Fair value in squeeze-out of large mining companies

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Abstract
The objective of the paper was to evaluate and propose a method for the valuation of the purchase of minority interest in the squeeze-out of large mining companies in the Czech Republic. The research was conducted on a case of a specific company. An analysis of the relevant industry, potential, and financial analysis were performed. Based on these analyses, the method of DCF Equity (Discounted Cash Flow) was selected as a suitable method that can best capture and consider the specifics of the company assessed since, within this method, cash flows are discounted to the owners. The resulting fair value of the transaction reflects the stock market value to determine adequate cash settlement in squeeze-out. It sufficiently compensates the damage caused to the minority shareholder while accepting the price by the majority shareholder, who is willing to pay up to the amount corresponding to the benefits the transaction brings to them. In accordance with the IVS, the selected method is suitable for squeeze-out transactions, where legislators have the information on the values of the majority shareholder´s benefit and knows the value the minority shareholder is willing to accept in squeeze-out.

Keywords
Squeeze-out, fair value, market value, mining companies, stocks, shareholder, DCF Equity

Introduction

Minority squeeze-out enables majority shareholders to freeze out majority shareholders for adequate compensation and thus obtain full control over the target company. Croci et al. (2017) note that positive development of stock price increase the probability of squeeze-out, while operating performance seems to have the opposite effect, with stock price responding positively to the announcement on squeeze-out. Squeeze-out transactions are controversial because majority shareholders may expropriate the shares of minority shareholders at inadequate prices (Chen et al., 2017). According to Broere and Christmann (2021), in squeeze-out, a free-riding dilemma arises between majority and minority shareholders. Marquez and Zilmaz (2012) believe that the free-riding dilemma is partially reduced if minority shareholders have the same information about the value of shares as majority shareholders. According to Rapp (2020), determining an adequate compensation in the case of minority shareholders´ squeeze-out in accordance with the joint-stock company act is a major problem. Guthrie and Hobbs (2021) argue that a law that weakens the position of a majority shareholder in a hostile takeover also forces majority shareholders to a friendly takeover. Legislation of individual states does not provide a precise method of determining the value of shares held by a minority shareholder. According to Kolohoida et al. (2021), uniform regulation of bids at the level of states is maintained thanks to the General Corporation Law of Delaware, which is often a prototype for the corporate law of other states. Other main sources of the regulation of bids at the level of states are court precedents and American Law Institute Restatement of Law. The issue is also addressed by Ofir (2019), who analyses market rules and principles of equal opportunities to prevent inefficient transfers in squeeze-out transactions. According to Croci et al. (2017), post-deal litigations are frequent; almost all squeeze-outs are contested by minority shareholders. The authors claim that additional cash compensation is higher in valuation; evidence suggests that post-deal litigation by contesting the cash compensation offered within squeeze-out brings high profit to minority shareholders. Rationality in the valuation of minority shareholders´ stock is achieved if the estimated valuation contains all available information regardless of the valuation method used. Because value stock value is important for each group of shareholders (Saastamoinen and Savolainen, 2019; Slabá, 2016; Šuleř et al., 2020).

According to Kolohoida et al. (2021), minority shareholders are entitled to require the determination of the real value of shares they are holding and subsequent buyout of the stocks at such value (appraisal right). In many states, the price of purchased stocks is determined as their market value. As Kolohoida et al. (2021) claim, in some states, the court assesses not only the value of shares but also the income they may bring. Ballwieser (2020) sees the standard purpose of determining the compensation in judicial determination of arbitration value based on the subjective marginal price of majority and minority shareholder. The relevant marginal prices shall be determined according to an investment-theoretical valuation approach using the estimates of the future success rates, where uncertainty-revealing approaches shall be used instead of uncertainty-thicking approaches. Ballwieser (2020) argues that the price of majority shareholders needs to be higher than the marginal price of minority shareholders, and the court must choose a value from this range. If this does not happen, for example, due to the ongoing conflict situation, the standardised marginal price of the minority shareholder would be relevant. Broere and Christmann (2021) analyse two standard remedies of shareholders, "avoidance" and judicial "Price fairness review", showing that what restores the free-riding dilemma is strategic gambling of buyers for lower prices and shortcomings in proposal and implementation of squeeze-out laws rather than shareholder litigation.

The objective of the paper is to evaluate and propose a method for purchasing the share of minority shareholders in squeeze-out on a specific case. The research questions are formulated as follows:

The intention of the legislator in a squeeze-out transaction is to find an acceptable fair value both for a majority and minority shareholder.

RQ1: Does the implemented squeeze-out correspond with the intention of the legislator?

Fair value transactions can be identified by finding a suitable valuation method.

RQ2: What is the fair value of the transaction?

Literature Review

Within the neoclassical concept, Follert (2020) compares the investment-theoretical approach used to determine the marginal price and the financial-theoretical approach used to determine the hypothetically objective balanced market stock price. According to Ballwieser (2020), functional business valuation is based on an investment-theoretical basis. In contrast, Follert (2020) recommends that minority shareholders rely on experts who deal with the financial-theoretical business valuation. The International Valuation Standards Council (IVSC) is an international organisation dealing with the creation and publishing of standards – The International Valuation Standards (IVS) in the field of business valuation. The current interpretation of the definition of market value according to IVS is vividly discussed by Walacik et al. (2020). By means of depreciated reproduction costs, Arcuri et al. (2020) improved the analysis of property valuation in accordance with IVS using IT technologies. In the context of IVS, Lorenz et al. (2018) search for alternative approaches and present improvements that can be

achieved by their implementation. According to Mařík (2018), in the area of business valuation, German IDW Standard No. 1 (Grundsätze zur Durchführung von Unternehmensbewertungen) is closer to the conditions of the Czech Republic (CR). The suitability of the IDW Standard No. 1 for valuating capital assets is confirmed by Breuer (2007). Manachynska et al. (2021) introduce an actuarial multidimensional valuation model, i.e. assessment of the balance sheets of net assets as part of the cost approach in the case of agricultural companies. Nosov et al. (2022) determine the market value of land based on the value of surrounding land (cadastral valuation) and coefficient equal to the rate of return on invested capital. Zhichkin et al. (2020) compare the method of cadastral valuation and determine the price based on other indicators with the majority result of mutual agreement. Pronko et al. (2021) establish the basic differences between the areas of application of indicators of company market value and market capitalisation while outlining the current problems of the Ukrainian economy, which limit a wider application of market capitalisation in business valuation. According to the authors, the economic basis of company capitalisation, as well as capitalisation of any other asset, is the current value of future income generated by this asset. Belykh (2021) tries to find a compromise between the current value and development using multidimensional analysis (method of financial ratios, statistical method, balance, systematic and logical thinking, and visual presentation). The author concludes that the increase of the ratio of market value to sales depends mainly on the profitability ratio of assets; however, the influence of the factor is not the same for various segments of the utility diagram. According to the author, multidimensional analysis can be used as an alternative method of business valuation. Macdiarmid et al. (2018) choose a method of market approach with the use of business value as a value metric in determining the value of companies in the mining industry. They identify 8 value drivers (production; commodity price; revenues; earnings before interest, tax, depreciation and amortisation - EBITDA; EBITDA margin; gearing ratio; net debt to EBITDA ratio; a return on capital employed - ROCE). According to the authors, sales, commodity price and EBITDA multiple are the primary value drivers of mining companies, despite the different mix of the commodities. In large businesses valuation, Dierkes and Schäfer (2021) see a frequent assumption of constant and homogeneous growth; however, large companies often divert cash flows to finance other units. In business valuation, Dierkes and Schäfer (2021) consider cross-unit differences in return on invested capital and assume both constant payout and constant growth rate while meeting the condition of the homogeneity of business units. Akulenko and Esina (2021) evaluate businesses in automotive using a methodology based on considering the innovative aspect of their activities and propose a system of indicators based on the information included in accounting statements, which increases the objectivity of the comparative analysis results in business valuation. Pérez-vas et al. (2021) analyse three conventional models (net present value, internal rate of return, and payback) and a newer model of RO (real options), which estimates higher added value by considering the flexibility given by the expansion option in the calculations. A five-factor model focused on capturing size, value, profitability, and investment patterns in average stock returns is, according to Fama and French (2015), unable to capture low average income from small caps stocks, whose returns behave the same way as those of firms than make large investments despite low profitability. Penman et al. (2018) provide a framework for the identification of accounting data indicating risk and expected return. Under specific accounting conditions for measuring earnings profit and book value, Penman et al. (2018) determine expected return and provide reasoning in asset valuation models. Using economic ratios focused on costs and revenues, Teplická et al. (2021) evaluate the efficiency and functionality of mining processes. Relative efficiency is also used by Serrano-Cinca et al.(2021) to determine business value, where relative efficiency is identified by means of Data Envelope Analysis (DEA). The authors find a positive correlation between the efficiency in creating value for shareholders and efficiency in creating value for non-shareholders. However, they point to high sensitivity in selecting DEA outputs. Merchan et al. (2021) determine the value of a business using inventory tables, an estimate of asset value, other income and expenses, and proposals for corporate strategy development. Pysar (2018) uses systematic and analytical methods, as well as the methods of strategic development scenarios, to determine the development potential of the Ukrainian energy market. Sommer et al. (2014) deal with the valuation of peer groups, where companies with negative value indicators (e.g. negative EBIT) are excluded from the groups. The results obtained after the exclusion of such companies provide more accurate business value estimates. Blaesig et al. (2007) focus on the valuation of power plants´ assets in individual sub-periods, quantifying possible revenues and costs in the depreciation range and using production and trading planning tools; they present a stochastic planning tool that would optimise the use of production assets and market decision-making. Guj and Chandra (2019) state that in the case of frequently traded assets (for example, stocks of mining companies), volatility, i.e. the annualised standard deviation of daily price changes, captures both the impacts of market risk (i.e. commodity prices and exchange rates) and private/project risks (i.e. reserves and grades, metal recoveries, variability of capital, recurrent costs, etc.). Oh et al. (2020) confirm that stock markets of mining companies recognise nonmarket risks and apply a discount on the announcement (for example, if mines are located in the proximity of ecologically sensitive water resources) even in the countries with low political and institutional risks.

When determining the market value of a company´s stocks, the value of the corporate brand also plays a role. Aghaei (2021) chooses valuation models for the estimates of brand value in an industry using the multicriteria method Topsis, specifically Intangible Business, as the main model of the research and Brand Finance. According

to the author, the results of the Intangible Business model show that about 78.1 % of the company stock market value is related to its brand. According to Skalický et al. (2021), it is necessary to value the brand in many cases due to the requirement for reporting or transactional or other internal corporate reasons. According to Brunetti et al. (2019), the value of a brand depends on consumer perception of the given company.

Market valuation of companies is also dependent on the compliance and quality of explanations provided in statements and other mechanisms of internal business management (Ullah et al., 2021). The authors suggest that compliance and disclosure of information on quality management are value-relevant, but the ownership of institutional blockholders is negatively related to the market value of a company. Haque and Arun (2016) also confirm that better quality of company management reduces expropriation costs, which increases the investors´ trust in the future growth and thus the value of a company. Tarczyński et al. (2020) propose the use of the correlation between the value and fundamental strength of business stakeholders. According to Dorobantu and Odziemkowska (2017), good relationships with stakeholders increase the value of the business; however, little is known about how the specific types of management and administration affect business value. Březinová and Vrchota (2015) also state the relationship between the company's value, management system and media communication. Adams (2017) analyses the relationships of environmental, social, and political risk; delivering on corporate strategy; non-financial corporate reporting; and supervising the board of directors. By comparing these relationships, the author conceptualises mutual relationships and, by means of cross-country comparison, assesses to which different national social contexts with different governance and reporting lead to different perspectives and approaches to generating value. Social and political effects on business market value are addressed, for example, by Dorobantu et al. (2017), who find out that the reactions of stakeholders and shareholders after crises are largely influenced by the previous perception of stakeholders concerning the target organisations and the reactions of stakeholders on critical events. According to the author, stakeholders with a positive belief about a company mobilise to defend it against a critical even, while those with a negative perception strengthen their resistance. According to many authors, such as Březinová and Průšová (2014), the corporate strategy is a key factor determining the future value of the company. According to Vrchota and Březinová (2014), one of the risks in the industrial sector is the employment season, which may affect future incomes in the form of a shortage of employees of these companies.

Current literature presents many approaches and methods for the valuation of a distressed company; however, according to Buttignon (2020), it is a very tricky matter, and many theoretically suitable proposals (i.e. proposals based on the option valuation theory, even integrated with the theory of games) are very difficult to apply in reality. To be able to face many contingencies emerging in the valuation of real companies, a model of Discounted Cash Flow (DCF) model according to the liquidation scenario. Dorfleitner and Gleissner (2018) introduce a multi-period approach to valuating risky cash flows, where valuation is based on the expected value of the output or input and cash flow risk at the output, as captured by risk measure.

It follows from above that prior to the selection of business valuation method, strategic analysis, which is a prerequisite of trustworthy valuation with a specific result (Mařík, 2018; Škapa, Vochozka, 2019) and financial analysis, which is a basis for the financial plan as a background for revenue-based method, need to be carried out. The company´s macro-environment represents everything outside the business, its market environment, and generates factors that affect it (Hanzelková et al., 2017, Škapa, Vochozka, 2020), while the analysis of the internal potential includes mainly the corporate resources. To determine the market value of mining companies´ stocks (assuming the going concern principle), a suitable method appears to be the revenue-based method, which is the right one from the perspective of the economic theory but which is difficult to obtain data for. The revenue-based method shall be complemented by property valuation of market values.

However, the market value of shares is not sufficient for determining adequate compensation in squeeze-out. The task of an expert is to determine such a value that would sufficiently compensate for the damage of the minority shareholder while accepting the price by the majority shareholder, who is willing to pay up to the amount of the benefits the transaction will bring for them (Sedláková et al. 2019).

Materials and Methods

The environment of a large lignite mining company in the CR will be analysed by means of strategic analysis, where both internal and external aspects influencing the company, directly and indirectly, will be examined.

The strategic analysis includes the following analyses:

- The macroeconomic analysis will assess the potential of the CR economy where the company under review operates and makes most of its sales and the forecast. There will be monitored the development of inflation for forecasting the prices of electricity, lignite and the future development of costs, as well as the development of GDP.
- Analysis of the relevant industry will focus on markets where the company under review makes its sales, i.e. the lignite mining market and generation and selling of electricity and heat.

- Internal analysis of the company under review will lead to identifying resources and determining strategic capability.

The strategic analysis results should determine whether the company under review meets or does not meet the going concern principle.

Financial analysis determines the company's financial health based on the historical accounting data and comparison of the analysis indicators in space and time. It includes the following analyses:

- Horizontal analysis of assets, liabilities and earnings
- Vertical analysis of assets and liabilities
- Analysis of ratios
    - Profitability ratios – return on assets, return on equity, return on invested capital, return on sales I. and return on sales II.
    - Activity ratios – asset turnover, inventory turnover, inventory turnover period, Debtor collection period, asset turnover period and payables turnover ratio
    - Liquidity ratio – quick liquidity, cash liquidity and current liquidity
    - Debt ratios – Debt I., Debt II. and interest coverage
- Methods of comprehensive evaluation.
    - Solvency Index
    - Modified Taffler Index

A financial plan including the period until the depletion of coal resources (i.e. until 31 December 2036) is prepared, and its components are divided into costs, revenues, earnings, adjusted operating earnings, corporate tax, paid-up (or accepted new) interest-bearing debt, interest payable, capital construction, risks and non-operating assets. The plan is prepared using artificial neural networks (NN), specifically multilayer perceptron networks (MLP) and radial basis function networks (RBF). We work with the time series regression, and subsequently, variables are selected. For both variables, the predictor will be time, specifically year. Total costs or corporate tax rates are determined as the target variable. Subsequently, the parameters for calculating NN are set as follows:

1) number of iterations: 10000,
2) number of retained networks with the best performance: 5,
3) number of neurons in hidden layer MLP: 2-8,
4) number of neurons in the hidden layer RBF: 21-30,
5) signal propagation function in the hidden and output layers of MLP:
   a. Identity,
   b. logistics,
   c. hyperbolic tangent,
   d. sine,
6) other settings remain default.

The optimisation is carried out using the BFGS and RBFT algorithms. From the offered NN, the one with the best statistical characteristics (performance, error) and not suffering from overfitting is selected (otherwise, the statistical characteristics would be good, but the result would be nonsensical). The selected NN is applied as a model for predicting the given variable. Other variables are calculated in relation to costs or variables derived from costs (by analogy, EFC - Executive Fruit Company). The ratio for the prediction is determined by the weight of the current course of the variable to total costs, total extraction, or fixed assets. The overall amount of interest expense is predicted using linear regression based on the data from 1994-2004. The value of accepted interest-bearing debt is always 0 for the predicted period since the company is not expected to use debt in the coming years.

Based on the results of strategic and financial analyses and a summary of all (financial and non-financial) data, a suitable valuation method can be selected. In accordance with the selected revenue-based method, the amount of adequate compensation is determined, which would compensate the damage caused to minority shareholders by their squeeze-out from the company.

The analyses are performed using the data of the company for the accounting years 1994-2004.

For company characteristics, strategic analysis, financial analysis, financial plan, selection of valuation method etc., the following data and resources are used:

- Business register and collection of documents,
- Annual reports and financial statements of the company under review,
- Official websites of the company,
- Decision on mining permit,
- Shares owned by the company,
- An asset transfer agreement,
- Provided and verified information.

When assessing the potential of the company by means of strategic analysis, the data from the following resources are used:

- Czech Statistical Office websites,
- Czech National Bank (CNB) websites,
- Eurostat websites,
- Energy Regulatory Office websites,
- Laws and regulations of the CR,
- State energy concept of the CR from 2004,
- Macroeconomic predictions of the Ministry of Finance of the CR from October 2004,
- Macroeconomic predictions of the Ministry of Finance of the CR from April 2005,
- other publicly available resources.

Results

1. Strategic analysis

The strategic analysis includes the analysis of external factors, such as the macroeconomic environment, and analysis of internal factors influencing the company being valuated. The main goal of the valuation is to assess the revenue potential of the given company.

1.1. Macroeconomic analysis

The actual growth of the Czech economy in 2003 achieved 3.1 %. The economic level of the country is gradually catching up with the developed neighbouring countries, mainly due to the increase in gross fixed investment and exports. GDP growth is expected to remain at ca. 3.8 % in 2004 (compared to 3.1 % in 2003) and to decrease to 3.6 % in 2005 (compared to 3.2 %). The slight decrease in 2005 reflects the risks associated with the delayed effects of high oil prices. The growth was also enhanced by investments and household consumption. Although exporters increased their export performance, import still retained the edge over exports at constant prices. According to the Ministry of Finance of the CR, in the near future, the Czech Republic´s accession to the EU will still have a positive effect. Significant investment dynamics and stabilisation of the growth rate of household consumption are expected. In 2005, GDP growth was expected to reach ca. 3.6 %.

There are certain risks to maintaining positive development in the balance of public finance, where the public finance reform plays the most important role. Another possible risk is the development of oil or even metal prices. As market-driven estimates of GDP growth cannot be estimated, estimates released by trustworthy sources must be used. The table below shows the past development of the Czech Republic´s GDP and its forecast until 2007 according to the Ministry of Finance of the CR.

Table Development of GDP in CR and its forecast

Indicator/Year	2000	2001	2002	2003	2004	2005	2006	2007
Real GDP growth	3.9	2.3	1.5	3.1	3.8	3.6	3.7	3.8
Nominal GDP growth	5.3	7.7	4.3	4.9	8.0	6.8	6.8	7.1
Price level growth rate	1.3	5.0	2.8	1.7	4.0	3.1	3.0	3.2

Source: Macroeconomic prediction of the Ministry of Finance of the CR from October 2004

The forecast is calculated based on the expected development of the price level using the formula below:

$$1 + \% \ price \ level \ change = \frac{1 + \% \ nominal \ GDP \ growth}{1 + \% \ real \ GDP \ growth}$$

In 2003, the real growth of the Czech economy achieved 3.1 %, with consumer prices growing slightly in 2004. The majority part of this increase is caused by adjustments of GDP, excise tax, and changes in energy prices. Inflation also influenced solid economic growth and several price shocks, for example, in the case of oil. In addition, the year-on-year price increase was affected by higher prices of housing and food. In 2004, administratively influenced prices increased by 5.7 %, while market prices by 2 %. The Ministry of Finance o the CR expected 3.3% inflation for the year 2005 and 2.8% inflation for the year 2006. Inflation expectations for the three-year horizon published by the CNB is 2.8 %. The above institutions did not make a longer-term inflation forecast. According to Wojtyra et al. (2020), it is also important to determine the position of the end customer in the Czech Republic at finding the market price of the product.

In 2005, a decrease in the number of pice shocks and the related slight slowdown in the inflation rate was expected. Fuel and food prices are the key to the future development of inflation. Food prices are higher than those estimated by the CNB, and their future development is thus uncertain. The market and EU opened up for local farmers; purchase prices are thus rising, and the question remains of how long retailers and wholesalers will be able to push food prices down. On the other hand, the increase in food prices is offset by the decrease in fuel prices, which are expected to fall significantly at the end of the winter heating season, when oil prices are likely to fall globally. Strong inflation to euro and dollar, which will reduce the price of imported goods, will also have a positive effect on the expected inflation rate in 2005.

The CR shows the most stable price level of the eight post-communist countries which joined the EU, which makes the CR one of the countries with low-inflation economies. For the year 2005, the average growth of consumer prices is expected to be 2.4 %, while the industrial producent price growth is 2.5 %.

At the monetary policy meeting, the CNB kept the interest rates at the end of 2004 at the current level, achieving 2.5 %. Compared to its neighbours, interest rates in the CR are the lowest ones.

1.2. Analysis of the relevant industry

The company under review is active in the field of lignite mining and in the market of generation and sale of electricity and heat. These two fields account for 80 % of the earnings of the company, where the majority part (50 %) is represented by the generation and sale of electricity and heat. The sale of own products and by-products of gasification account for the remaining 20 %.

In the CR, electricity is generated in desulphurisation coal power plants (approx. 66 % of the total production in the year 2004), nuclear power plants (about 31 %) and hydropower plants. The majority producer of electricity in the CR is ČEZ, which produced about 61.6 TWh in the year 2004.

Coal power plants have the largest share in the production of electricity in the CR. Over the whole monitored period, they did not deviate from the constant values. In contrast, the largest percentage of electricity is produced by wind power plants. In 2003 and 2004, there was an increase in the production of electricity in nuclear power plants, which was due to the launching of the Temelín Nuclear Powerplant.

In 2004, the total production of electricity in the CR was 84 TWh, where the share of coal powerplants was approx. 63 %, while the share of nuclear powerplants was about 31 %. The company under review contributes some 5 % to the total electricity production in the market.

Lignite is the main source of energy production. In 1990, 78.4 million tons of lignite was mined in the CR. In 1998, it was only 51.3 million tons due to the nationwide restrictions of coal mining from the state. The future level of lignite mining will result from the accepted energy policy. If it is possible to use only the reserves allowed to be mined and energy consumption continues to grow, the increasing deficit could cause the depletion of lignite reserves by the year 2030.

Lignite is used mainly in the energy sector and, to a lesser extent, also in the chemical industry. In the CR, lignite remains the main energy source. Its deposits are located in the North Bohemian basin (Chomutov, Most, Teplice), in the Sokolovská basin and Cheb basin. The launch of the Temelín Nuclear Powerplant has resulted in energy savings as well as the use of local energy minerals, and thus the lignite deposits are expected to last longer.

In the CR, 47.84 million tons of lignite was mined in 2004; despite the sharp decline recorded in the coal industry after 1990, lignite remains the most important source for generating electricity and heat. Given the current mining limits approved in 1991, lignite quarries in the CR are expected to be depleted by 2030-2040.

Internal analysis

In the commodity of support services, in 2004, the company retained a significant share in the Czech market, namely 25.5 % in secondary regulation, 13.1 % in positive tertiary regulation and 8.2 % in negative tertiary regulation. Overall, it is the second best-known provider of support services. In 2004, the company also retained a good position in the lignite market, specifically 20.98 %. As a producer of soot, the company´s share in the market is 22.03 % and 7.46 % as a producer of grade coal.

The company trades in its basic products mainly on the basis of long-term contracts and short-term (one-year) purchase agreements. In the field of electricity, the company´s largest customer buys about 76.4 % and the second largest one 12.4 %. In the field of solid fuel, the largest consumers are power plants, heating plants, and wholesalers. A significant part of sales is also directed to other industries, e.g. chemical or engineering. In the area of sales of carbochemical products, customers were both from the CR and abroad.

The strategic analysis thus indicates that the CR is a low-inflation economy, with the average increase in consumer prices and prices of industrial producers fluctuating around 2.5 % in 2005. The lignite market remains stable and favourable for the company since it is an important, reliable and cheap domestic energy resource. This is mainly due to the irreplaceable supply from abroad and the growing energy consumption. Based on the findings of the strategical analysis, the going concern principle is not threatened (or the viability of the company until the depletion of the coal reserves).

2. Financial analysis

The purpose of financial analysis is to gain information about the financial health of a company. The main benefit is the comparison of individual indicators in time and space. The financial analysis represents a systematic analysis of data obtained mainly from financial statements.

Absolute ratios analysis shows a development of the key items of balance sheets and profit and loss account over time. This analysis is prepared in the form of a time series of the main indicators for the past periods, specifically for the development of assets, liabilities, and selected earnings of the company for the years 1994-2004.

2.1. Horizontal analysis

Horizontal analysis is based on observations of the values of time series indicators. In order to be able to consider the results of the horizontal analysis valid, the following conditions need to be met:

- Select the adequate length of the time series with the minimum of 5 years – in the case of the company under review; the length is 11 years (i.e.1994-2004),
- The same content of the indicator – the same calculation method,
- Confirmation that there have been no significant changes in society.

The above conditions were observed for the horizontal analysis.

Assets consist of fixed assets, current assets and accrued assets, with the fixed assets as the largest share accounting for 74.3 % of the total assets. No significant changes were recorded throughout the monitored period in the aforementioned assets. The average growth rate of the total assets in the monitored period 1994-2004 accounted for 2.7 %, and the balance-sheet total increased by CZK 3,877,905 thousand.

In terms of fixed assets, the largest share was represented by constructions (37.92 % of the total assets on average), individual movable assets and sets of movable assets (48.29 % of the total assets on average), unfinished, tangible fixed assets, and advances provided for tangible fixed assets.

Liabilities include equity, debt, and accrued liabilities. The largest liabilities item was equity throughout the monitored period, accounting for 62.8 % on average. The average growth rate of the total liabilities in the period 1994-2004 was 2.7 %, while the average growth rate of equity was 3.45 %. The company was almost two-thirds financed from its own resources. The golden balance rule of risk equalisation (i.e. the same or higher ratio of equity and debt) is observed.

Equity consists mainly of share capital (77.94 % of equity on average), funds (i.e. capital funds, reserve funds, profit funds, and other funds), earnings of the previous years and earnings of the current accounting period.

Debt is mostly represented by reserves (46.41 % of debt on average), long-term payables, short-term payables, bank loans and advances.

For the whole monitored period, the company achieved positive earnings for the accounting year, which grew except for the years 1995, 1997 and 2002. The amount of the total profit consists mainly of operating earnings. The sum of financial and extraordinary income achieved low or even negative values until the year 2000. This was mainly due to the interest expense. The highest profit was reported in the last year of the monitored period (2004), where the earnings for the accounting year was CZK 741,038, which was four times higher than the earnings from the year 1994. The year 2004 was successful for the company mainly due to the fact that the company increased sales o services and own products nearly by 8 % compared to the preceding year.

Vertical analysis

Vertical analysis is used to analyse the structure of assets and liabilities. In this case, the total assets and total liabilities can be considered synthetic ratios (accounting for 100 %), which are subdivided into individual parts. The objective of the vertical analysis is to determine the structure, i.e. the percentage share of sub-ratios on the synthetic ones in the monitored period of 1994-2004. The total assets consisted mainly of fixed tangible assets, whose average share represented 73.3 % of the balance sheet sum. Fixed intangible assets accounted for no more than 0.5 % (in the year 2002) of the total sum, while fixed financial assets 2.2 % (in the year 2004).

The share of the current assets on the total assets in the monitored period ranged between 16.2-30.9 %. The most important item of the current assets was short-term financial assets represented by cash in a bank account and short-term securities and shares. Another important item of the current assets were short-term receivables, consisting mainly of short-term trade receivables.

In the monitored period, the company financed its assets mainly from its own resources, whose share on the total liabilities grew, achieving 68.2 % at the end of the year 2004.

The dominant item of both liabilities and equity was the share capital in the amount of CZK 6,782,99d (in the first three years of the monitored period, the amount was about 170,000 lower), which represented the most significant item of the total assets. The major item of debt were reserves (13.1 % - 20.0 % of the total liabilities), represented mainly by statutory reserves for recovery and reclamation of land affected by mining and servers for property repairs). In the years 1994-1999, bank loans represented a significant item of debt financing. Since the year 2000, their share of total liabilities decreased gradually, accounting only for 1.1 % in the year 2004.

2.2. Analysis of ratios

The financial analysis ratio monitors the financial health and strength from several perspectives: profitability (return), activity, liquidity, and debt (solvency). More details in Table 1.

Table 1. Profitability ratios

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
ROA	3.28 %	3.30 %	2.55 %	3.03 %	2.87 %	3.26 %	3.76 %	4.30 %	3.80 %	3.59 %	6.30 %

ROE	2.30 %	2.21 %	2.61 %	1.91 %	2.03 %	2.24 %	3.37 %	5.08 %	3.20 %	4.94 %	7.06 %
ROCE	3.46 %	3.55 %	2.88 %	3.36 %	3.18 %	3.60 %	4.23 %	4.76 %	4.18 %	3.90 %	6.77 %
ROS I.	2.88 %	2.82 %	3.16 %	2.43 %	2.75 %	3.16 %	4.91 %	7.16 %	4.65 %	7.34 %	10.33 %
ROS II.	6.38 %	7.39 %	5.27 %	6.74 %	6.60 %	7.07 %	8.44 %	9.66 %	8.43 %	7.74 %	13.50 %

Source: Authors

All the above profitability ratios achieved positive values since the company achieved profit in the monitored period. The best results were achieved for the year 2004. This was mainly due to the highest earnings in the year.

Table 2. Activity ratios

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Asset turnover	0.51	0.45	0.48	0.45	0.43	0.46	0.45	0.45	0.45	0.46	0.47
Inventory turnover	22.52	22.27	22.09	20.67	19.23	18.86	19.87	15.98	16.40	19.64	26.87
Asset turnover period	701.04	806.06	744.56	800.53	828.43	780.59	807.45	808.97	798.78	775.66	771.82
Inventory turnover period	15.98	16.17	16.29	17.42	18.72	19.09	18.11	22.53	21.95	18.33	13.40
Debtor collection period	91.62	88.78	64.41	73.06	107.78	56.74	66.67	53.41	65.47	52.82	42.06
Payables turnover ratio	36.40	48.78	51.80	40.82	50.24	49.42	63.56	55.54	57.80	48.30	48.99

Source: Authors

Inventory turnover indicates that the highest utilisation of inventory was achieved in the year 2004. Debtor collection period provides information on how many days the company needs to collect its receivables. The period ranged from 42-108 days. The shortest debtor collection period was recorded in the year 2004, mainly due to the reduction of the number of receivables and increase in sales (Table 2).

Table 3. Liquidity ratios

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Current liquidity	3.75	3.24	1.50	2.30	2.78	2.22	2.19	2.92	2.82	2.91	4.42
Quick liquidity	3.31	2.86	1.29	1.87	2.53	1.90	1.80	2.57	2.46	2.55	4.11
Cash liquidity	0.79	1.09	0.50	1.11	1.10	1.18	1.19	1.88	1.59	1.75	3.39

Source: Authors

All liquidity ratios were in order in the monitored period, given the values recommended by experts. The company achieved the expert-recommended values, which means at least 1 in the case of current liquidity, 0.7 in the case of quick liquidity, and 0.2 in the case of cash liquidity (Table 3).

Table 4. Debt ratios

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Debt I. (Debt equity)	0.56	0.74	0.69	0.74	0.69	0.54	0.53	0.58	0.53	0.45	0.47
Debt II. (Debt ratio)	0.36	0.42	0.41	0.42	0.40	0.35	0.35	0.37	0.34	0.31	0.32
Interest coverage	2.98	4.06	2.53	2.59	2.67	3.49	5.18	8.60	13.54	27.64	98.48

Source: Authors

According to Kučera et al. (2021), the safe debt to equity ratio is 40 % of debt to equity (Table 4). In other words, Debt I. (Debt equity) should not exceed 0.40. The company did not exceed this value throughout the whole monitored period, and its assets are mostly financed through its own resources. The level of debt resources ensured sufficient long-term solvency. The growing interest coverage points to the gradual decrease in using bank loans and advances.

2.3. Comprehensive business evaluation

As the company is located in the CR, the comprehensive business evaluation methods applied are only those that take the location into consideration, i.e. Solvency index and Modified Taffler Index.

The solvency index is used to determine whether the company is solvent or insolvent. The Solvency index uses six ratios with assigned relevant weights to classify the company into one of these groups (Table 5).

Table 5. Solvency index

Solvency Index	Weight	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CF/Debt	1.5	0.17	0.14	0.17	0.16	0.22	0.28	0.30	0.26	0.26	0.35	0,36
A/Debt	0.08	2.79	2.38	2.47	2.35	2.47	2.86	2.89	2.74	2.91	3.22	3,15
Profit/A	10	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.03	0,06
Profit/Revenues	5	0.04	0.06	0.03	0.04	0.04	0.05	0.07	0.09	0.08	0.07	0,13
Inventory/Revenues	0.3	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.05	0,04
Revenues/A	0.1	0.51	0.45	0.48	0.45	0.43	0.46	0.45	0.45	0.45	0.46	0,47
Solvency index		0.98	0.98	0.83	0.89	0.97	1.20	1.38	1.48	1.42	1.56	2.14
Evaluation of the financial situation		Problem.	Problem.	Problem.	Problem.	Problem.	Solvent	Solvent	Solvent	Solvent	Solvent	Very Solvent

Source: Authors

Throughout the whole monitored period, the Solvency index did not fall below the critical value of 0, which indicates that the company was not at the risk of insolvency in none of the years of the monitored period. The worst solvency was recorded in the years 1994-1998. From the year 1999, the solvency of the company was evaluated as good, and even very good in the last year of the monitored period. The evaluation of the company under review by individual years without any interconnection was positive, despite the first five relatively weaker years when the company's financial situation was problematic according to the Solvency index. In each year, the value of the index was close to 1, which indicates a good financial situation of the company.

Taffler index uses four ratios, which represent sets of the original 90 ratios. There are two variants – basic and modified. For the purposes of the evaluation, the modified variant was used (Table 6).

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Table 6. Modified Taffler Index

Modified Taffler Index	Weight	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
EBIT/KZ	0.53	0.63	0.55	0.24	0.32	0.32	0.35	0.36	0.48	0.43	0.45	0,90
OA/Debt	0.13	0.54	0.47	0.40	0.51	0.62	0.59	0.67	0.72	0.73	0.74	0,97
KZ/A	0.18	0.05	0.06	0.11	0.10	0.09	0.09	0.11	0.09	0.09	0.08	0,07
Sales/A	0.16	0.51	0.45	0.48	0.45	0.43	0.46	0.45	0.45	0.45	0.46	0,47
Modified Taffler index		0.50	0.43	0.27	0.32	0.33	0.35	0.37	0.43	0.41	0.43	0.69
Evaluation		Solvent	Solvent	Grey zone	Solvent	Solvent	Solvent	Solvent	Solvent	Solvent	Solvent	Solvent

Source: Authors

According to the Modified Taffler Index, the company is evaluated as very good, solvent in all years except for the year 1996, when it was in the so-called grey zone, but its value was very close to solvent companies. The worse result was mainly due to the lower value of EBIT / short-term payables. In the year 1996, the company achieved the lowest EBIT with the highest short-term payables of the whole monitored period. However, from the next year, EBIT was growing.

Given the remaining recoverable reserves of the company, the financial analysis assumes the termination of its activities, completion of reclamation activities and liquidation of the company after the year 2036. This is primarily based on the data on the assumptions on coal mining prepared by the management of the company and capturing plans and savings of the new majority owner, who is able to accept them. The presented outlook shows the assumed development of assets, liabilities, cash flow revenues, costs for the period 2005-2014. Some data, such as the amount of investment, depreciation are taken over according to the outlook of the company, but some of them are modelled (predicted) separately by means of the regression function of the own model of the neural network.

The determined and accepted values are at constant prices. In the financial plan, the amounts are not adjusted for inflation. The financial plan works with the values not adjusted for the change in the price level, mainly due to the fact that an annual increase in revenue and expense items by the assumed inflation would increase the revenues and costs by the same percentage. In the next step, in their subsequent discounting, i.e. determining their net present value as of the valuation date, would provide the same values as if the adjustment for the assumed change in the level price (the original ones) is not included.

For the period from 2005 until the extraction of the total coal reserves and the cessation of the activities of electricity generation and other activities, the financial plan was compiled on the basis of the mentioned materials and documents. The following text contains sections that are essential for the compilation of a comprehensive financial plan for the period 2005-2036 applicable to the selected valuation method. It's about:

- the proposed use of production capacities of the mining and processing departments of the company,
- costs (including Other costs and Depreciation),
- revenues,
- earnings,
- adjusted operating earnings before tax,
- corporate tax,
- paid-up (or accepted new) interest-bearing debt,
- interest payable,
- capital construction,
- risks,
- non-operating assets.

Forecasting, predicting or planning future development (drawing up a financial plan) must be based on the model based on certain assumptions. In general, the model represents a simplified form of the most important features of a given section of reality built according to certain rules that imitate the given reality's behaviour and features.

The costs for the years 2005-2036 were predicted using the MLP 1-7-1 neural network. The neural network enabled the identification of the correlation coefficient between the total mining, which is detectable (assumed) based on the documentation prepared by the management of the company until the year 2036, and total costs obtained from the financial statements until the year 2004.

Correlation refers to the mutual linear relationships between observations or quantities x and y. The correlation coefficient expresses the degree of correlation, which can reach the values between -1 and +1, where the value of +1 indicates a direct dependence.

The correlation coefficient or the degree of correlation between the total mining and total costs according to the neural network was more than 0.96. This result can also be interpreted as total coal mining accounting for 96 % of the total costs. From the statistical point of view, it is recommendable to use a result that is at least 90 % correlated, which is the case here (Table 7).

Table 7. Expected costs for the period 2005-2036 (Million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total costs (Million CZK)	7 506	7 501	7 520	7 519	7 519	7 519	7 519	7 519	7 519	7 519	7 488
Mining (thousand tons)	9 600	9 570	9 666	9 664	9 664	9 664	9 664	9 664	9 664	9 664	9 500
Total costs/mining	0.782	0.784	0.778	0.778	0.778	0.778	0.778	0.778	0.778	0.778	0.788
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total costs (Million CZK)	7 488	7 488	7 488	7 488	7 488	7 341	7 341	7 341	7 341	7 341	4 570
Mining (thousand tons)	9 500	9 500	9 500	9 500	9 500	8 000	8 000	8 000	8 000	8 000	5 000
Total costs/mining	0.788	0.788	0.788	0.788	0.788	0.918	0.918	0.918	0.918	0.918	0.914
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Total costs (Million CZK)	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	-
Mining (thousand tons)	5 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	1 327	-
Total costs/mining	0.914	2.285	2.285	2.285	2.285	2.285	2.285	2.285	2.285	3.444	-

Source: Authors

When determining the FCFE, the adjusted operating earnings (after tax) need to be further adjusted for items representing non-cash transactions, i.e. other costs included in the operating earnings which do not represent expenses in the current period. These include changes in reserve balances, changes in provisional balances, changes in accrued balances and accrued accounts, as well as the depreciation of fixed assets.

The amount of total other costs for the period 1994-2004 achieved CZK 5,413 million, the earnings in the monitored period achieved CZK 4,503 million. The ratio of these variables is 1,20218097664. This coefficient is used to predict other costs in the period 2005-2036 (Table 8).

Table 8. Predicted Other costs for period 2005-2036 (Million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Earnings (Million CZK)	444	443	444	445	445	445	445	445	445	445	443
Other costs (Million CZK)	534	533	535	535	535	535	535	535	535	535	533

Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Earnings (Million CZK)	443	443	443	443	443	435	435	435	435	435	271
Other costs (Million CZK)	533	533	533	533	533	522	522	522	522	522	325
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Earnings (Million CZK)	271	271	271	271	271	271	271	271	271	271	-
Other costs (Million CZK)	325	325	325	325	325	325	325	325	325	325	-

Source: Authors

In depreciation modelling, the first step is to predict the trend of the fixed operating assets subject to depreciation. As the second step, the amount of planned depreciation for the period 2005-2036 is determined from the obtained values.

The resulting ratio of fixed assets and coal mining for the period 1994-2004 is 0.948848359. This indicates that nearly 0.95 thousand tons of lignite were mined using fixed assets at the amount of CZK 1 million in this period.

Based on the information obtained from the forecast document of the company, it shall be considered that in the next years (after 2004), the implementation of the certain investment project is a priority, which enables long-term processing of low-grade coal and contributes to ensuring the operation of the company as a whole.

As these investment projects have mainly the form of investment in depreciable assets (e.g. oxygen plant, pipeline, other constructions, etc.), the amount of fixed (operating) assets or the period 2005-2014 was taken from the long-term forecast document of the company, which considers the planned, completed, or launched investment projects. In the planned period from 2015 to 2036, there is the assumption that the same amount of fixed assets will be necessary for mining approximately the same quantity of coal as in the years 1994-2004 (Table 9).

Table 9. Predicted operating fixed assets for period 2005-2036 (Million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fixed assets (Million CZK)	10 878	10 782	10 770	10 735	10 714	10 689	10 644	10 566	10 506	10 480	9 109
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fixed assets (Million CZK)	9 080	9 172	9 170	9 170	9 170	9 170	9 170	9 170	9 170	9 014	9 014
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Fixed assets (Million CZK)	9 014	9 014	9 014	9 014	7 591	7 591	7 591	7 591	7 591	4 744	-

Source: Authors

The resulting ratio of fixed assets and depreciation provides information on the amount of depreciation in relation to the fixed operating assets. The overall amount of depreciation in the monitored period was CZK 9,890 million, while the number of fixed assets was CZK 11,941 million. The ratio is thus 0. 088346857 (Table 10).

Table 10. Predicted depreciation of operating asset for period 2005-2036 (Million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fixed assets (Million CZK)	10 878	10 782	10 770	10 735	10 714	10 689	10 644	10 566	10 506	10 480	9 109
Depreciation (Million CZK)	961	953	951	948	947	944	940	933	928	926	805
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fixed assets	9 080	9 172	9 170	9 170	9 170	9 170	9 170	9 170	9 170	9 014	9 014

(Million CZK)											
Depreciation (Million CZK)	802	810	810	810	810	810	810	810	810	796	796
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Fixed assets (Million CZK)	9 014	9 014	9 014	9 014	7 591	7 591	7 591	7 591	7 591	4 744	-
Depreciation (Million CZK)	796	796	796	796	671	671	671	671	671	419	-

Source: Authors

According to the neural network MLP 1-7-1, the correlation coefficient or the degree of correlation between the overall mining and total costs exceeds 0.96, which means that the total coal mining represents 96 % of the total costs. Based on this very good result, the values of total costs shall be chosen as fixed constants from which other items such as total revenues are derived.

The total planned revenues for the period 2005-2036 are determined using the product of the ratio of accumulated overall revenues to total costs for the period 1994-2004 and predicted amount of the total costs for the period 2005-2036 according to the neural network (see the formula below).

$$Predicted\ total\ revenues_{T+1} = \frac{\sum Total\ revenues_{1994-2004}}{\sum Total\ costs_{1994-2004}} * Predicated\ total\ costs_{T+1}$$

Where T = 2004-2035

Planned or predicted total revenues of the company for the period 2005-2036 are determined based on the above formula, i.e. predicted total costs in a given year multiplied by coefficient 1.059178284.

The earnings for the years 2005-2036 are data predicted based on the difference of predicted total revenues and predicted total costs in a given year (Table 11).

Table 11. Predicted earnings for the period 2005-2036 (million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total costs (million CZK)	7 506	7 501	7 520	7 519	7 519	7 519	7 519	7 519	7 519	7 519	7 488
Total revenues (million CZK)	7 950	7 944	7 964	7 964	7 964	7 964	7 964	7 964	7 964	7 964	7 931
Earnings (million CZK)	444	443	444	445	445	445	445	445	445	445	443
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total costs (million CZK)	7 488	7 488	7 488	7 488	7 488	7 341	7 341	7 341	7 341	7 341	4 570
Total revenues (million CZK)	7 931	7 931	7 931	7 931	7 931	7 776	7 776	7 776	7 776	7 776	4 841
Earnings (million CZK)	443	443	443	443	443	435	435	435	435	435	271
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Total costs (million CZK)	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	4 570	-
Total revenues (million CZK)	4 841	4 841	4 841	4 841	4 841	4 841	4 841	4 841	4 841	4 841	-
Earnings (million CZK)	271	271	271	271	271	271	271	271	271	271	-

Source: Authors

For the whole predicted period, the company will report positive earnings – profit – until the depletion of coal reserves. In the years 2005-2025, the reported annual profit will be about CZK 435 million. From the year 2026, there will be a decrease in the profit to CZK 271 million with a constant decreasing trend until the termination of the business activities (the year 2036). The decrease will be caused by the declining lignite mining.

Adjusted operating earnings is operating earnings generated only by operating capital, and it is a basis for determining free cash flows.

Adjusted operating earnings can be calculated as follows:

Operating earnings (OE)

- one-off operating revenues arising from non-operating assets

+ One-time operating expenses arising from non-operating assets
+ financial investment income and interest expenses, if arising from operating assets
- Financial costs related to operating assets
= revised operating earnings (before tax)

Planned adjusted operating earnings before tax for the period 2005-2036 are calculated as a product of accumulated adjusted operating earnings before tax (hereinafter referred also as "KPVHpředZ") and accumulated earnings for the period 1994-2004 and predicted amount of operating earnings for the period 2005-2036.

$$\begin{matrix} \text{Predicted adjusted operating} \\ \text{earnings before tax} \end{matrix}_{T+1} = \frac{\sum \text{Adjusted operating earnings before tax}_{1994-2004}}{\sum \text{Earnings}_{1994-2004}} * \text{Predicted earnings}_{T+1}$$

Where T = 2004-2035.

The ratio of accumulated operating earnings before tax to accumulated operating earnings for the period 1994-2004 is the coefficient 0.944750442525046 (Table 12).

Table 12. Predicted adjusted operating earnings before tax for period 2005-2036 (million CZK)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Earnings (million CZK)	444	443	444	445	445	445	445	445	445	445	443
Predicted adjusted operating earnings before tax (million CZK)	419	419	420	420	420	420	420	420	420	420	418
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Earnings (million CZK)	443	443	443	443	443	435	435	435	435	435	271
Predicted adjusted operating earnings before tax (million CZK)	418	418	418	418	418	410	410	410	410	410	255
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Earnings (million CZK)	271	271	271	271	271	271	271	271	271	271	-
Predicted adjusted operating earnings before tax (million CZK)	255	255	255	255	255	255	255	255	255	255	-

Source: Authors

Personal income tax for the period 1994-2004 showed a declining trend, falling by 14 % over 11 years from the initial 42 % to 28 %. For the following period, Personal Income Tax is predicted using neural network MLP 1-8-7. In the period 2005-2009, the predicted corporate income tax fluctuated around 22 – 23 % (specifically, 22 % in 2005 and 23 % in the years 2006-2009). For the period 2010-2036, the corporate income tax rate is expected to be 21%.

The predicted values of paid-up interest-bearing debt or the values of new interest-bearing debt are based on the historical data of the company on paid-up or new interest-bearing debt. Based on the data obtained from the annual report on the use and repayment of bank loans and advance, it can be stated that the company is trying to gradually meet its obligations to credit institutions until it reaches the stage when only its own resources will be used for financing its business activities. The above regression $y = 48.722x + 97837$ of paid-up interest-bearing debt shows that the debt liability for bank credits and advance should be paid in the year 2008. For the period of the prepared financial plan, new financial resources are considered. No data indicate the possible use of additional debt from creditors.

To correctly determine free cash flows for creditors (FCFE), the first necessary step is to deduct interest expenses from adjusted operating earnings before tax. The trend function (linear) $y = -13.285x + 26651$ is determined based on the historical data on interest expenses in the preceding 11 years. The development of interest expenses values shows a decreasing trend. Within the predicted period, interest expense is considered only for the years 2005 and 2006. From 2007 until the termination of business activities in 2036, zero interest expense is considered. The predicted course corresponds with the expected structure of debt.

The priority of the investment plan for the nearest future is the finalisation or implementation of investments that would enable the processing of coal of worse quality in terms of sulfur and ash content in the long run. Decisive capital construction includes the completion of a new oxygen plant, investment project "Opening of the new oxygen plant", finalisation of the construction of a new unit for the utilisation of liquid by-products of gasification under pressure, and completion of innovation steps in the technology for desulphurisation of expanding gases in compression gas processing plant in order to increase its operational reliability, capacity, and ability to process

high-sulfur coal. The investment asset renewal plan is full of activities that should enable the operation of all technologies of the processing and mining parts in the next at least 20-year cycle until the year 2014, i.e. until the depletion of coal reserves. The historical data on capital construction for the preceding 11 years determine the trend function (linear) as $y = -72.45x + 146\ 135.39$. The identified function shifted by ten years (i.e. intermittent time series) is used to predict the trend of capital construction further. Therefore, for the period 2005-2014, capital construction is planned to be constant at the amount of CZK 900 million per year (information is taken from the forecast document of the company). The aforementioned fundamental investment projects should enable and ensure the operation of the company for at least the next 20 years (i.e. at least until 2034); gradual reduction of investment is assumed until the depletion of coal reserves.

The non-operating assets of the company were quantified as of 31 December 2004 in the amount of CZK 226 million (financial investments), CZK 111 million (other financial investments), and CZK 8 million (other non-operating assets).

The performed analyses (financial and strategic) confirmed that the company shows a revenue potential, meets the going concern assumption and is assumed to show positive revenues until the termination of its business activities. Therefore, the most suitable methods seem to be revenue-based methods. For the valuation, the method of discounted cash flows, specifically the DCF Equity variant, is best able to capture and consider the specificity of the company under review.

Discounted rate is used to determine the amount the investor would pay now (present value) for the right to receive the expected flow of payments (for example, cash flow) in the future. The discounted rate for these methods (methods based on discounted cash flows) of calculating the business value is determined depending on the cash flow used:

- FCFF – at the level of the average weighted costs of equity (WACC), where the individual components are costs of equity and cost of debt and their weights,
- FCFE – at the level of costs of equity (r_e).

For the valuation, the DCF Equity method will be used, where the free cash flow of equity is discounted, and the discounted rate is used at the level of the cost of equity. The following text thus deals with the costs of equity (r_e). The discounted rate is determined for each year of the period 2005-2036.

Cost of equity expresses the expected rate of return for investors with regard to the degree of risk related to this investment. The cost of equity is most often determined using the CAPM (capital asset pricing model). Using this method, the cost of equity is calculated as follows:

$$re = rf + \beta * (RP + RR)$$

Where: r_e Cost of Equity
r_f Risk-free rate
β Beta coefficient
RP Risk premium
RR Residual risk

The risk-free rate for the period 2005-2036 is based on the historical data on the yield of the 10-year government of the CR for the period 2000-2004 obtained from the public database CNB ARAD. The predicted risk-free rate for the following period is determined based on moving average rounded to four decimal places.

The total risk premium for the CR represents the variable Risk premium (RP) in the calculation of the discounted rate according to CAPM. For the period 2005-2036, RP is determined based on moving average rounded to four decimal places.

Beta coefficient is determined according to the methodology of prof. Damodaran, where beta is calculated as a composition of a two-year and five-year beta coefficient regression assigning the weight of two-thirds to two-year beta regression and one-third to five-year beta coefficient. The Y-axis for determining the regression line is the so-called "Company return", which represents the return on the share of the company under review, i.e. the return on 1 share. The second axis (X-axis) shows the value of market return, which represents the average return on market shares. The average market return is represented by the profitability of individual companies operating in the mining industry. A two-year beta regression function is $y = 1.6188x + 0.0047$; in the case of five-year beta, it is $y = 0.3342x + 0.0725$. The resulting beta is given by the sum of two-thirds of the two-year beta and one-third of the five-year beta. Residual risk of the market is calculated in the same way. If these conditions are met, the resulting value of beta is 1.1906 (calculated as $1.6188 * 2/3 + 0.3342 * 1/3$; rounded to four decimal places) and residual risk of the market 2.73 % (calculated as $0.0047 * 2/3 + 0.0725 * 1/3 * 100$; rounded to four decimal places). The discounted rate (r_e) for each year is calculated according to CAPM.

Table 13. Discounted rate for the period 2005-2036 (valuation date 31 December 2004)

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Discount rate	15.93 %	15.40 %	15.15 %	15.26 %	15.25 %	15.40 %	15.30 %	15.27 %	15.29 %	15.31 %	15.32 %
Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Discount rate	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %
Indicator	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	-
Discount rate	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	15.31 %	-

Source: Author

For the valuation using DCF Equity (Table 13), the parameters used to achieve the objective of determining adequate compensation were taken from the financial plan. Specifically, it is accumulated free cash flow of equity and other items, for which the discounted accumulated FCFE needs to be adjusted. Discounted accumulated FCFE needs to be increased by non-operating assets at the valuation date and reduced by the total debt of the company at the valuation date.

Free cash flows of equity are discounted by r_e for each year determined according to the CAPM. The discounted rate is determined separately for each year. Individual parameters of the discounted rate r_e according to the CAPM are as follows:

- Risk-free rate (r_f) determined based on the yield of 10-year government bonds of the CR,
- risk premium (*RP*),
- beta coefficient based on the calculation methodology of prof. Damodaran,
- residual risk of the market (*RR*).

Finally, non-operating assets as of 31 December 2004 need to be added to the discounted accumulated free cash flow of equity and also interest-bearing debt and funds on a corporate saving account at the same date need to be deducted. The last step would be to adjust the resulting values by costs or revenues associated with the liquidation of the company after the depletion of coal reserves and the termination of the activities of the company (Table 14).

Table 14. Quantification of adequate compensation as of 31 December 2004

Item	Amount
Discounted accumulated FCFE	5,867,385,920 CZK
Total debt	-176,000,000 CZK
Corporate savings account	-75,208,000 CZK
Non-operating assets	+344,931,000 CZK
In total	5,961,108,920 CZK
Number of shares	6,782,994 pieces
Adequate compensation per share	879 CZK

Source: Authors

The amount of adequate compensation per share for the company minority shareholders as of 31 December 2004 determined using DCF Equity is CZK 879 (in words, eight hundred and seventy-nine Czech crowns).

Discussion

RQ1: Does the implemented squeeze-out correspond with the intention of the legislator?

The objective of the paper was to determine the adequate market value of shares in squeeze-out. For this purpose, a lignite mining company in the CR was analysed from various perspectives, including strategic analysis, which explained the development of the external environment (i.e. the Czech Republic), the relevant industry, and the potential of the company under review.

The analysis shows that the CR is one of the low-inflation economies, where the average consumer prices and prices of industrial producers will fluctuate around 2.5 % in the year 2005. The situation in the lignite market is stable and favourable for the company since lignite is an important, reliable and cheap domestic energy resource. This is mainly due to the irreplaceable supply from abroad and the growing energy consumption.

Financial analysis analysed the financial health of the company, specifically by using horizontal and vertical analysis, analysis of ratios, and comprehensive evaluation methods including Solvency index and Modified Taffler Index with regard to the environment the company operates in.

With regard to the remaining recoverable reserves, the financial analysis predicts the termination of its business activities after the year 2036, as well as the completion of land reclamation and liquidation of the

company. This is primarily based on the data on coal mining processed by the management of the company, which also consider the plans and savings of the new majority owner for the period 2005-2014. The remaining data were modelled (predicted) separately using the regression function or own model of neural network.

Throughout the whole monitored period (1994-2004), the company achieved positive earnings for accounting year, which grew except for the years 1995, 1997 and 2002. The overall earnings consist mainly of operating earnings. The sum of financial and extraordinary income recorded low or even negative values until the year 2000.

The total assets consisted mostly of fixed tangible assets, which accounted for 73.3 % of the balance sheet total. Fixed intangible assets accounted for the maximum of 0.5 % (in 2002) of the total amount, the fixed financial assets accounted for 2 % (in 2004). In the monitored period, the company financed its assets mainly by its own resources, whose share on the total liabilities grew, achieving 68.2 % at the end of the year 2004.

Throughout the whole monitored period, the Solvency index did not fall below 0, which means that the company was not at risk of bankruptcy. The worst solvency was recorded in 1994-1998; from the year 1999, the company showed a good solvency ratio, which was even evaluated as very good in 2004.

According to the Modified Taffler Index, the company was rated very well – solvent in all years except for the year 1996, when it was in the so-called grey zone, but with the value being very close to that of solvent companies.

The performed analyses (financial and strategic) show that the company has revenue potential, meets the going concern principle and is predicted to show positive income until the termination of its business activities.

The most suitable methods appear to be revenue-based methods. For the valuation, the method of discounted cash flows, the DCF Equity variant was used, as it is best able to capture and consider the specificity of the company under review.

This method is in line with the intention of the legislator, i.e. it is capable of determining the fair value in squeeze-out for minority and majority shareholders. The method considers significant events affecting the company and is not based on accounting data only.

RQ2: What is the fair value of the transaction?

The fair value of the transaction was determined using the method of DCF Equity. The financial plan provided the parameters used to achieve the objective of determining adequate compensation for the minority shareholder. Specifically, it included accumulated free cash flow of equity (FCFE) and other items the discounted accumulated FCFE needs to be adjusted for. The discounted accumulated FCFE had to be increased by non-operating assets at the valuation data and decreased by the total debt of the company at the valuation date. Moreover, non-operating assets as of 31 December 2004 had to be added to the discounted accumulated free cash flow of equity, and interest-bearing debt and funds on the corporate saving account had to be deducted. The last step would be to adjust the resulting values by costs or revenues from the liquidation of the company after the depletion of the total coal reserves and termination of the company´s business activities.

The method considers important events affecting the company and does not work with the accounting data only. It enabled to determine the fair value of the transaction, which would compensate the damage caused to the minority shareholder and does not exceed the value the transaction brings to the majority shareholder.

Conclusions

The paper submitted aimed to determine the adequate market value of shares in squeeze-out in a lignite mining company in the CR. The objective was to determine an adequate, fair value for both majority and minority shareholders while considering the accounting data as well as significant events affecting the company.

For this reason, both the micro and macro environment of the selected company was subject to strategic analysis. Both external and internal corporate environment was evaluated as stable and favourable for the company. The analyses of relevant industry and potential of the company and financial analysis showed that the company will survive in the future until the termination of its business activities (mining). The financial health of the company was evaluated as very good; the analysis does not indicate that the company would not be able to meet its liabilities.

Based on the above, the method of discounted cash flow DCF Equity was selected for the evaluation of the company; it is best able to capture and consider the specificity of the company under review since it discounts cash flows for owners (shareholders). The resulting fair value of the transaction reflects the market value of shares for determining adequate compensation in squeeze-out. It ensures adequate compensation for the damage caused to the minority shareholder while accepting the price by the majority shareholder, who is willing to pay up to the amount corresponding to the benefits the transaction will bring.

The limitations of the paper are given by the fact that the method is applicable only in the case of squeeze-out while respecting the IVS. The method enables the determination of fair value in squeeze-out if the legislator has the information on the value of benefits for the majority shareholder and knows the value the minority shareholders are willing to accept in their squeeze-out.

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