Business Valuation is a Question of Trust

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Cost-of-equity estimates play a central role in valuation and investment analysis, yet the way they are constructed can influence how risk and return are interpreted in decision-making contexts. This article argues that discount-rate methodologies should be evaluated not only by their statistical foundations but also by their transparency and interpretability.

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Debt Beta

Some Unrecognized or Disregarded Aspects

The article highlights some problems in the examination and evaluation of debt betas as a part of the CAPM-methodology that has gained growing attention by appraisers in the last two decades.

These problems relate to additional factors explaining debt betas, possible misapplication of debt beta based on the weighting of the market index, and its dependence on the leverage ratio.

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From the Editors

Communicating Uncertainty – and a New Frontier for Valuers

In May 2026, the IVSC's Valuation Risk Working Group published a Perspectives Paper "Managing and Communicating Value Uncertainty" that deserves the attention of every valuer working internationally. Its core message is simple but easily forgotten in daily practice – value uncertainty is not a sign that a valuation has failed. It is an inherent feature of estimating the worth of complex assets in complex markets, and it is analytically distinct from valuation risk, which reflects genuine errors or process failures.

This same push toward disciplined, defensible methodology is exactly what motivates EACVA's newest initiative: the CDAV – Certified Digital Asset Valuator. Digital assets are, almost by definition, an asset class where value uncertainty is unusually pronounced – thin markets, volatile on-chain data, and evolving regulation all complicate the picture. Digital assets have long outpaced the profession's ability to value them consistently. Institutional crypto exposure continues to grow, DeFi protocols now sit on hundreds of billions in locked value, and regulators from MiCA to IFRS are asking hard questions about fair value, stablecoin reserves, and NAV calculations for token portfolios – yet a standardised, defensible valuation methodology has largely been missing. The CDAV was developed to close that gap: a practice-oriented curriculum that bridges established valuation principles with blockchain infrastructure, tokenomics, and DeFi mechanics, culminating in a real-world case study rather than a purely theoretical exam. This issue of EBVM asks a question that runs beneath almost every valuation engagement, however different the four contributions may appear on the surface: how much can we trust the numbers we produce, and how well can we explain where that trust comes from?

Karagiannidis opens the issue with a guest essay written from the vantage point of the Greek mid-market, where multiples-based pricing still dominates deal practice. *Ernst/Kamarás* then turn to a methodological frontier: simulation-based corporate planning and valuation. Building on a case study, they present a structured process in which Monte Carlo simulation is used not merely to stress-test a plan, but to derive the cost of equity itself from the company's own risk position – explicitly incorporating insolvency risk along the way. *Pattikawa's* contribution addresses the cost of equity from a different angle entirely – not its statistical construction, but its role as a communication device. Contrasting covariance-based models such as CAPM with cash-flow-implied approaches derived from the relationship between FCFE, growth, and price. Finally, *Knoll/Lorenz/Manthey* take a critical look at debt beta, a concept that has gained increasing traction in valuation practice over the past two decades. Taken together, these four articles circle back to a common theme: valuation is only as credible as the transparency of the assumptions behind it.

We hope these contributions prompt discussion within your own practice, and, as always, we look forward to your feedback.

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Imprint

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Guest Essay

Integrating Financial Due Diligence Findings into DCF Valuations

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I. Introduction

This essay aims to address a persistent gap in deal advisory practice: the disconnection between the rigour applied in financial due diligence and the relative superficiality of the valuation methods ultimately used to price a transaction.

I write from the perspective of the Greek M&A market, where deal activity is predominantly driven by mid-market transactions in a largely SME-based economy, with advisory mandates ranging from local boutique firms to the Big 4 and international investment banks. In Greece, as in many Southeast European markets, multiples-based approaches often anchored to EV/EBITDA & EV/Sales comparables, remain the dominant pricing methodology, particularly in smaller and family-owned business transactions where formal valuation frameworks are rarely applied.

The governance environment amplifies this risk: corporate and finance managers who proceed without engaging a qualified, independent valuer bear a significant responsibility burden, as the absence of a rigorous, documented valuation process exposes both the decision and the decision-maker to challenge whether by co-investors, boards, regulators, or courts.

It is precisely in this context that integrating financial due diligence findings into a DCF-based valuation framework becomes not merely a matter of best practice, but of professional accountability.

II. Smart Money Never Skips the Valuation

Walk into any investment committee meeting and you'll hear the same refrain: "What's our basis for this number?" It's not just curiosity, it's survival instinct. In a world where capital allocation mistakes can sink careers and companies, professional investors have learned that gut feelings and back-of-napkin estimates are luxury items they can't afford.

Yet surprisingly, many deal participants still treat valuation as an afterthought or checkbox exercise. This disconnect creates both massive risks for the unprepared and significant opportunities for those who get it right.

III. The Real Cost of Winging It

The market is littered with cautionary tales of deals gone wrong due to inadequate valuation work. Consider the acquirer who paid a premium for a trending e-commerce business, only to discover post-close that the customer acquisition costs were unsustainable. Or the private equity firm that relied solely on industry multiples for a services business, missing the founder dependency risk that evaporated value overnight when key personnel departed.

These aren't outlier stories but predictable outcomes when valuation rigor takes a backseat to deal momentum. The irony is that the time and cost to prevent these disasters through proper analysis represents a rounding error compared to the losses from getting it wrong.

IV. Where the Market Gets Lazy (And Smart Money Profits)

The most interesting dynamic in today's deal environment isn't what everyone's doing but what they're not doing. Most buyers default to the path of least resistance: find some comparable transactions, apply the median multiple, and call it a day. This approach feels safe and defensible in committee meetings.

But here's what's fascinating about this market behavior: it creates systematic blind spots that sophisticated players can exploit.

When everyone's using the same playbook (market multiples), they're essentially competing for the same generic value proposition. Meanwhile, the deals that generate exceptional returns often come from recognizing value that doesn't show up in standard comparable analysis, operational leverage opportunities, strategic positioning advantages, or industry disruption plays that haven't been reflected in historical trading data.

This is where the private equity industry's relationship with DCF modeling gets particularly interesting. Many PE shops publicly dismiss DCF analysis because "you can't trust management projections." Fair enough management teams do tend toward optimism when selling their vision.

But dismissing DCF entirely means missing the forest for the trees. The real value of cash flow modeling isn't accepting management's numbers at face value but stress-testing their assumptions and understanding which variables actually drive returns. Smart investors use DCF as a diagnostic tool, not a crystal ball.

V. The Missing Pillar in Due Diligence

Here's where the market reveals a curious blind spot. Every sophisticated buyer understands the importance of comprehensive due diligence (tax advisors scrutinize liabilities and structuring opportunities, legal teams examine contracts and regulatory compliance, and financial due diligence teams dissect historical performance and operational metrics).

But then something strange happens. After spending weeks or months gathering this detailed, company-specific intelligence through FDD, most buyers abandon it when determining what to pay. Instead of leveraging these insights to build sophisticated DCF models that reflect the actual business characteristics uncovered during diligence, they default to market multiples that treat the target like every other company in the sector.

This disconnect is particularly glaring when you consider that FDD often reveals the most critical value drivers, customer concentration risks, working capital dynamics, operational leverage opportunities, or competitive positioning advantages that don't show up in any comparable transaction database. These insights should directly inform valuation assumptions, yet they're frequently ignored in favor of "market-based" pricing.

The irony becomes even more pronounced when you examine how DD outcomes are actually used in deal structuring. Tax DD findings directly influence deal structure and tax efficiency mechanisms. Legal DD discoveries shape representations, warranties, and indemnification provisions. Even FDD results are meticulously incorporated into working capital adjustments, earnout formulas, and other pricing mechanisms that sit below enterprise value.

But when it comes to the most fundamental question what the enterprise value itself is, then suddenly all this company-specific intelligence gets abandoned in favor of generic market multiples. The very insights that are deemed critical enough to influence every other aspect of deal structure are inexplicably ignored when determining the core valuation. This means buyers are using market-based EV assessments derived from other companies' characteristics rather than firm-specific EV assessments based on the actual business they're acquiring and the specific insights their own diligence has uncovered.

VI. The Valuation Due Diligence Gap

Smart acquirers have begun treating valuation analysis as a fourth pillar of due diligence, equal in importance to tax, legal, and financial workstreams. Just as you wouldn't complete a transaction without independent legal advice or tax structuring analysis, sophisticated buyers now recognize that independent valuation analysis of FDD outcomes is essential for optimal deal execution.

This means engaging certified valuation professionals not just to validate a purchase price, but to translate FDD findings into quantified value drivers through rigorous DCF modeling. These specialists serve as the critical link between diligence discovery and pricing decisions, ensuring that company-specific insights actually influence what you're willing to pay.

When valuation professionals independently analyze FDD outcomes—stress-testing growth assumptions, quantifying operational improvements, and modeling company-specific risk factors they often uncover value that generic market multiples miss entirely. They can identify which FDD findings truly matter for cash flow generation, and which are just noise, translating operational insights into financial impact

VII. The Competitive Intelligence Factor

Professional valuation work also serves a less obvious but equally important function: competitive intelligence. The valuation process forces deep dives into industry dynamics, competitive positioning, and market trends that inform not just pricing decisions but strategic direction.

Understanding why a company trades at a premium or discount to peers often reveals insights about sustainable competitive advantages, market positioning, or execution quality that influence everything from offer structure to integration planning.

VIII. Getting the Process Right

The organizations that excel at deal execution have learned to treat valuation analysis as an integral part of their due diligence process, not an afterthought. They engage valuation professionals early in the process often simultaneously with other diligence workstreams so that company-specific insights can inform valuation modeling in real time.

This integrated approach means that when FDD uncovers, say, a customer concentration issue or an operational efficiency opportunity, those findings immediately flow into updated DCF scenarios rather than being relegated to a generic risk adjustment applied to market multiples. The result is pricing that reflects the actual business being acquired rather than market averages that may have little relevance to the specific opportunity.

These sophisticated buyers also understand that valuation professionals bring a different analytical lens than traditional FDD teams. While financial diligence focuses on historical performance and operational metrics, valuation specialists translate those findings into forward-looking cash flow implications and risk-adjusted return scenarios. It's the difference between understanding what happened and quantifying what it means for future value creation.

IX. The Bottom Line Reality

In today's competitive deal environment, information asymmetries are increasingly rare. Most basic financial and market data is widely available, and standard analytical tools are commoditized. The differentiation comes from analytical depth, independent thinking, and the willingness to dig deeper than surface-level comparisons.

The players who consistently win aren't necessarily smarter – they're just more thorough in their preparation and more honest about what they don't know. They use multiple analytical approaches not because textbooks say they should, but because real-world experience has taught them that single-point estimates in complex transactions are usually wrong.

Whether you're deploying your own capital or managing others', the valuation discipline you bring to deal evaluation directly correlates with long-term performance. It's not glamorous work, but in a business where being wrong is expensive, being thorough pays compound returns.

The question isn't whether you can afford to invest in proper valuation capabilities it's whether you can afford to compete without them.

Simulation-Based Corporate Planning and Company Valuation

A Case Study for Practical Implementation

Simulation-based business valuation is a method that derives the cost of equity from an analysis of the risks identified within the company and takes market imperfections into account in the valuation. Valuation models in imperfect capital markets are more complex than the CAPM-based valuation models commonly used in practice. The aim of this article is to use a case study to demonstrate, in a structured eight-step process, how a simulation-based business valuation can be carried out in a practical manner.

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I. Methodology of Simulation-Based Corporate Planning and Valuation

The methodology behind simulation-based company valuation has a long history in Germany. Following the publication of early works on the then-novel method of Monte Carlo simulation, *Coenenberg*[1] applied it to the field of company valuation for the first time. However, simulation-based valuation methods have only become more important in the last 20 years, alongside with the further development of methods for quantitative risk analysis and risk aggregation, which are also based on Monte Carlo simulation.[2] The common core idea underlying the various simulation-based valuation methods has always been to (1) model an unbiased estimator[3] for cash flows forecast, taking into account existing opportunities and threats (risks) and (2) explicitly uncover uncertainties.[4,5] Unbiased forecast values that are determined by aggregating the risks with reference to corporate planning can be calculated independently of the theoretical concept of company valuation, i.e. also for a valuation based on financing theory using the Capital Asset Pricing Model (CAPM). In the context of investment-theoretical valuation theory, creating transparency regarding existing uncertainty was particularly important.[6]

A simulation-based valuation in conjunction with the so-called semi-investment valuation theory is highly relevant. This theory is based on the imperfect replication method[7] and explicitly takes into account earning uncertainties and insolvency risks in the valuation, both of them can be quantified using Monte Carlo simulation.[8] Due to the same basic methods and the same information requirements, simulation-based valuation methods have often been developed in close connection with simulation-based rating forecast methods.[9]

Due to the increased importance of information from risk management for operational decisions, legal requirements for early risk detection systems in companies (StaRUG and FISG) and higher requirements from capital providers for capital allocation to companies (e.g. amendment of MaRisk), the analysis of operational risks in valuation, investment and capital allocation decisions is becoming increasingly important. Models are required that adequately take into account the economic and business risks facing the company when making business decisions.

The methodology of simulation-based corporate planning and valuation has already been discussed intensively in the literature and is attracting increasing interest from valuation practitioners. Unlike the CAPM, the simulation-based company valuation takes into account the imperfections of capital markets and includes entrepreneurial risks in the analysis. Therefore, the methods associated with the simulation-based valuation are more demanding than those associated with a CAPM valuation. For this reason, valuation practitioners are calling for guidelines that define the steps of a simulation-based that defines a valuation process; allowing a certain degree of standardization and comparability.

The purpose of this article is to present a first draft of such a guideline. We have structured the guideline into steps so that the evaluation model can be created successively. This reduces the model's complexity. As with traditional evaluation projects, the guide also consists of a planning and evaluation section.

In this article we use the term "unbiased planning", although the term "unbiased" can have several meanings and is not often used in the literature to describe the situation discussed here, yet. Overall, in the English-language literature on corporate planning, "unbiased" tends to mean "undistorted" in the sense of not manipulated. In Germany, planning standards and auditing standards as well as legal requirements have led to an increasing demand for planning that reflects the values that will occur on average, i.e., expected values in the statistical sense. The Institute of Public Auditors in Germany (IDW), which issues guidelines and standards on issues such as auditing and company valuation, demands in its Practical Note 2/2018[10] that probabilities of default in a planning calculation should be estimates that are reflect expectations. Section II.3.5 of the principles of proper planning[11] also states that planning should generally be based on comprehensible expected values. However, there is no term in English literature that corresponds exactly to the German term "Erwartungstreu" used for this type of planning. In this article, the term "unbiased" is employed in this sense.

II. Case Study of Simulation-Based Planning and Evaluation

For our guidelines, we use a slightly modified business planning and valuation example from *Ernst* and *Häcker*[12], further developing it as a simulation-based planning and business valuation model.[13] We use the equity approach as the DCF ap-

1 Cf. Coenenberg, ZfB, (1970): 793-804.
2 Such procedures are initially necessary in order to fulfill economic and legal requirements for risk management; see Füser et al., DER BETRIEB (1999): 753-758; Berger et al., DER BETRIEB (2021): 2709-2714; Gleißner et al., DER BETRIEB (2023): 1489-1498.
3 In other words, forecast where the forecasted values correspond to the modeled statistical mean value.
4 See Matschke and Brösel, Business Valuation, 2021.
5 On expected plan values, cf. Behringer/Gleißner, Die Wirtschaftsprüfung (2021): 857-864; Rieg/Gleißner, Die Wirtschaftsprüfung (2022): 1407-1414; and on classification in the context of risk management, see Vanini/Rieg, Risikomanagement: Grundlagen – Instrumente – Unternehmenspraxis, 2nd ed. 2021; Gleißner, Grundlagen des Risikomanagements, 4th ed. 2022; Romeike and Hager, Erfolgsfaktor Risiko-Management 4.0. Methoden, Beispiele, Checklisten – Praxishandbuch für Industrie und Handel, 2020.
6 On simulative company valuation in this context, see Hering et al., Betriebswirtschaftliche Forschung und Praxis (2013): 256-280.
7 Cf. Dorfleitner/Gleißner (2018), Journal of Risk, 3; Dorfleitner (2020), Annals of Operations Research; Gleißner/Follert, Betriebswirtschaftliche Forschung und Praxis, (2022): 395-419.
8 Cf. e.g. Gleißner, Wirtschaftswissenschaftliches Studium (2011): 345-352; Ernst, Wirtschaftswissenschaftliches Studium(2022): 16-23; Ernst, Journal of Risk and Financial Management, no. 5 (2022); Gleißner/Ihlau, Betriebs-Berater (2017):1387-1391; Ernst/Gleißner, The Value Examiner, May–June 2023.
9 Cf. Bemmann, Entwicklung und Validierung eines stochastischen Simulationsmodells für die Prognose von Unternehmensinsolvenzen, 2007; Berger/Kamáras, CM (2020); Gleißner/Ernst, Business Valuation OIV Journal (2019): 3-18; Franken et al., Corporate Finance (2020): 84-96, on classification.

10 IDW Praxishinweis 2/2018, §43.
11 Cf. Federal Association of German Management Consultants, 2022.
12 See Ernst/Häcker, Financial Modeling, 2nd ed. 2016.
13 Cf. Ernst, Wirtschaftswissenschaftliches Studium, (2022): 16-23; Ernst, Journal of Risk and Financial Management, no. 5 (2022); see also Gleißner/Ihlau, Betriebs-Berater (2017): 1387-1391; and Gleißner/Ernst, Business Valuation OIV Journal (2019): 3-18.

proach, in which the cash flows to equity (CFtE) represent the relevant cash flows and the cost of equity represents the relevant cost of capital.

We proceed with the following steps:

Phase 1: Simulation-based (unbiased) planning
1. Description of the risk parameters with distribution functions for the Monte Carlo simulation
2. Integrating the risk parameters into the income statement and balance sheet planning
3. Modeling of insolvencies and their effects
4 Modeling the cash flows to equity as valuation-relevant payments using the Monte Carlo simulation

Phase 2: Simulation-based valuation
1. Evaluation of the simulation results for the cash flows to equity
2. Pricing of the risk based on the market data
3. Derivation of the cost of equity
4. Calculating the enterprise value using the risk premium method

Phase 1: Simulation-based (unbiased) planning

An unbiased plan that aligns with the mean expectations (mean values in a statistical sense) is a (methodological) prerequisite for any DCF valuation, regardless of the company valuation method.[14] While many valuations in practice assume a model-exogenously given plan – e.g. a plan adopted by the company – to be unbiased[15], in the context of a simulation-based company valuation the unbiased planning is determined valuation-model-independently with the help of the stochastic planning method. Therefore, this requirement is automatically fulfilled in a simulation-based company valuation.

Company risk analyses are always based on (integrated) corporate planning. Traditionally, management objectives are incorporated into corporate planning as targets or target values. However, more modern valuation approaches rely on corporate unbiased planning that does not reflect targets, and takes the company's uncertainties into account. This can be achived through simulation.[16] Unbiased plan values are plan values that reflect the average of various possible future developments, so they are mean values in a statistical sense.[17] Unbiased plan values form the basis for valuing the cash flows uncertainties, the rating analysis and, therefore, the company valuation[18]. As part of simulation-based corporate planning, the company's existing and unhedged risks are identified and their effects are described by quantifying the risks using distribution functions of the stochastic planning variables. These stochastic plan variables are then incorporated into the P&L and balance sheet planning, resulting in stochastic plan values instead of target values. The effect of the combination of these identified and quantified risks on a target variable (e.g. EBIT or cash flow) is then determined via Monte Carlo simulation. A Monte Carlo simulation is essentially a type of sampling procedure in which a large, representative sample is used to draw conclusions about the population. In a Monte Carlo simulation, random numbers are used to generate stochastic samples. The objective is to determine the company's overall risk position (the aggregated quantity of risks) and to determine the relative significance of these individual risks, taking into account their interactions (correlations). This requires the aggregation of all (material) risks across all risk types and also over time. Using Monte Carlo simulation, the effects of all individual uncertainties are combined based on their quantification (risk aggregation). Subsequently, the data will undergo statistical evaluation in order to obtain mean values, among other things. In this process, the expected effects of risks will be taken into account (unbiased planning), as well as fluctuation ranges (and thus risk content), which will be based on realistically possible combinations of risks. It is important to note that adding up (maximum) risk effects is not an appropriate way to determine the overall risk. On the one hand, this procedure leads to an entirely unrealistic combination but, on the other hand, this is just one of many possible scenarios (whereby this particular one is even impossible, the probability of all risks occurring simultaneously with their maximum impact is, in fact, zero). A Monte Carlo simulation provides "all" (at least many, typically several 10,000) realistic combinations. This makes it possible to explicitly determine the maximum combined damage levels that will not be exceeded at a certain probability level.

With the simulation of integrated planning, all items and all key figures of the planning are automatically simulated simultaneously. Consequently, the results (e.g. mean value) of any or all items can be obtained simultaneously.

Surprisingly, the unbiased planning method has received little international attention so far.

Summarising the relevant literature, the following steps for creating a plan that is consistent with expectations can be identified, which we also implement in our guidelines:
1. Identification of the company's relevant risks;[19]
2. Selecting and adapting suitable distribution functions for the identified risks (e.g. uniform, triangular or Gaussian-type distributions, ...);[20]
3. Transfer and integration of the risk distributions into the business plan for the Monte Carlo simulation;[21]
4. Risk aggregation to a target planning position (e.g. cashflow) using the Monte Carlo simulation;[22]
5. Analysis of the simulated uncertain development of the targeted position and derivation of the expected plan value.[23]

14 See Gleißner et al., CM (2022): 72-79.
15 This assumption, is usually not fulfilled.
16 Cf. Ernst/Gleißner, Journal of Risk and Financial Management (2022): 399-411.
17 Cf. Gleißner, Controlling (2008): 81-88.
18 Cf. Ernst, Journal of Risk and Financial Management, no. 5 (2022).
19 Cf. Gleißner, Risikomanagement im Unternehmen, 2001: 1-18.
20 Cf. Wehrspohn/Ernst, Distributions as the Basis of Quantitative Risk Management: An Overview of Various Use Cases, 2022.
21 Cf. Ernst, Journal of Risk and Financial Management, no. 5 (2022).
22 Cf. Jaeckel, Monte Carlo Methods in Finance, 2002; Pachamanova and Fabozzi, Simulation and Optimization in Finance: Modeling with MATLAB, @Risk, or VBA, 2010.
23 Cf. Stulz, Risk Management & Derivatives, 2003; Jorion, Value at Risk: The New Benchmark for Managing Financial Risk, 3rd ed. 2007; Friberg, Managing Risk and Uncertainty: A Strategic Approach, 2015.

As we believe that simulation is the only meaningful way to aggregate risks for calculating plan values that are consistent with expectations, we also refer to simulation-based planning as the basis for simulation-based company valuation. When using the simulation, risks with different distributions, and not just normal distributions, can be used.

Step 1: Description of the risk parameters with distribution functions for the Monte Carlo simulation

In step 1, for example as a result of a risk workshop, the risks are identified that have not been fully hedged by the company in a profit-neutral or liquidity-neutral manner. The quantification of risks and their aggregation in the context of corporate planning is a particularly important business task. Corporate planning and valuation on the one hand and risk management and controlling on the other should work closely together on this task. A probability distribution can be used to describe impact of a risk on earnings and/or liquidity in a period (e.g. one year). The most relevant and practical distribution functions in the context of risk management[24] are binomial, normal, triangular and the PERT distribution. These distributions – or combinations of these distributions – can describe the monetary impact of the risk in one year. In particular, the combination of the binomial distribution for occurrence[25] with other distributions is relevant for the amount of loss in practice. They thus integrate the frequency of occurrence and the level of impact of the risk.

Since historical time series of market data are often inapplicable to corporate planning, the distribution functions relevant to planning must be determined through expert surveys. While these provide the best planning data, they are subject to high methodological requirements. In some cases expert opinions can be obtained as part of risk workshops using a multi-stage process (Delphi technique). The results of the first round of questioning are incorporated into subsequent rounds of questioning, and leading to a more accurate assessment of the expected risks. Using such procedures requires extensive planning and an open risk and corporate culture.

Employee surveys can supplement this procedure. These surveys primarily contribute above all to identifying internal risks. Information can be obtained through interviews or written surveys. One often-cited advantage is that the employees are knowledgeable, as they are at the grassroots level and are therefore confronted with risks on a daily basis. However, it must be pointed out that a large amount of irrelevant information is often produced, resulting in an overwhelming number of identified risks that are almost unmanageable. This occurs because risks that appear to be current are discussed rather than the really important ones, or because many similar risks are named differently. Therefore, a general employee survey is not usually recommended for risk analysis. A broad opinion base can also be obtained through an expert survey.[26]

In addition to the standard distribution functions mentioned above, so-called expert distributions are available (e.g. in the Excel add-in Risk Kit. These capture the expert statements well using three quantiles and also allow for one- or two-sided unlimited representation of effects. This type of distribution functions help to quantify risk statements by experts. Furthermore, these techniques can also be used to determine the operational risks of banks and insurance companies, which are also quantified using expert surveys and must comply with regulatory requirements.

Table 1 shows the parameterization of the distribution functions used to model sales growth (using a triangular distribution as an example), cost of sales, distribution costs and general administrative costs (using normal distributions as an example). A normal distribution is used to model possible deviations from the planned value. In our example we assume that the latter items were planned unbiased, so the target value corresponds to the expected / mean value. Accordingly, the expected value of a deviation from the plan is zero, thus the expected value of the normal distribution is 0%. However, the items may deviate from the planned value by chance. This possibility is represented with a corresponding standard deviation as the second parameter of the respective normal distributions. Table 2 contains the distribution functions for modeling other operating expenses, also including event-driven risks (such as bad debts or loss of major customers). This means that a deviation from the planned value occurs only in a certain proportion of cases. Technically, this is modeled using combined distributions of probability of occurrence (binomial distribution) and uncertain loss amounts (triangular distribution, expressed as a proportion of sales). The loss of a major customer in $\mathbf{t}_{(5)}$. will be used as an example to explain this. The probability of a major customer defaulting is 5% per period. In one of the simulation runs, this risk has been realized, i.e. the event has occurred. The amount of lost sales is again a random variable with a triangular distribution that occurs with a minimum loss of 15%, a most probable loss of 20% and a maximum loss of 25%. The random number drawn from the triangular distribution is 18.66%. In the P&L item "Other operating expenses", 18.66% of turnover is added due to the loss of the major customer in this simulation run. Examples of individual random values from the corresponding distributions are shown as examples in the "random value" cells. These values can therefore be considered as one scenario from a Monte Carlo simulation (of e.g. 100,000 scenarios).

Step 2: Integrating risk parameters into income statement and balance sheet planning

In the second step, the Monte Carlo simulation parameters are integrated into the income statement and balance sheet planning by linking them to the appropriate items.[27] As a result, unbiased plan values (mean values) can be derived after the simulation has been carried out.

24 Cf. Wehrspohn/Ernst, op. cit. (Fn. 20); Gleißner, op. cit. (Fn. 5); Vanini/Rieg, op. cit. (Fn. 5).

25 Or piosson distribution in cases, where multiple occurrences are possible within a period.

26 Cf. Gleißner, op. cit. (Fn. 5).

27 Cf. Gleißner, op. cit. (Fn. 5).

Table 1: Distribution functions for modeling sales growth, cost of sales, distribution costs and general administrative costs

Risk assumptions for the most important planning items						
	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Triangular distribution	distribution	distribution	distribution	distribution	distribution	distribution
Sales growth						
- Minimum value	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
- Most likely value	6.00%	6.00%	6.00%	6.00%	2.00%	2.00%
- Maximum value	9.00%	9.00%	9.00%	9.00%	3.00%	3.00%
Random value in a simulation run (example) from the distribution	4.00%	4.33%	4.00%	3.67%	1.33%	1.33%
Normal distribution	distribution	distribution	distribution	distribution	distribution	distribution
Production costs						
- Expected value	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
- Standard deviation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Random value in a simulation run (example) from the distribution	4.00%	4.33%	4.00%	3.67%	1.33%	1.33%
Distribution costs						
- Expected value	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
- Standard deviation	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Random value in a simulation run (example) from the distribution	4.00%	4.33%	4.00%	3.67%	1.33%	1.33%
General administration costs						
- Expected value	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
- Standard deviation	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Random value in a simulation run (example) from the distribution	4.00%	4.33%	4.00%	3.67%	1.33%	1.33%

In the context of corporate planning, risks are understood as possible deviations from the target value (plan). This understanding of risk includes both

- opportunities (possible positive deviations) and
- threats (possible negative deviations).

The principles of proper planning (GoP[28]) take account of the close link between planning and risk by creating transparency about the risks that could trigger deviations from the plan. Similar to IDW PS 340 n.F. for auditing the early risk detection system, which is based on the KonTraG, the GoP requires the determination of the aggregated overall scope of risk, as this is the only way to assess the scope of possible deviations from the plan and the associated threat to the company's existence.[29]

Corporate planning that is designed in accordance with these requirements of the GoP is therefore an adequate basis for combining risk management and planning. It fulfils the formal requirements of a risk management system and avoids personal liability risks for management, the Management Board and the Supervisory Board.

Considering opportunities and risks enables the derivation of meaningful and decision-relevant unbiased planning values (mean values). It is an essential requirement of the GoP to determine plan values that are "on average" correct, i.e. plan values that adequately take into account possible positive and negative deviations from the plan. These plan values according to GoP are therefore precisely the unbiased plan values (mean values) and must be used in the valuation. Only such unbiased plan values can form the basis for business decisions (e.g. investment decisions or decisions on company acquisitions).[30] Table 3 shows an excerpt from the income statement planning.

28 BDU (ed.), Grundsätze ordnungsgemäßer Planung (GoP), 2022.
29 Cf. Nickert/Nickert, GmbHR (2021): 401-413.

30 Cf. Gleißner, op. cit. (Fn. 5): 582 et seq.

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Table 2: Distribution functions for modeling other operating expenses

Risk assumptions event-driven risks for other operating expenses						
	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Combined binomial distribution (occurrence) and triangular distribution (amount of loss)	distribution	distribution	distribution	distribution	distribution	distribution
Other operating expenses - Small losses						
Probability of loss	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
- Minimum value	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
- Most likely value	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
- Maximum value	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Entry into the simulation run	no entry	no entry	**enrty**	no entry	no entry	**entry**
Random value in a simulation run (example) from the distribution	0% (no entry)	0% (no entry)	0.58%	0% (no entry)	0% (no entry)	0.74%
- Medium failures						
Probability of loss	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
- Minimum value	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
- Most likely value	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
- Maximum value	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
Entry into the simulation run	**entry**	no entry	no entry	no entry	no entry	no entry
Random value in a simulation run (example) from the distribution	3.02%	0% (no entry)	0% (no entry)	0% (no entry)	0% (no entry)	0% (no entry)
- Major failures						
Probability of loss	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
- Minimum value	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
- Most likely value	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
- Maximum value	5.50%	5.50%	5.50%	5.50%	5.50%	5.50%
Entry into the simulation run	no entry	no entry	no entry	no entry	no entry	**entry**
Random value in a simulation run (example) from the distribution	0% (no entry)	0% (no entry)	0% (no entry)	0% (no entry)	0% (no entry)	4.78%
Combined binomial distribution (occurrence) and triangular distribution (amount of loss)	distribution	distribution	distribution	distribution	distribution	distribution
Probability of loss	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
- Minimum value	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
- Most likely value	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
- Maximum value	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
Entry into the simulation run	no entry	no entry	no entry	no entry	**entry**	no entry
Random value in a simulation run (example) from the distribution	0% (no entry)	0% (no entry)	0% (no entry)	0% (no entry)	18.66%	0% (no entry)

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Table 3: Excerpt from the P&L planning

Profit and loss account									
(Absolute figures in € million)	Is t_{-2}	Actual t_{-1}	Actual t_0	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Sales revenue (projected value)				**42,165**	**44,273**	**46,487**	**48,811**	**49,625**	**50,452**
Sales revenue (target value)	**36,528**	**39,741**	**40,157**	**42,566**	**45,120**	**47,828**	**50,697**	**51,711**	**52,745**
- Production costs (budgeted value)				20,432	21,454	22,526	23,653	24,047	24,448
- Production costs (target value)	17,975	19,070	19,347	20,627	21,864	23,176	24,567	25,058	25,559
Gross profit on sales (projected value)	**18,553**	**20,671**	**20,810**	**21,733**	**22,819**	**23,960**	**25,158**	**25,578**	**26,004**
Gross profit on sales (target value)	**0**	**0**	**0**	**21,940**	**23,256**	**24,651**	**26,131**	**26,653**	**27,186**
- Distribution costs (budgeted value)				10,505	11,030	11,581	12,161	12,363	12,569
- Distribution costs (target value)	8,958	9,981	10,080	10,605	11,241	11,915	12,630	12,883	13,141
- R&D costs	2,932	3,013	3,190	3,342	3,542	3,755	3,980	4,060	4,141
- General administrative expenses (budgeted value)				1,978	2,077	2,181	2,290	2,328	2,367
- General administrative expenses (target value)	1,713	1,866	1,883	1,997	2,117	2,244	2,378	2,426	2,474
+ other operating income	859	1,087	897	1,039	1,101	1,167	1,237	1,262	1,287
- Other operating expenses (budgeted value)				2,256	2,369	2,487	2,612	2,655	2,700
- Other operating expenses (target value)	1,660	2,970	1,620	2,278	2,414	2,559	2,713	2,767	2,822
Operating result (EBIT) (budgeted value)				4,691	4,902	5,123	5,353	5,433	5,515
Operating result (EBIT) (budgeted value in line with expectations)				**4,128**	**4,217**	**4,478**	**4,653**	**4,743**	**4,825**
Operating result (EBIT) (target value)	**4,149**	**3,928**	**4,934**	**4,757**	**5,043**	**5,345**	**5,666**	**5,779**	**5,895**
Operating result (EBIT) (risk value)				-629	-780	-883	-1,047	-1,037	-1,098

Step 3: Modeling insolvencies and their effects

In step 3, the insolvency risk – the possibility of a company insolvency (unable to pay) – is calculated. This must be taken into account in every company valuation.[31] Neglecting the effect of the probability of default is one of the most common errors found in valuation reports.

The probability of default has a negative impact on the company value.[32] Therefore, failing to consider the possibility of insolvency is a serious valuation error. Only under the unrealistic assumption of a perfect capital market do insolvency risks play no role in the company valuation.[33] In a perfect capital market, there are no insolvency costs and no financing or rating restrictions, which is why insolvency cannot occur as a result of illiquidity or over-indebtedness.[34] At best, a frictionless transfer of ownership rights to creditors is conceivable.

The method used in this article to quantify and record insolvency risks has several significant advantages over other methods presented in the literature.[35] Firstly, the simulation-based methods consistently utilise information from corporate planning and quantitative risk analysis in order to

- derive reliable estimates of earnings and cash flows in detailed planning (taking insolvency scenarios into account)[36]
- to record the effects of the probability of default on the development of earnings in the continuation phase and
- derive compatible risk-adequate discount rates (cost of capital rates), taking into account earnings and insolvency risks, expressed together as a risk measure of cash flows.

None of the methods presented in the literature to date are capable of doing this. None of those methods incorporate information from integrated corporate planning and from quantitative

31 Cf. Friedrich, Company Valuation in the Event of Insolvency Risk, 2015.

32 Cf. Gleißner, Die Wirtschaftsprüfung (2010): 735-743; Saha/Malkiel, Journal of Applied Finance (2012): 175-185; Franken et al., Corporate Finance (2020): 84-96.

33 Cf. Gleißner, Die Wirtschaftsprüfung (2010): 735-743; Knabe, Die Berücksichtigung von Insolvenzrisiken in der Unternehmensbewertung, 2012; Franken et al., Corporate Finance (2020): 84-96.

34 Cf. Ernst/Gleißner, Journal of Risk and Financial Management (2022): 399-411.

35 For a more detailed classification, see Gleißner, Management Research Review (2019): 1243-1258; Franken et al. (2020), Corporate Finance (2020): 84-96.

36 Cf. Gleißner/Ernst, EBVM, no. 2 (2023): 4-16.

risk analysis.[37] Nevertheless, there are some interesting approaches that combine the probability of default with corporate planning, but do not fall into the category of simulation-based planning. *Friedrich*[38], for example, uses a binomial model that considers insolvency risks and their costs. However, his model does not include an explicit risk analysis of the company or modeling of the negative free cash flows typical of insolvencies. The model by *Lahmann/Schreiter/Schwetzler*[39] offers an analytical solution for the inclusion of possible insolvency based on a given theoretical EBIT process. However, neither of the aforementioned nor earlier simulation-based approaches, such as those by *Schwarz/Moon*[40] and *Behm*[41], allow the discount rate to be derived consistently from the same database as the insolvency risk. Furthermore, previous methods are based on the idea of perfect capital markets. However, this concept is incompatible with insolvency costs or with rating and financing restrictions (as *Friedrich*[42] himself acknowledges).

The starting point for calculating the probability of default is the existing integrated income statement and balance sheet planning with the integrated, unhedged risks. These form the basis of a structural insolvency forecasting procedure. It provides a (future-oriented) risk-based estimate of the probability of default.[43]

There are various methods for estimating the probability of default.[44] The rating and insolvency forecasting methods used by banks and rating agencies are important because their quality is regularly confirmed by validation studies. These methods use financial ratios such as the equity ratio, return on assets or interest coverage ratio. They view the company and debt as a single unit (unlike entity valuation methods, which separate the two). Even with just a few financial ratios, such as the return on capital employed (*ROCE*) and the equity ratio (*EKQ*), it is at least possible to estimate the probability of default p using an empirically inductive determined function.

We use Gleissner's calculation formula[45], which has proven to be highly practical. The formula provides a probability of default. This probability of default can then be converted into a rating grade using the so-called "master scale", which matches rating grades and (empirical) probabilities of default (e.g. as with S&P).

$$p = \frac{0{,}265}{1 + e^{-0{,}41 + 7{,}42 \cdot EKQ + 11{,}2 \cdot ROCE}} \quad (1)$$

37 Cf. Hager/Romeike, op. cit. (Fn. 5); Vanini/Rieg, op. cit. (Fn. 5); Gleißner, op. cit. (Fn. 5).
38 Cf. Friedrich, op. cit. (Fn. 31).
39 Cf. Lahmann et al., Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung, no. 1–2 (2018): 73-123.
40 Cf. Schwartz/Moon, Financial Review, no. 4 (2001): 7-26.
41 Cf. Behm, Valuation of Innovative Companies, 2003.
42 Cf. Friedrich, op. cit. (Fn. 31).
43 Cf. Blum et al., IWH-Diskussionspapiere,, no. 6/2005; Bemmann, op. cit. (Fn. 9); Berger/Kamáras, CM (2020): 29-34.
44 Cf. Bemmann, op. cit. (Fn. 9); Gleißner, op. cit. (Fn. 5); Altman, Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta Models, 2000; Drobetz/Heller, What Factors Drive Corporate Credit Ratings? Evidence from German SMEs and Large Corporates, 2014.
45 See Gleißner, op. cit. (Fn. 5): 193.

The numerical values in the formula are derived from the calibration based on historical data that best explain past corporate insolvencies.

In our example, insolvency is determined based on illiquidity (over-indebtedness is neglected as it is no longer relevant in practice). It is assumed that if the company has a rating grade of B- or worse, or the corresponding estimated probabilities of default according to formula 1, the bank loans are cancelled (the rating grade effectively representing a covenant). A rating of B- is interpreted as a threat to the company's continued existence, as banks often cancel loans or reduce limits in such cases. For the sake of simplicity, we also assume that a credit cut triggered by a breach of the rating (grade B-) leads to insolvency. In practice, however, this is not always the case. Even if a rating of B- occurs, only about 1/3 of the cases are serious enough to prompt bank intervention and lead to insolvency. However, to avoid making the model too complex, the aforementioned simplification is used. In the event of insolvency, the company's results – and therefore all capital flows to the equity providers – are set to 0 in the year of insolvency and all subsequent years. This means that the effects of insolvency are mapped endogenously in the model and automatically included in the expected values and risks of the analysed items (e.g. cash flow). Table 4 shows the determined insolvency probabilities.

Step 4: Modeling the cash flows to equity as valuation-relevant payments from the Monte Carlo simulation

In step 4, the results of the cash flows to equity are calculated as the target value of the Monte Carlo simulation (see table 5). These results are then analysed (see figure 1).

The idea of the Monte Carlo method is predicated on the random drawing of stochastic input values from the distribution functions of the risk parameters determined in step 2. The corresponding earnings or target figures (in this case, the cash flows to equity) are determined via the corresponding relationship (cause-effect network) of the integrated income statement and balance sheet planning. The model employed to ascertain the target figures is typically deterministic in nature, i.e. the target figures are clearly determined once the parameters have been set. However, due to the random nature of the parameters, the target variables are, in principle, random variables.

The ensuing results of the modeling and the Monte Carlo simulation are frequency distributions, including the cash flow to equity (see figure 1 for the period TV), which form the basis for the subsequent risk analysis and company valuation. The tail risks in the frequency distribution are striking. They show that the combined occurrence of multiple risks can result in a cumulative and potentially harmful effect, thereby jeopardizing the existence of the company. Without simulation-based planning, these tail risks resulting from random combinations of risks would either be overlooked – if, for example, only the mean effects were added up and considered, thus entirely neglecting extreme values – or would be overestimated – if the quantiles of all risks were simply added up and interpreted as the quantile of the overall distribution at the same level. The latter approach is also methodologically incorrect. Regrettably, these errors frequently arise in practical applications.

Table 4: Calculation of the probability of default

Insolvency risk	t_1	t_2	t_3	t_4	t_5	TV
Probability of default (random number)	0.65%	0.56%	0.50%	0.44%	0.40%	0.37%
Survival probability (random number)	99.35%	99.44%	99.50%	99.56%	99.60%	99.63%
Equity ratio (random number)	42.15%	43.91%	47.20%	48.59%	49.92%	46.95%
Return on capital employed = Return on capital employed (ROCE) (random number)	8.86%	8.94%	9.01%	9.08%	8.88%	8.69%
Probability of default (expected plan value)	1.09%	1.01%	0.87%	0.82%	0.73%	0.67%

Table 5: Calculation of cash flows to equity with probability of **default**

€ million	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
EBIT (projected value)	4,691	4,902	5,123	5,353	5,433	5,515
+ Income from investments	0	0	0	0	0	0
+ Interest income	71	116	167	224	286	352
- Interest expense	466	309	320	335	346	353
Earnings before taxes (EBT)	**4,296**	**4,710**	**4,970**	**5,243**	**5,374**	**5,514**
- Taxes on income and earnings	1,043	1,143	1,206	1,272	1,304	1,338
- Change in deferred tax assets and liabilities and income tax liabilities	0	0	0	0	0	0
Annual result	**3,254**	**3,567**	**3,764**	**3,970**	**4,070**	**4,176**
+ depreciation and amortization	2,896	2,896	2,896	2,896	2,896	2,896
+ Change in other provisions	0	0	0	0	134	205
- Capital expenditures	2,896	2,896	2,896	2,896	2,896	2,896
- Changes in net current assets	535	768	731	773	272	278
+ Change in other (non-current) liabilities	0	0	0	0	0	0
+ Change in pension provisions and similar obligations	737	810	892	981	216	220
+ Change in non-current financial liabilities	-486	-444	-405	-370	78	79
+ Change in financing gap	0	0	0	0	0	0
+ Change in current financial liabilities	206	219	232	246	87	89
Cash flow to equity with probability of default	**3,176**	**3,384**	**3,751**	**4,054**	**4,312**	**4,491**
Cash flow to equity (with no change in expectations) with probability of insolvency	**2,617**	**2,530**	**2,719**	**2,891**	**3,491**	**3,503**

Phase 2: Simulation-based valuation

Step 5: Evaluation of the simulation results for the cash flows to equity

In step 5, the results of the simulated cash flows to equity are analysed. By calculating risk measures (e.g. standard deviation or value at risk), a frequency or probability distribution can be mapped to a real company performance indicator.[46] Risk measures serve as a kind of "bridge" between the outcomes of risk aggregation (simulation) and the numerical world of companies and facilitating the translation of risk scope of a distribution into business and application-oriented calculations. The remaining calculations in the valuation example pertain to the standard deviation and the coefficient of variation (based on the standard deviation) for the risk premium method (see table 6). The coefficient of variation defined as the standard deviation normalized to the expected value. The risk measure calculated here represents the cumulative risk in the period from the beginning to the end of the selected period.

46 Cf. Ernst, Risks, 2023.

Figure 1: Frequency distribution and statistical evaluation of the cash flow to equity in TV

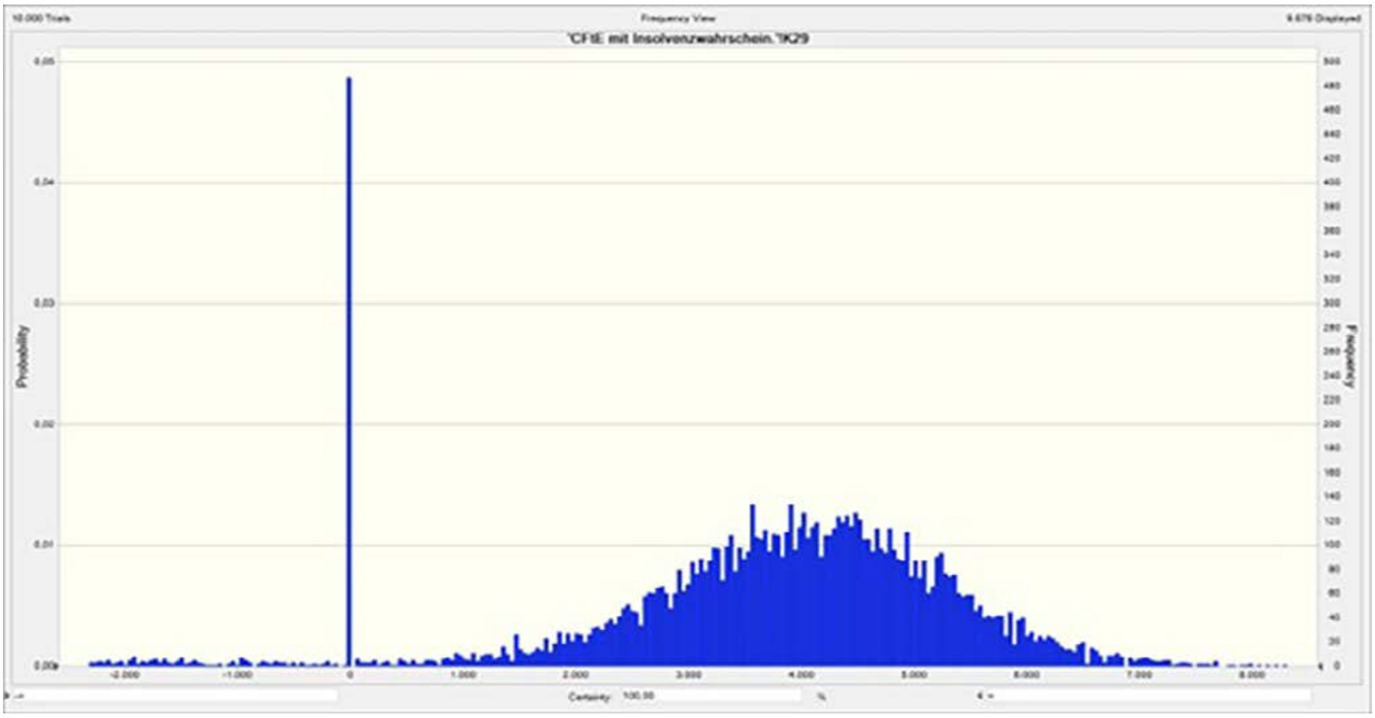

Table 6: Calculation of the coefficient of variation risk measure

	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Standard deviation σ	850	1,302	1,416	1,644	1,966	2,067
Average value μ	2,617	2,530	2,719	2,891	3,419	3,503
Coefficient of variation V	0,325	0,515	0,521	0,569	0,575	0,590

Step 6: Pricing the risk on the basis of market data

In step 6, the risk is adequately priced enabling the subsequent determination of the company's cost of capital in the next step. This requires the market risk premium (the excess return of a reference market, e.g. DAX) and the amount of risk on this market (e.g. the standard deviation of DAX). The market price of risk (or risk price for short) λ (lambda)[47] expresses the risk aversion and describes the return with which the valuation subject wishes to be remunerated for bearing the risk. Lambda is calculated by setting the market risk premium[48] (the excess return of a reference market, e.g. DAX) in relation to the amount of risk on this market (e.g. the standard deviation of DAX). The development of the market price is complex and depends on the assumed market process. In particular it depends on the type of return distribution on the market and the risk measure used. Under the realistic assumption of a martingale process of the investment in the market (comparable investment)[49], lognormally distributed returns, and the use of the coefficient of variation as a measure of risk, it can be posited that the market price will increase over time. Consequently, the utilization of period-specific lambdas is imperative. This assumption is consistent with the empirical evidence of a prevalent buy-and-hold strategy that can be observed among investors on the market. Table 7 shows the calculated risk premiums based on a risk-free interest rate of 1.80%, an expected market return of 6.01%, and a standard deviation of the market return of 20.00% (under the typical assumption of market development according to a martingale process).

Step 7: Deriving the cost of equity

In step 7, the cost of capital is derived for the risk premium method. In the risk premium method, the risk is expressed in the cost of capital, in this case the cost of equity. The company risk (earnings risk) itself is measured by the coefficient of variation from the result of the previous risk analysis of the company (see step 5) and the price of the risk, λ (lambda), from the assumptions about the comparative market (see step 6).

However, the diversification factor of the valuation subject (d) is still required. This depends on the asset structure of the valuation subject and describes the extent to which the risk of the valuation subject is diversified by the risks of other assets

47 Cf. Dorfleitner/Gleißner, op. cit. (Fn. 7).

48 Cf. Kaserer, Die Wirtschaftsprüfung (2021): 781-788.

49 A martingale process is an autoregressive process with an autoregression factor of 1 and independent random variables for the individual periods. The distribution function of the random variables is identical for each period.

Table 7: Calculation of the price of risk with the risk measure standard deviation

	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Expected excess return (cumulative)	4.21%	8.75%	13.64%	18.90%	24.56%	30.63%
Standard deviation of the excess return (cumulative)	20.00%	30.25%	39.62%	48.94%	58.53%	68.58%
Lambda λ_t (cumulative)	**21.05%**	**28.93%**	**34.43%**	**38.62%**	**41.96%**	**44.66%**

held. In order to take into account the entire risk scope of the company, this is set at one in this example (non-diversified valuation subject). However, it should be noted that the diversification factor can be adjusted on an individual basis (in the special case of the CAPM, the term d is the correlation to the market portfolio)[50].

Formula 2 presents the calculation method for the (cumulative) cost of equity, which is calculated using the cumulative values of the input parameters.[51]

$$k_t^{cum.} = \frac{1+r_f}{1-\lambda_t^{cum} \cdot V_t^{cum} \cdot d} - 1 \qquad (2)$$

r_f denotes the risk-free interest rate. The calculated cost of equity $k_t^{cum.}$ is defined as the cumulative return up to the end of the period t under consideration. They describe the return as a geometric average return if, contingent upon the aforementioned assumptions concerning the alternative investment, reinvestment takes place in the sense of a buy-and-hold strategy, encompassing the consideration of gains and losses from the investment.

As the geometric returns reflect the total return from t_0 to the respective planning period t, they must be annualized. This is done using the following formula to calculate the annualized cost of capital for year t:

$$k_t = \frac{1+r_f}{\sqrt[t]{1-\lambda_t^{cum} \cdot V_t^{cum} \cdot d}} - 1 \qquad (3)$$

Table 8 presents the calculation of the cumulative and annualized cost of equity. In the example, a log-normally distributed market return and a fixed risk-free interest rate are utilized.[52]

Many company valuers are accustomed to calculating the cost of capital for the individual periods from the arithmetic mean, i.e. deriving the cost of capital directly from the individual period-related parameters of the market risk premium and the risk-free interest rate. They do so without first carrying out the cumulation and breaking this down again to individual period values. The reason for this is that within the paradigm of traditional investment and valuation theory (particularly in the context of CAPM) it is assumed that the payment to be valued has the same (relative) risk development (in particular the martingale process) as the market itself. In this case, the utilization of the arithmetic mean to determine the capital cost rates is appropriate, as this approach is the mathematical equivalent of annualizing the geometric mean.

This assumption is justified by the market efficiency hypothesis, but only in the context of perfect capital markets where all price-relevant information is already priced into the share price. Given our intention to utilize the simulation-based company valuation for the valuation of companies on imperfect capital markets and explicitly modeling the risk development of the company, we must assume that the risk developments of the market and in the company may differ. Consequently, the approach described is necessary. However, it should be noted, that this procedure also encompasses the special case in which the assumptions of the CAPM (perfect markets) are fulfilled. In this particular instance, there is a mathematical equivalence between the two calculation methods.

As illustrated in table 8, that the cumulative equity costs increase due to the increasing values of the coefficient of variation and the lambdas. However, annualizing the equity costs results in a decline of the annual equity costs, with which the cash flow to equity is discounted, over the planning horizon.

Distinctions can now be made between two variants of calculating the equity costs for the terminal value (TV = perpetual annuity).

- **Variant A: Long-term risk in accordance with the average risk**: Variant A is based on the assumption that the risks associated with the terminal value can best be estimated from the average risks of the preceding periods. These average risks, in turn, form the basis for calculating the cost of equity in the TV. This variant corresponds to the procedure in table 8. This variant is particularly pertinent in contexts characterized by cyclical risks in cash flows.
- **Variant B: Long-term risk in accordance with a representative period**: Variant B operates under the assumption that the risks present in the TV period[53] are, in principle, representative of those that may arise in the future. Consequently, it is held that only the risks inherent to the TV period should be the exclusive basis for calculating the cost of equity in the TV. The cumulative risks of the preceding

50 See Gleißner, op. cit. (fn. 5): 521 ff. (for derivation).

51 Cf. Gleißner, Wirtschaftswissenschaftliches Studium (2011): 345-352; Gleißner, Management Research Review (2019): 1243-1258; Gleißner et al., Corporate Finance (2018): 161-171; Gleißner et al., Journal for SMEs and Entrepreneurship (2023).

52 See Dorfleitner/Gleißner, op. cit. (Fn. 7).

53 Or in any selected single period.

Table 8: Calculation of the cumulative cost of equity and the annualized cost of equity

	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Yield with risk-free interest rate (cumulative)	1.8%	3.6%	5.5%	7.4%	9.3%	11.3%
Coefficient of variation (cumulative)	32.5%	51.5%	52.1%	56.9%	57.5%	59.0%
Lambda λ	21.01%	28.93%	34.43%	38.62%	41.96%	44.66%
Diversification factor d	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost of equity (levered, cumulative)	**9.3%**	**21.8%**	**28.5%**	**37.6%**	**44.2%**	**51.1%**
Annual discrete equity costs (levered)	9.3%	10.3%	8.7%	8.3%	7.6%	7.1%

Table 9: "Own" standard deviation and coefficient of variation of the TV period

	Plan t_1	Plan t_2	Plan t_3	Plan t_4	Plan t_5	Plan TV
Risk-free interest rate (cumulative)	**1.8%**	**3.6%**	**5.5%**	**7.4%**	**9.3%**	11.3%
Risk-free interest rate period	1.8%	1.8%	1.8%	1.8%	1.8%	**1.8%**
Coefficient of variation (cumulative)	**32.5%**	**51.5%**	**52.1%**	**56.9%**	**57.5%**	59.0%
Coefficient of variation, period			*not determined*			**19.0%**
Lambda, cumulative	21.1%	28.9%	34.4%	38.6%	42.0%	44.7%
Lambda, period	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%
Diversification factor	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Cost of equity (levered, cumulative)	**9.3%**	**21.8%**	**28.5%**	**37.6%**	**44.2%**	51.1%
Annual discrete **equity costs**	9.3%	10.3%	8.7%	8.3%	7.6%	6.1%

periods are not considered here. The risk of the TV is then considered – independently of the risks of the other periods – as a representative risk of the future periods in accordance with the assumption of the Gordon-Shapiro model. In this instance, the cost of capital must be determined exclusively on the basis of the TV period's risk, excluding the cumulative risk effect of the prior periods in the calculation. The technical implementation of this calculation for any risk measure can be quite complicated, as a branched simulation may be required. However, for position-independent risk measures, such as the standard deviation, this is possible by "switching off" the risks in the preceding periods. Consequently, when employing this approach, it is therefore assumed that risk developments in earlier periods are not pertinent to the long-term future. Only those risks that are present in the TV period are relevant for the terminal value. To derive the capital costs of the TV from this, it is necessary to use the single-period lambda at this point. The valuation of the other periods does not change. Table 9 presents the coefficient of variation. determined in this way, alongside the other input parameters. (The input parameters utilized to calculate the cost of capital for the respective period are highlighted).

As demonstrated in table 8 and table 9, the discrepancy between variant B and variant A is confined exclusively to the "Plan TV" period. In this period, the cumulative input factors are not used, as in variant A, but rather the non-cumulative values of the TV period itself. Accordingly, the "one-period" version of formula 2 is employed, in each case with the period-related values serving as the input.

$$k'_{TV} = \frac{1+r_f}{1-\lambda_{TV}\cdot V_{TV}\cdot d} - 1$$

$$= \frac{1+1.80\%}{1-21.1\%\cdot 19.0\%\cdot 100\%} - 1 = 6.1\% \qquad (4)$$

The value of the cost of capital rate for the TV period k'_{TV} calculated in this manner is lower than in the previous variant A. Consequently, less risk is observed. This finding is consistent with the assumptions, as evidenced by the data presented in table 1 and table 2. An analysis of the assumptions indicates that the periods share nearly identical risk profiles, with the exception of the risk of uncertain sales growth, which is one of the lowest in the TV period. This means that the "own risk" of the TV period is lower than the average risk across the periods.

Step 8: Calculating the enterprise value using the risk premium method

In step 8, the simulation-based company valuation is carried out for the risk premium method. It can be seen that the expected cash flows to equity are discounted using the annualized cost of equity (see table 10).

Table 10: Calculation of the enterprise value using the risk premium method variant A

Equity approach for the standard deviation as a risk parameter (variant A)							
	Plan t_0 = 31.12.t0	Plan t_1 = 31.12.t1	Plan t_2 = 31.12.t2	Plan t_3 = 31.12.t3	Plan t_4 = 31.12.t4	Plan t_5 = 31.12.t5	Plan TV
Cost of equity (levered)		9.3%	10.3%	8.7%	8.3%	7.6%	7.1%
Cash flow to equity (expected)		2,617	2,530	2,719	2,891	3,491	3,503
Equity value (present value) of the periods and TV (operating)		2,394	2,098	2,074	2,035	2,284	37,325
Equity value (operating)	48,211						
+ Non-operating assets	-						
Equity value	**48,211**						

The formula is as follows:

$$\text{Enterprise Value} = \text{Equity Value} = \sum_{t=1}^{n} \frac{CFtE_t}{(1+k_t)^t} + \frac{TV}{(1+k_t)^n} \qquad (5)$$

with

$$TV = \frac{CFtE_{TV}}{k_{TV} - w_{TV} + p_{TV} \cdot (1 + w_{TV})} \qquad (6)$$

With w_{TV} as the annual growth rate (here 1.67% from the expected value of the growth rate in the TV period, based on a triangular distribution of the growth rate, see also table 1) and p_{TV} (here 0.67% from the expected value of the probability of default in the TV period, see also table 4) as the annual probability of default in the terminal value phase. It is important to note that, due to the existence of two possible variants for determining the cost of equity in the terminal value, there are consequently also two different values for the TV, depending on whether variant A or variant B is chosen.[54]

- Variant A: Long-term risk according to average risk
  As previously described, variant A defines the possibility that the average risk content may serve as a proxy for future outcomes. Consequently, the value of the cost of capital from table 8 must be utilized for the TV period in the TV calculation. This variant of the valuation is shown in table 10.

- Variant B: Long-term risk according to representative period
  Assuming that the TV period itself is essentially representative of the future, the cost of capital based on the period risk of the TV period – as demonstrated in step 8 variant B – must be employed when calculating the TV. As the risk in question is lower than the average risk over the periods, the value is correspondingly higher, as can be seen from table 11.

54 See Dorfleitner/Gleißner, op. cit. (Fn. 7); for further information on TV determination, see Dorfleitner, op. cit. (Fn. 7).

It cannot be stated categorically that one of the two company values is incorrect. The determination of the appropriate approach hinges upon assessment of which method, variant A or B, more accurately encapsulates the risk in perpetuity, i.e. the continuation phase, from the perspective of the valuation subject.

III. Conclusion

Simulation-based planning and company valuation are particularly suitable when the distinctive characteristics of the company and the imperfections on capital markets are to be explicitly considered in the valuation. Simulation-based company valuation requires unbiased planning (mean values), in which unhedged risks within the company are integrated into business planning via distribution functions. A Monte Carlo simulation is employed to generate a multitude of scenarios that depict possible characteristics of the target value (in this case, cash flow to equity). The target values are referred to as unbiased, as their value represents the average value across all possible scenarios. The simulation value of the target figure can be represented graphically for each planning year by a frequency distribution and they form the data basis for the subsequent risk analysis. The main difference between the simulation-based company valuation and the CAPM-based company valuation lies in the derivation of valuation-relevant risks. In the former, these risks are derived from the valuation object itself, as opposed to being derived from the capital market as in the latter. The risks identified, quantified, and aggregated in the company to be valued are, therefore, relevant to the valuation. The simulation-based company valuation thus complies with legal requirements of the StaRUG, the FISG, IDW PS 340 n.F., DIIR Auditing Standard No. 2 and the principles of proper corporate planning. As the simulation-based company valuation does not assume market perfection, market imperfections that actually exist in reality, such as insolvency risks can also be modelled. The company's cost of equity can be derived from the risk analysis of the cash flows to equity. It is important to note that the modelled risks over the planning period are also dependent on the preceding periods, thus classifying these risks as cumulative. If the pricing of the risk also assumes a buy-and-hold strategy for the alternative investment, the cu-

Table 11: Calculation of the enterprise value using the risk premium method variant B

Equity approach for the standard deviation as a risk parameter (variant B)							
	Plan t_0 = 31.12.t_0	Plan t_1 = 31.12.t_1	Plan t_2 = 31.12.t_2	Plan t_3 = 31.12.t_3	Plan t_4 = 31.12.t_4	Plan t_5 = 31.12.t_5	Plan TV
Cost of equity (levered)		9.3%	10.3%	8.7%	8.3%	7.6%	6.1%
Cash flow to equity (expected)		2,617	2,530	2,719	2,891	3,491	3,503
Equity value (present value) of the periods and TV (operating)		2,394	2,098	2,074	2,035	2,284	45,249
Equity value (operating)	56,134						
+ Non-operating assets	–						
Equity value	**56,134**						

mulative risk amount is valued with a cumulative risk price. The derivation of the cost of equity results in cumulative equity costs, which represent geometric returns. The geometric returns must then be annualized in order to be used for discounting the cash flow of the given period. This also signifies a notable divergence from the CAPM-based company valuation, wherein less realistic, arithmetic returns are employed due to the model assumptions.

The case study demonstrates that the simulation-based company valuation is capable of accurately reflecting the risk situation of a company and market imperfections. Consequently, it offers decision values that comply with legal requirements and auditing standards. Simulation-based company valuation requires the implementation of functioning risk management system in the company, providing the necessary data basis for planning and valuation. In addition it also requires the valuer to have quantitative knowledge of statistics, simulation, and stochastic processes. However, the case study has shown that these challenges can certainly be overcome and that a standardized valuation process has now emerged that can function as a guideline.

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Rethinking the Cost of Equity

A Transparency-Based Framework for Decision-Useful Business Valuation

Cost-of-equity estimates play a central role in valuation and investment analysis, yet the way they are constructed can influence how risk and return are interpreted in decision-making contexts. This article argues that discount-rate methodologies should be evaluated not only by their statistical foundations but also by their transparency and interpretability. Covariance-based models such as the Capital Asset Pricing Model concentrate uncertainty in historical statistical estimation, whereas cash-flow-implied approaches concentrate uncertainty in forward-looking economic expectations. While both approaches are subject to estimation risk, they differ in how clearly their assumptions can be linked to business fundamentals. Viewing the cost of equity as both a financial estimate and a communication device highlights the importance of model design in supporting informed judgment under uncertainty.

I. Introduction

The cost of equity is one of the most influential yet least directly observable inputs in business valuation. It plays a central role in discounted cash flow (DCF) models, capital budgeting, fairness opinions, impairment testing, and strategic planning. Despite its importance, its estimation remains inherently judgmental.

In practice, the most common framework for estimating the cost of equity is the Capital Asset Pricing Model (CAPM), which links expected return to systematic risk as measured by historical return covariance.[1] Although theoretically elegant, CAPM's empirical implementation involves a series of methodological choices that can be difficult for non-specialists to interpret.

Academic research has long debated the empirical performance of CAPM and alternative asset pricing models.[2] However, considerably less attention has been paid to how cost of equity models function as organizational tools in managerial decision contexts. Valuation is not only a technical exercise but also a communicative and governance process.[3] Discount rates influence investment approval, acquisition pricing, restructuring decisions, transfer pricing practices, and performance evaluation. When the logic of the discount rate is opaque to decision-makers, valuation risks losing transparency and may create behavioural distortions.

This paper argues that the evaluation of cost of equity methodologies in business valuation should incorporate transparency and decision usefulness as complementary design criteria alongside statistical validity. It develops a conceptual framework that contrasts covariance-based approaches such as CAPM with a cash-flow-implied formulation derived from the relationship between expected free cash flows to equity (FCFE), growth, and current market price. The contribution is not mathematical novelty, but a reframing discount-rate construction as an organizational design choice that influences communication, engagement, and governance quality.

Importantly, the paper does not argue that one approach is universally superior. Both covariance-based and cash-flow-implied models have weaknesses. CAPM relies on historical statistical relationships that may be unstable over time. Cash-flow-implied models depend on forward-looking forecasts that are inherently uncertain and subject to bias. The central claim is instead that disagreement under a cash-flow-implied framework tends to revolve around economically meaningful expectations that managers can discuss, whereas disagreement under covariance-based models often centers on statistical estimation choices that are less accessible to non-specialists.

1 Sharpe, Capital asset prices: A theory of market equilibrium under conditions of risk, Journal of Finance, vol. 19, no. 3 (1964): 425-442.

2 Fama/French, The cross-section of expected stock returns, Journal of Finance, vol. 47, no. 2 (1992): 427-465; Fama/French, The Capital Asset Pricing Model: Theory and evidence, Journal of Economic Perspectives, vol. 18, no. 3 (2004): 25-46.

3 Burchell/Clubb/Hopwood/Hughes/Nahapiet, The roles of accounting in organizations and society, Accounting, Organizations and Society, vol. 5, no. 1 (1980): 5-27; Simons, Levers of Control: How Managers Use Innovative Control Systems to Drive Strategic Renewal, 1995.

By integrating insights from valuation theory, behavioural decision research, and management control literature, this study broadens the criteria by which cost of equity methodologies can be assessed and opens a research agenda on the role of model transparency in financial decision-making.

II. Theoretical Background

1. Cost of Equity in Valuation and Collective Assessment of Risk

The conceptual foundations of valuation can be traced to the tradition of subjective value theory associated with Carl Menger and the Austrian school of economics.[4] From this perspective, value is not an intrinsic property of an asset but reflects the expectations, preferences, and knowledge of economic agents. Valuation is therefore inherently forward-looking and grounded in judgments about uncertain future outcomes. This subjectivity is embodied in both components of the valuation model: in the expectations that shape projected future cash flows and in the return investors require as compensation for bearing uncertainty. Even when formal asset pricing models such as the Capital Asset Pricing Model are used to inform the discount rate, their inputs ultimately depend on assumptions and interpretations of risk, reinforcing the idea that required returns, like cash-flow forecasts, are grounded in expectations rather than directly observable constants.

From this standpoint, the framework adopted in this paper is consistent with Menger's subjective value tradition. This perspective is not intended to replace modern financial theory, but rather to provide a conceptual lens through which valuation inputs – both projected cash flows and required returns – can be understood as expressions of investor expectations formed under uncertainty. In this sense, the subjective foundations of value are reflected throughout the valuation model, in both the numerator and the discount rate.

Formally, valuation theory expresses the value of equity as the present value of expected future free cash flows to equity (FCFE) discounted at the required return on equity.[5] The cost of equity therefore represents the rate that equates uncertain future cash flows with present price. In equilibrium asset pricing, expected returns compensate investors for bearing systematic risk, and the Capital Asset Pricing Model provides a parsimonious expression of this relationship.[6] Within this framework, risk is measured through covariance with the market portfolio, and required return is derived from exposure to systematic risk.

However, valuation practice differs from asset pricing research in its primary objective. Asset pricing models are designed to explain cross-sectional patterns in observed returns under equilibrium assumptions. By contrast, valuation in corporate and advisory settings is undertaken to inform specific decisions – such as investment approval, acquisition pricing, or performance evaluation – under conditions of uncertainty. As emphasized in the accounting decision-usefulness tradi-

4 Menger, Principles of Economics, 1871.

5 Damodaran, Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, 3rd ed. 2012; Koller/Goedhart/Wessels, Valuation: Measuring and Managing the Value of Companies, 7th ed. 2020.

6 Sharpe, op. cit. (footnote no. 1): 425-442.

tion, the relevance of a financial measure depends not only on theoretical consistency but also on its usefulness to decision-makers.[7] This distinction implies that the evaluation of cost of equity models in applied valuation may require criteria beyond statistical explanatory power.

Within an FCFE-based valuation framework, the required return is the discount rate that reconciles expected future cash flows with the current market price. From this perspective, market participants' collective assessment of risk is reflected in the price investors are willing to pay for those cash flows, irrespective of whether that price fully reflects fundamental value. Rather than measuring risk externally through historical covariance statistics, the FCFE framework infers the required return from the interaction of expectations and price. Consistent with the subjective foundations of valuation, this approach treats the cost of equity not as a directly observable physical parameter but as an equilibrium outcome of investor beliefs about risk, growth, and future performance.

III. Implied Cost of Capital Literature

An alternative to covariance-based models is the implied cost of capital (ICC) approach, which infers expected returns from valuation identities that equate current market price with expected future earnings, cash flows,[8] or residual income. ICC models have been widely used in empirical research to proxy for expected returns and to study market risk premia.

While this literature demonstrates that required returns can be inferred from prices and expected future fundamentals, its primary purpose has generally been measurement in asset pricing research. Less attention has been paid to how such formulations may function as decision tools in managerial and valuation-practice contexts. This paper extends the ICC logic by examining its interpretive and communicative properties in valuation practice.

In empirical and applied settings, ICC estimates are commonly derived from market prices of listed companies and external expectations, such as analyst forecasts of earnings, cash flows, or growth. ICC should therefore not be understood as mechanically deriving the discount rate from the subject company's own management forecasts. In private-company valuation, the ICC logic is more appropriately used by reference to listed peer companies or other market-implied evidence, with professional judgment regarding comparability, forecast bias, and differences between the peer group and the subject company.

IV. Transparency as a Design Criterion in Valuation

1. Valuation as an Organizational and Institutional Decision Tool

Although valuation models are often developed and debated within academic finance, their primary function lies in supporting decisions made within organizations and the broader business community. Valuation outputs inform capital allocation, mergers and acquisitions, restructuring, performance evaluation, transfer pricing, and strategic planning. In these contexts, valuation is not an abstract theoretical exercise, but a practical tool embedded in organizational processes and governance structures.[9]

Valuation results are typically discussed in committees, boards of directors, negotiations, and advisory engagements, where participants bring diverse expertise and perspectives. Consequently, the effectiveness of a valuation framework depends not only on its theoretical foundations but also on its capacity to support informed dialogue among decision-makers. Research in management control emphasizes that analytical tools influence decisions only when users understand and trust them.[10] When the logic of key parameters is opaque, decision-makers may either accept them mechanically – treating them as technical facts beyond challenge – or disengage from analytical discussion altogether.

This organizational perspective aligns with the decision-usefulness tradition in accounting research, which evaluates financial measures according to their ability to support informed judgments rather than solely by their theoretical elegance. From this viewpoint, valuation models serve a communicative function: they provide a structured language through which expectations about future performance, risk, and growth can be articulated and debated. If the construction of the discount rate is difficult to interpret, valuation risks losing this communicative role and becoming a purely technical exercise detached from managerial understanding.

Recognizing valuation as an organizational process therefore broadens the criteria by which cost of equity methodologies can be assessed. In addition to consistency with asset pricing theory, models may be evaluated according to their transparency, interpretability, and capacity to facilitate meaningful discussion within firms and advisory settings. This shift in perspective does not diminish the importance of theoretical rigor; rather, it acknowledges that the ultimate test of a valuation tool lies in how effectively it supports real economic decisions under uncertainty.

Beyond internal managerial contexts, valuation models are also applied in regulatory and quasi-judicial environments, including tax assessments, litigation, and transfer pricing disputes. In transfer pricing in particular, tax authorities and multinational enterprises must evaluate the economic reasonableness of profit allocations across jurisdictions, often relying on discounted cash flow methods to assess the value of transferred functions, risks, or intangible assets. In these settings, the interpretability of discount-rate assumptions becomes especially important, as both corporate taxpayers and tax inspectors must be able to scrutinize and debate the economic logic underlying valuation inputs. A covariance-based model such as the Capital Asset Pricing Model introduces additional

7 Beaver, Financial Reporting: An Accounting Revolution, 3rd ed. 1998.

8 Claus/Thomas, Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets, Journal of Finance, vol. 56, no. 5 (2001): 1629-1666; Easton, PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital, The Accounting Review, vol. 79, no. 1 (2004): 73-95.

9 Burchell/Clubb/Hopwood/Hughes/Nahapiet, op. cit. (footnote no. 3): 5-27.

10 Simons, op. cit. (footnote no. 3).

layers of statistical estimation – including beta selection, market index choice, and market risk premium assumptions – that may be difficult for non-specialist tax officials to assess consistently across cases and countries. As a result, disputes may arise from methodological differences rather than substantive disagreements about the underlying business economics.

This institutional perspective is consistent with guidance from the OECD Transfer Pricing Guidelines, which recognize the discount rate as a key element in valuation and emphasize that it should reflect the risk or uncertainty of the anticipated cash flows, while also acknowledging that no single method is appropriate in all cases.[11] By focusing on the alignment between risk and projected cash flows rather than prescribing a specific asset pricing model, the Guidelines implicitly recognize the role of professional judgment and context in discount-rate determination. Within this framework, a cash-flow-implied perspective – which expresses required return in terms of expected cash flows, growth, and price – may facilitate more transparent economic discussion between firms and tax authorities. Although such estimates remain uncertain and judgmental, they frame disagreement in terms of business fundamentals and long-term sustainability rather than purely statistical parameters, potentially supporting more consistent and economically grounded dialogue in cross-border valuation contexts.

2. Model Transparency and Interpretability

Model transparency can be defined as the degree to which non-specialist decision-makers can trace how economically meaningful inputs generate outputs. Transparency does not imply simplicity; rather, it implies interpretability. Research in judgment and decision-making shows that people rely more effectively on models whose logic they can understand.[12]

Covariance-based models such as CAPM rely on historical return regressions. Variation in beta estimates across time windows and market indices has been well documented.[13] As a result, disagreements about cost of equity often arise from statistical specification choices rather than differences in economic expectations.

Cash-flow-implied approaches, by contrast, derive required returns from expected cash flows, growth, and price. Disagreements in this framework typically center on assumptions about operating performance, competitive dynamics, and macroeconomic constraints – topics managers routinely evaluate. Thus, while both approaches are uncertain, they differ in the type of uncertainty emphasized: statistical measurement versus economic expectation.

V. Transparency-Based Cost of Equity Framework

1. Cost of Equity Formulations

Cost of Equity under Cash-Flow-Implied Approach

$$k_e = \frac{FCFE_1}{P_0} + g$$

This formulation is consistent with the logic of the Gordon growth model and the implied cost of capital (ICC) literature.[14] The first term represents the expected cash-flow yield, while the second term captures long-term growth expectations.

Where:
- k_e = Cost of equity
- $FCFE_1$ = Expected free cash flow to equity in the next period
- P_0 = Current equity price
- g = Expected long-term growth rate of FCFE

Cost of Equity under the Capital Asset Pricing Model

$$k_e = r_f + \beta\left(E\left[R_m\right] - r_f\right)$$

Where:
- k_e = Cost of equity
- r_f = Risk-free rate
- β = Beta of the stock
- $E[R_m]$ = Expected return on the market portfolio
- $(E[R\_m]-r_f)$ = Market risk premium

This formula states that the required return on equity equals the risk-free rate plus compensation for bearing systematic market risk.[15]

Beta Formula

$$\beta = \frac{Cov\left(R_i, R_m\right)}{Var\left(R_m\right)}$$

Where:
- R_i = Return on the individual stock (or asset)
- R_m = Return on the market portfolio
- $Cov(R_i,R_m)$ = Covariance between the stock and market returns
- $Var(R_m)$ = Variance of market returns

Beta measures how sensitive a stock's returns are to movements in the overall market:
- $\beta = 1$ → moves with the market
- $\beta > 1$ → more volatile than the market
- $\beta < 1$ → less volatile than the market

11 OECD, OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations, 2022.

12 Libby/Bloomfield/Nelson, Experimental research in financial accounting, Accounting, Organizations and Society, vol. 27, no. 8 (2002): 775-810.

13 Blume, On the assessment of risk, Journal of Finance, vol. 26, no. 1 (1971): 1-10.

14 Gordon, Dividends, earnings, and stock prices, Review of Economics and Statistics, vol. 41, no. 2 (1959): 99-105; Claus/Thomas, op. cit. (footnote no. 8): 1629-1666; Easton, op. cit. (footnote no. 8): 73-95.

15 Sharpe, op. cit. (footnote no. 1): 425-442.

2. Practical Illustration: FCFE-Implied Cost of Equity versus CAPM

The difference between the cash-flow-implied approach and CAPM can be illustrated with a simple mature-business example. The purpose is not to prove that one method is universally superior, but to show how each method frames the cost-of-equity discussion differently.

Assume a mature business has a current equity price of € 100 per share, expected FCFE of € 5 per share next year, and long-term FCFE growth of 3.25%. Under the cash-flow-implied approach:

The implied cost of equity is therefore 8.25%, consisting of a 5.00% expected FCFE yield and 3.25% expected long-term growth.

$$k_e = \frac{FCFE_1}{P_0} + g$$

$$k_e = \frac{5}{100} + 3.25\% = 8.25\%$$

A CAPM-based estimate using a risk-free rate of 4%, beta of 1.25, and an equity risk premium of 4.20% gives:

$$k_e = 4.00\% + 1.25 \times 4.20\% = 9.25\%$$

Using the same expected cash-flow set, the lower FCFE-implied discount rate supports an equity value of € 100 per share, while the CAPM-based discount rate produces a value of approximately € 83.33 per share.

The example should not be interpreted as proof that one method is always correct and the other incorrect. Rather, it shows that the two approaches locate uncertainty in different places. CAPM places the discussion around beta, covariance, market index selection, and the equity risk premium. The FCFE-implied approach places the discussion around expected shareholder cash flows, sustainable growth, and price.

For many non-specialist users, the second discussion may be easier to understand and challenge. The advantage of the FCFE-implied approach is not that it eliminates uncertainty, but that it expresses uncertainty in terms of business fundamentals rather than primarily in statistical capital-market parameters.

3. Strengths and Weaknesses of the Cash-Flow-Implied Approach

a. Strengths:

- Direct linkage to economic drivers of value
  The approach ties the required return to expected cash flows and long-term growth, which are the fundamental determinants of firm value in discounted cash flow valuation.[16]
- Conceptual alignment with managerial planning processes
  The key inputs – projected cash flows and growth assumptions – are consistent with the types of forecasts and strategic assessments routinely developed in budgeting, performance planning, and capital allocation decisions.
- Consistency with prevailing business and regulatory valuation practices
  By framing required return in terms of economically interpretable assumptions, the approach aligns with the way managers, advisors, and public authorities (e.g., in transfer pricing and impairment testing) typically discuss value drivers and long-term sustainability.

b. Weaknesses:

- Dependence on long-term forecasts subject to estimation error
  The approach requires explicit projections of future cash flows and growth, which are inherently uncertain and vulnerable to optimism bias, informational limitations, and model risk.
- High sensitivity to growth assumptions
  Small changes in long-term growth rates can materially affect implied return estimates, particularly in terminal value calculations, increasing the potential for parameter-driven valuation variation.
- Potential contamination from market mispricing
  Because the implied return is inferred from current market prices, the estimate may reflect temporary mispricing, investor sentiment, or market inefficiencies rather than solely fundamental risk.

4. Strengths and Weaknesses of Covariance-Based Models

a. Strengths:

- Grounded in equilibrium asset pricing theory[17]
- Provides a standardized framework

b. Weaknesses:

- Dependence on historical statistical estimates subject to instability
  Key inputs such as beta are inferred from historical return data and have been shown to vary across time periods, estimation windows, and market conditions, introducing estimation error and parameter uncertainty.[18]
- Sensitivity to methodological specification choices
  Required return estimates can differ materially depending on choices such as return frequency, length of estimation window, market index selection, and adjustments to beta or the market risk premium, increasing the potential for model-driven variation.
- Limited interpretability for non-specialist decision-makers
  Because core inputs are derived from statistical covariance measures rather than directly observable business drivers, the economic meaning of parameter changes may be difficult for managers and other stakeholders to assess, potentially reducing transparency in decision-making contexts.

16 Damodaran, op. cit. (footnote no. 5); Koller/Goedhart/Wessels, op. cit. (footnote no. 5).

17 Sharpe, op. cit. (footnote no. 1): 425-442.

18 Blume, op. cit. (footnote no. 13): 1-10; Fama/French, op. cit. (footnote no. 2): 25-46.

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Table 1: Difference between FCFE-implied discount rate and CAPM-based discount rate

Approach	Cost of equity	Value per share	Main discussion with the client
FCFE-implied approach	8.25%	€ 100	Whether FCFE, growth, and price are economically reasonable
CAPM approach	9.25%	€ 83.33	Whether beta, the historical sample, market index, and ERP are appropriate
Difference	1.00%	€ -16.67	The difference shows where uncertainty is located

5. Locus of Measurement Uncertainty: Statistical Estimation vs. Economic Expectations

Both covariance-based and cash-flow-implied cost of equity frameworks are inherently imperfect. Each relies on inputs that are subject to estimation error and model assumptions. The key distinction, however, lies in where the primary source of measurement uncertainty resides.

In covariance-based approaches such as the Capital Asset Pricing Model, measurement uncertainty is concentrated in statistical estimation. Required return estimates depend on parameters – most notably beta and the market risk premium – that are inferred from historical return data and are sensitive to methodological choices, including estimation windows, return frequency, and index selection. As documented in empirical asset pricing research, such parameters exhibit instability over time,[19] implying that variation in discount-rate estimates may reflect changes in statistical specification as much as changes in underlying economic risk.

In a cash-flow-implied framework, by contrast, measurement uncertainty is concentrated in forward-looking economic expectations. Differences in required return estimates arise primarily from variation in projected cash flows and long-term growth assumptions. These inputs are directly linked to assessments of competitive positioning, industry dynamics, operational risk, and macroeconomic conditions. Although such forecasts are inherently uncertain and potentially subject to bias, they are expressed in economically meaningful terms that managers routinely evaluate in strategic planning contexts. As a result, a cash-flow-implied framework may provide greater scope for transparent and constructive communication among decision-makers regarding the drivers of value and risk.

This shift in the locus of measurement uncertainty – from statistical estimation to economic expectation – has important implications for organizational discussion. Disagreement under a covariance-based framework often centers on technical estimation choices that may be difficult for non-specialists to assess. Under a cash-flow-implied or ICC framework, disagreement is more likely to focus on the economic expectations embedded in market prices and external forecasts, including assumptions about growth, profitability, risk, and comparability. Where ICC evidence is derived from listed peer companies and analyst forecasts, the discussion should distinguish between peer-market expectations and the subject company's own forecasts.

19 Fama/French, op. cit. (footnote no. 2): 25-46.

VI. Organizational and Behavioural Implications

1. Organizational Consequences

a. Reduced Decision Quality

When managers do not understand how the discount rate is derived, they may either accept it without scrutiny ("black-box reliance") or disregard it and rely on intuition.[20] Both responses can weaken the quality of capital allocation decisions. Research in management control systems suggests that analytical tools improve decision outcomes only when users understand and trust them.[21]

b. Reduced Accountability

Opaque valuation models can make it difficult to evaluate the reasoning behind decisions such as project rejection or acquisition approval. When key assumptions are embedded in statistical procedures, responsibility may shift from economic reasoning to technical authority, potentially weakening governance and internal debate.

c. Illusion of Scientific Certainty

Highly technical models can create a false sense of precision. Behavioural research shows that decision-makers often exhibit overprecision, placing excessive confidence in quantitative outputs even when underlying uncertainty is substantial.[22] In valuation contexts, this may lead firms to treat uncertain estimates as objective facts rather than conditional judgments.

d. Communication Gaps Between Experts and Leaders

If only specialists fully understand the model, strategic discussions can become fragmented.[23] Financial analysts may frame decisions in terms of beta and risk premia, while managers think in terms of products, markets, and growth. When valuation inputs cannot be clearly linked to operational drivers, valuation risks losing relevance as a strategic decision tool.

2. Broader Economic Implications

a. Potential Misallocation of Capital

If firms rely on discount rates that are poorly understood or mechanically applied, capital may be directed toward projects that align with model outputs rather than underlying economic value. Research on corporate capital budgeting shows that hurdle rates and discount-rate practices can differ substantially from textbook cost-of-capital prescriptions and

20 March, A Primer on Decision Making, 1994.
21 Simons, op. cit. (footnote no. 3).
22 Moore/Healy, The trouble with overconfidence, Psychological Review, vol. 115, no. 2 (2008): 502-517.
23 Burchell/Clubb/Hopwood/Hughes/Nahapiet, op. cit. (footnote no. 3): 5-27.

may remain sticky over time, potentially influencing which projects are accepted or rejected.[24] Over time, such mechanical use of discount rates may reduce allocative efficiency.

b. Concentration of Decision Authority

When financial tools are opaque, decision authority may shift toward technical specialists, reducing the ability of broader stakeholder groups to engage meaningfully in financial decision-making.[25] This can narrow the range of perspectives considered in strategic choices.

c. Systemic Lessons from Financial History

Experience from financial crises suggests that overconfidence in complex quantitative models can contribute to misjudgments of risk.[26] While valuation discount rates differ from regulatory risk models, the broader lesson remains relevant: opacity can amplify misplaced confidence in numerical outputs.

VII. Limitations and Future Research

This framework is conceptual in nature and assumes that market prices are at least moderately informative about investor expectations. It does not reject asset pricing theory, nor does it claim that cash-flow-implied returns are unbiased or free from estimation error. Both covariance-based and cash-flow-implied approaches rely on assumptions and are subject to measurement uncertainty. Empirical research is therefore needed to examine the behavioural and organizational effects proposed in this paper, including how different discount-rate frameworks influence managerial engagement, governance processes, and decision quality.[27]

Cost of equity estimation also plays an important role beyond firm-level decision-making. Changes in the cost of equity can cause significant swings in estimated value. Therefore, discount-rate assumptions influence outcomes in a range of economic contexts, including corporate investment and acquisition decisions, capital market pricing, tax bases and transfer pricing, privatizations and public asset sales, and regulated utility pricing. In these settings, valuation methodologies contribute to the allocation of economic resources across firms, investors, and public stakeholders. Consequently, the transparency and interpretability of discount-rate assumptions may have broader institutional relevance.

The analysis therefore has potential implications for public-sector and regulatory environments, such as government asset transfers and regulated pricing frameworks, where discount-rate choices can affect long-term resource allocation. If valuation methodologies are opaque or difficult to interpret, systematic biases or inconsistencies may accumulate over time. Future research could explore how transparency in cost of equity estimation affects accountability, comparability, and the quality of decision-making in such institutional settings.

VIII. Conclusion

The cost of equity in business valuation is often treated as a technical output of financial models. This paper argues that it should also be understood as a design choice that shapes how uncertainty, risk, and future performance are communicated and evaluated within organizations and institutional settings. By introducing transparency and interpretability as complementary criteria, the paper broadens the lens through which discount-rate methodologies can be assessed beyond their statistical properties alone.

Both covariance-based approaches, such as the Capital Asset Pricing Model, and cash-flow-implied frameworks are subject to important limitations. The former relies on historical statistical estimates that may be unstable and difficult for non-specialists to interpret, while the latter depend on forward-looking forecasts that are inherently uncertain and sensitive to growth assumptions. The key distinction lies in the locus of uncertainty: covariance-based models concentrate it in statistical estimation, whereas cash-flow-implied approaches concentrate it in economic expectations about future performance.

Framing required returns in terms of projected cash flows and growth connects valuation more directly to the economic narratives that managers, investors, and regulators use when discussing strategy, risk, and long-term sustainability. Although such estimates remain uncertain and conditional on prevailing expectations, they may provide greater scope for transparent and constructive dialogue than parameters derived primarily from statistical covariance. Accordingly, valuation models function not only as computational tools but also as communication devices that influence participation, accountability, and governance.

By viewing the cost of equity through both a financial and an organizational lens, this paper contributes to a more integrated understanding of valuation – one that acknowledges its subjective foundations, its formal expression in asset pricing models, and its practical role in real-world decision processes. Future research may build on this perspective by examining how the transparency of discount-rate construction affects decision quality, institutional consistency, and the allocation of resources across firms and public stakeholders.

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24 Graham/Harvey, How do CFOs make capital budgeting and capital structure decisions?, Journal of Applied Corporate Finance, vol. 15, no. 1 (2002): 8-23; Graham, Corporate Finance and Reality, Journal of Finance, vol. 77, no. 4 (2022): 1975-2049.

25 Graham/Harvey/Puri, Capital allocation and delegation of decision-making authority within firms, Journal of Financial Economics, vol. 115, no. 3 (2015): 449-470.

26 Turner, The Turner Review: A regulatory response to the global banking crisis, Financial Services Authority 2009.

27 Graham/Harvey/Puri, op. cit. (footnote no. 25): 449-470.

Debt Beta: Some Unrecognized or Disregarded Aspects

The article highlights some problems in the examination and evaluation of debt betas as a part of the CAPM-methodology that has gained growing attention by appraisers in the last two decades. These problems relate to additional factors explaining debt betas, possible misapplication of debt beta based on the weighting of the market index, and its dependence on the leverage ratio.

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I. Introduction

Although the concept of debt beta was taken up and investigated conceptually and empirically just a few years after the development of the CAPM,[1] it never gained the significance of the conventional beta for equity securities, especially shares. After all, it has gained in popularity in some areas of company valuation, e.g. at legal valuation events in Germany, in the last two decades. If you take the CAPM seriously and consider the volatility of (almost) all debtors, this development is to be welcomed in principle, although there are some additional problems compared to the usual equity betas. Examples include the lack of listed debt capital in many companies, the payment characteristics of debt capital, the necessary adjustment of the market portfolio, the consideration of default probabilities in expected returns, the lack of maturity matching with the riskless investment, and the unstable duration over time.[2] The following remarks go beyond the points regularly presented by deepening previous conceptual reservations or revealing new problems, starting from the usual procedure of econometric studies on debt betas.

II. The Correspondence Between Economics and Econometrics, Their Particular Significance for Debt Beta and the Role of Multicollinearity

1. The 1-Factor CAPM Model and Misguided Modifications

One of the most important reasons for the spread of the CAPM is its simplicity. This applies not only to the results of the theoretical model itself, but also to the most widespread way of its econometric implementation via the simplest conceivable form of univariate regression: In Sharpe's market model,[3] the slope factor of the regression line corresponds to the theoretical beta definition as a quotient of covariance and variance – certainly one of the most direct equivalents of the economic and econometric model in the entire economics!

However, this advantage is partly accompanied by undesirable properties, which are often compensated for by "modifications" of the econometric model, especially with regard to practical applications, e.g. the size premium and the country risk premium.[4] In fact, however, elementary requirements of the economic model are almost regularly ignored.[5] In particular, any expansion of the market model to include additional independent variables is a fundamental violation of the 1-factor model CAPM: The correspondence between economics and econometrics has been destroyed. Whatever such constructs may be, they are not variants of the CAPM!

2. An Important Objective in Debt Beta Studies

Misguided CAPM modifications are not in themselves a special feature of the debt beta. However, debt securities differ from equity securities in several respects. Even though they are generally classified as risky assets under the CAPM, this leads to some important problems[6] that have probably contributed greatly to the fact that debt betas are determined much less frequently than equity betas. Regardless of whether this exacerbates or reduces the "modification problem" of the last section for beta investigations in practice, there is another aspect in debt beta in which this problem occurs – rather indirectly, but quite seriously. Probably the most important aspect of general research on debt beta is the attempt to find empirical factors influencing its size[7] – comparable with some forms of the fundamental beta approach for equity securities.[8] For this purpose, debt betas of interest in a sample of J companies or portfolios[9] are first calculated in the same way as the beta for any asset j via the market model:

$$r_{j,t} = \gamma + \beta_j r_{M,t} + \varepsilon_{j,t} \qquad (1)$$

with

- $r_{j,t}$ = return of asset j in period t,
- $r_{M,t}$ = return of the market portfolio in period t,
- $\varepsilon_{j,t}$ = stochastic disturbance term.

If you form the expected values (marked by a bar over the variables) on both sides, you get

$$\bar{r}_j = \gamma + \beta_j \bar{r}_M \qquad (2)$$

If this determination has been carried out for all J betas, an attempt has been made to estimate the influence of various factors on beta via a linear regression. The result is

$$\beta_j = \delta_0 + \delta_1 f_{1,j} + \delta_2 f_{2,j} + \ldots + \kappa_j \qquad (3)$$

with

- δ_i = regression coefficient (δ_0 = intercept),
- $f_{i,j}$ = influencing factor i in the j^{th} expression of all J sample elements,
- κ_j = stochastic disturbance term,

or again in the expected values

$$\bar{\beta}_j = \delta_0 + \delta_1 \bar{f}_1 + \delta_2 \bar{f}_2 + \ldots \qquad (4)$$

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1 Cf. e.g. Percival, Corporate bonds in a market model context, Journal of Business Research (1974): 461–468.

2 Cf. e.g. Ballwieser, Debt Beta als problemloses Konzept? – Motivationen, Theoriehintergrund und Praxisrelevanz (2016): 437-445, and Knoll/Manthey, Verschuldung, Risiko und das CAPM: empirische Befunde bei HDAX-Gesellschaften, BWP (2021): 106-115.

3 Cf. Sharpe, A simplified Model for Portfolio Analysis, Management Science, vol. 9, no. 2 (1963): 277-293.

4 Cf. e.g. Barr/Lohrey, Working with Data: Public Company and Private Company Size Premia, The Value Examiner, March/April (2018): 18, for the size premium within the "modified CAPM Method" and the "Build-Up Method". For critique on an additional country risk premium, see Kruschwitz/Löffler/Mandel, Damodaran's country risk premium: a serious critique, Business Valuation Review, vol. 31, no. 2-3 (2012): 75.

5 Cf. Knoll/Kruschwitz/Löffler/Lorenz, RESPONSE: Vasicek and Blume Betas: Back to the Future (Parts I and II) January/February 2019; March/April 2019, The Value Examiner July/August (2019): 22-26 (26).

6 Cf. Knoll/Manthey, Verschuldung, Risiko und das CAPM: empirische Befunde bei HDAX-Gesellschaften, BWP (2021): 106-115 (107).

7 Cf. Manthey, Debt Beta – Analysis of European Data, Inaugural Dissertation, 2026, chap. 4 and other sources cited there.

8 Cf. Scheld, Fundamental Beta, Wiesbaden 2013, for an overview on that topic.

9 A common variant of such studies is to determine the beta of bond indices in overlapping time windows, adjusting the parameter meaning accordingly.

At this point at the latest, it becomes clear that a multi-factor model is being introduced through the back door, so to speak, and that the 1-factor model CAPM is thus miles away. The CAPM is silent – for good reason – about a substantial economic justification for high/low beta factors.[10] What is attempted here, on the other hand, corresponds to the idea of the widespread practice of determining a peer group if one does not wish to use the valuation object's own stock beta for whatever reason:

"Companies are (approximately) equal according to the CAPM if they have an (approximately) equal beta. The model leaves open the basis of this purely stochastically formulated comparability – if an online bookseller has the same beta as a steel producer, the two are perfect substitutes from an investor's point of view. A surrogate use now assumes equality due to other considerations and assigns a third-party beta to a company on this basis."[11]

The logical induction

$$\text{(almost) same beta} \Longrightarrow \text{“comparable” companies}$$

is reversed to[12]

$$\text{for other reasons “comparable” companies} \Longrightarrow \text{(almost) same beta}$$

This idea is now even being propagated in the direction of a regression according to equation (3) with the simultaneous use of AI.[13] After the stochastic identification of the relevant factors and their coefficients, the "comparable" companies are selected on this basis. This is no problem for a peer group determination beyond the CAPM, but contradictory with regard to the determination of a beta surrogate.

3. The Multicollinearity Quandary

However, a significant part of the research on debt beta is just as problematic as it is consistently unquestioned. Conversely, an econometric part finally becomes the subject of ambivalent considerations: The factors commonly used for linear regressions such as equation (3) to secure the absence of multicollinearity[14] are sawing at the root of the CAPM, because orthogonal regressors support the use of a multi-factor model. So, if there is approximately no multicollinearity and significant regression coefficients are obtained, this is not only a reason to rejoice, as long as evaluations are carried out within the CAPM.

10 The starting point for risk mapping in CAPM is the covariance matrix of risky returns. The model cannot "look back" beyond these given input variables, which is why any attempt to explain the beta factor using relationships outside the model would be pointless.

11 Knoll, Interview "CAPM und Unternehmensbewertung", Risiko-Manager, no. 23 (2014): 20 f. (translation of the German original).

12 Cf. Knoll/Kruschwitz/Löffler/Lorenz, Der Betafaktor zwischen theoretischer Definition und belastbarer Prognose, Corporate Finance (2020): 97, with particular reference to the business model.

13 Cf. Grbenic/Jagric, The Wind of Change: Das Leistungsvermögen der künstlichen Intelligenz bei der Zusammenstellung der Peer Group im Rahmen der Multiplikatorbewertung, BWP (2025): 2-10 (5 et seq.).

14 Farrar/Glauber, Multicollinearity in Regression Analysis: The Problem Revisited, The Review of Economics and Statistics (1967): 92-107.

III. Market Portfolio Construction

One argument that is repeatedly cited as a problem of debt betas concerns the market portfolio. In practice, this inevitably deviates from the theoretical ideal of the CAPM, which encompasses all risky assets, and is therefore only partially efficient.[15] In reality, a share index is usually used. Of course, this seems all the more problematic in the case of debt betas, because debt securities at hand are (rightly) classified as risky, but at the same time they are not included in the market portfolio proxy comprising risky shares only. Therefore, if you want at least an index consisting of shares and bonds, a weighted average of an equity and a bond index is often constructed in the absence of an original instrument.[16] Usually, in such studies, weights are used that are derived from approximate values for the average market capitalization of the two indices during the observation period or from published values for the general capitalization of the securities traded on the market.[17]

On the other hand, the combined index return weighted according to the market capitalizations of the two sub-indices in each return period considered would be ideally required for beta determination. Strangely enough, one comes across a connection that has not been discussed even in studies that have created such indices so far. To make this clear, the following abbreviations apply:

- r_{SI} = period rate of return of the share index,
- r_{BI} = period rate of return of the bond index,
- α = weighting factor for the share index with $0 < \alpha < 1$.

For beta, the following then applies:

$$\beta_j = \frac{\operatorname{cov}\left[r_j, \alpha r_{SI} + (1-\alpha) r_{BI}\right]}{\operatorname{var}\left[\alpha r_{SI} + (1-\alpha) r_{BI}\right]} \qquad (5)$$

15 On the fundamental consequences, see already the so-called Roll Critique, Roll, A Critique of the Asset Pricing Theory's Tests: Part I: on Past and Potential Testability of the Theory, Journal of Financial Economics, vol. 4, no. 2 (1977): 129-176.

16 For consistency reasons, this market portfolio is then obligatory for the equity beta, too, because the CAPM return equation does not allow the use of different market portfolios, cf. Knoll, Internationale Peer Group-Betas, Investorenperspektive und die Wahl des Marktportfolios in der objektivierten Unternehmensbewertung, Corporate Finance (2023): 248-252 (249).

17 For example, Weinstein, The systematic risk of corporate bonds, The Journal of Financial and Quantitative Analysis (1981): 257-278 (261) and Chen, Some Evidence on Yield Changes and the Systematic Risk of Bonds, Quarterly Journal of Business and Economics (1989): 43-54, here p. 47. Used the approximation for the market proxy portfolio, which consists 70% of equities and 30% bonds. Klein/Stellner, The systematic risk of corporate bonds: default risk, term risk, and index choice, Financial Markets and Portfolio Management (2014): 29–61, here p. 37, used the weights based on the ratio of equity and debt volume outstanding in the Euro area. The authors applied the market value of debt provided by the Bank for International Settlements and the market value of outstanding equity obtained from the European Central Bank. Based on these measures, the ratio was combined on monthly basis from 1999 to 2010. The weight of equities in the combined market portfolio deviated between 19% and 56%.

According to the calculation rules for (co)variances, the numerator of the fraction can be rewritten as

$$\operatorname{cov}\left[r_j, \alpha r_{SI} + (1-\alpha) r_{BI}\right] = \alpha \operatorname{cov}\left[r_j, r_{SI}\right] + (1-\alpha)\operatorname{cov}\left[r_j, r_{BI}\right] \quad (6)$$

and the denominator as

$$\operatorname{var}\left[\alpha r_{SI} + (1-\alpha) r_{BI}\right] = \alpha^2 \operatorname{var}\left[r_{SI}\right] + (1-\alpha)^2 \operatorname{var}\left[r_{BI}\right] + 2\alpha(1-\alpha)\operatorname{cov}\left[r_{SI}, r_{BI}\right] \quad (7)$$

If you plug this into the beta equation (5), you get

$$\beta_j = \frac{\operatorname{cov}\left[r_j, \alpha r_{SI} + (1-\alpha) r_{BI}\right]}{\operatorname{var}\left[\alpha r_{SI} + (1-\alpha) r_{BI}\right]} \quad (8)$$

$$= \frac{\alpha \operatorname{cov}\left[r_j, r_{SI}\right] + (1-\alpha)\operatorname{cov}\left[r_j, r_{BI}\right]}{\alpha^2 \operatorname{var}\left[r_{SI}\right] + (1-\alpha)^2 \operatorname{var}\left[r_{BI}\right] + 2\alpha(1-\alpha)\operatorname{cov}\left[r_{SI}, r_{BI}\right]}$$

The significance of this relationship results from the following characteristic: As a rule, the covariances with the individual indices are known or can be easily recalculated due to knowledge of the respective beta factor and the regularly known index return variance. Then the only variable still open is the covariance between the two indices. This is also easy to determine – either directly or by using the beta values and exploiting their regularly known variances. This allows the debt beta to be manipulated by determining the weighting. In the extreme case, one can insert any wanted value for β_j in equation (8) and then solve for the corresponding α or use the target search in EXCEL. The only limitations for a possible result are the debt betas realized by using one of the two indices alone, either the share index or the bond index. The following example gives an impression of a possible procedure.

Example: How to misapplicate debt beta by constructing the market portfolio

To determine the debt beta, an appraiser has been given the requirement that the market portfolio used should contain both shares and bonds. Unfortunately, she does not have access to a suitable mixed index, so she has to form the market portfolio from a weighted average of the equity and the bond index.

Measured by market capitalization, the equity index should have a weighting factor $\alpha = 0.7$ and the bond index a weighting factor of 0.3, as can be determined by a somewhat laborious calculation, depending on the available preliminary work of the commissioned data provider. This data supplier has now provided the following values:

$$\beta_{j,SI} = 0.1; \beta_{j,BI} = 0.5;$$

$$\operatorname{var}\left[r_{SI}\right] = 0.04; \operatorname{var}\left[r_{BI}\right] = 0.0025$$

Rearranging the beta formula results in

$$\operatorname{cov}\left[r_j, r_{SI}\right] = 0.1 \times 0.04 = 0.004;$$

$$\operatorname{cov}\left[r_j, r_{BI}\right] = 0.5 \times 0.0025 = 0.00125$$

With regard to **(8)**, the parameter that is still missing is $\operatorname{cov}[r_{SI}, r_{BI}]$. As already stated, you can derive it directly or indirectly by running a regression between the two index returns and transforming the beta formula as before. If we get, for example, $\beta_{(SI,BI)} = 0.2$, we can calculate

$$\operatorname{cov}\left[r_{SI}, r_{BI}\right] = 0.2 \times 0.0025 = 0.0005$$

as the missing covariance between the two indices. Inserting all these data in (8) and the knowledge about α allow the calculation

$$\beta_j = 0.15847\ldots \approx 0.158$$

For whatever reasons, our appraiser now wants to get a debt beta of 0.20. As this value is between 0.1 and 0.5, this is no great problem. Either by using the solution derived in the appendix or by a target search for α in EXCEL, she can obtain an α of 0.58 (rounded to 2 decimals). Of course, things become much more difficult concerning the effect on the total valuation, if the appraiser correctly (!) uses the same combined index also for the calculation of the equity beta, but none of us ever saw in practice an equity beta calculated against a combined index.[18]

This is undoubtedly a dangerous situation, or to put it another way: any weighting other than the ideal market capitalization raises suspicions of misuse and requires very good justification and transparency! In other words, you don´t need to examine many index pairs if you want to determine a debt beta that corresponds to a desired level. The weighting offers more opportunities to achieve the goal more easily and accurately. Of course, this does not mean that all deviations from the ideal are due to misuse – especially in scientific studies, we do not see any great danger of distortion of the results. But since the debt beta depends heavily on the construction of the market portfolio[19] and the described approach certainly causes much stronger distortions on the result than other problems such as

18 In Germany, the low level of attention paid to the demand for a uniform market index can be seen, for example, in the fact that international peer groups often use the various home indices of their peers when determining beta, cf. e.g. Knoll, Internationale Peer Group-Betas, Investorenperspektive und die Wahl des Marktportfolios in der objektivierten Unternehmensbewertung, Corporate Finance (2023): 248-252 (251-252).

19 Weinstein, The systematic risk of corporate bonds, The Journal of Financial and Quantitative Analysis (1981): 257-278, here: 260-262 and 272-273. Weinstein found that bond beta values were higher when a combined index was used, ranging from -0,276 to 1,432 (mean values vary between 0,051 and 0,301 depending on the time period), compared to the betas derived from a stocks-only market portfolio, which ranged from -0,218 to 1,166 (average values range between 0,028 and 0,205).

the lack of a normal distribution of the disturbance terms,[20] one should always keep this aspect in mind.

IV. Debt Beta Dependence on Leverage Ratio

An often econometrically confirmed factor influencing debt beta is the credit rating of the respective company.[21] Here you suddenly get into another problem that is surprisingly little discussed: Since the debt ratio is a major determinant of the rating, it indirectly influences the debt beta. Regardless of the fact that a corresponding connection beyond the CAPM seems plausible, it has a serious consequence: In the common adjustment formulas, the delevering/relevering mechanism is carried out with a leverage ratio that is independent of the debt beta and vice versa. If, on the other hand, the presumption of a correlation or influence is correct, then for this reason alone the adjustment formulas can only be applied without modifications if one can assume a constant level of indebtedness. This leads to (at least) two unpleasant consequences:

- As is well known, only some of the adaptation formulas are derived from this assumption, which itself is not without controversy.[22]
- In practice, and especially in the case of ratings, debt ratios, especially in equity, are regularly not determined on the basis of the theoretical market values to be required. On the other hand, however, it is to be expected that leverage ratios based on book values will show the same trend as leverage ratios based on market values (a low book-based ratio rarely corresponds to a high market-based ratio).

These findings alone raise questions that are unlikely to be answered in the application of the CAPM for valuation practice. Nevertheless, one should be aware of these problems and always ask oneself in individual cases whether they can have significant effects on the valuation result.

V. Conclusion

It is no coincidence that debt betas are not used in valuation practice to the same extent as conventional equity betas. This article outlined a number of aspects which, in addition to the well-known differences compared to equity betas, can be regarded as problematic for the research and practical evaluation of debt betas: the search for influencing factors for a substantive economic explanation, the risk of misapplication in the construction of the market portfolio and the dependence of the debt beta on the debt-equity ratio. As much as the general claim of the CAPM for all risky financial instruments suggests the inclusion of debt capital at risk of default in the determination of beta factors, not only the statements in this article show that debt betas are dangerous and often even mined terrain.

Our findings may make a small contribution to a better understanding of debt betas, but there is still a lot to be done. The status quo seems very unsatisfactory and perhaps one day it will be concluded that the problems of debt beta outweigh its advantages and that it should therefore no longer be used in some assessments.

Appendix:
Derivation of a Suitable α for a Wanted Debt Beta

We start with (8)

$$\beta_j = \frac{\operatorname{cov}\left[r_j, \alpha r_{SI} + (1-\alpha) r_{BI}\right]}{\operatorname{var}\left[\alpha r_{SI} + (1-\alpha) r_{BI}\right]}$$

$$= \frac{\alpha \operatorname{cov}\left[r_j, r_{SI}\right] + (1-\alpha)\operatorname{cov}\left[r_j, r_{BI}\right]}{\alpha^2 \operatorname{var}\left[r_{SI}\right] + (1-\alpha)^2 \operatorname{var}\left[r_{BI}\right] + 2\alpha(1-\alpha)\operatorname{cov}\left[r_{SI}, r_{BI}\right]} \Leftrightarrow$$

$$\beta_j\left(\alpha^2 \operatorname{var}\left[r_{SI}\right] + (1-\alpha)^2 \operatorname{var}\left[r_{BI}\right] + 2\alpha(1-\alpha)\operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)$$
$$= \alpha \operatorname{cov}\left[r_j, r_{SI}\right] + (1-\alpha)\operatorname{cov}\left[r_j, r_{BI}\right] \Leftrightarrow$$

$$\alpha^2\beta_j\left(\operatorname{var}\left[r_{SI}\right] + \operatorname{var}\left[r_{BI}\right] - 2\operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)$$
$$-2\alpha\beta_j\left(\operatorname{var}\left[r_{BI}\right] - \operatorname{cov}\left[r_{SI}, r_{BI}\right]\right) + \beta_j \operatorname{var}\left[r_{BI}\right]$$
$$= \alpha\left(\operatorname{cov}\left[r_j, r_{SI}\right] - \operatorname{cov}\left[r_j, r_{BI}\right]\right) + \operatorname{cov}\left[r_j, r_{BI}\right] \Leftrightarrow$$

$$\alpha^2\left(\beta_j\left(\operatorname{var}\left[r_{SI}\right] + \operatorname{var}\left[r_{BI}\right] - 2\operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)\right)$$
$$-\alpha\left(2\beta_j\left(\operatorname{var}\left[r_{BI}\right] - \operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)\right.$$
$$\left. + \left(\operatorname{cov}\left[r_j, r_{SI}\right] - \operatorname{cov}\left[r_j, r_{BI}\right]\right)\right)$$
$$+\beta_j \operatorname{var}\left[r_{BI}\right] - \operatorname{cov}\left[r_j, r_{BI}\right] = 0$$

Then you get by the "midnight formula"

$$\alpha_{1/2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

with

$$a = \beta_j\left(\operatorname{var}\left[r_{SI}\right] + \operatorname{var}\left[r_{BI}\right] - 2\operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)$$

$$b = -\left(2\beta_j\left(\operatorname{var}\left[r_{BI}\right] - \operatorname{cov}\left[r_{SI}, r_{BI}\right]\right)\right.$$
$$\left. + \left(\operatorname{cov}\left[r_j, r_{SI}\right] - \operatorname{cov}\left[r_j, r_{BI}\right]\right)\right)$$

$$c = \beta_j \operatorname{var}\left[r_{BI}\right] - \operatorname{cov}\left[r_j, r_{BI}\right]$$

Regularly, there will only be one feasible solution that fulfills the condition $0 < \alpha < 1$.

20 Cf. Alexander (1980): 1069.

21 Pratt/Grabowski, Cost of capital: applications and examples (2014): 220; Klein/Stellner, The systematic risk of corporate bonds: default risk, term risk, and index choice, Financial Markets and Portfolio Management (2014): 29-61 (41), found the relationship between debt betas and credit ratings. Knoll/Manthey, Verschuldung, Risiko und das CAPM: empirische Befunde bei HDAX-Gesellschaften, BWP (2021): 106-115 (114), found that the link was statistically insignificant.

22 Cf. Kruschwitz/Löffler/Lorenz. Zum Unlevering und Relevering von Betafaktoren: Stellungnahme zu Meitner/Streitferdt, WPg (2012): 1037-1047 – Zugleich Grundsatzüberlegungen zu Kapitalkostendefinitionen, Die Wirtschaftsprüfung, no. 65 (2012): 1048-1052.

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Industry Betas and Multiples

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I. 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.

II. 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.

III. Eurozone Cost of Capital Parameters as at 31 May 2026

The typified, uniform risk-free rate based on AAA-rated government bonds currently lies at 3.5% 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 5.0%. 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.

IV. 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 β_U = unlevered beta, β_D = debt beta, D = net debt, E = market value of equity. Debt betas rely on a company's individual rating on a given date. 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 + 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.

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

31 May 2026	Median Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Industries	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Industrials	*267*	0.81	0.85	0.82	0.87	0.91	0.85	*244*	0.95
Consumer Discretionary	*176*	1.02	0.94	0.85	0.90	0.81	0.90	*151*	1.02
Health Care	*131*	0.67	0.74	0.82	0.79	0.78	0.76	*117*	0.76
Financials	*146*	0.92	0.85	0.73	0.87	0.90	0.85	*143*	0.81
Utilities	*49*	0.44	0.59	0.65	0.40	0.45	0.51	*47*	0.62
Materials	*89*	0.83	0.97	0.88	0.90	0.90	0.90	*87*	0.91
Real Estate	*79*	0.55	0.83	0.71	0.41	0.73	0.65	*71*	0.84
Communication Services	*88*	0.59	0.67	0.51	0.62	0.52	0.58	*89*	0.61
Information Technology	*155*	0.90	0.93	0.84	0.82	0.76	0.85	*146*	1.04
Consumer Staples	*83*	0.59	0.50	0.40	0.43	0.43	0.47	*75*	0.55
Energy	*32*	0.39	0.70	0.47	0.82	0.46	0.57	*35*	0.40

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

31 May 2026	Median Equity-Ratios								
	1-Year							5-Year	
Industries	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Industrials	*285*	82.9%	80.1%	81.1%	81.0%	83.6%	81.7%	*245*	82.0%
Consumer Discretionary	*183*	81.6%	75.5%	75.3%	70.2%	71.2%	74.8%	*148*	81.3%
Health Care	*143*	97.5%	91.4%	93.8%	92.3%	91.5%	93.3%	*122*	96.5%
Utilities	*52*	66.9%	64.2%	61.6%	61.5%	64.7%	63.8%	*48*	66.7%
Materials	*94*	80.5%	77.8%	79.1%	76.1%	77.0%	78.1%	*87*	79.6%
Real Estate	*85*	53.5%	46.1%	48.1%	49.7%	49.0%	49.3%	*71*	48.5%
Communication Services	*100*	84.2%	78.4%	72.4%	73.0%	73.7%	76.3%	*86*	78.2%
Information Technology	*168*	97.1%	96.7%	95.5%	93.8%	93.7%	95.4%	*148*	96.3%
Consumer Staples	*88*	76.5%	72.7%	70.5%	72.9%	73.4%	73.2%	*77*	75.7%
Energy	*41*	73.7%	82.5%	85.5%	79.7%	85.5%	81.4%	*39*	82.9%

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

31 May 2026	Median Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Industries	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Industrials	*255*	0.63	0.68	0.58	0.70	0.72	0.66	*234*	0.76
Consumer Discretionary	*160*	0.79	0.75	0.66	0.70	0.70	0.72	*143*	0.84
Health Care	*116*	0.51	0.53	0.49	0.56	0.61	0.54	*107*	0.61
Utilities	*48*	0.33	0.47	0.49	0.40	0.36	0.41	*47*	0.47
Materials	*88*	0.67	0.82	0.67	0.72	0.79	0.73	*84*	0.74
Real Estate	*75*	0.39	0.53	0.51	0.35	0.50	0.46	*65*	0.57
Communication Services	*85*	0.48	0.57	0.40	0.42	0.42	0.46	*80*	0.56
Information Technology	*148*	0.78	0.79	0.66	0.70	0.69	0.72	*138*	0.91
Consumer Staples	*79*	0.51	0.47	0.35	0.43	0.42	0.43	*73*	0.51
Energy	*31*	0.17	0.58	0.42	0.71	0.00	0.37	*35*	0.43

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

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

31 May 2026	Median Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Materials	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Chemicals	*32*	0.80	0.99	0.86	0.83	0.77	0.85	*33*	0.86
Construction Materials	*12*	1.11	0.97	1.12	0.92	1.16	1.06	*10*	1.08
Containers & Packaging	*13*	0.84	0.85	0.86	0.77	0.85	0.83	*12*	0.61
Metals & Mining	*24*	0.81	1.29	0.86	1.09	1.26	1.06	*24*	1.37
Paper & Forest Products	*8*	0.76	0.53	0.69	0.42	0.83	0.65	*8*	0.36

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

31 May 2026	Median Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Materials	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Chemicals	*35*	83.2%	79.6%	84.3%	78.8%	80.1%	0.81	*33*	81.5%
Construction Materials	*13*	63.9%	67.1%	74.9%	81.9%	81.5%	0.74	*10*	75.8%
Containers & Packaging	*13*	84.3%	85.2%	85.8%	79.1%	78.4%	0.83	*12*	88.0%
Metals & Mining	*26*	72.4%	74.3%	70.4%	64.0%	74.4%	0.71	*24*	72.6%
Paper & Forest Products	*8*	85.9%	83.7%	80.3%	77.4%	72.3%	0.80	*8*	77.2%

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

31 May 2026	Median Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Materials	Comps incl. (Average*)	6/2021 to 5/2022	6/2022 to 5/2023	6/2023 to 5/2024	6/2024 to 5/2025	6/2025 to 5/2026	Average*	Comps included	6/2022 to 5/2026
Chemicals	*32*	0.64	0.83	0.64	0.71	0.64	0.69	*32*	0.73
Construction Materials	*12*	0.79	0.85	0.89	0.76	0.99	0.86	*10*	0.98
Containers & Packaging	*13*	0.77	0.65	0.76	0.59	0.68	0.69	*12*	0.58
Metals & Mining	*24*	0.64	1.03	0.59	0.85	0.96	0.81	*22*	1.05
Paper & Forest Products	*8*	0.66	0.48	0.59	0.41	0.72	0.57	*8*	0.34

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

V. 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 value of equity plus net debt) by its sales, EBITDA or EBIT. Earnings multiples are derived by dividing a companies' market value of equity 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 May 2026	Sales			EBITDA			EBIT			Earnings			Market to Book-Ratio		
Industries	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.
Industrials	1.1	1.0	*226*	7.8	6.8	*222*	12.3	10.9	*215*	15.6	13.7	*206*	1.8	1.7	*204*
Consumer Discretionary	0.9	0.8	*141*	6.7	6.0	*139*	12.0	10.2	*133*	13.2	11.0	*126*	1.6	1.5	*130*
Health Care	2.4	2.1	*99*	9.2	8.2	*79*	14.0	12.1	*75*	16.7	14.5	*70*	2.0	1.9	*81*
Financials	n/m	n/m	*n/a*	n/m	n/m	*n/a*	n/m	n/m	*n/a*	11.5	10.2	*108*	1.5	1.4	*106*
Utilities	2.8	2.8	*41*	8.9	8.5	*40*	16.0	14.5	*39*	17.4	15.9	*38*	1.9	1.9	*38*
Materials	1.1	1.1	*85*	7.3	6.4	*83*	13.3	11.0	*78*	15.9	12.9	*72*	1.3	1.2	*77*
Real Estate	11.5	11.3	*54*	16.6	15.9	*52*	17.2	16.9	*53*	13.2	12.5	*50*	0.7	0.7	*48*
Communication Services	1.4	1.3	*76*	5.8	5.3	*75*	11.1	10.0	*71*	13.7	11.6	*62*	1.6	1.5	*64*
Information Technology	1.3	1.2	*131*	9.2	7.9	*128*	14.3	12.7	*117*	21.2	17.9	*107*	2.4	2.2	*111*
Consumer Staples	0.7	0.6	*67*	7.2	6.6	*67*	11.6	10.6	*65*	13.7	12.5	*61*	1.5	1.3	*59*
Energy	1.4	1.3	*35*	5.7	6.0	*35*	8.8	8.7	*34*	10.9	11.5	*33*	1.9	1.7	*34*

Table 8: Median Subindustry (Materials) Multiples

31 May 2026	Sales			EBITDA			EBIT			Earnings			Market to Book		
Subindustry: Materials	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.	Trai-ling	Fwd. +1	Comps incl.
Chemicals	1.1	1.1	*34*	7.9	7.0	*32*	13.6	12.8	*27*	17.8	15.9	*25*	1.4	1.3	*29*
Construction Materials	1.4	1.3	*12*	6.4	6.0	*12*	10.4	9.3	*12*	13.4	11.2	*12*	1.4	1.3	*11*
Containers & Packaging	1.1	1.1	*11*	6.6	6.1	*11*	13.7	11.0	*11*	16.1	12.1	*11*	1.2	1.1	*9*
Metals & Mining	0.7	0.7	*21*	7.6	6.2	*21*	14.0	9.9	*21*	16.5	12.2	*18*	1.2	1.1	*21*
Paper & Forest Products	1.5	1.4	*7*	8.8	6.7	*7*	15.5	11.9	*7*	15.3	12.8	*6*	1.3	1.2	*7*

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

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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 October 2022 until 30 September 2025*) 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.

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 October 2022 until 30 September 2025*, 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.
- The trailing multiples are computed employing the value driver available closest to date of the transaction.
- 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.

I. Notes for application:

n indicates the number of observations (sample size) included in both, the computation of the multiples and the regression.

$\bar{x}_a$ indicates the arithmetic mean, $\bar{x}_h$ indicates the harmonic mean

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

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

$$\bar{x}_t = \frac{\sum_2^{n-1} x_i}{n-2}$$

The first quartile *Q1* indicates the boundary of the lowest 25%, the third quartile *Q3* 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. *Q2* 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:

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

and the corresponding p-values are reported in brackets. P-values below (above) the defined level of significance (0.01, 0.05 or 0.10) indicate that the null hypothesis of the multiples being normally distributed is rejected (accepted). Consequently, a p-value above (below) the defined level of significance indicates the multiples (not) to be normally distributed.

The skewness $\mathbf{sk}$ 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):

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

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 $\mathbf{p}$ 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. ◆

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Central and Western Europe – Trailing DEPV/Sales (operating), 1 October 2022 until 30 September 2025

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 – Trailing DEPV/EBITDA, 1 October 2022 until 30 September 2025

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

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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	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
386	1.91	0.85	1.99	0.98	2.34	2.64	[1,71 ; 2,10] (8,58 | 0,0137)	-0.67	0.48	ŷ = 2,614 x Sales - 1.822.593	0.94	10,772,455
4,626	1.89	1.44	1.94	1.71	1.95	2.30	[1,87 ; 1,91] (86,04 | 0,0000)	-0.77	0.30	ŷ = 0,365 x Sales + 2.166.195	0.14	744,824
1,975	1.64	1.09	1.64	0.82	1.89	2.37	[1,57 ; 1,70] (36,53 | 0,0000)	-0.12	0.48	ŷ = 0,491 x Sales + 1.702.653	0.26	1,016,176
4,047	1.74	1.23	1.76	1.26	1.85	2.11	[1,72 ; 1,77] (16,03 | 0,0003)	-0.33	0.35	ŷ = 1,492 x Sales + 366.940	0.82	2,963,148
1,331	0.86	0.05	0.75	0.25	0.74	1.28	[0,79 ; 0,93] (56,88 | 0,0000)	1.13	0.85	ŷ = 0,303 x Sales + 361.061	0.96	1,273,031
4,176	1.17	0.82	1.10	0.70	1.02	1.47	[1,14 ; 1,20] (139,27 | 0,0000)	1.02	0.55	ŷ = 1,118 x Sales - 629.918	0.77	4,409,101
2,061	1.08	0.07	1.00	0.40	0.91	1.52	[1,02 ; 1,14] (35,45 | 0,0000)	0.69	0.74	ŷ = 0,247 x Sales + 1.382.861	0.69	6,222,776
193	0.90	0.37	0.81	0.54	0.72	0.99	[0,76 ; 1,04] (13,85 | 0,0010)	1.33	0.73	ŷ = 0,647 x Sales + 2.958.071	0.82	8,856,742
327	0.42	0.25	0.27	0.21	0.22	0.28	[0,35 ; 0,49] (221,92 | 0,0000)	2.81	1.24	ŷ = 0,127 x Sales + 1.403.319	0.11	1,648,813
209	1.06	0.09	0.99	0.16	0.81	1.83	[0,79 ; 1,33] (4,12 | 0,1273)	0.68	0.88	ŷ = 0,018 x Sales + 270.119	-0.01	415,314
3,794	1.05	0.51	0.97	0.53	0.77	1.48	[1,01 ; 1,09] (111,10 | 0,0000)	0.97	0.69	ŷ = 0,434 x Sales + 1.246.185	0.87	2,133,838
918	1.81	1.20	1.85	1.40	1.94	2.31	[1,72 ; 1,89] (9,86 | 0,0072)	-0.53	0.41	ŷ = 1,843 x Sales - 87.175	0.79	2,551,666
1,422	1.55	0.71	1.57	0.94	1.46	2.37	[1,47 ; 1,64] (17,20 | 0,0002)	0.04	0.55	ŷ = 1,438 x Sales + 1.422.892	0.83	5,140,678
2,308	1.71	0.42	1.75	0.94	1.84	2.62	[1,63 ; 1,78] (36,85 | 0,0000)	-0.29	0.53	ŷ = 1,403 x Sales + 1.752.523	0.83	3,956,538
134	1.27	0.28	1.26	0.57	1.12	2.33	[0,93 ; 1,61] (2,64 | 0,2665)	0.16	0.73	ŷ = 0,666 x Sales + 12.775	1.00	438,090
81	1.46	0.13	1.45	0.21	1.36	2.30	[0,86 ; 2,06] (1,57 | 0,4558)	-0.06	0.75	ŷ = 2,157 x Sales - 14.344	0.97	70,433
392	1.15	0.10	1.09	0.37	0.98	1.98	[0,96 ; 1,34] (6,19 | 0,0453)	0.48	0.80	ŷ = 0,360 x Sales + 184.860	0.93	679,634
1,675	1.38	0.49	1.36	0.76	1.32	1.99	[1,31 ; 1,45] (14,30 | 0,0008)	0.24	0.57	ŷ = 1,265 x Sales + 65.789	0.51	1,246,892

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	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
462	11.45	9.09	11.53	7.17	10.70	15.66	[6,82 ; 16,07] (7,23 | 0,0269)	-0.11	0.41	ŷ = 8,363 x EBITDA + 3.855.758	0.96	11,837,890
2,667	11.57	5.00	11.96	3.00	15.22	17.23	[7,72 ; 15,41] (68,50 | 0,0000)	-0.54	0.57	ŷ = 0,552 x EBITDA + 2.852.764	0.05	1,487,038
2,034	9.57	4.05	9.52	2.22	8.77	16.37	[5,11 ; 14,03] (48,21 | 0,0000)	-0.00	0.70	ŷ = 0,715 x EBITDA + 2.610.458	0.07	1,714,090
1,637	10.87	8.75	10.78	8.30	10.28	13.84	[8,75 ; 13,00] (9,58 | 0,0083)	0.33	0.40	ŷ = 10,740 x EBITDA + 54.441	0.83	2,887,220
467	5.85	0.31	5.24	2.83	4.05	8.23	[1,39 ; 10,31] (33,06 | 0,0000)	1.31	0.79	ŷ = 3,042 x EBITDA + 301.120	0.95	2,051,044
4,551	10.70	3.09	10.55	6.92	10.58	13.65	[9,45 ; 11,94] (21,16 | 0,0000)	0.15	0.40	ŷ = 14,173 x EBITDA - 3.027.486	0.85	8,672,507
1,186	10.22	0.78	10.27	5.78	10.52	15.56	[5,97 ; 14,47] (11,47 | 0,0032)	-0.04	0.56	ŷ = 8,039 x EBITDA + 1.892.758	0.49	28,246,309
204	11.67	2.48	11.96	7.19	12.82	16.37	[0,41 ; 22,94] (3,20 | 0,2016)	-0.45	0.51	ŷ = 4,697 x EBITDA + 3.479.126	0.23	11,611,141
48	12.18	6.73	12.18	8.01	16.03	16.33	[-8,05 ; 32,41] (0,94 | 0,6255)	-0.71	0.46	ŷ = 15,217 x EBITDA - 219.578	0.95	4,279,417
284	9.09	3.55	9.34	3.75	12.07	13.10	[2,22 ; 15,95] (5,54 | 0,0627)	-0.47	0.56	ŷ = 13,647 x EBITDA - 617.083	0.99	1,015,138
1,970	6.83	3.19	6.08	1.96	5.46	9.21	[3,71 ; 9,96] (54,55 | 0,0000)	0.94	0.81	ŷ = 12,968 x EBITDA - 7.508.442	0.76	15,238,471
574	11.87	8.49	12.01	8.13	11.75	17.33	[6,64 ; 17,09] (5,42 | 0,0667)	-0.11	0.44	ŷ = 10,760 x EBITDA + 550.412	0.98	2,164,657
1,814	9.21	5.73	8.79	5.51	6.61	13.07	[6,20 ; 12,22] (34,42 | 0,0000)	0.69	0.58	ŷ = 5,062 x EBITDA + 1.508.155	0.81	4,895,355
2,791	8.48	4.80	7.95	5.35	6.49	11.81	[6,58 ; 10,38] (65,69 | 0,0000)	0.87	0.55	ŷ = 5,368 x EBITDA + 771.441	0.82	4,496,830
199	10.40	2.26	10.53	3.66	12.66	17.50	[-3,79 ; 24,58] (3,83 | 0,1472)	-0.24	0.64	ŷ = 13,844 x EBITDA - 61.154	0.92	446,068
381	9.81	2.11	9.93	7.17	9.87	12.94	[5,36 ; 14,26] (0,29 | 0,8659)	-0.14	0.45	ŷ = 13,517 x EBITDA - 382.591	0.99	746,782
1,513	7.77	6.11	7.43	5.91	7.64	8.68	[6,66 ; 8,89] (240,41 | 0,0000)	1.40	0.40	ŷ = 5,245 x EBITDA + 858.966	0.66	1,005,787
1,106	11.16	1.01	11.33	6.17	11.04	16.60	[6,95 ; 15,36] (14,94 | 0,0006)	-0.11	0.50	ŷ = 0,147 x EBITDA + 1.663.240	0.00	1,791,231

Central and Western Europe – Trailing DEPV/EBIT, 1 October 2022 until 30 September 2025

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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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 – Trailing DEPV/Invested Capital, 1 October 2022 until 30 September 2025

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

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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	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
429	15.93	11.99	15.68	10.20	13.76	23.44	[2,99 ; 28,87] (6,40 | 0,0408)	0.34	0.48	ŷ = 11,759 x EBIT + 4.822.693	0.96	12,680,226
2,372	21.49	19.50	21.57	19.89	21.66	22.81	[20,13 ; 22,85] (797,97 | 0,0000)	-1.29	0.18	ŷ = 28,978 x EBIT - 960.755	0.96	469,601
1,685	20.86	17.83	21.42	19.32	21.65	23.17	[18,09 ; 23,62] (305,35 | 0,0000)	-1.58	0.24	ŷ = 20,846 x EBIT + 85.589	0.78	501,041
2,098	17.22	13.04	17.29	11.73	15.43	24.03	[12,01 ; 22,43] (19,55 | 0,0001)	0.04	0.42	ŷ = 17,234 x EBIT + 494.556	0.70	4,425,953
606	13.11	3.46	12.61	5.54	8.66	22.73	[-2,94 ; 29,16] (12,05 | 0,0024)	0.52	0.71	ŷ = 5,487 x EBIT + 856.264	0.93	2,147,115
4,170	16.79	12.10	16.70	10.68	16.56	22.47	[13,36 ; 20,21] (33,05 | 0,0000)	0.06	0.42	ŷ = 21,874 x EBIT - 2.041.292	0.96	8,048,350
1,653	19.11	9.65	19.86	13.00	21.65	26.85	[10,86 ; 27,36] (29,93 | 0,0000)	-0.65	0.45	ŷ = 21,175 x EBIT - 1.614.074	0.92	17,129,609
397	16.10	3.92	16.26	7.16	17.66	22.89	[-1,64 ; 33,84] (4,88 | 0,0872)	-0.17	0.55	ŷ = 4,887 x EBIT + 3.571.745	0.36	9,208,597
134	11.18	6.95	10.30	5.34	8.72	16.33	[-11,98 ; 34,34] (4,04 | 0,1328)	0.98	0.69	ŷ = 5,388 x EBIT + 8.379.963	0.22	11,566,938
311	14.26	8.10	14.17	6.58	14.24	19.77	[-1,69 ; 30,21] (3,16 | 0,2056)	0.11	0.55	ŷ = 14,799 x EBIT + 189.247	0.97	1,568,839
1,755	17.14	9.03	17.59	9.60	20.56	23.18	[10,36 ; 23,92] (29,11 | 0,0000)	-0.51	0.46	ŷ = 21,771 x EBIT - 1.221.832	0.95	12,542,092
499	15.64	11.48	15.46	8.77	17.29	20.74	[4,74 ; 26,53] (5,22 | 0,0735)	0.07	0.47	ŷ = 11,388 x EBIT + 710.345	0.99	1,692,101
1,830	14.42	10.78	14.51	11.84	14.49	17.98	[11,16 ; 17,68] (0,49 | 0,7823)	-0.08	0.38	ŷ = 11,825 x EBIT + 750.856	0.92	3,105,281
3,011	14.55	7.61	14.50	11.39	14.33	17.72	[11,45 ; 17,65] (6,72 | 0,0348)	0.15	0.42	ŷ = 12,090 x EBIT + 539.647	0.93	2,795,038
247	14.11	3.12	14.21	7.92	15.24	19.09	[-5,00 ; 33,22] (2,24 | 0,3268)	-0.27	0.58	ŷ = 15,343 x EBIT + 38.782	0.89	504,305
333	12.10	2.10	11.55	8.75	11.20	14.25	[0,84 ; 23,36] (8,42 | 0,0148)	0.79	0.56	ŷ = 14,898 x EBIT - 199.164	0.99	1,069,996
1,626	9.75	7.10	8.66	6.31	8.34	9.36	[5,92 ; 13,58] (221,24 | 0,0000)	1.73	0.60	ŷ = 4,348 x EBIT + 1.733.356	0.25	1,819,053
1,025	15.50	9.39	15.61	8.89	17.34	19.78	[8,15 ; 22,86] (7,31 | 0,0258)	-0.19	0.46	ŷ = 19,194 x EBIT - 194.363	0.81	803,118

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	ŷ = DEPV (TEUR)	$\bar{R}^2$	se_y
912	0.88	0.71	0.90	0.69	0.98	1.12	[0,86 ; 0,89] (14,43 | 0,0007)	-0.63	0.34	ŷ = 0,741 x IC + 2.028.740	0.96	9,863,065
2,619	0.91	0.69	0.94	0.72	1.00	1.13	[0,91 ; 0,92] (65,34 | 0,0000)	-0.90	0.28	ŷ = 0,591 x IC + 891.718	0.55	688,877
1,954	0.84	0.64	0.85	0.59	0.87	1.09	[0,83 ; 0,84] (18,85 | 0,0001)	-0.41	0.33	ŷ = 0,781 x IC + 118.205	0.70	1,103,117
10,031	0.67	0.45	0.66	0.45	0.65	0.87	[0,66 ; 0,67] (73,43 | 0,0000)	0.23	0.41	ŷ = 0,823 x IC - 1.329.757	0.88	7,389,064
3,043	0.54	0.05	0.54	0.38	0.60	0.70	[0,53 ; 0,55] (4,74 | 0,0934)	-0.17	0.54	ŷ = 0,181 x IC + 1.359.334	0.69	2,306,836
6,532	0.63	0.50	0.61	0.45	0.60	0.77	[0,62 ; 0,63] (57,81 | 0,0000)	0.53	0.40	ŷ = 0,630 x IC - 235.042	0.90	2,920,453
10,160	0.52	0.09	0.50	0.28	0.48	0.72	[0,51 ; 0,52] (56,20 | 0,0000)	0.35	0.56	ŷ = 0,288 x IC + 2.132.592	0.47	6,678,700
3,091	0.57	0.39	0.55	0.42	0.50	0.72	[0,56 ; 0,57] (58,56 | 0,0000)	0.76	0.42	ŷ = 0,347 x IC + 2.380.234	0.76	4,324,782
1,057	0.49	0.44	0.48	0.38	0.49	0.54	[0,48 ; 0,49] (202,91 | 0,0000)	1.19	0.29	ŷ = 0,430 x IC + 442.859	0.83	4,097,826
4,127	0.64	0.46	0.62	0.44	0.59	0.79	[0,63 ; 0,64] (40,39 | 0,0000)	0.55	0.41	ŷ = 0,602 x IC + 303.912	0.75	4,833,536
6,435	0.67	0.45	0.66	0.46	0.64	0.85	[0,66 ; 0,67] (20,37 | 0,0000)	0.13	0.41	ŷ = 0,485 x IC + 665.874	0.80	2,917,958
3,569	0.57	0.38	0.56	0.29	0.61	0.77	[0,57 ; 0,58] (21,16 | 0,0000)	0.24	0.51	ŷ = 0,802 x IC - 2.265.389	0.71	3,616,043
4,379	0.63	0.40	0.62	0.35	0.58	0.95	[0,62 ; 0,64] (55,25 | 0,0000)	0.24	0.53	ŷ = 0,394 x IC + 1.660.622	0.71	4,944,680
8,678	0.59	0.36	0.57	0.32	0.50	0.88	[0,58 ; 0,59] (131,93 | 0,0000)	0.46	0.57	ŷ = 0,413 x IC + 1.278.650	0.64	4,421,531
1,814	0.76	0.43	0.78	0.56	0.76	1.02	[0,75 ; 0,77] (8,06 | 0,0178)	-0.22	0.40	ŷ = 0,283 x IC + 2.411.118	0.63	5,332,485
2,431	0.61	0.45	0.60	0.44	0.59	0.76	[0,60 ; 0,61] (13,60 | 0,0011)	0.41	0.38	ŷ = 0,513 x IC + 790.420	0.86	3,320,185
5,571	0.67	0.44	0.67	0.38	0.64	0.97	[0,67 ; 0,68] (78,05 | 0,0000)	0.13	0.46	ŷ = 0,568 x IC + 988.543	0.61	3,887,860
4,315	0.57	0.10	0.57	0.33	0.57	0.83	[0,56 ; 0,58] (33,88 | 0,0000)	0.06	0.58	ŷ = 0,683 x IC - 1.268.646	0.75	5,983,892

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Southern Europe – Trailing DEPV/Sales (operating), 1 October 2022 until 30 September 2025

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/EBITDA, 1 October 2022 until 30 September 2025

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
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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

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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
564	0.85	0.40	0.75	0.38	0.58	1.14	[0,76 ; 0,94] (31,34 | 0,0000)	1.25	0.82	ŷ = 0,126 x Sales + 53.568	0.60	127,000
542	0.89	0.36	0.78	0.37	0.67	1.11	[0,79 ; 0,99] (36,32 | 0,0000)	1.32	0.80	ŷ = 1,196 x Sales + 26.490	0.71	381,993
419	0.87	0.33	0.80	0.25	0.60	1.33	[0,76 ; 0,98] (8,66 | 0,0131)	0.80	0.80	ŷ = 1,432 x Sales - 16.213	0.84	56,340
1,240	0.88	0.32	0.78	0.51	0.64	1.05	[0,82 ; 0,94] (96,84 | 0,0000)	1.42	0.78	ŷ = 2,344 x Sales - 2.742.615	0.86	5,716,789
478	0.87	0.21	0.75	0.29	0.51	1.28	[0,73 ; 1,02] (22,14 | 0,0000)	1.20	0.94	ŷ = 0,471 x Sales + 61.390	0.72	289,997
725	0.99	0.40	0.90	0.45	0.79	1.35	[0,90 ; 1,09] (19,69 | 0,0001)	0.94	0.76	ŷ = 1,151 x Sales + 2.812	0.58	187,721
1,186	0.85	0.48	0.73	0.43	0.58	1.13	[0,79 ; 0,91] (127,04 | 0,0000)	1.57	0.79	ŷ = 0,487 x Sales + 144.430	0.89	690,661
596	0.96	0.16	0.90	0.33	0.91	1.50	[0,86 ; 1,06] (7,64 | 0,0219)	0.60	0.76	ŷ = 0,972 x Sales - 342.936	0.68	3,951,042
247	0.80	0.43	0.71	0.32	0.64	1.13	[0,69 ; 0,91] (41,05 | 0,0000)	1.59	0.76	ŷ = 0,587 x Sales + 229.526	0.83	1,067,327
891	0.76	0.20	0.65	0.33	0.66	1.01	[0,70 ; 0,83] (80,71 | 0,0000)	1.45	0.85	ŷ = 0,415 x Sales + 155.502	0.20	909,331
1,336	0.76	0.23	0.64	0.19	0.52	1.09	[0,69 ; 0,82] (78,23 | 0,0000)	1.30	0.96	ŷ = 0,088 x Sales + 145.765	0.14	401,635
521	0.85	0.46	0.78	0.43	0.73	1.19	[0,78 ; 0,93] (22,24 | 0,0000)	1.09	0.69	ŷ = 0,761 x Sales + 22.975	0.42	497,494
1,277	0.91	0.29	0.82	0.34	0.67	1.40	[0,84 ; 0,97] (34,78 | 0,0000)	0.94	0.78	ŷ = 1,177 x Sales - 5.342	0.89	135,997
2,345	0.98	0.44	0.91	0.42	0.82	1.46	[0,93 ; 1,03] (44,07 | 0,0000)	0.76	0.72	ŷ = 1,074 x Sales + 36.032	0.72	361,943
365	1.09	0.19	1.02	0.36	0.85	1.59	[0,92 ; 1,27] (6,00 | 0,0497)	0.66	0.79	ŷ = 0,226 x Sales + 36.414	0.27	93,683
140	1.32	0.62	1.30	0.85	1.05	2.05	[1,08 ; 1,57] (1,60 | 0,4497)	0.30	0.60	ŷ = 1,978 x Sales - 15.726	0.91	95,394
1,471	0.84	0.18	0.75	0.30	0.59	1.15	[0,78 ; 0,90] (54,65 | 0,0000)	1.09	0.85	ŷ = 1,732 x Sales - 32.484	0.93	179,753
784	0.89	0.22	0.79	0.31	0.67	1.32	[0,80 ; 0,98] (25,63 | 0,0000)	1.01	0.83	ŷ = 1,086 x Sales - 124.713	0.73	3,070,425

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
413	6.33	3.31	5.98	3.06	5.23	9.31	[2,43 ; 10,22] (6,20 | 0,0450)	0.67	0.66	ŷ = 5,893 x EBITDA + 114.917	0.54	1,191,138
376	6.49	2.97	6.02	3.52	4.67	9.54	[1,60 ; 11,39] (10,60 | 0,0050)	0.95	0.70	ŷ = 5,824 x EBITDA + 68.425	0.67	463,402
327	7.45	3.02	7.10	2.54	6.19	11.95	[0,37 ; 14,52] (5,39 | 0,0677)	0.46	0.71	ŷ = 6,705 x EBITDA + 43.551	0.73	196,128
1,234	7.08	3.59	6.57	4.38	5.88	9.02	[4,68 ; 9,48] (46,43 | 0,0000)	1.03	0.61	ŷ = 5,234 x EBITDA + 384.904	0.92	1,664,967
419	5.48	1.61	5.16	3.02	4.68	7.37	[2,70 ; 8,26] (12,62 | 0,0018)	0.90	0.65	ŷ = 5,622 x EBITDA + 33.096	0.86	304,901
510	7.27	4.12	6.75	3.43	6.03	9.78	[2,48 ; 12,07] (11,31 | 0,0035)	0.84	0.67	ŷ = 9,498 x EBITDA - 12.493	0.76	102,946
1,063	6.92	4.01	6.46	4.47	5.75	8.31	[4,60 ; 9,23] (43,67 | 0,0000)	1.07	0.59	ŷ = 5,590 x EBITDA + 318.582	0.76	1,143,219
703	7.66	2.61	7.26	3.26	6.05	12.37	[3,09 ; 12,23] (10,67 | 0,0048)	0.60	0.67	ŷ = 6,174 x EBITDA + 1.077.549	0.71	4,829,520
225	8.17	4.16	7.84	3.85	7.67	12.25	[-0,51 ; 16,85] (2,74 | 0,2537)	0.46	0.66	ŷ = 8,578 x EBITDA + 223.523	0.65	1,426,629
816	8.62	3.60	8.29	3.78	7.12	13.36	[3,69 ; 13,55] (12,30 | 0,0021)	0.44	0.65	ŷ = 5,683 x EBITDA + 812.731	0.58	2,275,085
950	6.39	2.92	5.82	2.89	4.88	8.54	[3,16 ; 9,63] (33,61 | 0,0000)	1.06	0.73	ŷ = 2,347 x EBITDA + 158.349	0.34	498,445
499	8.08	3.78	7.75	3.00	6.62	13.33	[1,81 ; 14,36] (8,45 | 0,0146)	0.40	0.69	ŷ = 13,359 x EBITDA - 556.985	0.79	2,376,734
1,170	5.41	2.24	4.82	2.25	4.07	7.33	[2,97 ; 7,84] (45,79 | 0,0000)	1.11	0.79	ŷ = 4,735 x EBITDA + 47.285	0.74	268,712
2,184	7.00	3.10	6.35	2.61	4.84	10.42	[4,09 ; 9,90] (57,93 | 0,0000)	0.90	0.78	ŷ = 17,231 x EBITDA - 310.243	0.92	2,076,225
338	8.00	3.87	7.59	3.22	6.86	11.95	[1,20 ; 14,79] (4,75 | 0,0930)	0.57	0.66	ŷ = 10,885 x EBITDA - 79.154	0.66	410,692
360	10.90	5.41	11.06	6.58	10.67	16.94	[3,04 ; 18,77] (4,04 | 0,1324)	-0.15	0.53	ŷ = 15,940 x EBITDA - 110.465	0.92	465,467
1,267	6.29	1.45	5.85	2.49	5.10	9.93	[3,50 ; 9,08] (23,62 | 0,0000)	0.75	0.74	ŷ = 8,738 x EBITDA + 61.932	0.70	423,605
757	6.87	2.78	6.22	2.73	5.72	9.19	[2,56 ; 11,19] (22,12 | 0,0000)	0.97	0.74	ŷ = 5,180 x EBITDA + 287.245	0.87	2,209,942

Southern Europe – Trailing DEPV/EBIT, 1 October 2022 until 30 September 2025

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 October 2022 until 30 September 2025

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
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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 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
547	12.17	5.23	11.52	4.87	9.37	20.51	[-3,07 ; 27,42] (10,49 | 0,0053)	0.55	0.73	$\hat{y}$ = 13,722 x EBIT + 286.999	0.65	1,814,951
343	9.73	3.79	9.10	5.83	7.07	13.81	[-0,77 ; 20,24] (12,07 | 0,0024)	1.00	0.67	$\hat{y}$ = 15,250 x EBIT - 27.407	0.89	178,632
333	9.57	3.82	8.90	4.00	7.37	14.43	[-2,15 ; 21,30] (5,17 | 0,0755)	0.65	0.72	$\hat{y}$ = 6,628 x EBIT + 53.296	0.72	200,736
1,336	12.65	5.04	12.05	5.23	9.22	20.96	[2,90 ; 22,40] (26,49 | 0,0000)	0.56	0.70	$\hat{y}$ = 5,274 x EBIT + 1.532.189	0.77	3,020,437
521	11.74	2.53	11.15	4.62	8.34	20.83	[-4,03 ; 27,52] (10,55 | 0,0051)	0.58	0.76	$\hat{y}$ = 8,314 x EBIT + 361.686	0.53	915,339
488	10.99	5.15	10.01	4.81	7.96	15.60	[-4,20 ; 26,18] (13,52 | 0,0012)	0.93	0.78	$\hat{y}$ = 17,969 x EBIT - 25.243	0.80	372,250
1,100	12.66	5.76	12.23	6.53	12.67	16.86	[4,68 ; 20,63] (11,75 | 0,0028)	0.44	0.60	$\hat{y}$ = 14,047 x EBIT + 273.763	0.71	1,404,742
692	10.97	3.29	10.49	4.66	10.23	16.52	[1,50 ; 20,44] (8,02 | 0,0181)	0.51	0.68	$\hat{y}$ = 13,139 x EBIT + 80.123	0.77	6,054,216
279	14.94	7.80	14.89	7.97	13.09	22.72	[-5,88 ; 35,75] (4,00 | 0,1352)	0.08	0.59	$\hat{y}$ = 13,570 x EBIT + 691.993	0.61	2,153,588
859	11.56	4.16	10.96	5.00	8.96	19.04	[1,66 ; 21,46] (13,67 | 0,0011)	0.57	0.69	$\hat{y}$ = 14,809 x EBIT - 199.911	0.71	6,201,008
1,079	11.03	4.11	10.36	4.54	7.82	17.74	[1,96 ; 20,11] (19,54 | 0,0001)	0.64	0.73	$\hat{y}$ = 5,558 x EBIT + 317.758	0.30	1,018,520
542	10.73	4.96	9.74	4.33	10.26	13.85	[-0,79 ; 22,24] (14,57 | 0,0007)	0.93	0.72	$\hat{y}$ = 15,816 x EBIT - 472.634	0.68	2,800,532
1,073	7.86	2.98	6.94	3.08	6.14	10.59	[2,45 ; 13,27] (107,50 | 0,0000)	1.43	0.80	$\hat{y}$ = 7,292 x EBIT + 51.897	0.83	226,004
2,211	9.93	3.97	9.09	3.42	7.50	15.87	[4,11 ; 15,76] (49,06 | 0,0000)	0.79	0.78	$\hat{y}$ = 20,420 x EBIT - 184.241	0.98	1,577,325
499	11.87	5.05	11.23	3.92	9.43	19.89	[-3,11 ; 26,85] (8,98 | 0,0112)	0.60	0.72	$\hat{y}$ = 14,215 x EBIT - 5.310	0.61	559,108
451	16.44	8.52	16.56	9.37	17.98	22.71	[1,41 ; 31,46] (5,61 | 0,0606)	-0.14	0.51	$\hat{y}$ = 21,657 x EBIT - 90.535	0.86	742,736
1,213	8.22	1.42	7.34	3.08	6.06	12.22	[2,16 ; 14,27] (44,81 | 0,0000)	1.05	0.83	$\hat{y}$ = 14,815 x EBIT + 3.203	0.79	412,108
800	10.39	3.25	9.49	3.35	8.02	16.51	[-0,57 ; 21,36] (17,83 | 0,0001)	0.82	0.79	$\hat{y}$ = 8,930 x EBIT + 468.374	0.81	2,767,011

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
676	0.56	0.36	0.56	0.37	0.55	0.77	[0,55 ; 0,57] (1,50 | 0,4723)	0.20	0.48	$\hat{y}$ = 0,686 x IC + 37.331	0.88	978,060
773	0.58	0.40	0.58	0.44	0.55	0.77	[0,57 ; 0,60] (1,20 | 0,5491)	0.22	0.43	$\hat{y}$ = 0,732 x IC - 70.643	0.97	582,246
435	0.58	0.34	0.56	0.31	0.55	0.82	[0,56 ; 0,60] (3,99 | 0,1363)	0.36	0.56	$\hat{y}$ = 0,575 x IC + 4.691	0.92	47,083
2,147	0.61	0.41	0.61	0.41	0.62	0.81	[0,61 ; 0,62] (7,20 | 0,0274)	0.03	0.43	$\hat{y}$ = 0,826 x IC - 1.616.702	0.93	3,360,581
564	0.56	0.25	0.56	0.29	0.46	0.96	[0,54 ; 0,59] (9,23 | 0,0099)	0.33	0.62	$\hat{y}$ = 0,539 x IC + 187.196	0.63	773,963
660	0.63	0.38	0.62	0.31	0.58	0.95	[0,61 ; 0,66] (9,08 | 0,0106)	0.22	0.57	$\hat{y}$ = 0,973 x IC - 38.550	0.90	236,569
1,369	0.47	0.29	0.43	0.20	0.38	0.69	[0,45 ; 0,48] (26,80 | 0,0000)	0.76	0.65	$\hat{y}$ = 0,193 x IC + 641.289	0.56	1,765,988
1,218	0.62	0.09	0.62	0.47	0.64	0.78	[0,61 ; 0,63] (0,91 | 0,6355)	-0.04	0.44	$\hat{y}$ = 0,610 x IC + 176.323	0.83	4,192,866
735	0.69	0.52	0.70	0.54	0.74	0.85	[0,68 ; 0,70] (6,45 | 0,0398)	-0.51	0.37	$\hat{y}$ = 0,589 x IC + 400.940	0.85	1,036,466
1,862	0.58	0.07	0.58	0.25	0.58	0.92	[0,57 ; 0,59] (30,78 | 0,0000)	-0.00	0.59	$\hat{y}$ = 0,878 x IC - 727.536	0.81	3,638,391
1,299	0.54	0.28	0.52	0.27	0.46	0.80	[0,52 ; 0,55] (19,71 | 0,0001)	0.47	0.61	$\hat{y}$ = 0,435 x IC + 125.863	0.50	642,210
875	0.64	0.43	0.64	0.33	0.66	0.92	[0,63 ; 0,65] (11,95 | 0,0025)	-0.08	0.47	$\hat{y}$ = 0,871 x IC - 206.871	0.94	1,244,068
1,513	0.58	0.31	0.56	0.36	0.52	0.79	[0,57 ; 0,59] (13,36 | 0,0013)	0.42	0.53	$\hat{y}$ = 0,895 x IC - 108.453	0.91	1,207,819
2,555	0.63	0.41	0.62	0.39	0.61	0.84	[0,62 ; 0,63] (13,53 | 0,0012)	0.18	0.49	$\hat{y}$ = 0,657 x IC + 102.097	0.98	1,986,507
687	0.56	0.34	0.55	0.32	0.56	0.80	[0,54 ; 0,57] (6,13 | 0,0467)	0.19	0.53	$\hat{y}$ = 0,639 x IC - 20.206	0.88	200,533
741	0.61	0.42	0.60	0.41	0.64	0.77	[0,59 ; 0,62] (1,20 | 0,5500)	0.00	0.45	$\hat{y}$ = 0,724 x IC - 97.228	0.97	311,427
1,449	0.56	0.21	0.56	0.37	0.55	0.77	[0,55 ; 0,57] (3,71 | 0,1564)	0.10	0.50	$\hat{y}$ = 0,615 x IC + 1.053	0.91	237,859
1,100	0.61	0.36	0.62	0.39	0.63	0.85	[0,60 ; 0,62] (6,08 | 0,0478)	-0.08	0.46	$\hat{y}$ = 0,476 x IC + 611.647	0.84	2,322,970

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News

News from IVSC

IVS Exposure Draft Consultation Receives Global Feedback

The IVSC's consultation on the latest IVS Exposure Draft closed at the end of April, attracting more than 1,000 responses to consultation questions from stakeholders in over 70 countries.

The feedback reflects broad engagement from across the valuation ecosystem, including valuers, valuation professional organisations, regulators, investors, preparers, auditors, academics, and other users of valuation information. IVSC's Standards Boards met in Lisbon from 15–19 June to review the feedback and agree final updates to the International Valuation Standards.

Te next edition of IVS is expected to be published in January 2027, supporting continued consistency, transparency, and confidence in valuation practice globally.

Perspectives Paper: Managing and Communicating Value Uncertainty

The IVSC has published a new Perspectives Paper, Managing and Communicating Value Uncertainty, examining one of the most important concepts in valuation practice.

The paper distinguishes between valuation risk, which relates to process-related issues that can and should be mitigated, and value uncertainty, which reflects the range of credible outcomes that may arise even where a valuation is fully IVS-compliant. It considers sources of uncertainty including data limitations, model constraints, market volatility, and assumption sensitivity.

Te paper also highlights the importance of clear communication with users of valuations. Its central message is that transparency around uncertainty strengthens confidence in valuations; it does not weaken it.

Read the paper here.

EUIPO Report Highlights Need for IVS-Aligned IP Valuation in Europe

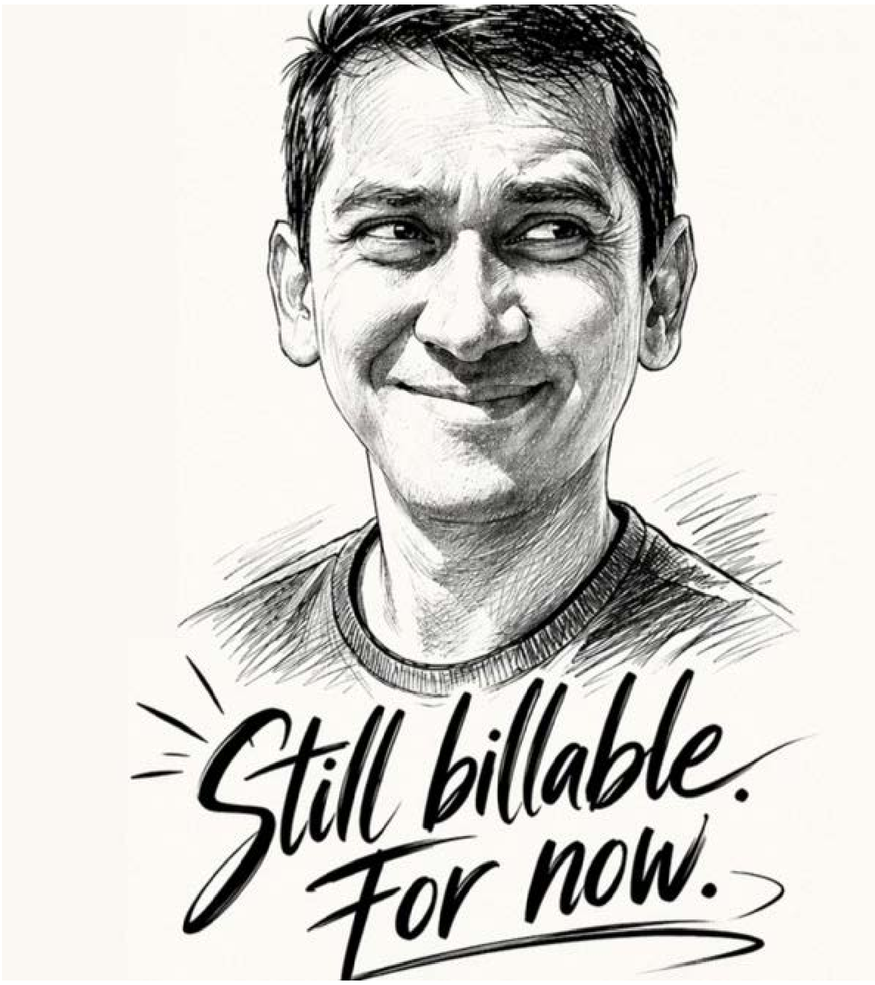
A new report from the European Union Intellectual Property Office (EUIPO) calls for an IVS-aligned architecture for IP-backed finance in Europe, recognising the importance of trusted valuation frameworks in supporting access to finance for innovation-led businesses.

The report identifies IVS as a foundation for credible IP valuation and highlights the need for consistency, transparency, and professional expertise as Europe seeks to unlock greater value from intangible assets.

ISC is working with EUIPO and European valuation professional organisations to explore approaches for building capacity among IP valuers across Europe. This includes supporting EU efforts to develop a stronger ecosystem of professionals trained to support IP-backed finance. The IVSC Europe Committee has held bilateral discussions with EUIPO counterparts and is planning an in-person roundtable as part of the IVSC AGM in Cologne in November.

Read more here.

Professional Insights: The Future of the Valuation and Damages Expert



The IVSC has published a new Professional Insights article considering the future role of valuation and damages experts in an AI-enabled world.

Written by Karthik Balisagar, the article reflects on how technology may change the economics and process of expert work, particularly in areas such as document review, modelling, research, and report preparation. However, it also underlines the continuing importance of professional judgement, independence, communication, and accountability.

The article argues that while AI may support parts of the expert process, it cannot replace the role of a professional who must stand behind their conclusions, explain complex analysis, and provide evidence under scrutiny.

Read the article here.

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News from EACVA

EACVA and EVI Host European Valuation Summit in Prague

On **15 June 2026** EACVA, in partnership with the European Valuation Institute (EVI), hosted the inaugural **European Valuation Summit** in Prague. The event brought together valuation professionals from 16 European countries, marking an important milestone in strengthening collaboration within Europe's valuation community.

The conference featured a full day of thought-provoking presentations and engaging panel discussions on topics that are currently shaping the valuation profession, such as valuation in private markets, rethinking price in buy-to-sell transactions, IPEV Valuation Guidelines, the cost of equity in a changing geopolitical and economic environment, the IPO lifecycle from the perspective of a stock exchange, IFRS challenges and their implications for business valuation, distressed companies valuation, and the acquisition and valuation of professional services firms. Beyond the technical programme, the networking dinner, conference breaks and closing reception, provided excellent opportunities for participants to reconnect with colleagues, establish new professional relationships and exchange ideas across national borders.

We are proud to contribute to the growth of the European valuation community, particularly at a time when greater professional expertise and judgement, continuing professional development, dialogue and cross-border exchange are more important than ever.

The conversation continues. We are therefore pleased to announce the **19th EACVA International Business Valuation Conference**, taking place in Berlin on 19–20 November 2026. We look forward to welcoming valuation professionals once again for two days of expert insights, practical discussions and valuable networking opportunities. Learn more and register here.

EACVA Launches Free Webinar Series on Digital Asset Valuation

Digital assets have moved from the margins of finance into mainstream institutional portfolios, yet many valuation professionals in Europe still lack a structured framework for assessing them. To close this gap, EACVA has launched a **free webinar series dedicated to the valuation of digital assets**, bringing together leading academics and practitioners from institutions across Europe and the US.

Running throughout 2026, the live and interactive sessions cover the full spectrum of the topic, from blockchain infrastructure and crypto asset use cases to IFRS and MiCAR regulation, valuation methodology, and data analytics for on-chain and off-chain sources. Sessions are open to everyone and free of charge.

The series also lays the groundwork for EACVA's new Certified Digital Asset Valuator (CDAV), the first specialised qualification combining traditional valuation expertise with blockchain, tokenomics and DeFi. For professionals whose work is beginning to touch crypto and digital assets, the CDAV offers a structured path to build defensible, institutional-grade valuation skills. Learn more about the webinar series and register here.

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