ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 70 11 Number 3, 2022

DIFFERENTIATED ESTIMATES OF VALUATION MULTIPLIERS BASED ON PRICE-TO-BOOK RATIO FOR THE CZECH BREWING INDUSTRY

Michal Drábek[1], Pavel Syrovátka[1]

[1] Department of Business Economics, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Link to this article: https://doi.org/10.11118/actaun.2022.011
Received: 2. 3. 2022, Accepted: 2. 5. 2022

Abstract

This article focuses on the differentiated estimations of industry multipliers in relation to Price-Book Value ratio (*P/BV*) with applying for the Czech brewing industry. Differentiation of estimates brings better approximation of these sector-wide multipliers to the defined groups companies within the given markets and thus increases the accuracy of the method of relative business valuation. Due to the absence of market data on privately held companies, the market value was assessed using the DCF method, while the book value was taken from the enterprise's accounts. The assumption of the linearity of the market-book value relationship for the subsequent calculations and differentiation of *P/BV* estimations was verified using regression analysis. The differentiation of *P/BV* ratio was made according to the size of entities, but mainly based on equality of market and book value, respectively according to the equality *P/BV* = 1. Then our results were supplemented by the calculation of industry *P/BV* ratio using *P/EAT* ratio and *ROE* decomposition. Using this additional method, the brewing industry was compared with other relevant industries in the Czech Republic.

Keywords: industry multiplier, market value, price-to-book, price-to-earnings, business valuation, DCF method, Czech brewing industry

INTRODUCTION

Brewing in the Czech Republic has a long tradition, with the first written record dating back to 993 – the documentation of brewing in the Břevnov monastery (Budějovický Budvar, 2008). The uniqueness of Czech beer is evidenced by the granting of the protected geographical indication "České pivo" by European Commission regulation No. 1014/2008 (European Commission, 2008). The popularity of domestic beer is reflected not only by its consumption, in which the Czech Republic holds the first place in the amount of beer drunk per person, but also in the amount of brewed beer, in which is also at the top of the beer production per person (NOVINKY.CZ, 2019). Czech beer is also very popular abroad and its exports are growing every year (see Ministry of Industry and Trade of the Czech Republic, 2022).

From the above, the importance of domestic brewing and the value of Czech beer as a product is evident. In this context the question arises as to whether the market is able to evaluate the added value of the breweries and the differences between individually entities. Before the quantification of the business's value, lets outline it's theoretic-methodological context.

The economic multiplier (α) is generally labelled as a coefficient that allows to quantify the size of the change in a certain economic variable (y) depending on the change of another influential variable (x): $\alpha = \Delta y/\Delta x$.

Multipliers are primarily used in macroeconomic analysis, e.g., the assessment of economic effects in the implementation of various measures – investment, expenditure, tax and transfer multiplier or monetary multiplier, and fiscal multiplier of economic policy, etc (e.g. Parry and Kemp, 2005; Glaeser, Sacerdote and Scheinkman, 2003; Hamerníková, Maaytová *et al.*, 2007).

Multipliers are also used at sectoral or regional level of economic analysis (e.g. Ferreira, Pié and Terceño, 2021; Sacks, 2002; Moretti, 2010; Čadil, 2010). In regional economic analyses, a local multiplier is often calculated as an intermediary for quantifying the circulation of funds in a defined area. At the sectoral level, we encounter their use, for example, in I/O cross-sectoral models, where we can assess changes in cash or physical flows in the defined economic sector, which were caused by various regulations and measures at the national, sectoral, or regional level. From the above its obvious that quantitative estimates of multipliers are associated with the relevant econometric models, or with estimates of their individual parameters.

The industry multipliers are according to Damodaran (2012) and Mařík *et al.* (2018) used also in the field of the business valuation as one of the methods for the market value assessment of individual companies. Within the non-tradable companies, there are many valuation multipliers which can be used for these purposes. One of them is price-to-book value ratio (*P/BV*). In this context, the a priori assumption of a linear relationship between the book value of equity (*BV*) and its market value (*P*) is usually used:

$$P = \alpha \times BV. \tag{1}$$

Based on equation (1), we estimate the valuation industry multiplier α as follows:

$$\alpha = \frac{\Delta P}{\Delta BV} = \frac{P}{BV}. \tag{2}$$

Another possibility for estimating the same industry multiplier is a method based on the *P/BV* ratio, respectively the ratio of the market value of equity (*P*) to net profit (*EAT*) and return on equity (*ROE*), see formula (3):

$$\alpha = \frac{\Delta P}{\Delta BV} = \frac{P}{EAT} \times ROE. \tag{3}$$

This estimate is also based on the assumption of a linear relationship (1) and a further decomposition of the *P/BV* ratio (4):

$$\frac{P}{BV} = \frac{P}{EAT} \times \frac{EAT}{BV}. \tag{4}$$

The third possibility of estimating the valuation-industry multiplier is based on the *P/EAT* ratio in relation to the value of return on assets (*ROA*) and financial leverage (*FL*):

$$\alpha = \frac{\Delta P}{\Delta BV} = \frac{P}{EAT} \times ROA \times FL. \tag{5}$$

This third option is also based on the assumption of a linear relationship between the book value and the market value of equity – equation (1), so relation (2) applies and at the same time we consider decomposition principle (6):

$$\frac{P}{BV} = \frac{P}{EAT} \times \frac{EAT}{A} \times \frac{A}{BV}. \tag{6}$$

In the decomposition – formula (6), variable *A* represents the total assets of the given company. However, quantification of the market value of equity (*P*) can be a problematic issue in these multiplier α estimates in all three cases, especially in the case of privately held companies. The second problem may be the a priori consideration of the linear relationship between *P* and *BV* – equation (1). The third problem may be the accuracy of these estimates, i.e., their real usability – within the industry there may be significant economic and financial variability between the valued companies.

These issues, especially the relationship between market and book values was also addressed by Damodaran (2012), who acknowledged that there is a much more complex relationship between these variables than most investors realize. While he pointed out that if the productive power of assets captured in purchase prices changes significantly, market and book values may also differ significantly. He also illustrated that the *P/BV* ratio is determined by the expected payout ratio, the expected earnings growth rate, the risk factor, and most importantly, return on equity, which he considered by far the most important determinant in general, and therefore, this ratio also has its place and predictive value. However, it is necessary to ensure the comparability of entities for which this indicator is calculated, namely in terms of the accounting standards applied, especially the method used to depreciate assets.

Other authors who have discussed the relationship between market and book values include Anandarajan *et al.* (2006), among others, who focused on the ability of book value to predict market value in Turkey and concluded that inflation-adjusted book value has a stronger link to the market value of a business than its earnings. However, it is important to mention the difference in financial reporting, where in the inflation-affected environment of Turkey, book values are not reported as purchase prices unlike the USA and the Czech Republic. According to Fernández (2019), accounting criteria are subject to a certain degree of subjectivity and differ from market criteria, which leads to the fact that book value almost never coincides with market value. Mařík *et al.* (2018) also highlight the existence of a significant deviation between the reported value of fixed assets and economic reality.

Several authors have also addressed the predictive power of *P/BV* ratios on stock returns, such as Doblas, Lagaras and Enriquez (2020) focusing on financial companies in Bahrain, and Chai, Chiah, and Zhong (2020) focusing on return

prediction in Australia, as well as Ball *et al.* (2020) in the US. The above studies demonstrate a link between the book and market value of equity and all of them focus on publicly traded companies. These sources also show that market value and book value are interrelated variables, but in most cases, they differ. This is in favour of determining the *P*/*BV* ratio and its use in the relative valuation of companies, or to determine the sector valuation multipliers, for example by determining a certain representative value. The accuracy of the estimates of such industry multipliers, of course, remains dependent on the consideration of the essential determinants of *P*/*BV*.

In the context of these facts, the research is focused on the estimation of the valuation multipliers usable in the Czech brewing industry, respectively there is the proposal of a methodological procedure for their differentiation for this industry, which is quite important across Europe.

Current authorities in the field of the business valuation in the Czech Republic (e.g. Mařík *et al.*, 2018) do not significantly develop the method of relative valuation and in praxis, the prevailing opinion is that this method is rather approximate – not always sufficiently accurate for business valuation of every company in given industry. The next page of this text mentions some of the limits of this method of sector multipliers. In our research we try to upgrade this method and to adapt it to the environment of Czech privately held companies. We examined this upgrade in the context of the Czech brewing industry as we evaluated 50 Czech breweries based on the DCF methodology. We thus have usable data inputs.

The aim of the paper is to supplement this valuation methodology in the sense of obtaining differentiated industry multipliers more appropriate to certain groups of breweries. This proposed addition of the relative valuation methodology could then have a more general overlap with other sectors.

The main implication of our findings for the praxis should be the overmentioned methodological upgrade and its adaptation for domestic environment, which should lead to its more frequent application in praxis. As a result, there will be a relatively simple approach to business valuation, which will suitably complement the most used income approach method DCF and contribute to a higher degree of accuracy in the market value assessment. In addition to this contribution for the professionals, there is also a significant contribution for the owners or the management of companies who need to assess the market value of their business for various purposes.

The possibilities of estimating differentiated multipliers will be based on the valuation of the most important Czech breweries and will specifically work with the achieved *P*/*BV* ratios. These will be calculated for the top 50 Czech breweries, which generate about 99% of sales in the brewing industry in the Czech Republic. Because all these companies are privately held, the market value must be assessed indirectly. For these purposes the income approach – discounted cash flow (*DCF*) methodology will be used.

The second investigated and compared option for estimating differentiated multipliers will be the determination of their value based on the *P*/*EAT* ratio[1] in relation to the values of *ROE* and *ROA* indicators and financial leverage. This extension of valuation multipliers should contribute to the increase of the accuracy of the multiplier valuation technique. In the case of *P*/*EAT*, the market value of the equity will also be assessed by the DCF method. Finally, the obtained estimates of industry multipliers based on *P*/*BV* and *P*/*EAT* extended by the influence of *ROE*, *ROA* and financial leverage will be compared and critically evaluated in relation to the real economic environment of the Czech brewing industry, or in its European context.

MATERIALS AND METHODS

In connection with the aim of this article, we will focus on the brewing industry in the Czech Republic, namely on the 50 most important breweries and brewing groups, whose turnover exceeds 99% of the turnover of the entire industry[2]. The data for the 2015–2019 period will be used. Accounting data of the valued breweries will be gathered through the Commercial Register of the Czech Republic – the Collection of Documents, maintained by the Ministry of Justice of the Czech Republic (2021).

For this sample of companies, it is necessary to assess the *P*/*BV* and *P*/*EAT* ratios for subsequent estimation of multiplier α. For these purposes (as already mentioned), the market values of the analysed entities will have to be assessed. However, unlike publicly traded companies, the above 50 businesses are not publicly traded, which means that one of the indirect valuation methods will have to be used.

Following a general consensus (IVS, 2017; EVS, 2016; Mařík *et al.*, 2018), three basic approaches can be used for making a valuation of a business – income, market and cost, and the market approach should be given priority according to the above authors; if it cannot be applied, then the income approach valuation can be used. The cost valuation approach is the last to be applied.

1 Corresponds to *P/E* ratio.
2 Calculated for businesses with available data.

For the purposes of the article, the market valuation approach can be considered difficult to apply and leads to inaccurate results. The reason for this fact is that for the domestic market:

- data on publicly traded companies is insufficient (56 titles traded on the Prague Stock Exchange, of which 20 are domestic, but with a limited number of transactions);
- most of the analysed businesses are incomparable in size and geographic scope to European publicly traded companies for which market valuation data is available;
- valuation based on sectoral multipliers defines a wide range within which the value of the valued business may fluctuate and for the purposes of this article, the most accurate results are needed – these will be achieved using the DCF income method, which is the most applied method for valuing privately held companies (see Vidal-Garcia and Ribal, 2019 or Vydržel and Soukupová, 2012).

The Discounted Cash Flow Method

This method is used in three variants, with the entity variant being by far the most used, which was confirmed in a study by the Vydržel and Soukupová (2012). The market value of equity (*P*) is by the entity approach assessed as follows:

$$P = EV - NOL + NOA, \tag{7}$$

where *EV* represents enterprise value, *NOL* non-operating and interest-bearing liabilities and *NOA* non-operating assets. According to Damodaran (2006) and Mařík *et al.* (2018), *EV* is calculated by the most widespread type of the DCF model – two-stage procedure, as follows:

$$EV = \sum_{t=1}^{T} \frac{FCFF_t}{(1+WACC)^t} + \frac{TV}{(1+WACC)^T}, \tag{8}$$

where $FCFF_t$ free cash flow to the firm in time[3] t, *TV* terminal value, *WACC* weighted average cost of capital, *T* represents the length of the first phase. The terminal value is then calculated using a parametric formula as follows:

$$TV = \frac{EBIT_{T+1} \times (1 - RR)}{WACC - g}, \tag{9}$$

where $EBIT_{T+1}$ represents adjusted *EBIT* in the first year of the second phase, *RR* represents the reinvestment rate in the second phase (calculated as *g* ÷ return on capital), and *g* represents the expected growth rate of free cash flow for the second phase.

Free cash flow to firm (*FCFF*) at the whole business level is calculated according to the following formula:

$$FCFF = EBIT \times (1 - TAX) + DA - I - \Delta WC, \tag{10}$$

where *EBIT* represents earnings before interest expense and tax, variable *TAX* represents the corporate tax rate, *DA* represents depreciation and amortization, variable *I* represents investment in operating fixed assets, and Δ*WC* represents the change in working capital. The above general approach is consistent with Damodaran (2006). Mařík *et al.* (2018) further adjusted *EBIT* for non-operating income and expenses and non-recurring items. These adjustments will also be used in this article.

The Discount Rate

The present value of free cash flow (*FCFF*) is determined using a discount rate at the *WACC* level. The equity-to-capital (*E*/*C*) and debt-to-capital (*D*/*C*) ratios are calculated from market data using an iterative calculation[4] rather than from accounting data. *WACC* were calculated as follows:

$$WACC = r_e \times \frac{E}{C} + r_d \times \frac{D}{C} \times (1 - tax), \tag{11}$$

while the cost of debt capital (r_d) is determined at the market data level using the ARAD time series database[5]. The cost of equity (r_e) is determined according to the CAPM model most used in valuation practice (see, for example, the study by Vydržel and Soukupová, 2012). The use of this model is also reported by Damodaran (2006), IVS (2017) and Mařík *et al.* (2018). However, for valuation purposes, the CAPM model is usually modified by extending the market risk premium (r_m) to include country risk (r_c), a premium for smaller market capitalization (r_{mc}), and other specific risks[6], which will also be used in this article. The formula for calculating the cost of equity capital presented below synthesises the approaches applied by the above authors and takes the following form:

$$r_e = r_f + \beta \times (r_m - r_f) + \mathrm{r_c} + \mathrm{r_{mc}}. \tag{12}$$

The risk-free interest rate (r_f) is determined following the Wenger (2003) approach, which is appropriate for a low interest rate environment. The

3 The sequential number of years in the first phase from the valuation date. The first phase means the phase for which the financial plan is set (10 years in this research).

4 For the procedure description see e.g., Mařík *et al.* (2018).

5 Bank interest rates on CZK-denominated loans by Czech non-financial corporations - new business. For more detail see the Czech National Bank (2021).

6 Non-systematic risks connected just to some of the companies, e.g., very low diversification in customer - supplier relationships, newly found company with volatile history and very uncertain future etc.

Beta coefficient (β) is determined using historical market price data for publicly traded companies (in a debt-free form), which is the most used approach in valuation according to Damodaran (2006) and Mařík and Maříková (2007). The conversion to debt ratio is done through the actual market debt level of the specific business.

According to the above-mentioned authors, the market risk premium in valuation practice is calculated at the historical data level for the longest possible period. In this article, the market risk premium will be determined as the average difference between stock and government bond returns based on US capital market data for the period between 1928 and 2019 (for data, see Damodaran, 2020a).

The country risk premium is determined at the product level of the spread between the 10-year credit default swap for the Czech Republic and the US and the ratio of stock and bond market volatilities for the US adjusted for the risk-free bond component, which is already part of the risk-free rate.

The premium for low market capitalisation is determined individually for each company in an iterative procedure based on the determined market capitalisation according to the methodology of the Ministry of Industry and Trade of the Czech Republic (2012). The iterative procedure[7] is also used to determine the market capital structure.

The Industry *P/BV* Ratio

After quantifying the *P/BV* and *P*/*EAT* ratios for all breweries in the sample, the process of quantification of industry valuation multipliers starts. This begins with a statistical verification of the initial assumption of linearity within equation (1), i.e. the sustainability of the considered procedure for estimating the values of differentiated valuation multipliers for the Czech brewing industry. For this purpose, a simple regression analysis is performed: $P = \alpha \times BV$, but it is logically expected to achieve a positive value of the regression coefficient: $\alpha > 0$. As evaluation statistical criteria for this regression, the value of the coefficient of determination (R^2), resp. its adjusted form (R^2*), F-test of the achieved value of R^2, t-test of the regression parameter α and LM nonlinearity tests are used. During this regression analysis, a reduced scope of the sample of breweries is used, see below (50-ex).

The estimation of differentiated industry multipliers for the Czech brewing industry starts in accordance with relation (2), i.e. on the basis of *P*/*BV* ratios of individual breweries in the given group. A simple arithmetic average for the sample is used for the industry summary. The obtained average value is compared with the median of the sample, which assess the presence of values that deviate the average from the mean value. In connection with this, regarding to obtain concise and practically usable estimates of industry valuation multipliers, certain selections in the initial sample of the Czech breweries are tested (see extreme values of *P*/*BV* and analysis of their logical-factual connections in following chapter). On the reduced sample (50-ex), its basic statistical characteristics are calculated (average, median, quartiles, standard deviation). These characteristics are compared with the initial unselected set, i.e. within all 50 breweries. In this way, two values of the industry multiplier are estimated. First, for an unreduced sample, based on all 50 breweries:

$$\alpha_{50} = \frac{1}{50}\sum_{i=1}^{50}\left[P / BV\right]_i \tag{13-1}$$

and further for the reduced sample, i.e. after exclusion (ex) of breweries with extreme values of the *P*/*BV* ratio:

$$\alpha_{50} = \frac{1}{50 - ex}\sum_{i=1}^{50-ex}\left[P / BV\right]_i. \tag{13-2}$$

In connection with the further accuracy increasement of the industry multiplier, the Czech breweries in the reduced sample are divided into those that show *P*/*BV* > 1 (their number is labels as *m*) and breweries that have *P*/*BV* ≤ 1 (their number is labelled as *n*). After this division of the sample, arithmetic averages are again determined as an estimate of differentiated industry-valuation multipliers. For Czech breweries with *P*/*BV* > 1, we can determine the value of the differentiated industry valuation multiplier as follows:

$$\alpha_{P/BV>1} = \frac{1}{m}\sum_{i=1}^{m}\left[P / BV\right]_i. \tag{14-1}$$

For the breweries with *P*/*BV* ≤ 1, the estimate of the differentiated multiplier is determined according to following equation:

$$\alpha_{P/BV\leq 1} = \frac{1}{n}\sum_{i=1}^{n}\left[P / BV\right]_i. \tag{14-2}$$

The second approach of estimating the differentiated industry multipliers is based on the *P*/*EAT* ratio, which is also assessed for all breweries in the sample. Its average value is determined within the reduced[8] sample, according to formula (15):

$$\overline{P / EAT}_{50\text{-}ex} = \frac{1}{50 - ex}\sum_{i=1}^{n}\left[P / EAT\right]_i. \tag{15}$$

7 The procedure is based on the same grounds as mentioned above in footnote 4.
8 The same reduction of the sample as in the case of the *P*/*BV* ratio.

This average is applied to estimate the industry valuation multiplier, which is differentiated by the value of return on equity, i.e. in accordance with the construction of the multiplier in equation (3). For the reduced sample, we can make an estimate of the industry multiplier as follows:

$$\alpha = \overline{P/EAT_{50\text{-}ex}} \times \overline{ROE}_{50\text{-}ex}. \quad (16\text{-}1)$$

According to division the sample due to the *P*/*BV* ratio (as in equation 14-1 and 14-2), we can estimate the differentiated valuation industry multipliers as follows:

$$\alpha = \overline{P/EAT_{P/B\rangle 1}} \times \overline{ROE}_{P/B\rangle 1}, \quad (16\text{-}2)$$

$$\alpha = \overline{P/EAT_{P/BV\leq 1}} \times \overline{ROE}_{P/BV\leq 1}. \quad (16\text{-}3)$$

The same procedure is used for estimates of the differentiated industry valuation multiplier, where the *ROE* breakdown into return on total assets and financial leverage is used, i.e. in accordance with the equation (5). In this case, the value of the industry multiplier can be estimated within the reduced sample as follows:

$$\alpha = \overline{P/EAT_{50\text{-}ex}} \times \overline{ROA}_{50\text{-}ex} \times \overline{FL}_{50\text{-}ex}. \quad (17\text{-}1)$$

Alternatively, the differentiated estimation can be calculated as follows:

$$\alpha = \overline{P/EAT_{P/BV\rangle 1}} \times \overline{ROA}_{P/BV\rangle 1} \times \overline{FL}_{P/BV\rangle 1}, \quad (17\text{-}2)$$

$$\alpha = \overline{P/EAT_{P/BV\leq 1}} \times \overline{ROA}_{P/BV\leq 1} \times \overline{FL}_{P/BV\leq 1}. \quad (17\text{-}3)$$

RESULTS

Following the described methodology, the research of the possibilities of estimating differentiated industry multipliers started by calculating the *P*/*BV* and *P*/*EAT* ratios for individual breweries. The list of individual breweries with the resulting ratios is shown in Tab. VIII as Attachment 1.

Market value of each brewery was assessed by the DCF method. This complex valuation process already provides unique data that are very valuable for praxis. Based on the DCF outputs and the reference variables, the individual *P*/*E* ratio, *P*/*BV* ratio and the basic statistics are calculated. According to Tab. VIII, the median value of *P*/*BV* is 0.80, the arithmetic average reaches 0.51, so the data are obviously skewed to the right side. The statistics of *P*/*E* ratio point out to left-side skewness – the median value of *P*/*E* = 15.29, the arithmetic average of *P*/*E* = 30.20.

Regarding the following process of the industry valuation multipliers estimation, attention is focused on the *P*/*BV* ratio, which is used as a means of expressing the multiplier and as a criterion for differentiation between the breweries in the sample.

Sample Reduction

Through the factual-logical analysis of the significant context of the *P*/*BV* calculation for the individual breweries, a reduction of the sample is made, see (50-ex). The justification for this reduction is as follows:

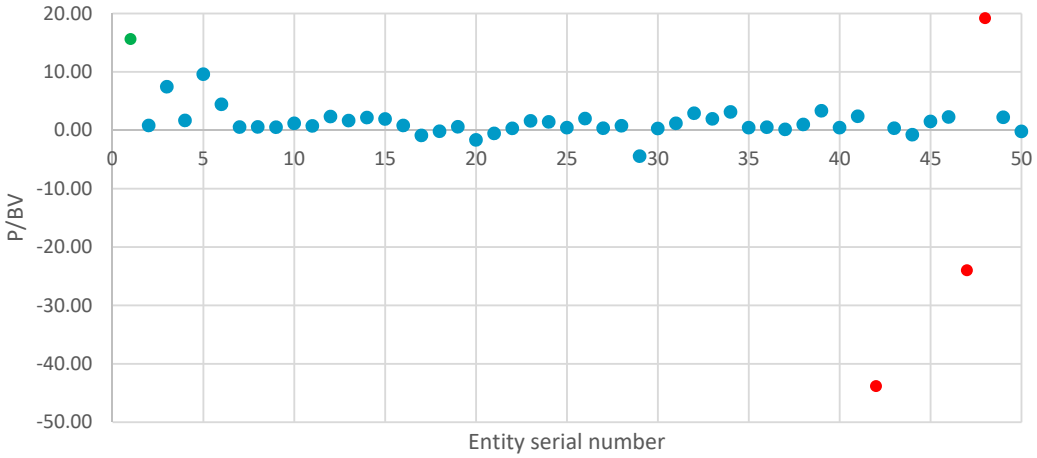
Entity 42[9] – "Pivovary Koruny české s. r. o." had a significantly negative market value of equity with a very low positive book value. However, the *P*/*BV* ratio calculated in this way does not make sense with different signs of the values being compared as for these purposes, the market value should be considered zero, which would naturally lead to a zero value of the *P*/*BV* ratio. However, such observation would not be relevant in terms of the relationship under examination.

Entity 47 – "pivovar-raven.cz s.r.o." had negative book equity values both as of the valuation date and throughout the 2015–2019 period, while its market value was estimated at positive values. However, the *P*/*BV* ratio calculated in this way does not make sense with different signs of the values being compared, as for these purposes book equity at 0 should be considered in comparison with a positive market value, which would lead to an infinite result.

Entity 48 – "Nachmelená Opice s.r.o." has been on the market for a very short period of time, showing an extremely high growth rate in its initial years, and as a result of the initial loss from previous years, the book value of equity is at very low levels, while the market value reflecting future development reaches much higher values – over the years, with the expected accumulation of positive economic results, the *P*/*BV* ratio will inevitably decline, and therefore the currently achieved value cannot be taken as a reference.

On the other side, Entity 1 – "Plzeňský Prazdroj, a.s." is kept in the sample. This entity represents a relatively specific business within the sector as it controls almost half of the entire market and is a well-known brand both domestically and globally. The Fig. 1 also shows that other businesses with low serial numbers (3, 5, 6) also show relatively higher values of the ratio. However, these observations cannot be excluded from the sample as their levels are based on market factors, not because of specific factors or economically meaningless values entering the calculation.

9 Entity numbering throughout the article is according to Tab. I.



1: *The P/BV ratio of Czech breweries*

The outliers in the context of the sample are shown in Fig. 1, where the individual breweries are plotted on the *x*-axis, with their serial number given by the achieved number of sales in 2019 (1 = highest sales). On the *y*-axis, we can see their values of the *P*/*BV* ratio.

After excluding the above observations, the following statistical indicators were further calculated (due to obvious differences among the six most important entities, these indicators were calculated in two columns – in the first column for the whole sample of 47 entities, in the second column without considering the top six businesses), see Tab. I.

I: *Basic statistical indicators of P/BV ratio (dimensionless)*

Indicator	a set of 47 entities	a set of 41 entities
minimum	-4.46	-4.46
1st quartile	0.38	0.33
median	0.80	0.74
3rd quartile	2.06	1.91
maximum	15.59	3.32
arithmetic average	1.58	0.85
standard deviation	2.93	1.38

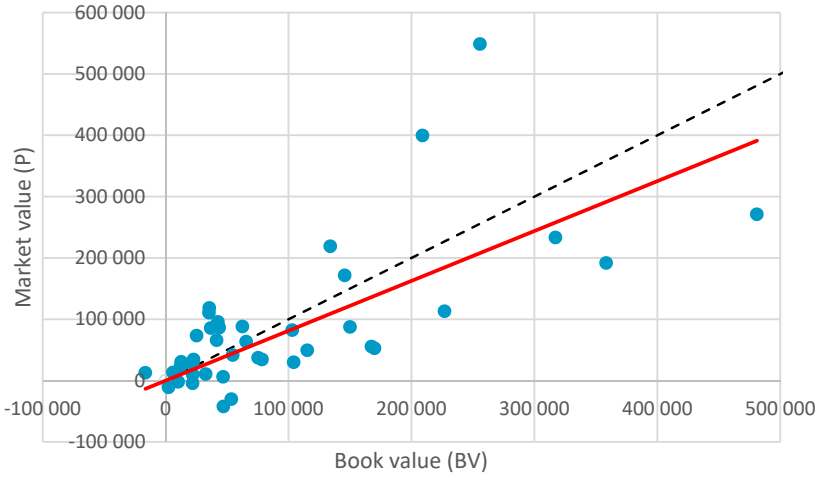
The above table (Tab. I) shows that the minimum value in both sets is the same, but the maximum differs a lot due to the inclusion of the top 6 entities in the first set. The 1st, 2nd (median) and 3rd quartiles do not differ a lot. Median *P*/*BV* ratio in the brewing industry is relatively close to 1, which indicates equality between the book and market values of equity (for the set of 47 entities it is a 20% undervaluation[10], for the reduced set it is a 26% undervaluation). The arithmetic average for the set of 47 entities differs significantly from the median. The higher value of the average than the median is given by the inclusion of the top 6 breweries in the sample – in the second column we can see that the median and the arithmetic average do not differ a lot. Because of that, the sample of 41 entities was made. This reduced sample shows also less variability according to its standard deviation.

Verification of the Linearity Assumption

Before the differentiated estimates of valuation multipliers for the Czech brewing industry, it is necessary to evaluate the assumption of linearity between *P* and *BV*, using a simple linear regression without an absolute term: $P = a \times BV$, which was performed on cross-sectional data for year 2019. The regression analysis is preferred over the corelation analysis due to the verification of unilateral dependence of the relationship $BV \rightarrow P$ in accordance with other authors who study the relationship between market and book value, especially Damodaran (2012). Parameter *a* is estimated by the OLS method. Regarding the sufficient reliability in evaluating the linearity between *P* and *BV*, the input sample of 41 breweries was reduced by one more brewery – Entity 20 – "Pivovar Samson, s.r.o." due to its significant overinvestment, which is far from adequate to free cash flow. This problem is automatically reduced in *P*/*BV* ratio, but in absolute values of *P* and *BV*, this problem caused significant inconsistency.

The OLS estimate on the above data results in regression coefficient $a = 0.8134$, with adjusted coefficient of regression 0.6589. The p-values of t-test and F-test reach lower than 0.0001 value. LM-nonlinearity test results in p-value 0.0795. After specification of models with other than linear form, we can confirm, that the linear function form is the best of all possible forms.

10 That means market value is lower than accounting value.



2: *The market and book values (blue points) of businesses (in thousands CZK)*

The statistical characteristics of the OLS estimate: confirm the sustainability of the initial assumption regarding the linearity of the relationship between *P* and *BV*. The economic logic of the relationship $a = 0.8134 > 0$ is also maintained.

Due to the confirmation of linearity between *P* and *BV*, it is possible to continue the proposed procedure of differentiated estimates of industry multipliers, which can be primarily applied in the valuation of Czech breweries. In the context of the focus of this article, we can mention other possibility of using the calculated regression parameter α, for which following equation applies: $\alpha = \Delta P/\Delta BV = P/BV$, so $a = \alpha$.

This different way of estimating the valuation multiplier for the Czech brewing industry gives us the opportunity to compare this value with estimates that will be assessed according to relations (13-2) or (16-1). Graphically, the result of the performed linear regression (full red line) is shown in Fig. 2.

In the Fig. 2 there is also a line (dashed black) passing initially at an angle of 45°, which reflects $P = BV$, i.e. $P/BV = 1$.

Estimates of Valuation Multipliers for the Czech Brewing Industry and the Possibilities of Their Differentiation

Following the methodological procedures (equations 14–17), the possibilities of differentiation of industry multipliers are stated in this section. The main implication of the differentiation of industry multipliers for the praxis is the replacement of one aggregated multiplier which represents the whole industry (i. e. more variable set of entities) by several multipliers where each describes the individual group of entities much more accurately. This will lead to a significant refinement of the valuation results of this method.

Based on the accounting data or basic financial indicators, any user can classify any brewery (or any company in a broader perspective, see Discussion) into a certain category and apply an adequate multiplier to assess its market value.

Estimates Based on the *P*/*BV* Ratio Differentiation

According to equations (14-1, 14-2), we divided the samples[11] of breweries into those that show $P/BV > 1$ and breweries that have $P/BV \leq 1$, see Tab. II. The table also shows the average difference and average absolute difference from 1.

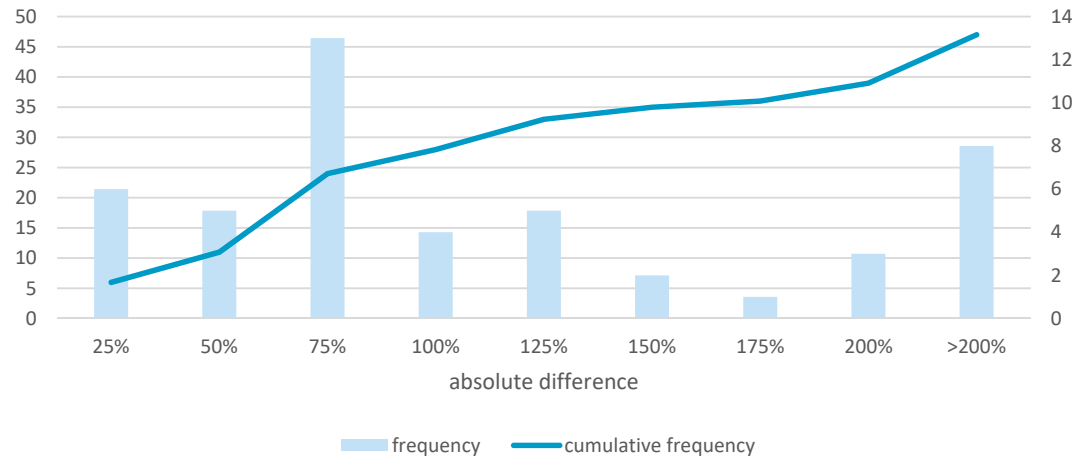
II: *Differentiation of breweries based on equality P and BV (dimensionless)*

Indicator	a set of 47 entities	a set of 41 entities
$P/BV \leq 1$	25	24
$P/BV > 1$	22	17
average difference from 1	0.58	-0.15
average absolute difference from 1	1.62	1.03

For both calculated variants, there is a majority of companies with *P*/*BV* less than 1, i.e. more companies show a lower market value compared to the book value.

From the Tab. II is also evident that exclusion of the top 6 breweries significantly reduces the differences from equality.

11 We use both samples, a set of 47 entities and a set of 41 entities.



3: *Frequency of observations based on the magnitude of deviation*

III: *Basic statistical indicators of P/BV ratio, differentiated (dimensionless)*

Indicator	a set of 47 entities		a set of 41 entities	
	P/BV ≤ 1	P/BV > 1	P/BV ≤ 1	P/BV > 1
minimum	-4.46	1.16	-4.46	1.16
1st quartile	-0.19	1.64	-0.19	1.58
median	0.43	2.17	0.38	1.98
3rd quartile	0.56	3.07	0.54	2.33
maximum	0.97	15.59	0.97	3.32
arithmetic average	0.03	3.35	-0.01	2.05
standard deviation	1.10	3.33	1.11	0.62

The absolute deviation of the book value from the market value is further illustrated in the following graph, which shows the calculation for a set of 47 businesses. The main (left) y-axis shows the frequency of businesses in cumulative terms, while the minor (right) y-axis shows the frequency in each class. The x-axis shows the percentage deviations of the market and book values, resp. *P*/*BV* from 1.

The *P*/*BV* ratio deviates from the value of 1 in about half of the businesses (24/47) by up to 75%, while less than a quarter show a deviation of up to 50%. However, it should be noted that a deviation of more than 200% was recorded for 8 companies – a half of which are the most important players on the market, and therefore, for a reduced set of 41 businesses, the results shown would be more favourable in terms of the relationship between the book and the market values.

The following table contains basic statistical indicators of *P*/*BV* ratios for both samples, differentiated by equality: *P* = *BV*.

The results in Tab. III are divided into 4 columns. First two of them are related to the set of 47 entities, last two of them are related to the set of 41 entities (sets' creation process is described in the chapter "Sample reduction"). Both sets are divided into two groups according to Tab. II. The results show that between both samples with *P*/*BV* ≤ 1, there is not much difference (5 of 6 top breweries has *P*/*BV* much higher than 1). To these breweries we can say that 25% of them has negative market value as well as all of them below average.

On the other hand, both samples with *P*/*BV* > 1 show median around 2, which means that the market value is twice as high as the book value. The set of 41 breweries with *P*/*BV* > 1 has also the most accurate values for industry multipliers application, according to its relative interquartile spreads and standard deviation.

The results, resp. the values of median and arithmetic average, also show that the data in the groups with *P*/*BV* ≤ 1 are skewed to the right side and the data in the group with *P*/*BV* > 1 in the set of 47 entities are skewed to the left side. The data in the group with *P*/*BV* > 1 in the set of 41 entities are almost symmetric.

Estimates Based on the P/EAT Ratio and ROE Decomposition

According to equations (16-1, 16-2, 16-3, resp. their decomposition in 17-1, 17-2, 17-3), we use *P*/*EAT* and related financial ratios for an alternative calculation of *P*/*BV* ratio.

IV: *P/BV ratio based on the P/EAT and ROE decomposition (dimensionless, ROA in %)*

Average indicator	a set of 45* entities		a set of 39* entities	
	P/BV ≤ 1	P/BV > 1	P/BV ≤ 1	P/BV > 1
P/EAT	0.53	20.33	-0.57	18.90
ROA	-3.47%	9.49%	-3.74%	7.86%
FL	2.82	1.92	2.89	1.86
P/BV	**-0.05**	**3.70**	**0.06**	**2.76**
P/BV mean (Tab. III)	0.03	3.35	-0.01	2.05
Difference	-0.08	0.35	0.07	0.71

According to equation (15), we use the reduced samples. The values of sectoral *P*/*EAT*, *ROA* and *FL* are according to methodology calculated as arithmetic average. The resulting *P*/*BV* is shown in Tab. IV.

The data in Tab. IV are divided into columns according to the same logic as in Tab. III, with one modification. The sets are reduced by two extreme values of Pivovar Nová Paka, a.s. (*P*/*E* ratio = 1 031.8) and Pivovar Chotěboř, s.r.o. (*P*/*E* ratio = -3 027). *P*/*E* ratio for the data groups with *P*/*BV* ≤ 1 is almost zero, *P*/*E* ratio for the data groups with *P*/*BV* > 1 is close to 20. Using the average values of *ROA* and *FL* for each group, the resulting *P*/*BV* ratios were calculated. The last three rows of Tab. IV show that the resulting *P*/*BV* ratio based on the *P*/*EAT* ratio and *ROE* decomposition do not differ significantly from the arithmetic average of *P*/*BV* calculated in Tab. III. The difference between these two estimates is shown in the last row of Tab. IV. The highest one (absolute values) can be seen in the last column, the data groups with *P*/*BV* ≤ 1 show the lowest absolute differences.

DISCUSSION

The results included in Tab. I and, after differentiation according to Tab. II, in Tab. III presents the *P*/*BV* ratio for Czech brewing industry differenced by the quartiles and by the equality of book and market value of equity. These values of *P*/*BV* as a differenced industry multiplier are directly applicable for indicative business valuation.

Further research is needed to verify the appropriateness of using these multipliers for privately held companies in other industries and the reliability of the results cannot be guaranteed in case of different valuation dates – for the dynamic point of view to the value of the breweries we are going to do a study focused on the changes in the market value of Czech breweries during the year 2020.

An interesting feature of the Czech brewing industry is that the book value of most of the businesses exceeds their market value (see the median *P*/*BV* ratios in Tab. I), while for manufacturing companies, the general rule is that the book value of equity will be lower than the market value of equity. This can be partly explained by the fact that some of the valued breweries are loss-making businesses, and some have invested heavily in production facilities and capacity expansion without any corresponding increase in profitability or turnover. For some breweries that are part of multinational groups, this can also be explained by the fact that these companies do not sell their products directly on the market, but the production is first purchased by the parent company, which then distributes the products. In some cases, the transfer prices set in this way are so low that the resulting cash flow of the brewery is disproportionate to its share of the entire production and distribution process and the book value of the brewery's assets exceeds the market value which is 'transferred' to the parent company in this way.

There is another factor that could cause the low values of the *P*/*BV* ratio – the relatively low profitability in food and beverage industry. Since there is no data for the *P*/*BV* ratio of privately held companies, the table below shows some key financial ratios for the breweries and selected “beverage” industries in Czech Republic for the comparison of its rentability and leverage. We used ratios *ROE*, *ROA* and *FL* because they are key to the proposed construction of estimates of industry multipliers, and therefore they outline the situation in the Czech brewing industry compared to other selected industries.

From the table above, it's evident that *ROE* and *ROA* in wine production and brewing industry is quite low. Relatively highest rentability reaches the dairy industry. In the business valuation professional community, it's well known, that the winemakers do not provide high capital gains and many of them (except the biggest corporates) do their work more as a hobby than a business. In the brewing industry it's not so obvious, but according to the results, in connection with the comparison above, this factor should be considered by breweries too. We can also see that brewing industry is the least indebted industry from the table above.

Once we have the data in Tab. V, we can also make an indicative calculation of differences of *P*/*BV* ratio between these industries. According to equation (6), we use the *P*/*EAT* and *ROE* decomposition to assess the *P*/*BV* ratio. The *P*/*E* ratio of index S&P 500 as

V: *Comparison of selected indicators (industry median)*

	2015	2016	2017	2018	2019	average
			ROE (EAT/BV)			
breweries	6.39%	5.74%	4.00%	2.83%	3.46%	**4.48%**
wine producers	-8.72%	2.21%	2.98%	1.78%	5.31%	**0.71%**
distilleries	4.25%	9.01%	4.79%	11.87%	9.38%	**7.86%**
dairies	1.87%	13.44%	9.69%	9.59%	10.01%	**8.92%**
			ROA (EAT/Assets)			
breweries	2.46%	3.22%	2.54%	2.00%	2.84%	**2.61%**
wine producers	-3.62%	0.73%	1.48%	0.55%	0.78%	**-0.02%**
distilleries	1.63%	2.85%	2.01%	4.68%	5.63%	**3.36%**
dairies	4.01%	7.72%	5.14%	4.29%	6.39%	**5.51%**
			FL (Assets/BV)			
breweries	1.76	1.72	1.66	1.54	1.41	**1.62**
wine producers	2.11	2.46	2.28	2.61	4.43	**2.78**
distilleries	2.46	2.60	2.71	2.56	2.37	**2.54**
dairies	1.77	1.58	1.86	1.75	1.68	**1.73**

Data source: TP Catalyst database – Bureau Van Dijk (2021)

a multidisciplinary industry value for the period 2015–2019 (the same as the period of data in the Tab. V) will serve us as the default value of the *P*/*EAT* for each industry.

We are aware of the differences of companies included in the S&P 500 index from the analysed Czech industries, but for the purposes of industry differences we found that appropriate[12]. The calculation is shown in Tab VI. We used median data for period 2015–2019 to smooth out potential discrepancies in the raw industry data.

According to the indicative calculation of *P*/*BV* for industries in Tab. VI we can see that the entities in the wine producing industry in the Czech Republic have the lowest market value of analysed industries and half of them should have negative market value. On the other hand, the distilleries and dairy industry have the *P*/*BV* twice as high as the brewing industry.

The median *P*/*BV* for the non-reduced sample of breweries for the period 2015–2019 (0.93) is not so far from the industry median shown in Tab. I (0.80, resp. 0.74), so these results are quite consistent together. In accordance with that there may be quite a lot of potential in using *ROE* decomposition to obtain industry valuation multipliers based on the multisectoral *P*/*E* ratio for the relative valuation of Czech privately held companies. However, as we said above, more research to this topic to use our findings for other industries is needed.

VI: *Indicative assessment of P/BV for other industries*

Industry	P/EAT	ROA	FL	P/BV
breweries	22.07	2.61%	1.62	**0.93**
wine producers	22.07	-0.02%	2.78	**-0.01**
distilleries	22.07	3.36%	2.54	**1.88**
dairies	22.07	5.51%	1.73	**2.10**

Source of S&P 500 *P*/*E* ratio data: Multpl.com (2022)

Further evaluation of our results might be a comparison with *P*/*BV* of publicly traded breweries – see Tab. VII. Top 6 companies according to market capitalization are included, for another, see Damodaran (2020b). The European industry average and median are also included.

From the Tab. VII it is clear that the *P*/*BV* multipliers for publicly traded companies in Europe differ significantly from the multipliers of Czech privately held breweries, which confirms the importance of our study and its subject.

Based on the general consensus within the literature (Mařík *et al.*, 2018; Damodaran, 2012; Duff&Phelps, 2017; etc.), it can be said that the differences are mainly due to the specificities of different capital markets. According to the above-mentioned authors, these differences are usually dealt with by applying various risk premiums (country risk premium, small-cap risk premium, illiquidity discount) when applying the DCF method.

12 An interesting fact is, that *P*/*E* ratio of S&P 500 has nearly the same value as the 3rd quartile of Czech brewery industry (22.07 vs. 22.18) and as e.g. Plzeňský Prazdroj (22.23), Heineken ČR (22.02) or DUP Družstvo (22.73).

VII: *P/BV of publicly traded companies*

Company	Exchange	Ticker	Country	P/BV
Anheuser-Busch InBev SA/NV	ENXTBR	ABI	Belgium	2.01
Diageo plc	LSE	DGE	United Kingdom	8.79
Heineken N. V.	ENXTAM	HEI A	Netherlands	3.92
Pernod Ricard SA	ENXTPA	RI	France	3.14
Heineken Holding N.V.	ENXTAM	HEI O	Netherlands	1.66
Carlsberg A/S	CPSE	CARL B	Denmark	3.75
median (49 companies)	-	-	Europe	1.74
average (49 companies)	-	-	Europe	2.82

Data source: Damodaran (2020b)

Regarding the comparability of the industry multiplier estimate based on *P*/*BV* with the proposed alternative estimates based on *P*/*EAT* supplemented by the above-mentioned financial and economic context, in both cases the Czech brewing industry was divided into two groups, namely with $P/BV > 1$ and $P/BV \leq 1$. With a differentiated approach to determining valuation multipliers within a given sector, the definition of groups of companies that are similar remains a key issue. In the case of our proposals, the logical breakdown of companies could be in relation to the size of the *ROE* or *ROA*. It is also possible to choose other criteria for the division of the industry into groups of companies, not only financial and economic, but also technological, etc.

CONCLUSION

The results of this article confirm the findings made by Prof. Damodaran (2012), who considers book value to be a significant factor that translates into market value. Therefore, it is evident that just like with publicly traded companies, the book value of equity is a significant determinant of market value for privately held companies.

However, the main contribution of this article is the suggestion of some differentiation in the quantification of industry valuation multipliers and clarification the *P*/*BV* ratio in connection with *P*/*EAT* ratio and *ROE* decomposition, which even more leads to a possibility of multisectoral application.

Acknowledgements

Supported by the grant No. PEF_DP_2021016 of the PEF Mendelu Internal Grant Agency.

REFERENCES

ANANDARAJAN, A. *et al.* 2006. The Role of Earnings and Book Values in Pricing Stocks: Evidence from Turkey. *Advances in International Accounting*, 19: 59–89.

BALL, R. *et al.* 2020. Earnings, retained earnings, and book-to-market in the cross section of expected returns. *Journal of Financial Economics,* 135(1): 231–254.

BUDĚJOVICKÝ BUDVAR. 2008. Beer history [in Czech: Historie piva]. *Budějovický Budvar* [online]. Available at: https://web.archive.org/web/20100125130042/http://www.budejovickybudvar.cz/o-pivu/historie-piva.html [Accessed: 2022, January 12].

BUREAU VAN DIJK. 2021. *TP Catalyst* [online]. Available at: https://tpcatalyst.bvdinfo.com/202101/version-20210114163019/TpCatalyst/ [Accessed: 2021, December 10].

CZECH NATIONAL BANK. 2021. *ARAD* Time Series Database - Interest Rates [in Czech: Databáze časových řad ARAD – Úrokové sazby]. Česká *národní banka* [online]. Available at: https://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=AAABAA&p_sestuid=&p_lang=CZ [Accessed: 2021, March 4].

ČADIL, J. 2010. *Regional economics: theory and applications* [in Czech: *Regionální ekonomie: teorie a aplikace*]. Praha: C. H. Beck. ISBN 978-80-7400-191-8

DAMODARAN, A. 2006. *On Valuation: Security analysis for investment and corporate finance*. 2nd Edition. Hoboken, New Jersey: John Wiley & Sons, Inc. ISBN 978-0-471-75121-2

DAMODARAN, A. 2012. *Investment valuation: Tools and techniques for determining the value of any asset*. 3rd Edition. Hoboken, New Jersey: Wiley. ISBN 978-1-118-01152-2

DAMODARAN, A. 2020a. *Historical Returns on Stock, Bonds and Bills* [online]. Available at: http://www.stern.nyu.edu/~adamodar/pc/ datasets/histretSP.xls [Accessed: 2021, April 24].

DAMODARAN, A. 2020b. *Globalcompfirms2020* [online]. Available at: http://www.stern.nyu.edu/~adamodar/pc/datasets/globalcompfirms2020.xlsx [Accessed: 2022, March 29].

DOBLAS, M. P., LAGARAS M. C. P. and ENRIQUEZ, J. A. 2020. Price to Earnings and Price to Book Ratios as Determinants of Stock Return: The Case of Financial Institutions Listed in Bahrain Bourse. *Journal of Applied Economic Sciences*, 15(3): 532–539.

DUFF & PHELPS. 2017. *Valuation Handbook. International Guide to Cost of Capital.* Hoboken, New Jersey: John Wiley & Sons. ISBN 978-1-119-36672-0

EUROPEAN COMMISSION. 2008. *Commision Regulation (EC) No 1014/2008 of 16 October 2008 entering certain names in the Register of protected designations of origin and protected geographical indications (České pivo (PGI), Cebreiro (PDO))*. Official Journal of the European Union L 276/27. Brussels: European Commission.

EVS. 2016. European Valuation Standards 2016. Brussels: TEGoVA. ISBN 978-90-819060-1-2

FERREIRA, V., PIÉ, L. and TERCEÑO, A. 2021. Economic impact of the bioeconomy in Spain: Multiplier effects with a bio social accounting matrix. *Journal of Cleaner Production*, 298: 126752.

FERNÁNDEZ, P. 2019. Company Valuation Methods. In: *Valuation and Common Sense*. 7th Edition. DOI: http://dx.doi.org/10.2139/ssrn.274973

GLAESER, E. L., SACERDOTE, B. I. and SCHEINKMAN, J. A. 2003. The social multiplier. *Journal of the European Economic Association*, 1(2–3): 345–353.

HAMERNÍKOVÁ, B., MAAYTOVÁ, A. *et al.* 2007. *Public Finance* [in Czech: *Veřejné finance*]. 3. ed. Praha: ASPI. ISBN 978-80-7357-301-0

CHAI, D., CHIAH, M. and ZHONG, A. 2020. Decomposing value: Changes in size or changes in book-to-market? *Pacific-Basin Finance Journal*, 64: 101467.

IVS. 2017. *International Valuation Standards 2017*. London: IVS Council. ISBN 978-0-9931513-0-9

MAŘÍK, M. *et al.* 2018. *Business valuation methods: Valuation process - basic methods and procedures* [in Czech: *Metody oceňování podniku: Proces ocenění – základní metody a postupy*]. 4th Edition. Praha: Ekopress. ISBN 978-80-87865-38-5

MAŘÍK, M. and MAŘÍKOVÁ, P. 2007. *Discount rate for income approach valuation of the company* [in Czech: *Diskontní míra pro výnosové oceňování podniku*]. Praha: Oekonomica. ISBN 978-80-245-1242-6

MINISTRY OF INDUSTRY AND TRADE OF THE CZECH REPUBLIC. 2012. *Benchmarking diagnostic system of financial indicators INFA - calculation methodology* [in Czech: *Benchmarkingový diagnostický systém finančních indikátorů INFA – metodika výpočtu*]. Available at: https://www.mpo.cz/assets/cz/rozcestnik/analyticke-materialy-a-statistiky/2016/11/metodika-vypoctu.pdf [Accessed: 2021, April 25].

MINISTRY OF INDUSTRY AND TRADE OF THE CZECH REPUBLIC. 2022. Foreign trade statistics [in Czech: Statistiky zahraničního obchodu]. *Ministerstvo průmyslu a obchodu* [online]. Available at: https://www.mpo.cz/cz/zahranicni-obchod/statistiky-zahranicniho-obchodu/ [Accessed: 2022, January 12].

MINISTRY OF JUSTICE OF THE CZECH REPUBLIC. 2021. Public Register and Collection of Documents [in Czech: Veřejný rejstřík a Sbírka listin]. *eJustice* [online]. Available at: https://or.justice.cz/ias/ui/rejstrik [Accessed: 4 March 2021].

MORETTI, E. 2010. Local multipliers. *American Economic Review*, 100(2): 373–377.

MULTPL. 2022. S & P 500 PE Ratio by Year. *Multpl* [online]. Available at: https://www.multpl.com/s-p-500-pe-ratio/table/by-year [Accessed: 2022, February 22].

NOVINKY.CZ. 2019. 192 liters of beer are brewed per capita in the Czech Republic every year [in Czech: V Česku se ročně uvaří 192 litrů piva na hlavu]. *Novinky.cz* [online]. Available at: https://www.novinky.cz/ekonomika/clanek/v-cesku-se-rocne-uvari-192-litru-piva-na-hlavu-jsme-prvni-pred-belgicany-40287376 [Accessed: 2022, January 12].

PARRY, G. and KEMP, S. 2005. Exploring Macroeconomics. 7th Edition. South Perth, WA: Tactic Publications. ISBN 1-875313-23-0

SACKS, J. 2002. *The money trail: measuring your impact on the local economy using LM3*. London: New Economics Foundation. ISBN 18-994-0760-X

VIDAL-GARCIA, R. and RIBAL, J. 2019. Terminal Value in SMEs: Testing the Multiple EV/EBITDA Approach. *Journal of Business Valuation and Economic Loss Analysis*, 14(1): 20180012.

VYDRŽEL, K. and SOUKUPOVÁ, V. 2012. Empirical Examination of Valuation Methods Used in Private Equity Practice in the Czech Republic. *The Journal of Private Equity*, 16(1): 83–99.

WENGER, E. 2003. The undesirably low base interest rate as a disruptive factor in the squeeze out [in German: Der unerwünscht niedrige Basiszins als Störfaktor bei der Ausbootung von Minderheiten]. In: *Kapitalgeberansprüche, Marktwertorientierung und Unterneh-menswert*. München: Verlag Valen, pp. 475–495.

APPENDIXES

Appendix : *List of the initial set of the 50 breweries with P/E and P/BV ratios (dimensionless)*

Entity no.	Name	P/BV	P/EAT
1	Plzeňský Prazdroj, a. s.	15.59	22.23
2	Pivovary Staropramen, s.r.o.	0.80	25.97
3	Heineken ČR, a.s.	7.44	22.02
4	Budějovický Budvar, n. p.	1.65	28.43
5	Pivovar Svijany, a.s.	9.58	25.83
6	Rodinný pivovar Bernard	4.43	26.00
7	Pivovar Zubr, a.s.	0.53	-63.95
8	Pivovar Litovel, a.s.	0.56	14.55
9	Pivovar Holba, a.s.	0.50	14.39
10	Pivovar Protivin, a.s.	1.18	-15.75
11	Tradiční pivovar v Rakovníku	0.74	32.80
12	Pivovar Nymburk, s.r.o.	2.33	16.19
13	Primátor, a.s.	1.63	13.85
14	Měšťanský pivovar v Poličce	2.14	17.88
15	Krakonoš, s.r.o.	1.91	17.71
16	DUP – družstvo	0.80	22.73
17	Hols, a.s.	-0.90	1.30
18	Chodovar, s.r.o.	-0.19	0.38
19	Měšťanský pivovar Havlíčkův Brod	0.58	-41.55
20	Pivovar Samson, s.r.o.	-1.67	7.40
21	Pardubický pivovar, a.s.	-0.56	0.76
22	Pivovar Černá Hora, a.s.	0.31	18.39
23	Bohemia Regent, a.s.	1.58	17.23
24	Pivovar Rohozec, a.s.	1.41	13.49
25	Dudák - měšťanský pivovar	0.43	110.38
26	Pivovar Ferdinand, s.r.o.	1.98	32.74
27	Pivovar Jihlava, a.s.	0.33	-30.07
28	Akciový pivovar Dalešice, a.s.	0.76	44.43
29	Žatecký pivovar, s.r.o.	-4.46	2.71
30	Pivovar Vysoký Chlumec, a.s.	0.29	-1.19
31	Pivovar Nová Paka, a.s.	1.16	1 031.8
32	Pivovar Hubertus, a.s.	2.89	23.47
33	Rožnovské pivní lázně, s.r.o.	1.93	17.33
34	Únětický pivovar, a.s.	3.13	19.82
35	Pivovar Klášter, a.s.	0.44	-0.66
36	Pivovar Uherský Brod, a.s.	0.49	18.21
37	Pivovar Rychtář, a.s.	0.13	1.79
38	Pivovar Chotěboř, s.r.o.	0.97	-3 027
39	Beskydský pivovárek, s.r.o.	3.32	15.10
40	Pivovar Trautenberk, a.s.	0.44	-14.80

Entity no.	Name	P/BV	P/EAT
41	Pivovar Kocour Varnsdorf,	2.39	77.08
42	Pivovary koruny české, s.r.o.	-43.82	10.77
43	Staročeský pivovárek, s.r.o.	0.33	-162.3
44	Pivovar Cvikov, a.s.	-0.77	7.24
45	Pivovar Falkenštejn, s.r.o.	1.50	19.02
46	Pivovar Koníček, s.r.o.	2.24	12.04
47	Pivovar-raven.cz, s.r.o.	-24.00	15.48
48	Nachmelená opice, s.r.o.	19.18	19.04
49	Pivovar Kunratice, s.r.o.	2.20	5.17
50	Pivovar Ogar, s.r.o.	-0.20	4.01
	arithmetic average	0.51	-30.20
	1st quartil	0.33	2.02
	median	0.80	15.29
	3rd quartil	2.10	22.18

Contact information
Michal Drábek: xdrabek1@mendelu.cz (corresponding author)
Pavel Syrovátka: pavel.syrovatka@mendelu.cz