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Relative Valuation of Private Held Companies: Valuation Multiples in the Czech Brewing Industry

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Abstract: This article focuses on the topic of the relative valuation from the perspective of non-publicly traded companies and the determination of industry multiples allowing the subsequent application of this approach to specific industries. I chose the Czech brewing industry as the target industry, represented by the 50 most important entities (covering more than 99% of the industry's turnover). Due to the fact that no market value data are available for this type of company, I first used an income valuation approach – the discounted cash flow (DCF) method to assess the market value of each company in the sample. I then quantified valuation multiples of P/E, EV/EBIT, EV/EBITDA, P/S, EV/S, P/BV, and EV/IC for each company, from which I determined industry statistics. I verified their suitability for use in the relative valuation approach and compared them with the results of existing studies on the most commonly used valuation approaches in the Czech Republic. Furthermore, I compared my own calculations of industry multiples for non-publicly traded companies with available data on industry multiples of publicly-traded companies in the brewing industry across Europe. The results of the comparison show that these multiples are on average lower for non-publicly traded companies than for listed companies.

Keywords: business valuation, relative valuation, DCF, industry multiples, brewing

JEL Classification: G12, G32

1 Introduction

The market value of a publicly traded company's equity can very easily be determined by the product of the share price and the number of shares issued. If necessary, it is possible to proceed to the actual calculation of the valuation, in

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which a number of procedures can be used (especially comparative valuation methods), for which there are also sufficient inputs necessary to determine the value of the valued company as accurately as possible. But what about non-publicly traded companies? (Table 1).

According to Damodaran (2020a), the valuation process does not differ between these two groups of companies as in both cases it is necessary to estimate the cash flow, determine the discount rate and calculate the present value. However, this applies only if the discounted cash flow (DCF) method is applied and assuming the availability of a large amount of data necessary for valuation using this method. However, in the case of the relative valuation approach, the situation is different.

2 Theoretical Framework

The Corporate Finance Institute (2017) considers the relative valuation method to be the most commonly used in the valuation of non-publicly traded companies. However, this is particularly true in the USA, where there is a well-developed capital market and a large amount of publicly traded companies' data from which valuation multiples can be derived for the value of a non-publicly traded company. In the European environment, the situation is different.

Vidal-Garcia and Ribal (2019) summarise the findings of other authors on the most commonly used valuation methods for non-publicly traded SMEs[1] in Europe. The authors cite studies conducted in the United Kingdom and Denmark[2] that found that the discounted cash flow method is preferable to the use of valuation multiples for estimating the value of small companies, loss-making companies or companies with a limited number of comparable publicly traded companies. Vydržel and Soukupová (2012) conducted a study on the most commonly used valuation methods in the Czech Republic. The result of this study is that 89% of respondents use the DCF method as the primary method for valuing non-publicly traded companies. A surprising finding of the study was that the use of valuation multiples was more common (91%) than the use of the DCF method, which would contradict the findings of studies in other European countries. However, the study goes on to report that when both approaches were used, the DCF method was preferred. The authors also mention the fact that in some cases valuation methods are used in a very superficial way – which cannot be considered surprising given

1 Small and medium-sized enterprise.

2 For a more detailed view, see Demirakos, Strong, and Walker (2010), Petersen, Plenborg, and Scholer (2006), and Jennergren (2008).

the fact that the number of publicly traded companies using the relative valuation approach in the Czech Republic is very limited.

Other studies conducted in France (Chastenet and Jeannin 2007) and Spain (Rojo and García 2006) also confirm the preference for the use of the DCF method in the valuation of non-publicly traded companies.

From the above, it can be concluded that for the European environment with a limited number of publicly traded companies from which valuation multiples could be derived, the application of a valuation method other than the comparative/relative valuation method is necessary for a sophisticated valuation, with the discounted cash flow method being the most commonly used.

However, the comparative method of valuation is of great importance for determining the market value of a company, as evidenced by the International Valuation Standards (IVS 2017): "although no one approach or method is applicable in all circumstances, price information from an active market is generally considered to be the strongest evidence of value". European Valuation Standards (EVS 2016), however more focused on real estate valuation, consider the comparative approach as the preferred method to arrive at market value and should be adopted wherever it is appropriate or acceptable to do so.

It can be said that the only objective obstacle to the application of the comparative valuation approach in the Czech Republic (and Europe in general) is the lack of data on the market value of comparable companies from which valuation multiples could be derived (see e.g. Mařík et al. 2018 or the range of traded titles on the Prague Stock Exchange – Burza cenných papírů Praha 2021).

The purpose of this article is to remove the aforementioned barrier to the use of a relative valuation approach for non-publicly traded companies and to establish industry-specific valuation multiples based on data from domestic non-publicly traded companies.

3 Methodology and Data

In this article I will work with the accounting data of companies for the period 2015–2019, with a valuation date of 31 December 2019. This data will be obtained mainly from Bureau Van Dijk databases (2021), e.g. TP Catalyst, and from the Commercial Register of the Czech Republic – Collection of Deeds (Ministerstvo spravedlnosti ČR 2021). Other data necessary for the strategic and financial analysis will also be obtained for the period 2015–2019, mainly from Eurostat (2021), Český statistický úřad (2021), Česká národní banka (2021), etc.

The companies included in the sample on which the valuation multiples will be determined will be selected according to the following conditions (Table 1):

Table 1: Search strategy of companies in the TP Catalyst database.

Search step	Criterion	Step result	Search result
1. All companies in the scope of analysis		24,026,831	24,026,831
2. Status	Active	16,558,160	16,558,160
3. World region/Country.	Address of incorporation only: Czech Republic	339,374	300,544
4. NACE Rev. 2 (Primary codes only)	1105 – Manufacture of beer	8,658	200
5. EBITDA margin (%)	All companies with a known value, 2019, 2018, 2017, 2016, 2015, for at least 3 of the 5 selected periods	3,827,126	88
Boolean search	1 and 2 and 3 and 4 and 5		
Total			88

Source: Bureau Van Dijk (2021).

I chose the Czech brewing industry. On the one hand it provides a sufficiently large data base, on the other hand there are not so many companies in this industry, so it was possible to work with practically the whole industry (>99% of total sales) and assess the value of each important company.

The number of valued companies will be reduced to the TOP 50 (ranked by the amount of sales in 2019), and these represent a total of 99.47% of the sales of the industry (sample of 88 entities). The input information for the whole valuation process is its purpose. Due to the fact that business valuation using multiples is more of an indicative valuation and because the results of the DCF valuation will be used in order to determine these multiples, the valuation will be done due to the decision-making purpose.

The interim step of DCF valuation is an important limitation (that does not occur among publicly traded companies) which effects topicality of the results, however, I still consider it the most accurate and appropriate solution to the given problem.

3.1 Market (Relative) Valuation Approach

Market-based methods determine the value of an asset by comparing it to identical or comparable (similar) assets for which price information is available (IVS 2017). Damodaran (2002) gives the same view. EVS (2016) define the market approach as a valuation made by comparing the subject asset with data obtained from such transactions in the market that meet the criteria for a relevant basis of value. There is a noticeable difference in the view of the International Valuation Standards and

prof. Damodaran versus the European Valuation Standards, where the former base their approach on comparisons with assets for which valuation information is known, while the EVS are based on data on transactions that have already taken place in the market.

These differences are due to the fact that there are more approaches to valuation using multiples. According to Matschke and Brösel (2021), this approach can be differentiated as follows:

- single valuation (valuation does not refer to 100% of shares):
  - stock-and-debt method
  - similar public company approach ("trading multiples")
  - initial public offering approach
- overall valuation (valuation refers to 100% of shares)
  - recent acquisition approach ("transaction multiples")
  - market multiples approach

An almost similar classification is mentioned by Mařík et al. (2018). This paper presents data useable for the overall valuation multiples approach. When the market (relative) valuation approach is used, the general procedure, according to Damodaran (2002), should be as follows:

- identifying comparable assets and obtaining information on their valuation.
- converting the valuation of comparable assets into standardised values (creating multiples).
- comparison of the standardised values of the asset being valued with the observed multiples.

Given the purpose of this article, i.e. estimating valuation multiples for a specific industry, only the first two points of the above procedure will be used.

The first point will be achieved by carrying out a valuation of the majority of companies in the industry, as there is no information available on the valuation of non-publicly traded companies. The valuation of these companies will be done using the discounted cash flow method in accordance with the information provided in the previous chapter 2.

3.2 Discounted Cash Flow Method

This method exists in three variants, with the entity variant being by far the most commonly used, as confirmed by the study of Vydržel and Soukupová (2012). This variant operates with cash flows and discount rate for the whole enterprise and its primary output is enterprise value. The most widespread type of DCF model is the

two-stage procedure, the form of which, according to both Damodaran (2006) and Mařík et al. (2018) is as follows:

$$\mathrm{EV} = \sum_{t=1}^{T} \frac{\mathrm{FCFF}_t}{(1+\mathrm{WACC})^t} + \frac{\mathrm{TV}}{(1+\mathrm{WACC})^T} \tag{1}$$

where "EV" represents enterprise value, "FCFF" free cash flow to the firm, "TV" terminal value, "WACC" weighted average cost of capital, "T" represents the length of the first phase, and "t" represents the sequential number of years from the valuation date.

The above implies the necessity of determining the variable TV, i.e. the terminal value. The method of calculation is given below under the subsection Terminal Value.

Once the present value of the first and second phase is established, the enterprise value is calculated. Equity value can then be determined by reducing the enterprise value by interest-bearing and non-operating debt and increasing it by non-operating assets, all as of the valuation date. The length of the first phase will be set at 10 years due to the application of the Wenger approach to the determination of the risk-free rate (see chapter 3.3).

3.2.1 Free Cash Flow Calculation (FCFF)

The above procedure implies the need to determine the free cash flow at the level of the whole enterprise (FCFF). This free cash flow is normally calculated according to the following formula:

$$\mathrm{FCFF} = \mathrm{EBIT} \times (1-d) + \mathrm{DA} - I - \Delta\mathrm{WC} \tag{2}$$

where "EBIT" represents earnings before interest expense and tax, "d" represents the corporate tax rate, "DA" represents depreciation and amortization, "I" represents investment in operating fixed assets and "ΔWC" represents the change in working capital.

The above general approach is in line with Damodaran (2006). Mařík et al. (2018) further adjust EBIT by excluding non-operating income and expenses as well as non-recurring items[3] (e.g. non-recurring sales of fixed assets or materials, insurance refunds, litigation compensation, etc.) and referring to it as adjusted operating profit. This designation is not used by Damodaran (2006), but the procedure is not inconsistent with what he recommends, so this article will also make

3 Non-recurring items are included in the FCFF only if there is a serious indication that they will occur in the future. If these items have occurred at some point in history without justification that they will occur in the future, they will not be planned.

use of these additional modifications. International and European valuation standards do not address this issue in detail.

This "general" approach of EBIT calculation can be specified as follows:

> The revenue plan of each company is based on several sources. The first one is a strategic analysis of brewing industry[4] – key information is: stable growth with very low dynamics (based esp. on the demographic development and beer consumption per capita) accelerated only by growing exports. The second one is historical data of each company and the third one concerns information from annual reports of each company about its plans and strategies. The resulting revenue plan of an individually company is a mix of these sources (based on the companies' plans and/or historical growth rate with subsequent convergence to sectoral potential, which was set at 2% p.a.) and this mix may vary depending on the nature of each company.

The cost plan of each company is based on the same logic, whereas the key strategic information is high competition in the industry, progressive excise duty and the bargaining power of suppliers (esp. hops, barley malt). The resulting cost plan is mainly based on the historical individual margin with partial convergence to sectoral one (differentiated according to quartile affiliation).

In the Czech financial statements, there is no separate breakdown of depreciation and amortisation, and therefore "DA" will correspond directly to the reporting item "adjustments to fixed asset values – permanent".

Investments are forecasted in such a way as to maintain the current fixed asset structure and their amount corresponds to both the historical development and the forecasted growth of individual companies. In this context, relevant indicators are calculated (CAPEX, average depreciation period, coefficient of revenue growth intensity on investments, reinvestment rate …) through which stabilization is achieved at the end of the first phase of the valuation model. However, the most important information for the investment plan is the companies' intentions as stated in their annual reports.

The change in working capital (operationally necessary) comprises the change in operating receivables, payables and inventories, the change in accruals and the change in provisions and allowances. The plan is mainly based on the individual values of average historical collection period, credit period and stock turnover. For companies without a relatively stable historical development or with some unreasonably extreme values, the industry averages were used in plan.

Given the nature of the above procedures, it is clear that despite the author's best efforts, the FCFF estimates and the resulting multiples are dependent on the quality of the projection performed.

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4 As an example of strategic analysis of Czech brewing industry, see Drábek (2020).

3.3 Discount Rate

To quantify the present value of FCFF under the DCF method used, it is necessary to construct a discount rate that considers the riskiness of future cash flows and their time value (Damodaran 2006; IVS 2017). Given the chosen DCF variant of entity, the discount rate must also be calculated at the enterprise-wide cash flow level (FCFF). Therefore, this discount rate must be a composite of both the cost of equity (r_e) and the cost of debt (r_d), the resulting rate being determined by their weighted average (WACC). These WACCs are by general definition (e.g. Damodaran 2006; Mařík et al. 2018) calculated as follows:

$$\text{WACC} = r_e \times \frac{E}{C} + r_d \times \frac{D}{C} \times (1 - d) \tag{3}$$

where 'E/C' represents the market share of equity in total capital and 'D/C' the market share of interest-bearing debt in total capital. The corporate tax rate is denoted as "d".

There are two approaches to determining the cost of debt for a private held company (Damodaran 2006; Mařík and Maříková 2007; Mařík et al. 2018):

- the use of interest rates on the company's existing loans
- estimation of the synthetic rating and determination of the risk premium

From my own experience, it is worth mentioning a third approach, used in valuation practice, where statistical market data on interest rates on CZK-denominated loans granted by banks to non-financial enterprises in the Czech Republic (only new business) are used to determine the cost of debt for enterprises in the Czech environment, according to data in the ARAD time series database (Česká národní banka 2020).[5]

In the case of using interest rates on existing loans, according to the above authors, it is necessary that the loans are newly granted (according to annual reports and other publicly available information). However, the second approach, based on the principle of the sum of the risk-free interest rate and the risk premium on debt, also has its limits, as it automatically gives all corporates without interest expenses the highest rating and therefore the lowest interest rate. In the framework of this article, the first method mentioned above will be used for companies where these data are available, in case of missing or unreliable data, the third method mentioned above will be used, namely the determination of the cost of debt according to the data in the ARAD database at a rate chosen according to the optimal level of interest-bearing resources of each company.

5 See Česká národní banka (2020).

The cost of equity will be determined according to the CAPM model most used in valuation practice (see 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 is usually modified by extending the market risk premium to include country risk and a premium for smaller market capitalisation. For the purposes of this article, the formula for calculating the cost of equity capital was constructed by synthesising the approaches of the above authors and is as follows:

$$r_e = r_f + \beta \times (r_m - r_f) + r_c + r_{mc} \tag{4}$$

where 'r_e' denotes the cost of equity, 'r_f' the risk-free interest rate, 'β' the coefficient reflecting systematic risk, 'r_m' the expected market return, 'r_c' the country risk premium and 'r_{mc}' the small market capitalisation premium.

The risk-free interest rate for valuation purposes was determined according to the Wenger (2003) approach. The Beta coefficient will be determined using historical data on the market prices of publicly traded companies, which according to Damodaran (2006) and Mařík and Maříková (2007) is the most used approach in valuation. These data can be found e.g. in Damodaran's database (Damodaran 2020d), I will use the data for European companies in the relevant industry. The Beta coefficient is measured in the same currency as the market return. Beta coefficients are taken in their unleveraged form. For the purposes of DCF valuation in this paper, the beta coefficient of each company is then transformed to the levered form according to Damodaran (2006) as follows:

$$\beta_z = \beta_n \times \left[1 + (1 - d) \times \frac{D}{E}\right] \tag{5}$$

where "β_z" denotes the levered beta, "β_n" the unlevered beta, "d" the corporate tax rate and "D/E" the market debt to equity ratio.

According to the above-mentioned authors, the expected market return is most often set at the level of historical data for the longest possible period. In this article, the expected market return will be determined using US capital market data for the period 1928–2019 (data drawn from Damodaran 2020b). This premium is determined by the average difference between the returns on S&P 500 (incl. dividends) and government bonds (10-year) over the period.

The country risk premium is determined according to Damodaran (2020c) as the spread between the 10-year CDS[6] for the Czech Republic and the 10-year CDS for the USA. This spread is further multiplied by the ratio of stock and bond market volatilities. As inputs to the volatility ratio, in line with the calculation of the market risk

6 Credit default swap.

premium, I chose the average standard deviation of the S&P 500 index return including dividends over the period 1928–2019 for the stock market volatility calculation and the average standard deviation of the 10-year US government bond return over the same period for the bond market volatility calculation. I used volatilities from the US market because even the domestic literature (Mařík et al. 2018) does not consider data on volatilities of the Czech stock and bond market to be very reliable. It is also common practice in the Czech Republic to use a volatility ratio of 1.5 in general (which I find highly inaccurate). A study by the Czech Institute for Property Valuation (Rajdl 2005) points to a volatility ratio for the Czech Republic of about 2.80. However, this study is outdated and more recent ones are not available. Based on this, I consider the use of a ratio of 2.80 (or even worse use the general value of 1.5) instead of 2.55 based on the US capital market to be less accurate for reasons of timeliness.

Given that the risk-free interest rate was set on bonds for the Czech Republic, the volatility ratio was further reduced by 1 to avoid duplicating this risk in the discount rate (the adjustment is based on Mařík et al. 2018).

There are also critical voices about the application of the country risk premium, e.g. Kruschwitz, Löffler, and Mandl (2011) oppose the use of this premium as they consider it theoretically and empirically unsupported and unproven. However, Damodaran (2012b) defends this approach by arguing that it is based on a common practice in which even investment banks and financial analysts apply an additional risk premium to developed capital market (e.g. US) ERP used for emerging markets. Mařík and Maříková (2014) consider the above criticism of the concept of country risk premium and acknowledge that the objections of Kruschwitz, Löffler and Mandl are valid, but say that there is currently no more appropriate procedure for taking country risk into account when using developed capital market ERP for Czech market than the one proposed by Damodaran. Taking all the above information into account, I find it necessary to apply a country risk premium to the discount rate despite some limitations of this approach.

The premium for small market capitalization will be determined in an iterative procedure individually for each company based on the determined amount of market capitalization, according to the methodology of the Ministry of Industry and Trade of the Czech Republic (Ministerstvo průmyslu a obchodu ČR 2012). Critical voices have also been raised about the application of this premium. One of them is Damodaran (2015), who makes several points for not applying the small market cap premium. One of them is the fact that when removing the smallest companies (with market capitalization less than $5 million) from the data sample, the effect of that premium disappears, thus he says that one can only consider a premium for these smallest companies, the so-called micro-cap premium.

Ang (2017) is also critical of the application of this risk premium, pointing out that its application is inconsistent with empirical evidence and the CAPM concept.

Grabowski (2018) responds to his criticism by defending the application of the premium and considers Ang's arguments unsubstantiated and the proposal of an alternative method misleading, referring to a number of studies confirming the existence of additional risk for smaller companies.

In practice, Ernst and Young (2020) in their valuation best practice use a small market capitalisation premium, following Duff and Phelps (2017), in an actual edition.

In Czech Republic, the use of this premium in valuation practice can be indirectly derived from the article by Fišer and Kroupová (2021), who discuss its application in the case of a squeeze-out, arguing that this premium should not be missed even for this valuation purpose. Further evidence indirectly confirming this fact is the article by Dědič, Lasák, and Buchta (2021), who refer to the decisional practice of the Delaware courts, according to which the size premium has been and continues to be part of common appraisal practice.

Empirical evidence of the existence of the size premium in the European and Czech environment is provided by Skálová, Podškubka, and Diviš (2018). The authors analysed size-based transaction multiples based on EV and sales, EBIT and EBITDA for the period 2005–2015, with the result that the transaction multiplier is proven to increase as the size of the company increases.

The market capital structure for the purpose of calculating the WACC will be determined using an iterative calculation. Convergence to market D/E ratio at the industry level was used for companies showing extreme values, especially for recently established and dynamically growing companies.

3.4 Terminal Value

Due to the choice of using a two-phase model, it is necessary to consider further the calculation of terminal value. There are several approaches to determine terminal value. IVS (2017) lists the following: Gordon's growth model, the market approach and residual value. Kislingerová (2001) provides five methods: using perpetuity, estimating the P/E ratio at the end of phase 1, final liquidation value, final book value, and the value creation factor model. Damodaran (2006) enumerates three ways: terminal liquidation value, multiples and growth models.

All of these sources (with the partial exception of Kislingerová) describe three variations of the calculation of terminal value in essentially the same way, depending on the (un)boundedness of the asset's duration. Since the going concern principle is assumed in the income valuation of companies, the "growth model" will be used in the article. Mařík et al. (2018) discusses this approach in more detail and presents three options for calculating terminal value for firms that

satisfy the going concern principle: perpetual annuity, the Gordon growth model and the parametric formula. Damodaran (2006) and Mařík et al. (2018) from their own experience recommend the use of a parametric formula. However, it is not only the expert recommendation of individuals, the use of parametric formula is also the most frequently used approach in domestic expert practice (Štěpánková 2020). The calculation of the terminal value (TV) by the parametric formula according to the above authors is based on the model of Copeland, Kollerr and Murrin (1994), modified:

$$TV = \frac{EBIT_{T+1} \times (1 - RR)}{WACC - g} \tag{6}$$

where "$EBIT_{T+1}$" denotes the adjusted EBIT in the first year of the second phase, "RR" denotes the reinvestment rate in the second phase and "*g*" denotes the assumed free cash flow growth rate for the second phase.

Parameter *g* corresponds to the expected long-term growth rate of the Czech brewing industry. According to the information in chapter 3.2.1 (stable, but very low growth), I assume this parameter at the long-term inflation target of the Czech National Bank, i.e. 2% p. a. This means the real growth rate 0% of domestic brewing industry, which is in line with the demographical development and consumption per capita prediction.

Parameter RR is calculated according to Damodaran (2012a) and Mařík et al. (2018) as the ratio of *g* to return on capital. The use of this approach makes it unnecessary to deal with the retentions.

3.5 Valuation Multiples

Once the value of the majority of companies within the industry has been assessed, I can proceed to calculate valuation multiples, of which there are a number. According to Vydržel and Soukupová (2012), the most used multiples in the Czech environment are EV/EBITDA (94%), EV/Sales (55%), EV/EBIT and P/E ratio (42%). In addition to these multiples, other less used multiples (P/Sales, P/BV, EV/IC) will be identified for which there is a comparison[7] in the form of multiples set for publicly traded companies.

7 The comparison will be made on the basis of data in the Refinitiv (2021) and Damodaran (2020d) databases.

4 Results

This chapter quantifies the individual valuation multiples for all companies in the sample. The variables related to enterprise value and equity value (also referred to as "price") were primarily calculated at the level achieved at the valuation date (state variables) and for 2019 (flow variables). For comparison, the results are also presented with the calculation of the reference variable at the 3-year and 5-year historical average, at the level of projected values (forward looking multiples) and at the level of the combined interval of historical + projected values. These variations have been calculated only for those indicators where this is relevant given the nature of the data. The outputs of the DCF valuation (enterprise and equity value) are available in Attachment 1.

4.1 P/E Ratio

The P/E ratio of individual companies is presented in this chapter. First, the Table 2 below shows the basic statistical characteristics:

Table 2: Basic statistics of the P/E ratio of the industry.

	5Y history	3Y history	31/12/2019	Plan	Plan + history
Minimum	−182.48	−557.70	−3,026.92	−44,096.67	−380.69
1st quartile	1.87	0.95	2.02	9.80	12.48
Median	17.01	15.12	15.29	13.50	16.30
3rd quartile	25.21	26.23	22.18	18.88	23.62
Average	20.04	21.86	−30.20	−871.54	18.84
Maximum	457.02	762.78	1,031.83	36.48	294.47

The Table 2 above shows considerable variability in the data at the edges of the interval, but the values of the median and the 25 and 75% quartiles are relatively stable and indicate significantly lower variability in the middle part of the data set. For illustrative purposes, the P/E ratio is also shown in the following histograms (the *x*-axis indicates the number of companies) (Figure 1):

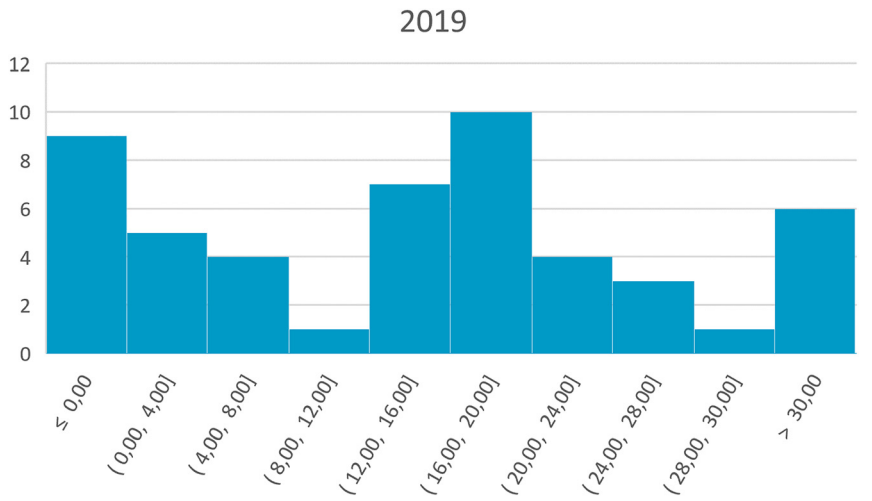

Figure 1: Histogram of P/E ratio for the brewing industry as of 31/12/2019.

The next graph shows the same indicator calculated using the 5-year average of the reference variable (Figure 2):

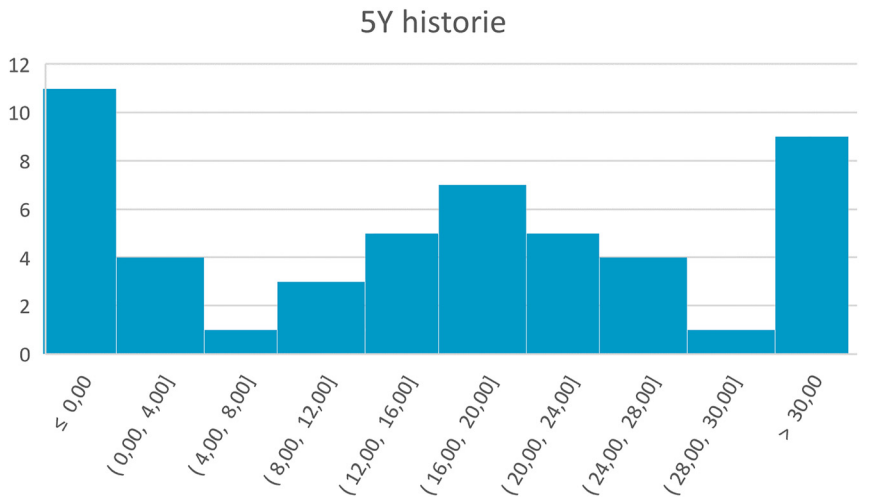

Figure 2: Histogram of P/E ratio for the brewing industry (5-year average).

Both graphs show that a significant number of companies at both ends of the interval exhibit relatively extreme values. However, if we disregard these results, there is an almost symmetric distribution of values along the P/E ratio interval (16–20>, especially on the historical results.

4.2 EV/EBIT

Within this chapter, the EV/EBIT of individual companies is presented. First, the Table 3 below shows the basic statistical characteristics:

Table 3: Basic EV/EBIT industry statistics.

	5Y history	3Y history	31/12/2019	Plan	Plan + history
Minimum	−120.74	−137.85	−2,415.20	−151.71	−359.02
1st quartile	−1.96	−4.12	6.11	9.68	10.54
Median	13.09	11.35	13.53	11.46	13.27
3rd quartile	20.31	21.47	19.69	16.25	18.82
Average	12.31	12.28	−34.51	9.68	14.52
Maximum	317.48	203.42	79.69	30.51	363.83

The above shows considerable variability in the data at the edges of the interval, but the median and 75% quartile values are relatively stable and indicate lower variability in the middle part of the data set. However, for the 1st quartile of values, the results vary considerably from period to period. For illustrative purposes, the EV/EBIT is also shown in the following histograms (*x*-axis indicates the number of companies) (Figure 3):

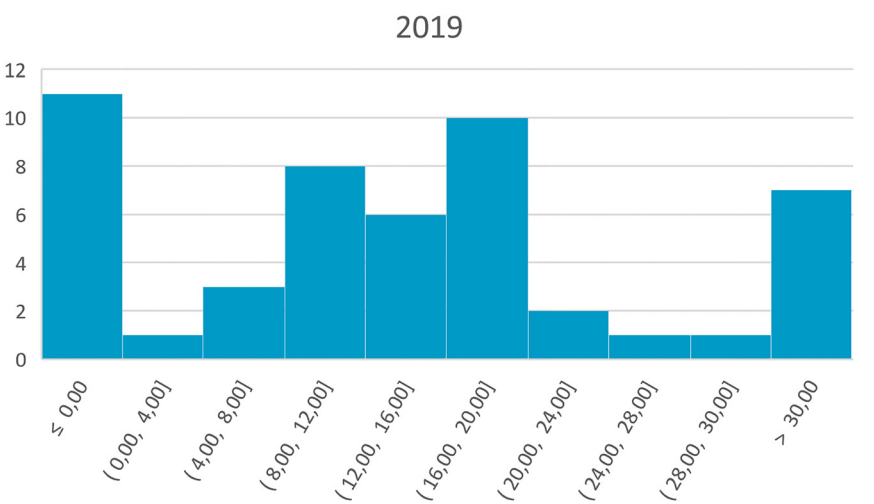

Figure 3: Histogram of EV/EBIT for the brewing industry as of 31/12/2019.

The next graph shows the same indicator calculated using the 5-year average of the reference variable (Figure 4):

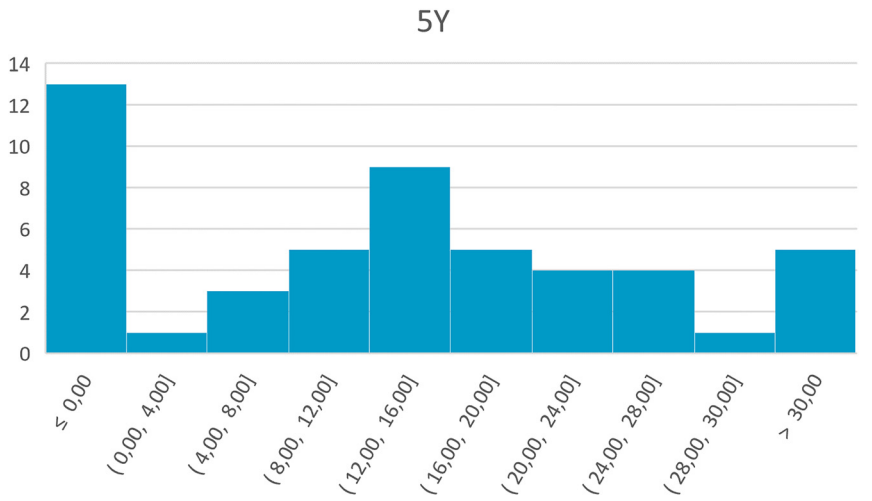

Figure 4: Histogram of EV/EBIT for the brewing industry (5-year average).

It is clear from both graphs that a significant number of companies at both ends of the interval exhibit extreme values – particularly for the negative value area. Setting aside these results, however, a rather symmetric distribution of values along the P/E ratio interval (12–16>, for the histogram of historical and valuation-date values, is evident.

4.3 EV/EBITDA

Within this chapter, the EV/EBITDA of individual companies is presented. First, the Table 4 below shows the basic statistical characteristics, and due to the

Table 4: Basic EV/EBITDA industry statistics.

	5Y history	3Y history	31/12/2019	Plan	Plan + history
Minimum	−66.69	−167.65	−14.70	−3.95	−7.44
0.1 percentile	3.21	4.52	3.34	3.92	3.95
0.2 percentile	4.81	5.29	5.17	4.35	4.69
1st quartile	5.11	5.73	5.68	4.58	4.81
0.3 percentile	5.30	5.90	5.98	4.74	5.14
0.4 percentile	6.33	6.49	6.66	5.59	6.24
Median	7.09	7.24	7.49	5.95	6.65
0.6 percentile	7.69	7.95	8.05	6.86	7.21
0.7 percentile	9.17	10.81	9.73	7.16	7.80
3rd quartile	9.62	11.52	10.73	7.29	8.05
0.8 percentile	13.34	12.11	11.00	7.38	9.54
0.9 percentile	16.02	15.96	12.07	10.74	13.11
Maximum	32.05	44.61	81.40	13.15	27.07
Average	6.16	6.05	8.54	6.33	7.38

importance of this indicator for the field of business valuation (see chapter Valuation multiples), it will be given more space compared to other valuation multiples.

From the above, there is also considerable variability in the data for this indicator in terms of maximum and minimum values, however, the values of these percentiles show a relatively stable trend and less variation in the data between levels. For illustrative purposes, the EV/EBITDA is also shown in the following histograms (*x*-axis indicates the number of companies) (Figure 5):

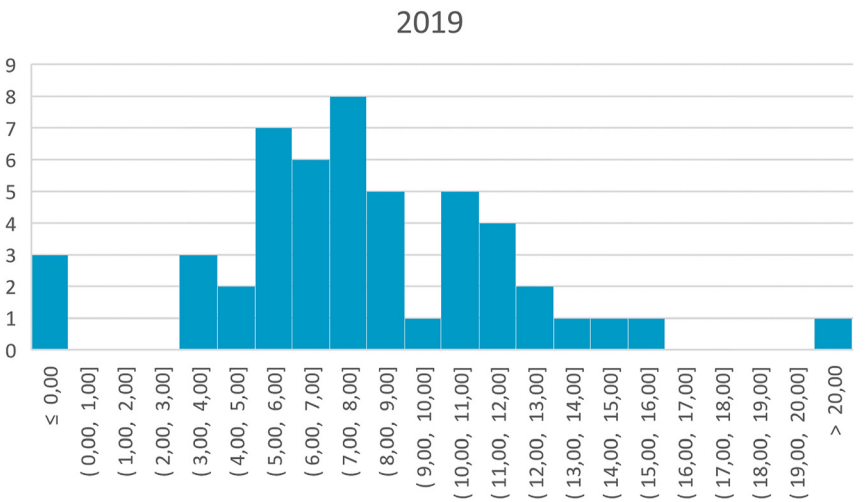

Figure 5: Histogram of EV/EBITDA for the brewing industry as of 31/12/2019.

The chart describing the situation as of the valuation date shows that, with the exception of a few outliers, all the companies are in the 3–16 multiple range, which is a wide range, but there is a hint of a normal distribution of the data, with most of the valued companies in the 5–9 EBITDA multiple range. The most common multiple in this sample is a value in the range 7–8 followed by an interval of 5–6.

The next graph shows the same indicator calculated using the 5-year average of the reference variable (Figure 6):

The graph based on the five-year history of the reference variable shows a higher incidence of outliers at the edges of the interval, as well as a significant number of companies standing outside the "main" area of the histogram, which is in the range of values 2–10. However, even this chart shows that multiples in the 5–6 and 7–8 range are the most common within the brewing industry.

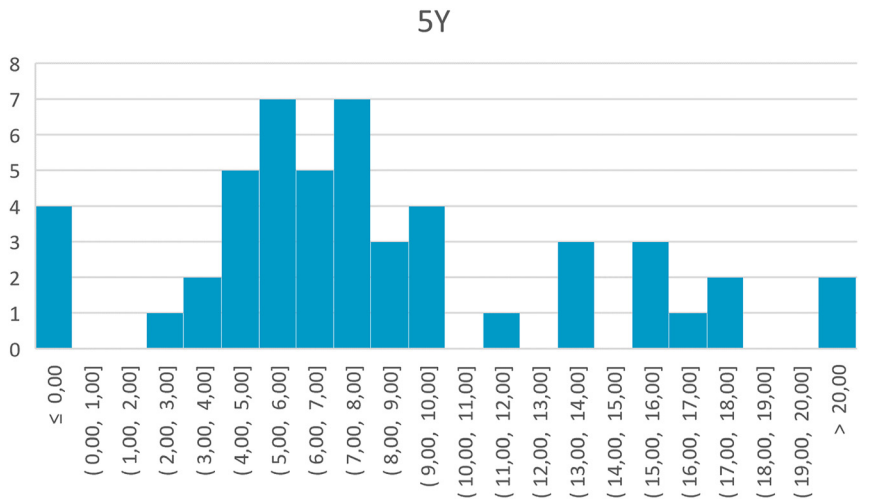

Figure 6: Histogram of EV/EBITDA for the brewing industry (5-year average).

4.4 P/S Ratio

Within this chapter, the P/S ratio of each company is presented. First, the Table 5 below shows the basic statistical characteristics:

Table 5: Basic statistics of the P/S ratio of the industry.

	5Y history	3Y history	31/12/2019	Plan	Plan + history
Minimum	−5.80	−5.58	−5.41	−4.84	−5.12
1st quartile	0.46	0.44	0.40	0.32	0.36
Median	0.76	0.76	0.72	0.61	0.66
3rd quartile	2.14	1.76	1.65	1.39	1.50
Average	1.26	1.15	1.09	0.89	0.97
Maximum	6.68	6.36	6.15	5.28	5.68

The above shows considerable variability in the data at the edges of the interval, but the median and 25% quartile values are relatively stable and indicate lower variability in the middle part of the data set. However, for the 3rd quartile of values, the results vary considerably from period to period, and the difference from the median is also considerably higher compared to the 1st quartile of values. For illustrative purposes, the P/S ratio is also shown in the following histograms (the *x*-axis indicates the number of companies) (Figure 7):

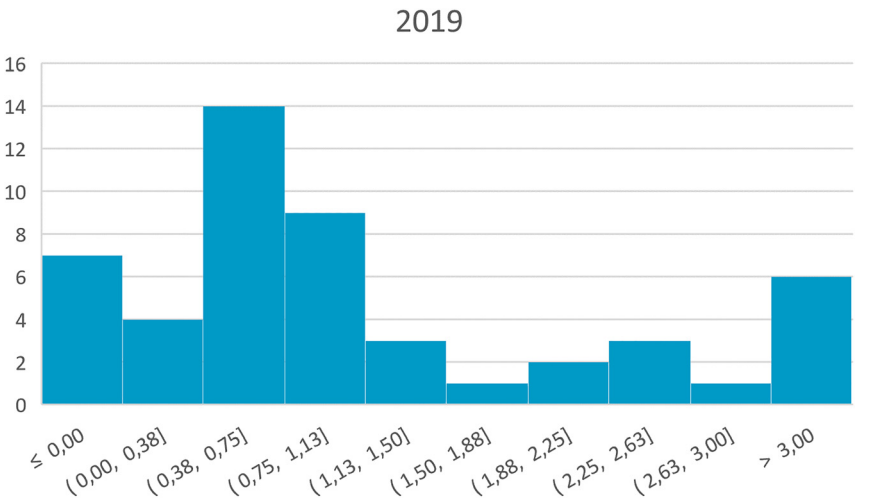

Figure 7: Histogram of P/S ratio for the brewing industry as of 31/12/2019.

The next graph shows the same indicator calculated using the 5-year average of the reference variable (Figure 8):

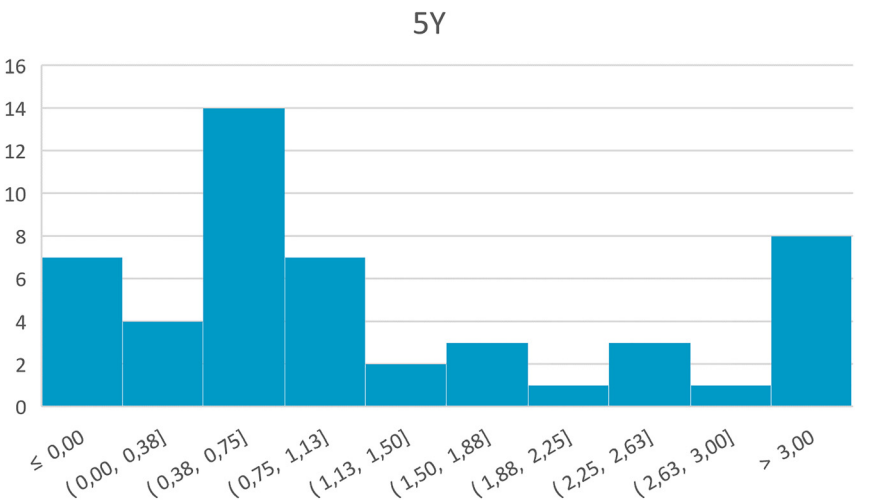

Figure 8: Histogram of P/S ratio for the brewing industry (5-year average).

It is clear from both graphs that a significant number of companies at both ends of the interval exhibit extreme values – particularly for the negative value area. However, if we disregard these results, the most frequent multiple in the industry is in the interval 0.38–0.75, followed by a multiple in the interval 0.75–1.13.

4.5 EV/S Ratio

The EV/S ratio of each company is presented in this chapter. First, the Table 6 below shows the basic statistical characteristics:

Table 6: Basic statistics of the EV/S ratio industry.

	5Y history	3Y history	31/12/2019	Plan	Plan + history
Minimum	−4.91	−4.72	−4.57	−4.09	−4.33
1st quartile	0.52	0.50	0.47	0.41	0.43
Median	0.92	0.86	0.81	0.67	0.75
3rd quartile	2.17	1.73	1.55	1.33	1.37
Average	1.34	1.22	1.15	0.93	1.02
Maximum	6.75	6.42	6.21	5.34	5.74

The above shows considerable variability in the data at the edges of the interval, but the median and 25% quartile values are relatively stable and indicate lower variability in the middle part of the data set. However, for the 3rd quartile of values, the results vary considerably from period to period, and the difference from the median is also slightly higher compared to the 1st quartile of values. For illustrative purposes, the EV/S ratio is also captured in the following histograms (*x*-axis indicates the number of companies) (Figure 9):

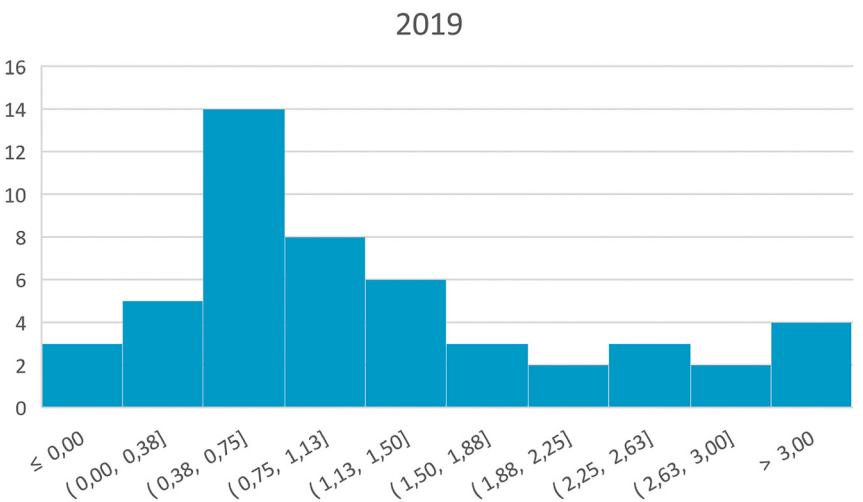

Figure 9: Histogram of EV/S ratio for the brewing industry as of 31/12/2019.

The next graph shows the same indicator calculated using the 5-year average of the reference variable (Figure 10):

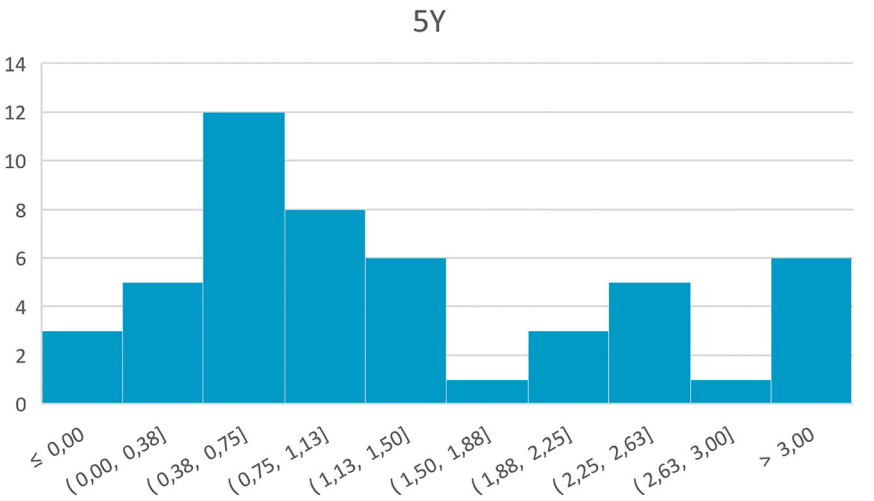

Figure 10: Histogram of EV/S ratio for the brewing industry (5-year average).

Both graphs show that, as with the previous P/S indicator, the most frequent values of the multiples are the interval 0.38–0.75 and 0.75–1.13. However, unlike the previous graphs, there is a hint of a normal distribution of values in the first half of the graph – the second half of the graph shows non-negligible numbers of enterprises for each interval.

4.6 P/BV Ratio

Within this chapter, the P/BV ratio of each company is presented. First, the Table 7 below shows the basic statistical characteristics:

Table 7: Basic P/BV ratio statistics of the industry.

	31/12/2019
Minimum	−43.82
1st quartile	0.33
Median	0.80
3rd quartile	2.10
Average	0.51
Maximum	19.18

The Table 7 above shows considerable variability in the data in terms of the interval margins, but the interquartile comparison also shows mutually differentiated values. The average of the values is skewed downwards compared to the median. For illustrative purposes, the P/BV ratio is also shown in the following histogram (the *x*-axis indicates the number of companies) (Figure 11):

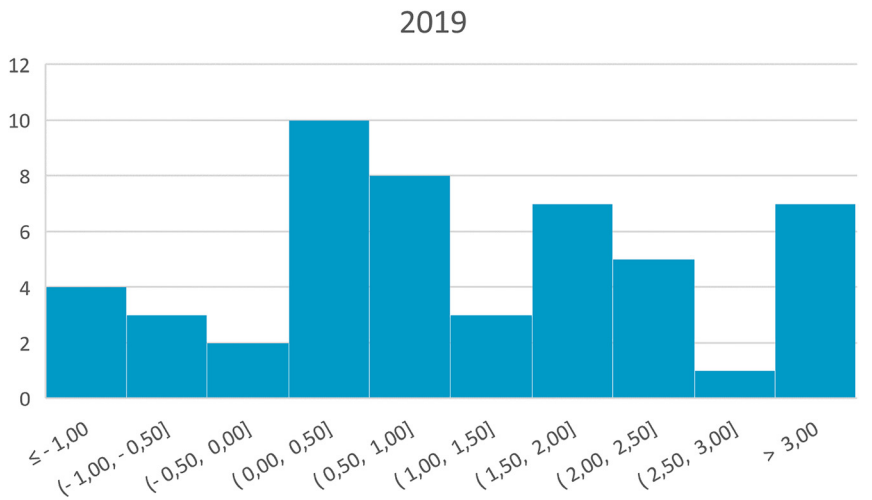

Figure 11: Histogram of P/BV ratio for the brewing industry as of 31/12/2019.

The chart shows that despite the significant number of companies at both ends of the interval, most of them are in the 0–2.5 range. However, this is a very wide range. A more detailed look at the P/BV ratio and the relationship between the book and market value of domestic breweries is dealt with in my article "Book Value in Business Valuation: P/BV Ratio in the Czech Brewing Industry", which is in progress now.

4.7 EV/IC Ratio

Within this chapter, the EV/IC ratio of each company is presented. First, the Table 8 below shows the basic statistical characteristics:

Table 8: Basic statistics of the EV/IC ratio industry.

	31/12/2019
Minimum	–44.58
1st quartile	0.54
Median	1.04
3rd quartile	2.19
Average	1.59
Maximum	37.76

The Table 8 above shows a considerable variability of the data in terms of the edges of the interval, but the interquartile comparison also shows mutually differentiated values – but the difference is lower compared to the EV/IC ratio. The average of the values is skewed upwards compared to the median. For illustration, the EV/IC ratio is also shown in the following histogram (*x*-axis indicates the number of companies) (Figure 12):

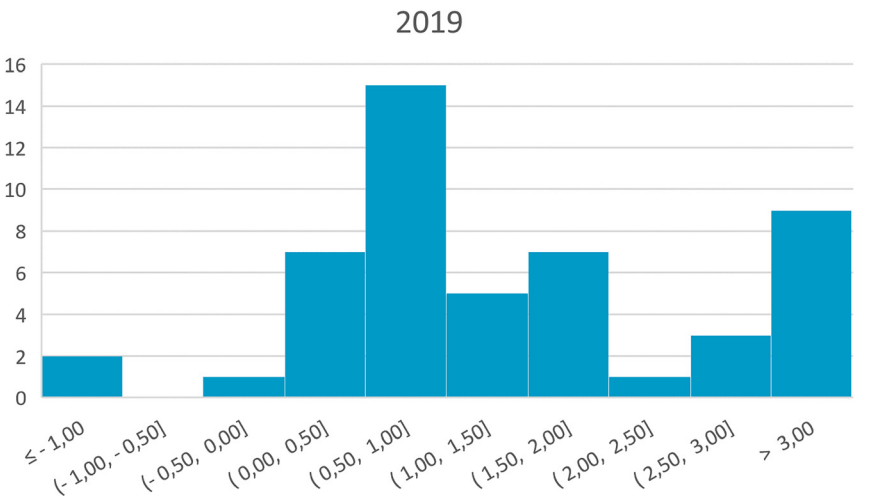

Figure 12: Histogram of EV/IC ratio for the brewing industry as of 31/12/2019.

The chart shows that the EV/IC ratio shows a much more symmetrical distribution of values compared to the P/BV ratio (ignoring the outliers at the edges of the interval). Based on the chart above, it can also be seen that the most frequent interval within which the indicator ranged was 0.5–1.0.

5 Discussion and Conclusions

Based on the previous chapter devoted to the research results, it is possible to get an idea of the individual relative valuation indicators for the Czech brewing industry.

In some cases, it may appear more reliable to use the historical average of the reference variable rather than the value at the valuation date, but the differences were not significant. Some of the indicators showed a considerable range of values, while for others the data partially followed a normal distribution. The results of the previous chapter present directly applicable values of valuation multiples for

calculating the relative (and indicative) valuation of any Czech brewery. Further research is needed to test the applicability of these conclusions to non-publicly traded companies in other industries.

Another important point is to determine the appropriateness of each relative valuation indicator for the valuation of the company. Two tables are created for this purpose.

The first table shows the selected differentials for each valuation multiple. For the sake of comparability, these values are further related to the median value of the individual valuation multiples. The baseline data is the five-year historical series (2015–2019) (Table 9).

The table shows that the EV/EBITDA multiple shows by far the smallest differences in the individual statistics relative to the median. The interquartile range of EV/EBITDA is 64% of the median. The second lowest deviations were shown by the statistical data on the valuation multiple P/E ratio, but compared to EV/EBITDA, these values are approximately twice as high.

The second table contains identical differentials for each valuation multiple but based on data as of 31/12/2019 only. For the sake of comparability, these values are also related to the median of the individual valuation multiples (Table 10).

Table 9: Share of selected difference indicators in the median of valuation multiples (5Y).

5Y history	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
Max-min	37.60	33.48	13.93	16.44	12.66
Median – 1st quartile	0.89	1.15	0.28	0.39	0.43
3rd quartile – median	0.48	0.55	0.36	1.81	1.36
3rd quartile – 1st quartile	1.37	1.70	0.64	2.20	1.79

Table 10: Share of selected difference indicators in the median of valuation multiples (31/12/2019).

31/12/2019	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
Max-min	265.46	184.38	12.83	16.03	13.25
Median – 1st quartile	0.87	0.55	0.24	0.45	0.42
3rd quartile – median	0.45	0.45	0.43	1.28	0.91
3rd quartile – 1st quartile	1.32	1.00	0.67	1.73	1.33

Even from the table based on data as of 31/12/2019, the valuation multiple EV/EBITDA shows the smallest differences in individual statistics relative to the median. From this comparison, EV/EBIT comes out as the second lowest multiple followed by the P/E ratio and EV/S pair at approximately the same level. It is also appropriate to compare pairs of multiples P/S with EV/S and P/BV with EV/IC. For the first pair, it is evident that basing the comparison purely on the enterprise value (EV) indicates more reliable results. Similarly, in the case of the second pair of ratios, EV is more appropriate – however, there is a difference in the reference variable (BV vs. IC), so the appropriateness of using EV in isolation cannot be clearly confirmed – however, IC is composed only of the operating part of the assets, while BV represents accounting equity in general – which implies that an operating factor (EV, IC) approach is more reliable than a purely equity-based approach.

At this point, there is a comparison with the previously mentioned study by Vydržel and Soukupová (2012), according to which multiples EV/EBITDA (94%), EV/Sales (55%), EV/EBIT and P/E ratio (42%) are most frequently used in the Czech environment. It is therefore evident that the above results are in line with practice, as it is the multiple with the lowest differentials that is used most often. The other three valuation multiples (EV/S, EV/EBIT and P/E ratio) show slight differences in the order of preference, but all three are consistently the most appropriate/most used after the EV/EBITDA multiple according to both the cited study and my own calculations. Other indicators not mentioned show much higher variability, making their use less appropriate – again in line with the study cited.

Despite the fact that the EV/EBITDA valuation multiple has the best characteristics and is the most commonly used in the Czech Republic, it is advisable to consider the use of a few multiples (not the single one) to provide a more comprehensive picture.

As mentioned in the introduction to this article, valuation multiples for publicly traded companies can be found in several databases. The following table compares the results of this work in the form of valuation multiples for non-publicly traded Czech companies with valuation multiples available for publicly traded companies in Europe for the brewing industry. The median value of the data set is always compared, as of 31/12/2019.

Table 11: Comparison of observed indicators with values for publicly traded companies.

	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
Brewing industry CZ	15.29	13.53	7.49	0.72	0.81
Brewing in Europe	23.09	15.73	11.36	1.09	1.70
Alcoholic beverages Europe	18.02	15.51	11.58	1.37	1.96

Data source: Damodaran (2020d) and Refinitiv (2021).

The comparison in the Table 11 above shows that non-publicly traded companies in the Czech brewing industry have significantly lower valuation multiples compared to publicly traded companies in the European region. The least significant difference was observed for the EV/EBIT multiple, at approximately 14%. The most commonly used EV/EBITDA multiple differed by approximately 34%. In the case of the comparison with the alcoholic beverages industry in general, the differences for EV/EBIT and EV/EBITDA are almost comparable, while for the other indicators the deviations are different.

It follows from the above that the use of industry multiples of publicly traded companies to value a non-publicly traded company may lead to an overvaluation of the valued company in the brewing industry. However, it must be considered that this is the mean value of the set and therefore the use of these publicly available multiples may lead to the correct result when applied to "above average" companies. An example is the EV/EBITDA ratio. In the Czech brewing industry, there were a total of 4 companies out of the sample of 50, which achieved values in the interval 11–12, i.e. approximately comparable to the above results from the databases.

A weakness of this paper may be the potential bias in the value of the resulting multiples due to the DCF method used and my valuation approach itself. For this reason, to eliminate bias due to the method and approach applied, I have done an illustrative valuation of a publicly traded company in the brewing industry in Europe and then compared the results of that valuation with the actual market data. I have selected Olvi Oyj Group, a company listed on the Finnish stock exchange (OMXHEX), at random from the companies involved in Damodaran's database. I applied the same valuation procedure as in the case of my sample of 50 private held companies, which I only adapted to the Finnish, respectively European environment (e.g. risk-free rate and country risk premium). The results are summarized in the following Table 12:

Table 12: Comparison of observed indicators with values for publicly traded companies.

Olvi Oyj Group	Stock value (eur)	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
DCF valuation	52.28	22.40	17.26	11.87	2.34	2.22
Real data	51.20	21.93[a]	16.76	11.53	2.29	2.16
Difference	1.08	0.47	0.50	0.34	0.05	0.06
Difference (%)	2.11%	2.16%	2.98%	2.98%	2.16%	2.98%

Data source: Olvi Oyj Group (2022), Yahoo Finance (2022). [a]Note: the company reports a value of 22.2 in its annual report.

The first row contains the results of my valuation using the DCF method. The second row contains the actual valuation of the company's stock as of the valuation date (close price) and multiples obtained from the company's actual accounting data. The last two rows contain the differences between my DCF valuation and the

actual market data for the company. Based on the results in the table, it is evident that the differences are not so significant that the DCF valuation method and my valuation approach itself could substantially bias the resulting multiples.

For the purpose of comparing the results of the DCF valuation and the comparative approach based on multiples of publicly traded companies, a valuation of individual companies has also been done using the above multiples for the 'brewing in Europe' industry. The results are presented in the table in Attachment 2. For clarity, all values are expressed at the equity value level (price). Based on the last row of that table, it is clear that sales-based multiples for publicly traded companies are not very suitable in this case – in comparison with the last row of the table in Attachment 1, the industrial total is very different. On the other hand, these absolute values are not a very appropriate comparison because of the significant influence of the companies with the highest market cap. Therefore, a calculation of the differences between DCF and listed companies' multiples valuation was done in Attachment 3. Based on those data, it can be said that the differences between these approaches are significant, with EV/EBIT and EV/EBITDA multiples showing the lowest average difference (54,58% and 83,79%) and standard deviation (837,96% and 135,25%).

For completeness, the differences between the DCF valuation and the multiples for the Czech brewing industry are shown in Attachment 4. The values of average difference and standard deviation are significantly lower than when applying multiples of listed companies. On the other hand, this back-calculation cannot be considered as very valid, since it involves the measurement of quantities that are derived from each other.

In conclusion, all results point to a "value gap" for unlisted companies. At the aggregate level of the whole industry, this value gap corresponds to the difference in multiples shown in Table 11. In order to identify this value gap more accurately, it would be useful to identify it at a more detailed level, e.g. according to the quartile distribution as the results in this paper are also broken down. It would also be beneficial to do more value gap differentiation based on the similarity of certain groups of breweries in the sample to publicly traded companies.

However, this is beyond the scope of this paper, since, among other things, this article aimed to remove the barrier to using a comparative/relative valuation approach for non-publicly traded companies and to establish industry-specific valuation multiples based on data from domestic non-publicly traded companies. Within the results section, these valuation multiples are listed, and within the discussion section, their limitations and recommendations for their application are presented.

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Attachment 1 – DCF valuation results (th. eur)

No.	Brewery	Enterprise value	Equity value (price)
1.	Plzensky Prazdroj, a. s.	4,215,843	4,171,922
2.	Pivovary Staropramen, s.r.o.	407,904	666,393
3.	Heineken Ceska republika, a.s.	307,996	291,301
4.	Budejovicky Budvar, narodni podnik	264,211	311,130
5.	Pivovar Svijany, a.s.	150,765	150,088
6.	Rodinny pivovar Bernard, a.s.	157,241	168,111
7.	Pivovar Zubr, a.s.	7,699	7,543
8.	Pivovar Litovel, a.s.	11,038	10,675
9.	Pivovar Holba, a.s.	5,483	4,448
10.	Pivovar Protivin, a.s.	7,069	6,747
11.	Tradicni pivovar v Rakovniku, a.s.	7,673	9,184
12.	Pivovar Nymburk, s.r.o.	4,071	3,369
13.	Primator, a.s.	8,380	8,623
14.	Mestansky pivovar v Policce, a.s.	16,699	21,595
15.	Krakonos, s.r.o.	9,944	15,725
16.	DUP – druzstvo	1,936	3,240
17.	Hols, a.s.	4,367	–1,664
18.	Chodovar, s.r.o.	926	–76
19.	Mestansky pivovar Havlickuv Brod, a.s.	3,063	3,439
20.	Pivovar Samson, s.r.o.	–17,764	–21,011
21.	Pardubicky pivovar, a.s.	2,572	–1,186
22.	Pivovar Cerna Hora, a.s.	5,562	2,071
23.	Bohemia Regent, a.s.	3,777	2,591
24.	Pivovar Rohozec, a.s.	4,868	3,472
25.	Dudak – Mestansky pivovar Strakonice,a.s	1,653	1,946
26.	Pivovar Ferdinand, s.r.o.	4,805	3,397
27.	Pivovar Jihlava, a.s.	2,057	2,186
28.	Akciovy pivovar Dalesice, a.s.	1,635	1,638
29.	Zatecky pivovar, s.r.o.	1,563	–433
30.	Pivovar Vysoky Chlumec, a.s.	1,195	1,175
31.	Pivovar Nova Paka, a.s.	1,073	1,015
32.	Pivovar Hubertus, a.s.	4,256	2,887
33.	Roznovske pivni lazne, s.r.o.	934	934
34.	Uneticky pivovar, a.s.	5,121	4,359
35.	Pivovar Klaster, a.s.	1,197	382
36.	Pivovar Uhersky Brod, a.s.	1,590	1,463
37.	Pivovar Rychtar, a.s.	323	244

(continued)

No.	Brewery	Enterprise value	Equity value (price)
38.	Pivovar chotebor, s.r.o.	1,678	2,502
39.	Beskydsky pivovarek, s.r.o.	4,051	4,660
40.	Pivovar Trautenberk, a.s.	1,079	1,349
41.	Pivovar Kocour Varnsdorf, s.r.o.	1,073	1,201
42.	Pivovary koruny ceske, s.r.o.	–1,683	–1,683
43.	Starocesky pivovarek, s.r.o.	445	422
44.	Pivovar Cvikov, a.s.	1,143	498
45.	Pivovar Falkenstejn, s.r.o.	1,477	1,352
46.	Pivovar Konicek, s.r.o.	3,342	3,768
47.	Pivovar-raven.cz, s.r.o.	770	450
48.	Nachmelena opice, s.r.o.	1,990	1,756
49.	Pivovar Kunratice, s.r.o.	648	524
50.	Pivovar Ogar, s.r.o.	–146	–175
	Total	5,634,590	5,875,547

Attachment 2 – Valuation results using multiples of listed companies (Equity value, th. eur)

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
1.	4,332,897	3,604,841	3,158,468	736,673	1,107,795
2.	592,378	479,533	673,821	185,866	549,073
3.	305,347	239,475	282,723	153,402	223,133
4.	252,645	256,203	315,854	122,764	238,848
5.	134,155	115,644	111,597	35,027	54,084
6.	149,298	136,451	141,864	36,254	67,549
7.	–2,723	–206	17,250	28,704	44,720
8.	16,939	15,308	25,918	24,399	37,782
9.	7,138	6,370	18,386	20,189	30,529
10.	–9,890	–8,335	9,688	12,613	19,398
11.	6,463	7,211	17,457	11,985	20,248
12.	4,804	4,594	7,394	9,037	13,427
13.	14,379	12,526	13,367	7,939	12,654
14.	27,882	28,329	29,915	7,548	16,696
15.	20,494	20,684	21,116	7,333	17,245

(continued)

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
16.	3,291	1,831	3,451	6,379	11,276
17.	−29,613	−23,832	−12,649	5,741	2,944
18.	−4,595	−3,003	−29	6,093	8,524
19.	−1,911	−1,275	6,506	6,028	9,800
20.	−65,569	−47,005	−21,660	4,217	3,346
21.	−36,032	−26,106	−5,746	4,983	4,032
22.	2,600	−1,302	6,453	3,954	2,692
23.	3,472	2,143	4,195	4,104	5,230
24.	5,944	4,483	6,211	4,624	5,833
25.	407	1,142	4,175	3,918	6,419
26.	2,395	697	3,625	3,898	4,686
27.	−1,678	−1,252	3,872	3,137	5,034
28.	851	986	2,735	2,212	3,462
29.	−3,694	−3,956	−1,778	3,054	2,778
30.	−22,804	−18,980	2,274	3,055	4,757
31.	23	154	1,223	2,483	3,825
32.	2,840	2,038	5,001	2,757	2,942
33.	1,245	1,048	2,058	2,550	3,986
34.	5,078	4,585	8,395	2,112	2,540
35.	−13,394	−11,902	370	2,331	2,830
36.	1,855	1,434	3,362	2,085	3,133
37.	3,153	574	1,100	1,954	2,975
38.	−19	1,678	3,330	1,581	3,296
39.	7,125	6,646	6,294	2,092	3,880
40.	−2,104	−1,048	2,170	1,543	2,682
41.	360	1,066	1,528	1,472	2,430
42.	−3,608	−2,454	−1,585	1,352	2,114
43.	−60	123	1,485	1,119	1,726
44.	1,588	438	425	1,438	1,604
45.	1,641	1,380	2,141	1,026	1,479
46.	7,228	5,355	5,104	974	1,948
47.	671	387	673	850	1,009
48.	2,128	1,870	1,920	749	937
49.	2,339	1,573	1,101	613	834
50.	−1,008	−644	259	506	763
Sum	5,722,352	4,817,500	4,892,808	1,496,718	2,580,927

Column “no.” refers to the table in Attachment 1.

Attachment 3 – Differences between DCF and listed companies' multiples valuation

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
1.	3.86%	−13.59%	−24.29%	−82.34%	−73.45%
2.	−11.11%	−28.04%	1.11%	−72.11%	−17.61%
3.	4.82%	−17.79%	−2.94%	−47.34%	−23.4%
4.	−18.8%	−17.65%	1.52%	−60.54%	−23.23%
5.	−10.62%	−22.95%	−25.65%	−76.66%	−63.96%
6.	−11.19%	−18.83%	−15.61%	−78.43%	−59.82%
7.	−136.1%	−102.74%	128.7%	280.55%	492.88%
8.	58.69%	43.41%	142.8%	128.57%	253.94%
9.	60.46%	43.22%	313.34%	353.89%	586.34%
10.	−246.57%	−223.53%	43.59%	86.93%	187.49%
11.	−29.62%	−21.49%	90.08%	30.5%	120.47%
12.	42.6%	36.35%	119.47%	168.22%	298.5%
13.	66.75%	45.27%	55.01%	−7.94%	46.74%
14.	29.11%	31.19%	38.53%	−65.05%	−22.69%
15.	30.33%	31.53%	34.28%	−53.37%	9.67%
16.	1.58%	−43.48%	6.54%	96.9%	248.09%
17.	1,679.25%	1,331.94%	660.03%	−444.94%	−276.87%
18.	5,938.46%	3,846.88%	−62.26%	−8,108.04%	−11,302.9%
19.	−155.56%	−137.08%	89.19%	75.28%	184.97%
20.	212.07%	123.71%	3.09%	−120.07%	−115.93%
21.	2 937.69%	2 100.83%	384.39%	−520.06%	−439.9%
22.	25.54%	−162.88%	211.53%	90.91%	29.96%
23.	34.01%	−17.28%	61.89%	58.36%	101.82%
24.	71.19%	29.11%	78.89%	33.18%	67.99%
25.	−79.08%	−41.32%	114.52%	101.35%	229.85%
26.	−29.5%	−79.49%	6.7%	14.75%	37.96%
27.	−176.76%	−157.26%	77.12%	43.5%	130.28%
28.	−48.04%	−39.8%	66.93%	35.04%	111.34%
29.	752.55%	812.9%	310.43%	−804.84%	−741.17%
30.	−2,040.36%	−1,715.02%	93.5%	159.96%	304.77%
31.	−97.76%	−84.8%	20.51%	144.63%	276.79%
32.	−1.62%	−29.4%	73.24%	−4.49%	1.9%
33.	33.25%	12.11%	120.26%	172.87%	326.6%
34.	16.48%	5.18%	92.56%	−51.55%	−41.74%
35.	−3,601.96%	−3,211.91%	−3.25%	509.58%	640.01%
36.	26.81%	−1.99%	129.81%	42.55%	114.18%
37.	1,192.47%	135.51%	351.03%	700.89%	1,119.83%
38.	−100.76%	−32.93%	33.12%	−36.79%	31.74%
39.	52.88%	42.6%	35.05%	−55.12%	−16.75%
40.	−255.97%	−177.66%	60.87%	14.38%	98.82%

(continued)

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
41.	−70.05%	−11.26%	27.2%	22.54%	102.27%
42.	114.43%	45.84%	−5.82%	−180.34%	−225.63%
43.	−114.22%	−70.95%	252.17%	165.4%	309.33%
44.	218.86%	−12.16%	−14.76%	188.74%	221.96%
45.	21.38%	2.07%	58.4%	−24.08%	9.41%
46.	91.82%	42.12%	35.46%	−74.16%	−48.3%
47.	49.15%	−13.91%	49.68%	89.09%	124.42%
48.	21.22%	6.53%	9.37%	−57.33%	−46.64%
49.	346.23%	200.1%	110.09%	16.96%	59.12%
50.	475.7%	268.01%	−247.9%	−389.2%	−535.79%
avg	147.48%	54.58%	83.79%	−151.79%	−143.93%
std	1,144.49%	837.96%	135.25%	1,158.93%	1,618.87%

Column “no.” refers to the table in Attachment 1, “avg ” = arithmetic average, “std” = standard deviation.

Attachment 4 – Differences between DCF and Czech breweries’ multiples valuation

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
1.	−31.21%	−25.84%	−50.44%	−88.29%	−87.88%
2.	−41.13%	−32.69%	−20.12%	−81.5%	−40.4%
3.	−30.58%	−30.11%	−37.96%	−65.07%	−66.43%
4.	−46.22%	−27.07%	−27.93%	−73.83%	−55.48%
5.	−40.8%	−33.8%	−51.13%	−84.52%	−83.04%
6.	−41.18%	−29.29%	−42.16%	−85.7%	−77.44%
7.	−123.91%	−102.64%	50.08%	152.42%	181.91%
8.	5.1%	22.85%	58.92%	51.61%	67.16%
9.	6.27%	19.91%	164.6%	201.07%	215.44%
10.	−197.07%	−206.9%	−6.95%	24.00%	34.73%
11.	−53.39%	−30.18%	30.93%	−13.44%	13.83%
12.	−5.56%	14.34%	37.6%	77.91%	79.32%
13.	10.44%	25.32%	3.16%	−38.94%	−28.49%
14.	−14.49%	15.99%	−0.94%	−76.82%	−51.25%
15.	−13.68%	18.26%	1.06%	−69.07%	−28.44%
16.	−32.72%	−45.76%	−16.05%	30.61%	87.18%
17.	1,078.39%	1,182.18%	524.57%	−328.8%	5.01%
18.	3,899.24%	3,478.61%	373.51%	−5,411.81%	−4,758.91%
19.	−136.8%	−130.35%	28.47%	16.26%	41.74%
20.	106.68%	94.55%	−26.77%	−113.31%	−99.52%
21.	1,911.85%	1,837.02%	327.3%	−378.63%	−96.64%

(continued)

No.	P/E	EV/EBIT	EV/EBITDA	P/S	EV/S
22.	−16.85%	−177.67%	47.99%	26.63%	−126.04%
23.	−11.25%	−35.27%	−8.85%	5.04%	−27.59%
24.	13.38%	5.4%	4.25%	−11.66%	−40.84%
25.	−86.15%	−47.43%	46.57%	33.56%	65.31%
26.	−53.31%	−88.16%	−43.77%	−23.89%	−55.81%
27.	−150.84%	−148.41%	18.8%	−4.81%	13.01%
28.	−65.58%	−48.2%	10.14%	−10.43%	0.99%
29.	464.64%	749.59%	327.59%	−567.53%	−165.19%
30.	−1,385.09%	−1,489.11%	27.02%	72.43%	92.34%
31.	−98.52%	−87.72%	−22.47%	62.26%	76.89%
32.	−34.85%	−45.92%	−1.93%	−36.65%	−76.15%
33.	−11.75%	−3.59%	45.22%	81.00%	103.62%
34.	−22.86%	−12.00%	21.01%	−67.87%	−81.33%
35.	−2,419.33%	−2,805.98%	−108.78%	304.34%	141.88%
36.	−16.02%	−16.93%	48.57%	−5.45%	−2.3%
37.	756.00%	98.01%	186.37%	431.24%	465.36%
38.	−100.51%	−37.71%	−1.02%	−58.07%	−19.92%
39.	1.25%	24.46%	−6.5%	−70.23%	−53.43%
40.	−203.3%	−163.98%	12.88%	−24.13%	5.36%
41.	−80.16%	−22.19%	−12.49%	−18.72%	2.14%
42.	42.02%	25.41%	−37.92%	−153.29%	−159.99%
43.	−109.42%	−75.8%	130.29%	76.04%	92.45%
44.	111.18%	−42.59%	−87.91%	91.53%	−14.00%
45.	−19.61%	−13.52%	1.28%	−49.64%	−52.62%
46.	27.04%	23.8%	−6.84%	−82.86%	−69.41%
47.	−1.22%	−35.94%	−25.57%	25.43%	−30.1%
48.	−19.71%	−10.26%	−32.44%	−71.7%	−81.51%
49.	195.54%	154.75%	30.43%	−22.42%	−36.45%
50.	281.28%	218.77%	−191.94%	−291.83%	−299.46%
avg	63.90%	38.12%	33.79%	−134.35%	−101.61%
std	757.99%	744.87%	122.02%	768.73%	674.63%

Column “no.” refers to the table in Attachment 1, “avg ” = arithmetic average, “std” = standard deviation.

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