Business Valuation is a Question of Trust

EBVM

The European Business Valuation Magazine

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Volume 2
Issue 1, Spring 2023

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Business Valuation with Irregular Capital Expenditures

This article proposes an improvement to the valuation methodology for cases with irregular capital expenditures and derives a formula for normalising cash flow on capital expenditures in terminal value estimation. The formula is verified by a comparative model of discounted cash flows with a long forecast period. The model indicates that the rules of thumb, such as equating capital expenditures to depreciation, are a source of inaccuracy in business valuations, while the proposed normalisation formula is a solution for justified valuation without restricting and, in many cases, unrealistic assumptions of infinite divisibility and smooth renewal of fixed assets. This article provides an answer to a question that has been the subject of appraisal, academic and judicial debates for many years, namely the relationship between capital expenditures and depreciation.

ESG Integration – Current and Future in Business Valuation

Integrating ESG factors into business valuation models has important implications for investment and decisionmaking. This article summarizes numerous vectors of ESG – in particular climate change – that may affect valuation, followed by illustrating an approach integrating ESG factors into the valuation process. Finally, the article analyses the questions and challenges faced in ESG integration and the road ahead.

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Restructuring Valuation

– Towards a Framework of Principles to Mitigate Multi-Party Valuation Fights in Workouts –

Given the current market unrest and turbulent economic climate, we see an increasing focus on the need for business restructuring and debt workouts, partly fueled by the changes in legislation in the area of financial restructuring outside of insolvency proceedings. Obviously, this also affects the practice of business valuators. Simply put, the need for valuation support in restructuring cases is growing, both out-of-court and incourt.

From the Editors

Forthcoming Changes in Valuation Standards

The importance of consistent and internationally applicable business valuation standards is constantly increasing with the ongoing internationalisation of business valuations. By addressing practice business valuation issues at European level, a platform like the EBVM can provide ideas and opportunities to enhance national and international business valuation standards and contribute to further harmonization at European and international level. To this end, the magazine will observe and comment forthcoming changes and intended revisions of national and international valuation standards.

In 2023 the IVSC will launch a public consultation on proposed changes to the International Valuation Standards (IVS). In addition to proposed updates to the asset-specific standards, the consultation will outline a series of fundamental changes to the General Standards (IVS 100 to IVS 106), which are applicable to all valuations, regardless of asset type and valuation purpose. With the General Standards Improvement Project the standards shall become more relevant to non-valuers involved in the valuation process. Additionally, the General Standards shall be updated to improve compatibility with other standards and requirements such as IFRS or US GAAP. Furthermore, additional standards on data, inputs and models shall be included. The consultation is scheduled to start in April 2023.

Moreover, the ongoing revisions of the business valuation standards in Germany and Austria are expected to be completed in 2023. In Austria, one major topic covers the set of bases of value which currently focusses on the so called Objectified Value and – differing from IVS and many local standards – does not comprise Market Value. The concept of the Objectified Value is unique in Germany and Austria and mainly driven by squeeze out-case law. To improve the international comparability of the standards, the Austrian standard setter intends to introduce Market Value as an additional basis of value for business valuations.

In this issue of the EBVM, *Hanna Murina* sets up a formula for normalising future capital expenditures in terminal value estimation for cases with irregular capital expenditures. Verifying the formula by a DCF-model indicates that equating capital expenditures to depreciation is a source of inaccuracy in business valuations. *Marc Broekema* and *Jan Adriaanse* deal with multi-party valuation fights in workouts and consider why restructurings fail. Further to discussing the problem of biases and "noise" in valuations, they develop a framework of principles to mitigate valuation fights and help increase the chances of survival of distressed companies. *Wiley Pun, Allison Pan* and *Beryl Lin* present a framework to integrate ESG factors – in particular climate change – into business valuations through five steps. Furthermore, they face questions and challenges of ESG integration and future developments.

We wish you a pleasant reading and are happy to receive your feedback.

Prof. Dr. Klaus Rabel, WP, StB, CVA
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Imprint

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Publisher:
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European Association of Certified Valuators and Analysts
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Commercial Register: Frankfurt HRB 75029

ISSN 2940-8849

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Magazine typesetting:
Main-Post GmbH

Submission Dates:

Issue:	Submssion Dates:
Summer 2023:	15 April 2023
Fall 2023:	15 July 2023
Winter 2023:	15 October 2023

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This article is based on an article published in Ukrainian language in the journal World of Finance, no 2(71) (2022), http://sf.wunu.edu.ua/index.php/wof.

I. Introduction

There is an opinion that business valuation is more of an art than a science.[1] With all due respect to the art and to the uncertainty of conditions in the valuation process, this article increases the weight of science by deriving a formula for normalising irregular capital expenditures for the post-forecast period. The need for normalisation arises from the terminal value estimation using the Gordon growth model (GGM) proposed in 1959. This model assumes that free cash flow will stabilise during the forecast horizon and then has steady growth in perpetuity. The assumption of steady growth in perpetuity may be justified for operating cash flow. However, this assumption is less accurate for capital expenditures, which are inherently irregular expenditures on long-lived assets. In addition, the unevenness of capital expenditures is particularly characteristic of capital-intensive industries, infrastructure businesses, real estate businesses, and is also characteristic of many small businesses. The article proposes an improvement that makes DCF valuation in such cases more universal and reliable. The goal of this article is to derive a formula for normalising irregular capital expenditures to estimate the terminal value, taking into account the impact of inflation and real growth. The normalisation formula will allow for relaxing the restrictive assumptions that fixed assets are infinitely divisible and evenly renewed.

II. Review of literature

The prior research looked at the ways to forecast the cash flow of capital expenditures in the steady-state period and identified deficiencies in the practice of equating to depreciation charge. However, appropriate alternatives were not proposed. The key paper about terminal value estimation with discounted cash flows is the article by *Gordon*,[2] in which the formula of the Gordon growth model is proposed. Other authors analysed the results of business valuation using the method of discounted cash flows with the GGM formula and compared them with the results of other valuation methods (DDM, APV, RIM),[3] as well as analysed the results of the terminal value assessment both with the GGM formula and with other approaches (stock market multiples, M&A multiples, value driver formula).[4] Research mostly confirms the benefits of using the GGM formula, which is also reinforced by the popularity of the formula in investment business practices.

Some authors equate the steady-state free cash flow ($\mathbf{FCFF}_t$) with the free cash flow of the last period in the forecast horizon without adjustments,[5] while other authors insist on the importance of terminal value adjustments or normalisation of the steady-state free cash flow.[6] The most detailed analysis of potentially important adjustments to refine the terminal value based on GGM was carried out by *Jennergren*.[7] He examined the impact of tax deferrals arising from differences in tax and financial depreciation, the impact of differences in depreciation and useful life periods, and the impact of inflation and lumpy capital expenditures. The disadvantage of this analysis is in the restrictive assumption about zero real growth of business, which is a significant constraining factor for the practical application of the proposed adjustments for lumpy capital expenditures. A review of the existing literature did not reveal proposals for normalising irregular capital expenditures, but Jennergren's terminal value adjustment is similar to the proposed normalisation in this article.[8] This adjustment takes into account the effect of inflation of fixed assets on capital expenditures and the time value of money effect of irregular (lumpy) capital expenditures. The adjustment from latter effect increases valuation for distant-in-time lumpy capital expenditures and decreases for relatively close-in-time capital expenditures. The effects are estimated cumulatively over an infinite period and proposed as an adjustment to terminal value.[9]

The advantage of normalising the steady-state free cash flow ($\mathbf{FCFF}_t$), rather than adjusting the terminal value, is that normalising fits better with the logic and structure of business valuation. It provides more explicit consid-

1 Reis/Augusto, The Terminal Value (TV) Performance in Firm Valuation: The Gap of Literature and Research Agenda. Journal of Modern Accounting and Auditing, vol. 9, no. 12 (2013): 1628.

2 Gordon, Dividends, Earnings, and Stock Prices. The Review of Economics and Statistics, vol. 41, no. 2 (1959): 99-105.

3 Luehrman, Using APV: a better tool for valuing operations. Harvard Business Review, vol. 75, no. 3 (1997): 146-154; Courteau/Kao/Richardson, The Equivalence of Dividend, Cash Flows and Residual Earnings Approaches to Equity Valuation Employing Ideal Terminal Value Expressions, 2002, SSRN ID 233399; Hess/Homburg/Lorenz/Sievers, Extended Dividend, Cash Flow and Residual Income Valuation Models – Accounting for Deviations from Ideal Conditions, 2008, SSRN ID 1225902; Schill, Business Valuation: Standard Approaches and Applications, 2017, SSRN ID 2974498.

4 Reis/Augusto, op. cit. (footnote No. 1): 1622-1636; Shefrin, Free Cash Flows, Valuation and Growth Opportunities Bias. Journal of Investment Management, vol. 12, no. 4 (2014): 4-26; Buttignon, Terminal Value, Growth, and Inflation: Some Practical Solutions. Business Valuation Review, vol. 34, no. 4 (2015): 158-172; Beitel, Terminal value calculations with the Discounted Cash Flow model: differences between literature and practice. (Master's thesis. University of Twente 2016). https://purl.utwente.nl/essays/70011; Behr/Mielcarz/Osiichuk, Terminal Value Calculation in DCF Valuation Models: An Empirical Verification. E-Finance, vol. 14, no. 1 (2018): 27–38.

5 Schill, op. cit. (footnote No. 3): 14; Schill/Chaplinsky/Doherty, Methods of Valuation for Mergers & Acquisitions, 2006, SSRN ID 909677: 3.

6 Rupić/Obradović/Rupić, Free cash flow valuation model in capital budgeting. European Project Management Journal, vol. 7, no. 1 (2017): 80; Koller/Goedhart/Wessels, Valuation. Measuring and Managing the Value of Companies, 7th ed. 2020: 299.

7 Jennergren, Continuing value in firm valuation by the discounted cash flow model. European Journal of Operational Research, vol. 185, no. 3 (2008): 1548-1563.

8 Ibid.: 1548-1560.

9 To describe the link between cash flow normalisation for the last forecast year and an adjustment to terminal value let's consider the difference between normalised and not normalised cash flow to be $(CF_t^n - CF_t)$, then the cumulative effect of this difference over an infinite period can be estimated with GGM formula $(CF_t^n - CF_t)*(1+g)/(r-g)$ and it will be the respective adjustment to terminal value that arises from the difference.

eration of the factors, as well as being responsive to the request for such normalisation by practicing appraisers[10] and the recommendations of other researchers.[11] Another advantage of the proposed normalisation in this article is that it is free from the restrictive requirement of zero real growth, which was set in Jennergren's approach.[12] Instead, the proposed normalisation takes real growth as a variable for steady-state nominal growth.

III. Methodological foundations

In DCF valuation, the terminal value (TV_t), or the value of the business derived from the post-forecast horizon, determines a significant part of the total value. The share of the terminal value increases with shorter forecast horizons, a higher level of growth, a lower discount rate, and a smaller difference between the discount rate and steady-state growth ($r - g > 0$). In the appraisal practice, the share of terminal value in the total business value is 56-100% for the Fast Moving Consumer Goods (FMCG) segment and 125% on average for the high-tech segment.[13] Therefore, the quality of business valuation significantly depends on the correctness of estimates of the terminal value and its components.

The GGM model for estimating the terminal value (TV_t) implicitly assumes that business operations stabilise during the forecast horizon and reach steady-state growth parameters by the end of this period. The model assumes that after the forecast horizon, the steady-state free cash flow ($FCFF_t$) changes with an annual growth rate (g) and is discounted at a discount rate (r):

$$TV_t = \frac{FCFF_t * (1+g)}{(r-g)} \qquad (1)$$

Using this formula, it is very important to note that the steady-state free cash flow in year (t) has to be derived assuming terminal value conditions with an annual growth of (g). This growth rate is applied to the cash flow of the last year (t) of the forecast period ($FCFF_t$) meaning that this cash flow determines the entire terminal value of the business.[14] That implicitly assumes that all the components of the cash flow in the year (t) are in a steady-state: in many cases, this is too strong assumption.

According to DCF valuation methodology for a non-financial firm, the steady-state free cash flow ($FCFF_t$) consists of operating cash flow and cash flow for capital expenditures.

One of the methods to calculate operating cash flow assumes that the result of operating activities before interest expenses and income tax ($EBIT$) is (a) reduced by income tax in the amount that if the business had no debt and interest expenses ($NOPAT = EBIT - EBIT * TR = EBIT * (1 - TR)$), (b) increased by depreciation charge (DA) and (c) decreased by an increase in working capital (DWC). The expectation of stabilisation in the operating cash flow is reasonable based on high recurrence and regularity of the operational activity, the assumption of stability in the external conditions and the stabilisation of business operations during the forecast horizon. Although researchers have different opinions about how realistic is the assumption about the stability of external conditions,[15] this assumption ca be accepted for the purpose of optimising investment decisions based on expectations.

The cash flow for capital expenditures consists of payments for fixed assets, if it has regularity, and – unlike operating cash flow – is not a part of frequently repeated operations, it is of a much lower frequency. Due to the nature of capital expenditures in the creation and reproduction of assets with long useful lives, it is reasonable to expect irregularity in this cash flow, rather than the assumption of its evenness and steady growth, which is the important GGM requirement for terminal value estimation. The irregularity is particularly expected for businesses with a high concentration of fixed assets in items of very long useful lives that cannot be replaced in parts.

In practice and in methodological recommendations for terminal value estimation there are references to a rule of thumb that the steady-state capital expenditures should be at the level of depreciation charge. Sometimes, even influential authors rely on this rule of thumb without explicit acknowledgement.[16] However, this rule of thumb has a very clear and fair objection that is based on arguments about the impact of inflation on prices of fixed assets, as well as the importance of the expected real growth of business, which should be supported with additional fixed assets.[17]

The impact of inflation and real growth (if both are positive) indicates the need for steady-state capital expenditures at a level higher than depreciation charge. At the

10 Matthews/Rosenbloom, Delaware's Unwarranted Assumption That Capex Should Equal Depreciation in a DCF Model. Business Valuation Update, vol. 24, no. 8 (2018): 8.

11 Matthews, Capital Expenditures, Depreciation, and Amortization in the Gordon Growth Model. Business Valuation Review, vol. 33, no. 4 (2014): 114; Rotkowski/Courtnage, Estimating Capital Expenditures and Depreciation Expense in the Direct Capitalization Method. Insights (2016): 21, 27.

12 Jennergren, op. cit. (footnote No. 7): 1560.

13 Koller/Goedhart/Wessels, op. cit. (footnote No. 6): 285-286.

14 Alternatively, the next period ($t+1$) may be taken to estimate the steady-state free cash flow and the respective terminal value with formula $TV_t = FCFF_{t+1}/(r-g)$ and the same challenges as with formula (1).

15 Behr/Mielcarz/Osiichuk, op. cit. (footnote No. 15): 30-31; Schill, op. cit. (footnote No. 3): 6.

16 Thomas/Gup, The Valuation Handbook Valuation Techniques from Today's Top Practitioners, 2010: 598.

17 Jennergren, op. cit. (footnote No. 7): 1561-1562; Matthews, op. cit. (footnote No. 11): 114, 118; Hanhardt/Bramsemann, Estimating the Reinvestment Rate in the Terminal Value, 2017, SSRN ID 3098937: 4.

same time, the factor of technological progress and the corresponding increase in the efficiency of fixed assets may lead to an opposite effect and reduce the estimated steady-state capital expenditures relative to depreciation charge.[18] A survey of practicing appraisers in the U.S. during 2011-2017 indicates that the share of cases of equating steady-state capital expenditures to depreciation charge declined from 66% to 45% and the share of cases of estimated steady-state capital expenditures above depreciation charge increased from 28% to 53%.[19]

Therefore, the uncertainty in the estimation of steady-state capital expenditures for businesses with irregular capital expenditures calls for additional research efforts. In cases of irregular capital expenditures, there is a problem and a contradiction with the assumption of steady state in the application of the GGM model to estimate the terminal value, which creates high uncertainty in the correctness of valuation.[20] To solve this problem, I proposed to find a solution for the steady-state normalisation of irregular capital expenditures.

IV. Deriving the steady-state normalisation formulas

1. Single fixed asset

To derive the steady-state normalisation formula, I developed first a sequence of discounted cash flow for capital expenditures after the forecast horizon of a single fixed asset that cannot be renewed in parts. This results in irregular capital expenditures that arise only after complete depreciation at the end of useful life. So, I assume that at the end of its forecast horizon this asset will have:

- gross value adjusted for current prices (F_0),
- useful life in years ($m \in (1;\infty)$),
- ratio of used years to total useful life that – in the case of assumed straight-line depreciation – can be approximated by the depreciation level, which is the ratio of accumulated depreciation to the historical gross value of fixed assets ($d \in (0;1)$),
- discount rate (r) and
- rate of business steady growth in perpetuity (g).

The adjusted gross value of the asset (F_0) can be estimated from the historical accounting gross value (F_h) adjusted for forecasted average annual inflation of the fixed assets ($1+i_h$) to the power of the number of years the assets were in use ($d*m$) by the end of the forecast horizon using formula (2) or by other ways of updating the gross value to replacement cost with zero depreciation level at the end of the forecast horizon.

$$F_0 = F_h * \left(1+i_h\right)^{d*m} \tag{2}$$

The steady growth rate in perpetuity (g) is a nominal growth rate that results from forecasted inflation (i) and forecasted real growth (g^r) according to (3):

$$g = \left(1+i\right)*\left(1+g^r\right)-1 \tag{3}$$

Assuming straight-line depreciation over time, the forecasted depreciation level at the end of the forecast horizon (d) depends on the length of the forecast horizon (n), useful life (m) and the initial depreciation level at valuation date (d_0) as follows from (4):[21]

$$d = \frac{\mathrm{MOD}\left(d_0 * m + n; m\right)}{m} \tag{4}$$

The cash flow for capital expenditures will not occur every year, but only at the end of useful life and after complete depreciation of the old asset. The serial number of the period for the first capital expenditure will be equal to the residual useful life ($m-d*m$). The amount of the first cash flow will be determined by formula (5):

$$F_1 = F_0 * \left(1+i\right)^{m-d*m} * \left(1+g^r\right)^m = \\ = F_0 * \left(1+i\right)^m * \left(1+g^r\right)^m * \left(1+i\right)^{-d*m} = F_0 * \frac{\left(1+g\right)^m}{\left(1+i\right)^{d*m}} \tag{5}$$

according to which the adjusted gross value of fixed assets (F_0) is again adjusted for the inflation during the residual useful life ($(1+i)^{m-m*d}$) and adjusted for the required real growth for the entire subsequent useful life cycle ($(1+g^r)^m$).[22] The sequence of cash flow for capital expenditures (6) is formed by increasing each previous value by a steady rate of nominal increase during the entire period of useful life [$(1+g)^m=((1+i)*(1+g^r))^m$]:

18 Cornell/Gerger, Estimating Terminal Values with Inflation: The Inputs Matter – It Is Not a Formulaic Exercise. Business Valuation Review, vol. 36, no. 4 (2017): 119, 122.

19 Matthews/Rosenbloom, op. cit. (footnote No. 10): 9.

20 This uncertainty may be reduced by expanding the forecast horizon and by doing so reducing the terminal value share in the total estimated value. Such reduction may be achieved thank to (a) greater reliance on detailed forecasting of capital expenditures and (b) greater discounting of the remote terminal value.

21 I estimate the residual years of the useful life with the mathematical operator MOD (modulo), which returns the remainder of the division of d_0*m+n by m. Its syntax in Excel: MOD(number; divisor). This operator helps to safeguard boundaries for $d \in (0;1)$ in cases when fixed assets are renewed during the forecast period.

22 The real growth rate assumption reflects the long-term expectations of the market demand and respective planned production capacity. The planned capacity is created in the moment of irregular capital expenditures and is enough to cover the growth needs for all the years till the next irregular capital expenditures occur. In the period between the irregular capital expenditures, production capacity is not changed.

$$F_0 * \frac{(1+g)^m}{(1+i)^{d*m}};\ F_0 * \frac{(1+g)^m}{(1+i)^{d*m}} * (1+g)^m;$$

$$F_0 * \frac{(1+g)^m}{(1+i)^{d*m}} * (1+g)^{2*m};\ F_0 * \frac{(1+g)^m}{(1+i)^{d*m}} * (1+g)^{3*m} \ldots \quad (6)$$

The discounted value of cash flow for capital expenditures at the end of forecast horizon (S_1) is the sum of sequence (7). This sequence is a descending geometric progression because each subsequent item is equal to the previous item multiplied by a constant denominator (q), which is less than one.

$$F_0 * \frac{(1+g)^m}{(1+i)^{(d*m)} * (1+r)^{(m-d*m)}};$$

$$F_0 * \frac{(1+g)^m}{(1+i)^{(d*m)} * (1+r)^{(m-d*m)}} * \left(\frac{1+g}{1+r}\right)^m;$$

$$F_0 * \frac{(1+g)^m}{(1+i)^{(d*m)} * (1+r)^{(m-d*m)}} * \left(\frac{1+g}{1+r}\right)^{2*m};$$

$$F_0 * \frac{(1+g)^m}{(1+i)^{(d*m)} * (1+r)^{(m-d*m)}} * \left(\frac{1+g}{1+r}\right)^{3*m} \ldots \quad (7)$$

where

$$b_1 = F_0 * \frac{(1+g)^m}{(1+i)^{d*m} * (1+r)^{m-d*m}};\ q = \left(\frac{1+g}{1+r}\right)^m;$$

$$S_1 = \frac{b_1}{1-q} = F_0 * \frac{\frac{(1+g)^m}{(1+i)^{d*m} * (1+r)^{m-d*m}}}{1-\left(\frac{1+g}{1+r}\right)^m} =$$

$$= F_0 * \frac{1}{(1+i)^{d*m}} * \frac{(1+g)^m * (1+r)^{d*m}}{(1+r)^m - (1+g)^m} \quad (8)$$

Therefore, the sum of all items in the progression can be calculated with formula (8) and in our case it will be the value of future cash flow for capital expenditures, discounted to the date at the end of forecast horizon.

The normalised cash flow for capital expenditures (f_0) should reflect conditions of steady annual capital expenditures for evenly renewed asset[23] and at the same time to be a correct equivalent of the irregular cash flow for capital expenditures (7). To construct this equivalence, I developed a second sequence of the cash flow for steady annual capital expenditures, which complies with the assumption of infinite divisibility and even renewal. Then, I discounted this sequence to the date at the end of the forecast horizon (9). The resulting sequence is also a descending geometric progression with the sum of S_2 (10):

$$f_0 * \left(\frac{1+g}{1+r}\right);\ f_0 * \left(\frac{1+g}{1+r}\right)^2;\ f_0 * \left(\frac{1+g}{1+r}\right)^3;\ f_0 * \left(\frac{1+g}{1+r}\right)^4 \ldots \quad (9)$$

where

$$b_1 = f_0 * \left(\frac{1+g}{1+r}\right);\ q = \left(\frac{1+g}{1+r}\right)$$

$$S_2 = \frac{b_1}{1-q} = f_0 * \frac{\frac{1+g}{1+r}}{1-\frac{1+g}{1+r}} = f_0 * \frac{1+g}{r-g} \quad (10)$$

The equivalence means equality of the sums of discounted values of these two cash flow sequences ($S_1 = S_2$) as presented in (8) and (10). This equation can be solved for the normalised cash flow for capital expenditures (f_0):

$$F_0 * \frac{1}{(1+i)^{d*m}} * \frac{(1+g)^m * (1+r)^{d*m}}{(1+r)^m - (1+g)^m} = f_0 * \frac{1+g}{r-g}$$

$$f_0 = F_0 * \frac{1}{(1+i)^{d*m}} * \frac{(1+g)^m * (1+r)^{d*m}}{(1+r)^m - (1+g)^m} * \frac{r-g}{1+g}$$

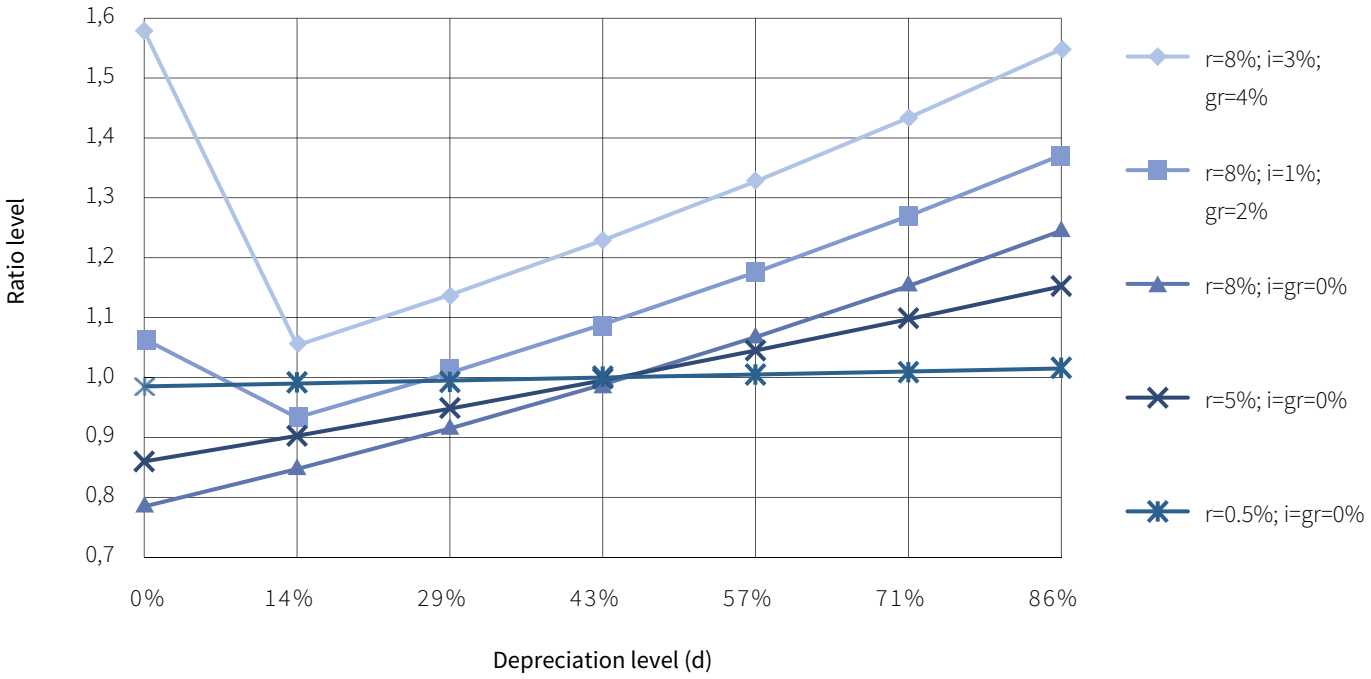
$$f_0 = F_0 * \frac{(1+g)^{m-1} * (r-g)}{(1+r)^m - (1+g)^m} * \left(\frac{1+r}{1+i}\right)^{d*m} \quad (11)$$

Formula (11) determines the normalised capital expenditures in the last forecast year[24] for fixed assets with uneven renewal.

23 This implies annual capital expenditures in proportion to the depreciation of fixed assets in the current period, taking into account inflation in fixed asset prices and needs of real business growth.

24 If in the estimation of terminal value a researcher explicitly takes the cash flow of the next year after the forecasting period ($FCFF_{t+1}$ instead of $FCFF_t*(1+g)$), it should take F_0 and d as of the next year (t+1) too.

Figure 1: Capex(n)/DA ratio in the last forecast year for irregular capital expenditures (useful life m=7)



Comment: the normalisation was performed based on formula (11) and the terms of the example model presented in Appendix A.

2. Several fixed assets or group of fixed assets

In case of several assets or groups of fixed assets with different useful lives ($\mathbf{m_y}$) and depreciation levels ($\mathbf{d_y}$), the formula can be transformed into a sum of normalised capital expenditure cash flows **(12)** for assets grouped by the parameters ($\mathbf{m_y}$, $\mathbf{d_y}$), where ($\mathbf{y}$) is group identifier from 1 to k. The use of formulas **(11)** and **(12)** to some fixed assets with uneven renewal does not preclude from forecasting steady-state capital expenditures for other fixed assets with even renewal at the level of depreciation adjusted for inflation and real growth.

$$f_0 = \sum_{y=1}^{k} F_{0y} * \frac{(1+g)^{m_y-1} * (r-g)}{(1+r)^{m_y} - (1+g)^{m_y}} * \left(\frac{1+r}{1+i}\right)^{d_y * m_y} \qquad (12)$$

The normalisation formulas **(11)** and **(12)** improve valuation methodology by lifting often unrealistic assumption about infinite divisibility and even renewal of fixed assets and refines estimation of the terminal value and the whole DCF valuation.

V. Verification

To verify the accuracy of the proposed formula **(11)**, a DCF model was created

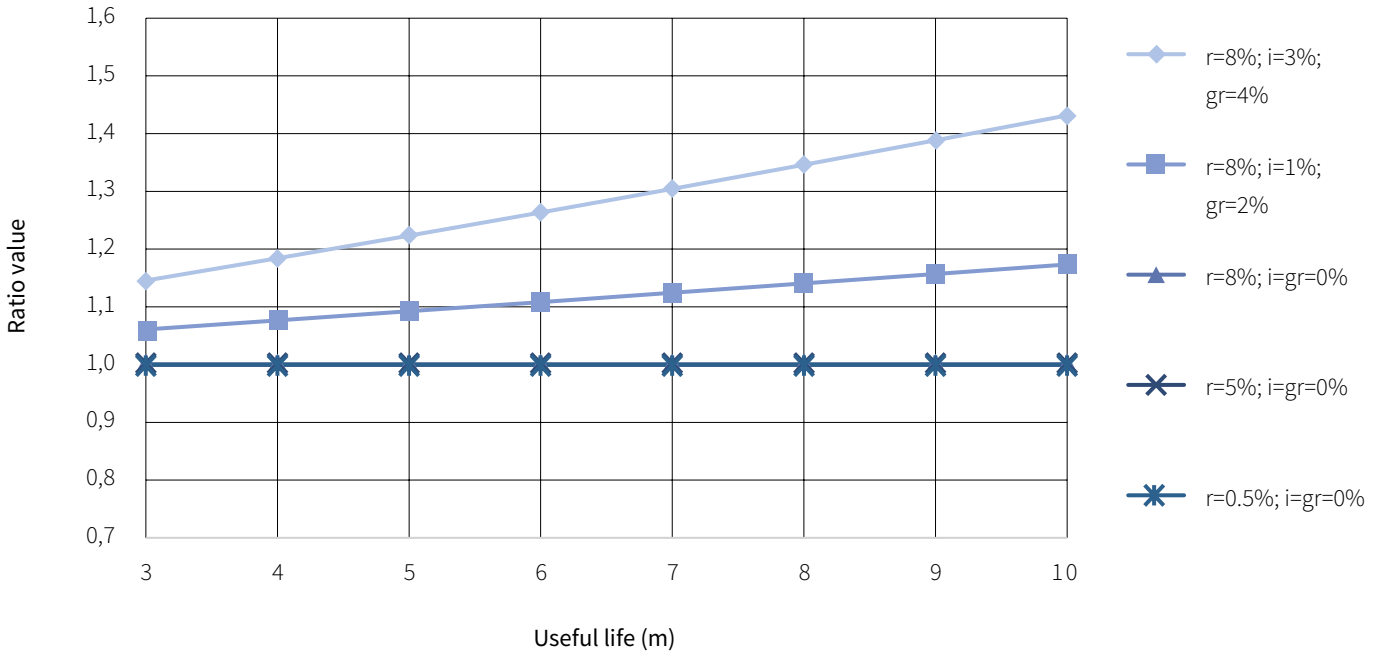
- with irregular capital expenditures and
- without terminal value but with an arbitrarily chosen long forecast period (3,000 years[25]).

which approximates the sum of discounted cash flows in perpetuity. Then the result of the approximation with explicit forecast for the long period is compared with business valuation with terminal value, in which irregular capital expenditures are normalised with the proposed formula **(11)**, and all other terms remain the same. The comparison is complemented with a sensitivity analysis for different combinations of the variables ($\mathbf{F_h}$, $\mathbf{d}$, $\mathbf{g^r}$, $\mathbf{i}$, $\mathbf{m}$, $\mathbf{r}$). The results of the comparative model do not reveal evidence of inaccuracies in the normalisation formula **(11)**.[26]

25 The cutting period of 3,000 was chosen in the estimation experiment to be large enough so that the value associated with the tail after the cutting period is not anyhow significant under various scenarios of the assumed variables. As the sensitivity analysis for the cases of small differences between discount rate ($\mathbf{r}$) and the nominal growth ($\mathbf{g=(1+i)*(1+g^r)-1}$) such long period of 3,000 year does matter. If the sensitivity analysis excludes unrealistic combinations with small differences between the discount rate and the nominal growth, then the cutting period may be reduced to 100–200 years.

26 See Appendix.

Figure 2: Capex(n)/DA ratio in the last forecast year for regular capital expenditures



Comment: Fixed assets with a regular and smooth renewal have a stable depreciation level that depends on variables m, i, gr and does not depend on discount rate r.

VI. Analysis of the ratio of normalised capital expenditures to depreciation charges

The comparative DCF model with a long forecast period also allows for analysing the ratio of normalised capital expenditures (**Capex(n)**) to depreciation charges (**DA**) in the last forecast year in response to inquiries from practicing appraisers.[27] The model indicates that the **Capex(n)/DA** ratio for irregular capital expenditures depends on the depreciation level of fixed assets at the end of the forecast horizon (**d**) and other variables (**m, i, g^r,** and **r**).

- In the case of a low non-zero depreciation level, the ratio is below average, and in the case of a high depreciation level, the ratio is above average. This relationship is explained by the fact that, in the first case, future capital expenditures are distant in time and, therefore, have a relatively lower discounted value.[28] In the second case, future capital expenditures are close in time and have a relatively higher discounted value. This difference reflects the key concept in finance theory about the time value of money.
- The ratio deviates from the average level more with higher level of discount rate (**r**) and longer useful life of fixed assets (**m**) because these two factors are determinative in discounting future capital expenditures.
- At the same time, increases in inflation rate (**i**) and real growth rate (g^r) shift the ratio curve upward, increasing the ratio of **Capex(n)/DA** for all depreciation levels (Figure 1). This shift can be explained by the fact that inflation and real growth first affect capital expenditures and after that transmit into depreciation during the subsequent useful life cycle.

A special situation is the state of zero depreciation level, in which depreciation still reflects the level of prices and real growth of the previous useful life cycle of fixed assets, while the normalised cash flow takes into account the prices and real growth of the next future cycle.

The illustrative example of the DCF model in Appendix demonstrates a situation in which – at the end of the forecast horizon – fixed assets have a low depreciation level (14% in column 7 Table 2) and the cash flow of earnings is expected for another five years (columns 8-12 Table 3) without respective cash outflows for capital expenditures, which arise only the sixth year in a lumpy amount (column 13 Table 3). Being consistent in taking

27 Matthews/Rosenbloom, op. cit. (footnote No. 10): 9.

28 If we exclude situations of negative inflation and negative real growth, then the only reason for **Capex(n)/DA<1** is grounded in relatively new low-depreciated fixed assets. In this case, the fixed assets are going to generate an earnings cash flow and tax benefits associated with depreciation charges for a long period without cash outflows for capital expenditures. During this period, the cash inflows can be invested and generate additional interest or other income by the time when the need for capital expenditures arises. Such a possibility of additional income is reflected in the concept of time value of money and estimated by discounting. Therefore, relatively new undepreciated fixed assets are associated with a lower present value of future capital expenditures. The opposite situation is with heavily depreciated fixed assets: lumpy cash outflow on capital expenditures is expected earlier and disproportionally higher relative to the respective earnings and depreciation charges (potentially bearing a need for borrowing money and paying interest expense).

into account the time value of money during the forecast horizon and afterwards, the discounting of the relatively distant cash outflows on capital expenditures leads to a lower present value in the normalised capital expenditures for terminal value estimation. In our illustration of a useful life of seven years (m=7) the discounting makes $\mathbf{Capex(n)}$ fall below the level of the depreciation charge: $\mathbf{Capex(n)/DA=16.4/17.4=93\%}$.

In the case of regular capital expenditures that change from period to period only at the rate of nominal growth, the ratio $\mathbf{Capex(n)/DA}$ becomes stable after reaching a steady depreciation level (see figure 2).[29] In this case, the ratio

- $\mathbf{Capex(n)/DA=1.0x}$ given zero nominal growth rate $\mathbf{(g=0)}$,
- $\mathbf{Capex(n)/DA>1.0x}$ given positive nominal growth rate $\mathbf{(g>0\%)}$.

The shift in the ratio above 1.0x is explained by the same reasoning as the upward shift of the ratio curve for irregular capital expenditures. The ratio $\mathbf{Capex(n)/DA}$ for regular capital expenditures cannot fall below 1.0x given non-negative nominal growth. This is because there is no possibility for time mismatches for cash inflows and outflows associated with fixed assets so that discounting reduces the value of capital expenditures below the depreciation charge.

29 In conditions of zero nominal growth, the depreciation level of fixed assets with regular and smooth renewal is approaching to 50% with increasing lengths of useful life (m), but in conditions of positive nominal growth, higher capital expenditures are required for the renewal each next period, which decreases the steady depreciation level.

VII. Conclusions

The proposed formulas **(11)** and **(12)** for normalising irregular capital expenditures is an improvement to DCF valuation methodology. The improvement allows for lifting the restrictive and often unrealistic assumptions about the infinite divisibility of fixed assets and evenness in the renewal. The illustrative DCF model for a business with irregular capital expenditures indicates that the ratio of normalised capital expenditures to depreciation charge can be both below and above 1.0x depending on depreciation level, discount rate, inflation, and real growth rate. The proposed formulas are a contribution to the reliability of DCF valuation methodology that makes terminal value estimation with Gordon growth model more justified and universal.

Appendix: Verification of the Normalisation Formula for Irregular Capital Expenditures

A DCF model has been developed for verification of the formula (11). The model provides for valuation of a business with irregular capital expenditures. It applies two valuation approaches: (a) with terminal value calculated at the end of the forecast period using normalised capital expenditures with the proposed formula and (b) without terminal value but with a long forecast horizon (3,000 years) that approximates the perpetuity.

For approach (a) in table 2 I normalised the last forecast year (t = year 7) to calculate a normalised steady-state free cash flow of 3.8.

The following tables present the key assumptions (Table 1), the summary results of two approaches (Table 2, Table 3) and a sensitivity analysis to changes in normalisation variables (Table 4 , Table 5, Table 6). All cash flows are assumed to occur at year-end. ◆

Table 1: Key assumptions of the valuation

Indicator	value
Inflation rate ($\mathbf{i}$)	1.00%
Real growth rate ($\mathbf{g^r}$)	2.00%
Nominal growth rate $\mathbf{g=(1+i)*(1+g^r)-1}$	3.02%
Discount rate ($\mathbf{r}$)	8.00%
Fixed assets gross value at the beginning of forecast horizon ($\mathbf{F_{h0}}$)	100.0
Useful life of fixed assets in years ($\mathbf{m}$)	7
Cumulative depreciation at the end of forecast horizon ($\mathbf{d}$)	14%

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Table 2: Valuation with terminal value and normalisation

Year		1	2	3	4	5	6	7	*Normalised year (7)*
NOPAT=EBIT*(1-TR)	*1*	2.7	3.2	3.7	4.3	4.9	5.4	2.7	2.7
Depreciation charge	*2*	14.3	14.3	14.3	14.3	14.3	14.3	17.6	**17.6**
Change in working capital	*3*	-0.05	-0.06	-0.07	-0.08	-0.10	-0.11	-0.05	-0.05
Operating CF	*4=1+2+3*	**16.9**	**17.4**	**17.9**	**18.5**	**19.0**	**19.6**	**20.2**	**20.2**
Increase	*5*		*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	
Capex CF	*6*	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-123.2**	**0.0**	**-16.4**
Capex/DA ratio	*7=6/2*	0.0	0.0	0.0	0.0	0.0	8.62	0.0	**0.93**
Cum. depreciation	*8*	*29%*	*43%*	*57%*	*71%*	*86%*	*0%*	***14%***	
FCFF	*9=4+6*	**16.9**	**17.4**	**17.9**	**18.5**	**19.0**	**-103.5**	**20.2**	**3.8**
	10							*Gordon's formula*	78.4
Discount factor	*11*	0.926	0.857	0.794	0.735	0.681	0.630	0.583	0.583
Discounted FCFF (year 0)	*12*	15.7	14.9	14.2	13.6	13.0	-65.2	11.8	45.8
Enterprise value (year 0)									**63.7**

Table 3: Valuation without terminal value and normalisation

Year		1	2	3	4	5	6	7
NOPAT=EBIT*(1-TR)	*1*	2.7	3.2	3.7	4.3	4.9	5.4	2.7
Depreciation charge	*2*	14.3	14.3	14.3	14.3	14.3	14.3	17.6
Change in working capital	*3*	-0.05	-0.06	-0.07	-0.08	-0.10	-0.11	-0.05
Operating CF	*4=1+2+3*	**16.9**	**17.4**	**17.9**	**18.5**	**19.0**	**19.6**	**20.2**
Increase	*5*		*3%*	*3%*	*3%*	*3%*	*3%*	*3%*
Capex CF	*6*	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-123.2**	**0.0**
Capex/DA ratio	*7=6/2*	0.0	0.0	0.0	0.0	0.0	8.62	0.0
Cum. depreciation	*8*	*-29%*	*-43%*	*-57%*	*-71%*	*-86%*	*0%*	*-14%*
FCFF	*9=4+6*	**16.9**	**17.4**	**17.9**	**18.5**	**19.0**	**-103.5**	**20.2**
Discount factor	*10*	0.926	0.857	0.794	0.735	0.681	0.630	0.583
Discounted FCFF	*11=9*10*	15.7	14.9	14.2	13.6	13.0	-65.2	11.8

Year		8	9	10	11	12	13	14
NOPAT=EBIT*(1-TR)	*1*	3.3	3.9	4.6	5.3	6.0	6,7	3.3
Depreciation charge	*2*	17.6	17.6	17.6	17.6	17.6	17.6	21.7
Change in working capital	*3*	-0.06	-0.08	-0.09	-0.10	-0.12	-0.13	-0.06
Operating CF	*4=1+2+3*	**20.8**	**21.4**	**22.1**	**22.8**	**23.5**	**24.2**	**24.9**
Increase	*5*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*
Capex CF	*6*	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-151.7**	**0.0**
Capex/DA ratio	*7=6/2*	0.0	0.0	0.0	0.0	0.0	8.62	0.0
Cum. depreciation	*8*	*-29%*	*-43%*	*-57%*	*-71%*	*-86%*	*0%*	*-14%*
FCFF	*9=4+6*	**20.8**	**21.4**	**22.1**	**22.8**	**23.5**	**-127.5**	**24.9**
Discount factor	*10*	0.540	0.500	0.463	0.429	0.397	0.368	0.340
Discounted FCFF	*11=9*10*	11.2	10.7	10.2	9.8	9.3	-46.9	8.5

Year		…	100	…	200	…	Amount for 1 – 3,000
NOPAT=EBIT*(1-TR)	*1*		58.9		1459.7		
Depreciation charge	*2*		263.8		4870.0		
Change in working capital	*3*		-1.16		-28.62		
Operating CF	***4=1+2+3***		**321.6**		**6301.0**		
Increase	*5*		*3%*		*3%*		
Capex CF	***6***		**0.0**		**0.0**		
Capex/DA ratio	*7=6/2*		0.0		0.0		
Cum. depreciation	*8*		*-43%*		*-71%*		
FCFF	***9=4+6***		**321.6**		**6301.0**		
Discount factor	*10*		0.000		0.000		
Discounted FCFF	*11=9*10*		0.15		0.00		**63.7**

Table 4: Sensitivity analysis of the difference in two valuation approaches to changes in F_{ho}, F_h, and d

	F_{ho}	1	50	100	150	200
	F_h	1	62	123	185	246
d	14%	-6.7E-15	-5.2E-15	-5.2E-15	-6.2E-15	-5.2E-15
	43%	-6.1E-15	-6.3E-15	-6.3E-15	-5.7E-15	-6.3E-15
	86%	-6.3E-15	-4.8E-15	-4.8E-15	-5.4E-15	-4.8E-15

Table 5: Sensitivity analysis of the difference in two valuation approaches to changes in i and g^r

	g^r	0.0%	1.0%	2.0%	3.0%	4.0%
i	0%	-9.2E-16	-1.4E-15	-3.1E-15	-5.7E-15	-7.5E-15
	1%	-2.1E-15	-3.7E-15	-5.2E-15	-1,3E-14	-3.1E-14
	2%	-3.0E-15	-3.6E-15	-1.0E-14	-2.9E-14	-6.1E-14

Table 6: Sensitivity analysis of the difference in two valuation approaches to changes in m and r

	m	2	4	7	12	20
r	5%	-4.2E-14	-2.6E-14	-2.4E-14	-6.5E-15	-7.4E-15
	8%	-1,2E-14	-1.0E-14	-5.2E-15	-5.5E-15	-2,3E-15
	10%	-7.1E-15	-5.0E-15	-4.8E-15	-3,4E-15	-2.4E-15

ESG Integration – Current and Future in Business Valuation

Integrating ESG factors into business valuation models has important implications for investment and decision-making. This article summarizes numerous vectors of ESG – in particular climate change – that may affect valuation, followed by illustrating an approach integrating ESG factors into the valuation process. Finally, the article analyses the questions and challenges faced in ESG integration and the road ahead.

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I. Introduction

Since 2022, the UK government had made ESG disclosure mandatory for all private UK firms with asset turnover greater than £500m, publicly quoted UK firms and professional UK firms.[1] The guidelines for sustainability reporting include the disclosure of greenhouse gas use, energy use, gender pay gap and anti-modern slavery measures. There is also a range of non-mandatory guidelines, including indirect water use, embodied finite resources, and more detailed carbon accounts including supply chain emissions and embodied carbon emissions. Though the current guidelines cover all three factors of ESG, there is relatively more focus put on the environmental factor. Under increasing pressure from different stakeholder groups to be more transparent, many companies publish ESG reports, following the Global Reporting Initiative's ("GRI") framework for sustainability[2] allowing information to be clear, comparable and able to be accounted for in business valuations.

ESG means environmental, social and governance. While governance is already a key factor in business valuation, and to a certain extent the social trend and human capital within social factors, environmental factors – in particular climate change – are less often considered explicitly. Climate change refers to long-term shifts in the earth's weather pattern that can be caused by natural phenomena or human activity. Climate change is a part of environmental factors. In response to climate change, the Paris Agreement calls for limiting global warming to 1.5°C, and to reach this goal, emissions need to be cut by 45% by 2030 and net zero by 2050. When observing past studies concerned with individual ESG factors and financial performance, the relationship observed between environmental performance and financial performance stands out with the highest number of positive relations when compared to the number of studies that show negative relations.[3] An advantage of including ESG metrics in investment processes is its ability to act as an active driver for risk and returns.[4] For example, when considering climate change, commodity prices could be affected by drastic changes in weather patterns, therefore firms with forward-looking strategies targeting this issue could have stronger competitive advantages compared to those without. Furthermore, it allows an opportunity for high ESG-scoring businesses to reap the benefits of having access to a lower cost of capital.[5] Opposingly, firms that do not consider this factor in their management strategies may suffer from unanticipated costs. Therefore, taking account of the environmental factor in investment decisions could be considered as a good method for risk management.

The quantification of ESG factors in the valuation process has gained greater emphasis over the past few years. This article will elaborate a five-step of ESG integration framework based on the link between climate change and business valuation, building on the model proposed by international organizations. In the five steps of identification, assessment, filtration, integration, and triangulation, we focus our practice on integration, which mainly introduces integration methods in different valuation approaches.

II. The link between ESG and business valuation

Business valuation is performed in one or more of the three approaches, namely income approach, market approach and cost approach. The emphasis is mostly if not solely financially driven. While ESG was not explicitly mentioned before it became the well-known acronym nowadays, any business is affected by ESG to various extent as these factors affect the operating environment which in turn impact financial performance directly or indirectly. With climate change being the focus in international media and recent United Nations Climate Change Conferences or COP, the following section connects ESG – in particular climate change – to business valuation.

1. How does climate change affect business valuation?

Climate change is often identified as the biggest risk factor within ESG as social and governance factors have always been managed to a certain extent. These changes then bring risks and opportunities, which will affect the future financial health of organizations and ultimately business valuation.

a) Risk and Opportunities

Risk: Climate change brings dramatic changes to the environment, and these changes may directly or indirectly disrupt company operations and bring risks.

For transition risks, the transition to a low-carbon economy will face extensive policy, legal, technological and market changes. Such changes can pose financial or reputational risks to the organization. While physical risks include dramatic changes in the environment, such as extreme heat and storms, droughts, and wild-

1 HM Treasury, Sustainability Reporting Guidance: 2021-22, » Link (last access 20.02.2023).

2 GRI, GRI Standards, » Link (last access 20.02.2023).

3 Friede/Busch/Bassen, ESG and financial performance: aggregated evidence from more than 2000 empirical studies, Journal of Sustainable Finance & Investment, vol. 5, no. 4 (2015): 210-233; Whelan/Atz/Van Holt/Clark, ESG and Financial Performance: Uncovering the Relationship by Aggregating Evidence from 1,000 Plus Studies Published between 2015-2020, » Link (last access 20.02.2023).

4 Briand/Urwin/Chia, Integrating ESG into the Investment Process, MSCI ESG Research, 2011.

5 Business Valuation Resources, High ESG scores lower the cost of capital, study finds. BVWire Issue 244-3 (2023), » Link (last access 20.02.2023).

fires, as well as longer-term effects such as sea-level rise, desertification, and changes in precipitation patterns. These risks can be divided into two categories: systemic risks and company-specific risks. For the changes that are more prevalent across the whole industry, such as policy changes affecting the industry transition to cleaner energy, the related risks are systemic risks. On the other hand, if a particular physical risk factor is location specific and does not affect other players in the same industry outside that location, it is a firm level idiosyncratic risk.

Opportunities: In this transitional period, opportunities and risks coexist. On the other hand, the transition to a low-carbon economy also brings investment opportunities.

By improving the efficiency of energy use, organizations can directly reduce medium and long-term operating costs. To meet global carbon reduction goals, countries around the world need to convert most of their electricity to low-carbon alternative energy sources. As investment in renewable energy installations increases and technology advances, using low-carbon energy sources may save on annual energy costs. While organizations that actively develop low-emission products can improve competitiveness and capitalize on shifting consumer and producer preferences. The transition to a low-carbon economy brings new markets and new opportunities. For example, the construction of green infrastructure (such as low-carbon power generation, and energy efficiency improvement) brings new opportunities to the market. Moreover, climate resilience could be produced when organizations develop adaptive capacity to respond to climate change to better manage associated risks and seize opportunities, including the ability to address transitional and physical risks. Further opportunities include improving efficiency, designing new production processes and developing new products.

b) Influence

Climate-related risks and opportunities will affect an organization's future financial health. The financial impacts most relevant to a given industry are primarily revenue, expenditures, assets and liabilities, and capital and financing.

- **Revenue:** Under the influence of transition risk and physical risk, demand for products and services may change, potentially impacting organizational revenue. At the same time, some potential opportunities will also increase or create new revenue.

Example – Standard Life Investments:
Background:
In April 2015, the European Commission voted in favour of implementing 'real world' NOX emissions testing procedures in the automobile industry.
The trend of increasingly stringent environmental regulations will affect the automotive industry. This case study analysed pollution reduction solutions available to automakers and assessed the extent to which a company may need to pass the cost of complying with increasing regulation on to their customers and/or supply chain.

Impact on valuation:
Margins and R&D budgets at traditional auto manufacturers will be under increasing pressure to comply with more stringent emission regulations.

Opportunities:
Korean integrated petrochemical manufacturer LG Chem is a leading lithium-ion battery manufacturer. It has been investing in new kinds of battery technology. LG Chem's excellent ESG performance increases the company's likelihood of meeting its EV battery revenue target.[6]

- **Expenditures:** When facing climate-related risks and opportunities, an organization's costs can be impacted. The extent of this impact depends on the organization's cost structure and resilience.

Example – Standard Life Investments *(continued):*
The cost for vehicle manufacturers to comply with the more stringent emissions regulation will increase under real world testing procedures.

- **Assets and liabilities:** Changes in policies, technologies and markets related to climate change may affect the valuation of assets and liabilities. Attention needs to be paid to the impact of new investments, asset restructuring, and asset impairment on assets and liabilities (especially long-term assets).

Example – National Grid:
National Grid made the commitment to reducing its impact by achieving net zero for its Scope 1 and 2 emissions by 2050. According to the 2019/2020 annual report of National Grid, the company has evaluated the impact of new net zero commitments. And in this annual report, the practices on adjustments and estimates of the useful life of its assets have been shown.[7] The role of the natural gas network in the pathway to achieving the GHG reduction targets set is currently uncertain.
Because of the uncertainty described relating to the useful economic life of its gas assets, the report provides a sensitivity on the depreciation, presuming a shorter UEL (useful economic life).[8]

6 UNPRI, Valuing the impact of increasingly stringent environmental regulation, n.d., » Link (last access 20.02.2023).
7 A4S, Scenario Analysis – practical example: National Grid, 2022, » Link (last access 20.02.2023)
8 National Grid, Annual Report 2019/20, 2020, » Link (last access 20.02.2023).

- **Capital and financing:** Organizations may increase their debt to address climate-related impacts, such as reduced cash flow and increased R&D spending. At the same time, climate-related risks and opportunities may affect an organization's ability to raise capital by affecting investors' perceptions of an organization's reputation.

2. Importance of incorporating ESG in valuation

The impact of ESG factors on shareholder value is uncertain. Nevertheless, valuation results that take into account the impact of ESG, especially climate change, can better guide the decision-making of investors and managers.

Climate change will significantly and persistently affect long-term economic growth and prosperity. Climate-related risks and opportunities also affect company operations and ultimately affect shareholder value by affecting operating cash flow, discount rates and debt.

The uncertain impact of climate change brings difficulties to both investors and corporations in decision-making. Valuations that consider the impact of climate change will differ from those that do not. Traditional valuation methods focus more on financial metrics and ignore the long-term impact of climate change on companies. Therefore, integrating climate change into valuation tools can reassess risks and asset value to bring investors and managers a reference.

III. Framework of ESG integration valuation

Materiality is one of the important factors to be considered in the incorporating process. Materiality is a concept that defines why and how certain issues or information are important for a company or a business sector. At its core, materiality is an accounting principle that defines which information is relevant, and relevance is one of the characteristics of information that is useful for decision-making.[9] GIC addresses that valuers should be mindful of the materiality of ESG factors in the integration process. In materiality assessment processes, valuer experience is required, as the same factors are likely to be of different importance for different industries and the set of material factors may change over time.[10]

For example, environmental factors are more important for energy-intensive industries than for other industries. Human capital, as one of the social factors has a greater impact on intangible-rich industries, and less impact on more traditional capital-intensive industries.[11] It may also vary from one geography to another. For example, Europe is likely to have more stringent requirements than less developed economies.

Accounting for Sustainability (A4S) was established in 2004. It aims to transform finance to make a sustainable business, business as usual. A4S has introduced a five-step climate change valuation framework to guide valuators to integrate climate change risks and opportunities into their valuations.[12] The author believes that these steps can be extended to broader ESG factors.

Overall, this is a framework trying to bring climate change integration, and then ESG integration from qualitative to quantitative in business valuation.

1. Identify

The first step is to identify the key business-value drivers. Valuators can consider from these areas—core activities, revenue/costs, geographies, and operating environment. In practice, valuers should identify the material ESG factors first. In this regard, the Sustainability Accounting Standard Board (SASB), now part of the IFRS Foundation, provides an important reference for the process of materiality identification. SASB Standards surface sustainability information which is financially material. It also creates tools including a materiality finder and materiality map to help users to find out how general sustainability issues manifest across industries.[13]

2. Assess

a) Assess the risks and opportunities

Assess risks and opportunities by identifying relevant sources of those identified ESG factors for a company or asset, identifying existing or potential sources of mitigation and enabling factors.

b) Scenario analysis

There are different climate scenarios depending on human activities in the future. The exact timing and magnitude of climate change impacts are difficult to grasp. This uncertainty makes it challenging for organizations to assess the potential impact of climate-related risks and opportunities on their business and financial performance. The TCFD recommends a scenario analysis approach that considers potential impacts under different conditions, consistent with the requirement in the "assess" step.

9 Value Reporting Foundation, SASB, Double and Dynamic: Understanding the Changing Perspectives on Materiality, 2020, » Link (last access 20.02.2023).

10 GIC, Materiality – a practical approach to integrating ESG, 2021, » Link (last access 20.02.2023).

11 IVSC, Time to Get Tangible about Intangible Assets, 2022, » Link (last access 20.02.2023).

12 A4S, Essential Guide to Valuation and Climate Change, 2021, » Link (last access 20.02.2023).

13 Value Reporting Foundation, SASB Standards: Exploring Materiality, n.d., » Link (last access 20.02.2023).

Example – HKMA Pilot Banking Sector Climate Risk Stress Test (CRST):

The Hong Kong Monetary Authority assessed the exposure of banks participating in the test scheme to climate risks under three scenarios. These three scenarios include a physical risk scenario of a worsening climate situation and two transition risk scenarios representing different pathways (i.e., disorderly and orderly).

A disorderly transition path means that climate policy will not be introduced until 2030, resulting in a sudden reduction in greenhouse gas emissions thereafter to meet the goals of the Paris Agreement. This will cause significant changes in energy consumption patterns and carbon prices.

The orderly transition path assumes that authorities will take an early and incremental approach to adopt new technologies to reduce GHG emissions. The resulting changes in energy consumption patterns and carbon prices will be more gradual than in the disorderly transition scenario. The goals of the Paris Agreement will be achieved in a more orderly manner, with less disruption to the global economy throughout the process.

Physical risk scenario: In Hong Kong, the physical risks are mainly typhoons and floods, two climate hazards. They can lead to property devaluation and business interruption. As such, the assessment focuses on the vulnerability of Hong Kong residential mortgages and other property-related loans, as well as potential operational losses associated with climate events.

Transition risk scenarios: Transition risk will primarily manifest as increased credit risk exposure. Rising carbon prices often result in the cost of credit for lending to high-emitting companies. Deterioration of corporate financial conditions and therefore deterioration of credit conditions in the transition risk scenario will affect bank profitability, loan provisions, and credit.[14]

c) Alternative methods to access ESG Data

Alternatively, ESG achievements of a company could be reflected by their ESG score by Bloomberg ESG Data Service and/or other prominent service providers including Sustainalytics, MSCI ESG Research, and ESGI.

The ESG ratings vary amongst providers as each provider has their unique methodology for estimating firm-specific ratings. The Bloomberg ESG Data Service score is calculated by evaluating companies on an annual basis, doing so by collecting information from firm sustainability reports, annual reports, websites, direct contact and other public resources. They then create a score between 0 to 100 for individual firms. This score is calculated through 120 ESG indicators, including those relating to climate change, carbon emissions, and political contributions.[15] Meanwhile, ESG data collected by MSCI comes from government databases, firm disclosures and NGO databases. They only look at 37 ESG indicators and they give out ratings between AAA to CCC, with AAA as the best rating and CCC as the worst rating.[16]

As the methods of assessment differ, the reports and ratings between firms may not be consistent. Hence, drastic differences may exist when comparing the same sets of a firm when using different providers.

3. Filter

After assessing risks and opportunities, these factors should be filtered using available information. For each risk and opportunity, the likelihood and materiality (i.e., the level of the potential impact on financial performance) should be considered. Factors that have a greater relationship with the company are included in the valuation analysis.

4. Integrate

After filtering out the risks and opportunities associated with climate change or ESG factors, we need to consider how these risks and opportunities translate into financial valuation implications. How to integrate climate change or ESG risks and opportunities as a whole into different valuation methods is a challenge.

a) DCF approach

Adjust discount rate: When the impact on cash flows is uncertain/difficult to quantify, the method of adjusting the discount rate is used.

When adjusting the discount rate, assess whether the corresponding risks and opportunities are industry-wide or company-specific. If they are industry-wide, they are likely to have been included in the adjustment of the discount rate. If they are systematic risk prevalent to the whole industry, the risk may already be reflected in the industry beta and double counting should be avoided. If they are idiosyncratic risk specific to the entity, then it would warrant an adjustment to discount rate, provided that the impact of risks and opportunities has not been considered in cash flow and terminal value. The key to adjusting the discount rate is to avoid double-counting effects.

14 Hong Kong Monetary Authority, Pilot Banking Sector Climate Risk Stress Test, 2021, » Link (last access 20.02.2023).

15 Bloomberg, Global Environmental, Social & Governance – ESG Data, 2022, » Link (last access 20.02.2023).

16 MSCI, ESG Investing: ESG Ratings, 2022, » Link (last access, 20.02.2023).

Adjust cash flows and/or terminal value: As risks and opportunities become more quantifiable, visible, and certain, including risks and opportunities in cash flows is more recommended than adjusting for discount rates. Valuators should focus on all elements of the filtered ESG factors affecting cash flow, including revenue, costs and capital expenditures, and then calculate the impact on cash flow that is highly measurable, deterministic, immediate, and known.

b) Market approach

To account for ESG factors for private companies, a valuer can follow the following process:[17]

- Identify and assess the comparability of the relevant ESG criteria for the comparable companies. And then assess the industry-specific metrics (financial metrics and activity-based metrics).
- Assess the performance of the subject company for such criteria.
- Adjust multiples (e.g., EBITDA, etc.) as compared to the comparable companies along with the industry metrics.

In the process of comparing and adjusting, valuers can consider integrating ESG scores/climate metrics to the multiples. For example, instead of comparing carbon emissions and earnings per share separately, valuers can compare "carbon adjusted" earnings per share metric directly. After integrating climate metrics, P/E ratio can be expressed as P/"carbon adjusted E". Applying this approach requires more companies to proactively disclose ESG data such as carbon emissions for sufficient benchmarking.

Example – Danone:
Danone is the first company to claim to use a "carbon-adjusted" EPS metric. Carbon-adjusted EPS metrics are calculated based on Danone's theoretical cost per share of greenhouse gas emissions and then subtracted from its regular earnings per share.[18] What's exciting about this move is that it's a simple financial calculation in a profit and loss account that's easy to understand.

Valuers may also do multi-variate regression on various metrics if these parameters are significant statistically after the previous steps.

Multi-variate regression is a statistical technique that can be used to analyse the relationship between a single dependent variable and several independent variables. Each predictor value is weighed, the weights denoting their relative contribution to the overall prediction. $Y=a+b_1X_1+b_2X_2+b_3X_3+\ldots+b_nX_n$. Here Y is the dependent variable, and $X_1,\ldots,X_n$ are the n independent variables.

$X_1,\ldots,X_n$ here are those material factors. Y represents a single dependent, a multiple (e.g., P/E, EBITDA, etc.). We can find out the relationship between several key value drivers and one multiple by applying such statistical method.

c) Cost approach

Under summation method of cost approach, valuers calculate a company's net asset by subtracting liabilities from assets. ESG factors may affect the valuation of assets and liabilities. For example, property values in flood-prone areas may need to be adjusted according to the level of flood risk. Companies' provisions or actual outflow for environmental protection-related penalties may also increase if laws and regulations become more stringent on carbon emissions.

5. Triangulate

The final step of the framework is triangulation, which is a systematic process of using multiple methods to gather a range of quantitative estimates. Triangulation has always been business valuation best practice. Valuators need to assess the estimated value of the subject entity concerning market considerations.

IV. Challenges in application

There are also some challenges in the application of ESG integration, including doubts about methodology and difficulties in implementation.

1. Skepticism of the relationship between ESG and value creation

Aswath Damodaran is skeptical that ESG creates extra value. He argued that the idea that adding ESG constraints to investing will increase expected returns is counterintuitive. Most of the time, constraints incur costs or limit opportunities. Considering stakeholder interests may conflict with creating financial returns for shareholders. ESG may not do anything for value, but it adds luster to companies, keeps them priced above their less socially conscious peers, and enriches investors who trade on it. Alternatively, ESG may indeed add value, but the market will adapt to this quickly and investors will not benefit from investing in ESG stocks as they are paying a premium already priced in.[19]

2. Lack of comparability

The importance of particular ESG factors varies across industries (e.g., technology, mining, manufacturing, retail), so making industry-to-industry comparisons is difficult.

Even within the same industry, due to the lack of consensus on reporting, measuring and interpreting ESG information, there is a lot of ESG data of different breadth and depth on various companies in the market. Yet they

17 IVSC, ESG and Business Valuation, 2021, » Link (last access 20.02.2023).

18 CNBC, Danone Hopes It's Blazing a Trail by Adopting a New Earnings Metric to Expose the Cost of Carbon Emissions, 2020, » Link (last access 20.02.2023).

19 Damodaran, Sounding Good or Doing Good? A Skeptical Look at ESG, 2020, » Link (last access 20.02.2023).

may report different metrics without standardization on a comparable unit (e.g., emission per store vs. emission per square meter), which makes ESG data confusing. ESG score providers should further disclose and explain the measurement mechanisms and methods they use for investors better understanding of the divergence. In addition, more public discussions on how to measure corporate ESG performance would help improve the quality of ESG scores.

In the process of identifying important ESG factors, subjectivity has a great influence on the results, which requires a high level of competence of the valuator. Fortunately, as mentioned in Section III., SASB's (now ISSB) tools offer a possible solution to this challenge.

3. Greenwashing and alike

What is green or not is not necessarily well defined in certain jurisdictions, so as performance towards social responsibility and good governance. The lack of assurance over ESG data and disclosure standards allows the risk of "greenwashing" where investors or the public may perceive a company as "green", "socially responsible" or "well governed" while it is not.

4. Relationship between ESG data and financial data

In the practice of integrating ESG in valuation, one of the major challenges is dealing with the relationship between ESG data and financial data. In a market approach, valuers compare the different performances of ESG indicators to adjust multiples that are correlated with the financial performance. They may have correlations, but correlation only measures association, it does not mean if performance of ESG factors causes changes of financial multiples or performance.

5. Double counting

The possibility of "double counting" climate change value impacts also needs to be considered when incorporating ESG factors. Certain ESG factors may already be implicit in the valuation processes. This means that certain characteristics relevant to climate change risk factors are already considered in the valuation. Great care needs to be taken in practice not to view these as "new climate change risks"[20].

V. Conclusion – Current and Future

With society's focus on sustainable investing, integrating ESG factors into valuation models is both the now and future.

Currently, the practice of incorporating ESG into valuation is still in its infancy. The International Valuation Standards Council (IVSC) survey shows that less than 20% of valuation providers currently consider ESG factors in some detail in their valuation reports. There should be more clarity on the criteria for addressing valuers' responsibilities for considering ESG in the valuation process. The majority of valuers surveyed by IVSC think that IVSC needs to issue more explicit standard requirements around ESG considerations for more consistent application.[21]

More companies choose to apply ESG disclosure standards voluntarily. Faber, Chair of the International Sustainability Standards Board (ISSB), says that the SASB industry-based standards have been adopted by more than 1,500 companies, among which is more than half of the largest listed companies in the world. And this has made the standards a market-proven solution. Accountants also have an important role in ESG. They can ensure sustainability information is consistent, comparable, and verifiable by utilizing their core skills. When this information becomes available, we will begin to see sustainability information drive market prices and influence investor behavior on a global scale.[22]

Standardization of ESG disclosures is also gradually improving. ISSB has delivered proposals to create a comprehensive global baseline of sustainability disclosures. The exposure drafts build upon the recommendations of TCFD and incorporate SASB's industry-based disclosure requirement. And the proposals were originally scheduled to be issued by the end of 2022 (now 2023) after the consultation. This will be a milestone in ESG practice. As more and more companies adopt standardized sustainability disclosures, the first three steps in the framework can become simpler for investors and valuers, as they have already been completed by the companies. But for those companies that do not disclose according to the standards, valuers still need to consider identification, assessment, and filtration in the valuation practice.

According to the framework proposed by A4S, we can integrate climate change factors (and similarly S&G factors) into valuation practice through five steps: identify, assess, filter, integrate and triangulate. We can also extend this framework to integrate S and G factors in business valuation.

There is still a long way to go for integration in the future. With the gradual unification of disclosure standards, the quality of ESG integration will gradually improve and a better world becomes a reality. ◆

20 A4S, Essential Guide to Valuation and Climate Change, 2021, » Link (last access 20.02.2023).

21 IVSC Valuation Webinar: The Evolution of ESG in Valuation, 2022, » Link (last access 20.02.2023).

22 HKICPA, A New Standard of Sustainability, » Link (last access 20.02.2023).

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Restructuring Valuation

– Towards a Framework of Principles to Mitigate Multi-Party Valuation Fights in Workouts –

Given the current market unrest and turbulent economic climate, we see an increasing focus on the need for business restructuring and debt workouts, partly fueled by the changes in legislation in the area of financial restructuring outside of insolvency proceedings. Obviously, this also affects the practice of business valuators. Simply put, the need for valuation support in restructuring cases (we coin the term "Restructuring Valuation") is growing, both out-of-court and in-court.

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I. Introduction

Business restructuring can be described as the holistic process of taking strategic, organizational, leadership, and financial measures to recover a company's short and long-term viability. A workout can then be described as a voluntary agreement concluded between the affected parties with a financial interest in a company in distress and regards the review of conditions pertaining to available funding. It often constitutes a reduction of nominal debts through payment of a percentage in combination with remission of (part of the) remaining debt, a so-called "haircut".

Another option is the conversion of (part of the) debt into a subordinated loan or a so-called "debt holiday", i.e., temporary relief from installment repayments and or interest obligations. A "debt-for-equity swap" is another possible option, where lenders become (part) shareholders in exchange for a certain degree of debt alleviation leading to the debt burden being relieved.[1]

In this article, we focus on common bottlenecks in such processes, specifically those of valuation fights. Research and practice show that workout negotiations are often hindered by or even fail due to disagreements on the (perceived) value of the company to be restructured. Lengthy debates and negotiation processes are not uncommon, during which the financial state of the distressed company further deteriorates, and chances of survival often disappear. Moreover, perceptions can vary in such a way that dissenting parties simply cannot bridge the value gap consensually. For example, in our first contribution to this journal, we discussed a restructuring case in which there was a (maximum) difference between the calculated valuation outcomes of two parties of EUR 171 million.[2] Obviously, these differences in opinion – often leading to multi-party valuation fights – are detrimental, if not fatal.

We first discuss research on why restructurings fail in practice. We then address the problem of so-called cognitive biases and "noise" – as potential drivers of valuation fights in workouts. Third, partly based on results from an explorative study, we present a "framework of principles to mitigate multi-party valuation fights in workouts".

II. Why restructurings fail and the role of valuations

There is a great deal of empirical evidence for why restructurings fail. We include a list of the most common failure factors:

- Management and shareholders have a passive attitude towards the necessary restructuring, i.e., there is a lack of urgency to quickly take harsh measures.
- Partly because of the above, insufficient strategic, operational improvement, and cost-cutting measures are taken. Moreover, necessary business model change is neglected, commonly referred to as "management is rearranging the deck chairs on the Titanic" thus not handling the underlying problems.
- The company is unable to provide sufficient insights to key stakeholders into the actual financial situation, i.e., stakeholders are in the dark about the current and short-term cash position.
- Lack of a proper business turnaround plan. The plan should serve as a compass for company management in the turnaround process, not least in the negotiation process with lenders.
- Objective cashflow prognostications, showing a certain degree of going concern viability, are missing.
- Reliable valuations of the company are unavailable, and stakeholder negotiations are frustrated by different perceptions and multi-party fights on the value of the company. The result is an ongoing negotiation process in which parties increasingly take set positions, often fueled by their valuation advisors. Meanwhile, the company drifts into a state of bankruptcy.
- For the most part, because of the above, the company is unable to timely access bridge capital, for instance in the form of a cash injection from (new) lenders and or shareholders. Bridge capital should serve as the "oxygen" for a distressed company to explore and discuss long-term options with its key stakeholders, as well as to provide the company enough time to „fix the business".[3]

It is probably no surprise that these failure factors are in fact opposite and, consequently, supportive (like a "mirror") to the success factors of business restructurings as found in practice. Furthermore, these factors often tend to stem from the execution rather than the planning process itself. In other words, the behavior of management and key stakeholders regarding the problems is critical.

1 For an overview of financial instruments, see among others, A Toolkit for Corporate Workouts, Washington: World Bank Group, 2022.

2 Broekema/Adriaanse, Valuation Ambiguities under the European Directive on Preventive Restructuring Frameworks: Insights from the Netherlands, The European Business Valuation Magazine, vol. 1, no. 1 (2022): 4-10.

3 For an overview see Slatter/Lovett, Corporate Turnaround, Managing Companies in Distress, 1999; Adriaanse/Van der Rest (ed.), Turnaround Management and Bankruptcy, Routledge Advances in Management and Business Studies, 2017.

For the purpose of this article, it is important to stress that the chances of survival of a distressed company significantly increase when parties quickly agree on the reorganization value (i.e., assuming a renewed going concern premise) and liquidation value, as this brings clarity on the fair and economic position of all parties involved. This then opens the way for constructive and more objective (or better: less subjective) negotiations between management, lenders, creditors, and shareholders on the way forward, and on who should bear losses, and to which extent. This is often referred to in the insolvency industry as "being in or out of the money". However, although this sounds logical, practice is far more capricious, with factors like "cognitive bias" and "noise" playing a major role in restructuring valuations. We elaborate on this in the following section.

III. The problem of biases and "noise" in valuations

In recent years, the topic of "psychology in business" has been gaining popularity, both in academia and in practice. Academic research in the valuation and insolvency law domain is increasing, especially regarding decision-making processes. For example, empirical research shows that judges, bankers, valuation experts, and insolvency law experts are susceptible to many forms of cognitive biases or „fallacies" when in a situation where they are required to make rational judgments and professional decisions.[4] These professionals are not alone in this; all human beings are susceptible – no one is infallible.

Biases can be defined as patterns of irrationality i.e., humans can be affected in their judgments and decisions by factors that should if they were to behave fully rationally, not have any bearing on these judgments and decisions. A number of common biases observed in the field of restructuring valuation are:[5]

- *Engagement bias:* In experimental research by Leiden University, it was found that business valuators tend to unconsciously favor their client's interests. They adjust the perceived value of a company significantly downwards when representing a buyer, and upwards when representing a potential seller. The same information and valuation method were used; therefore, the theoretical outcomes of the experiment should have been similar. In valuation restructuring practice we observe the same phenomenon; we are rarely confronted with a valuation outcome that intuitively contradicts the economic interest of the represented party.
- *Anchoring bias:* In the same study, it was also found that business valuators are susceptible to anchoring bias, i.e., when confronted upfront with a desired result – expressed through an anchor like a value – from a client's perspective (in the specific context of this article, this could be lenders in a debt workout who desire a certain low outcome to justify a debt-for-equity swap). It unconsciously leads to an outcome in the range of that result. A control group, that did not receive any information upfront about the desired result, was significantly less likely to adjust an outcome in a certain direction.

Obviously, these biases form a breeding ground for (destructive) conflicts in a workout situation.

Another disturbing topic is the psychological concept of "noise", a phenomenon that has recently gained interest due to the work of Nobel prize winner *Daniel Kahneman*, together with fellow researchers *Oliver Sibony* and *Cas Sunstein*.[6] Noise concerns the occurrence of unwanted variability in judgments that should in fact be identical (or at least more or less equivalent) when asked to a group of experts with similar professionalism. It is therefore not about bias. The latter rather concerns a systematic deviation in a certain direction, while noise lacks systematics. However, it should be noted that noise may also occur within the phenomenon of bias. The starting point is that with an accurate decision, all decision-makers (read in this context: professional business valuators) should end up approximately in the middle of an imaginary dartboard („*bull's eye*"). Thus, they all take (roughly) the same decision based on a specific case description and equal information. Where the decisions actually go in all directions, that is noise. Incidentally, the possibility of an accurate or correct/best decision (the bull's eye) does not always play a role.

This also applies to valuations in a restructuring situation. However, this does not lessen the problem of noise. Even when no (in)correct answer is possible, a large degree of variability is undesirable, especially in a workout context where a high degree of variability leads to multi-party conflicts, uncertainty, and possibly, a drift into bankruptcy.

4 For instance, Broekema/Strohmaier/Adriaanse/Van der Rest, Are Business Valuators Biased?: A Psychological Perspective on the Causes of Valuation Disputes, Journal of Behavioral Finance, vol. 23, no. 1 (2022): 23-42.

5 Authors acknowledge that up till today, more than 150 biases have been discovered in the social sciences. For further study see, among others, Ghisellini/Chang, How Many Real Biases Are There? In: Behavioral Economics, Palgrave Macmillan, 2018.

6 Kahneman/Sibony/Sunstein, Noise. A Flaw in Human Judgment, London, 2021.

Decades ago, the American judge Marvin Frankel drew attention to major differences in perception, analysis, and decision-making by professionals, although he did not call it "noise" at the time. He commissioned a study of the judgments of fifty judges on a series of cases that were identical for each participant. He concluded, "Absence of consensus was the norm". As an illustration, the sentence for a heroin dealer ranged from one to ten years, and in a judicial case of blackmail, the sentences ranged from a $ 65,000 fine to twenty years in prison.

Other studies also show a similar, significant degree of noise in judgment and decision-making. For example, research into a thousand verdicts from juvenile courts in America showed that stricter sentences were handed down on Mondays if the local American Football team had lost the weekend before, an effect which also trickled down to the rest of the week, albeit to a lesser extent. That the mood of a judge influences a verdict has also been demonstrated in France. An analysis of six million judgments over a period of twelve years demonstrated that judges were more lenient if it was the suspect's birthday. Finally, a four-year study of 270,000 asylum applications found that an asylum application was less likely to succeed on hotter days.

In short, noise in professional judgments apparently arises from relative differences between evaluators, their personal characteristics, and arbitrary situational factors.[7] In this article, it is relevant to observe that valuation professionals are probably also vulnerable to noise. Combined with the biases, this leads to the conclusion that many valuation conflicts in corporate workouts probably arise due to at least these psychological aspects. In the next section, we discuss whether it is possible to mitigate their effects.

IV. A framework of principles to mitigate valuation fights in workouts

A review of the literature shows that, in practice, mitigating biases and noise is difficult. For example, even when decision-makers are explicitly made aware of the fact that biases may occur, they still can be trapped. However, it is worthwhile exploring ways to mitigate biases and noise, especially in cases where specific strategies and principles for practice are developed. We present a framework of principles to mitigate potential valuation fights. We first discuss the conceptual idea behind such standards. Then, we present seven specific principles for workout practice and discuss how these should be applied in the field.

1. The conceptual idea behind principles

The literature on the impact of principles on professional performance is mixed, with some studies reporting little evidence of a significant effect, with others demonstrating a more significant impact.[8] In particular, research in the private sector, where most business valuators operate, highlights the importance of effectively implementing principles as part of a learning process that involves instillation, reinforcement, and measurement. However, a sudden and full adherence to new principles to address biases and noise in restructuring valuation practices may be unrealistic given the autonomy of professionals in the field. Nevertheless, a framework of principles with a certain purpose (mitigating biases and noise as proposed in this article) serves as a reflection of the need to protect both the private interests of the profession – read: *credibility* – and the public. In this specific case, we refer to stakeholders in a restructuring context, with economic and legal rights that need to be respected and protected.

The extent to which the implementation and enforcement of the principles we propose will benefit the valuation profession and the restructuring field requires further study, but findings in a similar area provide a starting point. In 2000, INSOL International – a worldwide federation of professionals with over 10,500 members who specialize in turnaround and insolvency – introduced the „Statement of Principles for a Global Approach to Multi-Creditor Workouts".[9] It was drawn up by more than 150 restructuring experts and endorsed by the World Bank, the Bank of England, many international commercial banks and consultancy agencies, as well as the British Bankers' Association (with 320 banks as members; established in more than 60 countries).

The core of this statement – consisting of eight principles to be applied in restructurings and workout negotiations – soon became recognized by professional stakeholders in the restructuring field, who now regard the principles as a *best practice* for dealing with complex workout negotiations.

The main characteristics of the eight principles are summarized in table 1.

7 For further information on the studies see Partridge/Eldridge, The Second Circuit sentencing study: A report to the judges of the Second Circuit. Federal Judicial Center, 1974 and Chen/Loecher, Mood and the Malleability of Moral Reasoning: The Impact of Irrelevant Factors on Judicial Decisions, 2016.

8 For an overview of the literature on (the difficulty of) debiasing strategies and principles in practice, see among others Morewedge/Yoon/Scopelliti/Symborski/Korris/Kassam, Debiasing Decisions: Improved Decisions Making With a Single Training Intervention. Policy Insights from the Behavioral and Brain Sciences, vol. 2, no. 1 (2015): 129–140.

9 For more information see www.insol.org. In 2017 a slightly revised version of the statement was introduced under the name „Statement of Principles for a Global Approach to Multi-Creditor Workouts II".

Table 1: Summary of principles of the INSOL Statement of Principles for Multi-Creditor Workouts

Principle	Characteristic
1	The relevant creditors voluntarily mark time, i.e., create an informal cooling-off period
2	None of the creditors takes any individual action on the condition that their relative positions remain intact
3	The debtor (the company in financial difficulties) does not take any actions which may jeopardize the relative (economic) positions of the creditors
4	To speed up the communication and decision-making process, creditor groups are formed (groups of secured, senior, and junior creditors for instance)
5	To be able to evaluate proposals for solutions, the debtor must grant the relevant creditors timely and full access to all relevant information
6	All proposals for workout agreements must be formulated based on prevailing legislation and the relative economic positions of the creditors
7	All information must be available and should be treated confidentially
8	When new (bridge) financing is provided during the restructuring and as part of a workout deal, it must be given priority status by all participating creditors

The fundamental objective of the INSOL principles can be defined as follows: (i) jointly creating a relatively stable situation where none of the parties take any individual action to prevent a chaotic and, for the company, potentially life-threatening "race to collect"; (ii) to create a free flow of information on which all parties within the process can take informed decisions, without worsening their relative economic positions. In other words, this informal set of principles ensures:

> "...a cooperative basis by which lenders/creditors recognize individual and collective risk at a point in time and keep that balance throughout an agreed debt recovery strategy [workout] that seeks to preserve business".[10]

The INSOL statement underlines two aspects. First, it shows that professional practitioners can and will use principles when it is (potentially) beneficial for desired outcomes. In the case of workouts, this is a more efficient process with less risk and more benefit for all stakeholders involved. Second, a specific statement of principles to mitigate valuation fights as proposed in this article may help to spur the chances of success of a workout in which the INSOL principles are already applied. More specifically, it can help mitigate conflicts between involved parties regarding their economic positions (see principle six).

To conclude, the general lack of formal regulations ("hard law") in the field of business valuation means that the use of informal principles ("soft law") might counteract the effects of bias and noise among valuators in the context of workouts. This approach seems well suited to the nature of the valuation profession, and the underlying idea is supported through the widespread adoption of soft principles and standards by other professional organizations, such as federations of corporate professionals (accountants, lawyers, brokers, bankers) and organized professionals such as surgeons or archivists. Principles may also serve as practical guides for ethical behavior, beliefs, and evaluations, as formal rules are commonly too restrictive for that purpose.

2. Exploring a framework of principles

In this section, we present the framework of principles to mitigate multi-party valuation fights in workouts [hereafter: the framework]. We first introduce the methodology followed by a detailed substantiation of each step of the framework.

a) Methodology

The framework has been inspired by previous research into the use of principles and the application of principles used in different professions.[11] We used this as a starting point and tailored it to the specific context of workout situations.

b) The seven principles framework

The overarching objective of the seven principles is to help increase the chances of survival of distressed companies. The principles should be seen as mutually supporting (co-dependent) and together they form an entity – the framework.

Principle 1: Valuation biases, noise, and workout conflicts awareness training

Part of business valuators' education should be mandatory training to create awareness around biases, de-biasing strategies, and noise, especially in the context of workouts. The underlying aim of this training program is to enable business valuators to experience the (negative) effects of their own biases, what noise is, and how biases are formed by others. Participation in this awareness training program will contribute to preventing unconscious decision-making processes in the context of business valuation and workouts.

10 See World Bank Group, op. cit. (footnote 1): 31.

11 Among others see Wessels/Boon, Soft law instruments in restructuring and insolvency law: exploring its rise and impact, TvOB, no. 2 (2019): 53-64.

Moreover, valuators should train themselves in the specific field of corporate turnaround and financial restructuring to understand the (basic) concepts: (i) cause of decline analysis, (ii) strategic analysis and risk assessment in distressed situations, (iii) turnaround planning, (iv) insolvency legislation, and (v) stakeholder dynamics in restructuring. Although this may sound obvious, it is our experience that not all valuators understand the specific complexity and challenges of companies in distress. For example, the "hold-out" problem with creditors or the uncertainty surrounding commercial opportunities of distressed companies when financial problems become public can result in going-concern scenarios "overnight" becoming insolvency scenarios. Furthermore, company management – the prime provider of input information for the valuation process – might be too optimistic or have other reasons to claim and substantiate (perceived) going concern value.

Simply put, the valuation of a distressed company is often far more complex than the valuation of a successful, fast-growing, or mature company. To conclude, valuators' being aware of and understanding "distress dynamics" is crucial to mitigate conflicts in practice.

Principle 2: Debiasing and noise-reducing information processing protocol

Biases and noise often result from exposure to irrelevant and or prejudiced information. To reduce this risk of bias and noise, such information should be withheld from a business valuator. To protect the executive business valuator from being exposed to potentially predetermining information, a second person (i.e., the lead valuator) conducts the intake with the client and filters out the irrelevant information.

As discussed, engagement bias leads to business valuators unconsciously favoring their clients' wishes, while from a purely theoretical perspective, it should not matter to valuators whether they work for, in the case of workouts, the company, its shareholders or (a syndicate of) lenders. By building in a "filter" to separate irrelevant information, for instance, prejudiced, unsubstantiated opinions about the market, the company itself, and/or its strategic outlook, from relevant, substantiated, objectified information, deviations are (theoretically) mitigated. As a result, conflicts among parties regarding value outcomes decrease.

Principle 3: Avoiding knowledge of the client's value perception

When business valuators are asked to value a business or a business interest in a workout situation, they should avoid having any knowledge of the client's value perception towards the valuation object, either through the client or through the client's representative. This principle specifically addresses the phenomenon of anchor bias.

Financial distress concerns a situation in which the stakes are high, the more because the parties involved (e.g., lenders, shareholders) realize that their investments are likely to (partially) vaporize. This can initiate the "race to collect", where parties try to get as large a "piece of the pie" as possible. Clearly, while involved in intense restructuring negotiations, these parties will regularly pressurize the hired valuator to devise a favorable outcome for them, given the specific situation and legal or economic position.

As an example, shareholders will probably want to avoid a debt-for-equity swap as with that they (fully or partly) lose economic and or voting rights. With that in mind, the so-called reorganization value of the company should be as high as possible as then shareholders will be "in the money", in a theoretical liquidation scenario. The consequence is that lenders cannot, in principle, force shareholders to give up shareholder rights because, in a pure theoretical bankruptcy scenario, all lenders should and will be satisfied. Thus, shareholders have an incentive, as clients, to pressurize business valuators to propose an outcome that proves otherwise. If not, they might put pressure on the business valuator to adjust the outcome with "suggestions", for example, alternative insights on the company and its market or the cost of capital.

We earlier introduced the phenomenon of engagement bias, so in the scenario sketched above, this increases the risk of business valuators (unconsciously) being manipulated. Alternatively, this may also occur when lenders are the valuators' clients, with a preference for a low outcome, for example, to merely make a debt-for-equity swap happen. To conclude, the business valuator should avoid interference from the client as much as possible while executing the valuation process, in particular about the preferred outcome for the workout deal to be negotiated.

Principle 4: Signaling subjectivity and performing a debiasing and noise-reducing exercise with a colleague

When business valuators are engaged through a client or another professional such as an insolvency lawyer to support a client's interests, they should be aware of any subjective party information that might influence their perceptions regarding the valuation object. At the initial stages of the engagement, the business valuator must check which elements might affect the perception of the valuation case using a practical "valuation biases and noise checklist". When finalizing the valuation work, valuators then compare their work with the initially listed

elements together with at least one colleague who was not engaged in the project and amend the valuation assumptions if necessary.

Principle 5: Criteria setting on quality of valuation to align mutual expectations

When business valuators are requested to conduct a valuation in a workout situation, the executive business valuator discusses (principle 2) the (non-technical) client evaluation criteria before conducting the valuation. In case of doubt regarding mutual expectations, the executive business valuator takes the initiative to discuss this with the business valuator. The topics of "potential valuation biases and noise" must form part of the discussion with the client.

Principle 6: Four-eyes principle

Business valuators should, through confidential conversation, discuss their valuation assumptions and valuation outcomes with at least one colleague, the Four-eyes principle. Preferably, the discussions should include several peers before releasing the final valuation report. The topic of "potential valuation biases and noise" should explicitly be discussed and documented among engaged peers.

Principle 7: Mirroring to assess the "other party" perspective

Business valuators should always consider an alternative valuation scenario – in addition to their initial valuation outcome – from the perspective, position, and potential criticism of their client's counterpart(s). The initial valuation outcome should then be reconsidered and amended if necessary. In a workout situation, this means that at least one or two additional perspectives should be considered, for example from the lenders' and or shareholders' point of view if the business valuator represents company management, and vice versa.

V. Conclusion

In this article, we introduce a framework of principles to mitigate valuation conflicts in workouts. The framework has been designed to serve as a discussion starter for the professional business valuation field. The urgency to discuss the role of business valuations in financial restructurings is especially relevant because of the increasing turbulence in the European business climate. Simply put, "the restructuring season is starting" and the business valuation community should be critical of its role in the restructuring field. Lessons need to be learned, and practices should be improved to ensure the profession is considered fully credible in the eyes of the other parties at the workout table, including insolvency practitioners, lenders, creditors, and board members.

It is evident that the debate on how valuation fights can be mitigated in workouts should also take place among the sector organizations active in or relevant to the international restructuring practice e.g., the European Association of Certified Valuators and Analysts (EACVA), the International Valuation Standards Council (IVSC), valuation professional organizations (VPOs), INSOL International and INSOL Europe. The international academic community can also make an active contribution to establishing mitigation principles. Meanwhile, individual business valuators can apply the principles proposed in this article, or critically review the current use of self-developed principles and quality procedures in this regard. ◆

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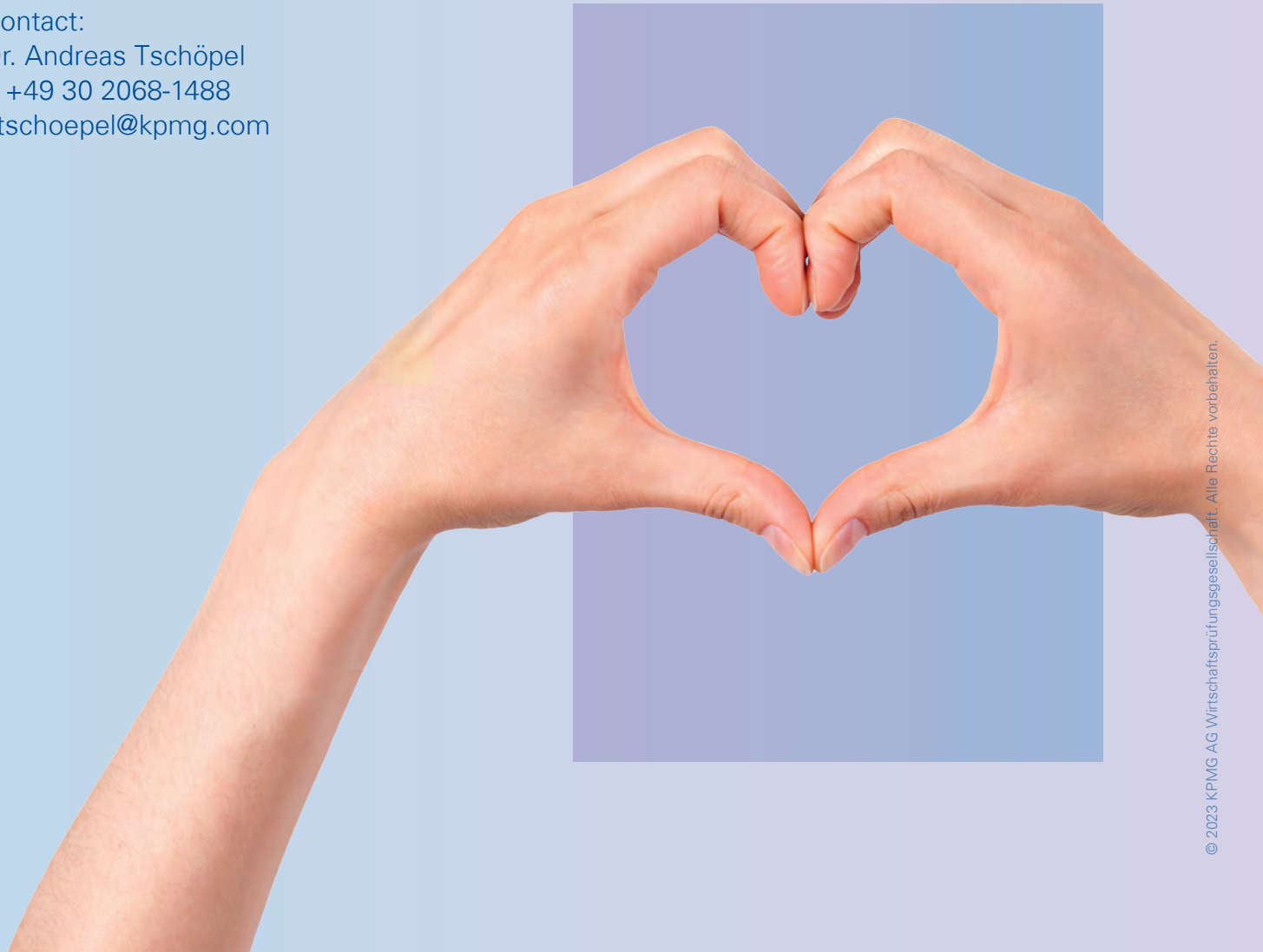

Industry Betas and Multiples

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General

To derive the provided betas and multiples, only companies from the Eurozone have been considered. The included companies have been grouped on industry-level, as well as on sub-industry level based on the Global Industry Classification Standard (GICS). For each edition of the journal, aggregates for all eleven main industries and one individually selected sub-industry will be shown. Due to the special characteristics of companies operating in the financial industry (high leverage, leverage as part of the operating business, high dependency on the interest level, etc.) we only provide levered betas and equity-based multiples for that industry.

The underlying data has been obtained from S&P at the beginning of February 2023. All presented values are based on raw data and raw calculations. They have carefully been checked and evaluated but have not been audited nor have individual values been verified. Certain results may be misleading in your setup or specific context. All results should be critically evaluated and interpreted. The data and usage are on your own risk.

Eurozone Cost of Capital Parameters as at 31 January 2023

The typified, uniform risk-free rate based on AAA-rated government bonds currently lies at 2.25% for the Eurozone. It is derived from yield curves based on Svensson parameters and results published by the European Central Bank. The overall long-term market return for the Eurozone is estimated at around 8,75%, leading to a market risk premium of 6,5%. Estimations of the market return rely on historical returns as well as on forward-looking return estimates and risk premiums based on Eurozone companies with current market share prices and earnings forecasts from financial analysts.

Betas

Levered, debt and unlevered betas are calculated over an observation period of a single five-year period (monthly returns) as well as on five one-year periods (weekly returns). The provided unlevered betas rely on raw levered betas, uncertain tax shields, and including debt betas.

Raw levered betas are obtained from a standard OLS regression with stock returns being the dependent and stock market index returns (S&P Eurozone BMI Index) being the independent variable. Stock and index returns are total returns, thus including dividends, stock splits, rights-issues, etc. (if available). Levered betas below zero and above three are treated as outliers and are excluded.

Unlevered betas have been estimated based on Harris-Pringle, assuming uncertain tax shields and including debt beta:

$$\beta_u = \beta_L \frac{E}{E+D} + \beta_D \frac{D}{E+D},$$

where β_u = unlevered beta, β_D = debt beta, D = Net Debt, E = Market Value of Equity. Debt Betas rely on a company's individual rating on a given date. Annual rating-specific levels of debt betas are extracted from a broad market analysis. Net Debt includes *Total debt (incl. lease liabilities*[1]*) + net pensions + minority interest + total preferred equity - total cash - short term investments*. In accordance with the observation period, parameter averages of debt beta, net debt and market equity over the individual periods are applied when unlevering levered betas. Unlevered betas below zero and above two are treated as outliers and are excluded.

Data Source: All data has been obtained from the KPMG Valuation Data Source.
See https://www.kpmg.de/valuation-data-source for details.

1 After the adoption of IFRS 16, reported total debt might now also include operating lease liabilities, which were not considered in prior years. For years before the adoption of IFRS 16, we include discounted estimates for operating lease liabilities based on reported operating lease liability payments in order to align the total debt estimations.

Table 1: Average Levered Industry Betas for five single 1y-periods and one 5y-period

31 January 2023	Average* Levered Betas								
Industries	1-Year, weekly returns							5-Year, monthly returns	
	Comps incl. (Average*)	8/2018 to 7/2019	8/2019 to 7/2020	8/2020 to 7/2021	8/2021 to 7/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Industrials	*252*	1.06	1.06	1.02	0.99	0.89	1.00	*231*	1.15
Consumer Discretionary	*158*	0.95	1.03	1.05	1.13	1.04	1.04	*141*	1.24
Health Care	*129*	1.11	0.73	0.74	0.82	0.79	0.84	*118*	0.81
Financials	*140*	0.90	0.94	1.04	0.90	0.98	0.95	*127*	1.13
Utilities	*48*	0.75	0.31	0.82	0.57	0.69	0.63	*44*	0.70
Materials	*82*	1.11	1.25	1.03	0.88	0.90	1.03	*79*	1.19
Real Estate	*81*	0.59	0.35	0.80	0.50	0.71	0.59	*71*	0.80
Communication Services	*86*	0.98	0.70	0.81	0.75	0.75	0.80	*79*	0.86
Information Technology	*151*	1.22	0.92	0.84	1.08	0.94	1.00	*138*	1.11
Consumer Staples	*58*	0.68	0.58	0.60	0.61	0.72	0.64	*57*	0.65
Energy	*34*	1.07	1.21	1.05	0.73	0.58	0.93	*34*	1.09

Table 2: Average Industry Leverage for five single 1y-periods and one 5y-period

31 January 2023	Average* Debt-Equity-Ratios								
Industries	1-Year							5-Year	
	Comps incl. (Average*)	8/2018 to 7/2019	8/2019 to 7/2020	8/2020 to 7/2021	8/2021 to 7/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Industrials	*132*	90.8%	88.9%	88.9%	48.9%	58.5%	75.2%	*159*	56.4%
Consumer Discretionary	*71*	135.4%	95.4%	125.5%	90.0%	81.8%	105.6%	*91*	78.5%
Health Care	*51*	25.2%	21.4%	17.3%	25.0%	297.2%	77.2%	*66*	21.6%
Utilities	*31*	115.1%	80.0%	73.3%	66.9%	77.0%	82.5%	*35*	74.7%
Materials	*53*	96.5%	70.6%	56.5%	43.4%	49.2%	63.2%	*60*	50.5%
Real Estate	*36*	97.2%	99.0%	120.8%	109.4%	236.0%	132.5%	*46*	108.4%
Communication Services	*41*	104.2%	111.6%	254.1%	52.6%	77.9%	120.1%	*51*	63.8%
Information Technology	*65*	28.0%	12.5%	10.8%	13.8%	29.4%	18.9%	*69*	11.4%
Consumer Staples	*38*	160.7%	178.6%	165.8%	202.7%	316.7%	204.9%	*44*	159.5%
Energy	*20*	124.2%	217.3%	370.1%	105.9%	58.1%	175.1%	*22*	97.6%

Table 3: Average Unlevered Industry Betas for five single 1y-periods and one 5y-period

31 January 2023	Average* Unlevered Betas								
Industries	1-Year, weekly returns							5-Year, monthly returns	
	Comps incl. (Average*)	8/2018 to 7/2019	8/2019 to 7/2020	8/2020 to 7/2021	8/2021 to 7/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Industrials	*132*	0.92	0.88	0.87	0.85	0.74	0.85	*159*	0.97
Consumer Discretionary	*71*	0.80	0.89	0.87	0.89	0.80	0.85	*91*	0.99
Health Care	*51*	0.96	0.67	0.65	0.74	0.68	0.74	*66*	0.69
Utilities	*31*	0.69	0.35	0.65	0.47	0.44	0.52	*35*	0.56
Materials	*53*	0.91	0.93	0.80	0.74	0.74	0.83	*60*	0.92
Real Estate	*36*	0.56	0.46	0.63	0.47	0.46	0.52	*46*	0.58
Communication Services	*41*	0.81	0.68	0.65	0.59	0.59	0.67	*51*	0.71
Information Technology	*65*	1.17	1.02	0.94	1.00	0.92	1.01	*69*	1.07
Consumer Staples	*38*	0.62	0.56	0.55	0.56	0.51	0.56	*44*	0.54
Energy	*20*	0.93	0.85	0.92	0.62	0.54	0.77	*22*	0.91

Source: KPMG Valuation Data Source, see www.kpmg.de/valuation-data-source.

*Average = Arithmetic Mean

Table 4: Average Levered Subindustry (Health Care) Betas for five single 1y-periods and one 5y-period

31 January 2023	Average* Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Health Care	Comps incl. (Average*)	2/2018 to 1/2019	2/2019 to 1/2020	2/2020 to 1/2021	2/2021 to 1/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Biotechnology	*44*	1.36	0.89	0.86	1.01	0.93	1.01	*40*	0.92
Health Care Equipment & Supplies	*24*	1.02	0.60	0.63	0.88	0.84	0.79	*20*	0.77
Health Care Technology	*9*	0.84	0.86	0.70	0.69	0.73	0.76	*10*	0.86
Pharmaceuticals	*24*	1.01	0.68	0.75	0.69	0.60	0.75	*23*	0.72
Health Care Providers & Services	*19*	0.91	0.51	0.65	0.59	0.61	0.65	*18*	0.74
Life Sciences Tools & Services	*7*	1.20	0.75	0.47	0.73	0.99	0.83	*7*	0.65

Table 5: Average Subindustry (Health Care) Leverage for five single 1y-periods and one 5y-period

31 January 2023	Average* Debt-Equity-Ratios								
	1-Year							5-Year	
Subindustry: Health Care	Comps incl. (Average*)	2/2018 to 1/2019	2/2019 to 1/2020	2/2020 to 1/2021	2/2021 to 1/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Biotechnology	*8*	-6.1%	-10.2%	-14.5%	-19.5%	-13.2%	-0.13	*16*	-15.3%
Health Care Equipment & Supplies	*12*	14.3%	22.0%	9.7%	20.8%	22.7%	0.18	*13*	12.3%
Health Care Technology	*2*	22.5%	28.1%	38.0%	18.5%	24.1%	0.26	*4*	24.6%
Pharmaceuticals	*12*	31.1%	32.2%	27.4%	50.8%	1213.3%	2.71	*15*	34.8%
Health Care Providers & Services	*11*	99.0%	69.1%	71.9%	95.3%	259.5%	1.19	*11*	94.9%
Life Sciences Tools & Services	*6*	22.6%	17.2%	10.7%	13.7%	14.6%	0.16	*7*	15.7%

Table 6: Average Unlevered Subindustry (Health Care) Betas for five single 1y-periods and one 5y-period

31 January 2023	Average* Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Health Care	Comps incl. (Average*)	2/2018 to 1/2019	2/2019 to 1/2020	2/2020 to 1/2021	2/2021 to 1/2022	2/2022 to 1/2023	Average*	Comps incl.	2/2018 to 1/2023
Biotechnology	*8*	1.35	1.11	0.74	0.69	0.98	0.97	*16*	0.84
Health Care Equipment & Supplies	*12*	1.06	0.63	0.74	1.03	0.79	0.85	*13*	0.66
Health Care Technology	*2*	0.51	0.53	0.51	0.71	0.49	0.55	*4*	0.79
Pharmaceuticals	*12*	0.88	0.63	0.68	0.66	0.57	0.68	*15*	0.70
Health Care Providers & Services	*11*	0.66	0.43	0.54	0.58	0.34	0.51	*11*	0.54
Life Sciences Tools & Services	*6*	1.13	0.81	0.54	0.71	0.90	0.82	*7*	0.59

Source: KPMG Valuation Data Source, see www.kpmg.de/valuation-data-source.

*Average = Arithmetic Mean

Multiples

Multiples are computed based on actuals (based on the annual report) and forecasts (based on estimates by analyst) for the trailing year and the forward +1 year. Trading multiples for Sales, EBITDA and EBIT are each derived by dividing a companies' enterprise value (market capitalization plus net debt) by its sales, EBITDA or EBIT. Earnings multiples are derived by dividing a companies' market capitalization by earnings (net income). The market-to-book ratio is derived by dividing a companies' market value of equity by its book value of equity. Multiples below zero and above 500 are treated as outliers and are excluded. ◆

Table 7: Average Industry Multiples

31 January 2023	Sales			EBITDA			EBIT			Earnings			Market to Book-Ratio		
Industries	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.
Industrials	1.9	1.4	*237*	9.1	8.3	*211*	15.1	13.9	*229*	16.1	14.3	*215*	3.0	2.3	*214*
Consumer Discretionary	2.2	1.4	*144*	10.8	8.2	*119*	15.9	16.8	*135*	18.3	12.7	*129*	3.1	2.4	*132*
Health Care	8.4	5.6	*109*	17.9	13.1	*82*	18.7	17.2	*86*	23.9	19.2	*75*	3.6	2.6	*85*
Financials	n/m	n/m	*n/a*	n/m	n/m	*n/a*	n/m	n/m	*n/a*	11.5	9.3	*109*	1.2	1.1	*103*
Utilities	4.5	4.0	*46*	11.4	9.1	*45*	17.6	15.4	*46*	27.3	16.6	*46*	3.1	2.8	*44*
Materials	1.9	1.4	*75*	7.3	7.1	*68*	12.6	10.5	*73*	17.3	11.4	*72*	1.6	1.5	*67*
Real Estate	12.0	11.5	*62*	17.8	17.7	*58*	26.1	19.7	*61*	14.7	12.8	*57*	0.7	0.7	*51*
Communication Services	2.3	2.2	*77*	7.7	8.1	*69*	19.9	14.1	*76*	17.7	17.3	*72*	3.0	2.4	*65*
Information Technology	2.2	2.0	*141*	16.0	14.7	*119*	17.8	14.2	*129*	22.6	21.8	*123*	4.0	3.6	*117*
Consumer Staples	1.5	1.4	*56*	12.9	10.2	*40*	14.6	13.0	*56*	15.7	14.4	*54*	2.1	2.0	*50*
Energy	1.7	1.5	*34*	5.5	4.8	*30*	11.9	7.5	*32*	12.0	9.0	*31*	2.2	5.6	*29*

Table 8: Average Subindustry (Health Care) Multiples

31 January 2023	Sales			EBITDA			EBIT			Earnings			Market to Book-Ratio		
Subindustry: Health Care	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.
Biotechnology	13.3	9.0	*34*	20.5	24.9	*17*	18.4	26.4	*15*	44.3	14.5	*9*	6.3	4.1	*18*
Health Care Equipment & Supplies	3.9	3.0	*20*	39.3	12.8	*14*	19.3	15.6	*17*	24.9	19.7	*16*	2.9	2.7	*15*
Health Care Technology	2.6	2.2	*6*	10.4	9.3	*5*	17.1	14.3	*5*	20.4	17.0	*4*	2.7	2.4	*5*
Pharmaceuticals	12.8	7.8	*24*	10.4	8.8	*22*	16.7	11.6	*24*	16.1	16.2	*23*	2.9	2.1	*22*
Health Care Providers & Services	1.2	1.1	*18*	11.8	8.0	*17*	18.2	18.3	*18*	15.5	23.3	*16*	1.5	1.4	*18*
Life Sciences Tools & Services	4.2	3.8	*7*	16.3	13.8	*7*	27.2	19.4	*7*	39.8	26.1	*7*	4.8	3.9	*7*

Source: KPMG Valuation Data Source, see www.kpmg.de/valuation-data-source.

*Average = Arithmetic Mean, n/m=not meaningful, n/a=not available

Transaction Multiples

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The computations of the transaction multiples are based on the transaction and company data collected from various M&A databases, with the data being driven to consistency.

We publish transaction multiples for Europe and resulting regression parameters (including transactions of the period *1 January 2020 until 31 December 2022*) for the following multiples:

- Deal Enterprise Value/Sales
- Deal Enterprise Value/EBITDA
- Deal Enterprise Value/EBIT
- Deal Enterprise Value/Invested Capital

The multiples in this issue cover Europe as a total. In the following issues we will provide a regional breakdown into:

- Central and Western Europe, Southern Europe
- Scandinavia and Britain
- Eastern Europe

When using the data (multiples and regression), please consider the following:

- Sectors and resulting sector multiples are formed according to the *NACE Rev. 2 industry classification system.*
- The multiples indicate the Deal Enterprise Value *(DEPV = Market value of total capital corrected)* for a private firm. They are scaled to the levels of value Control Value, Pure Play Value and Domestic Value. Additionally, the multiples *do not include any identifiable Synergistic Values*. When applying the multiples to other levels of value without adjusting the value driver (reference value), respective *Valuation Adjustments* (Minority Discount for Minority Values, Conglomerate Discount for Conglomerates, Regional Premiums for Cross-Border transactions by international acquirors and Strategic Premium for Synergistic acquisitions) must be applied.
- The multiples are computed using transaction data collected from the previous three years. Therefore, the available multiples include transactions of the period *1 January 2020 until 31 December 2022*, with the transactions of the *latest six months given double weight*.
- The reliability of the recorded transaction data and the resulting multiples was analyzed according to the fraction of the transacted share, low and high values of the value driver as well as up-side and down-side percentiles of the observations on multiples; recognized outliers were eliminated.
- Trailing multiples are computed employing the value driver available closest to date of the transaction. Forward multiples are computed using mean and/or median estimates for the forthcoming three to six years after the transaction (not available for Invested Capital).
- The EBITDA multiples and the EBIT multiples are based on companies with only a positive EBITDA or EBIT at date of the transaction.
- The regression assumes a linear relationship between the value driver and the Deal Enterprise Value. Furthermore, it is assumed that the observed Deal Enterprise Values as well as the respective value drivers show no trend over time, making them ready for a cross-section analysis. The error terms are assumed to be normally distributed, having constant variances (homoskedasticity), being independent (no autocorrelation) and showing an expected value of zero.
- The range of the multiples (confidence interval) applies a 95% confidence level, assuming the observed multiples to be normally distributed (after elimination of outliers).
- Sectors with less than 20 observations were ignored.
- The various regions are compounded as follows:
  Central and Western Europe: Andorra, Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, The Netherlands, Switzerland
  Southern Europe: Croatia, Cyprus, Gibraltar, Greece, Italy, Malta, Portugal, San Marino, Slovenia, Spain, Turkey

Scandinavia: Denmark, Finland, Iceland, Norway, Sweden
Britain: Ireland, United Kingdom
Eastern Europe: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kosovo, Latvia, Lithuania, Moldova, Montenegro, North Makedonia, Poland, Romania, Russia, Serbia, Slovakia, Ukraine.

The data is evaluated carefully; however, the author denies liability for the accuracy of all computations.

Notes for application:

n indicates the number of observations (sample size) included in both, the computation of the multiples and the regression. $\bar{x}_a$ indicates the arithmetic mean, $\bar{x}_h$ indicates the harmonic mean

$$\bar{x}_h = \frac{n}{\sum_{i=1}^{n} \frac{n}{x_i}}$$

and $\bar{x}_t$ indicates the truncated mean (10% level = 10 % of the observations sorted in ascending order being eliminated up-side and down-side)

$$\bar{x}_t = \frac{\sum_{2}^{n-1} x_i}{n-2}$$

The first quartile Q_1 indicates the boundary of the lowest 25%, the third quartile Q_3 indicates the boundary of the highest 25% of the observed multiples. Using this information, the actually employed multiple may be related to the group of the 25% lowest (highest) multiples observed. Q_2 indicates the median of the observed multiples. The confidence interval reports the range (lower confidence limit to upper confidence limit) of the multiples applying a 95% confidence level. Assuming the multiples observed to be normally distributed, this indicates all multiples lying within these limits. To evaluate the assumption of normally distributed multiple observations, the results of the Jarque-Bera Test for Normality are reported in brackets

$$JB = n\left[\frac{(skewness)^2}{6} + \frac{(kurtosis-3)^2}{24}\right]$$

Values above the reported 5% significance points reject the null hypothesis of normality, indicating the confidence interval to be less reliable:

n	5%	n	5%	n	5%	n	5%
100	4,29	200	4,43	400	4,74	800	5,46
150	4,39	300	4,6	500	4,82	∞	5,99

The skewness **sk** indicates the symmetry of the distribution of multiple observations. A negative skewness indicates the distribution to be skewed to the left, whereas a positive skewness indicates the distribution to be skewed to the right (a skewness of zero indicates the distribution to be symmetric). The coefficient of variation **cv** indicates the dispersion of the observed multiples adjusting for the scale of units in the multiples, expressed by the standard deviation as a percentage of the mean. It allows for a comparison of the dispersion of the multiples across sectors. A lower (higher) coefficient of variation indicates a lower (higher) dispersion of the observed multiples and, similarly, a higher (lower) reliability of the sector multiples.

The (linear) regression equation allows for computing the Deal Enterprise Value of a private firm directly from the observed transactions (without using a multiple). Disregarding the error term, it consists of a slope expressed in terms of the value driver employed and a constant (intercept)

$$\hat{y}=\text{DEPV}=\text{slope x value driver}+\text{constant}(+\text{error term})$$

The reliability of the OLS regression equation (goodness of fit) is indicated by the adjusted coefficient of determination

$$\bar{R}^2 = 1 - (1 - R^2)\frac{n-1}{n-p}$$

(with **p** indicating the number of explaining variables + 1 = 1 + 1 = 2; being sensitive to the number of observations), indicating the variability of the observed multiples that is explained by the regression equation. Unlike the (unadjusted) coefficient of determination, the adjusted coefficient of determination is not limited to the range between zero and one. A higher (lower) coefficient indicates a better (poorer) regression. The standard error of the regression equation similarly indicates the goodness of fit of the regression equation, indicating the degree of similarity between the regression residuals (error terms) and the "true" residuals. A lower (higher) standard error indicates a better (poorer) regression. ◆

Trailing DEPV/Sales (operating), 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	472
B	05 - 09	Mining and quarrying	3,354
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,653
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	2,104
CC	16 - 18	Manufacture of wood/products, paper/products, printing	784
CD	19	Manufacture of coke and refined petroleum products	220
CE	20	Manufacture of chemicals and chemical products	2,598
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	547
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	1,412
CH	24 - 25	Manufacture of basic metals, fabricated metal products	3,344
CI	26	Manufacture of computer, electronic and optical products	4,004
CJ	27	Manufacture of electrical equipment	2,732
CK	28	Manufacture of machinery and equipment	2,689
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	1,658
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	2,281
D	35	Electricity, gas, steam and air conditioning supply	1,535
E	36 - 39	Water supply, sewerage, waste management, remediation activities	499
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	3,510
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	7,052
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	4,084
I	55 - 56	Accommodation and food/beverage service activities	558
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	4,642
JB	61	Telecommunications	1,583
JC	62 - 63	Computer programming/consultancy, information service activities	6,397
K	64 - 66	Financial and insurance activities	1,970
L	68	Real estate activities	515
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	3,988
MB	72	Scientific research and development	864
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	521
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	1,911
P	85	Education	290
Q	86 - 88	Human health and social work activities	725
R	90 - 93	Arts, entertainment and recreation	558
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	306

Trailing DEPV/Sales (operating) Multiples									Trailing Sales (operating) Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
0.91	0.09	0.83	0.30	0.79	1.17	[0,79 ; 1,04] (48,5)	0.84	0.84	$\hat{y}$ = 0,657 x Sales + 37.104	0.38	184,342
1.42	0.33	1.42	0.89	1.40	2.01	[1,38 ; 1,46] (400,4)	-0.01	0.52	$\hat{y}$ = 0,977 x Sales + 1.542.344	0.85	8,155,293
1.12	0.01	1.06	0.36	0.90	1.81	[1,04 ; 1,19] (224,5)	0.51	0.74	$\hat{y}$ = 1,401 x Sales + 818.665	0.74	3,900,568
1.68	0.97	1.70	0.98	1.72	2.40	[1,61 ; 1,75] (288,2)	-0.20	0.50	$\hat{y}$ = 1,074 x Sales + 927.017	0.50	1,248,488
0.95	0.29	0.85	0.29	0.72	1.35	[0,85 ; 1,06] (85,4)	0.96	0.85	$\hat{y}$ = 1,111 x Sales + 28.541	0.95	451,162
1.00	0.36	0.98	0.28	0.90	1.73	[0,86 ; 1,15] (33,6)	0.14	0.69	$\hat{y}$ = 0,909 x Sales - 1.667.785	0.98	4,563,499
1.66	0.25	1.69	1.05	1.69	2.35	[1,60 ; 1,72] (318,0)	-0.24	0.49	$\hat{y}$ = 2,101 x Sales - 505.819	0.91	3,291,059
1.49	0.29	1.51	0.85	1.51	2.29	[1,34 ; 1,64] (72,1)	-0.15	0.58	$\hat{y}$ = 2,113 x Sales + 31.204	0.97	662,206
0.99	0.29	0.89	0.37	0.73	1.46	[0,91 ; 1,06] (147,5)	0.95	0.80	$\hat{y}$ = 2,132 x Sales - 246.343	0.92	3,591,408
1.16	0.14	1.10	0.52	0.96	1.80	[1,11 ; 1,20] (414,7)	0.51	0.68	$\hat{y}$ = 0,336 x Sales + 857.386	0.52	1,931,757
1.14	0.61	1.05	0.56	0.90	1.55	[1,10 ; 1,18] (426,5)	0.87	0.64	$\hat{y}$ = 1,082 x Sales - 645.696	0.61	3,183,782
0.79	0.57	0.74	0.52	0.68	0.95	[0,78 ; 0,81] (484,9)	1.93	0.53	$\hat{y}$ = 1,300 x Sales - 2.262.459	0.62	3,613,979
0.98	0.53	0.90	0.52	0.90	1.24	[0,95 ; 1,02] (189,8)	1.08	0.65	$\hat{y}$ = 0,766 x Sales + 436.842	0.76	1,658,573
1.04	0.09	0.97	0.39	0.83	1.50	[0,98 ; 1,11] (201,9)	0.63	0.74	$\hat{y}$ = 0,494 x Sales + 4.172.709	0.40	18,745,788
1.66	0.41	1.72	0.74	2.00	2.43	[1,59 ; 1,74] (329,2)	-0.51	0.53	$\hat{y}$ = 0,841 x Sales + 1.577.840	0.58	2,023,858
0.83	0.17	0.72	0.22	0.61	1.22	[0,76 ; 0,89] (127,9)	1.08	0.89	$\hat{y}$ = 1,233 x Sales - 302.314	0.94	4,758,491
1.07	0.36	0.97	0.34	0.88	1.47	[0,91 ; 1,23] (55,7)	0.84	0.82	$\hat{y}$ = 0,442 x Sales + 923.790	0.33	2,290,899
0.67	0.14	0.56	0.18	0.47	0.94	[0,64 ; 0,70] (265,9)	1.50	0.97	$\hat{y}$ = 0,177 x Sales + 334.855	0.15	898,542
0.96	0.08	0.87	0.30	0.62	1.68	[0,92 ; 1,00] (881,6)	0.79	0.85	$\hat{y}$ = 0,834 x Sales + 303.457	0.89	3,338,604
0.93	0.16	0.84	0.49	0.65	1.29	[0,90 ; 0,97] (426,6)	1.12	0.78	$\hat{y}$ = 0,640 x Sales + 777.536	0.50	3,476,968
1.51	0.72	1.52	0.89	1.50	2.21	[1,38 ; 1,63] (74,0)	-0.06	0.54	$\hat{y}$ = 1,573 x Sales + 38.393	0.86	435,158
1.37	0.25	1.35	0.67	1.32	2.08	[1,33 ; 1,42] (617,3)	0.20	0.61	$\hat{y}$ = 1,739 x Sales + 178.963	0.93	2,333,374
1.67	0.79	1.72	1.17	1.77	2.31	[1,60 ; 1,75] (186,0)	-0.39	0.48	$\hat{y}$ = 1,499 x Sales + 2.025.719	0.95	3,115,856
1.31	0.28	1.27	0.53	1.18	2.04	[1,27 ; 1,35] (883,7)	0.31	0.65	$\hat{y}$ = 2,067 x Sales - 1.358	0.92	1,158,885
1.33	0.24	1.31	0.46	1.21	2.25	[1,24 ; 1,42] (301,2)	0.19	0.70	$\hat{y}$ = 0,641 x Sales + 103.938	0.89	1,821,000
1.23	0.45	1.20	0.62	1.15	1.97	[1,11 ; 1,36] (62,6)	0.39	0.65	$\hat{y}$ = 0,917 x Sales + 38.051	0.77	227,823
1.14	0.39	1.08	0.39	0.89	1.84	[1,09 ; 1,19] (527,8)	0.57	0.74	$\hat{y}$ = 0,356 x Sales + 926.370	0.40	2,032,048
1.42	0.25	1.42	0.80	1.41	2.08	[1,32 ; 1,53] (110,1)	0.04	0.57	$\hat{y}$ = 2,108 x Sales + 15.709	0.96	593,395
0.88	0.22	0.80	0.24	0.68	1.47	[0,77 ; 0,99] (62,7)	0.75	0.85	$\hat{y}$ = 1,689 x Sales - 1.800	0.94	169,476
0.81	0.16	0.70	0.22	0.40	1.31	[0,74 ; 0,88] (207,7)	1.06	0.98	$\hat{y}$ = 0,315 x Sales + 51.063	0.93	594,592
0.96	0.25	0.91	0.32	0.81	1.52	[0,82 ; 1,10] (36,9)	0.52	0.76	$\hat{y}$ = 0,651 x Sales + 19.091	0.60	415,767
1.26	0.27	1.25	0.63	1.32	1.71	[1,18 ; 1,34] (72,2)	-0.06	0.55	$\hat{y}$ = 1,608 x Sales - 49.598	0.97	501,921
1.22	0.34	1.17	0.57	1.08	1.92	[1,09 ; 1,35] (65,7)	0.52	0.67	$\hat{y}$ = 1,322 x Sales + 6.564	0.85	255,867
0.94	0.34	0.86	0.26	0.51	1.63	[0,75 ; 1,13] (42,3)	0.82	0.91	$\hat{y}$ = 0,167 x Sales + 254.228	0.77	397,813

Forward DEPV/Sales (operating), 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	354
B	05 - 09	Mining and quarrying	5,984
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,116
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	3,741
CC	16 - 18	Manufacture of wood/products, paper/products, printing	1,170
CD	19	Manufacture of coke and refined petroleum products	730
CE	20	Manufacture of chemicals and chemical products	6,065
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	1,959
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	4,337
CH	24 - 25	Manufacture of basic metals, fabricated metal products	5,668
CI	26	Manufacture of computer, electronic and optical products	7,428
CJ	27	Manufacture of electrical equipment	3,333
CK	28	Manufacture of machinery and equipment	7,117
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	5,609
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	4,256
D	35	Electricity, gas, steam and air conditioning supply	3,193
E	36 - 39	Water supply, sewerage, waste management, remediation activities	1,487
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	5,866
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	10,428
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	6,134
I	55 - 56	Accommodation and food/beverage service activities	2,308
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	6,644
JB	61	Telecommunications	1,970
JC	62 - 63	Computer programming/consultancy, information service activities	13,042
K	64 - 66	Financial and insurance activities	1,530
L	68	Real estate activities	504
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	6,537
MB	72	Scientific research and development	2,404
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	322
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	4,755
P	85	Education	547
Q	86 - 88	Human health and social work activities	1,471
R	90 - 93	Arts, entertainment and recreation	547
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	376

Forward DEPV/Sales (operating) Multiples									Forward Sales (operating) Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
1.24	0.58	1.22	0.81	1.07	1.62	[1,12 ; 1,35] (36,0)	0.40	0.55	$\hat{y}$ = 0,601 x Sales + 2.027.363	0.65	2,765,872
0.65	0.22	0.60	0.31	0.53	0.92	[0,63 ; 0,66] (413,0)	0.91	0.70	$\hat{y}$ = 0,290 x Sales + 2.453.261	0.64	12,631,838
1.64	0.78	1.67	1.02	1.80	2.20	[1,55 ; 1,72] (138,4)	-0.37	0.48	$\hat{y}$ = 2,021 x Sales - 1.160.468	0.95	9,429,342
1.02	0.76	0.91	0.64	0.79	1.15	[0,99 ; 1,05] (336,2)	1.56	0.62	$\hat{y}$ = 0,904 x Sales + 270.540	0.76	4,653,318
0.93	0.75	0.91	0.68	0.93	1.10	[0,92 ; 0,95] (56,6)	1.14	0.39	$\hat{y}$ = 0,858 x Sales + 162.206	0.93	902,419
0.51	0.37	0.46	0.36	0.44	0.54	[0,49 ; 0,53] (279,3)	2.38	0.63	$\hat{y}$ = 0,413 x Sales + 351.591	0.92	9,373,816
0.84	0.65	0.76	0.53	0.71	0.93	[0,83 ; 0,85] (582,0)	1.76	0.57	$\hat{y}$ = 0,497 x Sales + 4.107.213	0.60	11,974,974
1.56	0.98	1.54	0.90	1.57	2.11	[1,50 ; 1,62] (243,3)	0.21	0.48	$\hat{y}$ = 1,578 x Sales - 1.376.987	0.82	12,178,282
0.91	0.25	0.85	0.55	0.76	1.16	[0,89 ; 0,92] (252,2)	1.23	0.55	$\hat{y}$ = 0,548 x Sales + 638.580	0.90	2,577,314
0.72	0.31	0.63	0.24	0.37	1.09	[0,70 ; 0,75] (712,4)	1.03	0.92	$\hat{y}$ = 0,263 x Sales + 4.008.029	0.12	7,709,238
0.97	0.70	0.87	0.53	0.73	1.23	[0,95 ; 0,99] (631,9)	1.30	0.63	$\hat{y}$ = 0,834 x Sales - 296.171	0.75	3,835,155
0.79	0.57	0.67	0.45	0.59	0.87	[0,77 ; 0,82] (505,4)	2.12	0.73	$\hat{y}$ = 0,648 x Sales - 61.156	0.76	4,268,862
0.70	0.41	0.60	0.33	0.53	0.87	[0,68 ; 0,71] (579,6)	1.49	0.75	$\hat{y}$ = 0,359 x Sales + 2.846.500	0.20	7,006,456
0.49	0.32	0.42	0.26	0.38	0.58	[0,48 ; 0,50] (1.260,3)	2.27	0.76	$\hat{y}$ = 0,308 x Sales + 1.845.182	0.62	9,627,527
1.10	0.56	1.02	0.48	0.97	1.48	[1,06 ; 1,14] (398,3)	0.85	0.67	$\hat{y}$ = 0,572 x Sales + 1.658.109	0.48	3,072,494
0.61	0.18	0.48	0.29	0.38	0.64	[0,58 ; 0,64] (502,9)	2.16	0.99	$\hat{y}$ = 0,200 x Sales + 4.509.202	0.41	10,218,667
0.43	0.29	0.33	0.22	0.30	0.48	[0,40 ; 0,45] (2.061,4)	3.68	1.04	$\hat{y}$ = 0,332 x Sales + 1.031.883	0.68	4,632,216
0.59	0.22	0.47	0.22	0.35	0.71	[0,57 ; 0,61] (888,8)	2.10	1.01	$\hat{y}$ = 0,524 x Sales - 157.264	0.63	5,285,162
0.66	0.27	0.55	0.23	0.44	0.86	[0,64 ; 0,67] (936,1)	1.70	0.91	$\hat{y}$ = 0,406 x Sales + 538.229	0.50	8,250,357
0.53	0.21	0.39	0.18	0.29	0.53	[0,51 ; 0,56] (810,3)	2.05	1.17	$\hat{y}$ = 0,171 x Sales + 2.491.932	0.28	4,292,226
0.62	0.28	0.46	0.19	0.26	0.55	[0,57 ; 0,66] (253,9)	1.66	1.16	$\hat{y}$ = 0,167 x Sales + 2.249.390	0.15	3,084,275
1.29	0.71	1.24	0.55	1.08	1.97	[1,25 ; 1,33] (932,0)	0.42	0.65	$\hat{y}$ = 1,014 x Sales + 511.487	0.57	8,509,276
1.61	0.84	1.62	1.10	1.50	2.36	[1,55 ; 1,67] (238,8)	0.09	0.48	$\hat{y}$ = 0,584 x Sales + 5.414.948	0.52	10,037,425
1.26	0.65	1.21	0.61	1.06	1.99	[1,23 ; 1,28] (1.810,0)	0.41	0.63	$\hat{y}$ = 1,134 x Sales - 211.806	0.47	6,851,998
1.39	0.45	1.37	0.43	1.58	2.19	[1,29 ; 1,49] (238,0)	0.01	0.66	$\hat{y}$ = 0,253 x Sales + 1.735.702	0.48	6,806,341
1.25	0.72	1.20	0.65	1.12	1.87	[1,14 ; 1,36] (57,0)	0.54	0.60	$\hat{y}$ = 0,375 x Sales + 436.140	0.42	541,868
0.91	0.39	0.81	0.29	0.70	1.33	[0,88 ; 0,94] (656,4)	0.93	0.79	$\hat{y}$ = 0,247 x Sales + 2.138.652	0.30	4,418,887
1.61	0.96	1.60	0.93	1.64	2.15	[1,56 ; 1,67] (295,0)	0.09	0.48	$\hat{y}$ = 1,981 x Sales - 1.059.605	0.79	8,355,456
1.09	0.62	1.08	0.47	1.03	1.76	[0,98 ; 1,20] (51,1)	0.15	0.60	$\hat{y}$ = 0,670 x Sales + 490.716	0.50	890,637
0.57	0.27	0.43	0.19	0.28	0.57	[0,54 ; 0,59] (495,9)	1.75	1.09	$\hat{y}$ = 0,272 x Sales + 975.563	0.47	2,960,599
1.03	0.57	0.94	0.43	0.65	1.57	[0,92 ; 1,14] (59,8)	0.84	0.73	$\hat{y}$ = 0,378 x Sales + 784.998	0.79	1,025,844
1.00	0.72	1.01	0.86	1.02	1.33	[0,98 ; 1,02] (67,8)	-0.03	0.40	$\hat{y}$ = 0,474 x Sales + 2.770.439	0.74	2,178,593
1.60	1.32	1.59	1.16	1.68	1.99	[1,53 ; 1,66] (49,6)	0.07	0.37	$\hat{y}$ = 1,395 x Sales + 104.566	0.73	593,679
0.95	0.38	0.91	0.36	1.07	1.24	[0,86 ; 1,04] (22,9)	0.48	0.65	$\hat{y}$ = 0,217 x Sales + 1.966.088	0.11	1,971,152

Trailing DEPV/EBITDA, 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	290
B	05 - 09	Mining and quarrying	2,941
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,315
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	1,288
CC	16 - 18	Manufacture of wood/products, paper/products, printing	660
CD	19	Manufacture of coke and refined petroleum products	268
CE	20	Manufacture of chemicals and chemical products	2,141
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	580
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	1,030
CH	24 - 25	Manufacture of basic metals, fabricated metal products	2,785
CI	26	Manufacture of computer, electronic and optical products	3,591
CJ	27	Manufacture of electrical equipment	1,846
CK	28	Manufacture of machinery and equipment	2,973
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	1,696
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	1,970
D	35	Electricity, gas, steam and air conditioning supply	1,331
E	36 - 39	Water supply, sewerage, waste management, remediation activities	445
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	3,097
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	5,871
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	2,759
I	55 - 56	Accommodation and food/beverage service activities	907
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	3,735
JB	61	Telecommunications	1,776
JC	62 - 63	Computer programming/consultancy, information service activities	4,680
K	64 - 66	Financial and insurance activities	1,675
L	68	Real estate activities	939
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	3,467
MB	72	Scientific research and development	875
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	376
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	2,061
P	85	Education	215
Q	86 - 88	Human health and social work activities	590
R	90 - 93	Arts, entertainment and recreation	462
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	209

Trailing DEPV/EBITDA Multiples									Trailing EBITDA Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
8.34	1.35	8.02	3.62	6.96	11.83	[-1,28 ; 17,96] (36,7)	0.54	0.72	$\hat{y}$ = 18,482 x EBITDA - 211.840	0.97	515,129
5.35	1.55	4.71	0.87	3.74	8.79	[3,27 ; 7,43] (304,8)	0.95	0.93	$\hat{y}$ = 3,623 x EBITDA + 191.536	0.40	15,171,843
8.69	0.07	8.54	4.69	8.65	12.17	[5,92 ; 11,46] (150,9)	0.22	0.54	$\hat{y}$ = 12,489 x EBITDA - 662.493	0.93	7,462,587
9.41	6.82	9.22	6.02	8.48	13.03	[6,78 ; 12,04] (157,3)	0.30	0.48	$\hat{y}$ = 6,782 x EBITDA + 827.637	0.81	1,297,896
8.21	2.97	7.81	3.15	5.76	14.54	[1,68 ; 14,74] (96,9)	0.54	0.74	$\hat{y}$ = 7,132 x EBITDA + 447.716	0.66	2,066,206
6.77	4.00	6.27	3.46	5.08	8.99	[1,36 ; 12,18] (17,4)	1.03	0.65	$\hat{y}$ = 5,591 x EBITDA + 1.325.441	0.92	9,443,108
6.14	1.43	5.63	0.82	4.45	11.02	[3,25 ; 9,03] (299,8)	0.45	0.88	$\hat{y}$ = -0,028 x EBITDA + 6.379.381	-0.00	7,133,061
11.17	1.76	11.37	7.85	11.69	14.46	[7,11 ; 15,22] (63,4)	-0.36	0.42	$\hat{y}$ = 11,300 x EBITDA + 212.122	0.80	3,147,299
7.48	3.69	7.02	3.63	6.33	10.42	[4,28 ; 10,68] (112,5)	0.78	0.64	$\hat{y}$ = 7,207 x EBITDA + 38.762	0.72	3,091,692
7.71	1.76	7.39	5.17	6.98	9.81	[6,19 ; 9,23] (221,4)	0.72	0.55	$\hat{y}$ = 4,347 x EBITDA + 1.336.321	0.76	2,290,558
8.53	6.11	8.16	4.91	7.24	11.85	[7,08 ; 9,99] (397,8)	0.63	0.51	$\hat{y}$ = 13,282 x EBITDA - 2.265.439	0.81	4,214,550
6.38	4.23	5.67	4.66	5.04	6.75	[5,05 ; 7,70] (266,0)	2.06	0.56	$\hat{y}$ = 10,866 x EBITDA - 2.838.085	0.83	2,965,637
8.35	4.67	7.93	5.80	7.10	10.35	[6,66 ; 10,03] (238,6)	0.90	0.54	$\hat{y}$ = 11,791 x EBITDA - 1.848.732	0.73	4,965,954
8.54	1.53	8.13	5.32	6.90	10.84	[5,99 ; 11,10] (159,4)	0.81	0.56	$\hat{y}$ = 2,186 x EBITDA + 4.375.147	0.54	4,308,044
9.28	3.94	9.30	7.43	8.64	11.98	[7,62 ; 10,93] (150,0)	0.03	0.43	$\hat{y}$ = 6,218 x EBITDA + 1.235.012	0.80	1,357,148
7.73	2.15	7.30	3.00	6.03	12.30	[3,86 ; 11,59] (172,0)	0.56	0.72	$\hat{y}$ = 9,755 x EBITDA + 536.634	0.88	5,525,280
7.80	3.75	7.50	3.68	6.59	10.46	[2,29 ; 13,30] (55,0)	0.48	0.65	$\hat{y}$ = 6,691 x EBITDA + 471.071	0.83	1,194,747
6.67	1.73	6.18	2.54	5.70	9.18	[4,69 ; 8,65] (308,4)	0.77	0.74	$\hat{y}$ = 4,743 x EBITDA + 252.868	0.55	1,017,562
8.36	3.46	8.06	3.71	7.72	12.72	[6,83 ; 9,88] (729,0)	0.41	0.61	$\hat{y}$ = 5,002 x EBITDA + 1.011.975	0.79	5,843,007
8.81	2.01	8.78	3.94	9.12	13.21	[6,64 ; 10,98] (380,8)	0.02	0.57	$\hat{y}$ = 8,569 x EBITDA + 131.357	0.69	2,140,486
8.76	6.51	8.32	5.64	7.41	10.83	[5,85 ; 11,67] (87,8)	0.92	0.50	$\hat{y}$ = 6,543 x EBITDA + 338.162	0.76	1,131,902
7.47	1.94	7.03	3.93	5.99	10.34	[5,87 ; 9,07] (366,7)	0.76	0.62	$\hat{y}$ = 4,915 x EBITDA + 523.864	0.80	4,733,752
6.85	4.38	6.17	3.70	5.63	8.50	[4,79 ; 8,90] (149,3)	1.29	0.64	$\hat{y}$ = 4,015 x EBITDA + 2.052.632	0.78	6,859,864
7.32	2.81	6.82	3.49	5.83	10.52	[5,73 ; 8,91] (463,4)	0.78	0.67	$\hat{y}$ = 5,393 x EBITDA + 208.243	0.94	1,197,873
8.23	2.92	7.85	3.17	7.76	11.96	[4,93 ; 11,53] (208,2)	0.40	0.66	$\hat{y}$ = 5,910 x EBITDA + 214.015	0.89	940,540
10.44	6.18	10.38	6.34	9.72	14.67	[6,71 ; 14,18] (119,8)	0.09	0.48	$\hat{y}$ = 10,119 x EBITDA + 75.616	0.76	931,253
7.94	4.01	7.64	4.76	6.79	11.12	[6,31 ; 9,57] (357,3)	0.54	0.58	$\hat{y}$ = 6,594 x EBITDA + 460.807	0.81	1,498,395
10.93	2.01	11.17	7.21	12.22	14.90	[6,80 ; 15,06] (108,8)	-0.40	0.47	$\hat{y}$ = 7,988 x EBITDA + 828.308	0.75	1,725,305
5.98	1.16	5.49	2.15	4.54	9.22	[0,70 ; 11,26] (37,5)	0.79	0.79	$\hat{y}$ = 12,726 x EBITDA - 21.154	0.96	100,578
6.63	2.15	6.13	3.97	5.64	7.89	[4,68 ; 8,57] (155,4)	1.08	0.67	$\hat{y}$ = 6,061 x EBITDA + 58.035	0.92	738,987
6.45	3.30	5.76	2.77	5.01	8.32	[-0,56 ; 13,47] (15,9)	1.20	0.74	$\hat{y}$ = 6,495 x EBITDA + 14.000	0.97	137,937
7.62	5.60	7.35	6.39	7.30	8.73	[5,33 ; 9,91] (21,0)	0.92	0.46	$\hat{y}$ = 7,334 x EBITDA - 26.968	0.99	377,331
9.00	3.84	8.86	4.80	8.41	12.70	[3,30 ; 14,70] (58,7)	0.16	0.58	$\hat{y}$ = 5,242 x EBITDA + 211.394	0.60	538,256
5.22	3.03	4.47	2.36	3.42	6.48	[-1,46 ; 11,91] (19,4)	1.69	0.88	$\hat{y}$ = 2,859 x EBITDA + 86.650	0.89	316,127

Forward DEPV/EBITDA, 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	349
B	05 - 09	Mining and quarrying	5,753
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,202
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	3,837
CC	16 - 18	Manufacture of wood/products, paper/products, printing	1,218
CD	19	Manufacture of coke and refined petroleum products	730
CE	20	Manufacture of chemicals and chemical products	6,301
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2,367
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	4,347
CH	24 - 25	Manufacture of basic metals, fabricated metal products	5,721
CI	26	Manufacture of computer, electronic and optical products	7,879
CJ	27	Manufacture of electrical equipment	3,252
CK	28	Manufacture of machinery and equipment	6,784
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	5,678
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	4,664
D	35	Electricity, gas, steam and air conditioning supply	3,499
E	36 - 39	Water supply, sewerage, waste management, remediation activities	1,492
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	7,718
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	10,026
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	6,397
I	55 - 56	Accommodation and food/beverage service activities	2,313
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	7,090
JB	61	Telecommunications	2,227
JC	62 - 63	Computer programming/consultancy, information service activities	10,085
K	64 - 66	Financial and insurance activities	2,893
L	68	Real estate activities	3,027
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	6,800
MB	72	Scientific research and development	2,780
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	322
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	4,986
P	85	Education	590
Q	86 - 88	Human health and social work activities	1,454
R	90 - 93	Arts, entertainment and recreation	558
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	365

Forward DEPV/EBITDA Multiples									Forward EBITDA Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
5.08	4.28	5.12	3.95	4.90	6.26	[4,42 ; 5,74] (27,5)	-0.14	0.32	$\hat{y}$ = 4,230 x EBITDA + 769.797	0.90	1,403,627
2.80	1.29	2.44	1.42	2.52	3.22	[2,50 ; 3,09] (3.376,1)	2.63	0.79	$\hat{y}$ = 0,956 x EBITDA + 4.067.467	0.69	12,055,324
8.32	6.51	8.29	5.64	8.24	11.08	[6,84 ; 9,80] (134,5)	0.10	0.40	$\hat{y}$ = 6,186 x EBITDA + 3.009.099	0.87	14,388,749
5.62	4.34	5.22	3.70	5.34	6.52	[4,98 ; 6,26] (355,4)	1.67	0.53	$\hat{y}$ = 9,472 x EBITDA - 3.721.123	0.75	4,656,022
5.45	4.74	5.11	4.11	5.06	6.04	[4,75 ; 6,15] (555,1)	2.46	0.43	$\hat{y}$ = 4,062 x EBITDA + 497.161	0.95	787,859
2.62	1.93	2.50	1.93	2.33	3.21	[2,28 ; 2,96] (353,6)	2.37	0.54	$\hat{y}$ = 1,886 x EBITDA + 2.841.002	0.89	10,636,090
4.95	3.71	4.35	2.86	4.08	5.55	[4,37 ; 5,53] (772,5)	1.93	0.64	$\hat{y}$ = 2,417 x EBITDA + 4.775.842	0.64	11,261,559
8.29	5.28	7.96	4.22	6.70	12.11	[5,96 ; 10,62] (306,1)	0.57	0.60	$\hat{y}$ = 5,910 x EBITDA - 246.942	0.88	9,142,749
5.20	1.31	4.88	3.69	5.08	5.78	[4,81 ; 5,59] (591,0)	1.79	0.46	$\hat{y}$ = 4,272 x EBITDA - 14.917	0.85	3,366,780
4.35	2.48	4.11	2.06	3.97	6.29	[3,92 ; 4,79] (358,9)	0.96	0.62	$\hat{y}$ = 5,971 x EBITDA - 985.144	0.69	4,613,149
5.97	4.33	5.46	3.79	5.21	7.11	[5,35 ; 6,58] (595,0)	1.55	0.58	$\hat{y}$ = 9,303 x EBITDA - 2.577.063	0.72	10,243,117
5.71	4.58	5.14	3.67	4.86	6.31	[4,92 ; 6,50] (372,6)	1.87	0.55	$\hat{y}$ = 4,443 x EBITDA + 433.214	0.85	3,628,852
6.02	3.54	5.41	3.89	5.24	6.87	[5,29 ; 6,75] (580,5)	1.66	0.61	$\hat{y}$ = 11,858 x EBITDA - 6.053.136	0.80	9,069,710
4.14	2.93	3.80	2.63	3.80	4.79	[3,77 ; 4,51] (2.861,0)	2.37	0.60	$\hat{y}$ = 2,035 x EBITDA + 3.424.919	0.66	9,099,780
6.14	3.41	5.47	3.70	5.14	7.03	[5,17 ; 7,11] (441,1)	1.75	0.62	$\hat{y}$ = 3,658 x EBITDA + 1.349.777	0.59	2,728,757
5.46	2.66	4.85	3.13	4.71	6.65	[4,31 ; 6,62] (290,9)	1.63	0.71	$\hat{y}$ = 0,701 x EBITDA + 5.977.182	0.72	6,794,235
3.13	2.54	3.01	1.99	3.14	3.81	[2,90 ; 3,37] (210,1)	1.59	0.45	$\hat{y}$ = 2,283 x EBITDA + 828.139	0.79	3,621,490
6.24	3.45	5.72	3.42	4.97	8.46	[5,38 ; 7,11] (614,6)	1.10	0.66	$\hat{y}$ = 3,526 x EBITDA + 1.646.088	0.69	4,389,791
5.25	3.25	4.72	2.63	4.40	6.79	[4,66 ; 5,84] (703,4)	1.39	0.69	$\hat{y}$ = 3,947 x EBITDA + 1.177.246	0.50	13,710,260
3.73	1.81	3.27	1.66	2.41	5.09	[3,19 ; 4,27] (1.019,5)	1.96	0.83	$\hat{y}$ = 1,379 x EBITDA + 2.807.245	0.26	4,458,497
4.70	3.25	4.18	2.28	3.10	6.17	[3,73 ; 5,66] (200,3)	1.26	0.68	$\hat{y}$ = 2,381 x EBITDA + 1.691.814	0.24	2,888,981
7.15	5.01	6.66	4.15	6.19	9.34	[6,30 ; 8,00] (498,0)	1.07	0.56	$\hat{y}$ = 5,634 x EBITDA + 388.390	0.80	6,454,825
5.35	4.24	5.17	3.56	4.98	7.07	[4,78 ; 5,92] (89,9)	1.14	0.46	$\hat{y}$ = 3,127 x EBITDA + 2.929.774	0.82	5,912,792
7.16	4.43	6.52	3.74	5.83	9.06	[6,17 ; 8,15] (872,5)	1.10	0.65	$\hat{y}$ = 7,322 x EBITDA - 964.623	0.87	4,072,665
7.48	2.63	7.11	4.40	6.83	9.82	[6,02 ; 8,94] (260,4)	0.72	0.56	$\hat{y}$ = 1,833 x EBITDA + 1.588.189	0.58	4,509,267
10.43	7.77	10.30	7.46	9.52	13.71	[8,99 ; 11,86] (312,8)	0.25	0.40	$\hat{y}$ = 10,503 x EBITDA - 84.327	0.85	2,546,337
5.06	3.45	4.66	2.99	4.38	6.18	[4,55 ; 5,57] (427,2)	1.33	0.60	$\hat{y}$ = 3,721 x EBITDA + 615.252	0.67	3,046,512
9.39	6.03	9.19	5.18	8.34	14.04	[7,09 ; 11,70] (355,7)	0.39	0.55	$\hat{y}$ = 6,128 x EBITDA + 341.602	0.79	7,607,844
5.95	3.73	5.52	3.54	5.19	7.92	[2,24 ; 9,65] (22,8)	1.49	0.64	$\hat{y}$ = 4,185 x EBITDA + 210.215	0.75	631,994
4.38	3.27	3.96	2.51	3.39	5.50	[3,92 ; 4,84] (413,6)	1.63	0.61	$\hat{y}$ = 2,139 x EBITDA + 1.741.917	0.54	2,788,878
6.38	4.24	5.80	3.30	4.59	8.41	[3,17 ; 9,60] (55,5)	1.08	0.65	$\hat{y}$ = 2,842 x EBITDA + 849.415	0.76	1,036,716
5.48	4.40	5.43	4.14	5.55	6.25	[5,06 ; 5,89] (26,2)	0.74	0.34	$\hat{y}$ = 2,850 x EBITDA + 2.481.467	0.77	2,057,171
6.43	5.34	6.32	4.69	6.27	8.05	[5,23 ; 7,62] (44,4)	0.38	0.39	$\hat{y}$ = 5,972 x EBITDA + 111.023	0.69	646,506
4.23	3.15	3.60	2.92	3.64	3.99	[1,85 ; 6,62] (237,6)	2.99	0.75	$\hat{y}$ = 3,439 x EBITDA + 88.925	0.95	454,677

Trailing DEPV/EBIT, 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	386
B	05 - 09	Mining and quarrying	1,701
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,288
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	805
CC	16 - 18	Manufacture of wood/products, paper/products, printing	864
CD	19	Manufacture of coke and refined petroleum products	215
CE	20	Manufacture of chemicals and chemical products	1,293
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	612
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	961
CH	24 - 25	Manufacture of basic metals, fabricated metal products	2,780
CI	26	Manufacture of computer, electronic and optical products	3,569
CJ	27	Manufacture of electrical equipment	1,997
CK	28	Manufacture of machinery and equipment	2,973
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	1,556
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	1,556
D	35	Electricity, gas, steam and air conditioning supply	1,369
E	36 - 39	Water supply, sewerage, waste management, remediation activities	435
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	3,129
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	5,448
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	2,372
I	55 - 56	Accommodation and food/beverage service activities	800
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	3,381
JB	61	Telecommunications	1,836
JC	62 - 63	Computer programming/consultancy, information service activities	4,530
K	64 - 66	Financial and insurance activities	2,759
L	68	Real estate activities	1,336
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	3,075
MB	72	Scientific research and development	714
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	386
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	1,948
P	85	Education	193
Q	86 - 88	Human health and social work activities	580
R	90 - 93	Arts, entertainment and recreation	279
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	188

Trailing DEPV/EBIT Multiples									Trailing EBIT Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
12.50	2.25	11.98	4.46	8.94	22.77	[-9,61 ; 34,60] (58,5)	0.46	0.78	$\hat{y}$ = 25,129 x EBIT - 126.182	0.96	815,964
10.08	3.08	9.15	4.01	7.96	12.93	[3,52 ; 16,64] (168,0)	1.02	0.77	$\hat{y}$ = 5,750 x EBIT + 6.877.120	0.57	14,311,928
12.35	0.07	12.03	5.65	11.36	18.69	[5,12 ; 19,57] (161,9)	0.28	0.61	$\hat{y}$ = 15,106 x EBIT + 464.574	0.93	7,355,260
13.15	8.76	12.94	6.60	13.22	17.26	[6,34 ; 19,96] (75,4)	0.23	0.50	$\hat{y}$ = 9,446 x EBIT + 743.624	0.69	1,217,516
15.45	5.30	15.52	6.62	14.52	26.77	[0,00 ; 30,90] (140,6)	0.05	0.65	$\hat{y}$ = 11,855 x EBIT + 1.042.102	0.63	2,377,986
10.02	4.77	9.00	3.40	8.86	13.13	[-8,46 ; 28,50] (18,8)	0.94	0.77	$\hat{y}$ = 7,296 x EBIT + 3.884.171	0.64	7,606,436
13.58	3.62	13.40	8.47	13.43	18.56	[7,57 ; 19,59] (126,8)	0.13	0.51	$\hat{y}$ = 14,561 x EBIT + 350.355	0.77	3,806,438
14.43	1.89	14.22	9.09	13.70	19.25	[3,81 ; 25,05] (68,3)	0.28	0.53	$\hat{y}$ = 12,685 x EBIT + 326.816	0.88	1,219,583
10.46	3.36	9.90	5.30	9.28	14.86	[4,08 ; 16,83] (88,6)	0.68	0.63	$\hat{y}$ = 8,936 x EBIT + 46.547	0.91	1,089,966
10.01	4.08	9.72	6.74	10.25	12.29	[7,72 ; 12,29] (126,3)	0.72	0.51	$\hat{y}$ = 6,036 x EBIT + 912.702	0.84	1,878,856
12.66	9.08	12.19	7.94	11.48	16.61	[9,87 ; 15,46] (322,2)	0.64	0.48	$\hat{y}$ = 23,344 x EBIT - 3.012.996	0.96	5,236,814
12.11	7.35	11.03	7.64	8.38	13.88	[6,21 ; 18,01] (215,9)	1.25	0.63	$\hat{y}$ = 14,646 x EBIT - 1.327.861	0.87	2,690,160
11.46	5.83	10.89	7.12	10.57	14.77	[8,19 ; 14,73] (209,6)	0.86	0.55	$\hat{y}$ = 22,610 x EBIT - 5.457.839	0.91	8,136,258
11.38	7.68	10.89	6.88	11.01	14.72	[7,29 ; 15,47] (114,1)	0.77	0.52	$\hat{y}$ = 4,800 x EBIT + 3.441.905	0.59	4,139,772
14.61	4.14	14.45	9.29	12.83	20.40	[6,52 ; 22,69] (195,5)	0.27	0.57	$\hat{y}$ = 6,874 x EBIT + 1.369.526	0.75	1,303,528
10.88	3.55	10.25	3.83	9.29	17.06	[3,13 ; 18,62] (167,0)	0.59	0.73	$\hat{y}$ = 9,487 x EBIT + 2.910.295	0.78	8,785,848
11.23	5.34	10.46	6.02	10.02	15.56	[-0,95 ; 23,41] (38,3)	0.76	0.67	$\hat{y}$ = 10,134 x EBIT + 290.531	0.87	1,063,652
9.13	2.47	8.27	3.62	7.40	13.64	[5,10 ; 13,15] (281,0)	0.95	0.77	$\hat{y}$ = 11,294 x EBIT - 151.345	0.58	2,754,593
11.44	1.07	10.81	5.42	9.61	15.43	[7,88 ; 15,01] (599,5)	0.66	0.66	$\hat{y}$ = 19,524 x EBIT - 1.361.777	0.87	7,698,949
13.99	0.19	13.80	8.33	14.01	18.91	[9,00 ; 18,97] (237,4)	0.19	0.52	$\hat{y}$ = 16,589 x EBIT - 176.054	0.76	1,933,513
11.55	6.20	10.52	5.66	7.65	16.81	[1,51 ; 21,59] (88,0)	1.02	0.68	$\hat{y}$ = 5,567 x EBIT + 1.210.101	0.52	1,627,293
12.04	2.27	11.66	6.34	11.53	16.06	[8,10 ; 15,97] (353,6)	0.38	0.59	$\hat{y}$ = 12,351 x EBIT + 275.360	0.91	3,361,246
13.25	7.82	12.92	7.76	13.26	16.86	[8,83 ; 17,67] (189,3)	0.39	0.49	$\hat{y}$ = 11,641 x EBIT + 1.087.104	0.87	5,301,868
11.78	3.14	11.20	4.44	10.51	16.46	[7,27 ; 16,29] (558,4)	0.49	0.69	$\hat{y}$ = 14,912 x EBIT + 61.271	0.97	807,463
11.18	2.39	10.55	4.68	9.35	17.95	[5,99 ; 16,38] (309,0)	0.62	0.69	$\hat{y}$ = 6,718 x EBIT + 311.771	0.60	1,461,301
13.75	6.83	13.53	7.99	13.47	19.14	[6,98 ; 20,52] (153,5)	0.19	0.54	$\hat{y}$ = 15,424 x EBIT - 27.671	0.77	1,517,750
10.65	3.98	9.87	5.85	9.07	14.25	[6,47 ; 14,84] (270,5)	0.89	0.67	$\hat{y}$ = 7,234 x EBIT + 640.031	0.80	1,607,073
13.82	1.80	13.71	8.22	13.46	17.95	[4,22 ; 23,41] (80,4)	0.13	0.54	$\hat{y}$ = 12,626 x EBIT + 254.527	0.91	972,465
7.61	1.18	6.37	2.24	4.41	10.38	[-5,11 ; 20,33] (33,5)	1.30	0.98	$\hat{y}$ = 21,740 x EBIT - 23.558	0.92	107,632
9.89	2.21	9.05	5.54	7.75	12.96	[4,77 ; 15,01] (166,2)	1.07	0.71	$\hat{y}$ = 7,613 x EBIT + 94.729	0.88	922,151
9.43	3.80	8.39	3.20	7.17	11.54	[-11,52 ; 30,38] (15,6)	1.24	0.85	$\hat{y}$ = 14,451 x EBIT - 10.712	0.99	68,019
14.72	8.38	15.01	10.97	14.55	19.27	[6,45 ; 23,00] (62,5)	-0.46	0.45	$\hat{y}$ = 17,981 x EBIT - 187.652	0.94	790,390
10.51	3.59	9.51	3.95	7.61	16.40	[-7,94 ; 28,95] (28,4)	0.91	0.78	$\hat{y}$ = 5,017 x EBIT + 245.779	0.61	514,905
6.83	4.63	6.26	3.67	5.67	9.12	[0,51 ; 13,15] (13,9)	1.10	0.64	$\hat{y}$ = 7,708 x EBIT - 23.084	0.90	323,144

Forward DEPV/EBIT, 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	343
B	05 - 09	Mining and quarrying	5,625
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,170
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	3,805
CC	16 - 18	Manufacture of wood/products, paper/products, printing	1,213
CD	19	Manufacture of coke and refined petroleum products	676
CE	20	Manufacture of chemicals and chemical products	6,285
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2,056
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	4,342
CH	24 - 25	Manufacture of basic metals, fabricated metal products	5,668
CI	26	Manufacture of computer, electronic and optical products	7,750
CJ	27	Manufacture of electrical equipment	3,043
CK	28	Manufacture of machinery and equipment	6,355
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	5,651
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	4,406
D	35	Electricity, gas, steam and air conditioning supply	3,145
E	36 - 39	Water supply, sewerage, waste management, remediation activities	1,492
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	7,766
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	9,569
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	6,295
I	55 - 56	Accommodation and food/beverage service activities	2,313
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	6,966
JB	61	Telecommunications	2,152
JC	62 - 63	Computer programming/consultancy, information service activities	9,666
K	64 - 66	Financial and insurance activities	2,828
L	68	Real estate activities	3,177
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	6,693
MB	72	Scientific research and development	2,351
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	306
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	4,905
P	85	Education	606
Q	86 - 88	Human health and social work activities	1,412
R	90 - 93	Arts, entertainment and recreation	526
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	349

Forward DEPV/EBIT Multiples									Forward EBIT Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
7.06	5.85	7.13	5.57	7.45	8.63	[5,83 ; 8,28] (25,1)	-0.37	0.32	$\hat{y}$ = 5,299 x EBIT + 1.008.901	0.88	1,595,882
4.45	1.72	3.67	2.08	3.59	4.59	[3,48 ; 5,41] (1.502,5)	2.32	0.90	$\hat{y}$ = 1,082 x EBIT + 4.940.702	0.63	13,274,486
11.39	8.78	11.03	7.72	9.94	14.79	[7,64 ; 15,14] (117,5)	0.65	0.47	$\hat{y}$ = 7,648 x EBIT + 3.752.441	0.85	15,576,245
10.26	7.99	9.63	6.72	8.38	12.61	[8,20 ; 12,31] (253,2)	1.23	0.52	$\hat{y}$ = 16,029 x EBIT - 3.031.971	0.73	4,770,852
7.77	6.71	7.11	5.76	6.93	8.56	[6,12 ; 9,42] (333,2)	2.38	0.46	$\hat{y}$ = 5,084 x EBIT + 691.698	0.94	814,694
3.80	2.66	3.69	2.68	3.55	4.84	[3,15 ; 4,45] (69,5)	1.51	0.51	$\hat{y}$ = 2,515 x EBIT + 3.793.699	0.88	11,730,198
8.33	6.06	7.68	4.24	7.51	10.87	[7,01 ; 9,66] (415,7)	1.14	0.58	$\hat{y}$ = 3,210 x EBIT + 5.449.719	0.62	11,431,062
9.71	6.50	8.91	5.52	8.13	13.00	[6,03 ; 13,39] (148,8)	1.21	0.62	$\hat{y}$ = 7,738 x EBIT - 438.533	0.92	8,011,205
9.11	2.20	8.53	5.77	8.85	10.87	[7,71 ; 10,52] (288,7)	1.46	0.50	$\hat{y}$ = 6,620 x EBIT + 312.912	0.82	3,614,970
6.89	3.51	6.26	2.84	6.33	9.36	[5,47 ; 8,32] (501,2)	1.63	0.71	$\hat{y}$ = 8,129 x EBIT - 674.267	0.74	4,284,747
9.05	6.76	8.28	5.13	7.34	11.42	[7,62 ; 10,47] (571,7)	1.31	0.58	$\hat{y}$ = 11,482 x EBIT - 2.006.312	0.79	8,817,919
7.39	6.04	6.75	4.94	6.42	8.56	[6,19 ; 8,60] (408,8)	1.93	0.52	$\hat{y}$ = 6,412 x EBIT + 235.122	0.88	3,310,856
7.87	4.84	7.53	5.69	7.52	8.95	[7,03 ; 8,71] (2.245,2)	2.07	0.49	$\hat{y}$ = 14,269 x EBIT - 4.229.144	0.89	6,965,207
6.62	5.00	6.31	4.81	6.06	8.00	[6,03 ; 7,22] (841,5)	1.68	0.47	$\hat{y}$ = 2,927 x EBIT + 4.137.565	0.71	8,503,119
9.20	4.65	8.50	5.43	7.56	11.73	[7,14 ; 11,25] (295,3)	1.24	0.60	$\hat{y}$ = 5,571 x EBIT + 1.345.269	0.59	2,774,079
7.57	3.46	7.48	5.07	7.16	10.27	[6,31 ; 8,83] (117,5)	0.51	0.52	$\hat{y}$ = 0,775 x EBIT + 7.198.250	0.69	7,299,178
5.40	4.50	5.21	3.89	5.18	6.42	[4,82 ; 5,98] (80,1)	1.28	0.41	$\hat{y}$ = 4,413 x EBIT + 452.893	0.83	3,240,431
8.08	4.91	7.42	5.03	6.81	9.68	[6,80 ; 9,36] (552,3)	1.51	0.62	$\hat{y}$ = 5,545 x EBIT + 1.229.985	0.75	3,918,718
8.99	5.70	8.28	4.23	7.09	12.90	[7,39 ; 10,59] (809,5)	0.95	0.65	$\hat{y}$ = 6,185 x EBIT + 1.847.458	0.60	12,597,548
7.08	4.30	6.40	3.82	5.88	9.27	[5,74 ; 8,42] (550,5)	1.66	0.68	$\hat{y}$ = 4,035 x EBIT + 1.776.454	0.50	3,653,514
7.47	5.33	6.74	3.74	5.08	9.77	[5,24 ; 9,70] (244,8)	1.13	0.65	$\hat{y}$ = 4,823 x EBIT + 1.040.080	0.37	2,630,213
11.37	8.03	10.65	6.79	10.10	14.55	[9,41 ; 13,32] (497,1)	1.09	0.53	$\hat{y}$ = 8,580 x EBIT + 773.221	0.92	4,080,587
10.52	8.54	10.48	7.61	10.30	13.57	[8,95 ; 12,09] (110,5)	0.29	0.38	$\hat{y}$ = 6,454 x EBIT + 3.342.881	0.72	7,349,910
11.30	8.12	10.57	6.58	9.97	14.82	[9,55 ; 13,04] (710,6)	1.05	0.54	$\hat{y}$ = 9,562 x EBIT + 235.011	0.94	2,814,397
9.44	3.86	8.96	5.96	9.00	11.34	[7,28 ; 11,60] (138,9)	1.10	0.53	$\hat{y}$ = 3,962 x EBIT + 1.153.593	0.76	3,482,504
11.17	7.94	10.71	7.47	9.69	14.69	[8,91 ; 13,43] (221,4)	0.86	0.47	$\hat{y}$ = 10,567 x EBIT - 27.323	0.86	2,411,675
8.71	6.19	8.14	5.09	7.49	11.19	[7,34 ; 10,08] (462,2)	1.10	0.57	$\hat{y}$ = 5,437 x EBIT + 967.718	0.72	2,802,445
11.44	7.41	10.77	7.12	10.08	14.74	[7,34 ; 15,55] (176,8)	0.90	0.58	$\hat{y}$ = 7,539 x EBIT + 319.663	0.85	6,921,707
9.62	3.54	9.49	4.73	9.83	14.50	[1,41 ; 17,82] (17,5)	0.46	0.58	$\hat{y}$ = 8,958 x EBIT + 159.634	0.46	1,172,553
7.06	5.41	6.34	4.01	5.78	8.95	[5,93 ; 8,19] (481,6)	1.75	0.59	$\hat{y}$ = 4,552 x EBIT + 1.099.158	0.63	2,512,720
10.45	8.26	9.85	7.09	9.39	12.05	[6,21 ; 14,69] (37,6)	1.40	0.46	$\hat{y}$ = 8,469 x EBIT + 400.794	0.77	1,016,076
15.51	9.70	15.56	9.57	16.95	20.30	[10,11 ; 20,91] (165,9)	-0.16	0.43	$\hat{y}$ = 4,385 x EBIT + 3.771.686	0.69	2,345,281
10.63	8.21	10.05	7.10	9.67	13.51	[5,23 ; 16,02] (26,5)	1.17	0.49	$\hat{y}$ = 7,192 x EBIT + 381.124	0.62	705,824
7.93	5.82	7.85	6.89	8.96	9.29	[5,04 ; 10,82] (9,1)	0.36	0.43	$\hat{y}$ = 9,047 x EBIT - 149.485	0.95	466,347

Trailing DEPV/Invested Capital, 1 January 2020 until 31 December 2022

NACE Rev. 2 Sector			n
A	01 - 03	Agriculture, forestry and fishing	682
B	05 - 09	Mining and quarrying	7,514
CA	10 - 12	Manufacture of food products, beverages, tobacco products	1,675
CB	13 - 15	Manufacture of textiles, wearing apparel, teather and related products	1,750
CC	16 - 18	Manufacture of wood/products, paper/products, printing	1,138
CD	19	Manufacture of coke and refined petroleum products	869
CE	20	Manufacture of chemicals and chemical products	5,088
CF	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2,222
CG	22 - 23	Manufacture of rubber, plastic products, other non-metallic mineral products	3,746
CH	24 - 25	Manufacture of basic metals, fabricated metal products	6,016
CI	26	Manufacture of computer, electronic and optical products	5,592
CJ	27	Manufacture of electrical equipment	4,143
CK	28	Manufacture of machinery and equipment	6,161
CL	29 - 30	Manufacture of motor vehicles, trailers, other transport equipment	5,748
CM	31 - 33	Manufacture of furniture, other manufacturing, repair/installation of machinery and equipment	2,828
D	35	Electricity, gas, steam and air conditioning supply	4,798
E	36 - 39	Water supply, sewerage, waste management, remediation activities	1,943
F	41 - 43	Construction - Buildings, civil engineering, specialized construction activities	10,289
G	45 - 47	Wholesale/Retail trade, repair of motor vehicles and motorcycles	9,795
H	49 - 53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities	6,344
I	55 - 56	Accommodation and food/beverage service activities	2,845
JA	58 - 60	Publishing, motion picture/video/television programme production, music publishing, broadcasting	7,739
JB	61	Telecommunications	2,828
JC	62 - 63	Computer programming/consultancy, information service activities	10,863
K	64 - 66	Financial and insurance activities	6,537
L	68	Real estate activities	4,492
MA	69 - 71	Legal/accounting activities, management consultancy, architectural/engineering activities, technical testing	7,922
MB	72	Scientific research and development	2,249
MC	73 - 75	Advertising/market research, other professional/scientific/technical activities, veterinary activities	649
N	77 - 82	Rental/employment/security activities, travel agency, facility management, office/business support activities	5,925
P	85	Education	542
Q	86 - 88	Human health and social work activities	1,776
R	90 - 93	Arts, entertainment and recreation	837
S	94 - 96	Other service activities - repair of computers/personal/household goods, other personal service activities	478

Trailing DEPV/Invested Capital Multiples									Trailing Invested Capital Regression		
$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	$\hat{y}$ = DEPV (TEUR)	$\bar{R}^2$	se_y
0.57	0.06	0.56	0.23	0.56	0.83	[0,54 ; 0,59] (92,3)	0.13	0.64	$\hat{y}$ = 1,138 x IC - 56.286	0.99	217,736
0.52	0.32	0.51	0.37	0.53	0.64	[0,52 ; 0,52] (382,3)	0.50	0.44	$\hat{y}$ = 0,545 x IC - 283.065	0.88	6,421,263
0.65	0.01	0.65	0.39	0.64	0.90	[0,64 ; 0,67] (203,8)	0.04	0.48	$\hat{y}$ = 0,851 x IC + 148.103	0.98	4,064,197
0.73	0.57	0.73	0.52	0.76	0.90	[0,72 ; 0,74] (158,1)	-0.11	0.36	$\hat{y}$ = 0,738 x IC + 104.054	0.95	598,927
0.75	0.43	0.77	0.45	0.84	1.07	[0,74 ; 0,77] (157,3)	-0.40	0.46	$\hat{y}$ = 1,055 x IC - 77.667	0.97	498,530
0.52	0.33	0.51	0.33	0.50	0.69	[0,52 ; 0,53] (77,5)	0.40	0.40	$\hat{y}$ = 0,590 x IC - 120.948	0.87	10,283,546
0.76	0.18	0.76	0.56	0.76	0.96	[0,75 ; 0,76] (463,1)	-0.16	0.36	$\hat{y}$ = 0,896 x IC - 658.893	0.96	3,632,603
0.76	0.24	0.78	0.55	0.82	1.00	[0,75 ; 0,77] (239,3)	-0.58	0.40	$\hat{y}$ = 0,979 x IC - 772.300	0.98	4,030,498
0.69	0.23	0.69	0.48	0.74	0.85	[0,68 ; 0,69] (351,3)	-0.27	0.39	$\hat{y}$ = 0,718 x IC - 218.185	0.84	3,676,105
0.51	0.17	0.49	0.30	0.46	0.66	[0,51 ; 0,52] (578,3)	0.75	0.53	$\hat{y}$ = 0,261 x IC + 712.022	0.73	1,656,645
0.68	0.48	0.67	0.46	0.62	0.90	[0,67 ; 0,68] (684,4)	0.25	0.43	$\hat{y}$ = 0,643 x IC - 53.535	0.91	2,028,954
0.70	0.50	0.69	0.49	0.64	0.88	[0,69 ; 0,70] (444,2)	0.32	0.38	$\hat{y}$ = 0,653 x IC + 89.966	0.96	1,529,708
0.66	0.44	0.66	0.39	0.64	0.93	[0,66 ; 0,67] (793,0)	0.09	0.48	$\hat{y}$ = 0,289 x IC + 1.412.029	0.52	2,889,568
0.60	0.18	0.59	0.34	0.57	0.83	[0,60 ; 0,61] (702,9)	0.31	0.50	$\hat{y}$ = 0,570 x IC - 1.109.305	0.77	7,422,832
0.66	0.33	0.66	0.37	0.67	0.93	[0,65 ; 0,67] (360,7)	0.01	0.48	$\hat{y}$ = 0,712 x IC + 3.151	0.88	1,055,005
0.56	0.28	0.55	0.38	0.53	0.74	[0,56 ; 0,57] (412,4)	0.31	0.47	$\hat{y}$ = 0,482 x IC + 649.737	0.89	4,111,364
0.48	0.31	0.46	0.33	0.43	0.56	[0,47 ; 0,48] (109,3)	1.06	0.46	$\hat{y}$ = 0,437 x IC + 173.736	0.91	2,237,884
0.58	0.28	0.57	0.35	0.55	0.79	[0,58 ; 0,58] (1.083,7)	0.25	0.52	$\hat{y}$ = 0,678 x IC - 102.151	0.82	3,284,454
0.59	0.25	0.58	0.35	0.55	0.81	[0,59 ; 0,60] (1.172,4)	0.29	0.53	$\hat{y}$ = 0,464 x IC + 158.892	0.92	2,581,782
0.47	0.05	0.44	0.24	0.37	0.65	[0,46 ; 0,47] (639,2)	0.83	0.62	$\hat{y}$ = 0,256 x IC + 1.426.877	0.46	3,512,891
0.62	0.44	0.60	0.42	0.58	0.76	[0,61 ; 0,62] (274,7)	0.44	0.41	$\hat{y}$ = 0,554 x IC + 121.412	0.77	1,327,765
0.67	0.31	0.67	0.42	0.67	0.89	[0,67 ; 0,68] (928,8)	0.07	0.45	$\hat{y}$ = 0,570 x IC + 542.442	0.85	3,350,257
0.83	0.63	0.85	0.60	0.81	1.12	[0,82 ; 0,83] (329,3)	-0.39	0.36	$\hat{y}$ = 0,474 x IC + 2.838.712	0.88	4,697,864
0.66	0.32	0.65	0.37	0.63	0.93	[0,65 ; 0,66] (1.457,0)	0.13	0.50	$\hat{y}$ = 0,518 x IC + 457.773	0.67	2,692,101
0.65	0.12	0.65	0.43	0.66	0.89	[0,64 ; 0,65] (735,9)	-0.15	0.49	$\hat{y}$ = 0,375 x IC + 266.352	0.89	1,061,777
0.64	0.25	0.63	0.49	0.61	0.78	[0,64 ; 0,65] (288,2)	0.27	0.39	$\hat{y}$ = 0,481 x IC + 592.219	0.94	1,510,393
0.63	0.33	0.62	0.36	0.61	0.85	[0,62 ; 0,63] (951,1)	0.06	0.48	$\hat{y}$ = 0,332 x IC + 962.849	0.60	2,352,455
0.71	0.32	0.72	0.47	0.73	0.98	[0,70 ; 0,72] (279,0)	-0.24	0.46	$\hat{y}$ = 0,979 x IC - 617.608	0.97	3,082,282
0.57	0.26	0.56	0.28	0.53	0.79	[0,55 ; 0,59] (76,5)	0.34	0.57	$\hat{y}$ = 0,770 x IC - 17.084	0.88	244,484
0.63	0.16	0.62	0.43	0.61	0.81	[0,62 ; 0,63] (540,6)	0.08	0.44	$\hat{y}$ = 0,227 x IC + 1.895.152	0.40	60,862,608
0.66	0.46	0.67	0.47	0.70	0.84	[0,65 ; 0,68] (49,9)	-0.15	0.40	$\hat{y}$ = 0,640 x IC - 10.926	0.88	908,102
0.74	0.50	0.74	0.57	0.70	0.93	[0,73 ; 0,75] (150,1)	0.05	0.35	$\hat{y}$ = 0,647 x IC + 370.695	0.82	1,438,741
0.68	0.42	0.68	0.43	0.59	0.97	[0,66 ; 0,70] (105,0)	0.17	0.47	$\hat{y}$ = 0,603 x IC + 79.552	0.82	253,494
0.51	0.03	0.51	0.28	0.50	0.75	[0,49 ; 0,52] (63,4)	-0.11	0.48	$\hat{y}$ = 0,227 x IC + 1.339.999	0.38	216,463,586

News from IVSC

New IPEV Guidelines incorporate IVS

The International Private Equity Valuation (IPEV) board has published its latest valuation guidelines incorporating IVS.

The IPEV Guidelines set out recommendations, intended to represent current best practice, on the valuation of Private Capital Investments. The objectives of these Valuations Guidelines is to set out best practice where Private Capital Investments are reported at 'Fair Value' and hence to help investors in Private Capital Funds make better economic decisions.

In the latest edition of the Guidelines, the IPEV Board notes:
„A valuation of Private Capital Investments prepared in accordance with the International Valuation Standards (IVSs) and following these Valuation Guidelines will be consistent with the requirements of applicable financial reporting standards and will also maximise investor's trust and confidence."

» Find out more...

IVS are being updated – Find out more!

The International Valuation Standards Council (IVSC) is set to host a series of three webinars on May 9th, 11th, and 16th to share and discuss proposed updates to the International Valuation Standards (IVS). These proposed changes will be open for public consultation for 12 weeks, starting at the end of April 2023.

Representatives of the IVSC's technical standards boards will lead the webinars, providing an opportunity for stakeholders to learn more about the proposed changes and the reasons behind them. Participants will also be able to ask technical representatives questions and gain insights into the standard-setting process.

The webinars are open to anyone and have been scheduled to accommodate different time zones. IVSC encourages interested individuals to sign up now and take advantage of this opportunity to learn more about the proposed updates to the IVS.

Register here:

- Tuesday, **9 May 2023** – 13:00-14:30 (UK/BST) – » Webinar Registration - Zoom
- Thursday, **11 May 2023** – 13:00-14:30 (US/EDT) – » Webinar Registration - Zoom
- Tuesday, **16 May 2023** – 12:00-13:30 (Singapore/SGT) – » Webinar Registration - Zoom

IVSC and WIPO to collaborate

IVSC and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations, have signed a Memorandum of Understanding (MoU) to strengthen cooperation and collaboration on issues related to the valuation of intellectual property and other intangible assets. The MoU will facilitate the exchange of information and expertise between the two organisations, and will include collaboration in research and development activities, training and capacity building, and the promotion of best practices in the valuation of intellectual property and other intangible assets. WIPO leads the development of a balanced and effective international IP system that enables innovation and creativity. In the context of broader efforts to ensure that intangible assets support entrepreneurs and enterprises globally, WIPO is making the valuation and financing of intellectual property a key area of focus.

WIPO
WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

» Find out more

Global experts appointed to IVSC Business Valuation Board

IVSC is pleased to announce the appointment of seven new members to its Business Valuation Board (BVB). The appointments come as part of the IVSC's ongoing efforts to broaden the Board's geographic field of expertise and enhance its collective skillset.

Business and intangible asset valuation play a critical role in today's global economy, as these assets often make up the majority of a company's value. As such, it is crucial that these valuations are performed in a consistent and transparent manner, in line with international standards. The BVB is responsible for developing these standards and ensuring that they remain relevant and up-to-date.

The new appointees bring a wealth of experience from a range of fields, including M&A, financial reporting, and standard setting. They are prominent in their areas of expertise and include global valuation leaders in professional bodies, global investors, and multinational firms.

» Find out more...

Mary Barth Appointed to IVSC Board of Trustees

IVSC is pleased to announce the appointment of Professor Mary Barth to its Board of Trustees on an initial three-year term. Mary is the Joan E. Horngren Professor of Accounting, Emerita at Stanford University, Graduate School of Business (GSB). Previously, she was on the Harvard Business School faculty and an Arthur Andersen & Co audit partner. She currently serves as Vice Chair of the Trustees of the Financial Accounting Foundation (FAF), and was a member of the International Accounting Standards Board (IASB), President of the American Accounting Association (AAA), and International Monetary Fund External Audit Committee chair.

» Find out more...

News from EACVA

Certified Valuation Analyst (CVA)

– International Course Dates 2023 –

EACVA is the largest business valuation association in Europe with almost 18 years of experience supporting the business valuation profession. As a European Chapter of NACVA EACVA provides the globally recognized **Certified Valuation Analyst (CVA)** certification, having trained over 1,400 individuals in Europe since 2005. CVA is the most widely recognized business valuation credential and the *only* business valuation credential accredited by the National Commission for Certifying Agencies (NCCA®) and the ANSI National Accreditation Board® (ANAB®). CVA Training (45 hours of class instruction) delivers the most comprehensive and complete foundational training teaching to the International Body of Knowledge for Business Valuations on how to value business enterprises, on business valuation methodologies, approaches, and case studies, professional standards and ethics, specialty areas of business valuation and valuation of intangible assets practice.

Course Dates:

- **10 – 17 May 2023** – live online six-day training (Wednesday to Friday & Monday to Wednesday / 45 hours of continuing training credit)
- **4 – 8 December 2023** – in-person five-day training (Monday to Friday / 45 hours of continuing training credit) Training Location: Hotel Palace Berlin, Germany
- Proctored CVA Exam – in a testing center or via live remote proctoring

Our experienced team of renowned instructors will prepare you to pass the business valuation certification (CVA) exam. Understanding and applying the generally accepted business valuation methodologies and approaches and adhering to professional standards that govern the business valuation profession, will put you in a stronger position to better serve your clients.

» Learn more and register...

EACVA's International Business Valuation Conference

30 November and 1 December 2023 I Hotel Palace Berlin

We cordially invite you to attend our 16th International Annual Business Valuation Conference in Berlin – *THE premier networking event for business valuation professionals form Europe and around the globe*. It will provide an exciting learning opportunity for all attendees to hear from some of the most renowned speakers in the business valuation field while connecting and networking with other valuation professionals. It will provide an exciting learning opportunity for all attendees to hear from some of the most renowned speakers in the business valuation field while connecting and networking with other valuation professionals.

Save the Date! More information will be soon available at www.ValuationConference.de

EACVA's Live Web Seminar: Valuation Meets ESG & Sustainability

– Analysis – Value Driver – Valuation – 20 April 2023

On **Thursday, 20 April 2023** at 14:00–16:15 (CET) EACVA will host a live web seminar on ESG & Valuation. Participants should get accustomed on how to integrate ESG (Environmental, Social and Corporate Governance) issues into business valuations. Different aspects of how to quantify risks, opportunities, assets, liabilities and cash flow effects will be explained in this web seminar.

Seminar Description: ESG and sustainability are not only buzzwords in today's business valuation. Investors, analysts and valuation appraisers more and more often take ESG-related topics into account when determining the value of businesses. They do it because it is today broadly understood that ESG and sustainability can have a real impact on the value discovery.
In this seminar we shed light on the most important aspects of ESG integration: How to include ESG into valuations; How far can we use our existing valuation framework for this? And where do we have to extent it? Where to look at from an analytical point of view? How can we translate this into a practicable valuation approach?

Content:

- The different shades of ESG aspects (and how to deal with them in business valuation)
- Balancing cost-benefit effects of ESG in business valuation
- Typical practical examples and how to deal with them in our valuation models
- Discussion & your questions to the speaker

Speaker: Prof. Dr. Matthias Meitner, CFA, *Managing Partner at VALUESQUE and Professor for Finance, Accounting & Business Valuation, International School of Management (ISM) in Munich, Germany*

» Learn more and register...

More Business Valuation Events 2023

Apart from Certified Valuation Analysts (CVAs) training and exam, EACVA also offers a range of events to both its members and professionals from the valuation industry in general to supply them with the know-how, tools and techniques to keep you up-to-date with current developments in business valuation: Annual Business Valuation Conference, Around the Valuation World International (monthly webcasts for EACVA/NACVA members), business valuation seminars (live online and in-person), etc.

Upcoming events:

- **27 March 2023**: Around the Valuation World international: Kroll Cost of Capital New Beta Module (Part II) – Carla Nunes, CFA, *Kroll*
- **24 April 2023**: Around the Valuation World international: DLOM – Ashok Abbott, Ph.D. MBA
- **22 May 2023**: Around the Valuation World international: ESOPs – Brady T. Finney
- **15 November 2023**: EACVA's Live Web Seminar: Start-Up Valuation – Analysis and Valuation of Young and Innovative Business Models – Prof. Dr. Matthias Meitner, CFA, *VALUESQUE / International School of Management*

» Learn more and register...

IVSC Members Introduce Themselves:

Created in 1969, the Compagnie nationale des Commissaires aux comptes (CNCC) is the only institute of Statutory auditors (commissaires aux comptes) in France.
It is an independent institute, recognised by Law and placed under the auspices of the Ministry of Justice.
It gathers 11,600 individuals and 6,300 firms who are all statutory auditors in public practice.

How would you describe your organisation?

The CNCC represents, supports, and promotes the profession vis à vis the public authorities (Ministries, Government, Parliament...), the regulators (audit regulator, but also market regulators and prudential regulators) and more widely all the other stakeholders of the profession. It also provides technical support to the profession by issuing guidance on a wide range of questions related to auditing, assurance, ethical and legal matters and valuation issues. It jointly sets professional standards with the French Audit regulator (Haut Conseil de Commissariat aux comptes – H3C) based on international standards (ISAs). It offers continuous education to its members. It has a very important thought leadership role on the future and the attractiveness of the profession.

Please tell us about your member structure.

As mentioned above, our members must register with the institute to be allowed to practice as a statutory auditor. We therefore gather all the profession from the Big 4 to SMPs and sole practitioners.

What are your member benefits?

Our members practice statutory audit of course, but they are also allowed to provide other services to their audit clients, as long as it does not threaten their independence, and they can also provide other services to non audit clients. In that context, the CNCC has a Valuation Commission that deals with various issues faced by valuation practitioners. It also organises yearly a valuation day that deals with the most important topics of the year in the field of valuation. Membership of the IVSC would enable the CNCC members to:

- be up to date with the most recent developments of the international valuation standards (IVS),
- build on the work of the IVSC in order to remain in line with the most up to date good practices,
- reinforce their professional competence,
- promote the attractiveness of the profession to young professionals.

What are the most challenging valuation topics for your members right now?

At present the Valuation Commission of the CNCC works on three very challenging issues:

- valuation in a context of crisis (COVID, inflation, war in Ukraine…),
- the integration of sustainability in business valuation,
- the data analysis.

What valuation standards do your members follow?

There are no valuation standards endorsed by law in France. Nevertheless, the IVSC standards constitute a frame of reference and the CNCC's Valuation Commission regularly publishes doctrinal works and guidance relating to valuation matters.

What is the "raison d'être" of your organisation?

To promote the missions and ethical principles of statutory auditors, a profession of public interest that creates conditions of trust, transparency and security in the economic, social and environmental spheres, and to stimulate innovation, to support its members' desire for progress and to assist them in meeting the needs of companies and markets, as well as societal expectations. The CNCC's Valuation Commission is fully in line with this perspective.

Why are you member with IVSC?

The main objective of the CNCC is to be a key player in transparency, financial security and prevention. By becoming a member of the IVSC, the CNCC has strengthened its public interest role by joining an organisation that shares its values of strong ethics and robust standards, in line with the IVSC's mission which is "to ensure consistency, transparency and comparability." ◆

Certified Valuation Analyst (CVA)

- Business Valuation is a Question of Trust -

Credentialing Training and Exam (in English) Dates 2023

Date	Delivery Method
10 – 17 May 2023	**Live Online** (six-day training: Wednesday to Friday and Monday to Wednesday)
4 – 8 December 2023	**In Person** in **Berlin** (five-day training: Monday to Friday)

For dates of CVA trainings and exams in German language please visit www.eacva.de.

Understanding and applying the generally accepted business valuation methodologies and approaches and adhering to professional standards that govern the business valuation profession, will put you in a stronger position to better serve your clients.

Taught by seasoned business valuation experts, this training delivers the most comprehensive and complete foundational training, teaching to the international body of knowledge for a business valuation designation.

To learn more visit www.EACVA.com/certified-valuation-analyst or contact EACVA at: info@eacva.de or +49 69 247 487 911.

European Association of Certified Valuators and Analysts (EACVA)

EBVM

The European Business Valuation Magazine

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