Czech University of Life Sciences Prague

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Bachelor Thesis

Approaches to common stock valuation

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Economics and Management

Thesis title

Approaches to common stock valuation

Objectives of thesis

The goal of the thesis is to establish several methods of common stock valuation and compare them in terms of effectiveness from multiple viewpoints. In the theoretical part, the objective is to introduce and analyze several models that deal with common stock valuation. In the practical part, the goal is to employ the methods introduced in the theoretical part to a real-world common stocks.

Methodology

The theoretical part introduces and explains the pros and cons of several stock valuation models. In the practical part the introduced methods are employed in an evaluation of a common stock while comparing the predictions of the methods with real changes in the stock over time. To accomplish this, fundamental analysis is utilized in order to learn the intrinsic value of the common stock.

The proposed extent of the thesis
30-40

Keywords

Common stock, dividend, fundamental analysis, intrinsic value, discount rate, market value, financial market

Recommended information sources

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Expected date of thesis defence
2021/22 SS – FEM

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Prague on 15. 03. 2022

Declaration

I declare that I have worked on my bachelor thesis titled "Approaches to common stock valuation" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on March 15th, 2022   _____

Approaches to common stock valuation

Abstract

It has been hundreds of years since the first stock markets have begun to function. Over time, investors have developed dozens of models that would help them evaluate whether a share in a company is worth buying or not. This thesis introduces some of these models during the literature review, while also explaining the approach of fundamental analysis to the evaluation of stocks. Later the models introduced are compared to one another from several viewpoints.

In the practical part, fundamental analysis is applied to selected firms to provide a practical example of the use of introduced models. The results are then discussed, evaluated and compared to real changes in the common stocks.

Keywords: Fundamental analysis, intrinsic value, dividend, common stock

Přístupy k hodnocení kmenových akcií

Abstrakt

Už to jsou stovky let kdy se otevřely první burzy s akciemi. Časem investoři vytvořili tucty modelů, aby jim pomohli s vyhodnocením, jestli je akcie hodná koupě, či ne. Tato práce některé z těchto modelů jsou představuje v praktické části, spolu s vysvětlením přístupu fundamentální analýzy k hodnocení akcií. Později jsou představené modely porovnány z různých úhlů pohledu.

V praktické části je fundamentální analýza aplikovaná na vybrané firmy za účelem poskytnutí praktického příkladu využití představených modelů. Výsledky jsou diskutovány a porovnány s opravdovými změnami v kmenových akciích.

Klíčová slova: Fundamentální analýza, vnitřní hodnota, dividenda, kmenová akcie

1. Introduction

Purchase of a common stock, also known as ordinary share, gives the investor a right to a portion of total net assets owned by the company issuing the share and, if the company distributes dividends, a right to receive them.

The investor purchases these shares believing them to provide value over time, either in the form of afore-mentioned dividends, or in the eventual sale of the share, which would have increased in price by the time of its sale.

However, some firms may not perform up to the investors expectations and distribute less than expected in dividends or their sub-par conduct of operations causes decrease in share price and therefore loss of value to the investor.

To predict the performance of a given company investors employ thorough analyses and mathematical valuations models that give insight into the internal undertakings of a firm and its possible future success.

Some of these analyses and valuation models are discussed in this work and their efficacy of predicting a company's success discussed There are several reasons why one might invest – to store or increase value over long time, increase value over time or to safeguard the value against economic instability.

2. Objectives and methodology

2.1. Objectives

The goal of this thesis is to establish several methods of stock valuation and compare their effectiveness from different viewpoints. In the theoretical part, the objective is to introduce and analyze several models that deal with common stock valuation. In the practical part, the goal is to employ the methods introduced in the theoretical part to real-world common stocks and compare the predictions to real changes in the stock.

The research questions are as follows:

- What is the intrinsic value of selected stocks, and how does it compare to the market value?

- How do results of different valuation models compare to one another?

2.2.Methodology

In the theoretical part the methods examined in this work are introduced, with their strengths and weaknesses explained.

The first method established is the widely used fundamental analysis. The top-down approach to evaluation is discussed, reviewing first the environment on a scale of countries, then on an industrial scale and lastly examining the companies themselves.

For the valuation of the price of stocks in question, the H-model and the FCFE model are deployed.

Data used in the evaluation is gathered from publicly available sources, either directly supplied by the companies in their regular reports (such as balance sheets, cash flow statements) or from secondary sources such as Yahoo! finance, Prague stock exchange, or Wall street journal markets.

3. Literature review

The most basic concept of stock valuation and purchase of stock is as follows: a stock that is undervalued will rise in price and so it is bought, while an overvalued stock's price will fall, so it is sold. To discern whether a stock is undervalued or overvalued, the intrinsic value of a stock is sought and then compared to the market value.

The intrinsic value of a stock represents its true value on the market, or at least the value that resulted from an informed analysis made by an investor.

To find a stock's intrinsic value investors employ thorough analyses such as technological, psychological, or fundamental, with fundamental being the most complex of the aforementioned. (Gottwald, 2012)

3.1.Fundamental Analysis

The approach of fundamental analysis is often used by investors as it provides a medium- and long-term forecast of the stock's price trend and knowledge on which factors influence the stock's price. (Gottwald, 2011)

According to Baresa, Bogdan and Ivanovic (2013) When selecting which stock an investor wishes to invest in he has two main approaches for doing so;

The top-down approach focuses first on the macro environment – the overall economic picture of a country or even the continent or world, then the state of the industry in which a firm operates and finally choosing the firm within the industry and analyzing its performance.

The bottom-up approach starts with a several firms of interest which are deeply evaluated. After evaluation the investor works his way up, through industry environment and then the macro environment. In this approach there is a bigger emphasis on the evaluation of the individual firm.

The practical part of this work will be using the top-down approach, as it, in the author's opinion, provides broader outlook on the overall environment of the stock.

3.1.1. Macro environment

In this step the firm is examined in the environment of the State or States it operates in. The results from this analysis inform the investor both on the potential discount rate of stocks, as well as the required returns that should be expected from the investment.

One of the popular approaches to analysis of the Macro environment is the STEP analysis (also known as PEST). Ho (2014) defines the factors as generally out of the firm's sphere of influence, while simultaneously still affecting the company.

These factors analyzed include:

1. Social factors - lifestyle and demographic trends, public opinion and consumer preference.
2. Technological factors - innovations, technological trends
3. Economic factors – interest rates, GDP, inflation rate, unemployment rate
4. Political factors – tax and law policies, environmental regulations

3.1.2. Industry environment

Audretsch and Feldman (1996) define the life cycle of an industry in three stages;

The introductory or exploratory stage in which a new product or service is founded, the market is split into a multitude of participants who take out loans to fund their business and market the product. An overall very rapid growth is present, but uncertainty is also high.

The growth or development stage in which the benefits of the new industry are understood by the public and consumer demand, as well as industry growth, is very high. Those firms that gain a good market foothold in this stage greatly benefit from it in later stages, so research and development and marketing are among the firms' chief interests. The degree of uncertainty is much lesser than in the first stage.

Maturity stage is characterized by slow growth and focus on profit margins. Companies have already established themselves, some gained loyal customers and/or achieved economies of scale or scope, making a barrier for new entrants into the industry. Risk and uncertainty are at the all-time low during this phase, but so is the potential for large amounts of value made from stock purchase and the importance of proper valuation is decreased.

After these stages comes the decline of the industry, as companies start to leave in favor of other products, or outright stop existing due to bankruptcy, being bought by other companies or other means. Demand is every lower and revenues decline. Companies can diversify into other markets to improve growth. Weak competitors and new entrants have hard time competing.

It is vitally important for an investor to correctly discern which part of the life cycle the industry currently resides in. For example, a good investment in the introduction stage can lead to orders of magnitude higher returns than an investment in the maturity stage.

3.1.3. The firm environment

To achieve the goal of finding the intrinsic value of a stock fundamentalists investigate the company's cashflow statement, income statement and balance sheet, as data found there is critical for the forecasting of the company's future performance.

3.1.3.1. Balance sheet

The balance sheet shows the assets, liabilities and equity of a company in a single given point in time, whether it is a monthly, quarterly or an annual report. The information here can tell whether a firm is using their assets efficiently or how well it can manage its debt. Several ratios that inform about a firm's future prospects can be deducted from the information found here, such as P/B or P/E ratio.

3.1.3.2. Income statement

The income statement reveals company's revenues and expenses over an extended period of time. Important difference between cash flow statement, in income statement revenues and

costs are recorded in the period in which they happened, not necessarily when the payment was received.

Information such as firm's net income can be found here which is crucial to valuation through the FCFE model explained later.

3.1.3.3. Cash flow statement

From a cash flow statement an investor can discern how effective a company is at managing its cash and what it spends it on. It should be noted that some items found here do not represent a real income of cash but are rather an estimated amounts of cash saved through other means, such as in the case of depreciation. Cash flow statement can inform about the flexibility and long-term prospects of a firm. From this statement information such as capital expenditures or net debt issued can be examined and used in the FCFE valuation model.

The cash flow statement is used to ascertain how is a company generating its revenue, what is the company spending its revenue on and whether or not it can pay short term debts.

The statement can also lend insight into the long-term prospects of a company; is it reinvesting revenues in the way of purchasing new capital. Does the firms income come mostly from purchase of goods by customers, or is the company shifting more towards revenues from its financing activities.

3.1.4. Dividend yield

It is the result of dividing the amount received from a single share's dividend, also known as residual income, by the market price of that share. This ratio does not account for the growth of share price and so may be applicable only to some stocks, as some are considered "growth stocks", meaning they do not pay out dividends and investors expect to extract value solely from the eventual sale of a share which increased in value since time of purchase.

Chisholm (2009) states that **outliers** can be found during evaluation; companies that pay little in dividends in proportion to the share price, which may indicate that the firm is the previously mentioned growth company or companies that pay unusually high amounts.

In the latter case, a company may be high risk, and trying to incentivize investment by high dividends or the company has limited room for growth, so it compensates the investors mostly through dividends, rather than growth and eventual sale of stock. Examples could include some low margin industries, such as water or electricity providers, so-called utility stocks.

Some companies may start to pay dividends, or substantially increase their dividend yields, once their growth has slowed to further incentivize purchase of their stock.

3.1.5. Price/Earnings ratio

The ratio of market price per share divided by earnings per share. For example, if a single share has an estimated P/E ratio of 5, it would take 5 years of accumulating net earnings **at the current rate of profits** to break even with the purchase price. Gottwald (2012) names it as the most used valuation tool in stock markets, providing an indicator of relative value between similar companies. As such it can be used both during the analysis of the firm environment and the industry environment.

A high P/E ratio could represent the market's belief that the earnings will grow at a faster rate, or that the company represents a lower risk of investment, which may or may not be justified. Prospective P/E ratios should account for such discrepancies when calculating the intrinsic value of a stock (Gottwald, 2012).

3.1.6. Price/Book ratio

Chrisholm (2009) Defines this ratio as the price of a share compared to the book value of a company (also known as shareholder's equity). The book value is established by subtracting a company's total assets by its total liabilities. **This informs what the company would be worth if they sold all their assets and paid off all their liabilities.**

A company with a high ratio may indicate that the share price is overvalued, as in the case that the company is liquidated it will not have enough cash to pay its investors.

This ratio only takes into account tangible assets, so value of a brand name, firm's reputation and intellectual property is not quantified and may lead to wrong estimates.

3.1.6.1. Relationship between P/E and P/B ratio

According to Halsey (2001), comparing these two ratios can inform the investor about what he should expect of a company in the future:

- high performing company - high P/B, high P/E, expected positive residual income, increasing income.
- declining company - high P/B, low P/E, expected positive residual income, decreasing income.

- improving company - low P/B, high P/E, expected negative residual income, increasing income.
- poor performing company - low P/B, low P/E, expected negative residual income, decreasing income.

While "high" or "low" is hard to estimate on its own, the ratios in analyzed firms can be compared to other firms in the industry or the industry average. If it is 70%-40% above or below average, it can be considered high or low respectively. If it is much higher than average (2-3 times) it is a cause for concern.

3.2. Technical analysis

The technological approach seeks to predict the market in a different manner – rather than analyzing all possible factors that could influence the market, it believes that all factors are already present in the market price of the company's stock. Trader is watching the market and reacting by purchase or sale of stock when certain conditions are met. (Kirkpatrick, Dahlquist, 2011)

These conditions involve seeing whether a stock has a long-term trend, considering the average price of the stock over several weeks or months **(also known as moving average)** and buying or selling the stock when the price hits certain thresholds. While traditional fundamental analysis overall focuses more on long-term investing and **collection of dividends,** technical analysis can also be used for short-term profits in the market while engaging in so called day trading. As such it will not be used in the practical part.

3.3. Stock valuation models

A common stock can be valued either by calculating the present value of future income from dividends**,** or by assessing a firms value through cash that is retained in the firm by the end of a period, known as a free cash flow. Some of these models are discussed in the following chapter, as well as some of the terms necessary for understanding the valuation process.

3.3.1. Risk premium

Each investment carries a certain risk with it, and so the investor wishes to have an expected amount of minimal return from his investment that will balance out the insecurity of the investment. This value, called a Risk premium, increases as the uncertainty of the investment

rises. Examples of factors that can influence this value are: inflation rates, market or stock volatility and credit score.

3.3.2. Beta

According to Dimitriou (2012) Beta is a measure of how much the price of a selected company's stock moves when market shifts. A Beta of below 1 indicates a more stable company that is not affected by market change, while a Beta of above 1 implies that the stock is highly sensitive to changes in the market.

3.3.3. Capital asset pricing model

In order to evaluate a stock investor needs to know what returns he should expect from the investment. To estimate this "required rate of return", this work will use the Capital asset pricing model, or CAPM for short. Chrisholm (2009) defines the model as:

$$r_a = r_f + [\beta \times (r_m - r_f)]$$

Where: r_a = required rate of return

r_f = risk-free rate – this compares the stock to a "risk free investment". In the financial world, no such investment exists, so the stock is compared to a growth rate in most safe investments one can find, often meaning government-issued bonds and securities.

ß = the security's beta, as was explained before

r_m = the expected return on a diversified market portfolio in order for an investor to buy or not to sell a stock

$r_m - r_f$ = the difference between the market portfolio return and the risk-free rate, i.e. the

market risk premium. Dimitrou (2012) describes this as compensation for investors for taking the extra risk of investing in the stock market, over buying less risky assets such as government bonds.

3.3.4. The H-model

The H-model is based on the principle that the price of a common stock is equal to the present value of its future dividends. It assumes that change happens in a linear fashion.

According to Fuller and Hsia (1984), analysts that estimate fair share prices and expected returns need their valuation models to meet these requirements:

1) Conceptually sound

2) Relatively few estimates required

3) Is flexible in describing dividend growth rate patterns

4) Allows for straightforward calculation of share price given discount rate or discount rate given share price

As is, the model could prove useful in quick analysis of a share, as it requires simple calculations that could be done by hand. Unlike the popular three-step model it requires 3 estimates only;

- short-term adjusted growth rate – a period where company experiences an extraordinary growth
- the "halfway point" in this short-term growth rate – a number of years during which the short-term growth rate gravitates towards the long-term growth rate, divided by two
- the long-term growth rate itself.

$$P_0 = \frac{D_0}{r - g_n}[(1 + g_n) + H(g_a - g_n)]$$

P_0 – present value of a share, D_0 – most recent dividend paid, r – discount rate, g_n – long-term growth rate, g_a – short-term adjusted growth rate, H – duration of short-term adjusted growth rate divided by two.

The equation has no exponential terms and can be rearranged within 4-5 steps to express/calculate discount rate.

Fuller and Hsia (1984) also show that the results are comparable to the three-step model which is more complex, while H-model also is more realistic with linear change to dividends paid out, rather than an abrupt change happening in a set year.

3.3.5. Free cahs flow to equity model

According to Chrisholm (2009), dividends are becoming less important as a proportion of total return on a share than they were historically. He also states that companies that do not pay dividends often have positive free cash flows. It is often used to value firms without a stable dividend policy or paying little to no dividends.

Free cash flows models focus on examining the cash flows generated by a firm, as good management of cash flows could indicate overall good management and positive future outlook

Damodaran (2010) defines the model as follows:

FCFE= Net income + Depreciation – Capital expenditures + Changes in working capital + Net debt issued.

Net income can be taken from the income statement, while the rest is found in the statement of cash flows.

Afterwards, FCFE is discounted at the required rate of return acquired from the capital asset pricing model. Present value = sum of all future cash flows.

Dimitrou (2009) then instructs to sum up all the estimated cash flows in the following manner:

$$Value = \Sigma_{t=1}^{t=n} \frac{FCFE_t}{(1+r)^t} + \frac{\frac{FCFE_n}{r-g_n}}{(1+r)^n}$$

Where:

FCFE$_t$ is the expected cash flow in year t.

R is the discount rate acquired from the capital asset pricing model.

g$_n$ is the long term expected growth rate.

Value presents the current value of the equity of the examined firm. To gain the present value of a share, divide this result by the number of shares outstanding.

3.3.6. Valuation models comparison

The H-model is much more intuitive for beginner investors, as it sums up **future incomes from dividends provided by the firm.** It requires few estimates and therefore is less prone to user error. These estimates can be deduced from past growth in dividends distributed. The model is most useful for valuating companies that are expected to provide most of their value to investors through dividend income rather than as a result of growth in the price of the share and the eventual sale.

In its base form, it requires less research into the company's cash flows, income and balance sheet, as none of the inputs into the model require data from those documents. In addition to being a rather straightforward model arithmetically, having easy calculations that can

be done with just pen and paper, this model can be seen as a sort of "beginner model" or a quicker and simpler way to evaluate stocks when compared to other models available.

Its downsides include the fact that companies that pay little or no dividends cannot be accurately valued by this model, and a lack of estimating value extracted by the eventual sale of the company's share.

The FCFE model is able to works for valuation of any firm, not just a one that distributes dividends. The model also requires greater observation of the internal processes of the company, which, while more time consuming, provides greater insight into the future of the company. For example, high capital expenditures in one year could cause an increase growth and development of the company in future years, which can be reflected in the investor's estimates.

FCFE model requires much more user input and estimates, therefore it causes greater risk of user error or unlikely estimates. The model is also harder to grasp simply by number of variables present and number of calculations required, so it should be recommended only to investors, who have mastered the use of simpler models.

4. Practical part

4.1. Macroenvironment

As vaccines are distributed throughout the world, and herd immunity is achieved it appears that the coronavirus pandemic is slowly nearing its end. According to an interview with Dr. Anthony Fauci, a U.S. infectious disease expert, it is time to start returning to normal lives (Reuters 2022)

The US and other countries are slowly lifting mask mandates and vaccination restrictions. Even though in many regions, daily cases are at an all-time high, thanks to vaccinations and the less severe nature of the prevailing omicron variant hospitalizations are much lower, indicating that covid could be seen as common flu in a couple of years.

Return to normal conditions will likely have large impact on number of industries. Home-delivery applications that people grew reliant upon, either because of governmental bans on in-person pickups in store or fear of being in a public space, are likely to decline in popularity. Bars, restaurants, cafés and other food-related establishments will likely see a large increase in customers, especially in the coming summer.

The industrial sector is also expected to return to normal working conditions, as previously mentioned restrictions are lifted, and production and therefore consumption of energy is expected to increase.

As of now, much of the world is dealing with an energy crisis with Czech Republic and Germany being one of the highly-affected countries. The prices of natural gas and oil have increased to their all-time maximums throughout to world, in anticipation by the shortages of these commodities caused by sanctions imposed on the Russian Federation.

In conclusion all around the world countries were or will be hit by a shortage of energy and many are trying to compensate and find new sources to the energy market from which they would buy. **With this established, this work will be focusing on the energy supply sector.**

4.1.1. STEP analysis

4.1.1.1. Social factors

As of now, much of the public is favoring ecologically produced goods and services, some even go out of their way and pay premium to buy "green" goods and services, therefore clean sources of energy such as photovoltaic power plants or wind powered generators are in favor.

While nuclear power is considered low-emission and clean, past prejudices still affect the public opinion about building nuclear power plants.

In a public poll conducted in 2021 German citizens appeared to be even more opposed to nuclear power than in other countries, as the responses were almost balanced with 48,2% of respondents reacting positively and 43,7% of respondents reacting negatively to the idea of keeping nuclear power to achieve EU's climate protection goals (Civey 2021).

To put these results in perspective, in a poll conducted by the Polish government 74% of respondents in were in favor of building new nuclear power plants (2021), while in the USA 76% of respondents were in favor of nuclear power (Bisconti, 2021).

In Czech Republic, according to a Stem poll (2012) the public opinion of nuclear power has been rising since 2000, which was further supported by Želísko (2019).

As a result, one could expect a sharp rise in use of renewable energy in Germany, as well as in Czech Republic, where it would be accompanied by building of additional nuclear facilities.

4.1.1.2.   Technological factors

Solar energy and renewables as a whole saw a lot of progress in recent years, dropping the price per MWH, as Birol et. al. (2020) mention it became the cheapest way of producing electricity in history – in some regions it is selected not because of concern for the environment, but simply because it is the most cost-effective option available. However, in a following report Birol et. al. (2021) state that the pandemic has stalled the shift to clean energy, which leads to believe that renewables are expected to yet enjoy their true boom

4.1.1.3.   Economic factors

4.1.1.3.1.   GDP Tables

OECD provides the following stats in GDP including projections for 2022:

Year	GDP growth rate (%)		
	Czech Republic	Germany	World
2012	0,7	2,1	3,1
2013	1,3	2,5	3,1
2014	4,9	4,1	4,0
2015	6,5	3,1	4,1
2016	3,6	3,5	3,4
2017	6,7	4,5	4,9
2018	5,8	3,1	4,9
2019	7,0	3,2	4,0
2020	-1,7	-3,4	-2,6
2021	7,4	6,0	9,4
2022 (forecast)	8,6	7,4	8,0

Source: https://data.oecd.org/gdp/nominal-gdp-forecast.htm#indicator-chart

Over the last 10 years Czech Republic showed a growth an average annual growth of 4,6%. Just as in any other country, the Covid 19 pandemic slowed GDP growth, just like everywhere in the world, however the drop in production was not as severe as in other parts of the world as

Czech Republic implemented very strict lockdown measures for several months which stunted growth and production in the short term, but allowed for speedy recovery at the end of spring and return to production.

Germany was hit harder by the pandemic, showing higher impact in GDP than the rest of the world. Its average annual growth over the past ten years is 3,28%, which is less than that of Czech Republic, but the growth presented by Germany is much more stable overall with less pronounced extremes.

4.1.1.3.2.   Inflation rate

Year	Inflation in Consumer Price Index (%)		
	Czech Republic	Germany	World
2012	3,29	2,01	2,24
2013	1,44	1,50	1,60
2014	0,34	0,90	1,74
2015	0,30	0,51	0,68
2016	0,68	0,49	1,20
2017	2,45	1,50	2,28
2018	2,14	1,73	2,61
2019	2,84	1,44	2,07
2020	3,16	0,50	1,37
2021	3,84	3,14	3,99
2022 (forecast)	6,15	2,84	4,39

Source: https://data.oecd.org/price/inflation-forecast.htm#indicator-chart

According to the table, inflation worldwide was steadily decreasing in years 2012-2015, after which it started growing again. In recent years, inflation has rapidly increased, reaching record heights in the past 10 years. While this increases the required rate of return, it should also incentivize investors to take larger risks, as risk-free investments are unlikely to produce value which would outpace inflation.

According to the ČSÚ (Cieslar 2022) one of the main drivers of inflation is the increase in energy prices, as the HICP (Czech version of CPI) increased to 8,8% in January. While Czech Republic usually remains around average in inflation, these statistics are higher than the average 5,3% estimated to take place in January in the EU.

While Germany is also experiencing peak inflation rates in the past ten years, the results are still less extreme than in Czech Republic. This will be accounted for when considering the risk premiums.

4.1.1.1.   Political factors

As a result of the current situation in Ukraine supply lines are disrupted and the prices of oil and natural gas are reaching all time heights, as according to Eurostat (2022) European union received 38,1% of natural gas from Russia in 2020, with some countries having as high as 100% dependence on Russian providers for their natural gas needs. As a result, some countries are considering or already pursuing energy independence from fossil fuel suppliers. (The Hill 2022)

Germany cancelled the plans for an extended "Nord Stream 2" natural gas pipeline which could lead to **scarcity of energy and further increase in energy price.** (Politico 2022).

It should be noted that Germany announced shutting down several nuclear powerplants over the course of the coming years as the deemed them non-green, further increasing the needs for energy, that they plan to substitute with natural gas and coal powerplants in addition to renewables. (Abc News 2022)

Recently, Germany announced it will be shifting to 100% renewable energy by the year 2035 (Bloomberg 2022), making it apparent that growth in solar, wind and water energy generating companies will be present.

To support this transition, Germany has announced that it will be allocating 200 billion euros to funding the first phase of transformation taking place in 2022-2026. This is not solely focused on renewables, as minister of finance, Christian Linder, said that these funds will also improve research in hydrogen technology and electric vehicle charging network, further establishing Germany's move to energy independence (Carbonbrief 2022).

4.1.2. Summary:

The world appears to be moving away from fossil fuels both because of effects it has on the climate and because of the reliance on the fuel suppliers it causes. While Czech Republic is

open both to nuclear power and renewable energy, Germany is relying only on renewable energy going in the future.

4.2. Industry environment

In the analysis of microenvironment emphasis is placed on examining companies that provide the comparable goods or services to estimate the state of the market and the lifecycle of the economy.

4.2.1. Industry lifecycle

While the market of traditional energy suppliers and distributors has been operating for decades, renewable energy is another matter entirely as, according to Birol et. al. (2021), renewable power portfolios have generated higher investment returns than a fossil fuels oriented ones, while also providing high diversification benefits. From 2014 to today renewable portfolios have grown by almost 200%, while fossil fuel portfolios have increased by only half as much.

This would indicate that renewable energies are still located in the introductory or growth stages both of which promise high value to investors.

4.2.2. Industry analysis

While many states have pledged to reduce their emissions, according to Ghosh and Nanda (2010) there are still technologic along the way: "The most important issue is to ensure that technology options are available at the required scale and at an acceptable cost, particularly for sectors which are more difficult to decarbonize, such as industry or transport"

Birol et. al. (2021) say that climate change can cause large scale damage to the energy infrastructure. According their estimates, 25% of the global electricity network are at a risk of damage from cyclone winds, 10% of coastal refineries are facing the danger of coastal flooding, and 33% of thermal power plants are located in areas with severe water shortage or low water quality.

Also according to Birol et. al., there are large opportunities for renewable energies manufacturers in the future. Depending on how fast the transition to lower emissions happen, the payoff is around 1 trillion USD, which is an amount comparable to the oil market.

4.3. Firm environment

4.3.1. Firm introduction

4.3.1.1. 7c Solarparken AG (HRPK.DE)

A small firm dealing in operation of photovoltaics situated in Germany, where it manages solar farms located mainly in Bavaria and Saxony regions. Several projects, which will provide around 6 MWp, were also recently completed in Belgium. (Solarparken 2022)

The company emerged in 2015 upon the acquisition of 7C Solarparken NV by Colexon Energy AG and renaming the **joining** of the two firms into 7C Solarparken AG. The company has been almost steadily growing since then.

4.3.1.2. Energiekontor AG (EKT.DE)

Is a medium-large firm operating 130 wind farms and 12 solar parks, totaling to a power output of around 1 gigawatt. Most of these farms operate in Germany with 11 of them split between Portugal and the United Kingdom. (Energiekontor 2022). The company has also built several solar park projects, **they only provide not all that much.**

4.3.1.3. ČEZ (CEZ.PR)

ČEZ is one of the major suppliers to Czech Republic, having a 70% market share of electricity made in Czech Republic and supplying 35% of end users in 2020 (Ekonomický deník 2021). The number of end users is expected to rise even further 2022 with the bankruptcy of seral other suppliers, who accounted for around 4% of end users according to Ekonomický deník (2021) **It is the mother company of several other smaller institutes gathered under its one flag**. In 2020 ČEZ produced 60,9 TWh of energy (ČEZ 2022) out of total 81 TWh produced in Czech Republic (ČSÚ 2022).

The Czech ministry of finance is a major stakeholder in ČEZ at 69% (ČEZ 2020) so this provides some stability to the firm, which will be accounted for in considering the risk premium.

ČEZ also declared that it will build 7,5 GW in renewable sources by the year 2030 (ČEZ 2022).

4.3.2. Historical performance

As ČEZ is based in Czech Republic, all its financial data is written in Czech Crowns. To ease the valuation process, all Czech Crown data was converted to European Euros at the rate of 24,73 Crowns per Euro as was recorded by the Czech national bank on 28.2. (ČNB 2022)
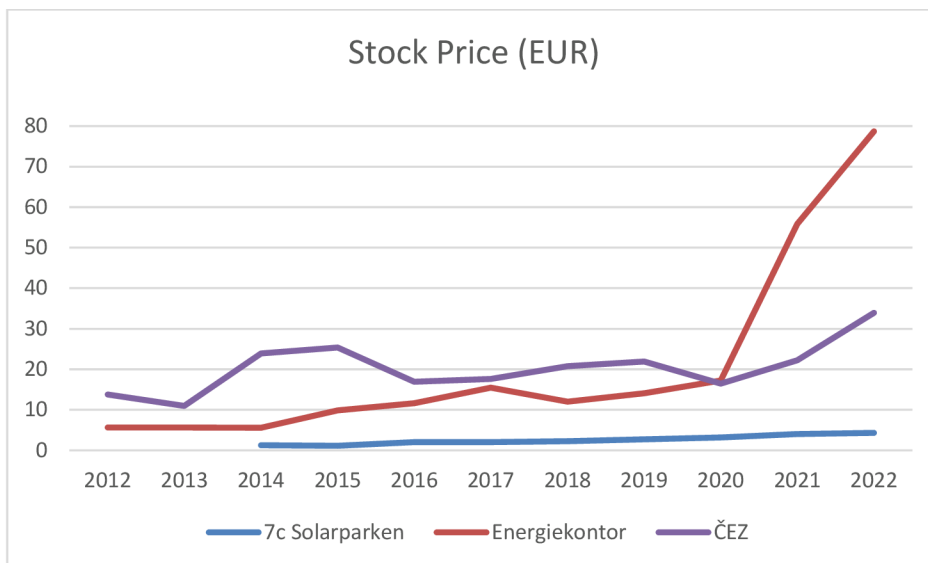
4.3.2.1. Share price

Figure 1:Historical stock prices

Source: Yahoo! finance

All prices are displayed at their adjusted closing price (adjusted for share splits and distributions)

From the above graph can be determined that since 2016 companies have shown a clear upwards trend. This is especially true for Energiekontor, whose stock price increased by 300% in only a span of two years since 2020. ČEZ has also experienced growth in these past two years, but is still well below its historical maximum of approximately 54 euros attained before the financial crisis of 2008, or even the maximum of sometime afterwards in 2011 where it reached 38 euros, but ČEZ is mostly interesting from the point of dividends, which will be discussed later on. 7c Solarparken data is only shown since 2014 as the company as it is known today started operating at that time.
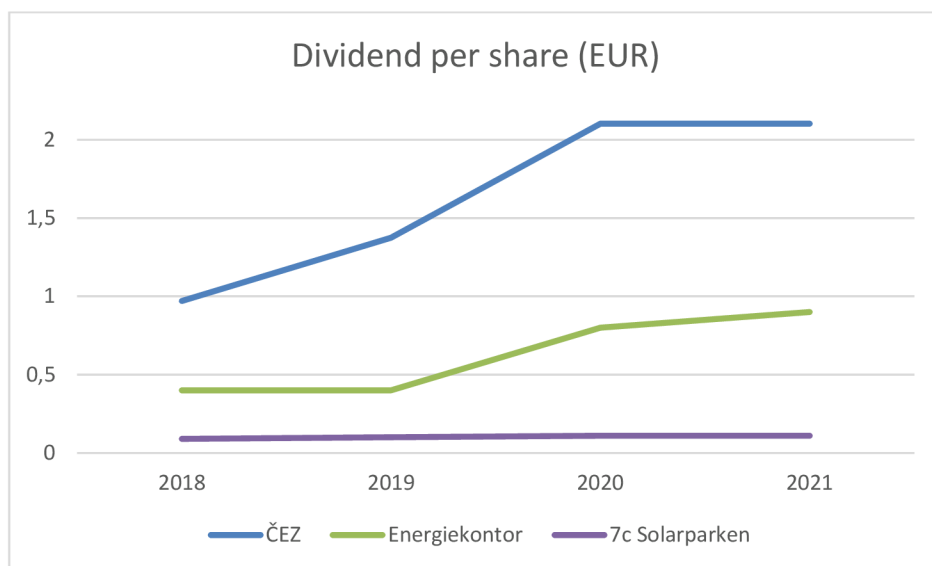
4.3.2.2.   Dividend historical data

Figure 2:Historical divedends per share

Source: Yahoo! finance

From the graph, it can be discerned that all companies have shown constant dividend growth in recent past. It should be noted that 7c Solarparken has also shown growth, around 8% a year on average, however due to the small size of the dividend it is not easily discerned when compared to the other companies.

Of especial interest should be the dividends of ČEZ which have increased by more than 100% over the course of three years, and with a promising future prospects stated in the analysis of previous environments, we can guess the growth will continue in a similar fashion in the future

With this historical data and previous facts established in the analysis of the world economy, we can estimate growth in future years at

4.3.3.   P/E & P/B ratio, Beta

Table below presents the current share price divided by latest **shareholder's equity value and** the trailing twelve months average P/E ratios.

Company	P/B ratio	P/E ratio	Beta
Energiekontor	15,57	74,11	1,02

| 7c Solarparken | 1,87 | 64,7 | 0,55 |
| ČEZ | 2,55 | 83,14 | 0,49 |

Source: Yahoo! Finance, WSJ

According to Siblis Research (2022) the average P/B ratio in the energy sector in last 3 years moves from around 1,2 to 1,9. With this in mind, from the table above can be observed that Energiekontor has a very high P/B ratio, surpassing even the average IT firm's ratio, which is situated around the average of 12,25. It firms are known to rely on intellectual property more than physical assets, meaning Energiekontor could be highly overvalued by investors The other companies all have average, to slightly above average ratios which looks promising.

Concerning P/E ratio, findings above show that all above companies have rather high P/E ratios. This comes less surprising in Energiekontor and 7c Solarparken which specialize in green energy solutions which have gained popularity in recent years, and according to previous analyses shown in this work, have promising expected returns in the future. High ratio in ČEZ could be justified by having a large portion of market share and providing promisingly high dividend returns in recent past.

4.4. Valuation

As all companies

4.4.1. Assumptions & estimates

Future cash flows will be estimated using similar methods as the H-model – assuming rapid growth in the short term that slowly evens out over long term.

4.4.1.1. ČEZ and Czech Republic

ČEZ has experienced a large increase in dividend growth over the past seven years, averaging around 7% annual growth. With energy prices going up and several energy competitors leaving the scene during the last quarter of 2021, we can expect dividends to increase even further in the future. However, as of March 2022 inflation has reached highest numbers in 20 years peaking around 11%.

The risk-free rate on state-issued bonds in Czech Republic in March reached an average of 3,7 % (Trading Economics 2022). To adjust for the current market instability, the risk-free rate will be set to 6% and risk premium to above average 14% for ČEZ. The H will be set to 3 which

is much lower than with the other firms. as sooner or later new competitors will arrive into the market and take away the short-term advantage granted to ČEZ by the **energy market crash.**

With the gdp growth rate over the last 10 years averaging around 4,6%, it can be estimated that the stock's growth into perpetuity to be around 4,5% for free cash flows and 5% for dividends, for as companies reach the maturity stage of industry lifecycle, the growth in their stock price slows, and they focus more on providing steady stream of income for their shareholders.

4.4.1.2.   Solarparken, Energiekontor and Germany

As Germany promised to speed up its transition to carbon neutrality, it can be expected that firms that deal in renewable resources will experience growth in the upcoming years, as new projects in solar, wind and water energy generation are undertaken and commissioned by the government

With this in mind we can expect large growth in Energiekontor as a large and promising firm dealing with both solar and wind power and similar, although a **bit smaller growth in** 7c Solarparken as the company only deals in solar and operates on a smaller scale than Energiekontor.

Situation in Germany is more stable, with inflation less than half that of Czech Republic. However, the risk-free rate in Germany is also much lower with even long-term government bonds averaging returns of less than 1% (World Government Bonds 2022). The risk-free rate will be set to 3% for both Energiekontor and 7c Solarparken. Market return to 9% with Solarparken, but it will be increased to 11% for Energiekontor, because of the elevated P/E and P/B ratios of the firm.

The average GDP growth rate in Germany was lower over the last ten years at around 3,28%. However, as was indicated by Birol et. al. (2021) and announced policies analyzed in the STEP analysis, there is potential for large growth in the renewable energy sector for decades to come. With this established, perpetual growth rate of dividends is set to 8% for Energiekontor and 5,5% for 7c Solarparken. This is lowered for cash flow growth rate to 6% and 4% respectively.

4.4.2. H-model valuation

Considering the above mentioned, the table below is presented for use in valuation with the H-model:

	$_0$	Risk free rate	Market return	eta	r	g $_n$	g $_a$	$_0$
ČEZ	,1	0,06	0,15	,49	0,104	0,05	,08	4,2
Energiekontor	,9	0,03	0,12	,02	0,121	0,08	,15	2,2
7c Solarparken	,1	0,03	0,10	,55	0,068	0,055	,12	0,7

Source: own calculations, included in attachements

After calculations, ČEZ is currently undervalued by about 20%, as its currently trading at €33,92. This is not entirely surprising, as based on historical data and present situation analysis, ČEZ was looking promising even before applications of models.

Energiekontor appears severely overvalued, as was indicated with its P/B ratio. Even when estimating very generous short-term and long-term growth rates, its intrinsic value based on dividends distributed is still much lower than the €79,3 it is trading today. This may be due to low amount of paid out dividends, as Energiekontor shows the signs of a growth firm, so it is recommended to pay attention to the free cash flow valuation as well.

Solarparken, on the other hand is looking much more prospective. The estimates made were much more conservative for this smaller firm, but it still appears undervalued as it is trading at €4,35. Just like Energiekontor, Solarparken shows signs of growth firm, however unlike Energiekontor, it also pays a substantial amount in dividends to stakeholders.

4.4.3. Free cash flow to equity

At the time of writing this work, annual report for year 2021 has not been released by any of the evaluated companies, therefore data from 2020, alongside quarterly and semi-annual reports is used to estimate free cash flows. All numbers are in thousands of **euros. Data collected from marketwatch.com, wsj.com, finance.yahoo.com**

4.4.3.1. ČEZ

	Net income	Depreciation	Capital expenditures	Change in working capital	Net debt issued	FCFE
Sep 21	20 7 357	360 550	310 833	465 238	318 917	110 752
Jun 21	-275 263	329 426	256 265	966 855	-537 995	-1 706 952
Mar 21	33 9 127	312 045	289 410	-317 300	-70 331	608 731
Dec 20	31 6 087	280 922	431 690	465 238	-321 342	-621 261
2020	21 9 806	1 296 888	1 291 956	857 154	-830 598	-1 463 015
2019	58 0 962	1 326 556	1 204 608	-848 424	256 629	1 807 963
2018	41 7 421	1 284 802	1 051 657	-420 210	211 601	1 282 377

Source: own calculations, included in attachements

It appears that 2020 was particularly harsh on ČEZ concerning free cash flows. Not only was the company's net income much lower, likely due to decrease in industrial production and the following fall in de caused by the Covid-19 pandemic, but the company also paid off a lot of its debt resulting in a large negative cash flow. This may be one of the reasons ČEZ stock decreased substantially in 2020, **even though, as an energy company, it should be considered a safe investment.**

Year 2020 was an outlier therefore the estimates going forward will be based on average cash flows taken from years 2018 and 2019, with penalty of 50% to account for the still recovering economy and diminished net income caused by lesser industrial demand for electricity due to lockdowns present for most of 2021.

Year	FCFE	Discounted Cash flow

2020	-1 463 015	
2021e	824 734	747 042
2022e	880 404	722 344
2023e	939 831	698 462
2024e	1 003 270	675 370
2025e	1 070 991	653 041
2026e	1 143 282	22 961 823
	Final value in EUR	26 458 081 056
	Shares outstanding	537 989 759
	Present value of 1 share	49,17952547

Source: own calculations, included in attachments

Even with conservative estimates in free cash flow to equity growth rates ČEZ still managed to provide good value. The results presented here support the valuation done with the H-model, in that ČEZ is a promising purchase on the stock market.

4.4.3.2.   Energiekontor

	Net income	Depreciation	Capital expenditures	Change in working capital	Net debt issued	FCFE
Jun 21	5 650	9 660	39 450	-7 430	57 080	4 0 370
Dec 20	9 920	7 940	762	24 620	N/A	- 7 522
2020	20 425	19 384	790	-42 180	4 250	8 5 449
2019	24 4	22 551	7 482	-25 760	9 610	5 0 683
2018	6 680	18 546	22 266	523	-2 890	- 453

Source: own calculations, included in attachments

Energiekontor appears to be doing much better in cash flows than it was with dividend evaluation. Even in 2020, a year when a lot of companies experienced a decline in their cash flow activities, Energiekontor presents an all-time-high free cashflow, with almost 30% increase since the last period. One thing to note is the very large amount of debt issued in first half of 2021. This amount vastly exceeds any other borrowings in previous years, so a more conservative FCFE estimation of growth in 2021 will be set.

Year	FCFE	Discounted Cash flow
2020	85 449	
2021e	51 030	45 522
2022e	57 579	45 820
2023e	64 969	46 120
2024e	73 306	46 421
2025e	82 714	46 725
2026e	93 329	806 242
	Final value in EUR	1 036 850 478
	Shares outstanding	14 120 000
	Present value of 1 share	73,43

Source: own calculations, included in attachments

Using current estimates, Energiekontor still appears to have lesser intrinsic value than it is currently traded for on the Frankfurt stock exchange. While the value calculated with the FCFE model is much closer than the one calculated by the H-model, it is still not a good stock option.

4.4.3.3.   7c Solarparken

	Net income	Depreciation	Capital expenditures	Change in working capital	Net debt issued	FCFE
Jun 21	6 020	14 960	8 760	-3 750	-11 780	4 190
D	-1	14 120	2 950	4 870	-9 340	-4

ec 20	240					280
Jun 20	6 490	12 210	2 690	-3 254	-830	18 434
2020	5 248	26 326	5 644	1 620	-10 170	14 140
2019	7 883	22 908	13 506	-3 440	-6 287	14 438
2018	5 891	19 776	12 761	-5 630	6 899	25 435

Source: own calculations, included in attachments

7c Solarparken has provided very stable free cash flows over the last few years, even through substantial debt repayment. However last semi-annual reports raise concern about the firm's success in 2021, as the company's main source of cash flows has been historically during the first half of the year, with the company having negative cash flows for the second half.

In 2021 the first half of the year provided very little in the way of cash flows, leading to believe that second half of the year may lead to none, or even negative net cash flow in 2021. This was mostly due to above-average debt repayment, but also due to very high capital expenditures, which should indicate accelerated growth in the future.

Year	FCFE	Discounted Cash flow
2020	14140	
2021e	3520	3 252
2022e	20021	17 092
2023e	22263	17 561
2024e	24757	18 043
2025e	27529	18 538
2026e	30613	284 276
	Final value in EUR	358 760 963
	Shares outstanding	31740000
	Present value of 1 share	11,30

Source: own calculations, included in attachments

7C Solarparken appeared unfavorably at the start of the valuation when compared to the other firms, as it was much smaller, relatively new and specialized only in photovoltaics, whereas the other firms were established and diversified. Both valuation models proved these assumptions wrong however, as the results came in very favorably for Solarparken.

4.5. Comparison to market value

Lastly the results of the valuation models will be compared to changes in their real-world stock equivalents.
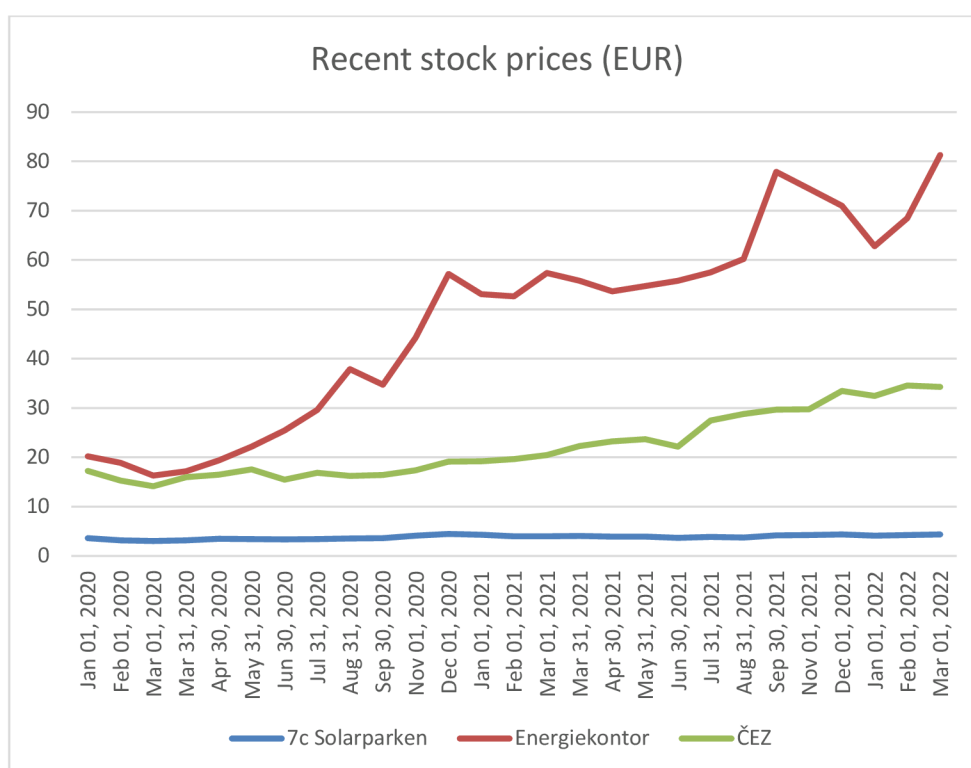

Figure 3: Recent stock prices closely examined

Source: Yahoo! Finance

The historical data presented in the graph above are somewhat in accordance with the results of valuation models. Energiekontor is performing extraordinarily well and so is ČEZ. Solarparken are not growing as well, but still presenting an increase of around 30% in stock price since march 2020 and 5% since march 2021. The lesser increase in price when compared to the

other firms can be attributed to the company's smaller size and therefore lesser popularity – meaning less investors know about the firm and can invest in it.

Energiekontor's success could be explained by the fact it is a popular renewable energy company, with assets in multiple states. Therefore it could be selected because of recent trends favoring "green" mindset like buying electric vehicles and, as in this case, investing in "green" companies and not because of thorough valuation.

5. Results and discussion

In the valuation of the H-model the following results of estimated intrinsic were obtained: ČEZ: €44,25, Energiekontor: €32,29 and 7c Solarparken: €10,7. The result of ČEZ and Energiekontor were unsurprising, as the former is a stable firm that pays large sums in dividends and the latter is a still growing firm that pays a little. However, Solarparken proved to be a very interesting option, as the valuation model returned an intrinsic value much higher than what the current market price is. As such based on this valuation method the advice to investors would be to buy and hold ČEZ and 7c Solarparken stocks, while not buying or selling Energiekontor stock.

Using the FCFE model returned similar results; ČEZ: €49,17, Energiekontor: €73,43 and 7c Solarparken: €11,3. While ČEZ and Solarparken further cemented their place as a good stock option, Energiekontor was still unfavorable, and is not recommended to investors as a stock to buy and hold.

Considering data retrieved from the use of the two models, ČEZ and 7c Solarparken are fully recommended as an investment, while Energiekontrol should be sold at the earliest convenience and not bought until its market price falls at least below €70.

6. Conclusion

This thesis was dedicated to exploring approaches to common valuation. In theoretical part the popular top-down model was introduced, with explanations on what to focus in each step of the valuation. Later two valuation models were established, each with applications to different types of firms, properties and user requirements.

In the practical part of the thesis, practical example of valuation is conducted on three different companies that vary in size, age, fame and scope. Results of this valuation are

compared to the market values of the selected firm's shares and insight is provided to potential investors. In this both of the established research questions are answered.

In conclusion, the topic of stock valuation is extremely broad, and nearly anything that happens in the world can affect the price of a stock. More often than not, these factors are beyond the investors influence and also beyond the possibility of prediction. This work merely aims to lend some insight into the world of stocks and perhaps serve as an introduction for new potential investors.

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