Business Valuation is a Question of Trust

EBVM

The European Business Valuation Magazine

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Volume 3
Issue 3 Fall 2024

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Framework for Start-up Valuation

This article aims to develop a model to value companies in their initial phases of development. The premise of the article is that start-up companies are perplexing to value. Each of the standard approaches to valuation, such as income, asset or market-based method, reveals its infirmity or significant limitations when confronted with the challenge of valuing start-ups. As a result, many valuation methods yield unrealistic numbers. We are presenting a framework that creates a coherent environment for successful start-up valuation. It emphasizes the following components: fundamentals of DCF valuation, intellectual capital contributions, embedded real options, calibrated capital structure, sensitivity and scenario analysis, coherent model with iterative financial functionalities.

The System Approach and Its Use in Asset Valuation

This article deals with the application of a systemic approach to the valuation of rights to immovable property. Emphasis is placed on a structured approach to assessing the characteristics of immovable property on which the value depends, as well as the essential characteristics of the surroundings that significantly affect the owner's utility and therefore the value of the property. The aim of the paper is thus to show the possibilities of using systems theory and the systems approach in solving valuation problems so that valuers can base their valuation on clear contexts that contribute to the quality of the valuation and facilitate the correct interpretation of valuation results.

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Call for Papers: EBVM

The EBVM aims to advance the knowledge and understanding of business valuation practice in Europe. Our mission is to provide a platform for the exchange of cutting-edge research, innovative techniques and practical experience in the field of business valuation.

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We look forward to receiving your contributions and working with you to promote excellence in business valuation. Please email your contributions, questions or suggestions (also on other topics) to EBVM@eacva.de.

From the Editors

The Business Valuation "Loser's Game" and the Big Valuation Picture

Our life as business valuation experts is not an easy one. We have to master capital market theory as well as well as statistics to derive proper discount rates. We have to understand taxation and commercial accounting rules in order to set up sound financial statement forecasts. We have to manage business model, competitive environment and boader market dynamics analysis in order to make or check cash flow projections, etc.

In theory, we could easily spend weeks or months with every single above-cited business discipline in every single valuation case. We could go deeper and deeper into every detail, run more and more analyses, approach the problems from yet another angle, etc. But in practice, things are quite different: Time and remuneration budget constraints, a lack of information availability and the general uncertainty about the future pose limits to our analytical efforts. And such limitations inevitably lead to our valuation works and outcomes being – by the very nature of practical circumstances – always a bit incomplete. This is quite an unsatisfying aspect of our work as valuation experts which ultimatively raises the question: how can we optimise the quality of valuation results in such an environment?

In 1970, Simon Ramo published a book called "Extraordinary Tennis for the Ordinary Tennis Player". In this book he showed that amateur tennis is a typical loser's game where most points are made by mistakes of the opponent player – in contrast to professional tennis where most points are made by winner shots. His advise to amateur tennis players: Just avoid making mistakes! In 1975, Charles Ellis demonstrated in his famous article "The Loser's Game", published in the Financial Analyst Journal, that equity investing is also a loser's game: Due to the complexity of the world, investors do best by avoiding severe mistakes and not by trying to optime every single performance contributor. And business valuation is not different, it is also a loser's game: The best valuation results in a world of uncertainty and complexity are achieved when keeping a holistic view rather than risking to make mistakes by wandering in a maze of details.

What does this mean for our work? While we certainly cannot fully ignore the many details of business valuation we should nevertheless step back at different points of our valuation process and have a look at the big valuation picture: Does this risk parameter really fit to our business model? Is this margin development seen at any other company in the industry? Do multiples support my DCF results? Does it all fit together? Only if we revisit these roots of valuation we can check whether it all makes sense. Don't give away this important way of adding quality to your valuation results.

We hope you enjoy reading this EBVM issue and look forward to your feedback

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Imprint

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Publisher:
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ISSN 2940-8849

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Magazine typesetting:
Main-Post GmbH

Submission Dates:

Issue:	Submssion Dates:
Winter 2024:	15 November 2024
Spring 2025:	15 February 2025
Summer 2025:	15 May 2025

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Framework for Start-up Valuation

This article aims to develop a model to value companies in their initial phases of development. The premise is that start-up companies are perplexing to value. Each of the standard approaches to valuation, such as income, asset or market-based method, reveals its infirmity or significant limitations when confronted with the challenge of valuing start-ups. As a result, many valuation methods yield unrealistic numbers.
We present a framework that creates a coherent environment for successful start-up valuation. It emphasizes the following components: fundamentals of DCF valuation, intellectual capital contributions, embedded real options, calibrated capital structure, sensitivity and scenario analysis, coherent model with iterative financial functionalities.

I. Introduction

Start-up companies are difficult to value. Each of the standard approaches to valuation reveals its infirmity or significant limitations when confronted with the challenge of valuing[1] start-ups. *Income-based methods* are difficult to use since young businesses typically have a short history with little or no revenues. For the same reason, the estimation of the cost of capital component that is to capture the project risk poses a huge challenge too. *Asset-based* methods are of little use since the start-up value usually lies in their future potential and not in the existing assets whose value at this stage is often negligible. *Market-based methods* rely on ratios that refer to certain benchmarks (earnings, EBITDA, sales), many of which are likely to be negative and consequently would generate negative valuations. Other methods such as Venture Capital Method, Pre-money and Post-money Valuation or First Chicago Method can only be called „crude or dirty" since they are basically simplified versions or combinations of the standard three approaches and as such share all the shortcomings when deployed to value young companies. For all the above reasons, many standard valuation techniques applied to young companies yield highly volatile numbers and the models that are used are very sensitive to any change in the parameters. Each valuation technique run the risk of embedding unrealistic assumptions.

According to *Damodaran „there are four pieces that make up the intrinsic valuation of start-ups a puzzle*:

- *the cash flows from existing assets,*
- *the expected growth from both new investments and improved efficiency on existing assets,*
- *the discount rates that emerge from our assessments of risk in both the business and its equity, and*
- *the assessment of when the firm will become a stable growth firm."*[2]

We also share *Damodaran's* view that "the value of a firm is the present value of expected cash flows generated by it, discounted back at a composite cost of capital that reflects both the sources and costs of financing used by it. This general statement applies no matter what kind of firm we look at, but the ease with which cash flows and discount rates can be estimated can vary widely across firms."[3]

Admittedly, the estimation of cash flows and discount rates in the case of young companies is challenging, but the fundamentals of valuation continue to apply.

In this paper, we aim to portray a framework that is a complex platform providing scope for determining inputs relevant to valuing companies in their initial phases of development and necessary tools for the integration of the inputs. Our framework reflects the complexity of start-ups valuation and emphasizes a range of components (fundamentals of DCF valuation, intellectual capital contributions, embedded real options, calibrated capital structure, sensitivity and scenario analysis, coherent models with iterative financial functionalities), some of which are highlighted in the literature review below. The components provide a scaffolding needed for a start-up valuation, which enables cohesion, rounds of calibration, captures flexibilities and growth potential, quantifies risk. Consequently, the iterations are ubiquitous across all the modules and contribute significantly to the valuation precision. The model should bridge the gap between theory and industry contemporary practice and needs.

II. Literature review

In this section, we review selected models and procedures of start-up valuation. Equity valuation models have continued to advance since the works of and *Fisher*[4] and *Williams*[5] who created the first model of DCF valuation and then *Gordon/Shapiro*[6], who further developed a concept of the required rate of return. Since then, research related to common equity valuation has grown tremendously and is one of the most researched topics in the finance literature. The research is followed by thousands of practitioners conducting business appraisals for mergers and acquisitions, privatization, liquidations, divorce cases, most of which require from them the unique quality of bringing together the art and the science of financial markets. A review of current practice advocates that consistency and cohesion between the diverse concepts that are used can add value to start-up valuation practice.

The emergence of high technology, shared economy or social media industries at the beginning of the 21st century, characterized by new transformative business models and negative earnings that persist for several years, has presented a challenge to traditional valuation methodology. In the following, we want to understand the term start-up as a collective term for young companies that are in the early seed stage, the young growth stage or the high growth later stage. Damodaran's paper was one of the first approaches to tackle the problem. He admits that „valuing companies early in the life cycle is difficult, partly because of the absence of operating history and partly because most young firms do not make it through these early stages to success". [7] The companies are characterized by the following factors:

- no history,
- small or no revenue and
- operating losses,

1 According to Damodaran "the payoff to doing valuation (instead of pricing) is greatest for these (start-up) businesses" () additions by the author; Damodaran, The Corporate Life Cycle, 2024, chapter 10 (Start-up and Young-Growth Businesses): 213.

2 Damodaran, Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges, 2009, SSRN paper Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges (last access: 12.09.2024).

3 Damodaran, The Dark Side of Valuation: Firms with no Earnings, no History and no Comparables, 2008, SSRN paper (last access: 12.09.2024).

4 See Fisher, Mathematical Investigations in the Theory of Value and Prices, 1892; Fisher, The Theory of Interest, 1930; for an analysis of the historical development see Parker, Discounted Cash Flow in Historical Perspective, Journal of Accounting Research, vol. 6, no. 1 (Spring, 1968): 58-71.

5 See Williams, The Theory of Investment Value, 1938.

6 See Gordon/Shapiro, Capital Equipment Analysis: The Required Rate of Profit, Management Science, vol. 3, no. 1 (1956): 102–110.

7 See Damodaran, Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges, 2009, SSRN paper (last access: 12.09.2024).

- dependence on private equity and
- the fact that many do not survive.

Then, he lists the challenges that are typically faced when valuing young companies:

- existing assets,
- growth assets,
- discount rates,
- terminal value and
- value of equity claims.

His main conclusion is that although valuing a young company poses a myriad of uncertainties, such companies still should be valued systematically after an appropriate valuation model has been chosen, no matter if this is a discounted cash flow, relative or real options valuation.

Many recent articles have attempted to address the valuation problems of start-up, early-stage young growth or high growth firms.[8] They often discuss the problem of valuating intellectual property[9] or applying the real-option theory[10]. Methods based on options theory have a strong scientific background but are not commonly used in practice. The assumption is that that many events in a firm have the same characteristics as options, and their payoffs mimic the payoffs of financial options. In general, it applies to equity too. Shareholders are in fact in possession of a call option: max (**V–D, 0**) – they will obtain the difference between the company's value (**V**) and its liabilities (**D**), or nothing, which is exactly the payoff of a call option. Thus, a firm can be seen as a portfolio of such real options. Their sum makes the company's value.[11]

Estimating the cost of capital is one of the problems faced when valuing young companies.[12] The iterative approach to equity valuation eliminates deficiency in the capital asset pricing model (CAPM) which is commonly used by appraisers to calculate discount rates. The main assumption behind the iterative model is that the costs of equity should capture the risk immanent in the capital structure.[13] It should track the structure and change whenever the debt-to-equity ratio alters. After several iterations, the model eventually obtains a unique solution for equity that is independent of the initial choice of equity.[14]

Matthias/Wimber begin their paper with an observation that „start-up firms typically produce negative cash flows in the first years after their foundation. Consequently, standard discounted cash flow methods are not applicable (…)"[15]. Then, they are trying to prove that the real options approach is especially advantageous in the realm of start-up firms. Those investing in start-ups finance growth opportunities and thereby acquire real asset options. Option valuation models, as opposed to DCF models, can adequately account for the option-like feature of start-up investment. In the paper, they combine the valuation techniques of real options pricing and optimal capital structure models. The model tries to capture the fact that many start-ups typically exhibit only a limited number of projects that have already been materialized, but at the same time hold potentially valuable additional investment options. Their model also allows for the derivation of optimal conditions for exercising the waiting option to invest in a start-up as well as its optimal capital structure upon establishment. They also show how unexercised additional options to invest (growth options) – even if producing negative cash flows at the time of investment – may significantly contribute to the start-up firm's value.

III. Framework and procedure

DCF methods are often perceived as having the following disadvantages[16]:

- Requires a large number of assumptions
- Prone to errors
- High level of detail can lead to overconfidence
- Tends to be overly complex
- Very sensitive to changes in assumptions
- Looks at company valuation in isolation
- Doesn't look at relative valuations of competitors
- Terminal value is difficult to estimate and represents a large proportion of the total value
- Weighted Average Cost of Capital (WACC) is difficult to estimate.

The more unique and the younger the business model or idea, the lower the visibility of the future the more difficult it is to implement. However, we believe that the benefits of addressing and ultimately answering all the challenging individual questions far outweigh the disadvantages. To achieve this, the analysis and valuation process should be well structured and intersubjectively verifiable.

8 Besides Damodaran's The Dark Side of Valuation: Valuing Young, Distressed, and Complex Businesses, 3rd ed, 2018; see Jackman/Puca, Discounted Cash Flow Method, in: Puca, Early Stage Valuation – A Fair Value Perspective, 2020: 141-175; Damodaran, The Corporate Life Cycle, 2024, chapter 10 (Start-up and Young-Growth Businesses), chapter 11 (High Growth Companies); Metrick/Yasuda, DCF Analysis of Growth Companies, in: Venture Capital & the Finance of Innovations, 2nd ed. 2021: 167-182, Isaksson/Fredriksen, 2020, Venture capital firms valuation in bull and bear markets: evidence from Sweden, International Journal of Entrepreneurship and Innovation Management, vol. 24, no. 2-3 (2020): 97-115; Mirzanti/Sinaga/Soekarno, Determinant factors in digital start-up valuation for agro seed funding, International Journal of Agricultural Resources, Governance and Ecology, vol. 15, no. 4 (2019): 338-357; Wessendorf/Kegelmann/Terzidis, Determinants of early-stage technology venture valuation by business angels and venture capitalsts", International Journal of Entrepreneurial Venturing, vol. 11, no. 5 (2019): 489-520.

9 See Uzma, A paradigm analysis of valuation of intellectual property, International Journal of Intellectual Property Management, vol. 9, vo. 1 (2016): 5-15; Kijek, Market valuation of innovation capital, International Journal of Innovation and Learning, vol. 15, no. 4 (2014): 411-421.

10 See Collan/Haahtela/ Kyläheiko, On the usability of real option valuation model types under different types of uncertainty. International Journal of Business Innovation and Research, vol. 11, no. 1 (2016): 18-37; Trigeorgis, Real Options, 1999; Kellog/Charnes, Real Options Valuation for a Biotechnology Company, Financial Analysts Journal, May–June (2000): 76–84.

11 See Capinski/Patena, Company Valuation – Value, Structure, Risk, 2008: 75-83; Luehrman, Strategy as a portfolio of real options, Harvard Business Review, September–October 1998: 89-98.

12 See Damodaran (2018), op. cit. (footnote 8): 290-296.

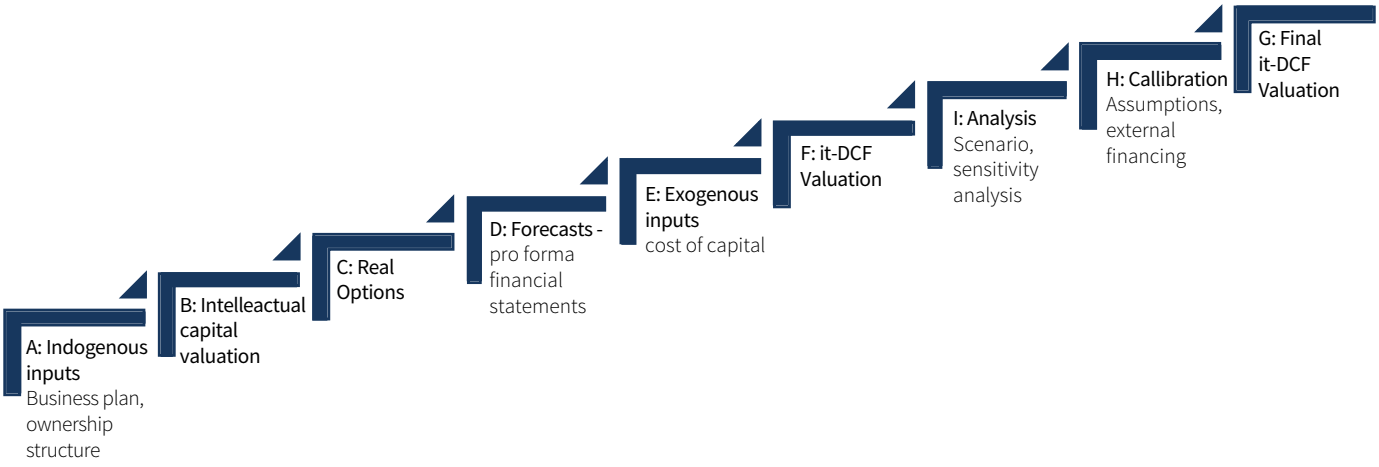
13 See Capinski/Patena, A New Method of DCF Valuation, Nowy Sacz Academic Review, 2 (2005): 35-41.

14 See Larkin, To Iterate Or Not To Iterate? Using The WACC In Equity Valuation, Journal of Business & Economics Research, vol. 9, no. 11 (2011): 29-33.

15 Bank/Wibmer, Start-up firm valuation: A real option approach, 2012, SSRN paper (last access 12.09.2024).

16 See for example CFI, DCF Analysis Pros & Cons (last access 12.09.2024).

Figure 1: Iterative DCF valuation



The framework presented in the paper is a fully integrated valuation procedure primarily based on the DCF model which is thoroughly augmented by embedding a few concepts and modules that create a coherent, conducive to start-up valuation, environment.[17]

- Interactive Financial Forecasting system based on business analysis
- Iterated DCF valuation model (it-DCF).
- Concepts of real options valuation.
- Intellectual capital valuation.
- Sensitivity and scenario analysis.
- Sanity Checks

All these concepts, once integrated into one coherent procedure, allow for the successful valuation of start-up companies. The models, mostly due to its unique characteristics such as integration via iterations and permanent calibration, helps to avoid pitfalls of traditional or dirty valuation methods when applied to young companies. Figure 1 shows the phases in the valuation process.

1. Interactive Financial Forecasting system based on business analysis

The guide for entrepreneurs and anyone who runs a business is the business plan. [18] It outlines the goals, strategies and operations that a company will use to achieve its objectives over a period of time. With a focus on start-up a business plan as well as the starting analysis for a valuation should (at a minimum) cover the following points:

- Unique character of the idea in solving a specific problem or pain point faced by others (potential customers)
- Analysis of the degree of innovation (incremental vs. radical, market pull or technology push): What?, Who?, How? and Where?
- Management Quality (and compensation)
- Analysis of the market and market share (TAM, SAM, SOM) and the path pattern as well as the speed with which the company can achieve it
- Analysis of competition
- Marketing and sales strategy
- Operational plans and supply chain analysis
- Investment and financing strategy

According to *Hamann/Halw/Guenther*[19] meta-analyses of 139 articles from 64 different journals and 19 non-journal publications, the business planning drives success of a company. This is in line with empirical studies like *Welter*[20], which also found that a company's success is correlated with how it plans to operate.

Finally, the projection of pro forma financial statements is a starting point for calculating free cash flows and then the company's value in any DCF model. They are an immanent part of the iterative DCF valuation model (it-DCF) which also includes free cash flow, cost of capital and valuation engine modules. The precision of the projections determined largely by how coherent the *pro forma* financial statements and the other modules are. An Interactive Financial Forecasting System (IFF) consists of all *pro forma* documents: balance sheets, income statements, cash flow statements, ratio analysis and can be built in standard spreadsheets.

Calculations in pro forma documents are interlinked. A change in one cell will trigger changes in many other cells (and finally in the valuation cell). First, the system needs two plugs that would balance the assets and liabilities. Typically, cash and short-term debt are the plugs. The short-term debt being a plug automatically adjust whenever the assets exceed liabilities. Otherwise, cash (the plug in the assets section) takes over and adjusts the cash level if there is a surplus of equity and li-

17 See also Patena, Iterative Techniques in Company Valuation, The Quarterly e-finance, no. 6 (2010): 14-27.

18 See Koeseoğlu, From Planning to Valuation: Mastering Business Planning and Sensitivity Analysis for Your Startup, in: Koeseoğlu, A Practical Guide for Startup Valuation: An Analytic Approach, 2023.

19 See Hamann/Halw/Guenther, Meta-analysis of the corporate planning–organizational performance relationship: A research note, Strategic Management Journal, July 2023: 1587-1835.

20 See Welter, The road to entrepreneurial success: Business plans, lean startup, or both?, New England Journal of Entrepreneurship, vol. 24, no. 1: 21–42.

abilities over assets. Cash is kept on the operationally justified level, irrespective. *Koller/Goedhardt/Wessels* coined the „reorganizing of balance sheets and income statements" phrase to explain the process.[21]

Technically, for the sake of such calculations, the spreadsheet needs to be switched into a manual calculation mode. The solution is provided through iterations enabled in MS Excel (preferences, calculation options, manual and iterative calculations). The model has dozens of such interlinked cells. For example, an increased cash level will impact the net income via the interest on deposits (which are related to cash levels). However, the higher net income will translate into even more cash in the next year, on the assumption of a certain pay-out ratio. Besides, the model is based on a set of assumptions (revenue growth, costs structure, plow back ratio, profit margin, interest on deposits and loans, etc.), that are predefined, but then can and should be redefined in the calibration phase.

It is important to note that any accumulation of cash should reduce the owners' risk (cost of equity), since cash has a beta of zero, and that any interest earned on cash will be a tax tax burden (conversely, like the tax shield of interest-bearing debt).[22]

The IFF system creates a coherent and fully integrated environment for financial planning and building pro forma financial statements. The impact of change in a single parameter may be easily tracked. Integrating IFF into the it-DCF valuation model (cf. section 2 below) allows creating hypothetical scenarios, conducting sensitivity analysis and simulations for various sets of inputs.

2. Iterative DCF (it-DCF) Valuation, capital structure and the cost of capital

The premise underlying DCF valuation is as follows: a company value (enterprise value, $\mathbf{V}$) is the present value of all the Free cash flows the company will generate in the future. The model has three components: Free cash flows, costs of capital (WACC) and discounting process.

$$V_0 = \frac{FCF_1}{\left(1+k_{WACC}\right)^1} + \frac{FCF_1}{\left(1+k_{WACC}\right)^2} + \ldots$$

and

$$V_0 = E_0 + D_0;$$
$$E_0 = V_0 - D_0$$

with

$$k_{WACC} = k_E \frac{E}{V} + k_D \left(1-T\right)\left(\frac{D}{V}\right)$$

Let us focus on two key aspects of calculating the company's cost of capital (WACC). The first involves linking the cost of equity to the changing capital structure. In our view, relying on a fixed WACC throughout the life of a project or the company is not ideal, especially when the company's value drivers – such as risk, return, and growth – are expected to undergo significant changes in the future, as is often the case with the business plans of start-ups and young growth companies.

We recommend adopting a time-varying capital structure. Depending on the financing assumptions applied during the detailed planning period, certain DCF techniques can be more advantageous. When targeting a capital structure based on market values (value-based financing assumption), the WACC method is preferable. Conversely, when targeting a fixed amount of debt (autonomous financing assumption), the APV method is advantageous, as both approaches avoid circular reference issues in their calculations.

Similarly, the total or capital cash flow method can be effective under the assumption that the tax shield from net debt carries the same risk as the operating business – an assumption that is often reasonable for young companies. For terminal value cash flows, it is essential to assume a financial steady state with a constant capital structure extending indefinitely, consistent with the conditions assumed at the beginning of the terminal value period.[23]

It is important to note that changes in the capital structure directly impact the cost of debt, the cost of equity, and the values of both equity and debt. However, implementing a time-varying capital structure in real-life calculations presents a significant challenge. Since equity value ($\mathbf{E}$) influences the cost of equity (k_E), yet this cost is simultaneously needed to determine equity value, a numerical approach is often the most practical way to address these logical loops.[24]

In practice, these complexities can be resolved through iterative calculations, which can be effectively implemented using tools like MS Excel. A detailed explanation of this approach can be found in works such as *Capinski/Patena*[25]. The iterative method of company valuation (it-DCF) addresses a fundamental issue often overlooked in standard DCF valuations: the fact that the levered cost of equity and the overall cost of capital are both influenced by the company's financial structure.

Another problem with valuing young companies is the cost of capital. The standard approach to use the Capital Asset Pricing Model is difficult because such young companies are not traded. The regression analysis cannot be used to obtain β.

21 Koller/Goedhart/Wessels, Valuation, Measuring and Managing the Value of Companies, 7th ed. 2020: 211-246.

22 See Damodaran, Damodaran on Valuation, 2nd ed. 2006: 339-349.

23 For different assumptions relating financing policies see for example Inselbag/Kaufold, Two DCF approaches for valuing companies under alternative financing strategies and how to choose between them. Journal of Applied Corporate Finance 10 (1197): 114-122; Kruschwitz/Löffler, (Stochastic) Discounted Cash Flow, 2nd ed. 2020.

24 There are analytical solutions available, but not common in practice, see for example for debt planned independently of $\mathbf{V}$, Heitzer/Dutschmann, Unternehmensbewertung bei autonomer Finanzierungspolitik, ZfB (now Journal of Business Economics) (1999): 1463 ff.

25 See Capinski/Patena, A New Method of DCF Valuation, Nowy Sacz Academic Review, 2 (2005): 35-41.

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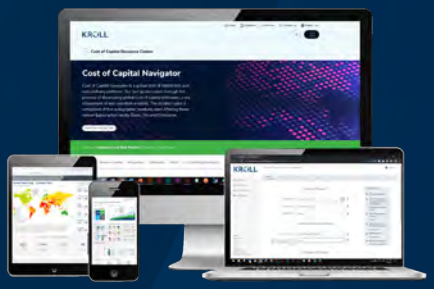

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Table 1: Rates of return required by venture capital investors

Authors \ Stage of Development	Seed Stage (Early Stage)	Young Growth (First / Second stage)	High Growth Later Stage (Later Stage / Bridge/IPO)
Everett, 2024 Pepperdine Private Capital Market Report 2024 (1– 3 quartile)	19.3%-68.3% (Pre Seed + Seed)	21.8%-29.3% (Start-up / Early Stage)	21.8%-25.5% (Growth / Expansion)
Honold/Wacker/Reiche: PwC (GER) Venture capital market study, 2023 (1–3 quartile)	18%-38% (n=28)	18%-31% (n=25)	16%-26% (n=13)
Damodaran 2009	50%-70%	35%-60%	25%-35%

According to *Bravo*, there is „evidence of a relationship between a firm's beta and the various stages of the corporate life cycle; a company's beta tends to decrease as it develops through the introduction, growth, and maturity stages, with the cost of equity being minimized in this last stage."[26]

The use of sector or peer group data (β), assuming that it would be possible to find „comparable" companies with similar return and growth expectations as well as comparable risk profile, does not solve the problem, as it is based on the assumption that we are experiencing diversifiable risk only. However, investors into young companies are typically idea or venture capital providers. Using estimated β, would assume that market risk only matters, and other risks are insignificant. According to Damodaran in the case of young companies or start-ups, it is difficult to assume that the investors are adequately diversified. [27]

Mueller[28] shows the following: „We show that owners exposed to idiosyncratic risk require higher returns as compensation for their risk exposure. The realisation of a business idea can therefore depend on the net worth of the potential entrepreneur. If the investment volume is large relative to the net worth, then the business idea needs to have a higher expected return in order to be realized. Furthermore, the available volume of additional bank or equity finance can be crucial, since it allows the potential entrepreneur to employ fewer of his or her own resources."

For that reason, he suggests using scaled β values, so-called total betas. Market beta in the equation below is a β value obtained for public companies listed in a stock exchange. Correlation between the companies used to find the β and the market is a scaling factor. For example, the biotechnology sector β is 2.57, whereas the correlation with the market is 29.42%, hence total beta is 4.33. In cases where investors are slightly better diversified, their correlation with the market is higher, and as a result, the total beta will be lower. If the company goes public (allowing full diversification), the original value of β (2.33) could be used again.

$$\beta_{\text{Total}} = \frac{\text{Market Beta}}{\text{Correlation with market}}$$

Typically, the costs of capital applied to start-up companies are very high. They have to reflect business risk, but also the probability that a company will not survive until its IPO. The Table 1 summarizes some statements and surveys[29] about the rates of return required by venture capital range, depending on a company's development stage.

3. Real options

Various flexibilities, which are immanent to any business project, are rarely captured by traditional methods of valuation. During the life of a project, the cash flows may be significantly lower or higher than the expected ones. When the cash flows are lower e.g. due to diminished demand or advert exogenous conditions, the project should be abandoned. In the case of favorable circumstances, we might be able to capitalize on success. Both decisions, to withdraw after failure or expand after success, depend on future events that are highly uncertain. The similarity with options theory seems obvious. A buyer of a „put" may exercise the option if the price of the underlying asset goes down, likewise, a buyer of a „call" may benefit from a situation when the price of an underlying instrument goes up. Hence, the expression „real options" is often used whenever referring to an option whose underlying assets are not financial instruments. Real options capture certain characteristics of projects that are ignored by the standard DCF approach: reversibility (projects can be abandoned or postponed), uncertainty (cash flow variability risk is considered) and flexibility (decisions concerning launching projects can be optimized). Real options categorization reflects the above

26 See Bravo, The Corporate Life Cycle and the Cost of Equity, Journal of Business Valuation and Economic Loss Analysis, 2019: 1-14, 12.

27 Damodaran, Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges, 2009, SSRN paper: 33.

28 Mueller, Returns to Private Equity –Idiosyncratic Risk Does Matter!, ZEW Discussion Paper No. 04-29, 3rd ed, 2009. Review of Finance, vol. 15, no. 3 (2011): 545–574. Here p. 29 of the open source discussion paper.

29 See Everett, Pepperdine Private Capital Market Report 2024: 67; See Honold/Wacker/Reiche: PwC (GER) Venture capital market study, 2023: 34; See Damodaran, Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges, 2009, SSRN paper: 15.

characteristics: deferral options, abandon options, contract options, and growth options.[30]

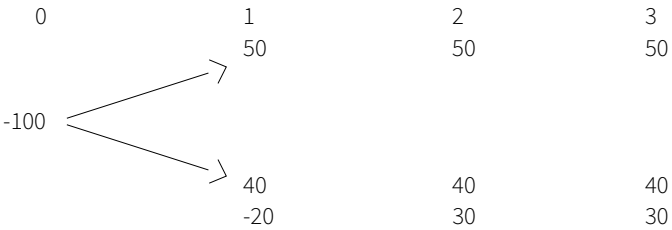
Here is a brief presentation of the basic ideas demonstrating the concept of a real option. If a company drills an oil well, it actually buys an option: if the drilling is fruitful, the company will launch the product. The expenses incurred during the exploration phase represent the option premium, and the cost of further investment incurred in the future T is the exercise price. The payoff depends on the success of the well and it is the difference between the value of the future expected cash flows (discounted to time $\mathbf{T}$) and the investment. The payoff is then given by the following formula: $\mathbf{max(0, R(T)-K)}$, where $\mathbf{K}$ is the value of the investment and $\mathbf{R(T)}$ is the value of the generated cash flows at time $\mathbf{T}$ (a situation known in the world of finance under the name „call option"). It is zero when the result of the drilling is negative, and the company does not invest. However, such options have features that distinguish them sharply from financial options: they can be rarely written or sold, we cannot hedge, nor can we replicate them using the underlying assets and bonds.

The example below illustrates the benefits of having an option to expand. When starting a business, we can build a bigger warehouse or buy more efficient (than necessary) machines, which may allow a business to increase production in case of larger demand without having to incur additional investments later on.

A project (garage gates business) requires an investment of 100 and will bear cash flows of 50 (success), or 40 (flop) for three years. The probability of success scenario materializing is 60%. Sales in years 2 and 3 may grow significantly (by 30) if an investment of 20 is made at the end of year 1. The cost of capital is 20%.

NPV of the project (without the option to expand) is negative (–3.1). Exercising the option to expand generates cash flows (in the optimistic scenario) of 30, 80, 80 in the three subsequent years. NPV of the project becomes 9.8 and the option is worth 12.9. However, the option was valued with a decision tree analysis (DTA), which raises some doubt: physical probabilities are arbitrary, adding more options will transform a decision tree into a chaotic bush-like structure.

Figure 2: Option to expand - DTA



30 See Copeland/Antikarov, Real Options: A Practitioner's Guide, 2001, Ferreira/Kar/Trigeorgis: "Option games": filling the hole in the valuation toolkit for strategic investment, McKinsey Working Paper on Risk, no. 7 (2008), Koller/Goedhart/Wessels, op. cit. (footnote 16): 807 et seq.; Cuauhtemoc/ Rafiuddin, Startup Valuation Based on the Real Options Approach, in: Koeseoğlu, A Practical Guide for Startup Valuation: An Analytic Approach, 2023.

Let us then take another approach to value the option, this time taken from a world of financial options. The technique relies on replication. First of all, let us simplify the cash flows and consider only two (both in year 1 – year 2 and 3 cash flows are discounted to year 1 value). With this interpretation, the payoffs of the option are 25.83 (high demand), or 0. Now, we need to find a stock (or tradable asset), whose value depends on the demand for garage gates It costs 5 and pays off 6 (if demand is high) or 4 if low. Let us also consider a risk-free asset that costs 10 and pays off 11 after one year. The portfolio composed of the stock (64.58 is invested) and bond (46.97 is borrowed) generate the same payoffs as the real option. If the demand is high, the portfolio value is:

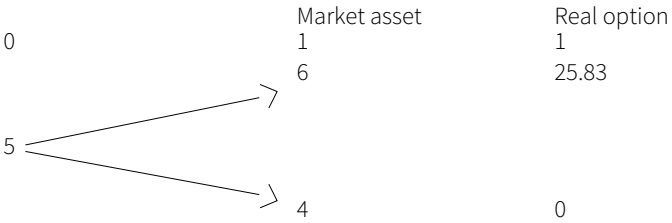
$$64.58 \cdot \frac{6}{5} - 46.97 \cdot \frac{11}{10} = 25.83$$

Otherwise, it becomes:

$$64.58 \cdot \frac{4}{5} - 46.97 \cdot \frac{11}{10} = 0$$

The payoffs are the same, hence the present values must equal too. The option value is then the same as the original value of the portfolio: 64.58-46.97=17.61. The result is different than the one obtained by DTA since instead of subjective probabilities, the market ones were used.

Figure3: Option to expand – binomial tree



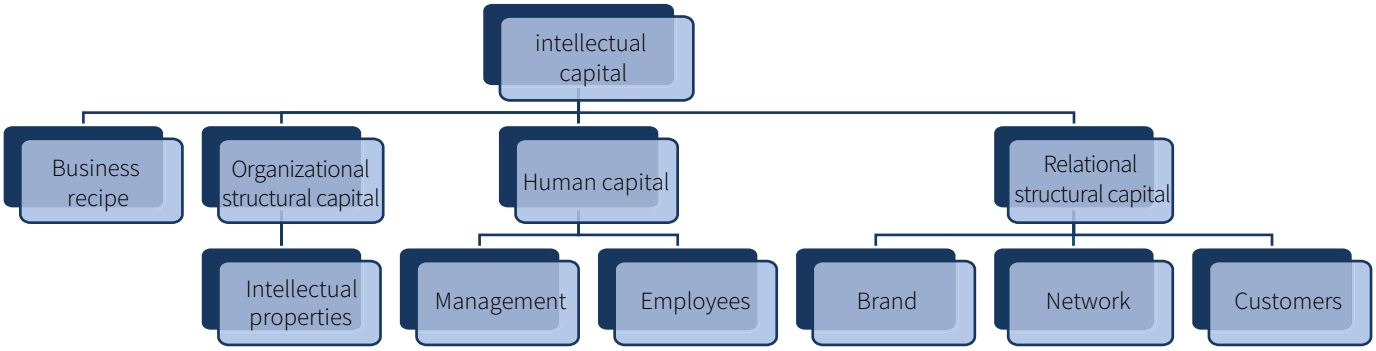
When applying financial option methodology, the Black-Scholes model is more often used as compared to the binomial trees approach. The model assumes certain price dynamics and does not involve scenarios. The valuation boils down to identifying a few parameters: the option pay-off, the underlying asset variability, and the risk-free rate. Calculating the price of a derivative involves calculating an integral, but for certain options such as call or put, the price may also be found analytically. Here is the formula for a call option.

$$c_t = S_t N(d_1) - Ke^{-r_f(T-t)} N(d_2),$$

where: $$d_1(S_t, T) = \frac{\ln(\frac{S_T}{K}) + (r_f + \frac{ó^2}{2}(T-t))}{},$$

$$d_2(S_t, T) = d_1 - \sigma\sqrt{T-t}.$$

Figure 4: Intellectual capital model, The IC Rating™ Model by Intellectual Capital Sweden



The value of the call option can be now calculated with the following parameters: K = 20 (strike), S = 30, variability = 30%, risk free rate = 10% and T = 1 (decision to expand will be taken in one-year time). Its value is 12.03.

Various flexibilities, immanent to any start-up project, can be easily captured by real options valuation. Hence, it is tempting to add real option to the start-up valuation framework and apply financial options valuation techniques to real options. It is also possible, providing there is a financial asset that is perfectly correlated with the underlying asset of the real option. Otherwise, the imperfect correlation may lead to a substantial lack of precision in the valuations.

4. Calibration including intellectual capital

At the point of conducting their valuation, start-up companies often do not have any assets other than intellectual capital, and the intangible assets they do possess typically are not formally evidenced in a form of patents or licenses. However, the companies may present a coherent business model, and the founders may have outstanding expertise in the field. In some cases, they have already incurred certain costs when preparing to launch the project. All these values can be described and adequately valued. There are many ways of how to present intellectual capital:

- Intellectual capital statements (reports consisting of know-how description, managerial challenges, initiatives, metrics).
- Intangible assets tracker (a set of metrics to assess the current company's performance and identify key factors for its future performance.
- Value creation index (a list of factors that predominantly contribute to value creation in various industries), the index may significantly improve the efficiency of the decision-making process.
- Total value creation (a tool that captures the value created by all stakeholders of a company).[31]

There is also a range of tools that might be used to analyze intellectual capital. One of them is IC Rating™, a concept developed by *Edvinsson* at Intellectual Capital Sweden[32]. The rating is used to „me*asure and describe non-financial assets that are not reported or described in traditional financial statements*", but that might be of critical importance to the long-term success of an organization in terms of its growth and profitability. In the case of idea companies, their valuation is especially difficult since the companies are not operational. The procedure below provides a way to link the IC valuation with required equity financing and optimal capital structure.

Valuing their intellectual capital is a good starting point since this is the only „tangible" asset such companies possess. Scrutinizing a business plan (if well prepared) may help to decide what is the value of the intellectual capital (technology, clients' database, etc.) contributed by the founders into a balance sheet (under goodwill). The goodwill is subject to amortization but does not impact the tax shield since it is written off from the taxable income. It is expected the founders will also contribute some cash.

Then, the external financing can be pre-determined. This follows several rounds of negotiations when the company's capital structure, including ownership structure, is decided. For example, the founders contribute 310 000 EUR as intellectual capital (goodwill) and 200,000 EUR in cash (51% share). The remaining 49% is provided by external investors.

At the next phase (after the ownership structure has been agreed upon) a post-money valuation phase follows. The DCF valuation is conducted in several rounds, which are a process of a constant calibration of the model. The calibration is based on certain boundary conditions: is the assumed financing sufficient to carry out the main investments and cover the costs, what is the minimum/optimal financing that would not jeopardize the company's liquidity? The calibration (validated by a scenario analysis) gives a final answer to a few questions concerning the company value, the optimal ownership structure and the required level of external financing.

Valuing start-ups' intellectual capital is crucial to determine the company's capital structure and the required external financing.

31 See Jacobsen/Hofman-Bang/Nordby, The IC Rating™ model by Intellectual Capital Sweden", Journal of Intellectual Capital, vol. 6, no. 4 (2005): 570-587.

32 See Edvinsson/Malone, Intellectual Capital, 1997.

Table 2: Scenario analysis – profitability

Scenarios	Values	Weights	IRR	kE	NPV
Optimistic	9,057,936	0.4	52.20%	17.23%	7,833,446
Realistic	1,683,754	0.5	18.60%	17.23%	440,999
Liquidation	269,433	0.1	8.51%	17.23%	-955,057
Weighted average	4,491,995		31.03%		3,637,633

5. Scenario and sensitivity analysis

In the DCF valuation the risk is mostly captured via a cost of capital. However, in the case of young companies, the standard approach is that scenario analysis[33] is also used to additionally capture the risk. Typically, three scenarios are being considered:

1. Success – the company reaches the IPO stage within 4-5 years (based on the business plan).
2. Realistic – the company is successful and able to pay dividends but will never reach the IPO stage (based on business plan verified by analysts).
3. Liquidation – the company is a failure, and the investors are trying to recover the investments by liquidating the assets. The revenues are lower than assumed and the net profits are negative in the years 1-5.

Table 2 shows the outcomes of the scenario analysis for a company. The profitability and the rates of return were based on NPV and IRR (for a 5-year investment). The approach helps to mitigate the risk involved in start-up valuations.

Sensitivity analyses, where the impact of every single assumption made on the final company value is quantified, are essential for a correct understanding of the valuation mechanisms within a valuation model.

The analysis first points out the set of critical assumptions, which may have a major impact on the calculated company's value. Apart from quantifying the impact of the assumptions, the analysis runs qualitative checks on the assumptions assessing the robustness of the arguments standing behind the critical factors for valuation. Consequently, the sensitivity analysis improves the objectivity of the model and mitigates the exposure to the manipulation of the results. The sensitivity analysis reveals its critical role in the valuation process and proves that it should be considered as the standard step in every DCF valuation.

Table 3 illustrates the sensitivity analysis performed for one parameter: marketing costs to revenues ratio. The original assumption was that the ratio is 22% in the forecast for year 1-2 and then 26% in years 3-5 forecasts (justified by stronger competition and more efforts needed towards clients' retention).

The sensitivity analysis implies that for years 1-2, one percentage point change translates into a 0.87% change in the company's value, whereas, for the years of 3-5, the one percentage point change translates into a 19% change. Undeniably, the analysis raises doubts about the effectiveness of marketing in the years 3-5 or the credibility of the forecasts.

6. Sanity Check

Although we have emphasized the importance of addressing valuation issues, it is clear that the results need to be checked for plausibility. An important step is to check the plausibility of the explicit assumptions on the value drivers of risk, growth, growth-equivalent costs, and investments, and return in the income approach against the corresponding implicit assumptions in the market approach[34] using consistent multiples[35] (or vice versa).

IV. Conclusions

In this article, we analyzed a range of components typically used in company valuation to elaborate a systematic approach to valuing young companies. We suggest that the use of the set of components may be augmented by integrating them into a coherent system and interlinking by deploying an iterative approach.

The integration works on a few different levels. First, the standard DCF valuation model is significantly enhanced by introducing the iterative approach: linking all the in the valuation processes steps (pro forma financial statements, free cash flows calculations, cost of capital estimation, discounting process) into a coherent whole. Second, certain components, such as intellectual capital, real options need to be considered a must in any valuation of start-up firms. Finally, the consistency of the model is also achieved by embedding a precise, based on spreadsheets functionalities, sensitivity analysis. In the environment of a complex valuation model, it improves the intersubjective veriziability of the model and reduces the risk of manipulating the results. The role of sensitivity analysis is critical in the valuation process and should be considered a standard step in any DCF valuation.

33 See for example: Koller/Goedhart/Wessels, op. cit. (footnote 16): 763 et seq.; Marrari/Gianfrate/Zanetti, Corporate Valuation – Measuring the Value of Companies in Turbulent Times, 2016: 54-71.

34 See Bernström, Valuation – The Market Approach, 2014; Mauboussin/Callahan, Valuation Multiples – What They Miss, Why They Differ, and the Link to Fundamentals, Morgan Stanley Counterpoint Global Insights, 23 April 2024; Meitner, The Market Approach to Comparable Company Valuation, 2006.

35 Chullen/Kaltenbrunner/Schwetzler, Does consistency improve multiple quality?, 2013 SSRN paper (last access: 20.09.2024).

Table 3: Sensitivity analysis - marketing costs to sales ratio and its impact on the company's value.

Marketing costs as % of sales in years 1–2 (column 1) and 3–5 (line 1)									
	22	23	24	25	26	27	28	29	30
19	79.23	60.07	40.90	21.74	2.57	–16.59	–35.76	–54.92	–74.06
20	78.36	59.20	40.03	20.87	1.74	–17.43	–36.59	–55.76	–74.92
21	77.53	58.36	39.20	20.03	0.87	–18.30	–37.46	–56.63	–75.79
22	76.66	57.50	38.33	19.17	0.00	–19.17	–38.30	–57.46	–76.63
23	75.79	56.63	37.50	18.33	–0.83	–20.00	–39.17	–58.33	–77.50
24	74.96	55.79	36.63	17.46	–1.70	–20.87	–40.03	–59.20	–78.33
25	74.09	54.92	35.76	16.59	–2.54	–21.70	–40.87	–60.03	–79.20

The components provide a solid scaffolding needed for a start-up valuation. Integrating them with the use of iterative techniques constitutes a decent framework for start-up valuation with the characteristics listed below.

4. Business Analysis based Interactive financial forecasting system – creates a coherent and fully integrated environment and enables rounds of calibration.
5. Iterated DCF valuation model – the value of a firm is the present value of expected cash flows, the cost of capital „tracks" the capital structure and changes accordingly
6. Real options – capture various flexibilities immanent to any start-up project.
7. Intellectual capital valuation – provides inputs to required equity financing and optimal capital structure.
8. Sensitivity and scenario analysis – improve the objectivity of the model and mitigates the exposure to the manipulation of the results.

Achieving a coherent start-up valuation process that is systematic and sustainable is a challenging endeavor. The approach proposed in the paper is believed to be efficient as it integrates relevant practices into a coherent, iterations-based process. Entities that are involved in a start valuation process such as venture capital, private equity or government assistance programs will greatly benefit from the enhanced process and more accurate valuation results. ◆

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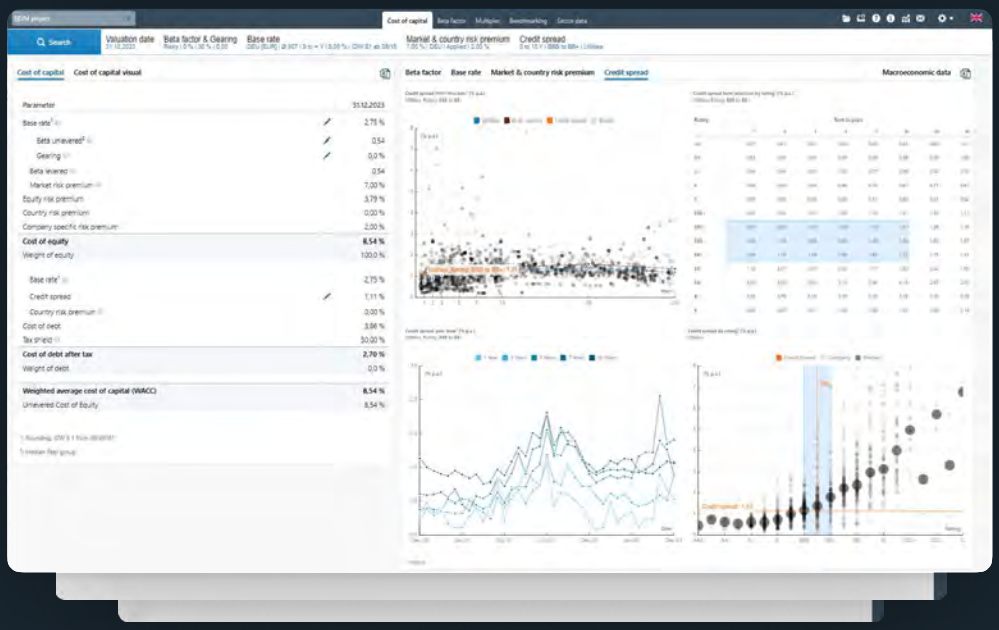

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The System Approach and Its Use in Asset Valuation

This article deals with the application of a systemic approach to the valuation of rights to immovable property. Emphasis is placed on a structured approach to assessing the characteristics of immovable property on which the value depends, as well as the essential characteristics of the surroundings that significantly affect the owner‘s utility and therefore the value of the property. The aim of the paper is thus to show the possibilities of using systems theory and the systems approach in solving valuation problems so that valuers can base their valuation on clear contexts that contribute to the quality of the valuation and facilitate the correct interpretation of valuation results.

I. Introduction

Asset valuation is one of the economic disciplines that is growing in importance. It is a process with overlap with tax, accounting and legal issues. There are many situations in which the valuation of assets is required by different entities. These may include, for example, banking institutions, insurance companies, municipal courts, police, lawyers and citizens. The complexity of valuation and appraisal problems places demands on appraisers that require the use of sophisticated approaches. At the current level of knowledge, systems methodology represents just such an approach. Systems methodology is seen as an integral part of *Bertlanffy's*[1] Generalized Systems Theory, science, and all types of engineering disciplines, beginning with systems engineering, especially in relation to the problems they address.

In the Czech Republic, *Janicek* and *Kledus* from the Institute of Forensic Engineering, Brno University of Technology are very important in the field of systems theory. *Janicek*[2] describes the systems approach as one of the possible approaches of humans to the realization of various activities, especially those related to various types of analysis of objects and processes that take place on them, to cognitive processes, to the solution of common and professional problems, but also to activities of the type of thinking or acting. The systems approach is a tool of scientific and practical knowledge, contributing to the effective implementation of cognitive processes and thus to the solution of problem situations on structurally and procedurally complex entities, regardless of their disciplinary nature.

II. Theory

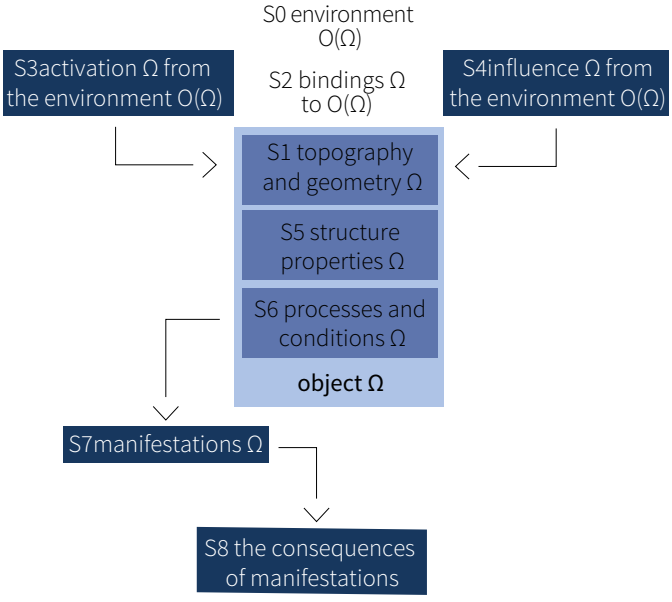
When solving problems using systems theory, it is necessary to distinguish between a system, which means a structured real or abstract entity with system properties (entity structuring, hierarchical structure, entity binding to the environment and purposeful behaviour of the entity) and a system, which means an abstract entity, purposefully created on the entity Ω in terms of the problem to be solved. It is usually a system of essential variables and includes those characteristics that are essential to the solution of the problem.

As *Janicek*[3] further states, it is characteristic of every entity Ω that it has a certain environment, shape (geometry) and that it occupies a certain position (topology) in the environment. It has certain links with its surroundings through which interactions are realized that activate and influence the entity. The activation of an entity causes processes on it that change its states. The entity manifests itself to its environment in a certain way, which has certain consequences. If an individual selects from the listed characteristics of an entity, i.e. from the environment, topology, geometry, connections, activation, influence, processes, states, manifestations and consequences, i.e. from the set of characteristics $\chi(\Omega)$ those that are essential for the solution of a specific situation, he receives the set of essential parameters $\Pi(\Omega)$ and from it the system of essential variables $\Sigma(\Omega)$. The individual characteristics of the entity Ω create the following subsets of variables after parameterization and formalization:

- subset of $\mathbf{S0}$ (environmental variables $\mathbf{v0}$, describing elements of the entity's environment),
- subset of $\mathbf{S1}$ (object quantities $\mathbf{v1}$ that describe the topology and structure of an entity),
- subset of $\mathbf{S2}$ (the binding variables $\mathbf{v2}$ describe the essential links of an entity with its environment $\mathbf{O(\Omega)}$ and the interactions taking place on them),
- subset of $\mathbf{S3}$ (the activation variables $\mathbf{v3}$ express the activation of the entity Ω from its environment $\mathbf{O}$, which triggers processes on the entity),
- subset of $\mathbf{S4}$ (the influencing variables $\mathbf{v4}$ affect the ongoing processes on the entity Ω),
- subset of $\mathbf{S5}$ (the structure-property variables $\mathbf{v5}$ express the properties of the elements of the structure of the entity on which the problem is solved),
- subset of $\mathbf{S6}$ (process and state variables $\mathbf{v6}$ describing processes running on the entity structure, putting the entity into different states, different from the initial states),
- subset of $\mathbf{S7}$ (the manifestation variables $\mathbf{v7}$ express the manifestations of the entity Ω, which correspond to the states the entity has reached because of processes),
- subset of $\mathbf{S8}$ (consequence variables $\mathbf{v8}$ describing the consequences of the entity's manifestations on its surroundings or on itself).

The system of essential variables can be formed as a system of subsets $\mathbf{S0}$ to $\mathbf{S8}$ (Figure 1):

Figure 1: General Structure of the Essential Variables System (using the principles defined in *Janicek*[4])



1 Karl Ludwig von Bertalanffy (1901–1972) was an Austrian biologist and philosopher, one of the founders of General Systems Theory, » Link (last access 20.09.2024).

2 Janicek, in: CERM (editor), Systémové pojetí vybraných oborů pro techniky, hledání souvislostí, 2007: 12.

3 Janicek, in: CERM (editor), Systémová metodologie, brána do řešení problémů, 2014: 25-A.

4 Ibid.: 60-A.

International Valuation Standards[5] distinguish in relation to the issue of valuation of assets and determination of their value:

- value based on market principles (e.g. Market Value, Liquidation Value) and
- value based on non-market principles (e.g. Taxable Value, Special Value).

The basic methods of valuation of assets include valuation in terms of their market value. Market value[6] is the estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion. According to generally accepted principles, this method of valuation must always be based on a market analysis. However, the implementation of such analyses requires the use of credible methods of carrying out comparative analyses so that they correctly consider not only the essential characteristics of the asset being valued but also the essential characteristics of its surroundings and the differences between the asset being valued and the asset used for comparison. The difficulty of carrying out such comparative analyses is then all the greater the greater the inhomogeneity of the market due to the heterogeneity of the characteristics of the assets traded on that market.

To import the market value, the principal valuation approaches are commonly used:

a) Market Approach,
b) Income Approach, and
c) Cost Approach.[7]

All approaches are based on the economic principles of price equilibrium, expected utility or substitution.

Market Approach

The market approach provides an indication of value by comparing the asset with identical or comparable (that is similar) assets for which price information is available (see IVS 103 Valuation Approaches and Methods, para 20.).

Income Approach

The income approach provides an indication of value by converting future cash flow to a single current value. Under the income approach, the value of an asset is determined by reference to the value of income, cash flow or cost savings generated by the asset (see IVS 103 Valuation Approaches and Methods, para 30.).

Cost Approach

The cost approach provides an indication of value using the economic principle that a buyer will pay no more for an asset than the cost to obtain an asset of equal utility, whether by purchase or by construction, unless undue time, inconvenience, risk or other factors are involved. The approach provides an indication of value by calculating the current replacement or reproduction cost of an asset and making deductions for physical deterioration and all other relevant forms of obsolescence (see IVS 103 Valuation Approaches and Methods, para 40.).

III. Real estate valuation in a systemic approach

The case study addresses the application of a systems approach to the valuation of immovable property rights (IVS 400 Real Property Interests).

The essential principles:

- A real property interest is a right of ownership, control, use or occupation of land and buildings (see IVS 400 Real Property Interests, para 20.2.).
- The immovability of land and buildings means that it is the right that a party holds that is transferred in an exchange, not the physical land and buildings. The value, therefore, attaches to the legal interest rather than to the physical land and buildings (see IVS 400 Real Property Interests, para 20.4.).
- Under most bases of value, a valuer must consider the highest and best use of the real property, which may differ from its current use. This assessment is particularly important to real property interests which can be changed from one use to another or that have development potential (see IVS 400 Real Property Interests, para 50.2.).

Cost Approach is generally applied to the valuation of real property interests through the depreciated replacement cost method. For the purposes of this paper, it is not so much the chosen approach that is important, but the demonstration of the application of the systems approach in valuation practice.

The first step requires a replacement cost to be calculated. This is normally the cost of replacing the property with a modern equivalent at the relevant valuation date. An exception is where an equivalent property would need to be a replica of the subject property to provide a participant with the same utility, in which case the replacement cost would be that of reproducing or replicating the subject building rather than replacing it with a modern equivalent. The replacement cost must reflect all incidental costs, as appropriate, such as the value of the land, infrastructure, design fees, finance costs and developer profit that would be incurred by a participant in creating an equivalent asset (see IVS 400 Real Property Interests, para 90.5.).

The cost of the modern equivalent must then, as appropriate, be subject to adjustment for physical, functional, technological and economic obsolescence (see IVS 103 Valuation Approaches, Appendix A30). The objective of an adjustment for obsolescence is to estimate how much less valuable the subject property might, or would be, to a potential buyer than the modern equivalent. Obsolescence considers the physical condition, functionality and economic utility of the subject property compared to the modern equivalent (see IVS 400 Real Property Interests, para 90.6.).

General principles state that the value of a thing depends on its utility. Using the system approach (Figure 1), the value depends on the properties of the object Ω and the properties of the environment of the object $O(\Omega)$. The properties of the Ω object depend on the design and state. The implementation of an object Ω is determined by the structure (elements and constraints) of

5 IVSC, New edition of the International Valuation Standards (IVS) published, 2024, » Link (last access 20.09.2024).
6 Ibid.: 24.
7 Ibid.: 33-53.

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S1, S2 and S5. The object Ω is activated by S3 and influenced by S4 from the environment S0. During the use of an object Ω, processes take place on its structure that put the object Ω into different states S6. The consequences are described in S7 and S8.

The properties of the object Ω are e.g. functionality, durability, economy, ergonomics and are described by characteristics, parameters and quantities. To create a system of essential characteristics and a system of essential quantities, it is necessary to define the terms characteristic and quantity.

Characteristic expresses a distinguishing sign. There are various classes of characteristic, such as the following:

- physical (e.g. mechanical, electrical, chemical or biological characteristics),
- sensory (e.g. related to smell, touch, taste, sight, hearing),
- behavioural (e.g. courtesy, honesty, veracity),
- temporal (e.g. punctuality, reliability, availability, continuity),
- ergonomic (e.g. physiological characteristic or related to human safety),
- functional (e.g. maximum speed of an aircraft).[8]

The quantity is created by the following processes:

- formalization – the characteristic of an entity is expressed in terms of common language (property name) and various symbols or signs,
- quantification – the process of comparison with a benchmark.[9]

The primary object in the application of the systems approach is the subject of the assessment itself, i.e. the valuation of the land, specifically its valuation.

The essential characteristics in solving a valuation problem are listed below.

S0 environment O(Ω):

- Remote environment of the object – the remote environment of the entity consists of those elements of the entity's environment that have links with the entity realized through elements of the immediate environment.10
- Bank (interest rate), market (supply, demand), state (inflation, taxes), construction companies (brand, quality and reliability).
- Immediate surroundings of an entity – the immediate surroundings of an entity consist of elements of the surroundings that have a direct link with an element of the entity.11
- Entity with ownership right to the land (proprietorship, corporate or partnership).

S1 topography and geometry Ω:

- Location – civic amenities, location of the land in the village.
- Geometric and positional determination of the plot – geometric shape and size of the plot, slope.

S2 bindings Ω to O(Ω):

- A binding is a real or abstract object that provides a connection between at least two elements and that allows those elements to interact with each other.[12]
- Real property interest (superior interest, subordinate interest, right to use land or buildings but without a right of exclusive possession or control). Fiscal policy (tax system, inflation rate). Competition from building societies (producer prices). Credit policy of banks. Supply and demand by investors for construction supplies and works.

S3 activation Ω from the environment O(Ω):

- Targeted activation by a person with a specific goal.[13]
- Construction life cycle – pre-investment phase (design), investment phase (construction), operational phase, end of life cycle (disposal).
- Project – construction and equipment (substandard, standard and above standard – above standard e.g. sectional garage door with electric control).
- Operational phase – age of the building (number of years of use of the building from the legal validity of the approval decision to the year to which the valuation is made), maintenance and repairs.

S4 influence Ω from the environment O(Ω):

- Interaction oriented from the environment to the entity that influences the processes caused by the activation.14
- Construction company – reputation, incidental budgetary costs and developer's profit, construction material supplier, availability of construction machinery and labour, transportation.
- Infrastructure – connections, roads, pavements, lighting.
- Zoning – buildability, number of storeys, floor area index.
- Function and purpose of use of the land area (zoning) – areas for housing, mixed areas, areas for recreation, areas for public amenities, areas for technical equipment, etc.
- Limiting influences of the land – flood risk, foundation conditions, protection zones.

S5 structure properties Ω:

- Composition of an entity, the sum of elements and relationships between them (land and building).

S6 processes and conditions Ω:

- Processes running on the entity structure, putting the entity into different states, different from the initial states (in the case of deprecation structures).
- Physical obsolescence – measuring depreciation by cost (also in the case of under-construction) or estimating depreciation by percentage deduction.
- Functional obsolescence – excess capital cost or excess operating cost.
- External or economic obsolescence – for example, there is a large luxury apartment on offer, but demand requires less expensive and smaller apartments.

8 ISO 2015, ISO 9000 Quality management systems – Fundamentals and vocabulary, 4th ed. 2015, » Link (last access 20.09.2024).
9 Janicek, op. cit. (footnote no. 3): 43-A.
10 Janicek, op. cit. (footnote no. 2): 37.
11 Ibid.: 37.
12 Ibid.: 38.
13 Ibid.: 43.
14 Ibid.: 43.

S7 manifestations Ω:
- The value of a legal title to immovable property.

S8 the consequences of manifestations:
The consequence is the behaviour of the subject[15] with ownership right in relation to the environment $O(\Omega)$.

- Market – sell or buy.
- Bank – credit.
- State – taxes.

IV. Creating a system of essential variables in practice

Land, which is expressed by the Size of Land variable, enters the valuation algorithm. The state of the market is described by the Unit Comparable Price variable.

The design of the property is primarily determined by the activations in the form of design (Size of Building, Construction and Equipment, etc.). The determination of Construction and Equipment takes into account differences in the technical level of construction and equipment, for example, as substandard (0.8), standard (1.0) and above standard (1.2). The cost of acquiring modern equivalent is affected by Cost of Developer, Cost of Capital, Incidental Budgetary Costs[16] and Infrastructure. The Price Indicator variable that is available in the market at the time of valuation has a significant impact on the generation of the cost of the modern equivalent.

The essential activation variable is time. The specific point in time is given by time t – the approval of the property, a certain event takes place at time tu – the valuation date of the property (i.e. the number of years the building has been in use from the legal force of the approval decision until the year to which the valuation is made). During use, processes take place on the property that change its condition. The condition of the property is then primarily determined by the activations during operation, e.g. duration of operation, intensity of use, nature of use, quality of maintenance, method of carrying out repairs. The period of use is then expressed in terms of Age of Building. Accrued Depreciation, which expresses the loss of value during the use of the property, must then be taken into account over time.

In Table 1 the practical importation of the essential variables in the calculation of the value of the property is shown.

Author's note:
The following general principles apply to valuation in the Czech Republic:

Cost of Developer CD of approx. 10% from PI, CE, SB:
- 0.10 × (340.86 €/m3 × 1.00 × 700 m3) = 23,860 €

Cost of Capital CC of approx. 4% from PI, CE, SB:
- 0.04 × (340.86 €/ m^3 × 1.00 × 700 m^3) = 9,544 €

Incidental Budgetary Costs IBC of approx. 6% from PI, CE, SB:
- 0.06 × (340.86 €/ m^3 × 1.00 × 700 m^3) = 14,316 €

The values of the coefficients I, UCP and PI are imported from the market.

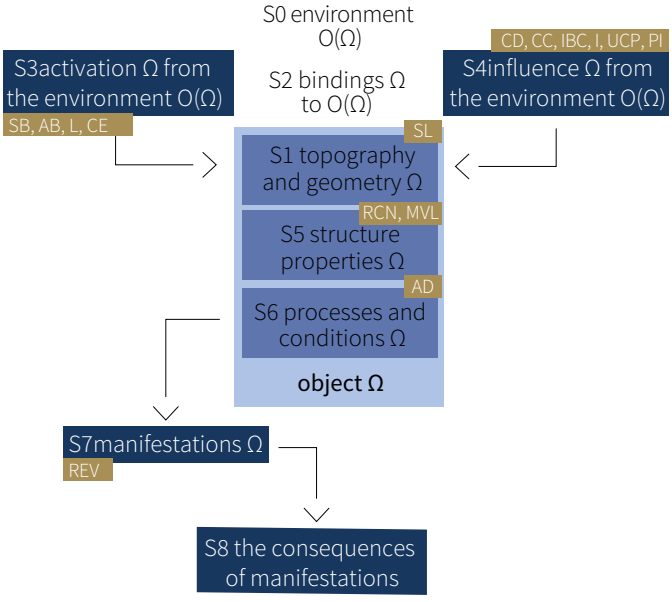
Physical Obsolescence PO is calculated as follows:
- (340.86 €/m^3 × 1.00 × 700 m^3) × (20 years/100 years)[17] = 47,720 €

Functional Obsolescence FO:
- Functional Obsolescence take into account the moral obsolescence of the building. The solution may be a ratio between a property with ideal utility parameters and a property under valuation. Basically, it is necessary to observe the level of utility characteristics of a particular property (functionality, safety, economy, environmental friendliness, etc.). In the illustrative case, it is determined by estimation.

External or Economic Obsolescence EO:
- External or Economic Obsolescence takes into account external factors, monitoring changes in the market, changes in land use planning, etc. In the illustrative case, it is determined by estimation.

The use of the general scheme to create a system of essential variables is outlined in Figure 2.

Figure 2: Schematic for the creation of a system of essential variables



15 The entitled subject is not meant here a specific buyer or seller, but generally a subject with a defined range of rights to the object, which allow him to dispose of the object, i.e. primarily to use the object, to appropriate its fruits, to hold the object and to dispose of it and especially to sell it to someone. Most often in valuation, the utility of an object is assessed from the point of view of the owner. However, depending on the circumstances, it may also be assessed from the perspective of other persons, e.g. in the case of immovable property from the perspective of a tenant, a beneficiary of an easement, the state (for tax purposes), etc.

16 Incidental Budgetary Costs are specific to site location, limiting operational aspects, etc.

17 In the calculation, the wear calculated by the linear method is chosen.

Table 1: ESG System of essential quantities in practice

Quantities	Abbreviation, derivation	Solution
S0 environment O(Ω)		
Empty subset		
S1 topography and geometry Ω		
Size of Land (m^2)	SL	250
S2 bindings Ω to O(Ω)		
Empty subset		
S3 activation Ω from the environment O(Ω)		
Size of Building (m3)	SB	700
Age of Building (years)	AB	20
Lifetime (years)	L	100
Construction and Equipment (-)	CE	1.00 (standard)
S4 influence Ω from the environment O(Ω)		
Cost of Developer (€)	CD	23,860
Cost of Capital (€)	CC	9,544
Incidental Budgetary Costs (€)	IBC	14,316
Infrastructure (€)	I	15,835
Unit Comparable Price (€/m^2)	UCP	119
Price Indicator (€/m^3)	PI	340.86
S5 structure properties Ω		
Replacement Cost New (€)	RCN=(PI×CE×SB)+CD+CC+IBC+I	302,154
Market Value of Land (€)	MVL=UCP×SL	29,691
S6 processes and conditions Ω		
Accrued Depreciation (€)	AD=PO+FO+EO	77,720
Physical Obsolescence (€)	PO=f(AB,L)	47,720
Functional Obsolescence (€)	FO	10,000 (estimate)
External or Economic Obsolescence (€)	EO	20,000 (estimate)
S7 manifestations Ω		
Real Estate Value (€)	REV=RCN-AD+MVL	254,125
S8 the consequences of manifestations		
Empty subset		

V. Conclusion

The article deals with current issues in the field of real estate valuation. The complexity of valuation problems places demands on valuers that require the use of sophisticated approaches. At the current level of knowledge, such an approach includes a systems approach. The systems approach provides a structured approach to assessing the essential characteristics of the property on which value is based, as well as the essential characteristics of the environment that significantly affect the owner's utility and therefore the value of the property. In this approach, the application of standard valuation methods and the quantification of input variables can be based on the relationship between the activations of the asset during its life cycle and its usefulness from the perspective of the beneficiary and also on the basis of the clarified causal relationships to infer the significant influences of the environment significantly increasing or decreasing the value of the asset and therefore its achievable selling price under normal commercial conditions. ◆

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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 an industry level and on a sub-industry level based on the Global Industry Classification Standard (GICS). In each issue 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 rate level, etc.), we only provide levered betas and equity-based multiples for that industry.

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 at your own risk.

Data source

All data has been obtained from the KPMG Valuation Data Source. The data source provides access to cost of capital parameters from more than 150 countries and sectors as well as peer-group-specific data from over 16,500 companies worldwide. The data covers the period from 2012 to the present. The data is updated monthly and is accessible from anywhere around the clock.
See www.kpmg.de/en/valuation-data-source for details.

Eurozone Cost of Capital Parameters as at 31 August 2024

The typified, uniform risk-free rate based on AAA-rated government bonds currently lies at 2.75% 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 8,5%, leading to a market risk premium of 5.75%. 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) and for five one-year periods (weekly returns).

Raw levered betas are obtained from a standard OLS regression, with stock returns being the dependent variable 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 $ß_U$ = unlevered beta, $ß_D$ = debt beta, D = net debt, E = market value of equity. Debt betas rely on a company's individual rating on a given date. Monthly rating-specific levels of debt betas are extracted from a broad market analysis. Net debt consists of total debt (incl. lease liabilities) + 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.

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

31 August 2024	Median Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Industries	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Industrials	*262*	1.00	0.96	0.85	0.82	0.89	0.90	*243*	1.11
Consumer Discretionary	*176*	1.01	0.99	1.02	0.90	0.94	0.97	*158*	1.21
Health Care	*131*	0.68	0.69	0.70	0.74	0.69	0.70	*120*	0.77
Financials	*141*	1.06	1.15	0.89	0.85	0.84	0.96	*134*	1.15
Utilities	*50*	0.79	0.73	0.60	0.70	0.62	0.69	*47*	0.73
Materials	*83*	0.98	0.91	0.87	0.92	0.83	0.90	*81*	1.13
Real Estate	*91*	0.79	0.60	0.59	0.81	0.68	0.69	*82*	0.90
Communication Services	*89*	0.77	0.69	0.58	0.69	0.58	0.66	*83*	0.88
Information Technology	*154*	0.86	0.79	0.94	0.88	0.80	0.85	*142*	1.04
Consumer Staples	*77*	0.54	0.45	0.68	0.48	0.41	0.51	*73*	0.60
Energy	*34*	1.02	1.21	0.46	0.76	0.48	0.79	*33*	0.92

Table 2: Median Industry Equity-Ratios for five single 1y-periods and one 5y-period

31 August 2024	Median Equity-Ratios								
	1-Year							5-Year	
Industries	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Industrials	*273*	70.4%	80.3%	77.4%	75.7%	74.4%	75.6%	*240*	75.8%
Consumer Discretionary	*184*	69.2%	84.0%	78.3%	73.9%	72.4%	75.6%	*153*	70.5%
Health Care	*140*	98.0%	99.1%	97.5%	91.5%	92.4%	95.7%	*122*	96.4%
Utilities	*51*	57.0%	61.2%	60.2%	57.6%	57.6%	58.7%	*47*	59.2%
Materials	*86*	66.9%	77.5%	73.9%	74.8%	74.4%	73.5%	*81*	73.6%
Real Estate	*97*	48.0%	51.8%	49.3%	40.6%	44.9%	46.9%	*87*	48.3%
Communication Services	*95*	71.4%	81.9%	79.3%	71.9%	67.4%	74.4%	*85*	76.1%
Information Technology	*163*	96.4%	98.4%	94.9%	93.5%	94.4%	95.5%	*145*	96.2%
Consumer Staples	*81*	69.7%	77.4%	72.9%	66.5%	66.3%	70.6%	*74*	70.5%
Energy	*38*	58.4%	66.4%	75.0%	79.2%	81.2%	72.0%	*34*	70.3%

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

31 August 2024	Median Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Industries	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Industrials	*251*	0.78	0.75	0.69	0.63	0.67	0.70	*229*	0.87
Consumer Discretionary	*165*	0.77	0.78	0.77	0.70	0.72	0.75	*144*	0.91
Health Care	*118*	0.65	0.57	0.62	0.64	0.56	0.61	*104*	0.59
Utilities	*50*	0.55	0.57	0.40	0.49	0.48	0.50	*47*	0.53
Materials	*83*	0.78	0.78	0.72	0.76	0.65	0.74	*79*	0.83
Real Estate	*86*	0.55	0.48	0.44	0.48	0.48	0.48	*75*	0.60
Communication Services	*85*	0.64	0.58	0.51	0.50	0.54	0.55	*80*	0.67
Information Technology	*148*	0.84	0.78	0.89	0.77	0.72	0.80	*131*	0.93
Consumer Staples	*74*	0.52	0.44	0.53	0.43	0.42	0.47	*69*	0.48
Energy	*33*	0.87	1.03	0.46	0.63	0.46	0.69	*33*	0.79

Source: KPMG Valuation Data Source, see www.kpmg.de/en/valuation-data-source
**Average = Arithmetic Mean*

Table 4: Median Levered Subindustry (Consumer Staples) Betas for five single 1y-periods and one 5y-period

31 August 2024	Median Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Consumer Staples	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Food Products	*37*	0.50	0.43	0.50	0.34	0.32	0.42	*35*	0.50
Consumer Staples Distribution & Retail	*19*	0.54	0.82	0.77	0.85	0.63	0.72	*16*	0.69
Beverages	*13*	0.70	0.65	0.64	0.53	0.59	0.62	*14*	0.60
Personal Care Products	*7*	0.49	0.55	0.82	0.37	0.63	0.57	*7*	0.51

Table 5: Median Subindustry (Consumer Staples) Equity-Ratios for five single 1y-periods and one 5y-period

31 August 2024	Median Equity-Ratios								
	1-Year							5-Year	
Subindustry: Consumer Staples	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Food Products	*39*	57.5%	75.9%	61.0%	63.2%	61.7%	0.64	*33*	58.0%
Consumer Staples Distribution & Retail	*20*	69.2%	70.5%	66.5%	61.8%	58.0%	0.65	*19*	65.8%
Beverages	*14*	68.6%	85.6%	74.4%	70.9%	66.8%	0.73	*14*	74.4%
Personal Care Products	*8*	100.8%	100.8%	97.3%	97.5%	94.7%	0.98	*7*	98.8%

Table 6: Median Unlevered Subindustry (Consumer Staples) Betas for five single 1y-periods and one 5y-period

31 August 2024	Median Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Information Technology	Comps incl. (Average*)	9/2019 to 8/2020	9/2020 to 8/2021	9/2021 to 8/2022	9/2022 to 8/2023	9/2023 to 8/2024	Average*	Comps incl.	9/2019 to 8/2024
Food Products	*34*	0.52	0.41	0.49	0.36	0.32	0.42	*31*	0.46
Consumer Staples Distribution & Retail	*18*	0.43	0.51	0.61	0.51	0.45	0.50	*16*	0.57
Beverages	*13*	0.61	0.63	0.50	0.44	0.46	0.53	*14*	0.50
Personal Care Products	*7*	0.45	0.45	0.72	0.36	0.61	0.52	*7*	0.47

Source: KPMG Valuation Data Source, see www.kpmg.de/en/valuation-data-source
**Average = Arithmetic Mean*

Multiples

Multiples are computed based on actuals (based on the annual report) and forecasts (based on consensus 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: Median Industry Multiples

31 August 2024	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	1.0	0.9	*236*	7.4	6.6	*229*	11.8	10.2	*224*	13.1	11.3	*208*	1.5	1.4	*220*
Consumer Discretionary	0.9	0.9	*157*	7.1	5.9	*155*	12.1	9.9	*143*	12.6	10.5	*125*	1.7	1.6	*148*
Health Care	2.4	2.4	*109*	10.4	8.9	*79*	14.2	12.8	*73*	16.6	15.4	*69*	2.2	2.1	*87*
Financials	n/m	n/m	*n/a*	n/m	n/m	*n/a*	n/m	n/m	*n/a*	8.4	7.8	*112*	1.0	0.9	*109*
Utilities	3.9	2.9	*44*	9.2	8.9	*43*	15.4	14.0	*44*	14.3	14.1	*42*	1.5	1.4	*43*
Materials	1.0	0.9	*76*	6.4	5.5	*75*	11.2	9.4	*72*	12.2	9.4	*66*	1.1	1.0	*69*
Real Estate	12.0	11.2	*67*	18.1	17.2	*63*	21.7	17.6	*65*	12.7	12.4	*58*	0.7	0.7	*59*
Communication Services	1.3	1.3	*76*	6.4	5.6	*75*	12.2	11.3	*67*	12.4	11.2	*63*	1.8	1.6	*68*
Information Technology	1.1	1.0	*142*	9.3	7.4	*137*	13.8	12.0	*118*	17.7	15.6	*102*	2.1	1.9	*115*
Consumer Staples	0.7	0.7	*62*	7.4	6.9	*61*	11.9	10.9	*61*	14.8	12.4	*58*	1.3	1.3	*57*
Energy	1.0	1.0	*32*	4.6	4.3	*32*	7.1	6.6	*31*	9.0	7.8	*31*	1.1	1.1	*31*

Table 8: Median Subindustry (Consumer Staples) Multiples

31 August 2024	Sales			EBITDA			EBIT			Earnings			Market to Book		
Subindustry: Information Technology	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.
Food Products	0.6	0.6	*23*	6.0	6.3	*23*	11.4	10.9	*23*	12.5	11.7	*21*	0.9	0.9	*20*
Consumer Staples Distribution & Retail	0.4	0.4	*16*	6.2	5.7	*16*	12.2	11.1	*15*	15.4	11.8	*15*	1.2	1.4	*15*
Beverages	2.1	2.0	*14*	9.5	9.0	*13*	11.7	10.7	*14*	15.4	12.1	*13*	1.3	1.4	*13*
Personal Care Products	2.2	2.1	*8*	13.3	12.0	*8*	18.0	16.0	*8*	25.3	22.0	*8*	3.7	2.9	*8*

Source: KPMG Valuation Data Source, see www.kpmg.de/en/valuation-data-source
**Average = Arithmetic Mean*

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 April 2021 until 31 March 2024*) for the following multiples:

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

In the previous issue we provided multiples for Europe in total. The multiples **in this issue** provide a regional breakdown into:

- **Central and Western Europe** and
- **Southern Europe**

In the following issue we will continue the regional breakdown into Scandinavia and Britain and 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 April 2021 until 31 March 2024*, 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

$$\left(\bar{x}_h = \frac{n}{\sum_{i=1}^{n} \frac{n}{x_i}} \right)$$

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

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

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. ◆

Central and Western Europe - Trailing DEPV/Sales (operating), 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Central and Western Europe - Forward DEPV/Sales (operating), 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
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n	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
263	1.98	0.94	2.06	1.11	2.40	2.59	[1,76 ; 2,20] (33,2)	-0.82	0.45	$\hat{y}$ = 1,629 x Sales + 3.748.269	0.66	5,756,789
955	1.98	1.75	2.00	1.49	2.11	2.39	[1,93 ; 2,03] (92,2)	-0.36	0.29	$\hat{y}$ = 1,395 x Sales + 830.497	0.44	871,881
397	1.45	0.73	1.45	0.79	1.39	2.49	[1,29 ; 1,62] (55,9)	0.24	0.59	$\hat{y}$ = 1,581 x Sales - 30.976	0.70	1,111,448
2,302	1.84	0.94	1.88	1.29	1.92	2.42	[1,79 ; 1,89] (246,4)	-0.42	0.38	$\hat{y}$ = 1,939 x Sales - 345.096	0.93	3,661,169
612	0.93	0.04	0.94	0.63	0.93	1.31	[0,89 ; 0,97] (73,0)	-0.23	0.50	$\hat{y}$ = 0,220 x Sales + 559.545	0.72	544,620
2,984	1.05	0.76	0.94	0.60	0.81	1.24	[1,01 ; 1,08] (261,6)	1.39	0.60	$\hat{y}$ = 1,191 x Sales - 1.833.218	0.67	5,158,952
1,106	1.03	0.06	1.00	0.55	0.99	1.44	[0,98 ; 1,08] (96,1)	0.35	0.60	$\hat{y}$ = 0,361 x Sales + 851.695	0.63	4,549,318
75	1.48	0.28	1.51	0.72	1.99	2.20	[1,10 ; 1,87] (12,8)	-0.39	0.58	$\hat{y}$ = 2,240 x Sales - 725.778	1.00	1,135,532
113	0.70	0.33	0.56	0.24	0.29	0.90	[0,45 ; 0,95] (11,7)	1.36	1.08	$\hat{y}$ = 0,133 x Sales + 1.831.489	0.03	2,542,650
140	0.79	0.04	0.70	0.02	0.59	1.22	[0,50 ; 1,07] (14,8)	0.95	1.09	$\hat{y}$ = -0,001 x Sales + 128.875	-0.04	207,129
1,809	0.95	0.40	0.86	0.45	0.65	1.41	[0,90 ; 1,01] (181,3)	1.02	0.75	$\hat{y}$ = 0,545 x Sales + 935.942	0.68	2,165,872
1,750	1.05	0.82	0.99	0.63	0.86	1.50	[1,02 ; 1,08] (137,2)	0.99	0.51	$\hat{y}$ = 0,588 x Sales + 2.585.782	0.26	3,485,545
843	1.78	1.11	1.83	1.07	1.74	2.63	[1,68 ; 1,88] (118,1)	-0.27	0.45	$\hat{y}$ = 1,822 x Sales + 1.208.311	0.93	3,789,756
1,444	1.84	0.69	1.92	1.11	2.17	2.67	[1,75 ; 1,93] (194,2)	-0.58	0.47	$\hat{y}$ = 1,758 x Sales + 1.570.688	0.93	2,656,163
75	1.16	0.21	1.10	0.62	0.68	1.99	[0,71 ; 1,62] (10,4)	0.46	0.80	$\hat{y}$ = 0,663 x Sales + 16.255	1.00	573,658
54	1.28	0.09	1.22	0.09	0.67	2.66	[0,28 ; 2,27] (10,9)	0.33	0.99	$\hat{y}$ = 2,895 x Sales - 55.813	0.72	80,517
311	1.28	0.18	1.24	0.37	0.98	2.32	[1,02 ; 1,54] (47,0)	0.41	0.78	$\hat{y}$ = 0,353 x Sales + 220.630	0.91	835,100
1,218	1.41	0.37	1.41	0.86	1.32	2.06	[1,34 ; 1,49] (149,8)	0.14	0.55	$\hat{y}$ = 0,756 x Sales + 501.416	0.27	1,255,922

n	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
284	1.67	0.66	1.74	1.30	1.93	2.13	[1,54 ; 1,80] (26,2)	-0.79	0.42	$\hat{y}$ = 1,847 x Sales - 1.021.387	0.95	10,942,537
1,905	0.90	0.68	0.79	0.57	0.71	1.03	[0,87 ; 0,94] (299,6)	2.12	0.66	$\hat{y}$ = 0,981 x Sales - 1.010.340	0.82	4,528,178
682	1.19	0.72	1.09	0.54	0.80	1.61	[1,06 ; 1,32] (80,2)	1.00	0.73	$\hat{y}$ = 0,469 x Sales + 2.258.575	0.53	4,109,169
7,406	0.89	0.60	0.81	0.51	0.78	1.10	[0,87 ; 0,90] (486,3)	1.42	0.56	$\hat{y}$ = 0,486 x Sales + 3.082.813	0.77	9,344,475
912	0.35	0.02	0.32	0.12	0.34	0.52	[0,34 ; 0,36] (65,1)	0.67	0.79	$\hat{y}$ = 0,008 x Sales + 2.171.077	-0.01	4,082,428
6,043	0.90	0.68	0.82	0.54	0.74	1.11	[0,88 ; 0,91] (497,9)	1.63	0.58	$\hat{y}$ = 0,696 x Sales + 729.813	0.69	5,878,322
6,328	0.46	0.07	0.41	0.27	0.36	0.55	[0,45 ; 0,46] (440,1)	1.46	0.72	$\hat{y}$ = 0,238 x Sales + 2.669.834	0.47	7,116,944
2,109	0.51	0.33	0.37	0.28	0.34	0.44	[0,48 ; 0,55] (1.228,2)	3.15	1.12	$\hat{y}$ = 0,377 x Sales + 76.007	0.82	3,064,795
698	0.34	0.26	0.29	0.20	0.25	0.44	[0,33 ; 0,36] (3.550,1)	4.43	0.84	$\hat{y}$ = 0,337 x Sales + 109.919	0.73	4,583,768
1,959	0.43	0.22	0.36	0.23	0.33	0.50	[0,42 ; 0,45] (5.391,7)	4.10	0.97	$\hat{y}$ = 0,487 x Sales - 1.077.213	0.74	5,336,868
5,351	0.51	0.29	0.41	0.26	0.34	0.57	[0,49 ; 0,52] (3.413,5)	2.89	0.96	$\hat{y}$ = 0,321 x Sales + 519.027	0.29	8,313,697
4,583	0.44	0.18	0.30	0.17	0.23	0.37	[0,42 ; 0,46] (991,3)	2.42	1.23	$\hat{y}$ = 0,211 x Sales + 1.112.716	0.34	4,917,650
3,011	1.10	0.49	1.02	0.41	0.84	1.68	[1,04 ; 1,15] (369,1)	0.72	0.74	$\hat{y}$ = 0,872 x Sales + 245.021	0.52	10,271,163
8,931	1.22	0.55	1.19	0.56	1.00	1.98	[1,19 ; 1,26] (1.260,3)	0.36	0.65	$\hat{y}$ = 0,723 x Sales + 2.510.793	0.37	8,003,482
322	1.78	0.74	1.84	0.79	2.09	2.46	[1,56 ; 2,00] (46,4)	-0.55	0.52	$\hat{y}$ = 0,171 x Sales + 3.906.084	0.53	11,394,726
86	0.82	0.35	0.74	0.26	0.32	1.34	[0,49 ; 1,16] (9,0)	1.10	1.00	$\hat{y}$ = 0,290 x Sales + 351.519	0.28	859,583
2,447	0.83	0.32	0.74	0.21	0.57	1.35	[0,78 ; 0,87] (275,4)	0.83	0.83	$\hat{y}$ = 0,280 x Sales + 3.585.995	0.21	6,359,847
2,855	0.98	0.07	0.92	0.46	0.94	1.39	[0,94 ; 1,02] (239,2)	0.76	0.71	$\hat{y}$ = 0,246 x Sales + 1.915.316	0.13	7,468,824

Central and Western Europe - Trailing DEPV/EBITDA, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Central and Western Europe - Forward DEPV/EBITDA, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
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C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
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F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	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
258	13.83	11.12	14.39	13.69	15.29	16.52	[8,51 ; 19,15] (25,6)	-1.28	0.31	$\hat{y}$ = 7,514 x EBITDA + 6.162.050	0.53	6,707,339
333	6.58	5.38	6.72	4.51	7.53	8.42	[5,27 ; 7,90] (40,8)	-0.47	0.35	$\hat{y}$ = 6,365 x EBITDA + 236.841	0.28	2,058,350
521	7.55	5.86	7.21	4.48	7.56	9.23	[4,76 ; 10,35] (25,0)	1.06	0.50	$\hat{y}$ = 6,943 x EBITDA + 291.631	0.58	2,256,123
1,052	11.39	8.94	11.48	8.93	10.66	15.11	[8,73 ; 14,06] (102,1)	-0.02	0.38	$\hat{y}$ = 12,085 x EBITDA - 98.740	0.88	2,683,046
231	8.53	0.27	8.22	6.02	8.42	9.90	[2,29 ; 14,77] (14,2)	0.69	0.54	$\hat{y}$ = 6,627 x EBITDA + 167.231	0.72	468,848
3,054	8.95	6.94	8.44	5.32	7.59	11.67	[7,35 ; 10,55] (328,0)	0.81	0.49	$\hat{y}$ = 12,640 x EBITDA - 3.209.454	0.84	4,055,010
558	8.80	0.58	8.57	4.57	8.51	12.05	[3,54 ; 14,05] (61,7)	0.31	0.59	$\hat{y}$ = 5,551 x EBITDA + 1.272.414	0.39	11,264,175
81	11.24	8.54	11.49	9.03	13.11	14.48	[2,30 ; 20,18] (9,5)	-0.87	0.37	$\hat{y}$ = 14,336 x EBITDA - 637.136	0.99	1,327,444
27	12.46	10.72	12.46	13.36	14.48	14.49	[1,41 ; 23,50] (2,3)	-1.44	0.28	$\hat{y}$ = 14,254 x EBITDA - 78.897	0.99	1,309,362
166	7.49	2.10	7.07	0.94	6.96	12.78	[-4,38 ; 19,36] (23,3)	0.24	0.78	$\hat{y}$ = 13,414 x EBITDA - 514.030	0.97	990,407
998	8.79	5.02	8.42	4.97	7.81	10.79	[5,30 ; 12,29] (96,9)	0.75	0.56	$\hat{y}$ = 12,436 x EBITDA - 1.708.510	0.77	5,013,664
515	11.09	8.02	11.14	7.76	10.77	14.66	[6,21 ; 15,97] (60,6)	0.05	0.45	$\hat{y}$ = 10,786 x EBITDA + 137.896	1.00	1,062,969
1,277	9.76	6.22	9.46	5.66	8.60	13.15	[6,11 ; 13,41] (161,9)	0.54	0.55	$\hat{y}$ = 6,043 x EBITDA + 1.069.981	0.85	4,576,284
2,023	9.19	4.54	8.87	5.54	7.36	13.05	[6,81 ; 11,58] (252,2)	0.48	0.53	$\hat{y}$ = 5,644 x EBITDA + 1.131.999	0.88	3,214,697
70	8.80	1.12	9.03	3.66	12.66	13.20	[-7,51 ; 25,11] (11,2)	-0.56	0.62	$\hat{y}$ = 8,385 x EBITDA + 255.874	0.54	2,190,962
86	8.88	0.61	8.82	4.41	8.65	13.07	[-7,95 ; 25,72] (11,0)	0.11	0.66	$\hat{y}$ = 13,159 x EBITDA - 178.760	1.00	513,287
778	7.00	4.33	6.56	4.64	6.25	8.50	[4,74 ; 9,26] (44,8)	1.35	0.53	$\hat{y}$ = 5,403 x EBITDA + 383.875	0.75	1,121,331
692	9.11	4.49	8.88	5.48	7.84	12.43	[4,34 ; 13,87] (82,2)	0.49	0.58	$\hat{y}$ = 9,966 x EBITDA - 62.896	0.73	968,845

n	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
349	7.89	6.16	7.99	5.54	7.76	10.63	[5,50 ; 10,28] (44,9)	-0.10	0.40	$\hat{y}$ = 5,152 x EBITDA + 4.415.766	0.96	9,571,129
2,013	5.06	3.74	4.72	3.15	4.44	6.25	[4,29 ; 5,82] (129,0)	1.14	0.54	$\hat{y}$ = 9,278 x EBITDA - 5.261.877	0.83	4,269,913
821	5.37	4.17	4.78	3.13	4.94	6.12	[3,68 ; 7,05] (151,7)	2.14	0.61	$\hat{y}$ = 2,958 x EBITDA + 1.861.756	0.58	3,711,357
7,042	4.54	3.68	4.21	3.05	4.13	5.33	[4,24 ; 4,84] (2.492,5)	2.22	0.52	$\hat{y}$ = 2,701 x EBITDA + 3.260.775	0.80	8,755,412
912	2.61	0.39	2.51	1.17	2.29	3.86	[2,11 ; 3,12] (106,2)	0.41	0.70	$\hat{y}$ = 2,316 x EBITDA - 219.094	0.27	3,475,907
6,183	5.47	4.01	5.02	3.70	4.75	6.28	[4,93 ; 6,01] (447,0)	1.51	0.56	$\hat{y}$ = 6,263 x EBITDA - 1.618.300	0.74	9,464,463
6,440	3.81	1.07	3.69	2.44	3.49	5.03	[3,55 ; 4,06] (213,3)	1.03	0.56	$\hat{y}$ = 2,572 x EBITDA + 2.287.525	0.39	14,102,755
2,759	4.60	3.98	4.54	3.64	4.58	5.42	[4,39 ; 4,81] (378,7)	1.11	0.34	$\hat{y}$ = 2,730 x EBITDA + 1.748.579	0.82	2,860,787
698	2.90	2.41	2.67	1.77	2.76	3.24	[2,49 ; 3,30] (855,5)	3.07	0.53	$\hat{y}$ = 2,277 x EBITDA + 674.287	0.72	4,693,218
3,038	6.62	3.60	6.11	3.01	4.87	9.26	[4,89 ; 8,34] (327,5)	0.83	0.69	$\hat{y}$ = 2,712 x EBITDA + 3.585.823	0.64	5,537,681
5,367	5.09	3.33	4.50	2.79	3.91	6.37	[4,34 ; 5,84] (453,5)	1.64	0.68	$\hat{y}$ = 5,489 x EBITDA - 2.075.925	0.64	11,654,305
4,712	3.05	1.35	2.59	1.28	1.84	4.15	[2,54 ; 3,56] (745,7)	2.00	0.91	$\hat{y}$ = 1,378 x EBITDA + 1.666.787	0.32	4,939,801
3,349	6.23	3.86	5.81	3.42	5.40	7.93	[5,10 ; 7,36] (236,3)	1.00	0.61	$\hat{y}$ = 4,899 x EBITDA + 424.455	0.75	8,125,501
7,605	6.22	3.42	5.69	2.75	5.36	7.97	[5,27 ; 7,17] (614,5)	1.01	0.69	$\hat{y}$ = 4,228 x EBITDA + 1.329.345	0.66	6,680,153
1,390	7.35	5.68	7.08	4.50	6.64	9.74	[5,91 ; 8,79] (141,2)	0.63	0.47	$\hat{y}$ = 1,272 x EBITDA + 2.056.789	0.66	4,762,348
1,599	10.10	8.59	10.16	8.34	9.67	12.67	[9,01 ; 11,19] (84,2)	-0.12	0.31	$\hat{y}$ = 10,484 x EBITDA - 293.127	0.90	2,667,173
2,533	4.92	3.12	4.22	2.44	3.69	6.10	[3,63 ; 6,21] (348,5)	1.99	0.77	$\hat{y}$ = 2,901 x EBITDA + 1.991.153	0.50	5,058,211
2,490	4.04	0.85	3.63	1.58	3.12	5.82	[3,10 ; 4,98] (202,2)	1.11	0.79	$\hat{y}$ = 3,387 x EBITDA - 439.335	0.57	5,528,722

Central and Western Europe - Trailing DEPV/EBIT, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Central and Western Europe - Forward DEPV/EBIT, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
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C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
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E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
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H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
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M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	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
199	19.00	12.61	19.47	8.50	23.32	26.86	[-6,72 ; 44,72] (31,4)	-0.47	0.47	$\hat{y}$ = 11,080 x EBIT + 5.713.072	0.49	6,819,416
102	24.94	11.56	26.09	27.26	27.94	29.03	[-3,64 ; 53,52] (18,2)	-2.22	0.32	$\hat{y}$ = 28,415 x EBIT - 124.902	1.00	385,994
247	14.91	9.19	14.55	6.41	12.70	22.72	[-6,27 ; 36,09] (33,5)	0.27	0.57	$\hat{y}$ = 15,368 x EBIT - 42.696	0.80	2,561,984
1,336	18.24	13.02	18.56	13.39	17.91	25.22	[11,00 ; 25,48] (164,4)	-0.20	0.42	$\hat{y}$ = 15,849 x EBIT + 1.095.023	0.81	2,917,526
209	10.04	4.28	9.87	6.88	9.13	11.88	[2,60 ; 17,48] (14,0)	0.60	0.48	$\hat{y}$ = 10,377 x EBIT - 103.352	0.74	426,212
2,796	13.93	10.68	13.28	8.49	11.77	18.85	[10,19 ; 17,67] (318,5)	0.70	0.47	$\hat{y}$ = 23,024 x EBIT - 3.863.040	0.94	5,181,538
1,041	19.63	7.73	20.46	12.96	22.05	27.08	[9,11 ; 30,15] (132,0)	-0.71	0.44	$\hat{y}$ = 22,215 x EBIT - 629.493	0.91	9,817,656
182	15.67	11.81	15.37	8.31	14.66	22.52	[-2,93 ; 34,27] (24,5)	0.24	0.47	$\hat{y}$ = 9,198 x EBIT + 1.791.443	0.73	5,362,574
91	12.28	9.34	11.70	7.33	8.22	14.63	[-13,24 ; 37,81] (7,9)	1.20	0.60	$\hat{y}$ = 8,871 x EBIT + 2.256.567	0.48	7,496,220
236	17.62	11.07	17.97	11.17	18.38	24.15	[0,58 ; 34,65] (31,2)	-0.38	0.43	$\hat{y}$ = 16,961 x EBIT + 383.365	0.96	952,629
939	15.97	7.57	16.07	8.01	18.81	23.52	[4,66 ; 27,28] (141,3)	-0.07	0.55	$\hat{y}$ = 24,229 x EBIT - 586.633	0.99	4,145,334
574	16.98	11.88	17.06	9.84	18.83	23.75	[4,71 ; 29,25] (82,1)	-0.06	0.47	$\hat{y}$ = 11,416 x EBIT + 801.940	0.99	1,147,711
1,326	14.59	10.50	14.81	12.51	14.63	18.21	[11,45 ; 17,72] (90,0)	-0.37	0.34	$\hat{y}$ = 13,852 x EBIT + 310.259	0.98	1,751,179
2,367	15.54	7.20	15.68	13.03	14.75	20.39	[12,20 ; 18,89] (196,7)	-0.08	0.39	$\hat{y}$ = 14,285 x EBIT + 408.149	0.91	2,995,022
91	14.61	2.07	14.61	9.29	15.03	18.23	[-18,04 ; 47,26] (8,6)	-0.06	0.57	$\hat{y}$ = 8,469 x EBIT + 448.161	0.46	2,130,541
102	12.55	0.78	12.29	6.28	10.75	17.96	[-23,85 ; 48,95] (11,7)	0.48	0.72	$\hat{y}$ = 16,636 x EBIT - 52.740	0.99	550,449
902	10.83	5.86	9.88	5.46	8.09	13.72	[2,28 ; 19,38] (100,7)	1.04	0.69	$\hat{y}$ = 4,045 x EBIT + 1.993.791	0.22	2,389,326
601	14.33	6.50	14.12	7.61	13.59	20.00	[2,28 ; 26,38] (81,8)	0.11	0.56	$\hat{y}$ = 22,075 x EBIT - 575.534	0.76	951,555

n	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
354	9.95	8.27	9.93	7.15	8.52	13.73	[6,49 ; 13,40] (48,0)	0.12	0.38	$\hat{y}$ = 6,784 x EBIT + 3.744.647	0.96	9,452,885
2,007	9.02	6.70	8.57	5.61	7.36	12.91	[6,69 ; 11,34] (232,0)	0.76	0.53	$\hat{y}$ = 14,210 x EBIT - 3.611.735	0.81	4,488,828
810	10.09	7.92	9.54	5.79	8.03	14.99	[5,78 ; 14,40] (92,1)	0.79	0.52	$\hat{y}$ = 5,272 x EBIT + 2.135.204	0.64	3,373,472
6,956	7.56	6.08	7.28	4.87	7.13	9.74	[6,90 ; 8,21] (293,6)	1.16	0.46	$\hat{y}$ = 3,847 x EBIT + 3.804.741	0.81	8,679,423
912	3.74	0.69	3.60	1.47	3.24	5.91	[2,72 ; 4,77] (122,9)	0.33	0.70	$\hat{y}$ = 4,231 x EBIT - 772.177	0.48	2,937,416
5,909	7.21	6.04	6.79	5.31	6.40	8.38	[6,61 ; 7,81] (902,5)	1.83	0.44	$\hat{y}$ = 8,255 x EBIT - 1.313.044	0.83	7,821,647
6,489	6.11	1.90	5.82	4.08	5.39	7.60	[5,36 ; 6,86] (2.409,0)	2.04	0.60	$\hat{y}$ = 4,553 x EBIT + 1.515.994	0.55	12,090,464
2,753	7.97	6.94	7.83	5.99	7.49	9.85	[7,24 ; 8,70] (702,7)	1.58	0.36	$\hat{y}$ = 4,936 x EBIT + 1.386.162	0.87	2,408,530
698	4.84	4.14	4.50	3.28	4.31	5.83	[3,88 ; 5,79] (950,1)	3.08	0.49	$\hat{y}$ = 4,502 x EBIT + 88.344	0.76	4,275,116
3,091	7.99	5.09	7.19	4.27	6.45	9.92	[5,59 ; 10,38] (280,5)	1.69	0.68	$\hat{y}$ = 4,187 x EBIT + 3.306.408	0.63	5,921,384
5,024	8.25	5.58	7.42	4.45	6.62	10.57	[6,36 ; 10,14] (391,1)	1.56	0.66	$\hat{y}$ = 7,820 x EBIT - 1.141.142	0.80	9,015,354
4,712	5.37	2.76	4.65	2.49	3.87	7.29	[4,01 ; 6,73] (1.079,1)	2.16	0.84	$\hat{y}$ = 3,052 x EBIT + 1.003.604	0.45	4,436,471
3,338	9.69	6.73	9.14	5.76	8.86	11.72	[7,47 ; 11,92] (190,8)	1.10	0.55	$\hat{y}$ = 7,455 x EBIT + 946.577	0.88	5,645,099
6,065	8.51	5.84	8.09	5.32	7.84	10.74	[7,24 ; 9,78] (294,8)	1.06	0.55	$\hat{y}$ = 7,429 x EBIT + 420.748	0.88	4,361,236
1,369	9.24	8.09	9.21	7.23	9.08	11.54	[8,17 ; 10,31] (95,5)	0.16	0.32	$\hat{y}$ = 2,787 x EBIT + 1.695.032	0.78	3,882,211
1,594	10.29	9.27	10.22	8.61	9.95	12.22	[9,30 ; 11,28] (43,4)	0.36	0.29	$\hat{y}$ = 11,351 x EBIT - 703.784	0.92	2,374,703
2,431	6.83	5.05	6.31	3.77	6.40	8.23	[5,46 ; 8,21] (251,3)	1.70	0.57	$\hat{y}$ = 5,287 x EBIT + 1.114.505	0.66	4,161,462
2,463	6.54	1.55	6.00	3.16	5.81	8.97	[4,49 ; 8,59] (190,4)	1.54	0.72	$\hat{y}$ = 4,889 x EBIT - 100.154	0.67	4,899,463

Central and Western Europe - Trailing DEPV/Invested Capital, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Southern Europe - Trailing DEPV/Invested Capital, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
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M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	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
284	0.83	0.69	0.85	0.62	0.89	1.01	[0,81 ; 0,85] (28,8)	-0.53	0.33	$\hat{y}$ = 0,845 x IC + 1.463.823	0.96	10,277,944
258	0.86	0.65	0.89	0.64	0.96	1.13	[0,83 ; 0,88] (25,3)	-0.69	0.36	$\hat{y}$ = 0,841 x IC + 91.954	0.88	493,458
510	0.80	0.64	0.81	0.58	0.86	1.00	[0,78 ; 0,82] (63,4)	-0.39	0.36	$\hat{y}$ = 1,007 x IC - 314.003	0.96	913,610
5,270	0.70	0.31	0.69	0.45	0.70	0.93	[0,69 ; 0,70] (662,5)	0.06	0.43	$\hat{y}$ = 0,754 x IC - 453.284	0.86	7,811,031
1,369	0.60	0.03	0.60	0.48	0.64	0.73	[0,59 ; 0,61] (112,0)	-0.34	0.52	$\hat{y}$ = -0,006 x IC + 2.227.053	-0.00	1,821,723
4,600	0.63	0.52	0.61	0.45	0.56	0.76	[0,62 ; 0,63] (434,0)	0.70	0.41	$\hat{y}$ = 0,632 x IC - 286.459	0.91	2,941,644
5,904	0.61	0.08	0.62	0.41	0.61	0.83	[0,61 ; 0,62] (587,2)	-0.05	0.49	$\hat{y}$ = 0,404 x IC + 1.350.518	0.59	5,879,253
2,174	0.61	0.41	0.59	0.43	0.54	0.77	[0,60 ; 0,61] (185,5)	0.50	0.40	$\hat{y}$ = 0,398 x IC + 1.837.893	0.73	3,706,177
784	0.43	0.38	0.41	0.32	0.37	0.50	[0,42 ; 0,43] (65,7)	1.55	0.38	$\hat{y}$ = 0,386 x IC + 471.733	0.81	3,688,072
3,183	0.63	0.40	0.61	0.43	0.59	0.80	[0,62 ; 0,64] (302,8)	0.42	0.44	$\hat{y}$ = 0,601 x IC + 597.916	0.77	4,821,537
3,097	0.66	0.46	0.65	0.39	0.64	0.91	[0,65 ; 0,67] (382,9)	0.19	0.46	$\hat{y}$ = 0,379 x IC + 1.242.517	0.72	2,458,702
3,472	0.42	0.29	0.38	0.22	0.28	0.64	[0,41 ; 0,43] (331,8)	1.03	0.65	$\hat{y}$ = 0,273 x IC + 1.400.968	0.27	5,528,814
3,016	0.62	0.39	0.61	0.37	0.57	0.84	[0,61 ; 0,63] (372,8)	0.27	0.52	$\hat{y}$ = 0,500 x IC + 730.928	0.80	4,460,140
6,000	0.63	0.36	0.63	0.32	0.59	0.97	[0,62 ; 0,64] (851,2)	0.16	0.56	$\hat{y}$ = 0,489 x IC + 910.949	0.69	4,074,529
1,090	0.73	0.23	0.75	0.56	0.74	0.92	[0,72 ; 0,75] (86,7)	-0.40	0.40	$\hat{y}$ = 0,204 x IC + 1.070.876	0.85	2,564,701
1,696	0.63	0.45	0.61	0.48	0.60	0.75	[0,62 ; 0,63] (70,7)	0.50	0.36	$\hat{y}$ = 0,469 x IC + 1.176.946	0.92	2,337,430
2,120	0.63	0.12	0.62	0.39	0.62	0.84	[0,62 ; 0,64] (235,1)	0.23	0.46	$\hat{y}$ = 0,226 x IC + 3.123.909	0.39	101,902,183
2,818	0.55	0.08	0.54	0.30	0.53	0.79	[0,54 ; 0,56] (323,1)	0.19	0.58	$\hat{y}$ = 0,649 x IC - 742.190	0.56	4,952,333

n	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
284	0.59	0.34	0.58	0.36	0.56	0.78	[0,56 ; 0,61] (30,5)	0.22	0.50	$\hat{y}$ = 0,701 x IC + 6.134	0.84	833,708
515	0.57	0.44	0.58	0.45	0.57	0.77	[0,56 ; 0,58] (49,0)	-0.24	0.36	$\hat{y}$ = 0,727 x IC - 89.737	0.96	677,349
209	0.60	0.34	0.59	0.32	0.57	0.82	[0,57 ; 0,64] (25,0)	0.24	0.57	$\hat{y}$ = 0,688 x IC + 558	0.83	57,043
1,063	0.68	0.51	0.69	0.53	0.67	0.84	[0,67 ; 0,69] (92,1)	-0.25	0.38	$\hat{y}$ = 0,677 x IC + 224.686	0.97	1,367,255
193	0.45	0.18	0.43	0.30	0.39	0.53	[0,42 ; 0,47] (16,2)	0.71	0.58	$\hat{y}$ = 0,299 x IC + 45.099	0.79	236,987
258	0.68	0.47	0.67	0.39	0.68	0.91	[0,65 ; 0,71] (35,0)	0.14	0.49	$\hat{y}$ = 0,951 x IC - 51.431	0.89	309,643
837	0.41	0.27	0.37	0.18	0.27	0.56	[0,40 ; 0,42] (85,3)	1.06	0.70	$\hat{y}$ = 0,184 x IC + 390.321	0.63	1,676,610
773	0.65	0.35	0.65	0.48	0.67	0.80	[0,63 ; 0,66] (60,5)	-0.14	0.40	$\hat{y}$ = 0,757 x IC - 205.968	0.91	3,147,786
462	0.65	0.49	0.66	0.50	0.71	0.82	[0,64 ; 0,67] (41,4)	-0.33	0.38	$\hat{y}$ = 0,510 x IC + 440.931	0.85	869,267
1,181	0.57	0.27	0.57	0.24	0.51	0.94	[0,55 ; 0,58] (184,3)	0.06	0.61	$\hat{y}$ = 1,009 x IC - 1.689.476	0.89	2,885,126
585	0.48	0.21	0.45	0.27	0.42	0.61	[0,46 ; 0,50] (55,3)	0.79	0.60	$\hat{y}$ = 0,300 x IC + 41.322	0.73	257,553
483	0.64	0.39	0.64	0.30	0.66	0.94	[0,61 ; 0,66] (72,5)	-0.07	0.50	$\hat{y}$ = 0,875 x IC - 340.792	0.93	1,614,574
896	0.60	0.38	0.59	0.36	0.56	0.81	[0,59 ; 0,62] (105,6)	0.35	0.51	$\hat{y}$ = 0,883 x IC - 113.555	0.89	1,485,383
1,487	0.62	0.33	0.61	0.39	0.58	0.84	[0,61 ; 0,63] (165,9)	0.32	0.51	$\hat{y}$ = 0,534 x IC + 185.324	0.92	3,466,561
327	0.51	0.32	0.50	0.25	0.51	0.68	[0,49 ; 0,53] (40,8)	0.31	0.55	$\hat{y}$ = 0,271 x IC + 130.663	0.53	342,350
354	0.61	0.43	0.61	0.42	0.62	0.78	[0,59 ; 0,63] (30,0)	-0.02	0.43	$\hat{y}$ = 0,731 x IC - 122.240	0.96	396,758
805	0.54	0.27	0.53	0.29	0.55	0.75	[0,53 ; 0,55] (75,2)	0.22	0.52	$\hat{y}$ = 0,551 x IC + 8.333	0.93	203,439
666	0.64	0.32	0.65	0.40	0.71	0.86	[0,62 ; 0,66] (72,1)	-0.25	0.46	$\hat{y}$ = 0,759 x IC + 2.110	0.90	1,835,005

Southern Europe - Trailing DEPV/Sales (operating), 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Southern Europe - Forward DEPV/Sales (operating), 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
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M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	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
263	1.02	0.46	0.97	0.39	0.89	1.61	[0,86 ; 1,17] (29,9)	0.62	0.73	$\hat{y}$ = 0,165 x Sales + 36.068	0.92	58,140
343	0.95	0.44	0.82	0.43	0.56	1.00	[0,79 ; 1,10] (32,9)	1.29	0.84	$\hat{y}$ = 1,333 x Sales + 38.376	0.69	450,109
199	0.82	0.35	0.74	0.24	0.54	1.30	[0,65 ; 0,99] (23,2)	0.92	0.88	$\hat{y}$ = 1,225 x Sales - 13.102	0.83	33,976
558	1.03	0.35	0.95	0.36	0.82	1.63	[0,91 ; 1,15] (61,0)	0.74	0.77	$\hat{y}$ = 0,061 x Sales + 212.236	0.07	512,200
193	0.76	0.17	0.66	0.25	0.44	1.26	[0,59 ; 0,93] (17,3)	1.24	0.95	$\hat{y}$ = 0,320 x Sales + 67.877	0.74	258,437
311	0.98	0.60	0.90	0.52	0.82	1.31	[0,87 ; 1,09] (21,4)	1.22	0.65	$\hat{y}$ = 1,062 x Sales + 7.563	0.65	156,384
816	0.80	0.49	0.68	0.45	0.56	0.89	[0,74 ; 0,86] (85,7)	1.84	0.78	$\hat{y}$ = 0,495 x Sales + 99.290	0.90	744,270
284	0.88	0.19	0.80	0.29	0.67	1.16	[0,73 ; 1,04] (27,1)	0.96	0.85	$\hat{y}$ = 0,430 x Sales + 366.642	0.38	2,579,489
172	0.61	0.39	0.58	0.32	0.51	0.93	[0,56 ; 0,65] (23,2)	0.62	0.60	$\hat{y}$ = 0,569 x Sales + 194.076	0.85	1,126,739
531	0.84	0.39	0.75	0.33	0.73	1.11	[0,75 ; 0,93] (40,1)	1.24	0.81	$\hat{y}$ = 0,495 x Sales + 105.721	0.18	1,130,993
719	0.80	0.16	0.67	0.19	0.54	1.20	[0,70 ; 0,90] (64,5)	1.24	0.96	$\hat{y}$ = 0,072 x Sales + 173.293	0.10	464,022
252	0.79	0.40	0.73	0.47	0.74	1.04	[0,71 ; 0,87] (15,1)	1.38	0.67	$\hat{y}$ = 0,488 x Sales + 75.616	0.54	244,145
767	0.97	0.36	0.89	0.42	0.79	1.40	[0,88 ; 1,05] (81,1)	0.85	0.74	$\hat{y}$ = 1,222 x Sales + 1.257	0.94	101,845
1,449	1.09	0.31	1.03	0.47	0.95	1.73	[1,02 ; 1,16] (179,2)	0.50	0.69	$\hat{y}$ = 1,857 x Sales - 70.800	0.99	475,481
188	1.11	0.14	1.05	0.31	0.85	1.77	[0,83 ; 1,39] (25,6)	0.54	0.83	$\hat{y}$ = 0,161 x Sales + 68.637	0.76	123,731
81	1.43	0.76	1.44	0.92	1.55	2.17	[1,14 ; 1,73] (11,2)	-0.21	0.53	$\hat{y}$ = 1,990 x Sales - 16.289	0.94	92,715
832	0.91	0.26	0.80	0.27	0.62	1.50	[0,81 ; 1,00] (91,0)	0.97	0.88	$\hat{y}$ = 1,810 x Sales - 31.009	0.91	210,224
429	0.88	0.16	0.78	0.28	0.67	1.26	[0,76 ; 1,00] (38,1)	0.98	0.85	$\hat{y}$ = 0,317 x Sales + 206.805	0.16	2,068,474

n	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
75	0.65	0.47	0.61	0.46	0.55	0.74	[0,57 ; 0,73] (4,4)	1.33	0.58	$\hat{y}$ = 0,376 x Sales + 810.160	0.81	1,644,649
472	1.34	1.17	1.29	0.99	1.11	1.58	[1,28 ; 1,40] (49,4)	1.03	0.41	$\hat{y}$ = 0,828 x Sales + 1.769.383	0.58	1,810,599
70	1.41	0.79	1.37	0.65	1.29	2.52	[0,93 ; 1,90] (11,2)	0.38	0.67	$\hat{y}$ = 2,914 x Sales - 831.313	0.96	674,148
730	0.79	0.39	0.75	0.36	0.72	1.11	[0,75 ; 0,84] (66,4)	0.78	0.64	$\hat{y}$ = 0,310 x Sales + 2.594.695	0.85	2,966,424
27	0.41	0.35	0.41	0.35	0.45	0.53	[0,40 ; 0,43] (2,1)	-0.69	0.32	$\hat{y}$ = 0,370 x Sales + 61.543	0.55	1,029,897
166	1.04	0.76	0.98	0.57	0.91	1.42	[0,92 ; 1,15] (17,3)	0.74	0.55	$\hat{y}$ = 0,505 x Sales + 579.915	0.94	904,480
467	0.43	0.32	0.37	0.26	0.29	0.54	[0,41 ; 0,45] (205,0)	2.54	0.73	$\hat{y}$ = 0,236 x Sales + 978.010	0.58	1,347,380
419	0.85	0.35	0.83	0.38	0.98	1.10	[0,80 ; 0,90] (11,0)	0.67	0.55	$\hat{y}$ = 0,558 x Sales + 3.324.772	0.60	8,059,518
311	0.49	0.38	0.45	0.35	0.44	0.54	[0,46 ; 0,52] (1.104,8)	4.03	0.67	$\hat{y}$ = 0,626 x Sales - 937.887	0.29	5,538,452
504	0.45	0.12	0.34	0.08	0.20	0.46	[0,38 ; 0,51] (53,0)	1.84	1.23	$\hat{y}$ = 0,644 x Sales - 2.670.855	0.58	5,633,711
290	1.29	0.11	1.31	0.47	1.37	2.15	[1,10 ; 1,49] (42,4)	-0.11	0.66	$\hat{y}$ = 0,125 x Sales + 2.757.328	0.02	3,288,244
145	0.31	0.26	0.28	0.21	0.26	0.39	[0,30 ; 0,31] (23,4)	1.89	0.48	$\hat{y}$ = 0,354 x Sales - 232.232	0.87	1,923,761
225	0.84	0.55	0.83	0.59	0.81	1.09	[0,80 ; 0,88] (5,1)	0.53	0.43	$\hat{y}$ = 1,384 x Sales - 494.543	0.81	721,207
596	1.04	0.22	1.01	0.61	1.02	1.35	[0,99 ; 1,10] (47,9)	0.50	0.53	$\hat{y}$ = 1,089 x Sales + 37.198	0.96	3,449,773
107	0.82	0.37	0.79	0.23	0.54	1.54	[0,64 ; 1,00] (20,2)	0.32	0.78	$\hat{y}$ = -0,166 x Sales + 543.088	-0.02	322,383
59	1.14	0.90	1.17	0.98	1.22	1.41	[1,04 ; 1,23] (4,0)	-0.64	0.35	$\hat{y}$ = 1,241 x Sales - 44.568	0.28	268,909
236	0.60	0.40	0.54	0.36	0.47	0.58	[0,55 ; 0,65] (21,8)	1.55	0.70	$\hat{y}$ = 0,448 x Sales + 129.183	0.87	365,434
317	0.93	0.27	0.91	0.53	0.76	1.49	[0,84 ; 1,03] (37,4)	0.32	0.65	$\hat{y}$ = 0,562 x Sales + 1.300.679	0.48	5,453,072

Southern Europe - Trailing DEPV/EBITDA, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
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C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Southern Europe - Forward DEPV/EBITDA, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
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M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	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
193	8.17	4.62	7.79	3.90	8.01	11.01	[-0,06 ; 16,39] (16,6)	0.60	0.61	$\hat{y}$ = 7,065 x EBITDA + 190.605	0.61	1,530,630
263	6.96	4.21	6.62	3.85	4.69	10.38	[0,88 ; 13,05] (33,8)	0.85	0.67	$\hat{y}$ = 6,517 x EBITDA + 77.606	0.66	520,027
161	8.02	4.10	7.70	2.53	7.11	12.59	[-2,97 ; 19,00] (25,2)	0.28	0.69	$\hat{y}$ = 5,410 x EBITDA + 35.829	0.80	155,474
649	7.43	3.66	6.88	3.57	5.94	10.07	[3,16 ; 11,69] (61,3)	0.88	0.66	$\hat{y}$ = 3,944 x EBITDA + 951.742	0.85	2,991,418
161	5.92	1.03	5.44	3.11	4.79	7.42	[-0,01 ; 11,85] (8,7)	1.15	0.69	$\hat{y}$ = 4,918 x EBITDA + 8.617	0.84	330,803
220	7.53	5.24	7.02	5.03	7.13	9.37	[2,09 ; 12,96] (13,3)	1.16	0.56	$\hat{y}$ = 11,972 x EBITDA - 26.104	0.84	115,646
735	7.06	4.47	6.50	4.58	5.72	8.17	[4,13 ; 9,99] (54,3)	1.25	0.59	$\hat{y}$ = 5,476 x EBITDA + 430.716	0.72	1,321,776
397	9.57	2.45	9.57	5.39	10.01	14.03	[2,34 ; 16,80] (56,0)	-0.03	0.59	$\hat{y}$ = 13,360 x EBITDA - 316.574	0.90	2,652,013
161	8.19	4.40	7.86	4.85	8.43	10.85	[-0,90 ; 17,29] (16,7)	0.48	0.62	$\hat{y}$ = 10,960 x EBITDA + 109.954	0.91	817,245
338	9.34	6.00	9.01	4.02	8.15	13.24	[2,32 ; 16,35] (42,3)	0.38	0.57	$\hat{y}$ = 5,376 x EBITDA + 877.811	0.46	2,987,909
558	7.20	2.21	6.65	2.82	5.25	11.05	[1,58 ; 12,82] (66,0)	0.82	0.75	$\hat{y}$ = 1,810 x EBITDA + 240.234	0.23	644,145
225	8.43	3.19	8.08	3.00	6.68	13.35	[-3,26 ; 20,12] (34,9)	0.39	0.74	$\hat{y}$ = 15,765 x EBITDA - 741.581	0.89	2,359,916
676	5.93	2.57	5.32	2.43	4.45	8.29	[2,13 ; 9,73] (59,8)	1.10	0.79	$\hat{y}$ = 5,416 x EBITDA + 56.679	0.79	254,274
1,283	7.33	2.58	6.77	2.84	5.41	11.60	[3,32 ; 11,34] (157,3)	0.82	0.77	$\hat{y}$ = 5,903 x EBITDA + 200.917	0.98	860,292
247	8.10	3.70	7.74	2.87	7.45	12.08	[-0,19 ; 16,38] (27,9)	0.54	0.66	$\hat{y}$ = 2,095 x EBITDA + 362.253	0.16	731,277
134	9.91	5.18	9.87	7.61	10.74	12.43	[1,18 ; 18,64] (10,1)	-0.12	0.48	$\hat{y}$ = 14,817 x EBITDA - 45.969	0.92	309,771
703	6.38	2.52	5.90	2.51	4.67	10.09	[2,02 ; 10,75] (83,8)	0.79	0.79	$\hat{y}$ = 13,527 x EBITDA - 34.145	0.91	218,771
397	6.89	2.68	6.33	2.77	5.50	9.09	[0,47 ; 13,30] (42,5)	0.83	0.77	$\hat{y}$ = 4,354 x EBITDA + 187.078	0.46	1,730,557

n	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
81	4.83	3.69	4.27	3.02	3.44	4.67	[-0,60 ; 10,25] (13,5)	2.02	0.68	$\hat{y}$ = 3,326 x EBITDA + 22.676	0.91	1,090,563
478	5.73	5.17	5.40	4.67	4.93	6.61	[4,54 ; 6,93] (656,6)	3.25	0.42	$\hat{y}$ = 4,130 x EBITDA + 979.531	0.81	1,260,631
129	10.10	6.14	10.12	5.38	10.73	14.23	[-0,83 ; 21,03] (17,4)	-0.07	0.52	$\hat{y}$ = 12,931 x EBITDA - 173.741	0.83	1,408,816
751	4.81	3.21	3.95	2.32	3.71	5.12	[2,36 ; 7,26] (103,5)	2.06	0.80	$\hat{y}$ = 1,974 x EBITDA + 2.691.867	0.89	2,517,243
43	7.55	3.59	7.55	2.33	4.26	14.98	[-18,12 ; 33,23] (9,3)	0.43	0.81	$\hat{y}$ = 1,624 x EBITDA + 1.235.037	0.10	1,153,714
274	7.46	5.44	6.91	4.61	6.19	8.15	[2,41 ; 12,51] (23,0)	1.15	0.58	$\hat{y}$ = 5,822 x EBITDA + 864.666	0.70	1,930,951
462	2.99	2.47	2.69	2.05	2.43	3.50	[2,48 ; 3,50] (49,3)	1.85	0.52	$\hat{y}$ = 2,056 x EBITDA + 618.083	0.69	1,141,203
542	4.80	3.73	4.65	3.73	4.67	5.87	[3,77 ; 5,84] (739,7)	2.58	0.48	$\hat{y}$ = 2,825 x EBITDA + 3.567.836	0.76	5,533,086
311	2.71	2.17	2.67	1.65	2.91	3.83	[2,33 ; 3,08] (40,7)	0.31	0.45	$\hat{y}$ = 2,533 x EBITDA - 25.346	0.50	1,535,232
649	4.72	1.54	4.09	1.26	4.12	7.06	[1,64 ; 7,80] (42,2)	1.24	0.88	$\hat{y}$ = 4,114 x EBITDA - 257.537	0.79	4,511,399
295	5.69	1.90	5.59	3.44	5.86	6.93	[3,41 ; 7,97] (15,5)	1.07	0.52	$\hat{y}$ = 5,580 x EBITDA - 54.339	0.88	1,221,727
182	4.95	2.97	4.83	1.99	4.76	8.09	[1,76 ; 8,15] (28,0)	0.31	0.62	$\hat{y}$ = 1,727 x EBITDA + 4.344.383	0.19	8,434,250
279	4.47	2.81	4.37	3.06	4.16	5.75	[3,39 ; 5,55] (26,9)	0.41	0.45	$\hat{y}$ = 5,925 x EBITDA - 437.789	0.77	4,523,307
725	5.16	2.06	4.57	3.28	4.00	6.14	[3,02 ; 7,30] (81,0)	1.86	0.69	$\hat{y}$ = 3,268 x EBITDA + 1.800.464	0.92	4,485,694
-	-	-	-	-	-	-	-	-	-	-	-	-
102	13.66	10.30	14.00	11.26	15.15	16.80	[5,29 ; 22,03] (6,0)	-1.00	0.32	$\hat{y}$ = 17,186 x EBITDA - 417.935	0.97	509,298
204	3.60	2.84	3.64	2.83	3.70	4.43	[3,08 ; 4,12] (17,1)	-0.39	0.36	$\hat{y}$ = 4,255 x EBITDA - 27.816	0.90	332,200
403	5.88	3.67	5.18	3.53	4.19	6.64	[1,70 ; 10,06] (35,4)	1.54	0.73	$\hat{y}$ = 3,577 x EBITDA + 1.341.790	0.83	2,820,778

Southern Europe - Trailing DEPV/EBIT, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

Southern Europe - Forward DEPV/EBIT, 1 April 2021 until 31 March 2024

NACE Rev. 2 Sector	
C10 - C12	Manufacture of food products, beverages, tobacco products
C13 - C15	Manufacture of textiles, wearing apparel, teather and related products
C16, C17, C31, C32	Manufacture of wood/products, paper/products, furniture; other manufacturing
C19 - C23	Manufacture of coke, chemicals, rubber, refined petroleum/chemical/pharmaceutical/plastic/mineral products
C24 - C25	Manufacture of basic metals, fabricated metal products
C26 - C27	Manufacture of computers, electronic/optical products, electrical equipment
C28 - C30, C33	Manufacture of machinery, motor vehicles, other transport equipment; repair/installation
D35	Electricity, gas, steam and air conditioning supply
E36 - E39	Water supply, sewerage, waste management, remediation activities
F41 - F43	Construction - Buildings, civil engineering, specialized construction activities
G45 - G47	Wholesale/Retail trade, repair of motor vehicles and motorcycles
H49 - H53	Transportation and storage - Land/pipelines, water, air; warehousing, postal/courier activities
J58 - J60, C18	Publishing activities, programme production, music publishing, broadcasting, printing
J61 - J63	Telecommunications, computer programming/consultancy, information service activities
K64 - K66	Financial and insurance activities
L68	Real estate activities
M69, M70, M73, N77 - N82	Legal/accounting activities, consultancy, advertising/market research, rental/employment/security activities, travel agency
M71, M72, M74, M75	Architectural/engineering/other professional activities, technical testing, scientific R&D, veterinary activities

n	Trailing DEPV/EBIT Multipless									Trailing EBIT Regression		
	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
209	11.82	5.87	11.17	5.32	10.31	16.16	[-8,24 ; 31,88] (20,2)	0.70	0.68	ŷ = 9,631 x EBIT + 158.351	0.66	1,649,593
220	10.03	5.79	9.19	6.04	6.77	15.41	[-3,43 ; 23,49] (17,6)	1.08	0.66	ŷ = 15,111 x EBIT - 6.559	0.86	207,678
161	9.81	5.72	9.29	4.10	8.83	15.55	[-4,99 ; 24,61] (20,2)	0.52	0.66	ŷ = 5,375 x EBIT + 47.722	0.79	159,885
660	10.01	4.37	9.31	4.76	8.23	14.10	[1,73 ; 18,28] (67,3)	0.80	0.68	ŷ = 3,996 x EBIT + 962.638	0.85	2,970,495
134	7.60	1.15	6.81	3.49	6.22	8.93	[-7,01 ; 22,21] (20,5)	1.87	0.80	ŷ = 5,075 x EBIT + 26.089	0.83	366,770
220	12.10	6.57	11.29	6.07	9.37	17.39	[-9,60 ; 33,79] (24,5)	0.85	0.70	ŷ = 20,810 x EBIT - 38.648	0.78	258,699
666	12.42	6.24	12.17	8.00	13.13	15.44	[4,78 ; 20,07] (58,1)	0.28	0.53	ŷ = 12,146 x EBIT + 385.868	0.75	1,241,750
376	12.90	2.98	12.83	7.31	13.43	18.84	[-0,27 ; 26,08] (42,6)	-0.00	0.58	ŷ = 17,235 x EBIT - 577.899	0.88	4,119,988
145	11.37	6.68	10.90	6.99	10.02	13.30	[-6,80 ; 29,54] (12,8)	0.77	0.61	ŷ = 10,632 x EBIT + 173.234	0.91	813,744
413	12.65	5.74	12.25	6.55	11.55	19.35	[-1,72 ; 27,02] (50,8)	0.39	0.63	ŷ = 12,853 x EBIT - 38.319	0.61	6,236,681
531	10.37	3.24	9.57	3.46	7.38	16.75	[-2,59 ; 23,33] (61,1)	0.74	0.78	ŷ = 2,688 x EBIT + 249.001	0.17	1,069,707
242	13.21	4.35	12.84	4.09	13.05	21.82	[-12,61 ; 39,02] (34,4)	0.40	0.71	ŷ = 19,499 x EBIT - 560.974	0.73	3,506,981
585	8.39	3.55	7.83	3.55	7.52	11.40	[2,10 ; 14,68] (33,5)	0.98	0.69	ŷ = 7,004 x EBIT + 71.328	0.82	251,772
1,154	10.43	3.39	9.59	3.35	7.46	17.54	[1,08 ; 19,79] (146,3)	0.72	0.80	ŷ = 7,805 x EBIT + 181.010	0.53	600,381
317	13.06	5.75	12.77	5.84	11.20	22.87	[-5,07 ; 31,19] (45,8)	0.41	0.65	ŷ = 4,220 x EBIT + 550.270	0.18	931,795
193	17.60	8.67	17.89	12.36	14.30	26.09	[-6,67 ; 41,86] (26,9)	-0.06	0.49	ŷ = 24,706 x EBIT - 88.069	0.89	736,101
698	8.68	2.38	7.78	3.02	5.62	13.50	[-0,44 ; 17,81] (72,7)	0.89	0.84	ŷ = 16,403 x EBIT - 11.268	0.87	267,885
424	10.22	3.00	9.36	3.33	6.86	16.95	[-6,69 ; 27,13] (51,8)	0.78	0.86	ŷ = 4,326 x EBIT + 276.857	0.45	1,708,677

n	Forward DEPV/EBIT Multiples									Forward EBITD Regression		
	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	cv	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
81	7.40	6.14	6.97	4.91	5.63	7.81	[-0,15 ; 14,96] (6,7)	1.39	0.52	ŷ = 5,415 x EBIT + 36.292	0.90	1,162,259
478	9.04	7.81	8.30	7.04	7.39	10.17	[5,11 ; 12,97] (110,5)	2.26	0.48	ŷ = 5,797 x EBIT + 1.101.985	0.86	1,082,822
129	14.68	8.63	14.96	8.74	16.71	20.64	[-4,71 ; 34,06] (17,2)	-0.40	0.47	ŷ = 20,959 x EBIT - 650.984	0.92	986,064
751	7.26	4.98	6.13	3.58	5.48	7.34	[2,23 ; 12,29] (78,1)	1.83	0.76	ŷ = 3,078 x EBIT + 2.536.986	0.90	2,404,324
43	9.85	4.80	9.85	2.85	6.37	19.06	[-30,31 ; 50,01] (9,2)	0.39	0.77	ŷ = 1,921 x EBIT + 1.291.804	0.08	1,169,289
274	10.70	7.70	10.09	5.99	8.36	14.17	[0,71 ; 20,69] (28,2)	0.84	0.56	ŷ = 7,786 x EBIT + 955.525	0.70	1,924,812
462	4.74	3.60	4.02	2.90	3.48	5.41	[2,07 ; 7,40] (419,0)	3.11	0.75	ŷ = 2,840 x EBIT + 748.214	0.66	1,201,148
537	7.35	5.83	7.23	5.99	7.14	8.82	[5,75 ; 8,94] (30,3)	0.36	0.39	ŷ = 4,504 x EBIT + 3.386.223	0.79	5,193,633
311	4.30	2.90	4.15	1.98	4.05	6.42	[2,63 ; 5,98] (46,0)	0.43	0.59	ŷ = 1,504 x EBIT + 1.851.437	0.09	2,068,601
612	7.44	2.51	6.70	1.80	5.93	12.30	[-0,14 ; 15,03] (46,9)	0.94	0.86	ŷ = 5,842 x EBIT - 219.355	0.81	3,672,283
295	8.04	4.32	7.86	6.06	7.39	10.07	[3,75 ; 12,34] (68,5)	1.60	0.50	ŷ = 7,413 x EBIT + 60.812	0.93	943,045
182	9.12	5.07	8.99	3.38	11.35	13.59	[-1,59 ; 19,83] (30,5)	0.04	0.62	ŷ = 3,392 x EBIT + 3.425.891	0.28	7,971,577
236	7.99	4.64	7.12	4.74	6.35	9.94	[-0,06 ; 16,03] (61,9)	2.20	0.65	ŷ = 16,248 x EBIT - 1.170.746	0.67	2,619,419
671	9.99	4.37	9.44	5.54	9.40	14.00	[3,82 ; 16,16] (43,0)	0.85	0.59	ŷ = 9,844 x EBIT + 854.635	0.93	4,298,484
-	-	-	-	-	-	-	-	-	-	-	-	-
107	13.80	10.69	14.24	11.58	15.34	16.61	[6,29 ; 21,31] (5,1)	-1.04	0.30	ŷ = 16,897 x EBIT - 339.574	0.97	474,957
199	4.89	4.16	4.88	3.88	5.21	5.62	[4,02 ; 5,77] (14,9)	0.07	0.34	ŷ = 5,395 x EBIT - 531	0.90	338,478
403	8.34	5.55	7.49	5.55	6.43	9.05	[1,57 ; 15,11] (32,8)	1.50	0.66	ŷ = 5,698 x EBIT + 1.104.235	0.86	2,549,594

News from IVSC

ECB Report Highlights Importance of IVS

A recent report by the European Central Bank (ECB) underscores the critical role of the International Valuation Standards (IVS) in enhancing transparency and consistency in commercial real estate valuation across Europe. The report advocates for the widespread adoption of IVS to mitigate risks associated with property valuation inaccuracies and to bolster the stability of the real estate market. This endorsement from a major regulatory body signifies a pivotal step towards harmonizing valuation standards globally.
Explore the ECB report here.

Perspectives Paper – Intangibles: Making Intangibles More Tangible

The IVSC has released a comprehensive Perspectives Paper titled "Making Intangibles More Tangible," which aims to enhance the understanding and valuation of intangible assets. As intangibles continue to dominate the economic landscape, this paper discusses methods and frameworks that can improve their visibility and valuation accuracy. It provides a series of lessons and case studies drawn from various sectors, illustrating how different approaches can be applied effectively in real-world scenarios. This paper is a crucial resource for professionals seeking to deepen their knowledge of intangible asset valuation and adapt to its growing significance in global markets.

Read the full paper here.

Perspectives Paper – ESG and Real Asset Valuation

The IVSC has recently published a Perspectives Paper focused on ESG (Environmental, Social, and Governance) factors and their impact on real asset valuation. This paper explores how ESG considerations are becoming increasingly significant in the valuation process, particularly for real assets. It highlights the need for robust frameworks to integrate ESG into valuation practices and discusses the challenges and opportunities that valuers face as they adapt to this evolving landscape. The paper serves as a guide for professionals to better understand and implement ESG factors in their valuation models.

Read the full paper here.

IVS to be Made Free from January 2025

In a landmark decision, the IVSC has announced that the International Valuation Standards (IVS) will be freely available starting January 2025. This initiative is aimed at democratising access to these standards, ensuring that professionals and stakeholders worldwide can benefit from universally recognised and accepted valuation practices without cost barriers. By making IVS freely accessible, the IVSC aims to foster greater consistency and professionalism in valuation across various industries and regions. Learn more about this initiative here.

Professional Insights: Bridging the Gap – Rethinking Financial Reporting for the Intangible Asset Revolution

In an enlightening interview, Professor Anup Srivastrava shares his expert insights on the evolving dynamics of financial reporting in the face of the intangible asset revolution. This piece, titled "Bridging the Gap – Rethinking Financial Reporting for the Intangible Asset Revolution" explores the challenges and transformative approaches needed to better represent the value of intangible assets in financial statements. Professor Srivastrava, a global expert and academic leader, discusses innovative strategies that could significantly alter financial reporting frameworks, enhancing transparency and investor understanding. This interview summarises the profound implications and necessary advancements as intangible assets continue to grow in economic significance. Read the insights here.

News from EACVA

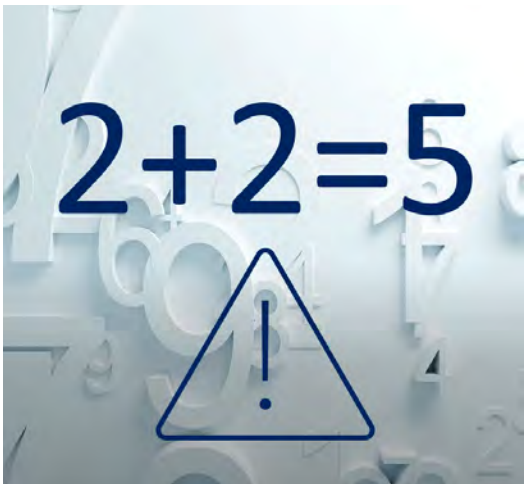
EACVA's Live Web Seminar: Valuation Meets ESG & Sustainability

– Analysis – Value Driver – Valuation –
Tuesday, 19 November 2024 **I 13:30–16:15 (CET/GMT+2)**

In this web seminar you will learn how to integrate ESG issues into business valuations. Different aspects of how to quantify risks, opportunities, assets, liabilities and cash flow effects will be explained. We will highlight the most important aspects of ESG integration:

- How to integrate ESG into valuations
- To what extent can we use our existing valuation framework? And where do we need to extend it?
- What do we need to look at from an analytical perspective?
- How can we translate this into a practical valuation approach?

Our Speaker: **Prof. Matthias Meitner, Ph.D., CFA**, Managing Partner at VALUESQUE | Professor for Finance, Accounting & Business Valuation at the International School of Management (ISM) in Munich, Germany.
» Learn more and register!



Lessons learned from 19 years of CVA case study valuations

Since 2005, well over 1,000 CVA candidates across Europe have completed their case study as part of the CVA exam. When analysing the sources of mistake, one tendency is evident: The mistakes with the most significant impact on the conclusion of value occur during the transition of the planning calculation from the last planning year (T) to the terminal value (TV) year (T+1). Causes of mistakes vary by country, as different valuation techniques are practised in different countries. Outside Germany, the DCF-WACC method is usually applied, normally combined with the assumption of a constant capital structure in market values. Austria and the Netherlands are an exception, where the APV method, combined with the consideration of periodic debt capital planning, is also used in reporting. The main source of mistake in the DCF-WACC method is the incorrect calculation of the FCF in year T+1.

Even if the sustainable operating result has been plausibly derived, mistakes regularly occur as investments vs. depreciation and amortization and the change in net working capital are not reconciled with the (indefinite) growth assumption. One reason for this is the following textbook formula: $\mathbf{TV_T = (FCF_T\,(1+g))\,/\,(WACC-g)}$. This formula starts with the FCF in the last planning year T. Its application can therefore only lead to correct results if the FCF in year T is already derived on the assumption of the TV growth, e.g. from year T+1 onwards. For this reason, in practical applications I recommend determining a FCF in year T+1 mathematically independent of the last year of a forecast, using the following formular: $\mathbf{TV_T = (FCF_T + 1)\,/\,(WACC-g)}$.

Alternatively, a transition year T+1 can be modelled and the start of the perpetual annuity is thus postponed by one year to T+2.

In Germany, the Flow-to-Equity method is used for business valuations for legal purposes. As the change in interest-bearing debt and cash and cash equivalents also influence the Flow to Equity in the, it is even more error-prone in this respect than the entity DCF methods. The mistake with the most massive value-destroying effect within the Flow to Equity application is the valuation of a legal derived dividend in year T+1 combined with the assumption of a company-specific inflation growth rate. In this case, the Flow to Equity has to take into account only a retention that is aligned with that inflation growth rate. If a dividend is used in terminal value year T+1 the Flow to Equity model develops into a Dividend Discount Model. This means that the terminal value growth rate must consider the internal rate of return (IRR) of the investments financed by the retained earnings (net income minus dividend payment). This IRR cannot be less than the cost of capital in an infinity calculation.

Reading the EBVM will help you to avoid this and other mistakes in your business valuations.

Wolfgang Kniest, CVA (EACVA)

EACVA Annual Business Valuation Conference 2024

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Prof. Dr. Dr. h.c. Clemens Fuest, *ifo Institute*

Sustainable finance, sustainability measurement and risk
Prof. Dr. Gregor Dorfleitner, *University of Regensburg*

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IVSC Members Introduce Themselves:

European Valuation Institute (EVI) is a premium analytical boutique founded in 2020 in Prague with the mission to enhance quality and ethics of valuation profession both locally in the Czech Republic and across Europe. EVI accomplishes this through in-depth research and sharing the findings with both the general and professional public, as well as through organising educational and networking events. EVI is also dedicated to delivering high-quality advisory services to their clients.

How would you describe your organisation?

EVI has been established to contribute to the development of the valuation community. Our vision is to enhance the quality of valuation practices and promote the consistent application of high-quality valuation and ethical professional standards. To achieve this vision, EVI is actively engaged in three main areas:

- Conducting research that addresses real-world challenges faced by practitioners in Europe;
- Offering educational opportunities to enhance professional knowledge and skills; and
- Providing complex financial advisory services for local and international clients, with a focus on valuation, litigation support, M&A advisory, and financial modelling.

All these areas are interconnected. For example, our experience from working on high-profile litigation, international arbitration, and M&A related projects gives us a unique insight that we use in our research. On the other hand, the deep understanding of the current market trends that we gain through our research enables us to continuously improve the services we provide to our clients.

Furthermore, since we want to be an active member of the global valuation community, we have joined the Luxembourg Valuation Professionals Association (LVPA) and the IVSC and cooperate with several education institutions.

Please tell us about your recent research activities.

EVI closely monitors and follows the latest global trends in finance and valuation and is focused on advancing applied research throughout Europe. Currently, EVI is conducting research to estimate the individual parameters of the discount rate used for valuation purposes. In 2023, EVI completed research on estimating the equity risk premium based on the data of European companies. This study leverages the most current data and information, incl. actual stock prices and analysts' forecasts of future financial figures to determine the implied risk premium. Our research is unique in relying on comprehensive data of all listed European companies, allowing us to estimate the equity risk premium that accurately reflects market conditions and expectations not only for the largest companies, but also for medium-sized companies in European countries with moderate risk, such as the Czech Republic.

To follow on the research on the equity risk premium, EVI is developing the methodology and calculations for other parameters of the discount rate.

Where can the findings of your research be accessed?

The findings of the latest research on estimating the equity risk premium have been presented at international and local conferences in USA, Germany, and the Czech Republic. The estimates of the equity risk premium are regularly updated on a monthly basis and published on EVI's website.

Please tell us about your educational activities.

In cooperation with universities and professional organizations, we organise conferences not only for local, but also European professionals in the financial sector, with the aim to support cooperation within the valuation community.

Moreover, EVI develops training courses to educate practitioners in the field of valuation and finance. This year, EVI organized the first seminar in the planned series of the valuation seminars on the specifics of valuation in Germany and Austria.

As a part of our cooperation with universities in the Czech Republic, we conduct lectures and discussions on our ongoing research, primarily addressing the returns and risks of securities.

Why and how do you promote ethical and high-quality professional standards?

Based on our professional experience and long-term collaboration with the IVSC, we recognize the vital importance of maintaining ethical and high-quality professional standards to enhance quality and trust in the valuation profession.

In our effort to promote and contribute to the use of the high-quality professional standards in the Czech Republic, we lead the translation of the International Valuation Standards (IVS), effective 31 January 2025, into Czech. This initiative is undertaken in partnership with other renowned Czech institutions. Additionally, EVI advocates for the IVS among various authorities and at numerous events and seminars.

Why are you member with IVSC?

We in EVI believe that high-quality valuation standards are essential for any valuation community, since they enable to maintain and increase the quality and ethics.

These standards also streamline communication among all stakeholders. Sharing the same objectives, EVI values the opportunity to be a partner of the IVSC in their effort to advance trust and quality of valuation profession and foster collaboration witin the community. ◆

EBVM

The European Business Valuation Magazine

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