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# VALUATION OF DISTRESSED GERMAN AUTOMOTIVE COMPANIES IN THE CONTEXT OF MERGERS, ACQUISITIONS, AND TURNAROUNDS

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Abstract:

This thesis evaluates different valuation approaches for distressed German mid-market automotive companies. By applying DCF, adjusted DCF, APV, real-option, multiples, and scenario-weighting techniques, recovery and enterprise values are estimated. By developing six distress-specific metrics based on qualitative and quantitative insights, the study builds a scorecard that recalibrates each model's weighting to determine a total enterprise value. The Schlote Holding GmbH case study results in a hybrid framework with an enterprise value of approximately €122 million. A Monte Carlo experiment yields a median of €139.9 million with a 5th–95th percentile range between €122.4 million and €157.4 million, confirming the framework's robustness.

Keywords: Distressed Valuation, German Mid-Market (Mittelstand), Automotive Industry, DCF, APV, Real Options, Comparable analysis, Scenario Analysis

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## List of Abbreviations

| | |
|---|---|
| **APV** | Adjusted Present Value |
| **CAPEX** | Capital Expenditures |
| **CAPM** | Capital Asset Pricing Model |
| **D&A** | Depreciation and Amortization |
| **DCF** | Discounted Cash Flow |
| **D/E** | Debt to Equity Ratio |
| **EBT** | Earnings Before Taxes |
| **EBIT** | Earnings Before Interest and Taxes |
| **EBITDA** | Earnings Before Interest, Taxes, Depreciation and Amortization |
| **EV** | Enterprise Value |
| **FCF** | Free Cash Flow |
| **NOPAT** | Net Operating Profit Less Adjusted Taxes |
| **PV** | Present Value |
| **Rf** | Risk Free Rate |
| **Rm** | Market Risk Premium |
| **SME** | Small, medium, Enterprise |
| **TEV** | Total Enterprise Value |
| **TV** | Terminal Value |
| **UFCF** | Unlevered Free Cash Flow |
| **WACC** | Weighted Average Cost of Capital |

# 1 Introduction

The German “Mittelstand” (Mid-Market) is widely recognized as a key driver of the national economy (The Federal Government, 2024; Berlemann et al., 2021). Nevertheless, in the years following the Corona pandemic, corporate insolvencies have reached new record levels, surpassing comparable figures seen during the financial crisis of 2009. According to the Federal Statistical Office (2025), more than 5,598 companies declared insolvency in the last quarter of 2024, illustrating a critical downward trend (see Figure 1 and 2 in the Appendix).

This pattern is particularly worrying for sectors that depend on steady demand, including Germany's automotive-supply industry, which is central to the country's economy. Fluctuations in demand, the shift to electric vehicles (EVs), reduced global M&A activity and limited private-equity investments show a market that lacks trust even with government support (The Federal Government, 2024). In Germany, there were 56 automotive bankruptcies in 2024, a 66% increase on the previous year and the highest number of sector failures since the outbreak of the pandemic in 2020. Since then, all major European car manufacturing countries have seen rising insolvencies, with Germany being the most affected.

The missing initiative to invest underscores the importance of reliable valuation methodologies that capture both micro- and macro-economic metrics and the unique complexities of distressed financial situations in the German automotive market. While most existing research on distressed valuations and debt structures focuses on large-cap or multinational companies, the German mid-market, characterized by its distinctive legal and cultural framework, remains understudied (Bork & Mangano, 2016). This deficit results in two dimensions: a lack of empirical comparisons tailored to mid-market firms, and insufficient modelling techniques that fully account for German sector-specific conditions. Consequently, there is a need to refine established valuation techniques for the mid-market and to question the suitability of standard metrics.

### 1.1 Problem Statement and Objective

Although theoretical valuation principles are well established, there remains a notable shortage of research examining how these models perform under distress. Germany's comparatively low distressed M&A activity indicates not only a market inefficiency but also a significant knowledge gap that necessitates methodological refinement. By analysing the performance of various valuation methods under distress this study aims to answer the following questions:

1. *To what extent do standard valuation techniques mis-estimate the EV of distressed mid-market firms, and which key modelling assumptions (discount rate, terminal growth, default probability, and illiquidity adjustments) account for the observed mis-estimation?*
2. *Can a multifaceted valuation through a scorecard-weighted framework offer more accurate valuations, reduce the spread and improve midpoint stability compared with any single method as evidenced in the Schlote Holding case?*
3. *Among the six distress-specific metrics (forward-looking viability, distress fit, practicability, stakeholder credibility, restructuring alignment, macro-responsiveness). Which variables explain the largest proportion of variance and valuation outcome?*

### 1.2 Methodology and Structure

This thesis is structured into six chapters. Chapter 2 provides a theoretical overview of the German Automotive Mid-Market and discusses key elements of distress valuation. In Chapter 3, a synthesis of valuation theory explores how these distressed conditions stand apart from ordinary valuations. Critical evaluation metrics are introduced to compare these methods, reflecting the study's emphasis on how well each approach accounts for different metrics. The heart of the research lies in assessing these valuations against a case study of Schlote Holding GmbH in Chapter 4. The findings of the case study are discussed and contextualized in Chapter 5 with respect to the initial research questions. Finally, Chapter 6 summarizes the key insights.

## 2 Literature review

A precise definition of financial distress and the German distress landscape of mid-market companies is essential for understanding the different levels of distress. Followed by exploring the German automotive sector's distress landscape and unique traits of German Mid-Market firms, to synthesize these insights and underscore their implications for valuation methods.

### 2.1 Decline and Distress Levels

According to Dambolena (1983), the misclassification of a company that still has recovery potential as a failure or default can create a self-fulfilling prophecy. Investors' negative perceptions of the company may prevent essential capital from being raised, leading to higher losses, legal costs, and possibly bankruptcy if the firm cannot fund a turnaround. Similarly, Poston et al. (2011) emphasize that not all declining firms are distressed, nor are all distressed firms necessarily in a decline phase.

Both decline and distress commonly follow a typical business lifecycle, ranging from management challenges to more severe near-bankruptcy scenarios (see Figure 3 in the Appendix). In Germany, these stages often correspond to the IDW S6 restructuring guidelines, issued by the German Institute of Public Auditors (2023), as shown in Figure 4 in the Appendix. As a result, it is important to accurately identify the specific level of decline and distress. The terms "failure," "default," "insolvency," and "bankruptcy" appear frequently in the literature, although they may seem interchangeable. A brief definition of each helps to clarify the valuation framework:

*Failure*, in economic terms, occurs when actual realized returns on invested capital remain persistently below comparable investments, potentially leading to the inability to cover basic costs (Dambolena, 1983). This situation does not necessarily imply that the firm must discontinue

operations. *Default* takes place when a borrower breaches one or more terms in a lending agreement with a creditor, signalling deteriorating performance and creditworthiness (Altman et al., 2019; Altman & Hotchkiss, 2005). *Technical default*, for example, involves the violation of a contractual covenant. *Insolvency* arises when a firm cannot meet its financial obligations, reflecting a lack of liquidity and possibly a temporary cash-flow shortfall (Closset & Urban, 2019). *Balance-sheet insolvency* is more severe, as total liabilities exceed the book value of assets. Lastly, *bankruptcy* is a formal, court-supervised process wherein a firm either reorganizes or liquidates once liabilities outweigh its assets (Altman et al., 2019; Gilson et al., 2000).

### 2.2 The Distressed Automotive Landscape in Germany

Germany's automotive sector has historically served as a cornerstone of the national economy, accounting for approximately 4.5% of Gross Domestic Product (GDP) and providing employment for nearly 900 000 individuals in 2025 and 13.2 million throughout the entire European Union (The Federal Government, 2024; ACEA, 2025). At full capacity in 2024, German manufacturing facilities could produce around 6.3 million vehicles; however, current output numbers show that the industry operates at only 65–70% capacity (IW & Puls, 2024).

It is noteworthy that medium-sized companies comprise 85% of all automotive-industry suppliers and contribute approximately 70% of the sector's total value (GTAI, 2025). According to the European Automobile Manufacturers Association (ACEA, 2025), Germany is home to 800 automotive companies, while the EU is home to around 14 000 such companies. Recent data indicate a substantial rise in financial distress among these mid-sized firms, driven by cumulative pressures such as the shift to EVs, heightened global competition, and post-pandemic disruptions (IW & Puls, 2024). According to the German Federal Bank (2024) Financial Stability Review, the rate of insolvencies among automotive suppliers in the mid-market segment has climbed by almost 30% compared to pre-pandemic levels, showing an all-time high.

### 2.3 Unique Traits of German Mid-Market Companies

The German “Mittelstand” is often characterised by resilience, innovative capacity and specialization in niche markets (De Massis et al., 2017; Pahnke & Welter, 2018). Despite their relatively small size and constrained resources, these firms have secured international positions as “hidden champions” (Heider et al., 2020). One of the most defining characteristics of the Mittelstand is the constrained access to financial resources compared to larger corporations (Berlemann et al., 2021). The mid-market frequently depends on capital from local banks and state funding mechanisms, which, while offering stability, can also exacerbate the firm's situation and limit strategic options during macro-economic uncertainties (Heider et al., 2020; Pahnke & Welter, 2018). According to De Massis et al. (2017), this market segment is effectively “breaking the rules of the game” by strategically overcoming challenges in industries often dominated by larger players. They do so by embracing a “niche focus and customer collaboration, globalization strategy, preference for self-financing, long-run mindset, superior employee relations, and community embeddedness,” which enables them to remain competitive in a globalized world.

### 2.4 Unique Challenges in Valuation of German Mid-Market Companies

In circumstances of distress and failure, the distinctive characteristics previously outlined can worsen the valuation and turnaround process from an analyst’s viewpoint. One of the primary challenges therefore lies in the limited transparency characteristic of privately held firms. The highly specialized markets in which mid-market companies operate necessitate the management of intangible assets, such as production knowledge and intellectual property rights, which are often underrepresented in accounting and valuation processes. The prevalence of family ownership in German mid-market companies further complicates this situation.

Decision processes involving multiple family shareholders can delay external negotiations or capital decisions (Pahnke & Welter, 2018). Research by Berlemann et al. (2021) demonstrates that while the specific "owner-management SME size" configuration fosters enhanced crisis resilience, it can hinder the firm's ability to adapt or incorporate external stakeholders.

In the context of German laws and regulation, legislators have recently introduced the StaRUG (Corporate Stabilization and Restructuring Act), which aims to offer firms a proactive, pre-insolvency restructuring procedure while improving protection of creditors (Berlemann et al., 2021; German Federal Ministry of Justice, 2020). Since the research of Jensen and Meckling (1976) and Myers and Majluf (1984), academics have argued that information asymmetries and conflicting interests between the firm and its creditors affect the firm's capital structure. In this regard, leading creditors fear expropriation and therefore show a reluctance to provide financing. This shift in power due to the StaRUG law further complicates favourable valuations, as critics argue that German creditor protection has become too strong in recent history (Closset & Urban, 2019), a trend that can also be observed in other countries (Armour, 2001).

### 2.5 Synthesis of Distress Market Insights and Implications for Valuation

Including the insights of the challenges in the German Automotive and mid-market, the purpose of the systematic comparison of valuation methods, is to provide a holistic view that delivers reliable insights. The present paper therefore needs to apply certain assumptions before delving deeper into the valuation methods. As described in the terminology, this study focuses on companies that are either mature or in a mature-growth phase. Additionally, companies that find themselves in a state of outright bankruptcy are excluded. The classification of midsize companies is taken from the German development bank “KFW” (2024) and is based on companies with up to 5,000 employees and annual revenues of up to €500 million. This research further assumes that the companies in question are viable and still have operational potential.

# 3 Analysis of Business Valuation Methods

Despite extensive coverage in academic and professional literature, company valuation remains challenging because each framework involves unique assumptions and requires precise estimates for critical parameters and therefore needs to be assessed, from a theoretical and context-specific viewpoint (Koller et al., 1992; Damodaran, 1995).

## 3.1 Theoretical Foundations of Valuation

The theoretical understanding of the classification and approach behind the different valuation methods is crucial for the further development of these valuations under the influence of distress. Distressed or declining companies introduce additional complexities, including heightened bankruptcy or liquidation risks, which can be difficult to integrate into traditional valuation frameworks (Altman, Hotchkiss, & Wang, 2019). The traditional methods can be classified in three dimensions according to Damodaran (1995) and Graham & Harvey (2001). Intrinsic valuation focuses on firm-specific cash-flow forecasts, discount rates, and fundamental operating conditions. Relative valuation relies on market comparable and ratios to infer value based on peer groups. Option-based approaches examine strategic flexibility within managerial decisions, capturing upside potential and downside risk not accounted for by conventional methods (Crystal & Mokal, 2006). Table 1 in the Appendix provides the foundational calculations for these approaches, while the subsequent chapters explore their challenges and adaptations in distressed contexts.

## 3.2 Intrinsic Valuation

### 3.2.1 Traditional DCF Method

The intrinsic value of a firm represents its fundamental worth. The DCF is the most widely used method in corporate finance first developed by Modigliani and Miller (1958). The central logic lies in discounting the FCF with the WACC. The accuracy of the approach is dependent upon

three fundamental factors: firstly, the projection of future cash flows over a defined period, which in distress scenarios can provide misleading insights, due to the deteriorating operational capabilities of the firm (Graham & Harvey, 2001). Secondly, the estimation of a suitable discount rate which depends on the WACC is influenced mainly by the debt and equity costs, which can shift significantly (Altman & Hotchkiss, 2005). And thirdly, the calculation of a terminal value that captures the firm's worth beyond the forecast horizon often relies on either perpetual-growth models or market multiples. Both methods have been shown to yield considerably inaccurate results in distressed valuation contexts (Damodaran, 2015).

### 3.2.2 Adjusted DCF

The Adjusted DCF approach acknowledges that standard DCF assumptions can falter when companies face severe financial distress. The core principle of the Modified DCF is therefore integrating scenario-based probabilities within the Base-DCF calculation (Altman & Hotchkiss, 2005; Damodaran, 1995). To be then modified by two main components (Damodaran, 2015): The *going-concern value* is estimated under the assumption that the firm successfully restructures and continues operating in the future. This can be calculated via the standard DCF method but relying on Scenario-Based Cash Flows via realistic or even optimistic forecasts. The distress value on the other hand is estimated by evaluating what the firm's assets would yield in liquidation, or a factoring scenario. Which can be integrated as follows:

$$Firm\,Value = (Going - Concern\,Value) \times (1 - \pi Distress) + (Distress\,Sale\,Proceeds) \times \pi Distress \quad (1)$$

In this formula, the term 'πDistress' is employed to show the chance the cumulative probability of default or failure over the forecast. Estimating πDistress may involve techniques such as the Altman Z-factor approach first introduced by Edward I. Altman (1968), which is a widely used method for predicting corporate insolvency risk.

For private firms, a second Z-score (Z') is often employed, the complete classification can be seen in Appendix Figure 5 (Altman et al., 2016). The second Z-score is formulated by:

$$Z' = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5 \quad (2)$$

$$X1 = \frac{Working\ Capital}{Total\ Assets} \quad X2 = \frac{Retained\ Earnings}{Total\ Assets} \quad X3 = \frac{EBIT}{Total\ Assets}$$

$$X4 = \frac{Book\ Value\ of\ Equity}{Total\ Liabilities} \quad X5 = \frac{Sales}{Total\ Assets}$$

If the Z-factor value falls below 1.23 it implies a high probability of insolvency. Meanwhile a score above 2.9 indicates high success chances of solvency, with values in between called the grey zone.

### 3.2.3 Adjusted Present Value

The APV valuation framework extends the conventional DCF analysis from Modigliani and Miller (1958). The primary rationale for APV is that highly leveraged and rapidly changing, or distressed, firms may not be adequately captured by static capital structure assumptions. Once the probability of default rises, the net advantage of debt through the use of tax savings can drop sharply. The total enterprise value is derived by first calculating the firm's value as if it were financed entirely by equity, then discounting the unlevered free cash flows at the un-levered cost of capital and adding the present value of tax shields, and subtracting any expected financial distress costs resulting in:

$$TEV_0 = \sum_{t=1}^{T} \frac{\text{UFCF} + \text{Terminal value}}{(1 + r_{\text{u}})^t} + \sum_{t=1}^{T} \frac{\text{Tax shields}}{(1 + r_{\text{tax}})^t}] - \sum_{t=1}^{T} \frac{\text{Distress Costs}}{(1 + r_{\text{distress}})^t}] \quad (3)$$

In this form, the unlevered cost of capital replaces any pre-tax WACC for discounting operating free cash flows. Some models discount these savings at the cost of debt and the interest paid on them, while others (Miles & Ezzell, 1980, 1985; Harris & Pringle, 1985) suggest using the

unlevered cost of capital. By avoiding a single, static WACC, the APV gives a valuation model that integrates how rapidly shifting debt levels, potential loss of tax benefits and rising distress concern interact. Critics like Fernández (2007), however, argue that under certain conditions WACC and APV approaches may converge to identical results, and that the additional parameters in APV should be recalculated at each stage.

### 3.3 Relative Valuation

Relative Valuation, often termed Comparable Company Analysis or trading comps, is a market-based approach to value assets or peer firms relative to the market (Plenborg & Pimentel, 2016). At its core, this approach involves the estimation of a target's value by comparing key performances as well as so-called multiples like EV/EBITDA, EV/Sales, Price-to-Earnings to name a few. As Koller, Goedhart and Wessels (2020) describe, peer companies need similar business models and should be in closely related industries and share expected growth, profitability and capital structure, and risk profiles. Moreover, Forward-looking multiples, based on projected rather than historical earnings, are especially relevant when dealing with private firms, where illiquidity and limited public disclosures complicate direct market-based valuations (Burgess, 2021). In circumstances where companies encounter financial challenges, forward-looking or asset-based multiples often emerge as more significant metrics, as they reflect a deeper understanding of capital structures and adjusted liabilities (Crystal & Mokal, 2006; Damodaran, 2015). For private companies that lack liquid trading markets, an illiquidity discount is often applied. While some studies, such as Paglia and Harjoto (2010), find that discounts can average 65–70%, valuation analysts commonly apply a lower discount in the range of 10–30%, consistent with studies and practical industry benchmarks from Damodaran (2018). Ultimately, while multiples-based methods can appear more straightforward than intrinsic valuations, employing them together with other approaches yields more robust results (Damodaran, 1995).

### 3.4 Option Pricing Valuation

#### 3.4.1 Real Options Method

The real option method is one of the most suitable valuations but also the most complicated method for distressed or turnaround scenarios. It builds upon the work of Black and Scholes (1973) and Merton (1974), with the idea of valuing equity by treating it as an option. Under the scenario of distress, it is possible that the value of the company may be positive, even when facing overall asset value under the total face value of debt. This theory holds due to the fact that shareholders "retain the right, though not the obligation, to exercise their option on the firm's assets" (Merton, 1974).

When viewing equity as a call option, it is possible to use the firm's debt as the strike price (Graham & Harvey, 2001). If the Firm is unable to generate a positive value, which surpasses its liability obligations, then creditors take control. Under this assumption it is also possible that the company's value can rise again, above the debt's face value (Block, 2007). Moreover, the real options approach can explicitly account for strategic decisions such as the potential abandonment or divestiture of underperforming subsidiaries or firm segments. These abandonment options represent additional strategic value beyond traditional DCF calculations. Therefore, the firm retains the right, but not the obligation, to divest or abandon assets at a salvage value if future market or operational conditions become unfavourable (Trigeorgis & Reuer, 2017)

#### 3.4.2 Scenario Analysis

Within option-pricing models, scenario analysis is used as a strategic tool to assess potential variations in financial data under different scenarios, rather than a standalone valuation. Rather than relying on a single best-case scenario, this method incorporates different developments (Damodaran, 2015; Koller, Goedhart, & Wessels, 2020). This approach helps to identify worst- and best-case conditions under which business performance could vary significantly.

### 3.5 Comparative Rating of Valuation Methods

Although the mentioned valuation methods remain fundamental, their application in distressed situations can lead to significant discrepancies between estimated and actual market value. As studies by Gilson, Hotchkiss, & Ruback (2000) have shown, when using traditional analyses, the ratio of estimated value to final market value can vary from less than 20% to more than 250%. Demiroglu et al. (2022) similarly report an average gap of 43.6% between plan-based and post-bankruptcy equity values. These large discrepancies are not easily explained by errors in modelling skills for discount rates or growth projections alone; rather, they result from strategic biases as well as incomplete or unreliable information and the complexities inherent in distress. Selecting a method that captures both firm-level and broader economic factors is therefore essential for achieving more reliable valuation outcomes.

#### 3.5.1 How well do Valuation Models work for Distressed Firms?

To achieve a more holistic evaluation of valuation models, the following framework is created. By adapting the VC-valuation foundation built by Achleitner and Nathusius (2004), this framework refines and extends their approach by integrating elements of distress from Damodaran's "Dark Side of Valuation" and Altman, Hotchkiss, and Wang's "Corporate Financial Distress, Restructuring, and Bankruptcy". The three mentioned works are widely recognized and synthesize new insight into the following six dimensions: First, forward-looking viability incorporates structural changes and long-term survival potential, in line with Damodaran's perspective. Second, capturing distress fit and valuation appropriateness integrates liquidity crises, default risk and undervalued intangibles, reflecting Altman et al. Third, practical feasibility requires models that can be implemented in distressed M&A settings for non-public firms, consistent with Achleitner and Nathusius. Fourth, stakeholder credibility depends on acceptance by courts, as advocated by Damodaran. Fifth, strong alignment with restructuring strategies underscores the

need for flexible adjustments. Finally, the macroeconomic shocks highlighted by Damodaran and Altman highlight the importance of resilience in valuation.

### 3.5.2 Scorecard and Results

The integration of these six dimensions within a unified framework ensures the methodological foundation of Achleitner and Nathusius (2004) valuation techniques is maintained, while also leveraging the empirical underpinnings of Altman and Damodaran's research on distressed firms. The final scorecard reveals that valuation methods for distressed firms differ not only in their underlying finance theories but also in how they address the 6 mentioned dimensions. The comprehensive analysis underlying this study is available in Appendix Table 2.

*Comparative Scorecard Evaluation*

| *Valuation Method / Metrics* | **Forward-Looking Viability** | **Distress-Fit & Appropriateness** | **Practicability** | **Stakeholder Credibility** | **Integrated Restructuring Perspective** | **Macro Responsiveness** |
|---|---|---|---|---|---|---|
| ***DCF/Adjusted DCF*** | + | – | + | + | + | + |
| ***APV*** | + | + | + | + | ++ | + |
| ***Multiples Approach*** | + | – | + | ++ | – | – |
| ***Real Options Method*** | ++ | ++ | - | -- | – | ++ |
| ***Scenario Analysis*** | + | ++ | + | + | + | ++ |

| *Legend* | | |
|---|---|---|
| | ++ | *Criterion is fully met* |
| | + | *Criterion is met with minor limitations* |
| | - | *Criterion is partially met* |
| | -- | *Essential aspects of the criterion are not fully met* |

As demonstrated in the scenario analysis, it appears that the highest scores were achieved for each metric, with strengths in forward-looking viability, distress fit and appropriateness, and macro responsiveness. This suggests that it results in the best option to support other valuation methods as a strategic tool, as it is not intended to be a standalone solution. Its "+" ratings for

practicability and stakeholder credibility are derived from its ability to seamlessly integrate with other models and challenges like the evaluation of distress or private companies. By contrast, DCF/Adjusted DCF, despite having positive ratings for Forward-Looking Viability and Stakeholder Credibility, can underestimate disruptive effects and negative cash flows. Despite these limitations, DCF remains a cornerstone in distressed valuation.

The Real Options Method offers the most robust framework for valuing uncertainty in the form of distress or shocks, but it poses challenges in terms of practical implementation and stakeholder acceptance due to the high level of complexity. Although the Multiples Approach is typically the simplest to apply, its distress fit and restructuring adaptability may be insufficient for capturing nuanced turnaround factors, especially in private or mid-market firms lacking extensive databases. Meanwhile, APV links capital structure changes to corporate value, and can therefore receive a higher grade in distress-fit and practicability. Although the APV method tops the scorecard with the highest composite score, it should not be used as a stand-alone valuation. The APV isolates most financing side-effects and therefore can miss feedback loops, which are interactions that matter greatly in distress. Its real power therefore shows up in recapitalisations and similar restructurings, where the separation of operating value from financing adjustments lets analysts calculate different distress and debt structures with greater clarity.

As noted in the research question of this paper, this scorecard provides an overview of the conceptual and practical challenges of valuing distressed companies, particularly for private and mid-market companies. It also addresses the various factors that influence valuation outcomes and, from a theoretical perspective, shows which possible multifaceted valuations offer advantages. For example, pairing Scenario Analysis with DCF/Adjusted DCF offers a means of broad macro-strategic scenario testing and stakeholder-friendly clarit. How these valuations play out in a case study will be examined in the next chapter.

# 4 Case Study Schlote Holding GmbH

This chapter presents an application of the different valuation models described in the previous chapter 3. To assess the impact of distress on the valuation, a case study was carried out on the Schlote Holding GmbH. After a brief introduction to the company, the interpretation of the data and methodology is presented, followed by an analysis of the key findings and steps in the calculation process.

## 4.1 Introduction Schlote Holding GmbH

Schlote Holding GmbH is a medium-sized German group of companies with roots dating back to 1969. Today, it functions as the strategic parent company of the Schlote Group with the current holding structure established on 1 January 2013 as the management company for all its production units. The company is primarily active as a development partner and series supplier for the automotive and automotive-supply industry and has developed into a highly specialized engineering company. Its core components are the machining of parts and the assembly of ready-to-install units. According to the 2021 Group Management Report, Schlote Holding GmbH acts as the parent company for a total of ten production sites – seven in Germany (e.g., Harsum, Saarbrücken and Wernigerode) and three abroad (in Italy, the Czech Republic and China). Over the past 20 years, the relatively small company has grown into a major market player as a supplier to larger automotive companies.

At its peak in 2017, the group had a turnover of €231 million and a profit of €3.56 million, employing around 1,600 people. Unfortunately, like most companies in the industry, Schlote Holding GmbH has been affected by a series of global and national crises. The company's decline over the last 5 years is detailed in Figure 6 in the Appendix. Strategically, Schlote has identified the current trends in electric mobility and hybrid technologies as a key development path and has secured future funding until the end of 2026.

### 4.2 Data and Methodology

The purpose of this case study is to provide a financial analysis of the company using the valuation models outlined above. The objective of this case study is to apply the various valuation methods introduced in Chapter 3 to Schlote Holding GmbH, with a focus on the impact of financial distress. The following four valuation approaches – DCF, Adjusted DCF, APV and Real Options – were analysed through the lens of a scenario-based approach consisting of three different scenarios (conservative, base and optimistic) to present a range of potential outcomes under different assumptions.

The comparative analysis was performed using two different peer groups, one consisting of Orbis & Moody's (2025) data on private companies, and the other consisting of listed companies through online reports. The selection of comparable companies was based on the following criteria: (1) similar revenue size, (2) comparable levels of financial distress, (3) a primary focus on manufacturing and automotive supply. The regression analysis used financial data sourced from Investing.com (2025) and Yahoo Finance (2025) for the public peer companies and the DAX index.

The primary data collection method for the Schlote data was the official federal website, Bundesanzeiger, which provides annual financial reports for Schlote Holding GmbH from 2016 to 2022; the financial figures for 2023 represent forecasts constructed from the half-year data provided by Schlote, as full-year data was not yet available. In addition, records of special "creditors' meetings" were analysed but no data regarding the company and market movements later than the end of April 2025 was included in the calculation. All assumptions and benchmarks used can be seen in detail in Appendix Table 3. In equity-research reports analysts usually project all three primary statements, in distressed situations balance-sheet forecasting becomes less

useful due to the volatility of capital structures and the uncertain recoverability of assets (Damodaran, 2015), the present model therefore forecasts the income statement and the free cash flow only. To quantify the impact of the weighting uncertainty, a 10 000 iteration Monte Carlo simulation with a one-way tornado analysis and a one-way sensitivity analysis was calculated. This procedure converts point scores into confidence bands and empirically ranks the scorecard factors.

### 4.3 Intrinsic Valuation

For the DCF valuation, free cash flows are projected over a defined five-year forecast period from 2025 to 2029 and then discounted at a WACC that varies according to each scenario's beta and discount rate, which are derived from industry benchmarks.

Starting with the conservative DCF scenario, a discount rate of 7.24 percent and a beta of 1.05 have been analysed, together with a moderate sales-growth rate of 1.0 to 1.4 percent. Operating margins begin at approximately 3.1 percent in FY 2025 and reach about 5.1 percent by FY 2029. Capital expenditure is set at 80 percent of EBITDA to reflect a higher level of distress and fewer investments in maintenance Capex in line with findings from Asquith et al. (1994). Under these assumptions, the ULFC is around €4.25 million in FY 2025 and €4.06 million in FY 2029. In this scenario, the enterprise value comes to about €67 million and a negative equity value of roughly €–27 million.

The base case assumes a discount rate of 7.06 percent, a beta of 0.95, and a slightly higher sales-growth rate of 1.5 to 1.9 percent over the five-year period. Capital expenditure is set at 75 percent of EBITDA, and the ULFC begins at around €5.83 million in FY 2025, moving toward €5.81 million in FY 2029. These factors lead to an enterprise value of approximately €99 million and an equity value of about €5 million, reflecting how adjustments in perceived risk and capital intensity can affect present values.

The optimistic scenario lowers the discount rate to about 6.89 percent, uses a beta of 0.85, and envisions sales-growth rising to 1.5 to 2.3 percent over the projection period. Capex is further reduced to 70 percent of EBITDA, which supports a healthier free-cash-flow profile. ULFC stands at roughly €7.63 million in FY 2025 and increases to around €8.24 million in FY 2029. The resulting enterprise value is about €143 million, and the equity value is near €49 million. Compared to the conservative scenario, the difference in equity values is about €76 million, indicating that even marginal reductions in the discount rate or more favourable operating assumptions can alter the firm's intrinsic valuation.

In determining Schlote's WACC, initially an 81 percent leverage ratio derived from book values was determined; however, industry peers generally exhibit market-based leverage ratios in the range of 45 – 60 percent, recognizing that market values provide a more accurate basis for capital-structure analysis, as emphasized by Brealey et al. (2023).

The adjusted DCF framework refines the conventional DCF approach by integrating the going-concern value with the possibility of financial distress. Therefore, the Altman Z′-Score is calculated to estimate the corresponding probability of distress. Distress-sale proceeds are then estimated by applying recovery cuts of 50 percent to non-current assets, 80 percent to operating current assets and 100 percent to cash. In the conservative scenario the Altman Z′-Score is 1.23 with an estimated 50 percent distress probability, while the base scenario's Z′-Score reaches 1.32 at 45 percent, and the optimistic scenario's Z′-Score stands at 1.43 at 40 percent. The conservative score sits exactly at the industry-specific threshold of 1.23 that marks the distress zone, whereas the base and optimistic scenarios fall into the grey area.

The unadjusted DCF element now yields going-concern values of €67 million, €99 million and €143 million across the three scenarios. After factoring in the respective probabilities of distress and the associated distress-sale proceeds, these figures adjust to €74 million, €103 million and

€137 million. In the conservative and base cases the higher distress proceeds outweigh the probability discount, so the adjusted values rise above the initial going-concern estimates, whereas in the optimistic case the adjustment reduces the €143 million outcome to roughly €137 million.

As mentioned earlier, the APV method provides an alternative to the DCF method by separating the unlevered value of the business from the tax benefits of debt (Miles & Ezzell 1980; Harris & Pringle 1985). In addition, it incorporates expected costs of distress applied across the five-year forecast period from 2025 to 2029. The €48 million distressed-cost deduction combines legal fees (5%), moderate asset discounts (7%) and brand-reputation impairment (3%), based on Andrade & Kaplan (1998), Campbell, Giglio & Pathak (2011) and Weiss (1990). In the conservative scenario, an unlevered discount rate of 5.25% and an unlevered beta of 0.636 produce an unlevered present value of about €102.7 million. Recurring interest payments, discounted at the same rate and taxed at 30.175%, generate a present value of the tax shield of roughly €13.2 million. After subtracting the discounted cost of distress at about €47.3 million, the resulting adjusted present value stands at roughly €68.6 million.

In the baseline scenario, the discount rate is 4.82%, aligned with an unlevered beta of 0.54, which yields an unlevered present value of about €163.9 million. The separately discounted tax benefits amount to around €13.3 million, while expected distress costs total roughly €53.9 million, leading to an APV of about €123.4 million.

In the optimistic scenario, the discount rate is 4.39%, reflecting an unlevered beta of 0.436, which raises the unlevered present value to around €255.5 million. The present value of tax shields adds roughly €13.5 million, whereas the estimated cost of distress stands at about €58.5 million, leaving a final APV of around €210.5 million.

### 4.4 Relative Valuation

The relative valuation provides a comparative overview of two samples of private and public companies. The private companies were selected because they were the closest comparable to the full Orbis & Moody's (2025) dataset. All publicly traded firms were screened, and only those whose 2022 financial statements documented a clear decline in revenue, EBITDA or sales volumes were retained. For the public sample, a 20% illiquidity premium was applied based on Damodaran (2018) to reflect the higher illiquidity of private companies when applying multiples. The private sample provides insights into operational efficiency and capital structure through ratios such as net profit margin, ROE and ROA, in addition to balance-sheet indicators, but they cannot be directly translated into TEVs. Nevertheless, they are useful indicators for benchmarking against other peers. For example, Schlote's debt-to-equity ratio of 4.8x is above the sample median of 1.4x, indicating a higher reliance on debt. The company's equity ratio of 0.2x also places it at the lower end of the sample, reflecting limited reliance on equity.

The EV/EBITDA range for the selected peers lies between 3.0x and 13.6x, while the EV/Revenue range spans 0.2x to 1.5x. The Schlote Holding is arguably on the lower end with the middle of these ranges at an EV/EBITDA of 3.6x and an EV/Revenue of 0.5x, and a negative P/E ratio that makes it irrelevant for valuation purposes. Applying the median-based ratios for 2022 and 2028 and then imposing a 20 percent illiquidity discount yields median enterprise values of roughly €190.0 million in 2022 and €246.8 million in 2028 on an EV/EBITDA basis, and about €108.0 million for 2022 and €115.7 million for 2028 on an EV/Revenue basis. These scaled values serve as the market-based component in the blended valuation framework.

### 4.5 Option Pricing Valuation

For the real-option method, put-based modelling was chosen. The put option, in this case the right to sell Schlote Holding's Chinese manufacturing site if it becomes unprofitable, incorporates the partial sale of the asset into its total enterprise value. In the real-options analysis for

Schlote Holding, the subsidiary is treated as a put option with a salvage value of €17.6 million in two years, as recorded in the Creditor Meeting of Schlote Holding GmbH (2024). This allows management to exit the manufacturing site rather than incur ongoing losses. The DCF framework described above serves as the floor valuation, with key inputs including a base volatility of 40 percent drawn from historical automotive-supplier data (Damodaran & NYU-Stern 2024) and an additional 10-percent adjustment to reflect the heightened risk of a private, distressed setting. Under these revised assumptions and across the three DCF scenarios, the real-option method yields an enterprise value of about €79 million in the conservative case, €111 million in the base case, and €155 million in the optimistic case.

# 5 Results

The following chapter discusses the results of the Case Study and the Valuation Methods.

## 5.1 Discussion

The valuation model was calculated in Microsoft Excel as shown in the case study in Chapter 4, while the overall average enterprise value from Appendix Table 4 is determined according to the qualitative and quantitative criteria set out in the scorecard of subsection 3.5. The scorecard metrics were translated into a weighted scoring system (Table 5), which incorporates all variables as well as each model's capacity for scenario-based analysis. The resulting enterprise-value outputs are visualised in Appendix Figure 7.

The proposed weighting yields the following distribution within the final EV: APV stands out with the highest combined score of 26 percent and the highest single-method value, followed by the Adjusted DCF with 23 percent and the traditional DCF and Real-Option methods at 20 percent. In contrast, the comparable analysis is included four times with individual weights of 2%, 2%, 4%and 4%, together amounting to 12% and respecting the significance of forward-

looking multiples (Burgess, 2021). Applying these weights to the scenario-average outcomes now produces a weighted-average enterprise value of €121.6 million, which serves as the blended point estimate in the updated football-field chart.

The Monte-Carlo calculation (10 000 runs; see Appendix Table 6) converged to a median EV of €139.9 million with a standard deviation of €10.5 million. The 5th–95th percentile band now ranges from €122.4 million to €157.4 million. These statistics convey two insights. First, the point estimate reported above (€121.6 million) understates the central tendency by roughly fifteen percent. Second, the dispersion of ± €10.5 million (approximately 7.5 percent of the median) is far narrower than the €69 million to €247 million span of unweighted single-model outputs, confirming, consistent with the second research question, that aggregation through a multifaceted framework substantially reduces model-specific idiosyncrasy.

The Tornado analysis (Appendix Figure 8) remains supportive. A shock to the dominant scorecard weight w7 (EV/EBITDA 2028 multiple) moves the blended EV by about €10.4 million, whereas an identical perturbation in the DCF weight w1 shifts the valuation by only €3.8 million. Because the eight weights must sum up to unity, extreme changes in any single coefficient are automatically cushioned by the offsetting adjustments in the others. Weight uncertainty therefore plays a secondary role relative to the assumption-level sensitivities discussed above.

Compared to the Monte Carlo and Tornado Analysis the one-way sensitivity analysis focuses on the variables within the models rather than the pure weight (Appendix Table 7 & 8). For example, a 100-basis-point change in the discount-rate build-up (WACC / CAPM beta) accounts for 40% of the aggregate error across all methods. The terminal-growth assumption contributes thirty-five percent, and a like-sized rise in the cost of debt adds about ten percent in total.

The remaining 15% arise from the default-probability calibration and the impact of the illiquidity haircut. These Results show that almost two-thirds of model-specific mis-estimation originates in discount-rate construction, precisely the weakness highlighted by the “Macro-responsiveness” and “Forward-looking viability” dimensions of the scorecard.

With the information of these results the third research question focusing on the explanatory power of the six-evaluation metrics in the scorecard can be answered. Besides the qualitative usefulness in choosing the right model and patter of the weight–EV correlations, this study confirms that the forward-looking viability and restructuring-alignment dimensions are the principal sources of variance. Furthermore, that the largest portion of influence can be attributed to the EV/EBITDA 2028 multiple.

Therefore, this thesis provides in sum, with the updated Monte-Carlo evidence, the football-field range, and the sensitivity results a consistent message. A Multifaceted valuation that combines model-weight diversification, parameter-level stress testing, and scorecard-based qualitative judgement narrows the dispersion of enterprise-value estimates and furthermore shows where further analytical effort in the model calculation is crucial.

### 5.2 Limitation

The proposed findings provide insights into different valuation approaches. Nevertheless, several limitations can be identified that constrain the results and design of this study. The primary limitation is the quality and timeliness of the available data. Most of the data used is one to two years old because of partial disclosure and incomplete financial information. In addition, the proposed framework used for the scorecard is based on a thorough literature review but remains subjective. It does not eliminate bias into the overall analysis and the calculated EV. The 10 000-iteration Monte-Carlo simulation mitigates these issues by testing a range of alternative

weights, but it does not account for the impact of individual variables, so investors and forecasters should perform additional weight-sensitivity checks. The one-way sensitivity analysis likewise focuses on single-parameter shocks, therefore as a result, it cannot capture interaction effects withing assumptions or impact of simultaneous changes.

## 6 Conclusion

This research project examines the conceptual and practical challenges in valuing distressed private mid-market companies. Unlike traditional valuations in non-distressed situations, processes vary due to underlying uncertainty and require individual adjustments. The underlying proposition, that multifaceted valuation methods offer more accurate recovery and total Enterprise value predictions, was supported by the analysis based on literature findings and formulated metrics.

By integrating theoretical insights from existing literature with practical findings from the Schlote Holding GmbH case study, a balanced valuation approach was developed, emphasizing macroeconomic influences, restructuring integration, and stakeholder considerations. Across different dimensions, valuation outcomes can significantly shift under precarious economic conditions. While investors generally understand the nature of distress, assigning strategic weights to different valuation metrics enables them to mitigate risks and potentially uncover hidden value not visible through traditional approaches.

Combining diverse valuation methods with the identified metrics, this study develops a comprehensive model that integrates qualitative and quantitative perspectives. Ultimately, this approach contributes meaningful methodological refinements for improved valuation accuracy, moving beyond purely quantitative outcomes under distress conditions.

## Appendix

### *List of Appendix Figures & Tables*

**Figure 1:** German All Insolvency Data 2021-2025. Source: Federal Statistical Office (2025)

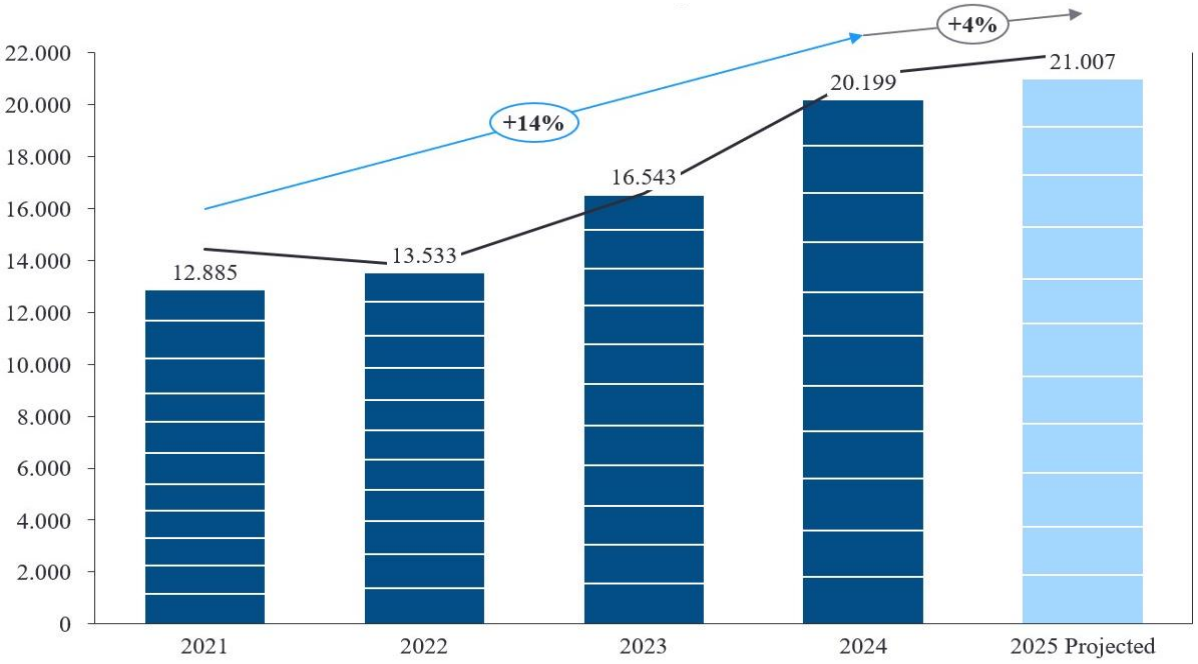


**Figure 2:** German Companies with over 100 Employee Insolvency Data 2021-2025. Source: Federal Statistical Office (2025)

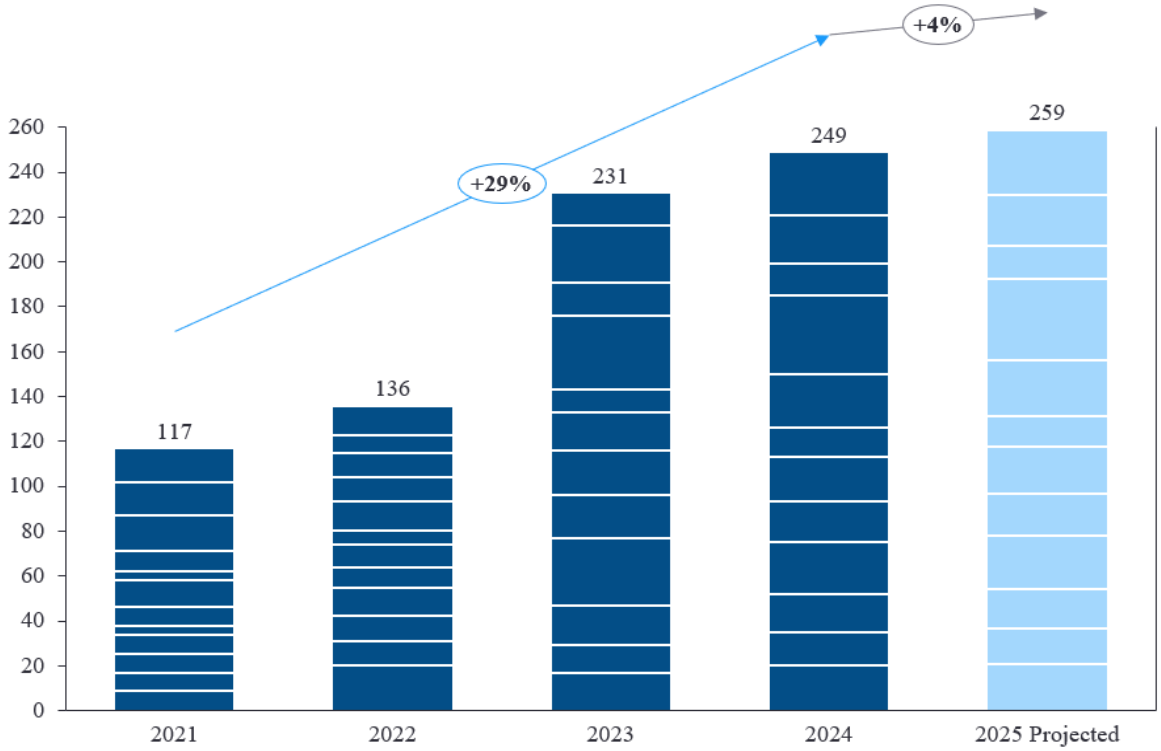

**Figure 3:** Business Lifecycle. Author's own illustration based on Damodaran (2015)

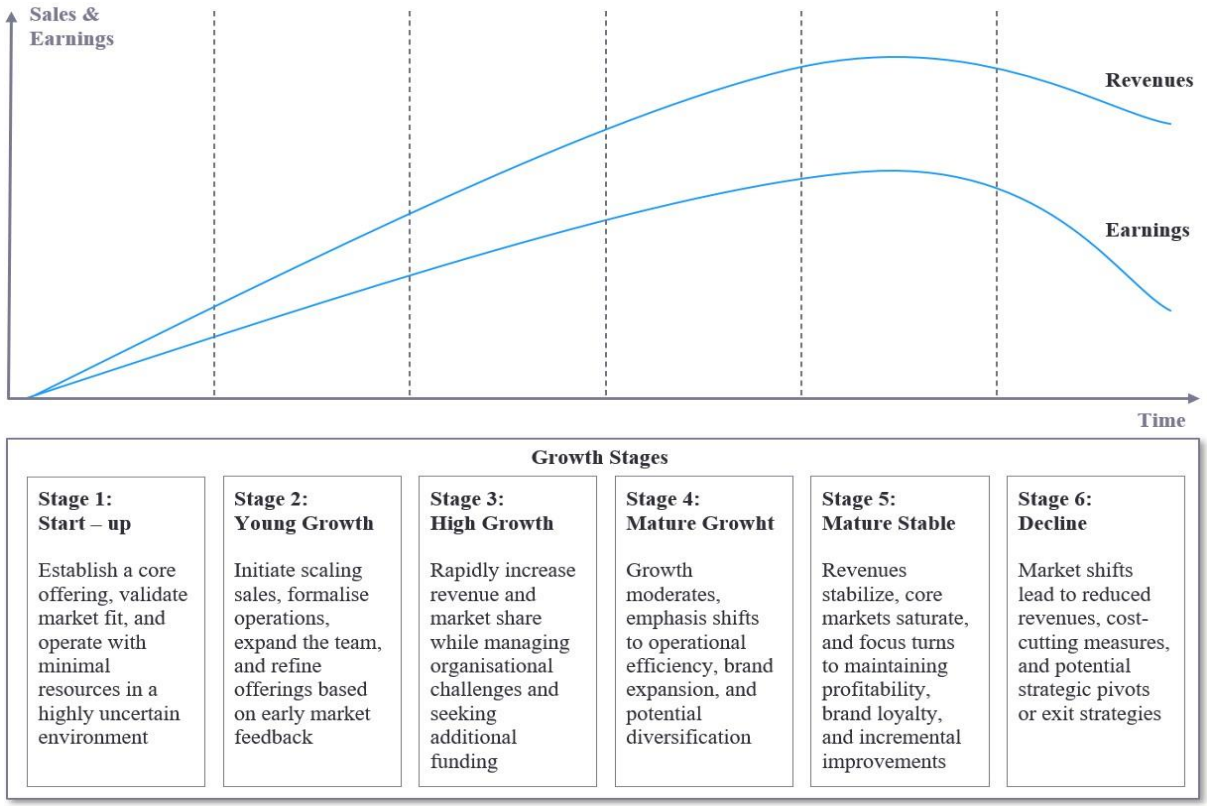


**Figure 4:** The IDW S6 Stages Crisis Continuum. Author's own illustration based on German Institute of Public Auditors (2023)

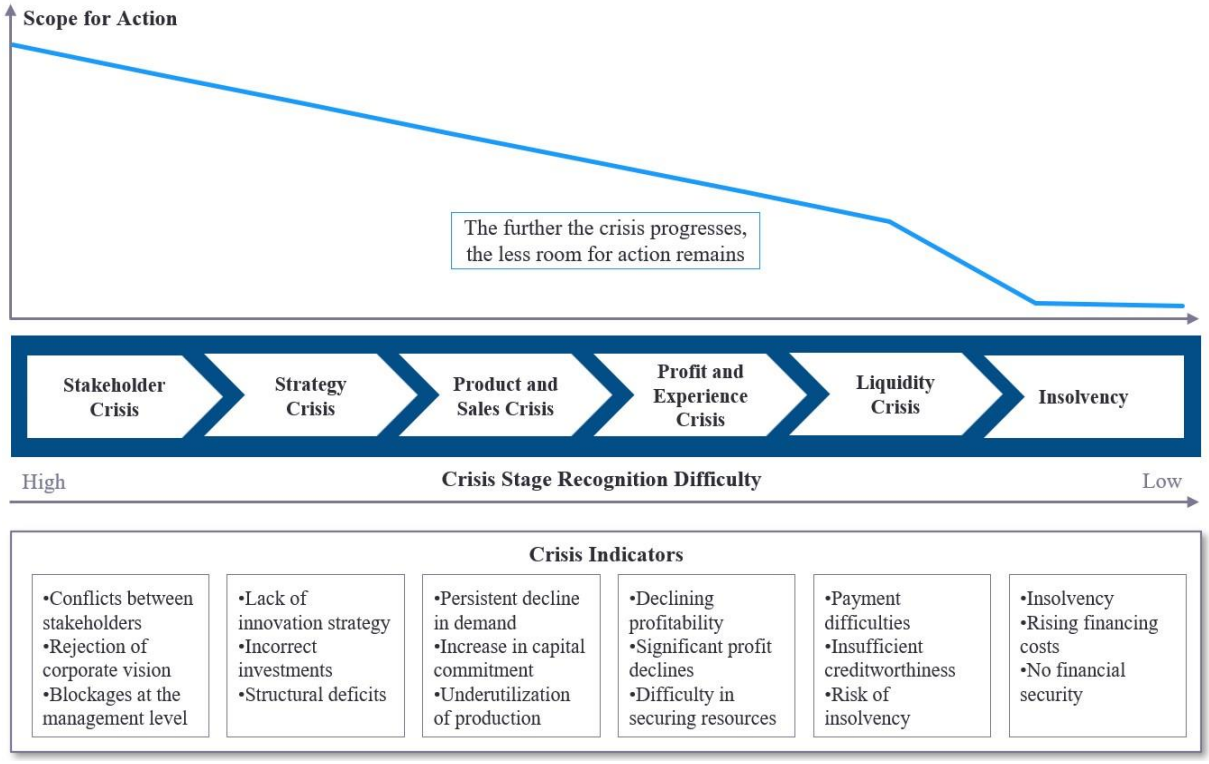

**Figure 5:** Altman Z-Score Classification. Source: Altman, E. I., & Hotchkiss, E. (2005)

1. Altman Z-Score for Public Manufacturing Firms

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

$$X1 = \frac{Working\ Capital}{Total\ Assets} \quad X2 = \frac{Retained\ Earnings}{Total\ Assets} \quad X3 = \frac{EBIT}{Total\ Assets}$$

$$X4 = \frac{Market\ Value\ of\ Equity}{Total\ Liabilities} \quad X5 = \frac{Sales}{Total\ Assets}$$

2. Altman Z′-Score for Private Manufacturing Firms

$$Z' = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5$$

$$X1 = \frac{Working\ Capital}{Total\ Assets} \quad X2 = \frac{Retained\ Earnings}{Total\ Assets} \quad X3 = \frac{EBIT}{Total\ Assets}$$

$$X4 = \frac{Book\ Value\ of\ Equity}{Total\ Liabilities} \quad X5 = \frac{Sales}{Total\ Assets}$$

3. Altman Z″-Score for Non-Manufacturing Firms

$$Z'' = 6.56X1 + 3.26X2 + 6.72X3 + 01.05X4$$

$$X1 = \frac{Working\ Capital}{Total\ Assets} \quad X2 = \frac{Retained\ Earnings}{Total\ Assets} \quad X3 = \frac{EBIT}{Total\ Assets}$$

$$X4 = \frac{Book\ Value\ of\ Equity}{Total\ Liabilities}$$

**Figure 6:** Crises Development Schlote Holding. Source: Schlote Holding GmbH (2018-2024)

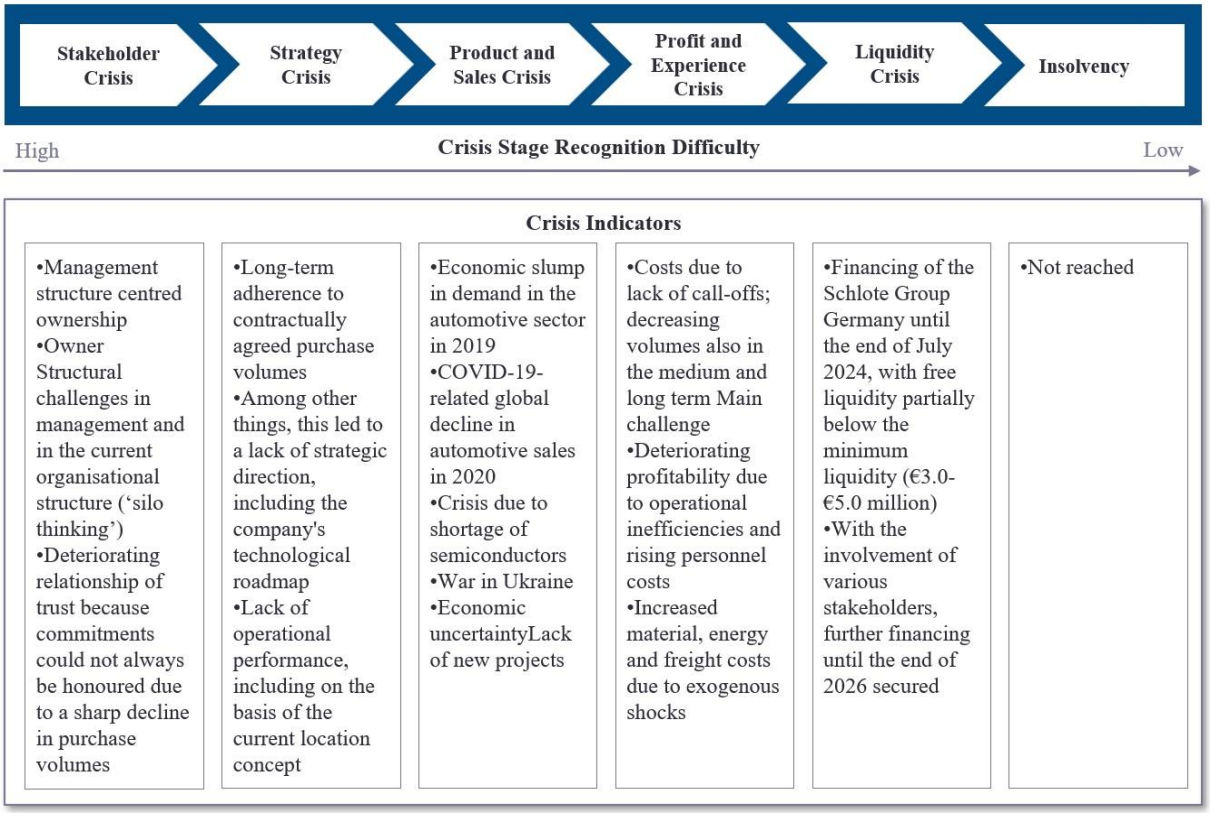


**Figure 7:** Enterprise Value Comparison (in €)

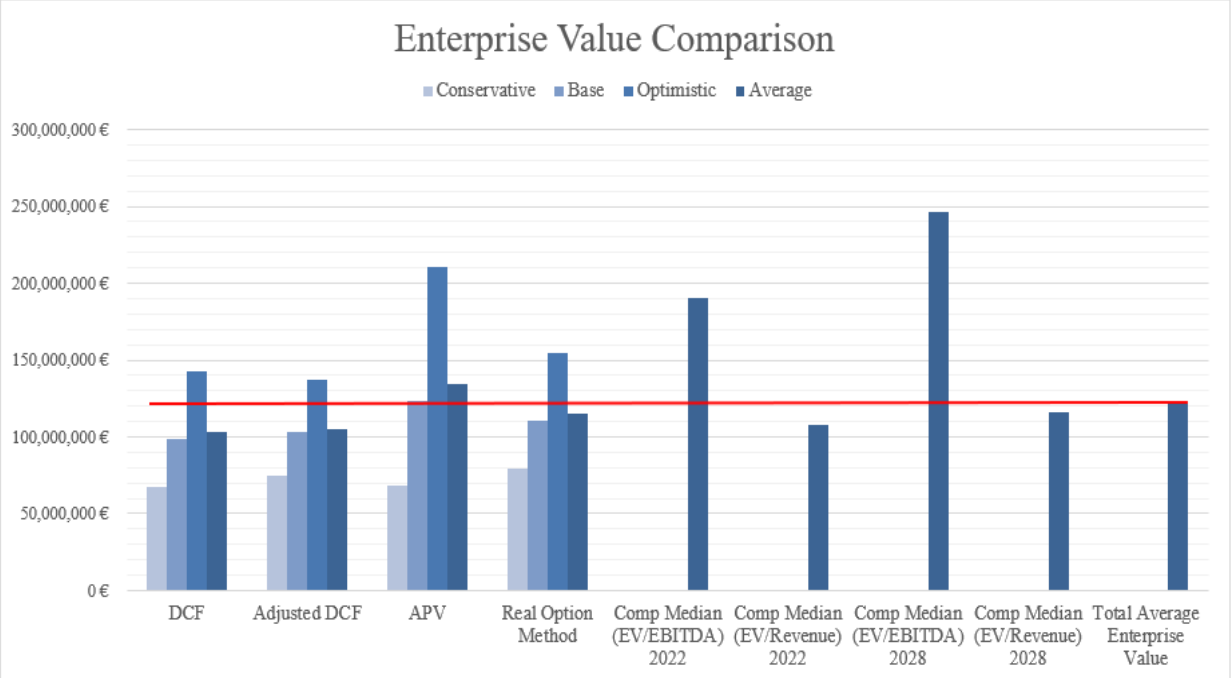

**Figure 8:** Tornado-Sensitivity Analysis

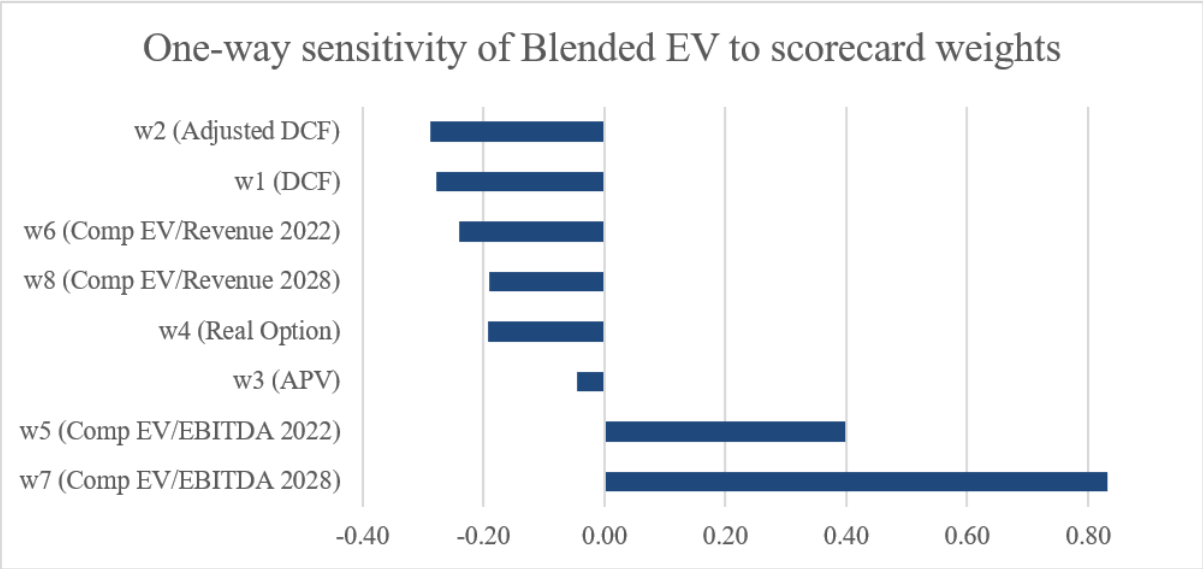

**Table 1: Part 1/2** Valuation Methods – Basic Calculation Steps. Source: (Altman et al., 2019; Damodaran, 2015; Koller, Goedhart, & Wessels, 2020; Graham & Harvey, 2001)

| *Valuation Method/ Steps* | ***DCF/Adjusted DCF*** | ***APV*** | ***Multiples Approach*** |
|---|---|---|---|
| I. Study the Target & Determine Key Drivers | Identify core drivers (e.g., revenue growth, margins).<br><br>*Example:*<br>$g = \frac{\text{Revenue}_t - \text{Revenue}_{t-1}}{\text{Revenue}_{t-1}}$ | Analyse operating fundamentals and capital structure to isolate operating performance.<br><br>Similar growth metrics (as in DCF) are used. | Select a universe of comparable companies based on industry, size, and risk.<br><br>*Example:* Price-to-Earnings (P/E) Ratio:<br>$\frac{P}{E} = \frac{\text{Price}}{\text{Earnings}}$ |
| II. Project Cash Flow Paths / Gather Data | Forecast Free Cash Flows (FCF) using:<br><br>$FCF_t = EBIT_t \times (1 - T) + \text{Depreciation}_t - \text{CapEx}_t - \Delta WC_t$ | Project Unlevered Free Cash Flows (UFCF) with the same operating formula:<br>$UFCF_t = EBIT_t \times (1 - T) + \text{Depreciation}_t - \text{CapEx}_t - \Delta WC_t$ | Collect historical financial data and compute key ratios.<br><br>*Example:*<br>EBITDA Margin= $\frac{EBITDA}{Revenue}$ |
| III. Determine Discount Rates / Key Ratios | Calculate the Weighted Average Cost of Capital (WACC):<br><br>$WACC = \frac{E}{V}R_e + \frac{D}{V}R_d(1 - T_c), \quad \text{with } V = E + D$ | Determine the unlevered cost of capital using CAPM:<br><br>$r_u = R_f + \beta_u(R_m - R_f)$ | Apply key multiples from comparable companies:<br><br>*Examples:*<br><br>$EV/EBITDA = \frac{\text{Enterprise Value}}{\text{EBITDA}}$<br><br>and<br>$\frac{P}{E} = \frac{\text{Price}}{\text{Earnings}}$ |
| IV. Determine Terminal Value / Benchmarking | Estimate Terminal Value using the perpetuity growth model:<br><br>$\text{Terminal Value} = \frac{FCF_n(1+g)}{WACC - g}$ | Calculate the unlevered Terminal Value:<br>$\text{Terminal Value}_{\text{unlevered}} = \frac{UFCF_n(1+g)}{r_u - g}$<br>Approximate Tax Shield (if debt is constant):<br>$PV(\text{Tax Shield}) \approx \frac{T \times \text{Interest Expense}}{r_d}$ | Benchmark terminal value by applying an average multiple to a key metric:<br><br>Valuation=Average Multiple × Selected Metric (e.g., EBITDA) |
| V. Discount & Aggregate to Determine Valuation | Discount all forecasted FCFs and the Terminal Value to compute Enterprise Value:<br><br>$EV = \sum_{t=1}^{n} \frac{FCF_t}{(1+WACC)^t} + \frac{\text{Terminal Value}}{(1+WACC)^n}$ | Summing the NPV of UFCF and the NPV of the Tax Shield:<br><br>APV= NPV(UFCF) + NPV (Tax Shield) | Derive overall valuation by applying the selected multiple:<br><br>Valuation=Average Multiple × Selected Metric |

**Part 2/2** Valuation Methods – Basic Calculation Steps.

| *Valuation Method/ Steps* | ***Real Options Method*** | ***Scenario Analysis***[1] |
|---|---|---|
| I. Study the Target & Determine Key Drivers | Identify embedded managerial options (e.g., expansion, abandonment).<br>$C = S \times N(d1) - K \times e^{-rT} \times N(d2)$<br>Determine key parameters such as current asset value (S) and exercise threshold (X). | Define key uncertainties (e.g., market demand, regulation) and outline multiple future scenarios.<br>Sets the stage for later scenario-specific adjustments. |
| II. Project Cash Flow Paths / Gather Data | Estimate baseline asset value and its volatility (σ) from historical data.<br>These inputs will later feed into option pricing models. | Develop detailed cash flow forecasts for each scenario by adjusting key assumptions, revenue, costs etc. |
| III. Determine Discount Rates / Key Ratios | Set option parameters using the Black–Scholes framework:<br>$d_1 = \frac{\ln(S/X) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$,<br>Option Price:<br>$C = S \cdot N(d_1) - X \cdot e^{-rT} \cdot N(d_2)$ | Assign scenario-specific discount rates (ri) that reflect each scenario's risk profile.<br>• Present value for scenario i:<br>$PV_{i,t} = \frac{FCF_{i,t}}{(1+r_i)^t}$ |
| IV. Determine Terminal Value / Benchmarking | Evaluate terminal value as an option payoff:<br>Payoff=max (ST−X, 0) | Estimate scenario-specific Terminal Value with tailored assumptions:<br>$\text{Terminal Value}_i = \frac{FCF_{i,n}(1+g_i)}{r_i - g_i}$ |
| V. Discount & Aggregate to Determine Valuation | Integrate the value of managerial options with the base-case valuation:<br>Total Value=Base-Case Value + Option Value | Compute a risk-adjusted valuation as a probability-weighted average of scenario outcomes:<br>Final Value=∑I (Probability i × Valuation i) |

[1] *Treated here as a valuation technique for classification purposes*

**Table 2: Part 1/2** Valuation Scorecard

| *Valuation Method/Metrics* | ***DCF/Adjusted DCF*** | ***APV*** | ***Multiples Approach*** |
|---|---|---|---|
| ***Forward-Looking Viability*** | DCF estimates the future cash flow of a company and catches its potential in the future (Damodaran, 2015; Koller, Goedhart, & Wessels, 2020). But without multiple scenarios and a single best forecast that might overlook probability disruption, it might overlook downside risk (Achleitner, Braun, & Engel, 2011). | Separates operating performance from financing effects, clearly projecting future benefits such as tax shields and financing advantages (Damodaran, 2015). But it still depends on accurate projections. | Multiples are primarily based on current or near-term market data, providing limited insight into long-term options, but overlooking market trends can give a hint of how optimistic or pessimistic the market is (Damodaran, 2015; Plenborg & Pimentel, 2016). |
| ***Distress-Fit & Appropriateness*** | DCF typically ignores default risk, intangible assets, and other drivers of distress (Goetz, 2020; Altman, Hotchkiss, & Wang, 2019). Therefore, it requires add-ons to capture extreme debt movements (Goetz, 2020). | APV is well suited for distress firms, due to explicitly valuing tax shields and subtracting distress costs from the balance sheet of the firm and therefore avoiding the risk of a single discount rate (Altman et al., 2019; Fernandez, 2007), resulting in a better valuation than the DCF for distress. | Standard multiples may misprice firms with negative earnings or high default risk (Altman et al., 2019; Gilson et al., 2000). Adjustments for distress can also be inaccurate or misleading if interpreted incorrectly (Goetz, 2020; Burgess, 2021). |
| ***Practicability*** | Widely used in practice, despite the considerable effort required to produce detailed cash flow projections (Graham & Harvey, 2001; Damodaran, 2015). With high-quality data and moderate assumptions, it is routinely used in restructuring (Altman et al., 2019; Burgess, 2021). | APV valuation is less common than DCF models, but it is adaptable if you already have a DCF model. However, estimating the probability of default and the timing of the tax shield can be quite subjective (Achleitner et al., 2011; Buttignon, 2020). | The fastest and most data-friendly approach for relative valuation. However, finding true comparable peer groups, especially under distress, can be challenging (Crystal & Mokal, 2006). |
| ***Stakeholder Credibility*** | Lenders (creditors) and managers prefer its cash-flow-based justification, although sometimes growth rates are in doubt (Altman et al., 2019; Fernandez, 2007). In cases of distress, a well-documented DCF can act as a settlement document. | Restructuring analysts are using the model increasingly. Courts and creditors may need to be educated on the differences between cash flow/tax shield approaches, but they appreciate its transparency on leverage (Altman et al., 2019; Graham & Harvey, 2001). | Courts and creditors often accept multiples as a market-based benchmark (Altman et al., 2019; Burgess, 2021). It's easy to explain and understand. |

| | | | |
|---|---|---|---|
| ***Integrated Restructuring Perspective*** | By changing future projections, DCF models can include cost savings, fresh injections of capital, or future asset sales (Plenborg & Pimentel, 2016; Burgess, 2021). It is, however, different in changing leverage in a WACC-based DCF, which compromises the precise impact of change and turnaround (Miles & Ezzell, 1985). | Because APV considers operational and financing changes separately, it is perfectly suited for all restructuring scenarios involving debt write-downs (Buttignon, 2020; Altman et al., 2019). | Multiples do not naturally reflect operational changes or liability renegotiations, or asset sales unless an analyst manually adjusts the firm's metrics. And the possibility that all other peer firms have exactly the same distress level is questionable (Buttignon, 2020; Modigliani & Miller, 1958; Damodaran, 2015). |
| ***Macro Responsiveness*** | DCFs can pick up interest rate fluctuations or economic downturns through growth rates, risk premiums, or terminal value modifications (Damodaran, 2015; Koller et al., 2020). But it does not explicitly model macro shocks in future periods. | Its sensitivity to macroeconomic factors is primarily reflected through the valuation of tax shields and financing effects, and large interest rate jumps, or economic downturns can be seen directly in the tax shield valuations and distress cost projections (Graham & Harvey, 2001) | Multiples can show macroeconomic shocks very well in the past, but not in the future. Thus, macro changes are only indirectly reflected (Graham & Harvey, 2001; Damodaran, 2015). |

**Part 2/2** Valuation Scorecard

| *Valuation Method/Metrics* | ***Real Options Method*** | ***Scenario Analysis***[1] |
|---|---|---|
| ***Forward-Looking Viability*** | Explicitly models managerial flexibility and future investment opportunities, capturing potential survival or abandonment decisions and therefore goes beyond statistic forecasts (Damodaran, 2015; Block, 2007). | Combines the modelling of multiple future states and potential development paths (Goetz, 2020). It fully accounts for structural changes by exploring best-case, base-case, and worst-case paths (Altman et al., 2019). |
| ***Distress-Fit & Appropriateness*** | Equity is viewed as a call option, reflecting default risk and upside potential (Altman et al., 2019). Real options also deal with intangible assets by valuing uncertain future payoffs (Goetz, 2020). | Provides a comprehensive framework by considering different scenarios. Analysts can construct a "default path" and a "turnaround path," each weighted by estimated probabilities (Gilson et al., 2000; Goetz, 2020). |
| ***Practicability*** | Involves complex modelling and subjective parameter estimation; surveys from Block (2007) show heightened difficulty, especially when capturing real options across the whole firm. | Generally practical and flexible, although determining scenario probabilities may be subjective, especially when following market trends (Damodaran, 2015; Plenborg & Pimentel, 2016). |

| | | |
|---|---|---|
| ***Stakeholder Credibility*** | Courts and creditors often view real options as too theoretical or lacking transparent inputs (Damodaran, 2015; Altman et al., 2019). | Courts and creditors appreciate seeing multiple outcomes as it demonstrates a thorough consideration of risk factors (Altman et al., 2019). But it almost never replaces a single "official" valuation. |
| ***Integrated Restructuring Perspective*** | Conceptually, real options can model distress and integrate partial liquidations, debt-to-equity swaps, or possible expansions, but few professionals use it as an actual option framework (Buttignon, 2020; Graham & Harvey, 2001). | Can integrate restructuring by developing distinct scenarios that reflect operational changes, for example asset sales or cost reduction. By modelling the success or failure of strategic actions, scenario analysis can integrate restructuring metrics (Damodaran, 2015; Goetz, 2020). |
| ***Macro Responsiveness*** | Real options incorporate volatility and scenario trees, making them highly responsive to economic shocks (Block, 2007; Damodaran, 2015). | Scenarios routinely incorporate macro factors, because most scenarios actively try to capture not only operational changes but also different economic environments (Koller et al., 2020). |

[1] *Treated here as a valuation technique for classification purposes*

**Table 3:** Assumption Table

| *Assumption & Benchmarks* | *Data* | *Reference* |
|---|---|---|
| *Levered / Unlevered Beta* | Conservative: **1.053 / 0.636**<br>Base: **0.953 / 0.536**<br>Optimistic: **0.853 / 0.456** | Regression Analysis based on (Investing.com, 2025 & Yahoo Finance, 2025) |
| *Base Volatility (σ)* | Originally 30-40%<br>Distress adjusted **50%** (estimated) | (Damodaran & NYU-Stern, 2024) |
| *Capex* | Conservative: **80%**<br>Base: **75%**<br>Optimistic: **70%** | (Asquith et al., 1994) |
| *Cost of Debt* | **6.75%** | Schlote Holding GmbH. (2024, May 21) |
| *Cost of Debt after Tax* | **4.71%** | Municipal Harsum (2025) |
| *Corporate Tax until 2024* | Tax rates Bevor 2024 remain constant at **29.125%.** | Municipal Harsum (2025) |

| | | |
|---|---|---|
| *Corporate Tax after 2024* | Tax rates After 2024 remain constant at **30.175%** | Municipal Harsum (2025) |
| *Growth rate* | Average **1.5%,** could grow higher due to new State funded debt | (European commission, 2024)<br>(ifo, 2025) |
| *Rf* | **2.5%** April 2025 | (Bloomberg, 2025) |
| *Risk Premium* | **4.33%** | (Damodaran & NYU-Stern, 2024) |
| *Revenue* | Conservative: **1.0-1.4%**<br>Base: **1.5-1.9%**<br>Optimistic: **1.5-2.3%** | Compared to the Forecasted *Growth rate* and integration of possible shifts in operating costs, product mix, or efficiency gains |
| *WACC original* | Conservative: **7.29%**<br>Base: **7.19%**<br>Optimistic: **7.09%** | Book Value from Schlote Holding GmbH. (2024, May 21) |
| *WACC adjusted* | Conservative: **7.24%**<br>Base: **7.06%**<br>Optimistic: **6.89%**<br>With Equity 40% and Debt 60% | Adjusted from Book value Equity to Market Value equity according to Brealey et al. (2023). |

**Table 4:** Enterprise Value in € by Valuation Metric

| Enterprise Value in € | | | | | |
|---|---|---|---|---|---|
| Metric | Conservative | Base | Optimistic | Average | Weight |
| DCF | 67,467,607 | 98,963,256 | 143,080,334 | 103,170,399 | 20% |
| Adjusted DCF | 74,409,319 | 103,180,448 | 136,758,285 | 104,782,684 | 23% |
| APV | 68,574,605 | 123,363,562 | 210,508,531 | 134,148,899 | 26% |
| Real Option Method | 79,381,888 | 110,877,537 | 154,994,615 | 115,084,680 | 20% |
| Comp Median (EV/EBITDA) 2022 | - | - | - | 189,965,484 | 2% |
| Comp Median (EV/Revenue) 2022 | - | - | - | 107,966,613 | 2% |
| Comp Median (EV/EBITDA) 2028 | - | - | - | 246,780,871 | 4% |
| Comp Median (EV/Revenue) 2028 | - | - | - | 115,724,709 | 4% |

| | | |
|---|---|---|
| ***Total Average Enterprise Value*** | ***121,642,272 €*** | *100%* |

**Table 5:** Scorecard Weight

| Method | Forward-Looking Viability | Distress-Fit & Appropriateness | Practicability | Stakeholder Credibility | Integrated Restructuring Perspective | Macro Responsiveness | Scenario Based Analysis Possible to integrate? | Weight |
|---|---|---|---|---|---|---|---|---|
| DCF | + (1) | – (0) | + (1) | + (1) | + (1) | + (1) | ++ (2) | *20%* |
| Adjusted DCF | + (1) | + (1) | + (1) | + (1) | + (1) | + (1) | ++ (2) | *23%* |
| APV | + (1) | + (1) | + (1) | + (1) | ++ (2) | + (1) | ++ (2) | *26%* |
| Real Options Method | ++ (2) | ++ (2) | – (0) | -- (–1) | – (0) | ++ (2) | ++ (2) | *20%* |
| Comp Median (EV/EBITDA) 2022 | – (0) | – (0) | + (1) | + (1) | – (0) | – (0) | – (0) | *2%* |
| Comp Median (EV/Revenue) 2022 | – (0) | – (0) | + (1) | + (1) | – (0) | – (0) | – (0) | *2%* |
| Comp Median (EV/EBITDA) 2028 | + (1) | – (0) | + (1) | + (1) | – (0) | – (0) | – (0) | *4%* |
| Comp Median (EV/Revenue) 2028 | + (1) | – (0) | + (1) | + (1) | – (0) | – (0) | – (0) | *4%* |

| *Qualitative symbol* | *Numeric value used in model* | *Rationale* |
|---|---|---|
| "++" fully meets | **+2** | Maximum positive contribution |
| "+" meets w/ minor limits | **+1** | Moderate support |
| "–" partially meets | **0** | Neutral (no uplift) |
| "– –" essential aspects not met | **-1** | Negative penalty |

**Table 6:** Monte Carlo Simulation - (10.000 Simulations)

| Statistical Measure | Enterprise Value |
|---|---|
| Average | 139,875,219 € |
| Median | 139,920,141 € |
| 5th percentile | 122,391,206 € |
| 95th percentile | 157,377,631 € |
| Standard deviation (σ) | 10,526,108 € |

**Table 7:** One-Way Sensitivity Analysis

| Sensitivity Analysis | | | | | |
|---|---|---|---|---|---|
| **Scenario** | **DCF EV** | **Adjusted DCF** | **APV EV** | **Real Options EV** | **COMP EV** |
| Average | 103,170,399 € | 104,782,684 € | 134,148,899 € | 115,084,680 € | 165,109,419 € |
| WACC ↑ (DCF only) | 87,362,099 € | 95,878,153 € | - | 99,276,380 € | - |
| CAPM ↑ (APV only) | - | - | 100,164,759 € | - | - |
| Cost of debt ↑ | 95,898,869 € | 100,686,167 € | - | 107,813,150 € | - |
| g ↓ | 90,377,617 € | 97,573,742 € | 103,299,900 € | 102,291,898 € | - |
| π<sub>dis-tress</sub> ↓ | - | 104,658,520 € | 140,156,525 € | - | - |
| Illiquidity ↓ (COMP only) | - | - | - | - | 185,748,097 € |

**Table 8:** One-Way Sensitivity Analysis – Error Attribution

| Error Attribution in € | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Assumption** | **Δ EV DCF** | **Δ EV Adjusted DCF** | **Δ EV APV** | **Δ EV Option** | **Δ EV COMP** | **Aggregate** | **% Contri-bution** |
| **Total error vs. benchmark (€ m)** | -18,471,873 | -16,859,588 | 12,506,627 | -6,557,592 | 43,467,147 | | |
| **WACC / CAPM (Δ EV, %)** | -15,808,300 | -8,904,531 | -33,984,140 | -15,808,300 | - | -74,505,271 | 41% |
| **Terminal *g* (Δ EV, %)** | -12,792,782 | -7,208,942 | -30,848,999 | -12,792,782 | - | -63,643,504 | 35% |
| **Cost of debt (Δ EV, %)** | -7,271,530 | -4,096,517 | - | -7,271,530 | - | -18,639,576 | 10% |
| **π<sub>dis-tress</sub> (Δ EV, %)** | - | -124,164 | 6,007,626 | - | - | 5,883,462 | 3% |
| **Illiquidity (Δ EV, %)** | - | - | - | - | 20,638,677 | 20,638,677 | 11% |
| ***Total*** | | | | | | **130,266,212€** | 100.0% |

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