years into the calculations to see the actual financials, the change in margins and patterns. The chosen sectors saw different impacts. The hypothesis was to either support or reject the prevailing analysis in the market and regression analysis, that technology companies were impacted positively, travel companies had suffered from the pandemic, and consumer staples got relatively low impacts. ICT sector showed immunity and growth, TTT, being highly dependent on physical presence suffered severe difficulties, while CS demonstrated resilience and saw a slight grow. The thesis also talks about the role of government intervening by introducing fiscal policies to mitigate such impacts on economies and outlines the longer-term implications on financial markets. The analysis is important to support the existing literature of the initial impact of 2020 by the pandemic but also filling the gap in multi-year pandemic impact several years after, offers insights for investors and decision makers for future crisis management and investment strategies.

Structure: introduction, ..., conclusions and suggestions, references.

Thesis consists of: ... p. text without appendixes, ... pictures, ... tables, ... bibliographical entries.

Appendixes included.

Keywords: COVID-19 pandemic, Discounted Cash Flow analysis, Economic impact, stock prices, company valuation, publicly listed companies, sectoral analysis.

Antros pakopos studijų Ekonomikos inžinerijos programos magistro baigiamasis darbas
Pavadinimas Koronaviruso (COVID-19) protrūkio poveikis biržinių bendrovių vertei bei
akcijų kainoms
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Anotacija

Šis darbas atskleidžia COVID-19 pandemijos poveikį ekonomikai, vyriausybėms, įmonėms ir kitiems subjektams ekonomikoje, analizuoja tris skirtingus sektorius ir juos atstovaujančias biržines bendroves, atspindinčias unikalius pandemijos aspektus, vertinimus ir akcijų kainas. Ši pandemijos sukelta sveikatos ir finansų krizė buvo jaučiama globaliai, šio darbo esmė yra išaiškinti pandemijos sukeltų ekonominių sunkumų poveikį pasirinktų įmonių vertėms ir akcijų kainoms. Įmonės pasirinktos iš informacinių ir ryšių technologijų (ICT), kelionių, turizmo ir transporto (TTT) bei būtiniausių vartojimo prekių (CS) sektorių. Naudojant kiekybines metodikas, įskaitant regresijos ir diskontuotų pinigų srautų analizes, darbe įvertinamas pandemijos poveikis įmonių vertėms ir jų akcijų kainoms, vadovaujantis istorinėmis finansinėmis ataskaitomis, maržomis bei tendencijomis prieš ir po pandemijos aprašant du scenarijus. Priešpandeminis scenarijus, prognozės atliekamos naudojant finansinę informaciją prieš pandemiją (iki 2020 m.), kai niekas nežinojo, jog tokia situacija artėja. Popandeminis scenarijus, kai į diskontuotus pinigų srautus įtraukiami pirmi du faktiniai 2020-2022 m. pandemijos finansiniai rezultatai, atskleidžiantys tuometinę ekonominę situaciją, maržas ir tendencijas, kurios naudojamos tolimesnei prognozei. Sektoriai parodė skirtingą poveikį. Hipotezė buvo arba patvirtinti, arba paneigti esančią literatūros bei regresinę analizes, kad ICT įmonės patyrė teigiamą poveikį, TTT įmonės nuo pandemijos nukentėjo, o CS įmonės patyrė santykinai mažą poveikį. Atlikus analizę ICT sektorius rodė atsparumą ir augimą, TTT sektorius patyrė didelių sunkumų, o CS sektorius šiek tiek augo. Taip pat pabrėžiamas svarbus vyriausybės vaidmuo švelninant poveikį ekonomikai ir apibrėžiama ilgesnė perspektyvos įtaka finansų rinkoms. Analizė ne tik papildė esamą literatūrą, nagrinėjančią pradinį 2020 m. pandemijos poveikį, bet ir papildė ją analize iki 2025 m. Šis darbas yra svarbus pateikiant įžvalgas investuotojams, įmonių vadovybėms būsimam panašių krizių valdymui ir investavimo strategijoms.

Prasminiai žodžiai: COVID-19 pandemija, Diskontuotų pinigų srautų analizė, Ekonominis poveikis, akcijų kainos, įmonių vertinimas, biržinės bendrovės, sektoriaus analizė.

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INTRODUCTION

Topic relevance. The COVID-19 global pandemic came unexpected and caught the whole world unprepared for what was going to happen, whether it is an everyday worker, a financial professional, a small or large business, or even a government. It was not an exception from any other larger-scale crisis that has ever happened before, raising fear, uncertainty, financial problems, and in this case, even serious health issues. People stopped working, traveling, businesses had to halt operations, disturb supply chains, and even be very concerned about their financial condition in the near future. Governments understood the magnitude of the global problem and had to act without any postponements, including monitoring monetary and fiscal policies. On the other hand, some sectors were even better off and benefited from the pandemic, as remote working, online shopping, and other virtual services gained demand at some points during the pandemic period. There are several reports and publications on how COVID-19 impacted the liquidity and volatility of financial markets as a whole, however, there is a lack of research made on how it impacted the stock prices and company valuations, thus company managers and investors need to understand what the reasons for such a financial turmoil were, how different sectors and businesses were impacted, what was the effect on businesses' financials, valuations, and stock prices. What is more, the existing publications cover just the initial pandemic slump and rebound in the markets in 2020 but there is a gap of research about what were the impacts in the following years for the longer period.

Research problem. How to properly assess the impact of the COVID-19 pandemic on a publicly listed company's value and stock price?

Research aim. To determine the impact of COVID-19 on the value and stock prices of publicly listed companies from theoretical and practical perspectives.

Research objectives:

1. To conduct a literature review on the COVID-19 pandemic, introduce equity markets and factors moving stock prices, and company valuation methods.
2. To review the methodology relevant to this research, such as statistical and income valuation methods.
3. To apply the methods on specific US publicly listed companies' representing chosen sectors using specific pandemic's data, and companies' financial data before the pandemic and during the pandemic to find the impact of the COVID-19 on such sectors and stock prices.

The methods of the research. To analyze what the COVID-19 pandemic and the economical downturn following it are, available literature sources, publications, research papers, graphs, and financial data are going to be used. Since it is hard to know whether some changes in stock prices or

valuations are attributable only to the pandemic or the measures applied by it, regression analysis will be performed. To examine the impact on the chosen sectors represented by the chosen US publicly-listed companies' valuations and stock prices, several discounted cash flow valuations will be executed to conclude which sectors experienced positive, negative or barely any impacts from the pandemic so in the future various parties, such as companies' management, decision makers, investors, and other stakeholders could be well-prepared when similar situation come in the future.

1. LITERATURE OVERVIEW

1.1. COVID-19 pandemic: concept, reasons, implications

1.1.1. The concept of a global pandemic, past examples

A pandemic is a very strong word and can cause lots of fear if misused. The World Health Organization (WHO) depicts a pandemic having an exponential growth of a disease, meaning that day by day the cases of people getting the disease grow more than the day before. It is also something that expands over large geographic areas, are very infectious and contagious. According to the Journal of Infectious Diseases (Morens et al., 2009), some past examples of pandemics include the deadly 14th-century plague (the Black Death) when more than 25 million people died, of cholera, influenza, or Spanish flu, infecting more than a third of the world's population, killing around 50 million people, and lastly HIV/AIDS to name the most well-known ones (Morens et al., 2009). Especially now, when globalization and international relations are rising, urbanization becomes more relevant, and it is way easier for people to spread various diseases across the world. Now after decades without any serious epidemics, the COVID-19 outbreak started shaking the world, resulting in many infected people and deaths. According to (Shang et al., 2021), "Many of these deaths could have been avoided if the vaccine was introduced. And the vaccine has not been developed as it was not profitable for pharmaceutical companies.". The opinion might sound controversial, however, the fact is, that it took a while until the COVID-19 vaccines were developed and deemed effective. At the time of writing the COVID-19 pandemic is still active, however the daily new cases are nothing near as it was during 2020 and the end of 2022.

1.1.2. The COVID-19 pandemic. A global shock

The SARS-CoV-2 pandemic, so-known as Coronavirus or just the COVID-19 pandemic was first hinted at around December 2019 when the first case was found in China. What initially looked like just a local, small-scale disease in Chinese territories, appeared to develop into one of the biggest and deadliest global pandemics that have ever shocked the world. The human-to-human transmitted disease has potentially started spreading from Asian lands to other continents, eventually reaching every single country in the world, gaining a global pandemic status. The virus was declared a global emergency by the World Health Organization (WHO) on January 30, 2020, and was declared a pandemic on 11 March 2020, alarming the whole world, and economies, making people feel even more uncertain about the future state of their lives. At the end of 2023, the global coronavirus cases have already climbed to over 700 million cases and reached almost 7 million deaths.

To fight the global pandemic, governments and households had to operate together introducing new measures to the world, what was later known as the "new normal". Large amounts of money were spent on research and development to find a treatment, vaccines were introduced. More than three years after it started, the infection does not spread as quickly and is not as dangerous anymore, according to (Worldometer.Info, 2022), more than 99% of the infected usually have mild conditions, however, some precautions are still in place.

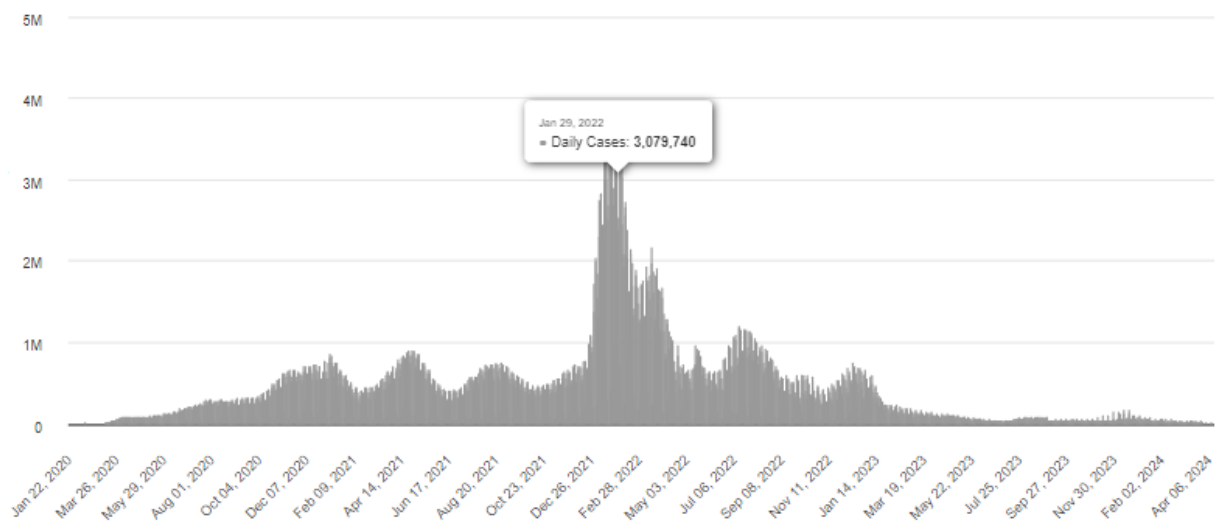


Figure 1. Daily global new COVID-19 cases

Source: (Worldometer.Info, 2024)

The daily new cases announced have dropped significantly, however it is clear that this pandemic occurs in waves, with periods having higher cases followed by periods with lower cases and it is still unknown if another wave can be expected. Please see figure 1 for the graphical representation of daily global new COVID-19 cases from the beginning of the pandemic until the beginning of 2024.

1.1.3. The general impact of COVID-19 on the economy. Government responses

In the beginning, when the fear and uncertainty were at their peaks, people had to follow strict social distancing rules and avoid crowded places, offices, and stores. Most of the public places were completely or partly closed, the government introduced lockdowns and border shutdowns. Traveling abroad was completely halted, entertainment, such as cruise lines, cinemas, and other places were strictly limited, factories and various manufacturing facilities had to be shut down to stop the virus from spreading. The implications covered various aspects of everyday lives, ranging from a shortage of employees, goods, and services, to negative impacts on companies' operations, financial performance, and the global economy as a whole. According to (Rauf et al., 2023), "The products'

supply chain has been broken, and national and international businesses will lose money. Revenue growth is slowing down because of poor cash flow in the market. There have been thousands of job losses due to the shutdown of industries.”. It is not surprising that such widespread diseases have massive economic costs and also require lots of spending on treatments, medical devices, research and developments, and controlling the outbreak in general. All the restrictions applied by governments to address the global pandemic had wide impacts on the economy and triggered one of the largest economic downturns in decades.

First of all, the lockdowns severely impacted manufacturing, economic mobility, consumer preferences, and consumption changed drastically, demand fell, slowing down the growth of gross domestic product (GDP) in the whole world. According to the World Development Report (World Bank Group, 2022), COVID-19 had the largest percentage of countries that experienced negative growth of GDP per capita since the beginning of the 20th century, including events such as World War I, World War II, the Great Depression, and the Global financial crisis of 2008 that almost ended in a collapse of the financial system. The US economy was not an exception, plummeting by around 32% in the second quarter of 2020, recovering in the third quarter, and finishing the year with a 3.4% decline (Macrotrends.Com, 2022). Please see the figure below to grasp the severity of the impact on countries’ GDPs.



Figure 2. Share of countries with a negative GDP per capita growth (%)

Source: (World Bank Group, 2022)

Consumption, being the biggest GDP element, largely contributed to the slump in GDP growth. In the early COVID-19 days, unemployment levels in the United States spiked to almost 15% (please see the chart below), the highest levels since the Great Depression, and remained relatively high more than a year after, at around 6% (Goldstein et al., 2021). The event left many people without jobs, gradually decreasing since then after the lockdowns were lifted and governments engaged in economic support programs.



Figure 3. US historical unemployment rate

Source: (Congressional Research Service, 2024)

Since participants in the global economy, such as households, businesses, and the financial sector are all closely related and a big impact on one can make a significant impact on another. High unemployment levels lowered households' purchasing power, thus lowering demand for various goods and services, consequently hurting businesses' revenue generation. In addition, many businesses' operations were halted and facilities closed, as a reaction to the spreading disease which posed an even higher risk for some companies. Under financial hardship, both households and businesses are considered riskier paying back their loans which poses a threat of many defaulted credits for financial sector participants which then becomes a danger to the whole country's economy.

A study conducted by 3 researchers on January 27, 2021, measured the impact of lockdown days, movement and international travel restrictions, confirmed cases, and fiscal measures on economic activities collecting daily panel data for 12 different countries from January 2020 to April 2020. After applying the panel vector autoregressive model, it was concluded that "lockdown days and restriction on movement have a negative impact on economic activities." (Chowdhury, Khan, et al., 2022). Moreover, the authors indicate four different causes that make the GDP of a country fall. It is the labour shortage stemming from lockdowns that result in production cuts, the decline in net exports, since the imports and exports were reduced because of the increased costs of the border crossing of various goods, and also because of the inability to meet the demand for goods production. The other two reasons are the reduction in tourism and hospitality and a fall in the marginal propensity to consume, which means that the public spends less and saves more (Chowdhury, Khan, et al., 2022). Another study conducted by (Ullah, 2023) indicates that all identified reasons resulted in negative impact on stock market returns: new confirmed COVID-19 cases, deaths, while new COVID-19 tests conducted impacted it positively.

The US government came to the rescue by introducing a multitude of different financial relief measures and engaging in monetary and fiscal policies, such as quantitative easing, altering interest rates, introducing stimulus packages, and more.

Quantitative easing is related to the form of monetary policy when the Federal Reserve Bank (the FED) engages in securities purchasing programs on the open markets, such as government bonds to supply money into the economy, making the dollars more accessible. As banks have an increased supply of money to lend, they can offer lower interest rates for businesses and households to boost economic activity in the country.

Another measure applied by the Federal Reserve was cutting the federal funds rate, which is a rate at which other banks can borrow money from each other, thus determining the rates for loans to the public as well. On March 3rd, 2020 the Federal Reserve started cutting rates to combat the pandemic, lowering it from the 1.50%-1.75% interval to 1.00%-1.25% with the first cut, followed by the second slash of 100 basis points, arriving at the 0%-0.25% level. Please see the figure below illustrating the changes in the FED funds rate.

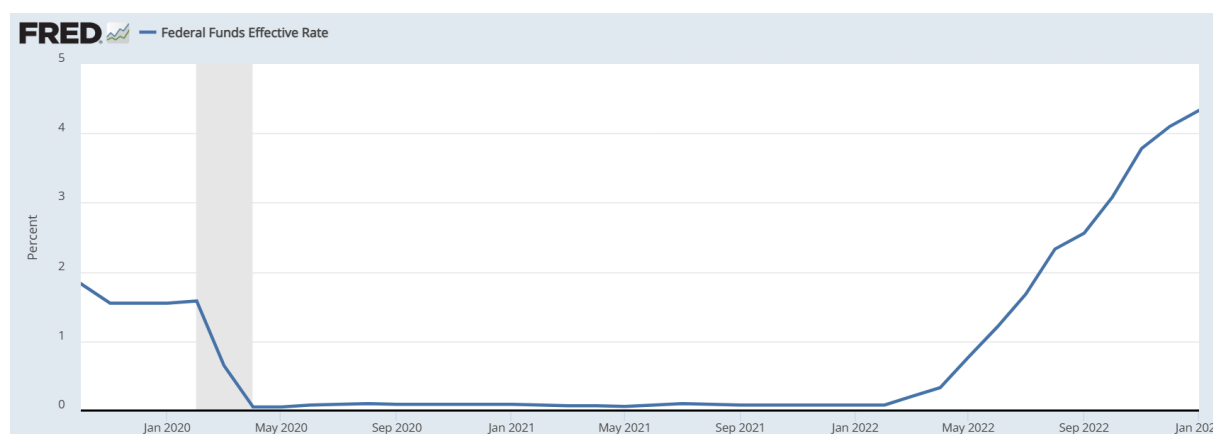


Figure 4. Changes in the US Federal Funds Effective Rate

Source: (*Federal Reserve Economic Data*, 2024)

Apart from the already mentioned measures applied, the US government flooded American citizens with direct cash deposits. According to the US Government Accountability Office, the government issued nearly 1 trillion US dollars to address the financial stress brought by the pandemic through 3 main acts, namely “the CARES Act, the Consolidated Appropriations Act, 2021, and the American Rescue Plan Act of 2021” (*US Government Accountability Office*, 2022). These stimulus packages by far exceeded the ones made for the recent crises, please see the figure below to grasp the magnitude of the financial help supplied.

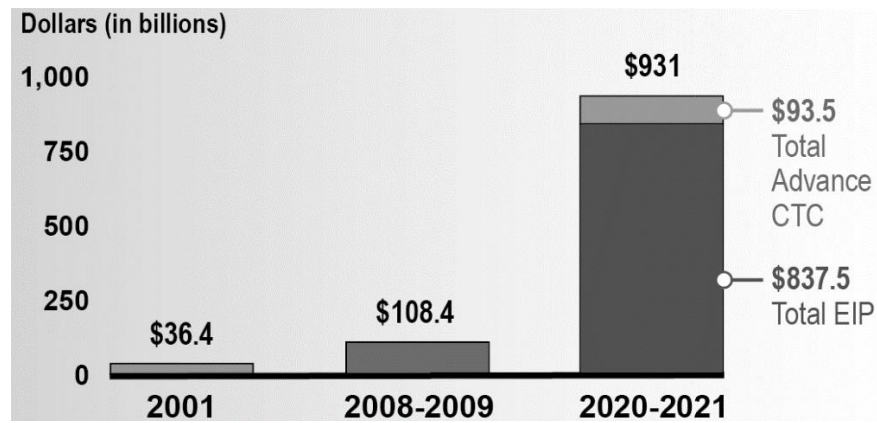


Figure 5. US stimulus payments during the recent crises

Source: (US Government Accountability Office, 2022)

There were more measures dedicated to escaping the financial hardship, such as more stimulus packages other than the ones mentioned, loan moratoriums that did not require making loan repayments for a specified amount of time, mortgage payments assistance for most vulnerable homeowners, and so on. Based on the research conducted by (Kurniawan et al., 2023), „financial support from the government through banking waivers and Covid-19 financial assistance positively influenced the sustainable financial performance and survival-recovery of MSMEs”. It is hard to imagine how many households and businesses would have ended up worse off if there would not have been any financial aid from the government. It helped to stay afloat in the near future by accessing cheap money or getting direct cash deposits but at the same time inflation started picking up and such high government debt levels posed a serious threat to the economy in the long.

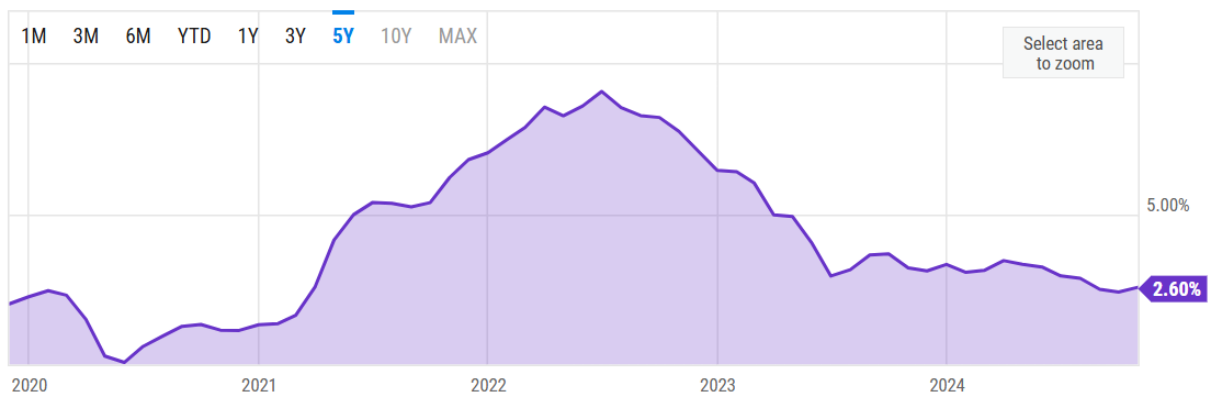


Figure 6. US inflation rate

Source: (Ycharts, 2024)

The inflation rate in the US fell significantly in 2020 and stayed relatively low until the end of the year, however not for long. There is no free money and the “printed” bills have to be repaid by someone, the inflation graph provided above perfectly depicts the situation.

Another study conducted by (Hamzeh Al Amosh & Saleh F. A. Khatib, 2023) showed, interestingly, that there might also be other measures that can help to mitigate such financial hardships, such as „compliance with ESG issues can mitigate negative financial impacts during crises and that while implementing ESG practices is costly, it satisfies stakeholders and generates financial gains for companies.”. It was also supported by another report published by (Soon-Yeow Phang et al., 2023), where „The authors find that firms disclosing sustainability practices exhibit higher market valuations relative to other firms.”.

1.1.4. **COVID-19 initial shock. The most impacted and the most resilient industries**

Even though the initial pandemic period hit the economy very hard, not all industries were impacted the same. When one loses, the other wins on the other side, meaning that if people stop demanding one good or service, it is usually because they are switching to something else. Pandemics are related to mobility limitations, thus “COVID-19 recession has crushed certain industries – those that depend on the movement of people – while leaving others relatively unscratched – those that depend on the movement of information” (Klein, 2021). Travelling, hospitality, and leisure industries experienced the largest slumps. The figure below explains the case of the United States that the highest unemployment rate spikes happened in economies that are mostly based on the movement of people, leisure, and hospitality, such as Las Vegas and Orlando, while San Francisco, Seattle, or Washington, DC are more resilient, being the cities that rely on technological, information, and governmental industries (Klein, 2021).

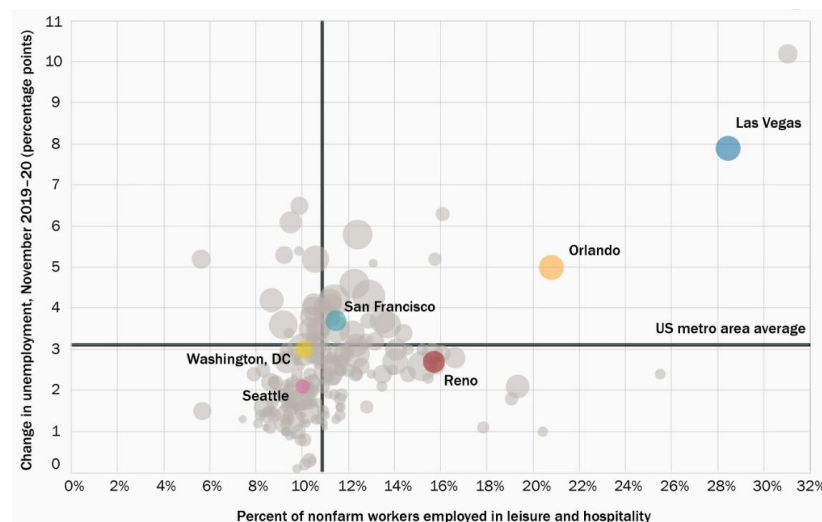


Figure 7. Unemployment rate increases by the % of workers in leisure and hospitality

Source: (Klein, 2021)

Apart from the leisure and hospitality industries, sectors and certain companies were hit hard that rely on physical locations, e.g., brick and mortar stores and those that have no presence in the digital space. Technological companies, such as e-commerce stores, digital entertainment, movie-streaming websites, or remote communication businesses saw significant demand boosts and users' growth as people started to search for alternatives of how to do the same things they are used to, but digitally, making these industries relatively resilient in the face of the pandemic.

1.2. Equity markets: Concept, influence on stock prices

1.2.1. What is equity and why is it needed? How does an equity market work?

Every business owner at a certain stage of their company has to think about expansion plans and how to bring their idea to the next level. When the company is still in its concept or idea form, usually the founders have enough capital to fund its initial operations, they can borrow money from their friends, relatives, or anyone who trusts them and their plans to lift the idea off the ground. However, it is not always sustainable and possible to fund businesses with your own or your friends' money, thus entrepreneurs have to generate ideas of how to attract more capital, which is one of the core elements of developing an enterprise. There are two main groups or categories of how a business can raise capital to fund its operations, and expansion plans, it is either through raising debt capital or equity capital. Debt capital includes such ways of accessing money as loans, credit cards, or bonds. Early-stage companies are considered extremely risky, especially when their capital raising is based only on trust for the founder and the logic of their initial product or service. This makes it hard to access debt capital from banks with good conditions because usually credit institutions tend to be more risk averse. Equity capital is usually what small businesses turn to, the process covers the exchange of a part of the company's equity for a certain amount of capital. There are several different capital raising rounds that startups or more developed companies engage in based on their maturity, starting from pre-seed and seed capital raising, Series A, B, C, D, and sometimes even beyond that (please see the figure below for the illustration of the maturities and corresponding capital raising round). Investors take different forms, depending on the riskiness and the capital raising round.

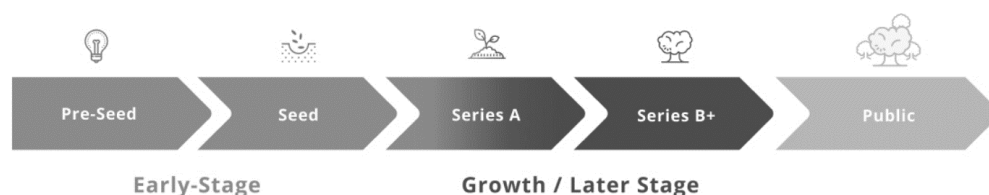


Figure 8. The capital raising rounds of companies based on their maturity

Source: (Diamandi, 2022)

One of them can be business angels, which are private high-net-worth individuals who are successful entrepreneurs themselves and can offer not only new capital but also expertise when investing in businesses early. Another type of investor can be a venture capital firm, which is a fund with pooled money, usually invested by high-net-worth individuals, financial firms, pension funds, or insurance companies. Venture capital firms usually aim for very early-stage companies that have massive growth potential, usually, it has to have a very strong management team and business plan, and operate in high-potential industries. Another type of entity that provides fresh capital to companies is private equity firms. The concept is similar to venture capital firms, however, they tackle more developed companies that already have proven business model, goods, and services, are already generating revenues, or has any other track record in their field. Depending on the company, some of them have an end goal for the future, which is to grow their business to the extent, when they can already apply for an initial public offering (IPO) to raise even more capital and list their stocks on the public market, so-called the stock market, which are then accessible by all type of investors. The equity market, also known as the stock market is “the mechanisms/conventions that exist for the issue of, investing in, and the trading of marketable equity instruments that represent the permanent or semi-permanent capital of the issuers (companies).” (Faure, 2013). The stock market is considered what is called a leading indicator of the economy, which can predict future events or directions in the economy, markets, businesses, since it usually “prices in” the information that might happen shortly, rather than waiting for it to happen and thus might be used as a gauge to access the current health of the economy.

There are two largest and leading stock exchanges in the US and the whole world, namely the New York Stock Exchange (NYSE) and the Nasdaq Stock Exchange, and are regulated by the local regulatory institutions in the US, such as the Financial Industry Regulatory Authority (FINRA) and the Securities and Exchange Commission (SEC). One of many measures, to gauge the state of the economy, would usually be stock market indices. A stock market index is a portfolio of certain companies that represent a certain economy’s or industry’s condition. There are three most followed market indices in the United States, namely the Standard & Poor’s 500 (S&P500), Dow Jones Industrial Average (DJIA), and the Nasdaq Composite. The S&P500 index represents almost 80% of the total value of the stock market in the US and thus is used the most in the media or analyses. It is compiled of the 500 largest American enterprises by market capitalization. The DJIA includes 30 very well-known and most influential stocks in the US (3M, Apple, Boeing, Chevron, Coca-Cola, and so on), while the Nasdaq index is the most volatile out of the three and better reflects moves in the technology sector and is made up of around 3700 stocks listed on the Nasdaq exchange. Analyzing the impact on the equity markets in this thesis, it is referred to these three main market indices in the

US, especially the S&P500, and the DJIA under the assumption that stock markets react before some changes or almost immediately to the news, events, or any measures applied by the government.

1.2.2. Reasons for stock price fluctuations in equity markets

After the company goes public, its shares are available in the secondary market and being traded between retail or institutional investors, and the stock price is then purely determined by supply and demand in the market which can be then directly or indirectly influenced by many different factors, such as fundamental, technical factors or even investor sentiment, that shows how investors feel about the current state of the economy and investing. Not all stocks are influenced the same by various events, news, or measures applied, it can greatly differ sector by sector.

First of all, stock prices are influenced by fundamental factors, such as the financials of certain companies after they issue quarterly or yearly reports, disclosing their performance, profitability, margins, financial health, future outlooks, and many more. Investors can determine whether the company looks undervalued or overvalued by looking at their financial results, using various multiples, such as price to earnings, and comparing it to other companies in the same industry or a general industry average, however it is never as easy. In a perfect world, where the prices are driven just by how good or how bad a company's financials or how low or high multiples are, it would be way easier for analysts and investors to generate returns, just by preparing financial forecasts and using historical data. However, another very important factor in investing is psychology, which can make investors excited, fearful, risk-loving, or risk averse, or just blindly follow the current market sentiment that is set by other investors, news, blog posts, youtube videos, and others. For example, during times when economies are not doing great market sentiments are not the most optimistic, even though a company might announce exciting expansion plans, news, or just report flawless financial results, the stock price might barely increase, stay flat, or even decrease. Under the current situation, when the COVID-19 pandemic is not as harmful anymore, but the economy is getting worse daily, the sentiment is wandering around its all-time lows, reflecting the current fear, uncertainty, and doubt (FUD) in the market. Please see the graph below reflecting historical consumer confidence & sentiment in the markets conducted by the Conference Board and the University of Michigan, the red line indicates the Consumer Optimism Index (COI) which is the average of the Consumer Confidence Index (CCI) and Consumer Sentiment Index (CSI), with the latter being very low, showing extreme pessimism about current and future state of the economy. The difference between CCI and CSI is that consumer confidence reflects general feelings about the economy, while sentiment explains how consumers feel more based on their circumstances.

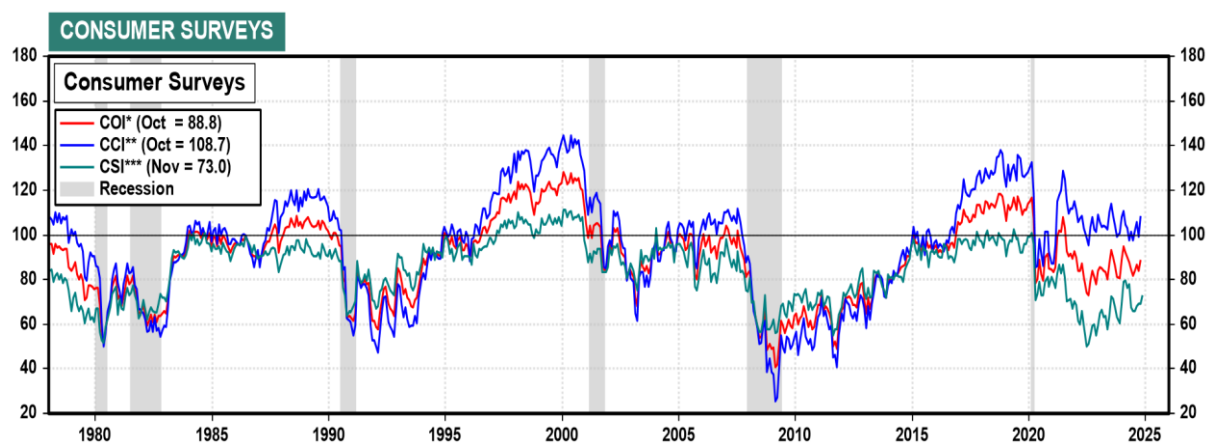


Figure 9. Historical consumer confidence and sentiment graph

Source: (Yardeni et al., 2024)

Technical factors such as inflation, current market trends, and news do also influence stock prices. During the periods when inflation is above its normal thresholds and rising, it is expected to simultaneously see some kind of government intervention and it usually takes the form of interest rate hikes. Increasing interest rates harms the stock markets since the debt capital is getting more expensive for households and businesses, thus slowing down the spending and economy. At the same time, other financial securities, such as bonds become more attractive, since rising interest rates coincide with the increase in bond yields, making them more profitable. In that case, a part of investors' capital might flow into bonds. Especially during uncertain and economically unstable times, when investors do not expect good returns from stock markets, they would much rather choose bonds that have characteristics of a much lower risk level. However, "if we look at history, we can see that on most occasions, rising inflation rates are synonymous with improving Gross Domestic Product (GDP)." but it should remain around the target threshold and in general the historical trend reflects lower stock market returns under the periods of rising inflation (Gabajiwala, 2022). Current market trends also have an influence, sometimes if the upward trend is strong for the whole market and everyone is optimistic, stocks can pick up the momentum and continue growing faster than one would expect them to, however the same can apply for negative periods. Momentum and trends can be also confirmed by technical analysis and charts that give certain entry points for trades, either to buy or sell a stock. The news plays a big role in impacting the investors' sentiment and simultaneously the stock market, especially during uncertain times and when investors' fear and doubt hit high levels. The market is usually the most sensitive to political news, government decisions, company mergers and acquisitions, equity issuance or repurchase, economic reports, and so on.

1.2.3. The impact of COVID-19 on equity markets

Knowing that the stock market is a leading indicator that grasps the financial state very fast and efficiently reflects it on the charts, the panic created by the pandemic was instantly seen on the US stock indices (such as the S&P500, Dow Jones, and Nasdaq) triggering what is now seen as one of the fastest stock markets crashes in the history of the US equity markets. There are many aspects apart from the pandemic deaths and reported cases that influenced the stock market performance that was reviewed above, such as macroeconomic indicators, government fiscal and monetary decisions, and so on. There is some research already performed on how the COVID-19 pandemic impacted certain aspects of stock markets, such as volatility, liquidity, and returns, mostly focusing on the beginning of the outbreak, thus evaluating the initial shock, however not as many reports and analyses on how it developed years after it started, following other important events for the whole economy.

(Ashraf, 2020) carried out an analysis for the period from January 22 to April 17, 2020, of how certain governmental actions impacted the returns of the global stock markets, choosing almost 80 different countries and their main stock index, trying to find what were the effects of three different measures, which are social distancing (closing schools, offices), increasing COVID-19 testing and quarantine, and issuing stimulus packages for households as cash payments. After running regression models it was concluded that the closures of schools and workplaces had a direct negative impact on stock market returns “due to their expected adverse impact on economic activity.”, however, a positive indirect effect, since it results in a reduction in new daily cases (Ashraf, 2020). On the other hand, the announcements of applying quarantine and testing measures and issuing income support checks for households resulted in a positive impact on the markets.

Another study collected data until 27 March 2020 and researched how COVID-19 impacted the stock market's risk, taking the standard deviation of daily returns into account. It was concluded that the US market volatility was greatly impacted, with its standard deviation spiking nearly four times in March compared to February. Volatility in the markets can change investors' sentiment, they might become more attentive and reactive, however more speculative, not always in their own advantage as the swings become much bigger and it could become a hit it or miss it situation. According to (Khan et al., 2023), “In a speculative bubble situation, the news of prices can affect irrational investors' decisions, which leads to catastrophic results in the market like a virus”. In addition, it was measured that governmental interventions, such as quantitative easing create more uncertainty and may cause problems in the long run (Zhang et al., 2020).

(Baker et al., 2020) assessed the impact of manually and automatically reviewed news about the outbreaks on the stock market comparing it to previous pandemics backing to 1900. Both positive and negative news related to COVID-19 was the dominant driver of the US stock market moves from February 24, 2020, through April 2020. The COVID-19 pandemic resulted in the most forceful stock market moves compared to other pandemics and it cannot be solely explained by the mortality of the

virus, since the Spanish Flu was way more mortal. Such moves are more likely to be supported by restrictions applied on mobility, lockdowns, while upward moves were created by fiscal and monetary policy responses. Please see the illustration of historical market volatility comparing different market crashes, which is calculated as the sum of squared returns over the past 10 trading days.

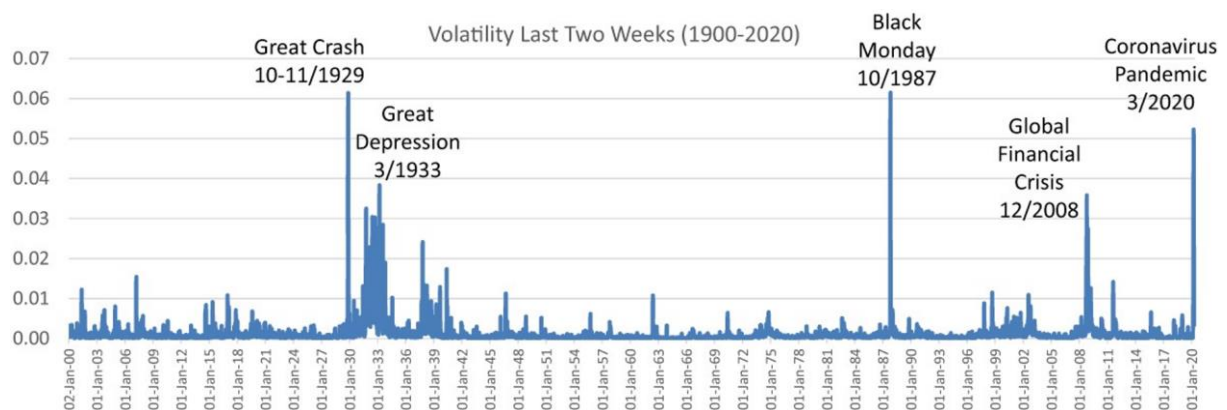


Figure 10. US stock market volatility from January 1900 to April 2020

Source: (Baker et al., 2020)

Another study that tries to quantify the effect of the news on the stock market's volatility was run by (Baek et al., 2020), mentioning that both positive and negative news had a significant effect, however, the negative news about pandemic deaths were twice as impactful as news about recoveries.

(Chowdhury, Dhar, et al., 2022) and (Chowdhury, Khan, et al., 2022) ran research applying various statistical methods and concluded that new confirmed cases, deaths, and the number of lockdown days do have a high impact on the market's sensitivity and stock prices, while the reaction to the announcements of financial help from governments was very optimistic. It is discussed that the pandemic's uncertainty and the economic downturns from it have made the stock market very sensitive and vulnerable.

Broadly speaking, the COVID-19 pandemic seems to have negative implications on the global stock markets, as well as the US stock market. However, it would be wrong to assume that all sectors were impacted the same way and were disturbed equally. Industries, that are more exposed to the movement of people were greatly affected by the mobility restrictions and lockdowns, while information technology and other digital companies appeared to be better off. (Chowdhury, Khan, et al., 2022) mentions the tourism and hospitality industry being impacted the worst, in general, the whole travel industry, such as airlines, cruise operators, hotels, and casinos took a significant hit. Another study conducted by (Kwan & Mertens, 2020) confirmed that between February and March 2020 the travel and consumer discretionary industries, which include hotels and luxury goods

experienced one of the hardest hits, however, energy, financial, and real estate industries got hit even more.

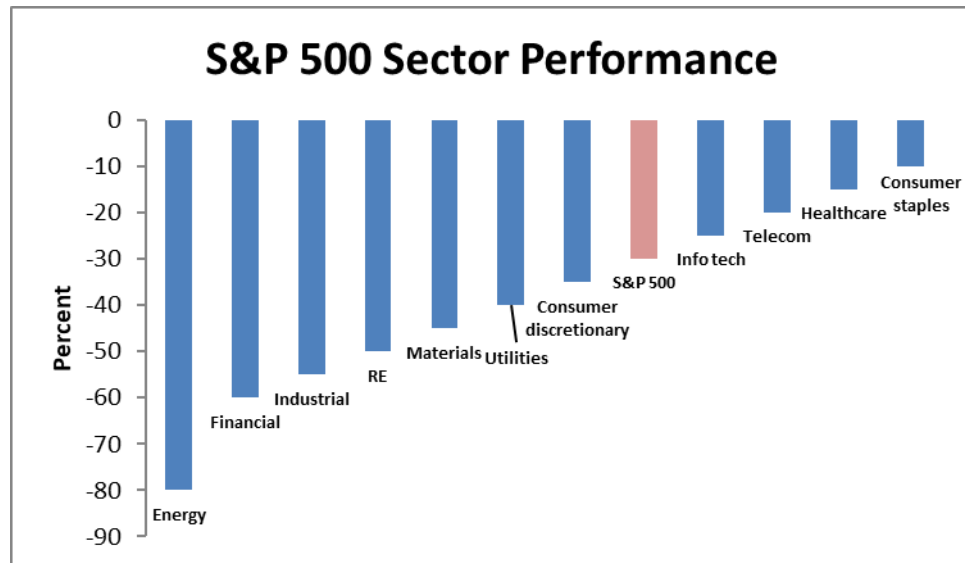


Figure 11. S&P 500 returns by sector: February 24 to March 20

Source: (Kwan & Mertens, 2020)

On the other hand, the pandemic shock was positive for telecommunications, healthcare, information technology, and consumer staples industries that overperformed the S&P500 index. Please see figure 11 listed above showing the percentage market and different industries' returns for the February-March period of 2020.

1.3. Company valuation: Concept, theory, influence

1.3.1. What is a company's valuation and why is it important?

A company's valuation is a complex process that requires professional judgment, expertise in various fields, such as economics, corporate finance, mathematics, and in general an understanding of how a business works and what can influence its performance and results. It is a procedure during which the company's economic value is calculated, so-called its enterprise value. No company is the same and valuation is a very unique process when different aspects have to be taken into consideration, such as its current state, future projections, capital structure, local regulation, location, market, and many more. There might be many different reasons why a company has to be valued, for example when a company wants to sell a part of all of its business, when a company wants to acquire another company or invest in it by buying a part of its share capital, for taxation purposes since the Internal Revenue Service (IRS) in the US requires a valuation from businesses based on their current market values, and so on. A valuation process includes thoroughly analyzing the target company's

management, financial statements, industry averages, and trends to conduct a financial forecast and apply relevant and correct assumptions.

There are several misconceptions about valuation, introduced by Aswath Damodaran, a professor of finance at the Stern School of Business. The first one is that a valuation is a tool to find the “true” value of a business, however, valuation is often based not only on the company’s financials but also on personal judgment and assumptions and the reason for valuation, thus all valuations are biased to any direction, either overvaluation or undervaluation of an asset, such a company. The second one is that a good valuation can provide a precise value of a company, however, there are no perfectly prepared valuations. The last misconception is that the more complex and quantitative the valuation is, the better. Since it is a complex process, it is easy to get lost between many variables and inputs, according to A. Damodaran “simpler valuation models do much better than complex ones.” (Damodaran, 2012).

1.3.2. Valuation methods, theory, advantages, and disadvantages

There are many different valuation methods and some of them can be applied differently. For certain industries one valuation method might be more applicable than the other ones, also it can depend on the business itself. There is various literature that distributes valuation methods across different groups. For example, (Fernández, 2007) groups the methods into 6 different categories presented in the table below.

Table 1. The methods for valuing companies

MAIN VALUATION METHODS					
Balance Sheet	Income Statement	Mixed (Goodwill)	Cash Flow Discounting	Value Creation	Options
Book value	Multiples	Classic	Equity cash flow	EVA	Black and Scholes
Adjusted book value	PER	Union of European Accounting Experts	Dividends	Economic profit	Investment option
Liquidation value	Sales	Abbreviated income	Free cash flow	Cash value added	Expand the project
Substantial value	P/EBITDA	Others	Capital cash flow	CFROI	Delay the investment
	Other multiples		APV		Alternative uses

Source: (Fernández, 2007)

(Damodaran, 2012) excludes three approaches to valuation, namely the Intrinsic valuation method, Relative Valuation, and Contingent Claim Valuation, which coincide with the Cash Flow Discounting, Income Statement, and Options valuation methods presented in the table above, respectively. Damodaran does not include the Balance Sheet method, which is one of the easiest to calculate, however, does not provide a very detailed view of the company’s value.

Lastly, (Faure, 2013) excludes three different valuation approaches, too, presented in the figure below.

SHARE VALUATION APPROACHES		
Balance Sheet Valuation Approach	Discounted Cash Flow Approach	Relative Valuation Approach
Book value per share	PV of dividends	Price / earnings ratio
Liquidation value	Free cash flow valuation techniques	Price / cash flow ratio
Replacement cost		Price / book value ratio
		Price / sales ratio

Figure 12. Share valuation approaches

Source: (Faure, 2013)

Looking at three different pieces of literature on business valuation, it is seen that three main valuation methods appear the most often, which are the Balance Sheet Valuation approach, Discounted Cash Flow approach (Cash Flow Discounting or Intrinsic Valuation method), and Relative Valuation approach (or Income Statement approach). It is worth including the Transactions Multiples approach under the hood of Relative Valuation which values a company according to the latest mergers and acquisitions (M&A) transactions and their corresponding multiples for which a part or the whole company was acquired.

The balance sheet valuation approach is the easiest one out of the three mentioned and requires the smallest amount of time to get the answer. It has three different ways to calculate it. First of all, the book value per share (BVPS) is simply the amount of equity on the company's balance sheet divided by the number of shares outstanding. To arrive at an equity number, liabilities have to be subtracted from the assets that the company has. The theory behind it is that it shows the value of the shareholders' equity that is left after all the debt is paid and the assets are liquidated and the BVPS is compared to the market value per share of the company, if it is higher than the BVPS, theoretically the share might look overvalued. The Liquidation Value approach is very similar to BVPS, it is just that the liquidation depicts the value of assets sold, and all liabilities paid, the difference is only that in liquidation the assets are sold on their current market price and thus would be a very important method in the case of bankruptcies, while book value accounts to the historical costs of assets, thus it depends on the current market conditions and prices of the assets to decide which valuation method gives a higher value. The last method of Balance Sheet is the Replacement Cost method which is usually used to calculate the value of a long-term asset, such as real estate by evaluating the amount of money it would cost to replace the asset, which also greatly depends on the market conditions and prices of raw materials. The disadvantage of the balance sheet valuation method is that it does not consider any future earnings, which could make the company more valuable in some cases.

The relative Valuation method is another method used very often both for publicly listed and private companies. It estimates the value of a company by collecting financial information of

comparable companies, such as its competitors or the industry averages to compare the financial multiples with its own and grasp how the market prices comparable companies, thus assuming that the market would be willing to pay a similar amount to your company, too. There are two groups of multiples, namely the equity and enterprise value multiples. The most used ones are price to earnings (P/E ratio), price to sales (P/S), price to book value (P/B), enterprise value to earnings before interest, taxes, depreciation, and amortization (EV/EBITDA), enterprise value to sales (EV/Sales), and enterprise value to earnings before interest and taxes (EV/EBIT). One advantage of this valuation method is that it can reflect the current market perception and the sentiment the best, if the market is bullish at the moment, it can be beneficial for a company to be valued higher, however it might be a disadvantage at the same time, arguing that it does not reflect the fair value of the company, since it can be greatly influenced by market moves and sentiment. Also, relative valuation usually requires less digging for information and less time to come up with a valuation than the Discounted Cash Flow method, which is analyzed next. Relative valuation is best used when a company has many comparable companies that are publicly listed and when an investor wants to find an overvalued company for a short-term investing move. As mentioned, multiples might be also used from the latest M&A transactions for comparable companies or the ones in the same sector, taking the average of those multiples and applying it to the firm being valued. However, many acquisitions happen from a synergetic standpoint, meaning that acquirers are willing to pay a premium to buy a company if it sees a way how it could help increase revenues massively, thus the method might result in boosted valuations. Also, many M&A transactions do not disclose their acquisition details, therefore it might be hard to find enough comparable companies to apply it.

Discounted Cash Flow (DCF) is the most sophisticated and extended valuation method, arguably used the most in the finance world when trying to arrive at the company's value based on its future cash flows. Under the method, the value of a firm is the present value of its forecasted free cash flows in the future, which depends on many various factors, such as the capital structure and cost of capital of a business, market risk, and so on. The method requires a multitude of assumptions and expertise to be done right. It can be an advantage since it is a very diligent method to value a firm, however, it is hard to be sure about forecasting a company's performance and many things can go wrong or completely miss the forecasts, distorting the value, what is more, it is much more sensitive to inputs and requires a plethora of them, thus it is easy to misvalue a company using the method. Another thing is that the inputs and assumptions can be easily manipulated by the valuator to bring the value where the valuator wants to. The approach is best used for companies that are and will be generating positive cash flows in the future and for investors who tackle long-term investments. When valuing the future cash flows, one might choose between calculating the free cash flows of the company or using the dividend discount model which states that the present value of

summed future dividends is what the company's stock should be currently worth. If the price under the method is higher than the current market price of the company's stock, the stock is considered to be undervalued and might be a great target for further analysis, since no analyst can decide whether it is worth investing in a stock just by applying one valuation method, whether it is the DCF or relative valuation approach.

1.3.3. The impact of COVID-19 on company valuation

Based on the analysis conducted in this paper, it is already clear that companies suffered greatly during the COVID-19 pandemic, especially when the strictest measures were applied by the government. Such moves hit companies' revenues, squeezed their margins, slowed operations and some of them even had to completely shut down some of their locations. The impact depends on the timeline of the pandemic, at the end of 2023 the inflation was twice lower than at its peak mid-2022 and stays at roughly 3.1%, however during 2022 it was at its highs, where the government had to engage in interest rates hiking, which simultaneously made it more costly for companies to borrow, thus increasing the cost of capital, which lowers the projected cash flows in the meantime. This is one of the reasons why highly leveraged companies suffer more during these periods, rather than the ones who fund their operations with private capital. (Abbas Rizvi et al., 2022) researched how COVID-19 impacted the valuations of non-financial European firms, using the DCF and residual income approaches, and compares the valuation it arrived at with the actual year-end price and available stock price targets posted by sell-side analysts. For the analysis, 10 European countries that have reported the most pandemic cases were taken as of 6 December 2021. The authors applied several scenarios related to some drops in revenues and increases in the cost of equity and under all scenarios a drop in valuations is recorded for all industries. Even if the cost of equity stays flat, the impact on revenue is big enough to lower valuations during the period, however, if the financial intervention could lower the cost of capital for firms, the deterioration would be modest.

Another study written by (Shen et al., 2020) analyzes the COVID-19 impact on corporate performances using the financial data of publicly listed Chinese companies. The research tries to test three hypotheses: 1. When the firm's investment scale is smaller, COVID-19 has a larger negative impact on the firm's performance. 2. The COVID-19 impact is larger if the sales revenue is relatively small. 3. The COVID-19 pandemic hurts the industries that were severely impacted, and thus have worse performance, following the pandemic. It was concluded that the pandemic had a serious negative impact on listed Chinese firms' performance by decreasing their revenue. For the most-impacted industries, like travel and transportation, a significant decline was measured in their performance in the first quarter of 2020, stemming from a drop in production, operations, and sales.

For those reasons, the recommendation for managers is to adjust the strategies based on the changing environment and for investors, to be cautious and assess the risks associated with their financial holdings.

1.4. Development of the COVID-19 pandemic. 3 stages

Looking back now, people see and evaluate the pandemic and its implications as one big event that shook the whole world. The outbreak is counting its fourth year being present, even though now there are only several COVID cases a day and everyone accepts that it is over, it has created hard times for societies. There were a multitude of various events, and different governmental actions between those years, taken to stop it from spreading and to curb the negative financial impacts. For this reason, for context it is important to divide the COVID-19 period into three different stages:

Stage 1: the period from when the World Health Organization declared the outbreak as a global emergency until the end of the year (January 30, 2020, until the end of 2020).

Stage 1 characteristics: broad global panic, travel bans, lockdowns, strict quarantine, halted businesses' operations and manufacturing plants, offices being shut down, and employees working from home. The US government dropped interest rates to 0% and engaged in quantitative easing. Period of high unemployment, low inflation, and GDP slump followed by a quick GDP rebound, caused by fiscal checks.

Stage 2: the period from the beginning of 2021 until the end of the year.

Stage 2 characteristics: full year of 0% interest rates making access to money very cheap, increasing government debt from fiscal checks, money flooding into the economy, positive investors sentiment, consistent stocks' bull market for the whole year. Inflation starts to pick up, growing from 1.4% at the beginning of the year to 7% at the end of 2021.

Stage 3: the period since the beginning of 2022.

Stage 3 characteristics: the government starts to hike the interest rates, quantitative tightening, so-called "tapering", increased layoffs caused by worsening companies' performances, increased costs, and squeezed margins, rising bond rates, thus getting more attractive than stocks as a safer investment. High and rising inflation, high government debt, consumer confidence at lows, investor sentiment is extremely pessimistic, and recession fears are fueled by the current state of the economy and the actual recession (two negative consecutive quarters of decreasing GDP).

2. METHODOLOGY

Relying on a single method for financial analysis can often result in inaccurate conclusions that need more supporting analysis. It can happen because different methods have different pros and

limitations, which may not accurately depict the real view of a certain firm's financial position or the impacts of external factors, like in this case the COVID-19 pandemic. For this reason, an approach of utilizing more than one method is crucial to arrive at a more reliable result. In this study, two different methods to see the impact of COVID-19 on selected companies are going to be used, namely regression analysis and Discounted Cash Flow (DCF) analysis. With the regression analysis the impact of various COVID-19 pandemic-related inputs on stock prices is going to be run to see what is the relationship between some chosen sectors and the inputs, while the Discounted Cashflow analysis is going to be used as the main method on top to either support or reject the initial regression analysis results that a specific impact, either positive, negative, or neutral was created on three chosen sectors.

2.1. Review of the methods used

2.1.1. Regression analysis

Before applying Discounted Cash Flow analysis, it is important to check statistical data and see how some chosen COVID-19 pandemic-related independent variables affected companies' stock prices of some specific sectors and later to support this outcome with another approach. For this work, a regression analysis is going to be run, which is a correlation of set of variables which is used mathematically as a predictive approach.

In chapter 1.2.3 it was researched how other authors ran regression analyses and quantified the impact of the pandemic on economic activities and stock markets. It was found that there was a negative impact, however the time periods used were way shorter than is planned to be done in this work. Most of the research papers analyze the initial impact at the beginning of February, 2020 until March or April, 2020, even though it is enough to see the impact, since it resulted in a massive stock market downturn, however it is still not as reflective and clear what is the longer term impact across the whole pandemic timeline, now when we know that it is partially gone and people do not really talk about it anymore. This is important gap in the existing research related to this topic as the initial market slump and fast rebound was very obvious in what kind of impact it had, however it is crucial to see how the situation develop years later, especially when the years from 2020 until the end of 2022 were drastically different from the government's responses standpoint, which clearly have an impact both of the investors' sentiment, the whole markets' momentum and even direct impact on companies' financial performances.

For this research multiple independent variables are going to be used to quantify the impact, such as number of COVID-19 cases, interest and inflation rates, as discussed in chapter 1.4, there were different time periods with different characteristics and some of them included 0% interest rates

and low inflation at the beginning, while from 2022 the inflation started picking up, thus the government had to apply certain measures to fight it, eventually starting to raise interest rates. Another independent variable will include the COVID-19 stringency index, calculated by (Edouard Mathieu et al., n.d.), which demystifies the measures of governments applied during the pandemic, including “school closures, workplace closures, cancellation of public events, restrictions on public gatherings, closures of public transport, stay-at-home requirements, public information campaigns, restrictions on internal movements, and international travel controls.”. The index stays in the range between 0 and 100, thus the largest it is, the stricter response was applied in that period. For dependent variable, stock prices for three different chosen companies are going to be chosen. The set of dependent and independent variables is going to look like it is showed in the table below.

Table 2. Inputs for regression analysis

Variable	Description
Si	The price of a chosen stock of a company
CASES	The number of COVID cases in absolute numbers
STRINGENCY	The stringency index from 0 to 100
INFLATION	Inflation rate from 0 to 100, %
INTEREST	Interest rates from 0 to 100, %

Source: data created by the author

The Ordinary Least Squares (OLS) regression analysis is going to be run, and the initial step is data gathering for the chosen time period, which is from the beginning of 2020 until the end of 2022 when the COVID is thought to be officially over, even though there are still some cases even until now. For the analysis, daily data is going to be collected for years 2020-2022 for stock prices, number of COVID-19 cases, stringency index for these exact days, inflation and interest rates.

According to (Nathan Christiaens & Jeroen Macharis, 2021), there are several assumptions for the model to work, including linearity, which states that the regression model is linear in the coefficients and the error term, second one is exogeneity, which means that the independent variables are not in correlation with the error term, third assumption is homoscedasticity, which states that “the variance of the error term is consistent for all observations”, fourth one is no residual autocorrelation, meaning there is no autocorrelation between the observations of the error terms, next is no multicollinearity, meaning there is no multicollinearity between the independent variables, and finally the error term has a population mean of zero, if it does not, the model impacts the output in a systematic negative way.

After all, the results of the analysis will be interpreted. First of all, coefficients (β) will be reviewed to see the expected change of the dependent variable (stock prices) for the change in one of the independent variables, e.g., if we get a -0.1 coefficient for an independent variable, it means that for one unit increase in the independent variable, it will create a decrease of 0.1 in the dependent variable with the assumption that other variables stay constant. What is more, the significance (p-value) also plays a role, which indicates if a coefficient has statistical significance, where a value less than 0.05 proves just that. Model fit is also going to be reviewed with R and R squared in a model summary table, which shows the determination coefficient and explains what part of the dependent variable is explained by independent variables, the closer it is to 1, the better, e.g., if it is 0.25, then independent variable X explains 25% of the dependent variable's Y variation. Additionally, multicollinearity to check if independent variables are correlated with one another, heteroscedasticity to see if the variance of residuals across independent variables, autocorrelation using Durbin Watson test to see if residuals correlate with each other, which could lead to misleading estimates. The end goal of the regression analysis is to see which independent variables had what kind of impact on the stock prices, to what extent, and in general what was the impact. It will serve as an initial point of view of how the stock prices were impacted based on COVID-19 data and governmental measures and later it will be either supported or negated by the further analysis using discounted cash flow valuation method.

2.1.2. Discounted Cash Flow (DCF) analysis

To have a reliable Discounted Cash Flow analysis, data collection, such as company's financials, other data to base the projections on, and market research to support the growth assumptions make a crucial part, since the DCF method is a very sensitive method to small changes in its inputs. After picking several companies from different industries using the methodology indicated below next to the sector analysis, financials of such companies are used, including financial statements, such as profit and loss statement to calculate and see the trend of sales and costs, balance sheet for working capital calculation and other aspects, and statement of cashflows to either get depreciation or capital expenditures data and sometimes even more if it is needed to adjust the cashflow situation for the future for the forecasted years based on the historical management of the cash. To forecast future cash flows, it involves several parts in the process:

Forecasting revenue is crucial for the analysis to work accurately, it involves forecasting future sales by using historical revenue data, market analysis, and industry reports to indicate growth rates for future years. For revenue analysis past revenue trends help to identify the patterns of growth, spot seasonalities, if any. It provides the top row and a starting point for projection of future sales. For

growing companies with a good historical momentum it is expected to forecast a positive revenue growth as companies tend to constantly invest more money in the business and scale to different markets, however the challenge can sometimes be if the revenues growth in the previous years is very volatile, for example, positive, however the growth rate ranges very widely, or some years have experienced positive revenue growth, while other years saw some declines and it becomes important to see whether such trend was a sector-wide trend or some company-specific or one-off event.

Forecasting costs is forecasted by analyzing historical cost structures and patterns, considering management's plans for product development, expansion, and similar. This is also very important to understand future profitability, forecast margins, and possible cash flow generation. Spotting cost patterns help to analyze fixed and variable costs and see main cost drivers. Usually it makes sense to forecast separate expenses accounts as they move very differently, on some accounts companies tend to save and put the company on a leaner approach, especially in harder times, such as crises or the pandemic, while sometimes the cost accounts can be seen to be changing in a relatively stable manner, thus either calculating the total costs changes, still splitting them into cost of goods sold, operating costs, and similar, or to calculate the margins, as the companies tend to keep their margins stable but seeking to improve when it leans toward to profitability rather than an exponential growth period with massive spending in research and development, sales and marketing, headcount, and other related costs.

Capital Expenditure projections involve taking future capital requirements into consideration based on the company's growth plans and investment needs, such as expansion projects, new products development. Capital expenditure takes the long-term investments of the company into consideration and can usually be found under capital expenditures row in the cashflow statements or under property, plant, and equipment outflows, as these represent the fixed-asset investments.

Net Working Capital represents the company's short-term health and is projected by using balance sheet and taking the company's balance of current assets and current liabilities. It helps to spot the current liquidity position of the company. There are many more inputs used in the forecast of the future cash flows that will be discussed or used in the calculations later on but these are the backbone of the forecast. It is also important to be as accurate as possible when forecasting the cashflows in the future, especially when it comes to the main activities of firms. Operating net working capital is most often used for discounted cash flow analyses to tackle just that, when the current assets are taken in the calculations without the cash and cash equivalents amount, while the current liabilities exclude the interest-bearing liabilities and other ones that are not related to the day-to-day activities of an enterprise.

Discounted Cash Flow is a complex model that needs both expertise and attention, since it includes many different inputs, assumptions, and is sensitive to changes in those. Using the model,

the long-term perspective is assumed, since the forecasted period usually includes at least five years with a terminal value at the end, showing the value of a firm if it continues operations in the future at a somewhat stable growth rate. This growth rate has to be very well-thought as the final result is very sensitive to this number and it should be understandable that if the company is growing its revenues double-digits now, it does not mean that such growth can be sustained for 10 or more years, thus usually a more conservative approach is applied when it comes to that. The formula to arrive at the enterprise value of a company using this method is shown below.

$$DCF\ Value = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+r)^t} + \frac{TV}{(1+r)^n}$$

Where:

FCFF – Free Cash Flow of the firm;

TV – Terminal Value;

r – the discount rate;

The **FCFF** is the input which shows the free cash flow available to the company's investors, including both equity and debt providers, thus called the unlevered free cash flow. The calculation is shown as:

$$FCFF = \text{Earnings before interest and taxes} * (1 - t) + D\&A - CapEx - \Delta NWC$$

Where:

D&A – Depreciation and Amortization show the non-cash expenses of the company that are used for the reduction of the tangible and intangible assets' value over time;

CapEx – Capital Expenditures, which shows the value of invested capital into fixed assets of the company;

ΔNWC – change in Net Working Capital, which reflects the change between current assets and current liabilities of a company;

Earnings before interest and taxes can also be shortened to **EBIT**, which provides a view of a company's operating profit or what they make from main company's operations.

The **discount rate** is an input in the calculation which shows the time value of money and the risk associated with the exact company which depends on its capital structure, sensitivity, size, country, and so on. In other words, it is called the cost of capital of a company. It discounts the future cash flows of the company to the present value, reflecting the assumed risk of these cash flows. Usually, and in this case, the weighted average cost of capital (WACC) is used as a discount rate reflecting the cost of debt and equity combined. It is also important to be cautious when calculating the weighted average cost of capital and choose the right inputs, as the final result can be very sensitive to this rate.

$$WACC = \frac{E}{V} \times Re + \frac{D}{V} \times Rd \times (1 - Tc)$$

Where:

E – equity value of a company;

D – debt value of a company;

V – (E+D);

Re – cost of equity;

Rd – cost of debt;

Tc – corporate tax rate. In some cases the fixed corporate tax rate is used, however in the covered years the US has changed the rate, thus the effective tax rate was volatile as well, sometimes, to better reflect the actual cashflow situation, it is recommended that effective tax rates are used.

As mentioned below, a balance sheet is needed to find out what is the current snapshot of the company's equity and debt ratio.

Cost of equity is a critical input for the analysis and is often computed by using the Capital Asset Pricing Model (CAPM) which shows the balance between risk and return, implying that the riskier the investment is, the more return can be expected by the investors. In other words, it depicts the return additional to the risk-free return as a compensation for taking more risk that comes with investing into equity, in simple terms, risk over what an investor can get by buying governmental bonds. Based on the research conducted by (Juniawan Mandala et al., 2023), “Barillas & Shanken (2015) found that the CAPM (Capital Asset Pricing Model) is the most popular and widely used model by professionals”, thus it is going to be used in this thesis.

$$Re = Rf + \beta \times (Rm - Rf)$$

Where:

Rf - risk-free rate;

β – beta coefficient;

Rm – expected market return;

Rm-Rf – market risk premium.

Risk-free rate is a return that in the market is considered basically riskless, although it is debatable whether any investment is purely riskless, but it is accepted that governmental bonds, being stable and relatively secure, especially for countries that have the highest credit ratings, are almost risk-free investments, thus their return are used as the risk-free rate for the calculations and acts as a benchmark when evaluating other investments. Based on the analysis presented by (Oxera, 2023), “we recommend that the NZCC consider a range of evidence on yields for government bonds with maturities between five and 20 years;”, which is usually a benchmark, and a governmental bond of 10 years is used the most.

Beta coefficient is a measure of market volatility and is on average equal to 1. If beta is >1 , it indicates higher risk than the average, if <1 – lower risk. According to (Chen, 2021), “By expressing covariance between a single security and the whole market, beta supplies the simplest measure of systematic risk not reducible through diversification”. The measurement helps to understand what the expected movement of a stock is based on how the market moves, or so called, what is its sensitivity.

Market risk premium basically shows the additional return that the market participants expect to earn over the risk-free rate. It is the difference between the expected return of holding the market portfolio and the risk-free rate, which compensates with a higher return for a higher risk taken. According to (Damodaran A, 2020), “estimating the equity risk premium, historical returns are used, with the difference in annual returns on stocks versus bonds, over a long period, comprising the expected risk premium”, basically taking the difference between the market portfolio and governmental bonds, which are considered risk-free, as the formula $(R_m - R_f)$ for the market risk premium shows.

Corporate tax rate is simply a rate at which companies get their profits taxed at, affecting the net income, thus cashflows of the company as well. It varies widely in jurisdictions, for example in the United States it is a flat 21% from the beginning of 2018 (while it was 35% before), while in Lithuania it is 15%. However, to reflect the cashflow situation of a specific company better for the discounted cashflow methods, the effective tax rate should be a better fit in the case.

Cost of debt is the interest rate that a company is paying for borrowed funds, and it is considered to be cheaper than equity because it does not dilute equity and it is also tax deductible. It is usual for a company to have several different loans, thus in that case often a weighted average of the interest rates is taken. Cost of debt can greatly impact the cost of capital, however it makes more sense for more established and stable companies to take debt as their creditworthiness is higher and they can get better interest rates than early-stage companies with less traction or fixed assets.

Terminal value shows the forecasted present value of all the future cashflows beyond the forecasted period which is usually 5 years. It usually makes a large difference in the final enterprise value of a company, thus it is important to carefully determinate the terminal growth rate for the analysis. For the calculation, the stable growth model is used the most often, which assumes that the cashflows of the company are going to grow at a stable rate forever. It is calculated using the formula below. At the same time, the discount rate is also utilized in the formula and even small changes can make a large impact, it just proves once again that even though discounted cash flow model is used often, and it requires a lot of analysis but is also effective, it is important to be very diligent and careful when exercising it.

$$TV = FCFE \times (1 - g) / (r - g)$$

Where:

FCFF – free cash flow to firm;

g – stable growth rate after forecasted period;

r – discount rate.

2.2. Data collection methodology

2.2.1. Industry and companies' selection criteria

As it was already discussed in paragraph 1.2.3 of this research, the whole stock market was impacted greatly as the indices plummeted on COVID news, however the sectors were not impacted the same way. Industries and a company from each of them will be chosen that experienced positive, negative, and neutral or less significant impact of the COVID-19 pandemic.

As already mentioned, (Chowdhury, Khan, et al., 2022) indicated that the whole travel industry suffered the most. To support the research, another source by the European Commission was reviewed. Regarding (European Commission, 2021), “The COVID-19 pandemic has resulted in the largest and most abrupt peacetime drop in economic activity in modern history. The impact has varied dramatically across sectors of the economy. In particular high-contact services such as tourism have suffered acutely, while those that facilitate noncontact activities, like ICT support or delivery of services, were barely affected.”. Another research by (Nayak et al., 2022) indicates that the most impacted sector was the Travel, Tourism, and Transport sector (hereinafter – TTT), while the least impacted, from the analyzed sectors, was consumer electronics, since the demand grew when lockdowns and quarantine was introduced, together with the Information and Communications Technology sector (hereinafter – ICT).

So, by now it is safe to say that according to the literature sources, the most negatively impacted sector is TTT, and the most positively impacted was the ICT sector. However, for the neutral sector there is a mix of different choices, sources mention consumer staples, utilities, manufacturing, agriculture. For the final source, according to (Szczygielski et al., 2022), the smallest variance was recorded in consumer staples and telecommunications, thus consumer staples sector seems to be the one which was impacted the least, since it is a sector that has a trait of defensibility, as people will always need some essential products through any uncertainties, financial or health crises.

For the analysis, companies are going to be chosen on their relevance and significance in the economy, which basically means that industry leader companies that are publicly listed in one of the US stock exchanges are going to be chosen. Another criterion for the selection is data availability, prioritizing industries and companies that have comprehensive and updated data available for public use. Guided by that, the analysis should be the most up to date and relevant to make conclusions from. Financial databases such as Yahoo Finance, and industry reports are going to be used for additional

data which is going to be necessary. All of this will be used in one of the public stock market sourcing websites, above indicated sectors will be chosen, companies are going to be filtered by market capitalization and some additional research will be done to find out the most influential company out of each sector for the economy.

2.2.2. Data collection for the Discounted Cashflow Analysis

As shown in the previous paragraphs, there are many different moving parts for the calculations of Discounted Cash Flow analysis and each of them can impact the result significantly. As the first step, free cashflows for firm (FCFF) are calculated which requires financial data of the company and clear steps of how and where from to gather such data are needed, since it will ensure the reliability and accuracy of the method by using trusted and approved sources.

For the financial statements, as mentioned, Yahoo! Finance database is going to be used as it is a well-known and accepted website to gather financial information of publicly listed companies. As alternatives, such companies' websites might be used as well since all of them are required to have an investors' relations page section where the financial reporting and filings are published. Another alternative, which is the most sophisticated is going straight to Securities and Exchange Commission's (SEC) website and access the Electronic Data Gathering Analysis and Retrieval (EDGAR) database for companies listed on the United States' stock exchanges. For the analysis, historical data of three to five years, depending on availability, of financial statements will be retrieved to indicate trends and patterns and create a robust basis for forecasting. For this, historical revenues' growth rates are going to be identified, normalized by averaging or taking a median of the results to get rid of any outliers. A similar approach will be applied for costs of the company to arrive at Earnings Before Interest and Taxes (EBIT) but in some cases historical margins are going to be used, such as Cost of Goods Sold margin, to forecast it ahead. In addition to revenue and future growth forecasting, market analysis will be carried out as it provides insights of the specific market growth in the future, thus the projected growth rate will be combined with the rate calculated from the financial information of the company. To fully cover the inputs of FCFF, effective tax rates are going to be retrieved from each company's SEC filings to arrive at the corporate income tax rate in the US for each company to better reflect the actual cashflow situations. Depreciation and Amortization data can be easily found in the income statement of a company, while Capital Expenditures (Capex) and change in Net Working Capital (NWC) require digging into the company's balance sheet and cashflow statement. Capex forecast can be determined by looking at the historical pattern of spending of the company and by understanding its investment cycle, what is more, there might be some

information of future investment or strategic initiatives indicated in companies' reports, such as quarterly filings.

For the calculation of discount rate, several different sources, such as research papers, academic papers are going to be used, for example for the risk-free rate official US websites will be utilized to find out the current yield of a long-term governmental bonds, industries' betas and market risk premiums are going to be retrieved from separate research papers, such as from professors like A. Damodaran and other sources. The cost of debt is usually found in the companies' reports by seeing the current interest rate being paid for outstanding loans. Equity and debt balances are retrieved from balance sheet of companies, and terminal growth rate for the use of perpetuity growth model is going to be estimated using the historical patterns and market analysis and industry reports.

2.2.3. Methodology of applying the DCF Analysis and results interpretation

In this section the methodology of applying Discounted Cash Flow valuation analysis and comparison of the results is detailed. The approach incorporates running two DCF valuations for each chosen company from different sectors with different timelines. The timelines have very different characteristics with two separate scenarios: the pre-COVID and the post-COVID scenario. By comparing these two timelines and values of the companies, the aim is to spot if there were any considerable implications of the pandemic on the chosen industries and provide the results in a concise table to better understand the financial impact of the pandemic.

The pre-COVID scenario is going to serve as a baseline for the comparison under normal circumstances before any events related to COVID happened, or in other words, the projections of the companies' financials are going to be performed as no COVID is to be seen in any foreseeable future. For this approach, the cashflows are going to be forecasted based on the publicly available financial data and market reports from 2019 and historical data before that. The patterns and previous growth will be used to identify growth rates for the future, spot the historical margins for operating and other expenses to project them into the future under normal conditions. The weighted average cost of capital will also be calculated for the end of 2019 based on the pre-pandemic conditions of the market, including the market risk-premium, risk-free rate, betas, and other relevant inputs for the analysis.

The post-COVID scenario includes all the implications raised by the pandemic, including all the infections, boarder closures, quarantine measures, stimulus packages, etc., and how the companies were impacted by that. As mentioned in the paragraph 1.4, the COVID period had a lot of different measures and rules applied, starting from the period when the World Health Organization declared the outbreak as a global emergency, until the end of 2023 when the daily COVID cases became less

noticeable. During this period the world experienced global panic, travel bans, lockdowns, businesses stopped their operations, had to shut down their offices and to get use to new business practices. In parallel, the US government lowered interest rates to 0% and started issuing stimulus and rescue packages. For long time, unemployment was high, inflation was low, interest rates stood at 0%, increasing the participation in the economy, however not for too long as the inflation started growing. The government had to hike the interest rates, companies' performances became worse, however not for all of them as some sectors, on the other hand, took advantage of the situation. With higher costs and inflation the margins lowered and stocks became less attractive because of higher yields of bonds, dumping the investors' confidence. There is no doubt that all these events in such a short period of time must have had some implications, that are still hard to quantify, however this thesis is prepared to do just that. For this period, the calculations are going to incorporate actual data for the years 2020-2022 to reflect the realistic data what actually happened and how the financials of the chosen companies from different sectors were impacted post-factum and the remaining period will be projected to complete the forecast of five years. For this, historical 2020-2022 financial statements from public databases will be retrieved, including income statements, balance sheets, and cashflow statements with some up-to-date sectors' growth information of recent market reports and analyses to adjust projected growth rates by reflecting current economic environment and recovery. Likewise, the weighted average cost of capital is going to be taken for the end of 2022 to reflect the post-COVID market situation.

The final step is the comparison of the results from these two scenarios to understand the impact of the COVID-19 pandemic on the companies' valuations and stock prices. This can be split in several parts, namely the valuation comparison, which shows the expected enterprise values and stock prices of three different companies in three different sectors under normal conditions, based on the forecasts with patterns and averages retrieved from financials up to the year 2019 versus the results we arrived at after the valuation reflecting the actual performance of the company during the COVID period and adjusted projections into the future due to the pandemic. The second part is the assessment of the impact, where the change in valuation between pre-COVID and post-COVID scenarios for three different companies is calculated in the form of percentage change. This will highlight the effect of the pandemic and the significance of it on different sector-representing companies. The last part is going to include the table of results and interpretation, discussing the potential reasons behind such impacts and changes in valuations. The table will include the name of the company, its sector, pre-COVID and post-COVID valuations and the change in it represented in percentage.

To finally decide what was the impact of the Coronavirus pandemic on the value and stock prices of publicly listed companies, a more sophisticated analysis and calculations are going to be carried out in the following section.

3. EMPYRICAL ANALYSIS

3.1. Selection of Sectors and Target Companies

The pandemic undoubtedly had a large impact on the economy as whole, however, as indicated in the literature review, not all sectors were impacted the same. The effects on sectors varied broadly, from rapid downturns, panic, bankruptcies to growth and grasping benefits from the situation of limitation on physical contact and quarantine. It is important now to look back at the period of the pandemic and indicate how different sectors were impacted. As the gathered literature states, the largest hit was taken by the Travel, Tourism, and Transport sector, which is no surprise, as the countries' borders were closed, tourism was shut down, thus travelling was halted, airlines stopped operating, tourism was almost non-existent at some peak COVID points, thus hotels, respectively, had to shut down as well. Airlines, being companies heavily relied on debt capital, had to completely stop operations and its main revenue source – flights. Thus, it is concluded in this thesis, that exactly this sector was hit the hardest. On the other hand, such closures created an opportunity and precedent for digital or information technologies to use the situation for better. Information and Communications Technology sector faced a significant growth, first, remote work, schooling increased the demand for software and hardware needed for this, digital communications were also the main source to have remote classes or meetings, even more increasing the demand for different appliances. As some sectors had lows and highs, there were several sectors who were not impacted as much in general, and one of them, which is being used for this work, is the Consumer Staples sector which reaction can be seen as more stable or less volatile during this period. This is usually the case during other crises as well, since the consumer staples sector is represented by companies that sell essential goods on which demand is not really impacted by any turmoil, since the products are ones, that people will need at any time.

As indicated in the previous sections, the criteria for the companies to be chosen that represent each of these three sectors is the economic significance and relevance in the economy in general, influence. Besides that, other important factor is the availability of data to run the regression analysis. The companies are one of the leaders based on the economic activity and market capitalization in their sectors and has a very significant impact on market trends, ensuring that the analysis is reliable and reflective of market dynamics, providing substantial insights for stakeholders.

Applying this reasoning, the company to represent the Information and Communications Technology is chosen to be Apple Inc. (AAPL). It is the industry's leader and one of the strongest brands in the world with a range of different products and services. It is a pivotal player in the sector and often drives technological trends and innovation. Apple has a global reach with a very strong financial performance and is a great candidate to reflect the changes of the sector. At the time of

writing, the total revenues of AAPL are almost reaching 400 billion US dollars and the company has a market capitalization of almost 3.5 trillion US dollars, being the largest company in the world now. The company chosen for Travel, Tourism, and Travelling is Delta Airlines. It is one of the largest global airlines and an industry leader, an American company operating domestic and international flights, making it a right company for the study. The revenues of the company is reaching roughly 60 billion US dollars and the company has a market capitalization of almost 31 billion dollars, being the largest airline company in the US by this metric. Lastly, for the consumer staples sector Procter & Gamble was chosen. It is a leading consumer goods manufacturer, having a range of essential products in daily life, such as care products like baby care, skin and personal care, to household care and others. The sales of the company reach more than 80 billion US dollars, while the market capitalization of Procter & Gamble is more than 400 billion US dollars.

3.2. Regression analysis of sector-specific responses to COVID-19

For the regression analysis the Ordinary Least Squares (OLS) method is going to be used. The data for dependent and independent values was collected for the US and has daily values. The independent values, as presented in the methodological part, includes four different measures, including firstly the number of daily COVID-19 cases in the US, second one is the stringency index which is a measure which depicts several different pandemic response indicators, such as school closures, travel bans, workplace closures and has a value from 0 to 100, the closer it is to 100, the more measures are applied to fight the pandemic. Third one is the inflation rate in the US, and the last one is interest rates in the US, all of the measures have daily values. For the dependent variables three chosen stocks representing three different sectors were taken and the daily stock prices were extracted, namely for Apple (AAPL), Delta Airlines (DAL), and Procter & Gamble (PG). Three different regression analyses will be ran for each stock to see what was the impact of the independent variables on them. The data was collected for the period from 2020.01.01 until 2022.12.31, simply said, when the COVID-19 pandemic started and when it ends. From 2023 there were and still are some cases present, however it is considered that the pandemic basically ended at the end of 2022, thus this period is going to be used.

First, the coefficients are going to be extracted and interpreted. Coefficients show the expected change in the dependent value created by each independent value from a one-unit change in it. For example, a 0.5752 coefficient in AAPL stock for the stringency index variable shows that a one unit increase in stringency index results in 0.5752 units increase in the stock price of AAPL, thus we could conclude that the more serious the pandemic got, the more it had a positive impact on the stock. Simply said, the coefficients show the direction and size of the relationship between

independent and dependent variables, either creating a direct (positive) or inverse (negative). Please see the table below indicating the results.

Table 3. Coefficient values

Variable	AAPL	DAL	PG
Stringency Index	0.575	-0.405	0.062
COVID Cases	0.00003	0.00001	0.00003
Interest Rate	-0.544	-4.586	-1.785
Inflation Rate	10.439	-0.766	3.282

Source: data calculated by the author based on information retrieved from the (*Yahoo! Finance*, n.d.), (*Our World in Data*, n.d.), and (*Federal Reserve Economic Data*, n.d.) databases.

Is it seen, that COVID cases had a very low impact on stock prices during the period, which can sound rather surprising at first, but as the pandemic stretched for two years straight, people started getting used to it and other measures, such as government responses, news about such things as boarder closures, school closures, and similar resulted in more volatility. This is also shown in the results above, as stringency index had a larger positive impact on Apple stock, larger negative impact on Delta Airlines, and not as big of an impact of PG. Interest rates had a negative impact on stock prices, which makes sense as increased borrowing costs make companies worse off. Delta Airlines seems to be suffering the most from it, from economic standpoint it could be explained as airlines usually have high levels of debt because its business model is comparably very capital intensive, thus high borrowing costs can reduce profitability significantly, which also applies for future expansion of fleets. Lastly, the inflation rate has the largest positive impact on Apple stock. Apple as a company is one of the most popular smartphones and other gadgets producers in the world with a high brand loyalty and many happy customers. It could be explained of high pricing power the brand has passing increased costs from inflation on the products and not making a high negative impact on demand, thus increasing sales, accordingly, share price as well. Also, fast-growing tech companies can be more resilient to inflation as they can expand and innovate rather fast keeping the margins healthy.

Secondly, p-values are going to be presented as it's another important measure that checks the hypothesis if a coefficient is different from zero. If a p-value is lower than 0.05, it suggests that the null hypothesis can be rejected, and the coefficient statistically differs from zero. On the other hand, when p-value is relatively high, it shows that a change in dependent value is not really related with the change in independent variable. The null hypothesis for this analysis is that the independent variables have no impact on the stock price of each different stock that is analyzed.

Table 4. p-values

Variable	AAPL	DAL	PG
Intercept	<0.001	<0.001	<0.001
Stringency Index	<0.001	<0.001	<0.001
COVID Cases	<0.001	0.002	<0.001
Interest Rate	0.279	<0.001	<0.001
Inflation Rate	<0.001	<0.001	<0.001

Source: data calculated by the author based on information retrieved from the (*Yahoo! Finance*, n.d.), (*Our World in Data*, n.d.), and (*Federal Reserve Economic Data*, n.d.) databases.

As it is seen, all the p-values are less than 0.05, indicating that there is strong evidence that all the independent variables have impacts on these stock prices, except for AAPL for the interest rate effect is 0.279 on the stock. It means that this independent variable is not statistically significant and any changes in interest rate do not have a significant impact on the stock's price or that the interest rate did not play an important role in moving the stock's price.

R-squared is also called the coefficient of determination and it simply shows whether and how effective the independent variables are explaining the dependent variable's variation. It has a measure from 0 to 1, the closer it is to 1, the better the model explains the variability of the response data around its mean. For example, in the case of this analysis, R squared can provide insights of how much of the stock price movements are being explained by variation in independent variables, such as COVID-19 cases, thus the higher it is, the more independent variable contributes to the variation of the stock's price. For AAPL stock, the R squared number is 0.799, which means that almost 80% of the variance in Apple's is explained by the model. AAPL has the strongest R squared result, while DAL and PG have measures of 0.400 and 0.625, respectively. For Delta Airlines it means that it has a moderate fit while for PG the model fits better. Please see the results illustrated below.

Table 5. R-squared values

	R-squared
AAPL	0.799
DAL	0.400
PG	0.625

Source: data calculated by the author based on information retrieved from the (*Yahoo! Finance*, n.d.), (*Our World in Data*, n.d.), and (*Federal Reserve Economic Data*, n.d.) databases.

To make the model more reliable, diagnostic tests for autocorrelation, multicollinearity, and homoscedasticity were run. For multicollinearity Variance Inflation Factor (VIF) was retrieved, Durbin-Watson test for autocorrelation, and Breusch-Pagan test for homoscedasticity were prepared. First, after running the models, there was a problem indicated of autocorrelation and homoscedasticity in the residuals, which could distort the p-values. The Breusch-Pagan test indicated the BP statistic of 66.96 for AAPL, 221.53 for DAL, and 129.19 for PG with P-values being lower than 0.001, thus suggesting heteroscedasticity. Also, after running the Durbin-Watson test, which has a score range between 0 and 4, where the closer the result is to 2, the better, findings were 0.074 for AAPL, 0.033 for DAL, and 0.11 for PG, showing a strong autocorrelation. To potentially fix the issue, Newey-West standard errors test was applied, and the new p-values were taken, please find them in the table below.

Table 6. p-values after Newey-West standard errors test

Variable	AAPL	DAL	PG
Intercept	<0.001	<0.001	<0.001
Stringency Index	<0.001	<0.001	<0.001
COVID Cases	<0.001	0.002	<0.001
Interest Rate	0.218	<0.001	<0.001
Inflation Rate	<0.001	<0.001	<0.001

Source: data calculated by the author based on information retrieved from the (*Yahoo! Finance*, n.d.), (*Our World in Data*, n.d.), and (*Federal Reserve Economic Data*, n.d.) databases.

As it is seen, the p-value of AAPL for interest rate has improved from 0.279 to 0.218, which made the model more robust, however even after running the test, the value remained well above the significance threshold, thus even though the issue was improved, it shows that the relation between AAPL stock and the interest rates was not significant. For VIF the scores for independent variables, namely Stringency, Cases, Interest rate, and Inflation rate were 2.544, 1.134, 1.853, and 1.800, respectively, which all fall below the threshold of 5, indicating that there are no concerns of multicollinearity.

All the independent variables used in this model were changing between 2020 and end of 2022 because of different reasons and factors created by the COVID-19 pandemic and the crisis it started, thus representing the overall impact on these stocks, representing three different sectors, created by the pandemic. According to the regression analysis, AAPL stock representing the ICT sector benefited from the situation during the pandemic through increased inflation rates that made

the consumer spending go up during the quarantine and increased work from home measures, as well as COVID cases had a slight positive impact and stringency index showed that the more serious measures are imposed, the more it benefited the sector, however there was a lack of significance in the impact of interest rates on the stock. The ICT sector signaled resilience and growth because of the shift towards technologies and digital services. Next, DAL stock, representing the TTT sector, had a different scenario. Stringency index had a negative impact due to measures placed on travelling, flights, boarder closures, and so on. COVID cases almost had no impact, as mentioned before, the cases were very volatile each day, thus people started normalizing them and the largest factors impacting stocks overall were the broader measures applied. An even bigger negative impact had the increase of interest rates, most likely because the TTT sector usually has large amounts of debts, thus increasing the financing costs and hurting the margins. The inflation rate also had a negative impact on the sector, hurting the consumer travel spending as well. The TTT sector suffered a negative impact during the period due to travel restrictions, closures, and more difficult economic positions. Finally, the consumer staples sector, represented by PG stock, compared to the previous two sectors, held a more stable position and even demonstrated some growth potential, even though it got hurt by the interest rates, like the TTT sector. On the other hand, inflation rates had a positive impact, possibly because essential products, even though more expensive because of inflation, do not lose demand as much as other sectors. COVID cases and stringency index had a very slight positive impact, thus making the sector relatively resilient with a lower impact.

In short, based on the regression analysis, COVID-19 period had a positive impact on the AAPL stock, thus ICT sector, negative impact on DAL stock, thus TTT sector, and a low positive impact on PG stock, thus consumer staples sector.

3.3. Discounted Cash Flow analysis

3.3.1. Inputs for the DCF Analysis, WACC calculations

The inputs and their exact values used for the Discounted Cashflow analysis are discussed, in some cases they were the same for each company pre-pandemic (valuation date is December 31, 2019) and post-pandemic (valuation date is December 31, 2022), however most of them differ.

Risk-free rate (Rf)

For the pre-pandemic and post-pandemic periods the United States 10-Year Bond yield is taken for December 31, 2019 (1.92%), and December 31, 2022 (3.88%), respectively from (*Investing.Com*, n.d.). The same rate is applied for all companies.

Equity risk premium (Rm)

For the pre-pandemic and post-pandemic periods the total equity risk premium provided by (Damodaran A, n.d.) is taken for the end of 2019 (5.20%), and the end of 2022 (5.94%), respectively. The country risk premium for the US is 0%, thus not applied. The same rate is applied for all companies.

Beta

For beta coefficient different approaches were applied for companies, it depends on the revenue streams the companies generate and to which industry it should be assigned. In AAPL case, the company generates revenue selling products and services. For products, the Electronics industry and for services the Information Services industries are assigned to get the unlevered betas using the database provided by (Damodaran A, n.d.). The beta coefficient for Electronics was 1.01 and 1.05 and for Information Services was 1 and 1.28 for pre- and post-pandemic, respectively. The weighted average beta is calculated using the proportional sales revenue that the company generates from products and services to arrive at unlevered betas of 1.01 and 1.10 for the periods. For DAL no weighted average is calculated since almost all revenue comes from Passenger and Cargo revenue streams which are assigned to the Air transport industry, the unlevered betas are 0.81 and 0.59, respectively. Finally, for PG also one industry is assigned of Household products for which the unlevered beta was 0.91 and 1.03 for the respective periods.

Cost of equity (CAPM)

Having all the inputs above, the cost of equity can be calculated using the Capital Asset Pricing Model method. Respectively, for the periods of pre-pandemic and post-pandemic, the cost of equities is 8.55% and 10.64% for AAPL, 6.97% and 9.13% for DAL, and 6.14% and 7.17% for PG.

Cost of debt (Rd)

Different approaches were also applied to calculate the cost of debt. Cost of debt, as it sounds, is usually calculated as the weighted average interest rate for the debt liabilities a company has, however when there are many, it gets hard to calculate or get detailed information for. For AAPL, the total debt was divided by the total interest rate expense, which were taken from its financial statements to arrive at a rough interest rate the company pays, which was 3.31% and 2.44% for the respective periods. The after-tax interest rate stood at 2.78% and 2.05%, respectively. For DAL the total debt, according to its 2019 annual report stood at 9.991 billion USD. 55% of debt had an interest rate from 2.6% to 4.38%, 17% had it from 3.2% to 8.02%, the rest mostly varied from 1.99% to 6%. The last promissory notes of 1.5 billion USD in 2019 were issued for a weighted average interest rate of 3.24%. To stay a bit conservative and taking the ranges of interest rates into consideration, 3.5% interest rate is taken for DAL for the pre-pandemic period (after-tax stood at 2.69%). To calculate interest rate, delta airlines only account for interest expense shown in income statement for debt and financial leases, which made around 11 billion US dollars at the end of 2019, thus for this reason

interest rate is derived from this amount. For the post-pandemic period the same method as for AAPL was applied, arriving at a rough interest rate of 4.47% (after-tax 3.07%). PG in its annual reports for 2019 and 2022 stated their short-term and long-term debts with respective weighted average interest rates for each. Having this information, a blended weighted average interest rate was calculated to arrive at 1.79% and 1.82% for the respective periods, while after-tax stood at 1.17% and 1.49%, respectively.

Tax rate

To reflect the actual cashflows as accurately as possible, an effective tax rate is used, to show what the company actually pays, accounting for any tax credits, deductions, and other factors, rather than using the fixed corporate rates. On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act (Garnett Allie Grace, 2024), which lowered the statutory federal income tax rate from 35% to 21% from 2018. The effective tax rates were different for the companies analyzed. AAPL applied a blended tax rate of 24.5% for 2017. For forecasting purposes, knowing that in 2018 it was reduced from 35% to 21% and for 2018 AAPL tax rate was 18.3% and for 2019 it was 15.9%, the rate was taken only from 2019 for pre-pandemic forecasting until 2024 to reflect the most up to date value. For post-pandemic, the effective tax rate was still a bit volatile, thus, to be more conservative, the average of last 4 years (2019-2022) will be taken which arrives at 14.95%, for the sake of simplicity and being conservative, 15% will be used for 2023-2024 forecast. For DAL, same as for AAPL, the last year's (2019) effective tax rate of 23.1% is taken for pre-pandemic, because in the past years there were changes in the US tax law. For post-pandemic the rate increased to 29.8% and 31.2% in 2021 and 2022, respectively because of the company's mark-to-market adjustments on equity investments which are considered capital assets for tax purposes. The company expects the tax rate to be between 23-26% in 2023, taking into consideration it was around 23% pre-pandemic, but it was high in 2022, 26% is taken for the post-pandemic forecast. For PG pre-pandemic the average effective tax rate for 2016-2018 is taken, since in 2019 it grew significantly and derived drastically from its previous years. Even though the tax law was altered, and the rate was lowered, PG's effective tax rate did the opposite, thus it is expected to decrease in the future. For post-pandemic, in 2020 tax rate was reduced by 17.5% compared to 2019 (it reached 17.2%) because of impairment charges in 2019. It stayed at 18.5% and 17.8% in 2021-2022, respectively, thus the average of three years is taken for forecast, arriving at 17.8%.

Discount rate (WACC)

Finally, to arrive at the discount rates applied for the periods for each company, all the inputs discussed above are used. Additionally, each company's Equity and Debt ratios are employed to get the final discount rate.

Table 7. WACC and its inputs values for each company

AAPL pre-pandemic		AAPL post-pandemic		DAL pre-pandemic		DAL post-pandemic		PG pre-pandemic		PG post-pandemic	
E	90,488	E	50,672	E	15,358	E	6,582	E	47,579	E	46,854
D	108,047	D	120,069	D	17,991	D	31,710	D	30,092	D	31,493
E+D	198535	E+D	170741	E+D	33349	E+D	38292	E+D	77671	E+D	78347
E/(E+D)	46%	E/(E+D)	30%	E/(E+D)	46%	E/(E+D)	17%	E/(E+D)	61%	E/(E+D)	60%
D/(E+D)	54%	D/(E+D)	70%	D/(E+D)	54%	D/(E+D)	83%	D/(E+D)	39%	D/(E+D)	40%
Rd	2.78%	Rd	2.05%	Rd	2.69%	Rd	3.07%	Rd	1.17%	Rd	1.49%
Re (CAPM)	8.55%	Re (CAPM)	10.64%	Re (CAPM)	6.97%	Re (CAPM)	9.13%	Re (CAPM)	6.14%	Re (CAPM)	7.17%
Rf	1.92%	Rf	3.88%	Rf	1.92%	Rf	3.88%	Rf	1.92%	Rf	3.88%
B	2.02	B	3.28	B	1.54	B	2.55	B	1.29	B	1.60
(Rm-Rf)	3.28%	(Rm-Rf)	2.06%	(Rm-Rf)	3.28%	(Rm-Rf)	2.06%	(Rm-Rf)	3.28%	(Rm-Rf)	2.06%
Country risk premium	0.00%	Country risk premium	0.00%	Country risk premium	0.00%	Country risk premium	0.00%	Country risk premium	0.00%	Country risk premium	0.00%
WACC	5.41%	WACC	4.60%	WACC	4.66%	WACC	4.11%	WACC	4.21%	WACC	4.89%

Source: data calculated by the author based on information retrieved from the (*U.S. Securities and Exchange Commission*, n.d.) website.

Please refer to the table above for the summary of calculations and the final values of discount rates, which for the periods of pre-pandemic and post-pandemic are 5.41% and 4.60% for AAPL, 4.66% and 4.11% for DAL, and 4.21% and 4.89% for PG.

3.3.2. Financial forecasts for pre-COVID and post-COVID periods

For the forecasting of revenues, historical financial data was retrieved from each company's investor relations pages as a primary and reliable source of such statements that the companies must upload regarding the requirements of the Securities and Exchange Commission (SEC). The financial data was taken for years 2017-2019 for the first scenario to reflect the trends and patterns of financials and growth before any impact potentially created by the pandemic and years 2020-2022 to reflect the impact, if any, of the pandemic on the growth, margins, and other important metrics that are going to be used for the forecasts to reflect the after-pandemic trends.

As it was already mentioned, Apple Inc. stock AAPL was chosen for the analysis of the potentially positively impacted sector, Delta Airlines (DAL) for potentially negatively impacted, and Procter & Gamble (PG) for potentially stable one. For the pre-COVID valuation scenario, four years of historical data (2016-2019) was taken from companies' SEC filings pages to reflect the financial data, including their income statements, balance sheets, and cash flow statements to forecast relevant financial data until year 2024, while for the post-COVID scenario, the historical financial data for 2020-2022 was taken and 2023-2024 years were forecasted, in which case 2020-2024 data was incorporated in the DCF calculations.

Pre-Covid and post-Covid calculations for Apple Inc. (AAPL)

Forecasting revenue is the first step. Apple has two categories making up the total net sales, namely products (hardware), including iPhones, iPads, MacBooks, wearables, and so on. The second category is services, including advertising, AppleCare, cloud services, digital content, payment services, such as Apple Card, Apple Pay. For the hardware part the management sees a growth in

accessories and wearables, such as AirPods, Apple Watch. The flagship product for the company continues to be iPhone taking the biggest portion of the sales, however in 2019 the company saw a 5.3% decrease in product sales with the tense competition and pressure on pricing and margins, while in 2018 it grew almost 15%. Since the latest historical year available had negative growth, the hardware forecast will be more modest, taking the average revenue growth of the last two years and accounting for the negative year. For this, 60% weight is given for the 2018 year's growth and 40% to the 2019 year's negative growth and onwards the average of two last years is taken. The total growth for 2020-2024 on average is around 6% with the forecasted revenue of 1.28 trillion US dollars. For the services side, 2018 and 2019 saw a nice growth of 21.5% and 16.5%, respectively. Apple has a vision of diversifying revenues from hardware, since it still makes most of its total net sales. Services are set to take a larger chunk of the revenues in the future, as the management sees it. Thus, sustained revenue growth is projected for the services part. The rolling 2-year average growth for 2018-2019 is taken arriving at the average growth of 18.3%. Adding up the forecasted revenues for products and services, the total net sales grow from 284 billion USD in 2020 to 394 billion USD in 2024, reaching an average growth of 8.66% for pre-pandemic. For post-pandemic as expected, people got used to working from home, boosting demand for products and services of Apple, in 2021 both increasing 35% and 27%, respectively compared with 2020. As it is seen now, the beginning of 2020 grew only 5.5% compared with 2019, while in 2022 sales grew almost 8%, however in dollar amount the jump was of around 30 billion USD, which reflects the expansion the company had during the period and sort of used the pandemic for better. Not taking the growth rate of 2021 fully into consideration and treating it as an outlier, the median is taken of 2020-2022 for products and services which is 6.32% and 16.15%, respectively, arriving at a total net sales growth of 8.27% for 2023 and 8.41% for 2024.

Delta Airlines splits its revenue into passenger, cargo, and other. Passenger revenue takes almost 90% of total sales. Passenger revenue grew on average almost at 8%, however slightly decreasing every year, for this reason a rolling 3-year average growth was taken. Since cargo revenue seemed not to be changing much, the average dollar amount was taken for the future years, ranging between 780-802 million US dollars a year for the forecast. Other revenue grew 10.8% and 4.2% in 2018 and 2019, however a -33.6% drop in 2017 was shown because of accounting adjustments made, since the company adopted different revenue recognition and retirement benefits standards, for this reason 2017 is not taken into consideration, thus the average of 7.46% is taken for the forecast of other revenue. Adding up the forecasted revenues for passenger, cargo, and other segments, it grows from 50.6 to 66.8 billion US dollars in 2020-2024, reaching an average growth rate of 7.27% for pre-pandemic. For post-pandemic the changes in revenues during the COVID period were outstanding. In 2020 the revenues of DAL dropped by 64% compared to 2019 reaching only 17 billion USD compared to 47 billion USD in 2019. In 2021-2022 it saw a 75% and 69% rebound, respectively and

in 2022 reaching 50.5 billion USD total sales, compared to 47 billion USD pre-pandemic sales in 2019, so it could be said that in 2 years DAL rebounded its sales and reached the previous points, thus it would be not logical to believe that the company will keep growing at 70% yearly. Taking into consideration that the business normalized in 2 years, the same growth rate forecasted for 2023-2024 in pre-pandemic scenario is taken to get rid of the massive outliers. Procter & Gamble is a mature company founded in 1837. Its yearly growth has slowed, however still shows a gradual increase in the past two years. Its net sales decreased overall from 84 billion USD in 2013 to 68 billion USD in 2019, where it dropped by 0.4% in 2017, jumped by 2.7% in 2018 and 1.3% in 2019. The rolling 3-year average is taken to forecast future growth. Post-pandemic the historical 2020-2022 growth was higher, sitting at an average of almost 6%, meeting increased demand of essential products. The rolling 3-year average growth is used again for the sales forecast arriving at 90 billion USD in 2024 for post-pandemic, compared to 73 billion USD in 2024 for pre-pandemic. Please see the final sales forecast for each company in the table below.

Table 8. Sales forecasts for each company

	PRE-PANDEMIC REVENUES (in millions)									CAGR	POST-PANDEMIC REVENUES (in millions)						CAGR
	2016	2017	2018	2019	2020	2021	2022	2023	2024		2020	2021	2022	2023	2024		
AAPL	215,639	229,234	265,595	260,174	283,581	305,878	332,631	361,380	394,098	8.58%	274,515	365,817	394,328	426,944	462,863	13.95%	
DAL	39,639	41,138	44,438	47,007	50,626	54,258	58,059	62,299	66,768	7.16%	17,095	29,899	50,582	54,276	58,170	35.82%	
PG	65299	65058	66832	67684	68503.55	69693.8	70674.9	71701.12	72799.88	1.53%	70950	76118	80187	84852.55	90070.41	6.15%	

Source: data calculated by the author based on information retrieved from the (*U.S. Securities and Exchange Commission*, n.d.) website.

COGS for AAPL is going to be derived from the forecast of historical gross profit margin, since companies usually keep their margins relatively stable and always have a goal in mind of growing them, however compared margins pre and post-pandemic is important to see how they changed. The gross profit margin for Apple Inc. for years 2016-2019 was relatively stable, ranging from 37.82% in 2019 to 39.08% in 2016. Even though it has been decreasing gradually, for forecasting purposes the average of these four years is taken for the first year and then for rolling 4 years for each year later. The average gross margin for 2020-2024 is predicted to be at around 38.3%. The percentage is then multiplied by each year's revenue to arrive at gross profit of 109 billion US dollars in 2020 and reaching 151 billion US dollars in 2024. However, for post-pandemic the COGS margin from revenues showed more stability than gross margin, thus COGS margin is multiplied by each year's revenue to arrive at forecasted COGS. For DAL and PG average COGS margin from revenues was also used to derive the forecasted amounts for both pre- and post-pandemic periods.

EBIT forecast was different for companies. For AAPL operating expenses, such as R&D and SG&A were forecasted separately to account for the trends in pre- and post-pandemic. For R&D the

average growth was taken, although 2018 had a higher growth of 23% compared to 2017. Apple is operating in a very competitive market with other countries or producers in Asia create a highly competitive scene, such as Huawei, Samsung. Thus, it is assumed that the investment in R&D will stay higher for the forecasted years until 2024, averaging more than 17% yearly increase in R&D Expenses. For post-pandemic R&D expenses were growing at an increasing pace as well, such trend is going to be used for the forecasted years, taking the 2020-2022 average growth. The growth of SG&A in 2016-2019 was primarily created by increase of headcount and marketing, as well as rising infrastructure-related expenses. However, for SG&A margin of total sales is calculated to see how much of sales the company allocated for such expenses both for pre- and post-pandemic. For the pre-pandemic years it ranges from 6.3% to 7%, and for post-pandemic it stayed relatively stable around 6-7%, thus the averages are taken. Like this forecasted yearly expenses were subtracted from gross profit to get EBIT for both periods. For DAL the EBIT margin for 2016-2019 was ranging from low 11.9% in 2018 to high 17.5% in 2016, however from this year the margin plummeted around 3% and in 2017 and 2019 was around 14-14.5%. The median of four years is taken to get 14.29% EBIT margin for the pre-pandemic period, arriving at operating revenue growing from 6.6 to 9.5 billion USD from 2019 to 2024. Now for 2020 the EBIT margin stood at -73% when the company had a 12.5 billion USD operating loss, compared to historical pre-pandemic 14.3% operating margin average. In 2021-2022 it started recovering and stood at 6.3% and 7.2%, respectively. In 2022 the margin increased by 0.93%, it should start gradually stabilizing after the pandemic hardships, thus the yearly 0.93% increase in margin is forecasted for 2023-2024, reaching 9.1% operating margin in 2024. PG's EBIT margin ranged between 20-21.2% in 2016-2018, however dropped to 8.1% in 2019. It was caused by a goodwill and indefinite lived intangibles impairment charge in 2019 of 8.3 billion USD who distorted the margins for the year. For this calculation the expenses are going to be treated as an outlier for 2019 and not going to be accounted, thus calculating the average EBIT margin for 2016-2018 for the forecasted years, applying the 20.6% margin and reaching 15 billion USD in 2024. For post-pandemic the forecasted margin stood at almost 23% because of increasing operating results for the company, reaching EBIT of 20.5 billion USD in 2024 post-pandemic forecast.

To forecast depreciation, there are several different methods, however the most used ones are the percentage of sales method, assuming that depreciation will grow, or decline based on the company's revenue, since historically depreciation tends to be closely correlated to moves in revenue. Another method could be calculating it as a percentage of capital expenditures, or investments in fixed assets, such as property, plant, and equipment, also taking an average of the margins for forecasts. In the case for AAPL, it was seen that depreciation in 2018 grew by 7.3% and 15.1% in 2019, thus creating a relatively high difference, but calculating the margin from revenues for 2017-2019 it is 4.43%, 4.11%, and 4.82%, respectively, which looks more stable, thus taking an average of

these could be a more accurate way to forecast depreciation for the company. For this reason, the average of 4.45% for depreciation increase is applied for the pre-pandemic period. However, for post-pandemic 2020-2022 the margin was dropping, but was stable in dollar amount. In 2020 compared to 2019 it decreased by 11% and by 1% in 2022, but grew in 2021 by 2.06%, thus this 2% growth is going to be used as depreciation typically grows with additional capital expenditures. For DAL and overall for capital intensive businesses depreciation tends to be closely related to revenue growth, for 2017-2019 depreciation margin from sales stayed between 5.24%-5.49% and showing relatively stable results, the 3-year average is taken for future years. For post-pandemic, same method was used, the average of 2021-2022 was taken, since 2020 was an outlier of 13%. For PG depreciation margin from sales was especially stable, thus the averages were used again to forecast depreciation expenses for both periods.

Since depreciation and capital expenditures are highly related, because capital expenditures drive depreciation, it makes sense to apply the same forecasting method for both. Since for AAPL depreciation to capex ratio did not show a relatively stable result, being at 82%, 82%, and 120% for 2017-2019, the capex to revenue margin is applied as well to forecast the investment into fixed assets. The capex margin from revenues was 5.43%, 5.01%, and 4.03% for 2017-2019, however it is assumed that the -21% drop in capital expenditures in 2019 is an outlier, thus the average for 2017 and 2018 is taken, arriving at a capex to revenue margin of 5.22% for pre-pandemic. For post-pandemic, the same method is applied and 2.80% margin is used. The same approach is used for DAL and PG, the capex margins from sales used for the pre- and post-pandemic forecasts being 10.5% and 11.5% for DAL and 5.2% and 4.0% for PG, respectively. Please refer to Appendices 3-4, Appendices 5-6, and Appendices 7-8 for the detailed income statement calculations for AAPL, DAL, and PG, respectively.

The last input to calculate free cash flows for firm is the changed in net working capital. The operating working capital, which is current assets subtracted by current liabilities excluding non-operating assets like cash and marketable securities and interest-bearing liabilities, was calculated for each company for both periods. To get the change in net working capital forecast historical data of 2018-2019 was used. The margins method was used for each company where current assets, such as inventories, receivables are divided by revenues for each year accordingly, while payables and other current liabilities amounts are divided by cost of goods sold. In this way the ratios are calculated for 2018-2020 for pre-pandemic and 2020-2022 for post-pandemic. Having the ratios, the average of them is taken for the following years and then multiplied by the respective component, either revenues or COGS. For example, to calculate the accounts receivable for AAPL for 2020, the receivable to sales ratio for 2017-2019 is calculated, the 3-year rolling average of these ratios are taken for forecasted years and then it is multiplied by already forecasted total revenues. Finally, previous year's

NWC was subtracted by the current year's NWC to arrive at the change in NWC which is going to be used for the FCFF calculation. The same method is applied for each company using their balance sheet current assets and current liabilities lines and amounts, accordingly. Please see Appendix 9 for calculations of each company's NWC and change in NWC.

Finally, having all the inputs forecasted, the free cash flows were calculated, please see the results in the table below for each company for pre-pandemic and post-pandemic periods.

Table 9. Pre- and post-pandemic FCFFs for each company

USD (millions)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
FCFF AAPL pre-pandemic	\$ 48,699	\$ 52,890	\$ 65,887	\$ 59,448	\$ 66,546	\$ 71,901	\$ 73,928
FCFF AAPL post-pandemic			\$ 72,127	\$ 93,476	\$ 108,584	\$ 104,296	\$ 107,304
FCFF DAL pre-pandemic	\$ 1,778	\$ 3,492	\$ 3,687	\$ 3,881	\$ 4,384	\$ 4,581	\$ 4,911
FCFF DAL post-pandemic			\$ (11,404)	\$ 3,726	\$ 790	\$ 2,542	\$ 1,568
FCFF PG pre-pandemic	\$ 10,051	\$ 4,844	\$ 8,517	\$ 10,572	\$ 10,687	\$ 10,206	\$ 10,748
FCFF PG post-pandemic			\$ 14,804	\$ 16,060	\$ 12,850	\$ 17,434	\$ 17,397

Source: data calculated by the author based on information retrieved from the (*U.S. Securities and Exchange Commission*, n.d.) website.

For summary, the FCFF for AAPL pre-pandemic forecast for 2020-2024 ranged between low 59.4 billion USD in 2021 and high 73.9 billion USD in 2024 and low 72.1 billion USD in 2020 and high 107.3 billion USD in 2024 for post-pandemic. For DAL pre-pandemic it was between low 3.7 billion USD in 2020 and growing each year to reach 4.9 billion USD in 2024, while for post-pandemic scenario it reached a negative 11.4 billion USD in 2020 and was volatile across the years, reaching a positive 790 million USD in 2022, 2.5 billion USD in 2023, and dropping to 1.6 billion USD in 2024. PG's FCFF resulted in a less volatile forecast, staying at a low 8.5 billion USD in 2020 and high 10.7 billion USD in 2024 for pre-pandemic and a low 12.8 billion USD in 2022 and a high 17.4 billion USD in 2023 for post-pandemic.

3.3.3. Applying the DCF valuations on the chosen companies

The valuation date for the analysis depends on the scenario to best reflect the potential impacts. For the pre-pandemic scenario the valuation date is December 31st, 2019, while for the post-pandemic scenario the valuation date is chosen to be December 31st, 2022. Even though there is no exact date when COVID-19 was considered finished, however 2022 was the year when the most transition happened, the cases did not reach as close as large numbers as before, most of the countries lifted all of the restrictions related to the pandemic and cases became more bearable, the worldwide image of COVID-19 has become less of a pandemic, but more of a virus. As it was mentioned in the COVID-19 in 2022 wrap-up by Johns Hopkins Bloomberg School of Public Health: "COVID became

less of a disruption in our lives, making it possible to resume pre-pandemic activities like travel, attending large events, and going to school in person and unmasked.“ (Jackie Powder, 2022).

Turning to the Discounted Cash Flow calculations, first the terminal growth rate is determined. There are several different methods, such as combining current revenue growth rates with market forecasted growth rates, however the rate must be a conservative one because of the assumption that the company is going to grow at this rate indefinitely. For each company the 5-year average US GDP growth is taken as a baseline. For 2015-2019, the average is 2.5%. For 2018-2022 there were some outliers in 2020 and 2021, when the US economy experienced a drop and a very quick recovery, however even with them, the 5-year average of 2018-2022 is 2.2% (*World Bank Group*, n.d.), close to the one during 2015-2019. Since AAPL has been growing at almost 6.5% pace during 2016-2019, the terminal growth rate was increased by additional 0.5% to account for it, but still staying conservative, as terminal growth rates are typically small. Overall, the 3% terminal growth rate is going to be used for both pre-COVID and post-COVID scenarios. DAL is a slower growing business than technology-driven AAPL and based on the global Air transportation market report compiled by (Vantage Market Research, n.d.) that forecasts the industry to grow revenues at 2.8% pace until 2028, to stay conservative, the terminal growth is kept at 2.5% for pre- and post-pandemic periods. Since PG has been growing at around 1.2% pace during 2016-2019, the terminal growth rate is decreased to 2% for both periods.

Net debt is another important metric which is subtracted from the enterprise value of the company after conducting the DCF analysis to arrive at the equity value from which, knowing the outstanding number of shares of the company, share price is calculated. Net debt is basically a value of total interest-bearing debt of the company less cash, which for Apple stood at 59.2 billion USD in 2019 and 96.4 billion USD in 2022. For DAL net debt was 15.0 and 28.4 billion USD, respectively and for PG it stood at 25.8 and 24.3 billion USD, respectively.

Finally, it is now possible to calculate the enterprise, equity values and stock prices for the pre-pandemic and the post-pandemic scenarios using free cashflows, discount rate presented by WACC, and terminal growth rate. Then the discounted cashflows are summed, terminal value is calculated on top to arrive at the enterprise value. Net debt is subtracted from that to get the equity value, and it is divided by the number of shares the company has outstanding to arrive at a share price.

For AAPL the pre-pandemic and post-pandemic enterprise value stood at 2.7 trillion USD and 5.9 trillion USD, respectively. The equity value was 2.6 and 5.8 trillion USD, and the corresponding share price was 571.98 USD (143.00 USD accounting to the stock split AAPL went through to be more comparable) and 356.43 USD (please see Appendices 8 and 9 for the calculations). The post-pandemic enterprise value of AAPL was 2.2 times (+118%) higher than before the pandemic,

thus it is clear that the company and its corresponding ICT sector had a strongly positive impact created by the COVID-19.

For DAL the enterprise value was 203.4 billion USD and 77.3 billion USD, respectively. The equity value reached 188.3 billion USD and 48.9 billion USD, and the corresponding share price was 288.88 USD and 74.98 USD (please see Appendices 10 and 11 for the calculations). The post-pandemic enterprise value of DAL was 2.6 times (-62%) lower than before the pandemic, this negative impact is even larger on the TTT sector than the positive impact AAPL representing the ICT sector had, thus the TTT seems to have a strong negative impact by the pandemic.

Finally, for PG the enterprise value reached 448.8 billion USD and 555.7 billion USD for the periods. The equity value was 422.9 billion USD and 531.4 billion USD, and the share prices were 169.02 USD and 222.38 USD, respectively (please see Appendices 12 and 13 for the calculations). Now for PG the valuation has seen a positive 1.2 times (+24%) impact created by the pandemic which shows that the Consumer staples industry and its essential products were positively impacted, however not to the magnitude as ICT and TTT sectors. Please see the table below for the summary representing all the companies, their corresponding industries and the impacts on them created by the pandemic.

Table 10. Valuations and pandemic impact summary

Company	Sector	Pre-COVID valuation	Post-COVID valuation	Change, %	Multiple
Delta Airlines	TTT	203,384	77,314	-62%	2.6
Apple Inc.	ICT	2,700,517	5,876,325	118%	2.2
Procter & Gamble	Consumer Staples	448,794	555,659	24%	1.2

Source: data calculated by the author based on information retrieved from the (*U.S. Securities and Exchange Commission*, n.d.) website.

Remembering the results and conclusions brought from performing the regression analysis, the pandemic period had a positive impact on the AAPL (ICT), negative impact on DAL (TTT), and a low positive impact on PG (Consumer staples). Comparing it to the summary provided above, it is seen that it matches very well and even the Consumer staples sector confirms the low positive impact the pandemic had on it.

CONCLUSIONS

1. According to the literature review, the initial COVID-19 pandemic impact on the economies, stock prices, company financial performances, and valuations seems to be negative, however, it can be mitigated by the intervention of governments' monetary and fiscal policies, dedicated to easing the financial burdens. It highlighted varying effects on different industries, some of them being impacted positively, such as Information and Communications Technology (ICT) sector, and some negatively, such as Travel, Tourism, and Transport (TTT).
2. After running research on methodology and valuation methods, regression analysis was performed using pandemic-related statistical historical data to measure the statistical impact of the pandemic on the sector-representing stocks and the discounted cash flow valuation method was run to either confirm or deny the initial findings and conclusions received from the literature review and regression analysis.
3. The empirical analysis showed significant differences in sectors responding to the pandemic. Based on the regression analysis, Apple, representing the Information and Communications Technology sector, saw a growth in its valuation. In contrast, Delta Airlines, from the Travel, Tourism, and Transport sector, suffered losses due to measures applied during pandemic, such as travel restrictions, while Procter & Gamble from the Consumer Staples sector stayed comparably stable, marking the resilience in essential goods during economic hardships. The Discounted Cash Flow analysis was performed for each company pre-pandemic and post-pandemic periods and confirmed the same pattern, where ICT was impacted positively by 2.2 times, TTT – negatively by 2.6 times, and Consumer staples saw a low positive impact of 1.2 times.

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APPENDICES

Appendix 1. AAPL pre-pandemic income statement forecasts

		ACTUALS				FORECAST				
INCOME STATEMENT	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Net sales:										
Products		196,534	225,847	213,883	228,491	241,018	255,856	270,745	286,957	
growth, %			14.91%	-5.30%	6.83%	5.48%	6.16%	5.82%	5.99%	
Services		32,700	39,748	46,291	55089.70	64859.46	76774.68	90634.47	107140.53	
growth, %			21.55%	16.46%	19.01%	17.73%	18.37%	18.05%	18.21%	
Total net sales	\$ 215,639	229,234	265,595	260,174	283,581	305,878	332,631	361,380	394,098	
growth, %		6.30%	15.86%	-2.04%	9.00%	7.86%	8.75%	8.64%	9.05%	
Cost of sales:										
Products		126,337	148,164	144,996						
Services		14,711	15,592	16,786						
Total cost of sales	131,376	141,048	163,756	161,782						
growth, %		7.36%	16.10%	-1.21%						
COGS margin, %	60.92%	61.53%	61.66%	62.18%	61.57%	61.74%	61.79%	61.82%	61.73%	
gross margin, %	39.08%	38.47%	38.34%	37.82%	38.43%	38.26%	38.21%	38.18%	38.27%	
Gross margin	84,263	88,186	101,839	98,392	108,971	117,043	127,109	137,977	150,826	
Operating expenses:										
Research and development	10,045	11,581	14,236	16,217	19035	22475	26174	30702	36006	
growth, %		15.29%	22.93%	13.92%	17.38%	18.07%	16.46%	17.30%	17.28%	
Selling, general and administrative	14,194	15,261	16,705	18,245	18,867	20,346	22,528	24,185	26,427	
SG&A margin, %		6.66%	6.29%	7.01%	6.65%	6.65%	6.77%	6.69%	6.71%	
Total operating expenses	24,239	26,842	30,941	34,462	37,902	42,822	48,701	54,888	62,433	
growth, %		10.74%	15.27%	11.38%	9.98%	12.98%	13.73%	12.70%	13.75%	
Operating income	60,024	61,344	70,898	63,930	71,069	74,221	78,408	83,089	88,393	
EBIT MARGIN, %	27.84%	26.76%	26.69%	24.57%	25.06%	24.26%	23.57%	22.99%	22.43%	
Other income/(expense), net	1,348	2,745	2,005	1,807						
Income before provision for income taxes	61,372	64,089	72,903	65,737						
Provision for income taxes	15,685	15,738	13,372	10,481						
Net income	\$ 45,687	\$ 48,351	\$ 59,531	\$ 55,256						
NET INCOME MARGIN, %	21.19%	21.09%	22.41%	21.24%						

Appendix 2. AAPL post-pandemic income statement forecasts

			ACTUALS				FORECAST				
(in millions, except per share data)	2016	2017	2018	2019	2020	2021	2022	2023	2024		
Operating Revenue:											
Passenger	33,777	\$ 36,947	\$ 39,755	\$ 42,277	\$ 45,565	\$ 48,864	\$ 52,343	\$ 56,205	\$ 60,278		
growth, %		9.39%	7.60%	6.34%	7.78%	7.24%	7.12%	7.38%	7.25%		
Cargo	668	\$ 744	\$ 865	\$ 753	\$ 787	\$ 802	\$ 781	\$ 790	\$ 791		
margin from total revenues, %	1.69%	11.38%	16.26%	-12.95%							
Other	5,194	\$ 3,447	\$ 3,818	\$ 3,977	\$ 4,274	\$ 4,593	\$ 4,936	\$ 5,304	\$ 5,700		
growth, %		-33.63%	10.76%	4.16%	7.46%	7.46%	7.46%	7.46%	7.46%		
Total operating revenue	39,639	\$ 41,138	\$ 44,438	\$ 47,007	\$ 50,626	\$ 54,258	\$ 58,059	\$ 62,299	\$ 66,768		
growth, %		3.78%	8.02%	5.78%	7.70%	7.17%	7.01%	7.30%	7.17%		
Operating Expense:											
Salaries and related costs	10,034	10,058	10,743	11,225							
Aircraft fuel and related taxes	5,133	6,756	9,020	8,519							
Regional carriers expense, excluding fuel	4,311	3,466	3,438	3,584							
Contracted services	1,991	2,108	2,175	2,641							
Depreciation and amortization	1,902	2,222	2,329	2,581							
Passenger commissions and other selling expenses	1,710	1,827	1,941	1,993							
Landing fees and other rents	1,490	1,501	1,662	1,762							
Aircraft maintenance materials and outside repairs	1,823	1,591	1,575	1,751							
Profit sharing	1,115	1,065	1,301	1,643							
Passenger service	907	1,123	1,178	1,251							
Ancillary businesses and refinery	0	1,495	1,695	1,245							
Aircraft rent	285	351	394	423							
Other	1,986	\$ 1,609	\$ 1,723	\$ 1,771							
Total operating expense	32,687	\$ 35,172	\$ 39,174	\$ 40,389							
COGS margin, %	68.0%	68.2%	70.5%	69.1%	69.0%	69.0%	69.0%	69.0%	69.0%		
growth, %		7.60%	11.38%	3.10%							
Operating Income	6,952	\$ 5,966	\$ 5,264	\$ 6,618	\$ 7,234.72	\$ 7,753.80	\$ 8,296.96	\$ 8,902.87	\$ 9,541.59		
EBIT MARGIN, %	17.54%	14.50%	11.85%	14.08%	14.29%	14.29%	14.29%	14.29%	14.29%		
Non-Operating Expense:											
Interest expense, net	(388)	\$ (396)	\$ (311)	\$ (301)							
Gain/(loss) on investments, net	0	\$ -	\$ 38	\$ 119							
Miscellaneous, net	72	\$ (70)	\$ 160	\$ (238)							
Total non-operating expense, net	(316)	\$ (466)	\$ (113)	\$ (420)							
Income Before Income Taxes	6,636	\$ 5,500	\$ 5,151	\$ 6,198							
Income Tax Provision	(2,263)	\$ (2,295)	\$ (1,216)	\$ (1,431)							
Net Income	\$ 4,373	\$ 3,205	\$ 3,935	\$ 4,767							
NET INCOME MARGIN, %	11.03%	7.79%	8.86%	10.14%							

Appendix 3. DAL pre-pandemic income statement forecast

	ACTUALS			FORECAST	
	2020	2021	2022	2023	2024
Net sales:					
Products	\$ 220,747	\$ 297,392	\$ 316,199	336,195	357,456
<i>growth, %</i>	3.21%	34.72%	6.32%	6.32%	6.32%
Services	53,768	68,425	78,129	90748.53	105406.38
<i>growth, %</i>	16.15%	27.26%	14.18%	16.15%	16.15%
Total net sales	274,515	365,817	394,328	426,944	462,863
<i>growth, %</i>	5.51%	33.26%	7.79%	8.27%	8.41%
Cost of sales:					
Products	151,286	192,266	201,471		
Services	18,273	20,715	22,075		
Total cost of sales	169,559	212,981	223,546		
<i>growth, %</i>	4.81%	25.61%	4.96%		
<i>COGS margin, %</i>	61.77%	58.22%	56.69%	58.89%	58.89%
<i>gross margin, %</i>	38.23%	41.78%	43.31%	41.11%	41.11%
Gross margin	104,956	152,836	170,782	175,506	190,271
Operating expenses:					
Research and development	18,752	21,914	26,251	30826.10715	36198.57841
<i>growth, %</i>	15.63%	16.86%	19.79%	17.43%	17.43%
Selling, general and administrative	19,916	21,973	25,094	27,930	30,279
<i>SG&A margin, %</i>	7.25%	6.01%	6.36%	6.54%	6.54%
Total operating expenses	38,668	43,887	51,345	58,756	66,478
<i>growth, %</i>	12.20%	13.50%	16.99%	14.43%	13.14%
Operating income	66,288	108,949	119,437	116,750	123,793
<i>EBIT MARGIN, %</i>	24.15%	29.78%	30.29%	27.35%	26.75%
Other income/(expense), net	803	258	(334)		
Income before provision for income taxes	67,091	109,207	119,103		
Provision for income taxes	9,680	14,527	19,300		
Net income	\$ 57,411	\$ 94,680	\$ 99,803		
<i>NET INCOME MARGIN, %</i>	20.91%	25.88%	25.31%		

Appendix 4. DAL post-pandemic income statement forecast

	ACTUALS			FORECAST	
(in millions, except per share data)	2020	2021	2022	2023	2024
Operating Revenue:					
Passenger	\$ 12,883	\$ 22,519	\$ 40,218		
growth, %	-69.53%	74.80%	78.60%		
Cargo	608	1,032	1,050		
growth, %	-19.26%	69.74%	1.74%		
Other	3,604	6,348	9,314		
growth, %	-9.38%	76.14%	46.72%		
Total operating revenue	17095	29899	50582	54275.87	58169.82
growth, %	-63.63%	74.90%	69.18%	7.30%	7.17%
Operating Expense:					
Salaries and related costs	9,001	9,728	11,902		
Aircraft fuel and related taxes	3,176	5,633	11,482		
Ancillary businesses and refinery	1,785	3,957	5,756		
Contracted services	1953	2420	3345		
Landing fees and other rents	1833	2019	2181		
Depreciation and amortization	2,312	1,998	2,107		
Regional carrier expense	1,584	1,736	2,051		
Aircraft maintenance materials and outside repairs	822	1,401	1,982		
Passenger commissions and other selling expenses	643	953	1891		
Passenger service	551	756	1,453		
Profit sharing	0	108	563		
Aircraft rent	399	430	508		
Restructuring charges	8,219	(19)	(124)		
Government grant recognition	\$ (3,946)	\$ (4,512)	\$ -		
COGS margin, %	123.3%	84.8%	70.3%	77.6%	73.9%
Other	1232	1405	1824		
Total operating expense	29564	28013	46921		
growth, %	-26.80%	-5.25%	67.50%		
Operating Income/(Loss)	-12469	1886	3661	4433.037	5291.971
EBIT MARGIN, %	-72.94%	6.31%	7.24%	8.17%	9.10%
Non-Operating Expense:					
Interest expense, net	\$ (929)	\$ (1,279)	\$ (1,029)		
Impairments and equity method results	(2,432)	(337)	(20)		
Gain/(loss) on investments, net	(105)	56	(783)		
Loss on extinguishment of debt	-8	-319	-100		
Pension and related benefit	219	451	292		
Miscellaneous, net	137	(60)	(107)		
Total non-operating expense, net	(3,118)	(1,488)	(1,747)		
Income/(Loss) Before Income Taxes	(15,587)	398	1,914		
Income Tax (Provision)/Benefit	3202	-118	-596		
Net Income/(Loss)	-12385	280	1318		
NET INCOME MARGIN, %	-72.45%	0.94%	2.61%		

Appendix 5. PG pre-pandemic income statement forecast

		ACTUALS				FORECAST				
Amounts in millions	2016	2017	2018	2019	2020	2021	2022	2023	2024	
NET SALES	65299	65058	66832	67684	68503.55	69693.8	70674.9	71701.12	72799.88	
growth, %		-0.37%	2.73%	1.27%	1.21%	1.74%	1.41%	1.45%	1.53%	
Cost of products sold	32909	\$ 32,638	\$ 34,432	\$ 34,768	34843.19	35529.76	36173.44	36638.22	37150.6	
COGS margin, %	50.4%	50.2%	51.5%	51.4%	50.9%	51.0%	51.2%	51.1%	51.0%	
Selling, general and administrative expense	18949	18,654	19,037	19,084						
growth, %		-1.56%	2.05%	0.25%						
Goodwill and indefinite lived intangibles impairment charges	0	0	0	8,345						
OPERATING INCOME	13441	13766	13363	5487	14097.64	14342.58	14544.49	14755.68	14981.8	
EBIT MARGIN, %	20.58%	21.16%	19.99%	8.11%	20.58%	20.58%	20.58%	20.58%	20.58%	
Interest expense	579	465	506	509						
Interest income	182	171	247	220						
Other non-operating income/(expense), net	325	(215)	222	871						
EARNINGS FROM CONTINUING OPERATIONS BEFORE INCOME TAX	13369	13,257	13,326	6,069						
Income taxes on continuing operations	3342	3,063	3,465	2,103						
NET EARNINGS FROM CONTINUING OPERATIONS	10027	10194	9861	3966						
NET EARNINGS FROM DISCONTINUED OPERATIONS	577	5217	0	0						
NET EARNINGS	10604	15,411	9,861	3,966						
Less: Net earnings attributable to noncontrolling interests	96	85	111	69						
NET EARNINGS ATTRIBUTABLE TO PROCTER & GAMBLE	10508	15,326	9,750	3,897						
NET INCOME MARGIN, %	16.09%	23.56%	14.59%	5.76%						

Appendix 6. PG post-pandemic income statement forecast

	ACTUALS			FORECAST	
Amounts in millions	2020	2021	2022	2023	2024
NET SALES	70950	76118	80187	84852.55	90070.41
growth, %	4.83%	7.28%	5.35%	5.82%	6.15%
Cost of products sold	\$ 35,250	\$ 37,108	\$ 42,157	42711.06	45533.48
COGS margin, %	49.7%	48.8%	52.6%	50.3%	50.6%
Selling, general and administrative expense	19,994	21,024	20,217		
growth, %	4.77%	5.15%	-3.84%		
OPERATING INCOME	15,706	17,986	17,813	19227.63	20567.12
EBIT MARGIN, %	22.14%	23.63%	22.21%	22.66%	22.83%
Interest expense	-465	-502	-439		
Interest income	155	45	51		
Other non-operating income, net	438	86	570		
EARNINGS BEFORE INCOME TAXES	15,834	17,615	17,995		
Income taxes	2,731	3,263	3,202		
NET EARNINGS	13,103	14,352	14,793		
Less: Net earnings attributable to noncontrolling interests	76	46	51		
NET EARNINGS ATTRIBUTABLE TO PROCTER & GAMBLE	13027	14306	14742	15708.99	16720.77
NET INCOME MARGIN, %	18.36%	18.79%	18.38%	18.51%	18.56%

Appendix 7. Pre-pandemic and post-pandemic Net Working Capital calculations

	AAPL							
EUR'000'000	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Accounts receivable, net	17,874	23,186	22,926	23,952	26,497	28,740	31,017	34,005
Inventories	4,855	3,956	4,106	4,902	4,890	5,439	5,978	6,421
Vendor non-trade receivables	4,855	25,809	22,878	19,500	25,884	26,757	28,167	31,923
Other current assets	17,799	12,087	12,352	16,129	15,280	17,109	19,065	20,249
Accounts payable	44,242	55,888	46,236	54,755	59,210	62,542	69,363	75,280
Other current liabilities	30,551	33,327	37,720	38,022	41,193	45,835	49,068	53,584
Deferred revenue	7,548	5,966	5,522	7,222	7,045	7,728	8,658	9,217
NWC	(36,958)	(30,143)	(27,216)	(35,516)	(34,896)	(38,060)	(42,862)	(45,483)
Change in NWC		(6,815)	(2,927)	8,300	(619)	3,163	4,802	2,621

	AAPL					
EUR'000'000	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	
Accounts receivable, net	16,120	26,278	28,184	28,752	32,501	
Inventories	4,061	6,580	4,946	6,450	7,041	
Vendor non-trade receivables	21,325	25,228	32,748	32,689	35,266	
Other current assets	11,264	14,111	21,223	18,989	21,117	
Accounts payable	42,296	54,763	64,115	66,496	73,454	
Other current liabilities	42,684	47,493	60,845	62,600	67,616	
Deferred revenue	6,643	7,612	7,912	9,246	9,805	
NWC	(38,853)	(37,671)	(45,771)	(51,462)	(54,949)	
Change in NWC	11,637	(1,182)	8,100	5,691	3,486	

	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Receivables/sales	0.078	0.087	0.088	0.084	0.087	0.086	0.086	0.086
Inventories/sales	0.021	0.015	0.016	0.017	0.016	0.016	0.017	0.016
Vendor non-trade receivables/sales	0.021	0.097	0.088	0.069	0.085	0.080	0.078	0.081
Other current assets/sales	0.078	0.046	0.047	0.057	0.050	0.051	0.053	0.051
Accounts payable/COGS	0.314	0.341	0.286	0.314	0.314	0.304	0.310	0.309
Other current liabilities/COGS	0.217	0.204	0.233	0.218	0.218	0.223	0.220	0.220
Deferred revenue/COGS	0.054	0.036	0.034	0.041	0.037	0.038	0.039	0.038
Total revenues (EUR'000'000)	229,234	265,595	260,174	283,581	305,878	332,631	361,380	394,098
COGS (EUR'000'000)	141,048	163,756	161,782	174,610	188,835	205,522	223,403	243,272

	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)
Receivables/sales	0.059	0.072	0.071	0.067	0.070
Inventories/sales	0.015	0.018	0.013	0.015	0.015
Vendor non-trade receivables/sales	0.078	0.069	0.083	0.077	0.076
Other current assets/sales	0.041	0.039	0.054	0.044	0.046
Accounts payable/COGS	0.249	0.257	0.287	0.264	0.269
Other current liabilities/COGS	0.252	0.223	0.272	0.249	0.248
Deferred revenue/COGS	0.039	0.036	0.035	0.037	0.036
Total revenues (EUR'000'000)	274,515	365,817	394,328	426,944	462,863
COGS (EUR'000'000)	169,559	212,981	223,546	251,438	272,592

	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Accounts receivable, net	2,377	2,314	2,854	2,878	3,068	3,370	3,560	3,822
Inventories	1,329	1,055	1,251	1,395	1,409	1,551	1,666	1,768
Prepaid expenses and other	2,284	1,406	1,262	1,924	1,745	1,877	2,129	2,196
Air traffic liability	4,364	4,661	5,116	5,374	5,739	6,203	6,620	7,097
Accounts payable	3,634	2,976	3,266	3,783	3,790	4,140	4,483	4,743
Accrued salaries and related benefits	3,022	3,287	3,701	3,800	4,087	4,431	4,708	5,057
Loyalty program deferred revenues	2,762	2,989	3,219	3,409	3,644	3,925	4,197	4,499
Other accrued liabilities	1,868	1,117	1,078	1,576	1,422	1,552	1,746	1,802
NWC	(9,660)	(10,255)	(11,013)	(11,745)	(12,459)	(13,454)	(14,398)	(15,412)
Change in NWC		595	758	732	714	995	945	1,013

	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)
Accounts receivable, net	1,396	2,404	3,176	4,068	4,230
Inventories	732	1,098	1,424	1,948	1,954
Prepaid expenses and other	1,180	1,119	1,877	2,597	2,373
Air traffic liability	4,044	6,228	8,160	9,358	9,996
Accounts payable	2,840	4,240	5,106	6,252	6,584
Accrued salaries and related benefits	2,086	2,457	3,288	4,046	4,092
Loyalty program deferred revenues	1,777	2,710	3,434	4,038	4,291
Other accrued liabilities	1,670	1,746	1,779	2,780	2,651
NWC	(9,109)	(12,760)	(15,290)	(17,859)	(19,056)
Change in NWC	(1,904)	3,651	2,530	2,569	1,197

	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Receivables/sales	0.058	0.052	0.061	0.057	0.057	0.058	0.057	0.057
Inventories/sales	0.032	0.024	0.027	0.028	0.026	0.027	0.027	0.026
Prepaid expenses and other/sales	0.056	0.032	0.027	0.038	0.032	0.032	0.034	0.033
Air traffic liability/COGS	0.156	0.149	0.157	0.154	0.153	0.155	0.154	0.154
Accounts payable/COGS	0.130	0.095	0.101	0.108	0.101	0.103	0.104	0.103
Accrued salaries and related/COGS	0.108	0.105	0.114	0.109	0.109	0.111	0.110	0.110
Deferred revenues (loyalty)/COGS	0.098	0.095	0.099	0.098	0.097	0.098	0.098	0.098
Other accrued liabilities/COGS	0.067	0.036	0.033	0.045	0.038	0.039	0.041	0.039
Total revenues (EUR'000'000)	41,138	44,438	47,007	50,626	54,258	58,059	62,299	66,768
COGS (EUR'000'000)	28,053	31,336	32,486	34,913	37,418	40,040	42,963	46,046

	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)
Receivables/sales	0.082	0.080	0.063	0.075	0.073
Inventories/sales	0.043	0.037	0.028	0.036	0.034
Prepaid expenses and other/sales	0.069	0.037	0.037	0.048	0.041
Air traffic liability/COGS	0.192	0.246	0.229	0.222	0.232
Accounts payable/COGS	0.135	0.167	0.144	0.148	0.153
Accrued salaries and related/COGS	0.099	0.097	0.092	0.096	0.095
Deferred revenues (loyalty)/COGS	0.084	0.107	0.097	0.096	0.100
Other accrued liabilities/COGS	0.079	0.069	0.050	0.066	0.062
Total revenues (EUR'000'000)	17,095	29,899	50,582	54,276	58,170
COGS (EUR'000'000)	21,080	25,365	35,558	42,100	43,006

	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Accounts receivable	4,594	4,686	4,951	4,884	4,984	5,088	5,134	5,220
Inventories	4,624	4,738	5,017	4,934	5,042	5,148	5,192	5,280
Prepaid expenses and other CA	2,139	2,046	2,218	2,198	2,218	2,278	2,298	2,332
Accounts payable	9,632	10,344	11,260	10,678	11,023	11,341	11,361	11,564
Accrued and other liabilities	7,024	7,470	9,054	8,044	8,388	8,770	8,663	8,854
NWC	(5,299)	(6,344)	(8,128)	(6,706)	(7,166)	(7,599)	(7,401)	(7,586)
Change in NWC		1,045	1,784	(1,422)	460	433	(197)	185

	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)
Accounts receivable	4,178	4,725	5,143	5,235	5,642
Inventories	5,498	5,983	6,924	6,857	7,379
Prepaid expenses and other CA	2,130	2,095	2,372	2,464	2,586
Accounts payable	12,071	13,720	14,882	15,165	16,359
Accrued and other liabilities	9,722	10,523	9,554	11,190	11,720
NWC	(9,987)	(11,440)	(9,997)	(11,799)	(12,472)
Change in NWC	1,859	1,453	(1,443)	1,802	674

	2017 (A)	2018 (A)	2019 (A)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)
Receivables/sales	0.071	0.070	0.073	0.071	0.072	0.072	0.072	0.072
Inventories/sales	0.071	0.071	0.074	0.072	0.072	0.073	0.072	0.073
Prepaid expenses and other/sales	0.033	0.031	0.033	0.032	0.032	0.032	0.032	0.032
Accounts payable/COGS	0.295	0.300	0.324	0.306	0.310	0.314	0.310	0.311
Accrued and other/COGS	0.215	0.217	0.260	0.231	0.236	0.242	0.236	0.238
Total revenues (EUR'000'000)	65,058	66,832	67,684	68,504	69,694	70,675	71,701	72,800
COGS (EUR'000'000)	32,638	34,432	34,768	34,843	35,530	36,173	36,638	37,151

	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)
Receivables/sales	0.059	0.062	0.064	0.062	0.063
Inventories/sales	0.077	0.079	0.086	0.081	0.082
Prepaid expenses and other/sales	0.030	0.028	0.030	0.029	0.029
Accounts payable/COGS	0.342	0.370	0.353	0.355	0.359
Accrued and other/COGS	0.276	0.284	0.227	0.262	0.257
Total revenues (EUR'000'000)	70,950	76,118	80,187	84,853	90,070
COGS (EUR'000'000)	35,250	37,108	42,157	42,711	45,533

Appendix 8. Discounted Cash flow calculations for AAPL, pre-pandemic

USD (millions)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV	
EBIT	71,069	74,221	78,408	83,089	88,393	88,393	
Tax expense	(11,300)	(11,801)	(12,467)	(13,211)	(14,055)	(14,055)	
EBIT * (1 - T)	59,769	62,420	65,941	69,878	74,339	74,339	
Depreciation	12,627	13,620	14,812	16,092	17,549	17,549	
CapEx	(14,809)	(15,973)	(17,370)	(18,871)	(20,580)	(20,580)	
Change in NWC	8,300	(619)	3,163	4,802	2,621	2,621	
FCFF	€ 65,887	€ 59,448	€ 66,546	€ 71,901	€ 73,928	€ 73,928	
USD (millions)		2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV
FCFF		65,887	59,448	66,546	71,901	73,928	73,928
WACC	5.41%						
Terminal growth rate	3.00%						
Discount factor		0.949	0.900	0.854	0.810	0.768	0.768
Discounted cash flow		62,505	53,501	56,815	58,235	56,804	56,804
Sum of discounted cash flow	344,663						
Terminal value	2,355,854						
Enterprise value	2,700,517						
Net debt	59,203						
Equity value (millions)	2,641,314						
Number of shares (thousands)	4,617,834						
Share price (EUR)	571.98						
After stock split	143.00						

Appendix 9. Discounted Cash flow calculations for AAPL, post-pandemic

USD (millions)	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV	
EBIT	66,288	108,949	119,437	116,750	123,793	123,793	
Tax expense	(9,545)	(14,490)	(19,349)	(17,512)	(18,569)	(18,569)	
EBIT * (1 - T)	56,743	94,459	100,088	99,237	105,224	105,224	
Depreciation	11,056	11,284	11,104	11,333	11,567	11,567	
CapEx	(7,309)	(11,085)	(10,708)	(11,966)	(12,973)	(12,973)	
Change in NWC	11,637	(1,182)	8,100	5,691	3,486	3,486	
FCFF	€ 72,127	€ 93,476	€ 108,584	€ 104,296	€ 107,304	€ 107,304	
USD (millions)		2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV
FCFF		72,127	93,476	108,584	104,296	107,304	107,304
WACC	4.60%						
Terminal growth rate	3.00%						
Discount factor		0.956	0.914	0.874	0.835	0.799	0.799
Discounted cash flow		68,957	85,441	94,889	87,136	85,710	85,710
Sum of discounted cash flow	507,841						
Terminal value	5,368,484						
Enterprise value	5,876,325						
Net debt	96,423						
Equity value (millions)	5,779,902						
Number of shares (thousands)	16,215,963						
Share price (EUR)	356.43						

Appendix 10. Discounted Cash flow calculations for DAL, pre-pandemic

USD (millions)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV	
EBIT	7,235	7,754	8,297	8,903	9,542	9,542	
Tax expense	(1,671)	(1,791)	(1,917)	(2,057)	(2,204)	(2,204)	
EBIT * (1 - T)	5,563	5,963	6,380	6,846	7,337	7,337	
Depreciation	2,722	2,918	3,122	3,350	3,591	3,591	
CapEx	(5,331)	(5,713)	(6,113)	(6,560)	(7,030)	(7,030)	
Change in NWC	732	714	995	945	1,013	1,013	
FCFF	€ 3,687	€ 3,881	€ 4,384	€ 4,581	€ 4,911	€ 4,911	
USD (millions)		2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV
FCFF		3,687	3,881	4,384	4,581	4,911	4,911
WACC	4.66%						
Terminal growth rate	2.50%						
Discount factor		0.955	0.913	0.872	0.833	0.796	0.796
Discounted cash flow		3,523	3,543	3,824	3,818	3,910	3,910
Sum of discounted cash flow	22,529						
Terminal value	180,856						
Enterprise value	203,384						
Net debt	15,109						
Equity value (millions)	188,275						
Number of shares (millions)	652						
Share price (EUR)	288.88						

Appendix 11. Discounted Cash flow calculations for DAL, post-pandemic

USD (millions)	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV
EBIT	- 12,469	1,886	3,661	4,433	5,292	5,292
Tax expense	2,556	(562)	(1,142)	(1,153)	(1,376)	(1,376)
EBIT * (1 - T)	- 9,913	1,324	2,519	3,280	3,916	3,916
Depreciation	2,312	1,998	2,107	2,944	3,155	3,155
CapEx	(1,899)	(3,247)	(6,366)	(6,251)	(6,700)	(6,700)
Change in NWC	(1,904)	3,651	2,530	2,569	1,197	1,197
FCFF	€ (11,404)	€ 3,726	€ 790	€ 2,542	€ 1,568	€ 1,568

USD (millions)	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV
FCFF	- 11,404	3,726	790	2,542	1,568	1,568
WACC	4.11%					
Terminal growth rate	2.50%					
Discount factor		0.960	0.923	0.886	0.851	0.817
Discounted cash flow	- 10,953	3,437	700	2,163	1,282	1,282
Sum of discounted cash flow	- 2,089					
Terminal value	79,404					
Enterprise value	77,314					
Net debt	28,444					
Equity value (millions)	48,870					
Number of shares (millions)	652					
Share price (EUR)	74.98					

Appendix 12. Discounted Cash flow calculations for PG, pre-pandemic

USD (millions)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV
EBIT	14,098	14,343	14,544	14,756	14,982	14,982
Tax expense	(3,482)	(3,543)	(3,592)	(3,645)	(3,701)	(3,701)
EBIT * (1 - T)	10,616	10,800	10,952	11,111	11,281	11,281
Depreciation	2,911	2,961	3,003	3,047	3,093	3,093
CapEx	(3,587)	(3,649)	(3,701)	(3,754)	(3,812)	(3,812)
Change in NWC	(1,422)	460	433	(197)	185	185
FCFF	€ 8,517	€ 10,572	€ 10,687	€ 10,206	#####	#####

USD (millions)	2020 (F)	2021 (F)	2022 (F)	2023 (F)	2024 (F)	TV
FCFF	8,517	10,572	10,687	10,206	10,748	10,748
WACC	4.21%					
Terminal growth rate	2.00%					
Discount factor		0.960	0.921	0.884	0.848	0.814
Discounted cash flow	8,173	9,735	9,443	8,653	8,745	8,745
Sum of discounted cash flow	53,493					
Terminal value	395,301					
Enterprise value	448,794					
Net debt	25,853					
Equity value (millions)	422,941					
Number of shares (thousands)	2,502,260					
Share price (EUR)	169.02					

Appendix 13. Discounted Cash flow calculations for PG, post-pandemic

USD (millions)	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV
EBIT	15,706	17,986	17,813	19,228	20,567	20,567
Tax expense	(2,701)	(3,327)	(3,171)	(3,429)	(3,668)	(3,668)
EBIT * (1 - T)	13,005	14,659	14,642	15,799	16,899	16,899
Depreciation	3,013	2,735	2,807	3,208	3,405	3,405
CapEx	(3,073)	(2,787)	(3,156)	(3,374)	(3,581)	(3,581)
Change in NWC	1,859	1,453	(1,443)	1,802	674	674
FCFF	€ 14,804	€ 16,060	€ 12,850	#####	#####	#####

USD (millions)	2020 (A)	2021 (A)	2022 (A)	2023 (F)	2024 (F)	TV
FCFF	14,804	16,060	12,850	17,434	17,397	17,397
WACC	4.89%					
Terminal growth rate	2.00%					
Discount factor		0.953	0.909	0.867	0.826	0.788
Discounted cash flow	14,113	14,597	11,135	14,403	13,702	13,702
Sum of discounted cash flow	81,652					
Terminal value	474,007					
Enterprise value	555,659					
Net debt	24,279					
Equity value (millions)	531,380					
Number of shares (thousands)	2,389,554					
Share price (EUR)	222.38					