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Article

# Paradigm Shift in Finance: The Transformation of the Theory from Perfect to Imperfect Capital Markets Using the Example of Company Valuation

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**Abstract:** In the capital market and financing theory, we are currently observing major upheavals. For decades, the neoclassical paradigm has dominated in science and practice. Triggered by economic and political crises, transformations, the COVID-19 pandemic, and political instabilities, a paradigm shift is currently occurring in finance. This paradigm shift leads to models and theories that can explain imperfections in capital markets and provide decision support for managers. The aim of this article is to analyse the paradigm shift and to demonstrate it using an example of business valuation theory. We draw on the insights of the philosopher Thomas Samuel Kuhn. He vividly explains the paradigm shift in science in his major work “The Structure of Scientific Revolutions”. A paradigm shift in science always encounters resistance. The reasons for this include the strong neoclassical school in finance and the dependence on research funds. Funders expect the use of established methods and the simplicity and dissemination of the models that have prevailed so far. On the other hand, the neoclassical models are unsuitable to explain the transformation processes on financial markets. This fact has been empirically proven. We show a variety of arguments that speak clearly about this paradigm shift. Their importance clearly outweighs the reasons to continue subscribing to the old paradigm. Accordingly, new theories and models have been developed to better explain the changes in the markets. With the simulation-based business valuation, an approach has been developed that considers different degrees of market imperfections. The simulation-based valuation can also depict the special case of the neoclassical paradigm, so that all market constellations can be covered.

**Keywords:** capital market theory; CAPM; company valuation; Monte Carlo simulation; paradigm shift; simulation-based valuation



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## 1. Introduction

The capital market and financing theory—hereafter referred to simply as ‘finance’—has been shaped by the neoclassical paradigm for decades. This also applies to the methods based on it, e.g., the company valuation. The neoclassical paradigm results in the idea of a perfect and/or complete capital market (Brealey et al. 2022). In a world of perfect and/or complete capital markets, the cost of capital is derived based on the Capital Asset Pricing Model (CAPM). Rating and financing constraints are ignored, and little attention is paid to information about a company’s earning risks (from risk management perspective). Economics, to which the neoclassical theory originally belongs, has long since abandoned the neoclassical paradigm (Spahn 2016), but why does the (business) finance theory, and the company valuation theory based on it, still adhere to the neoclassical paradigm today? What are the alternatives to the neoclassical paradigm? Can innovative approaches lead to a paradigm shift in finance? These are the questions discussed in this paper.

Currently, CAPM-based company valuations have come under increasing criticism from practitioners, academics, and courts. The reason for is that they do not offer any decision-making support in a world of imperfect markets and transformations (Ernst 2022; Gleißner and Ernst 2019). The world of business valuation is undergoing a period of upheaval. In the view of the economic philosopher Thomas Samuel Kuhn, is this the beginning of a scientific revolution with a paradigm shift in business valuation? Which reasons speak for and against the paradigm shift? Are there suitable alternative concepts to the CAPM that offer suitable solutions in the event of a paradigm shift? These questions are answered in this article.

The article is structured as follows: Section 2 explains Kuhn's concept of paradigm shift from a philosophy of science perspective and applies it to the business valuation theory. Section 3 shows existing obstacles (reasons) to why such a paradigm shift has not (yet) occurred. Based on this, Section 4 presents the starting points that suggest that such a paradigm shift will occur in the foreseeable future. Section 5 exhibits the method of simulation-based business planning and valuation as an alternative to the CAPM, before Chapter 6 summarizes the main considerations.

This article answers the following research questions: What factors can trigger a paradigm shift in business valuation? Which reasons speak for, and which reasons speak against, a paradigm shift? Which models can replace the valuation approaches of traditional capital market theory?

In our article, we deviate from the usual structure of scientific articles. These usually begin with a literature review of the current state of research. Since we list different fields of research in our article that speak for or against a paradigm shift, we refer in the text to the current state of research and the relevant license.

## 2. Philosophy of Science Explanation: Paradigm Shift

A shift away from the models of perfect markets to models of imperfect capital markets represents a paradigm shift that does not follow a smooth process but comes close to a revolution. In his major work "The Structure of Scientific Revolutions" (Kuhn 1970), Thomas Samuel Kuhn—one of the most important philosophers of science and historians of science of the 20th century—describes the development of science as a sequence of

1. normal scientific phases, which are characterised by a certain paradigm;
2. subsequent crises, in which the paradigm loses its scientific recognition due to anomalies;
3. scientific revolutions, in which a paradigm shift finally occurs.

The course of a scientific revolution can be characterised as follows: In the normal-scientific phase, researchers devote all their resources to working through a well-defined area of research prescribed by a paradigm. The paradigm offers them several methods that scientists are convinced are appropriate for problem solving. Due to changes in external factors, a few problems may arise that are difficult to solve with the tools of the given paradigm. At one point, scientists encounter anomalies that challenge the paradigm. Kuhn defines anomalies as a "phenomenon [...] for which his paradigm had not readied the investigator" (Kuhn 1970, p. 57). If scientists manage to explain these anomalies within the framework of the prevailing paradigm, they return to normal scientific activity. However, if they fail to solve the anomalies with their methods despite numerous efforts, this leads to a scientific crisis. Anomalies can develop in a way that undermines the confidence in a paradigm. An anomaly, for example, is considered particularly threatening when it touches the crucial foundations of a paradigm and consistently resists the attempts of normal science to eliminate it. The danger of crisis is also increased when a rival paradigm emerges: "Instead, the new paradigm, or a sufficient hint to permit later articulation, emerges all at once, sometimes in the middle of the night, in the mind of a man deeply immersed in crisis" (Kuhn 1970, pp. 88–89). The new paradigm is, usually, completely different from and incompatible with the old one. If more and more scientists turn their backs on the

old paradigm for various reasons, this leads to “an increasing shift in the distribution of professional allegiances” (Kuhn 1970, p. 159).

### 3. Obstacles to a Paradigm Shift in Capital Market Theory

The imperfections of capital markets are an empirically demonstrable phenomenon, the existence of which is undisputed among academics and practitioners. Moreover, Gleißner (2014) provides a comprehensive overview of the empirical studies on the CAPM. We are currently in the phase of the paradigm shift described by Kuhn from the paradigm of perfect capital markets to the paradigm of imperfect capital markets. The paradigm shift was triggered by anomalies that can no longer be explained by the theory of perfect capital markets. Despite the methods and the tools already available to capture imperfections in capital markets, there is still a great deal of resistance from the academia and practitioners. What could be the reason for this? Some of the reasons are listed below.

#### 3.1. Dominance of the Neoclassical School in Teaching

Students are usually taught by professors who have traversed their academic careers in the paradigm of modern capital market theory. Therefore, because of their entrenchment, they will often advocate the tenets of the existing paradigm rather than challenge it. “But science students accept theories on the authority of teacher and text, not because of evidence.” (Kuhn 1970, p. 80). Accordingly, these scholars formulate the teaching content that is more within the existing paradigm.

#### 3.2. Dominance of the Neoclassical School in Research

Research funds are usually made available for the research activities within a paradigm. This is because funders want to achieve a desired research outcome with a limited risk of failure. As a result, research activities are primarily funded within the existing paradigm and reinforce it. Scientists in finance, unlike in other sciences, have no financial incentive, and research projects to conduct research in other fields bring about a paradigm shift.

#### 3.3. Establishment of Modern Capital Market Theory in Practice

Modern capital market theory has a great advantage that, due to its restrictive assumptions, reduces the complex world to a great extent. It reduces to such an extent that interrelationships—e.g., in the determination of capital costs and the associated risks—can be explained quite simply. Modern capital market theory is also used by professionals who primarily do not have a finance background. These include, for example, auditors, tax advisors, or judges. It has taken a very long time to train these professionals in the modern capital market theory and to bring about a ready understanding of it. The idea of replacing this now with a paradigm of imperfect capital markets would overburden these professionals. As a consequence, it would be significantly more difficult to include knowledge of finance in a generally understandable way in the court and in expert opinions. Therefore, there is a great need, in practice, for simple and transparent models and an adherence to the existing paradigm of perfect capital markets.

#### 3.4. Transparency and Comprehensibility of Capital Market Models

The auditing firms regularly carry out so-called impairment tests when preparing the balance sheet. To enable comparability, e.g., of goodwill, these impairment tests should be carried out by the auditing firms using similar methods. This requires simple models for determining the cost of capital, as made possible by the modern capital market theory. Therefore, there is no interest on the part of the auditors and, most likely, their clients, to deviate from the common methods.

#### 3.5. Denying Weaknesses of Modern Capital Market Theory

The existence of anomalies due to the imperfections of capital markets is denied by the representatives of modern capital markets. They specify that these do not even exist

under the premises of perfect capital markets. If anomalies such as the occurrence of country risks or insolvencies can no longer be ignored, the representatives of modern capital market theory would attempt to define them as exceptions instead of developing more suitable models.

#### 4. Drivers of the Paradigm Shift in Capital Market Theory

However, the above-mentioned obstacles are also countered by certain positive drivers that are (likely) to lead to a paradigm shift right now.

##### 4.1. Legal Emphasis on Risk Analysis and Risk Aggregation as Part of Business Valuation

In risk management, there is an international trend to transfer risk management standards from the financial sector to the corporate risk management (see the international risk standards COSO ERM, DIN ISO 9001, and 31000 as well as ONR 49000). Associated with this, there are also legal requirements and auditing standards to set up risk management systems. These systems should be set up in such a way that possible “developments that threaten the existence of the company” can be recognised at an early stage as being related to the ongoing concern, and, essentially, a result from the combined effects of individual risks (with effects, e.g., on the covenants and the rating). In order to meet the legal requirement and auditing standards, companies must systematically identify, quantify, and aggregate risks (using Monte Carlo simulation) (Platon and Constantinescu 2014).

The Business Judgement Rule also results in the necessity for a risk analysis and an increase in the importance of methods for determining risk-adequate decision values (Matschke 1972, 1975). According to the Business Judgement Rule, “adequate information” must be substantiated in all business decisions made by the management. Due to the uncertain effects of such decisions, this requires, in particular, statements about the risks associated with the decision (Graumann et al. 2009; Graumann 2014; Gleißner 2021a).

In Germany, the legal minimum requirements for risk management were expanded in 2021 by the Corporate Stabilisation and Restructuring Act (StaRUG) and the Financial Market Integrity Strengthening Act (FISG). Pursuant to §1 StaRUG, medium-sized limited companies are now also obliged to recognise possible “developments threatening the existence of the company” at an early stage. This requires a risk analysis and a risk aggregation approach. The new §91 (3) AktG, introduced by the FISG, also requires listed companies to have a “comprehensive” risk management system. This system must have even more capabilities in dealing with opportunities and threats (risks). It is beyond the requirements for an early risk detection system most recently specified in the IDW Auditing Standard 340 (of 2020) (Berger et al. 2021; Velte and Eulerich 2021).

As a result, these legal changes mean that the data foundation for a risk-adequate, and, specifically, a simulation-based valuation (Gleißner 2021b) must exist in all companies, if only the legal minimum requirements for risk management are met there.

##### 4.2. Improved Data Situation for Risk Analysis

The previous justification for a risk analysis with a focus on (historical) capital market data, namely, the lack of suitable alternatives, can no longer be accepted today. Due to the increasing importance of risk management in companies, it can be assumed today that a lot of information about the opportunities and dangers (risks) of a company is available in the companies. A risk-appropriate valuation based on the information about the risks of the company (its earnings and cash flows) is thus possible (Ernst 2022).

##### 4.3. Legal Concerns about “Traditional Valuation Methods” Based on Perfect Markets

Gordon and Kornhauser, mockingly, remark that only lawyers would still believe that the CAPM could accurately describe the market process (Gordon and Kornhauser 1985; Fernández 2017). In the meantime, from a legal perspective, there are a number of significant concerns about the traditional valuation methods based on the idea of perfect capital markets and the CAPM (Follert 2020; Hüttemann 2016; Lauber 2014; Karami 2014).



The criticism from a legal perspective concerns the lack of distinction between the value and the price, which is playing an ever greater role due to increasing market imperfections.

In a legally guided company valuation, the following topics are seen as being particularly problematic: the compensation at a marginal price at which the minority shareholder can leave; the use of economically questionable objectified company values; the measurement of risk in the cost of capital according to the Capital Asset Pricing Model (CAPM or TAX-CAPM); the adoption of stock market capitalisation as a yardstick for the company value, and, finally, the compensation according to the cash value of compensation payments (Lauber 2014).

The sole consideration of the systematic risk in the CAPM is also often criticised (Gleißner 2014). Lauber sees this as a violation of the equivalence principles (Ballwieser and Hachmeister 2016) that are decisive for the business valuation. He states that, for the buyer and the seller of a company, the unsystematic risks and the individual risk appetite are at the centre of their marginal price considerations (Lauber 2014, pp. 473–74). This statement is consistent with the findings of empirical capital market research, according to which it is, precisely, the company specific risks that explain stock return fluctuations (Ang et al. 2006; Hagemeister and Kempf 2010; Walkshäusl 2013; Zhang 2009). For the acquirers of whole companies or large holdings, it is largely irrelevant how much the specific share fluctuates compared to the overall market. Moreover, it cannot be assumed that investors in companies are perfectly diversified (Lauber 2014).

#### 4.4. Findings of Empirical Capital Market Research on the Failure of Financial Valuation Approaches (CAPM)

Empirical capital market research (Rossi 2016; Gleißner 2014, with an overview of the studies) exhibits that “capital market-oriented” valuation methods are unsuitable for a risk-appropriate valuation of companies or strategies. This is, especially, true for the Capital Asset Pricing Model (CAPM). Capital market data, especially on fluctuations in stock returns, are not substitute for a forward-looking risk analysis of the company itself. Since the 1980s, the empirical capital market research has, increasingly, uncovered influences on the return of shares that cannot be explained by the CAPM, so-called “anomalies”. Largely independently of this, it has been shown that the beta factor can only be explained, though quite unsatisfactorily, by the fundamental factors of the company (such as the debt ratio). Banz (1981) showed the “size effect” (the above-average returns of small companies that cannot be explained by the CAPM), and Basu (1977) proved that shares with a low valuation level (low P/E ratio) give rise to expectations of above-average returns. All these findings were seen as a reason to develop a “new financial theory” years ago (see Haugen 2004).

Similar to their 1993 study, Jegadeesh and Titman (2011) again show a pronounced (risk-adjusted) outperformance, especially, of momentum investment strategies in their more recent study. The authors see their empirical result as a particularly serious indication against the efficiency of markets and the CAPM.

With the study by Fama and French (1992) and the three-factor model (Fama and French 1993) derived from it, an empirically based multi-factor model was established that can be regarded as a powerful alternative to the CAPM for explaining stock returns. Based on this, Carhart (1997) developed the four-factor model, including the momentum factor, which has been confirmed in many empirical studies as a further explanatory variable of stock returns. Fama and French (2015) developed a five-factor model that can explain stock market returns far better than the CAPM (Jegadeesh and Titman 1993, 2011; Walkshäusl 2019; supplementary to the “quality factor” Walkshäusl 2020). Azevedo et al. (2021) showed that, in the meantime, the indicators of sustainability, such as an ESG score, should also be taken into account in explaining stock returns (an extension of the five-factor model to include the momentum factor is conceivable; see Fama and French 2020).

Based on the findings of empirical capital market research, research today only accepts successors to the theory of efficient markets. Lo’s (2004, 2017) adaptive market thesis

describes a capital market with moderate imperfections. This is a further development of the efficient market hypothesis, which takes into account the limited information processing capacity of market participants and the heterogeneity of expectation formation. The adaptive market hypothesis explains why forecast models for stock returns allow (at least temporarily) for risk-adjusted excess returns.

Dempsey concludes in his summary of the model assumptions and the empirical results of recent years that the CAPM has completely failed. He expects a paradigm shift, and sums up as follows:

“In effect, the paradigm of the CAPM and efficient markets may need to be replaced with a paradigm of markets as vulnerable to capricious behavior”.  
(Dempsey 2013, p. 9)

#### 4.5. Changes in the Economic Fundamentals Due to Global Crises

The importance of the methods outlined in this paper and especially of the simulation-based company valuation becomes particularly clear when considering the serious economic crises of recent years (Gleißner 2020). The COVID-19 pandemic (Pourmansouri et al. 2022), the Ukraine war, with its consequence of an energy crisis in large parts of Europe, and the high inflation rates (inflation crisis) resulting from both crises are the result of risks that were already well known in risk research (Gleißner and Kamarás 2020). Such economic crises have a considerable impact on companies and lead to declining sales, rising costs, defaults by customers or suppliers, or rising interest rates due to increased inflation rates. These risks increase the overall risk exposure of companies. This must be taken into account when making investment and financing decisions as well as when valuing companies and strategies. The risks mentioned influence the expected value of a company's cash flows, the risk-adequate discount rate, as well as the need for equity capital to cover risks in a real imperfect market. The economic risks triggered by the severe economic crises have a low probability of occurrence but a high impact on a large number of companies (for the application of extreme value theory, see Bruhn and Ernst 2022). They are thus systematic risks. These risks are not included in traditional capital market theory; however, they are crucial in today's business valuations.

Capital market-oriented valuation methods derive discount rates from the stock returns of recent years. The problem here is that a large part of the relevant risks did not occur in the period under consideration. They are therefore not taken into account when determining the discount rate, especially when deriving the beta factor of the CAPM. Moreover, severe economic crises usually result in a significant increase in the number of insolvencies and thus in the insolvency risk of companies. In a real capital market with rating and financing restrictions, this should also be taken into account in the company valuation.

Overall, severe crises are a regularly recurring phenomenon. These are not taken into account in traditional equilibrium models. The real existence of macroeconomic and especially geopolitical risks shows that such risks must be taken into account in a special way in the further development of financial management, especially in the valuation methods employed. This is possible through an explicit analysis of all the significant risks of the companies.

#### 4.6. Inability of Modern Capital Market Theory to Take Transaction Effects into Account

The term VUCA (Kuznik 2016) summarises the challenges that companies have to face in an increasingly digitalised world. In the management theory, the term stands for Volatility, Uncertainty, Complexity, and Ambiguity. The volatility of transformation unleashes enormous forces and is the catalyst for a radical change. This leads to an uncertainty that is reflected in the decreasing linearity of models, the loss of equilibrium states, the devaluation of experience, and the importance of historical data. Networking leads to a higher degree of complexity; therefore, simple cause-and-effect relationships no longer exist, and the degree of planning certainty decreases. Information is imperfect and unevenly distributed. Digitalisation is associated with disruptive technologies that

create new players and threaten the business models of many established companies. These extreme events are associated with a high degree of parameter uncertainty and, therefore, pose specific problems for corporate planning, value-oriented corporate control, and risk management.

These statements describe quite the opposite of what is assumed as a premise of the model world in the modern capital market theory and are considered suitable as a basis for decision-making. Because of their model assumptions, they cannot in any way take into account the phenomena typical of a transformation phase.

#### 4.7. New Valuation Methods Available

In the past, it was regularly argued that there was no alternative to the theory of company valuation on perfect markets. Of course, this statement has “actually” always been untenable, since an alternative approach has existed for a long time in the form of the investment-theoretical valuation theory (Matschke and Brösel 2021; Hering 2021; Toll 2019).

The investment-theoretical valuation approaches are also applicable in an imperfect capital market and enable the derivation of decision values (Matschke 1975). In practical application, however, it is problematic that the valuation with the so-called “total models” presupposes a simultaneous optimisation of all options for action. Thus, it requires unrealistic claims in the level of information. The simplifying “partial models” (Hering 2021) reduce complexity; however, they do not provide a method for deriving risk-adequate discount rates and do not allow a link to risk simulation and risk aggregation.

However, the “semi-investment theory” valuation methods have been developed in the recent years, based on the fundamental ideas of investment theory (Matschke 1979; Hering 2000, 2021). They also do not require the assumptions of a perfect capital market, but have a higher practicability. We present this approach of the simulation-based business planning and business valuation in Section 5.

#### 4.8. Model Error and Liability Risk When Ignoring the Risk of Insolvency

The CAPM is based on the premise that there is a fixed investment universe to which neither a new investment can be added nor one from which an investment can be withdrawn. As a result, the insolvency of a company with the associated interruption of the payment stream is not foreseen for the owners. In connection with this, an infinite life span of the company is assumed. In the meantime, there are a large number of publications that address this issue and emphasise the importance of insolvency risk. (Gleißner 2010, 2017, 2019; Knabe 2012; Saha and Malkiel 2012; Friedrich 2015; Lahmann et al. 2018).

Today, there is no doubt about the importance of insolvency risk in a real world with rating and financing restrictions (Friedrich 2015 points out the incompatibility of the CAPM with insolvency risks and, especially, insolvency costs). The only question under discussion is: under different conditions, which approaches appear particularly suitable for capturing insolvency risks? The question is: in which case is a simulation necessary and in which ones is a simplified representation of the insolvency risk by means of an insolvency probability (as a surcharge on the discount rate) sufficient (see with an overview Franken et al. 2020)?

#### 4.9. Missing Strategy Assessment with the Capital Market-Oriented Valuation

Legal regulations in risk management require new assessment methods for decision-making (e.g., strategy assessment) in companies. In essence, strategy valuation means comparing the risk–return profiles of alternative (strategic) options. In valuation theory, such options are referred to as real options (for real options, see Amram and Kulatilaka 1999; Copeland and Antikarov 2001; Trigeorgis 1996). A future-oriented valuation of strategic opportunities differs significantly from the usual practice of a “traditional” capital market-oriented company valuation. For this, a consideration of historical stock market data is just as meaningless as the search for (risk-equivalent) companies for a peer group comparison.

Consequently, the strategy assessment starts with a structured description of the strategy (especially the business model) and a stringent derivation of an integrated corporate



plan based on it. Since the opportunities and the threats (risks) of alternative strategies usually differ significantly, a structured identification and quantification of risks is necessary and must be included in the assessment (Gleißner 2017).

## 5. The Simulation-Based Valuation as a Result of the Paradigm Shift

The narrow framework of today's paradigm of perfect markets (and the CAPM) is not without alternatives. What is required is a company valuation method that reflects the risk situation in a company and, at the same time, the imperfections of the real markets in such a way that the company value as a result can provide a meaningful basis for strategic decisions. The simulation-based business planning and business valuation is a suitable valuation tool for this purpose.

### 5.1. The Concept of Simulation-Based Business Valuation

"Semi-investment theory" valuation methods have been developed in recent years based on the fundamental ideas of the investment theory valuation. They too do not require assumptions of a perfect capital market, but have a higher practicability than the investment-theoretical valuation theory. In particular, they allow the use of the DCF method, commonly used in valuation practice. Instead of information on (historical) stock return fluctuations, such as the beta factor of the CAPM, the information from the risk analysis and the risk aggregation is used to derive planned values of unbiased cash flows and, in addition, consistent risk-adequate discount rates. The insolvency scenarios possible as a result of risks, and thus the insolvency risk, can also be easily reflected in the valuation calculation.

The derivation of the valuation equation is based on the idea of risk-value models (Sarin and Weber 1993; Spremann 2004) and the method of "imperfect replication" (Dorfleitner 2020; Dorfleitner and Gleißner 2018; Gleißner 2011, 2019; Gleißner and Ernst 2019). A central assumption is made here: the same risk measure ( $R$ ) and the same expected value of payments at the same time imply an identical value. A  $(\mu, R)$ -decision criterion is thus assumed, which includes the  $(\mu, \sigma)$ -principle of the CAPM as a special case (this means that the simulation-based valuation can also represent the world of perfect capital markets, although this is only to be considered as an unlikely special case). To derive the valuation equations, we need information about two alternative investment options available to the valuation subject. These can be specified as risk-free government bonds and a risky investment, such as, for example, a global stock index. In addition, only a few restrictive assumptions are required: two payments at the same time have the same value if they match in the expected value and the selected risk measure. The risk measure must be homogeneous, position invariant, or translation invariant (Dorfleitner and Gleißner 2018). Information from the capital market about the valuation subject is not required. With the valuation approach, security equivalents are calculated; a "conversion" into the risk-adequate discount rates for the use of the known instruments of DCF methods is possible. In addition to the business planning, the data basis here is, in particular, a risk analysis and a risk aggregation of the company, from which the risk measure of the valuation-relevant payments is derived.

### 5.2. Advantages of a Simulation-Based Business Valuation

The advantages of a simulation-based business planning and valuation address the weaknesses of the CAPM-based business valuation. They also offer solutions with which to take into account the risk situation in companies and the imperfections in markets.

#### 5.2.1. Using Unbiased Planning

Unbiased plan values are a necessary prerequisite for the application of the discounted cash flow method. An expected value expresses which cash flows will occur "on average" in all possible risk-related future scenarios. The plans of companies, which are mostly prepared for the purpose of corporate management, show the most probable values or target

values (Behringer and Gleißner 2018, 2021). However, when applying the DCF valuation methods, including a CAPM-based valuation, expected values are required. Existing opportunities and dangers (risks) must necessarily be taken into account. In a simulation-based valuation, the expected value of cash flow results directly from the simulation results (as the mean value of the calculated scenarios). This ensures that the corporate risks are comprehensively taken into account when determining the expected values.

#### 5.2.2. Considering Corporate Risks in Corporate Planning

Another advantage of simulation-based corporate planning is that all the essential relationships between the planned values and the risk values are considered and checked for plausibility when the simulation model is set up. In the simulation-based valuation, future scenarios of the company are then calculated using the Monte Carlo simulation while taking into account the dependencies of the planning items. The simulation-based valuation is based on a critically and systematically analysed planning model in which the existing dependencies and the uncertain planning assumptions are systematically examined.

#### 5.2.3. Considering the Insolvency Risk in the Company Valuation

The insolvency risk, which can be expressed by the insolvency costs and, in particular, the insolvency probability, influences the amount and the temporal development of the expected values of the cash flows and, furthermore, the cost of capital (Gleißner 2011; Lahmann et al. 2018). The possibility of insolvency leads to a finite life of companies and, in the case of actual insolvency, to a discontinuation of the payments to the owners. The consideration of the insolvency risk that occurs quasi-automatically in a simulation-based valuation is all that is necessary is to define the conditions under which insolvency occurs. In particular, the probability of the scenarios that lead to insolvency, and thus the interruption of the cash flow, can be determined. The effects of insolvency costs and probability are, thus, directly taken into account in the simulation when determining the expected values of the cash flows.

#### 5.2.4. Deriving a Risk-Adjusted Discount Rate (Cost of Capital Rate) Directly from the Simulation Results

In a simulation-based valuation, one does not need independent and potentially inconsistent models for the “numerator” and the “denominator”. The value of a payment depends on (1) the expected value, (2) the timing, and (3) the riskiness of the cash flows. The risk content of the cash that flows from the simulation can be expressed by a risk measure, such as the standard deviation or the value at risk of the cash flows. The risk measure can be directly converted into a matching risk-adjusted discount rate (or a certainty equivalent; for the basics of valuation with risk-value models and the procedure of “imperfect replications”, see Dorfleitner and Gleißner 2018; Dorfleitner 2020). In contrast to the traditional “capital market-oriented” valuation, the cost of capital in a simulation-based valuation can be derived directly from the earning risk. This earning risk is a result of the risk analysis and the risk aggregation instead of from historical stock return fluctuations (as is usually the case with the beta factor of the CAPM).

#### 5.2.5. Preparing Entrepreneurial Decisions

A consideration of the future risks is necessary. This is particularly important if the different strategic options for action, which differ specifically in their risk content, are to be compared within the framework of a strategy evaluation. In a strategy evaluation, as the basis for an “entrepreneurial decision” within the meaning of the Business Judgement Rule (§ 93 AktG), it is necessary that the expected earnings and risks associated with the decision are weighed against each other (Graumann et al. 2009). A simulation-based business valuation is, accordingly, appropriate for preparing the entrepreneurial decisions based on the comparison of the risk-adequate decision values of the options for action.

## 6. Conclusions

Finance, and in particular, business valuation, are areas that are currently undergoing a paradigm shift in the view of Kuhn. This paradigm shift is triggered by changes in the economic framework conditions and technological developments that lead to instabilities, imperfections, and transformations in the markets.

The models of modern capital market theory used so far in the company valuation, especially the CAPM, are quite appropriate when the economic development is stable and the real markets come close to the assumptions of the perfect markets. However, this situation no longer exists.

It is becoming apparent that the suitability of the traditional methods, due to their restrictive adoption, is diminishing in providing decision-making aids for the entrepreneurial action. This has triggered a crisis in finance (Quill 2020) and in the field of business valuation, which requires more appropriate methods in imperfect and rapidly changing markets.

A paradigm shift is always associated with the desire to adhere to the established methods. Reasons for this insistence include the influential neoclassical school in finance, a dependence on research funds, which expect the use of established methods, and the simplicity and dissemination of the models that have prevailed so far.

A number of factors evidence a paradigm shift. Their importance clearly outweighs the reasons to continue subscribing to the old paradigm. New laws and auditing standards require companies to have an early risk detection system that identifies, quantifies, and aggregates risks. This means that every company is obliged to keep the information available for a risk-appropriate company valuation and a risk-adequate financing. Deriving risks from capital market data is no longer sufficient today. Empirical capital market research has long shown that the CAPM is not suitable for explaining even the returns on shares. Accordingly, new approaches (e.g., multi-factor models) have been developed. However, these again use of market data and do not address the risk situation in the company. The CAPM is also increasingly being questioned by the legal community, as it is based on assumptions from which no arguments can be derived for a court decision in a concrete dispute. Furthermore, the CAPM does not take into account the probability of insolvency. However, it is precisely this risk factor that needs to be analysed in an early risk detection system. Perhaps, the most important reason that speaks against the CAPM is the fact that CAPM-based company valuation models cannot be used as a decision-making tool. The neoclassical finance theory and the CAPM lack the ability to evaluate options for action in a risk-adequate way.

The approach presented here has limitations that require further research activities. The paradigm shift has a strong impact on transaction practice and the implementation of accounting standards. Thus, the distinction between “value” and “price” of a company in M&A becomes clear. This can lead to liability problems for the board of directors and supervisory board. Furthermore, the practice of goodwill valuation in IFRS is critically questioned, as this has so far been performed using the CAPM. Furthermore, it should be examined how the paradigm shift affects other fields in finance. As fields of research, the application in other theories such as capital structure, working capital, portfolio management, or M&A can be mentioned.

In science and practice, innovative methods have been developed to take the imperfections of markets into account in the context of company valuations. We were able to show that the simulation-based business valuation eliminates and solves many weaknesses of the CAPM-based business valuation, especially because no perfection of markets is assumed. It should be emphasised that simulation-based business planning and the valuation are based on an unbiased planning that identifies, quantifies, and aggregates the risks existing in a company. The risk aggregation also includes the insolvency risk and fulfils the legal requirements for early risk detection systems. With simulation-based business planning and the valuation, the data basis is able to prepare entrepreneurial decisions.

Risk analysis, simulation-based business planning, and the valuation are highly suitable instruments for evaluating companies and their options for action in imperfect markets.

Moreover, they allow the derivation of a risk-appropriate financing structure. These instruments can trigger a revolution in Kuhn's view. The detachment from the restrictive assumptions of the neoclassical financing theory and the possibility of using information on corporate risks can open up new paths for many fields in the field of finance.

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## References

- Amram, Martha, and Nalin Kulatilaka. 1999. *Real Options: Managing Strategic Investment in an Uncertain World*. Boston: Harvard Business School Press.
- Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang. 2006. The Cross-Section of Volatility and Expected Returns. *Journal of Finance* 61: 259–99. [\[CrossRef\]](#)
- Azevedo, Vitor, Christoph Kaserer, and Lucila M. S. Campos. 2021. Investor sentiment and the time-varying sustainability premium. *Journal of Asset Management* 22: 600–21. [\[CrossRef\]](#)
- Ballwieser, Wolfgang, and Dirk Hachmeister. 2016. *Unternehmensbewertung: Prozess, Methoden und Probleme*, 5th ed. Stuttgart: Schäffer Poeschel.
- Banz, Rolf W. 1981. The Relationship between Return and Market Value of Common Stocks. *Journal of Financial Economics* 9: 3–18. [\[CrossRef\]](#)
- Basu, Sanjoy. 1977. Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis. *Journal of Finance* 32: 663–82. [\[CrossRef\]](#)
- Behringer, Stefan, and Werner Gleißner. 2018. Die Unternehmensplanung als Grundlage für die Unternehmensbewertung—Eine empirische Studie. *WPg-die Wirtschaftsprüfung* 71: 312–19.
- Behringer, Stefan, and Werner Gleißner. 2021. Unternehmensplanung als Grundlage für die Unternehmensbewertung. Die Perspektive der Wirtschaftsprüfer. *WPg* 74: 857–64.
- Berger, Thomas, Dietmar Ernst, Werner Gleißner, Kay H. Hofmann, Matthias Meyer, Ottmar Schneck, Patrick Ulrich, and Ute Vanini. 2021. Die Prüfung von Risikomanagementsystemen und die Defizite des IDW Prüfungsstandards 340. *Der Betrieb* 74: 2709–14.
- Brealey, Richard A., Stewart C. Myers, and Franklin E. A. Allen. 2022. *Principles of Corporate Finance*, 14th ed. New York: McGraw Hill.
- Bruhn, Pascal, and Dietmar Ernst. 2022. Assessing the Risk Characteristics of the Cryptocurrency Market: A GARCH-EVT-Copula Approach. *Journal of Risk and Financial Management* 15: 346. [\[CrossRef\]](#)
- Carhart, Mark M. 1997. On Persistence in Mutual Fund Performance. *Journal of Finance* 52: 57–82. [\[CrossRef\]](#)
- Copeland, Tom, and Vladimir Antikarov. 2001. *Real Options: A Practitioner's Guide*. New York and London: Texere.
- Dempsey, Mike. 2013. The Capital Asset Pricing Model (CAPM): The History of a Failed Revolutionary Idea in Finance? *Abacus* 49: 7–23. [\[CrossRef\]](#)
- Dorfleitner, Gregor. 2020. On the use of the terminal-value approach in risk-value models. *Annals of Operations Research*. Available online: <https://link.springer.com/content/pdf/10.1007/s10479-020-03644-2.pdf> (accessed on 10 August 2022).
- Dorfleitner, Gregor, and Werner Gleißner. 2018. Valuing streams of risky cashflows with risk-value models. *Journal of Risk* 20: 1–27. [\[CrossRef\]](#)
- Ernst, Dietmar. 2022. Simulation-Based Business Valuation: Methodical Implementation in the Valuation Practice. *Journal of Risk and Financial Management* 15: 200. [\[CrossRef\]](#)
- Fama, Eugene F., and Kenneth R. French. 1992. Section of Expected Stock Returns. *The Journal of Finance* 47: 427–65. [\[CrossRef\]](#)
- Fama, Eugene F., and Kenneth R. French. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 47: 3–56. [\[CrossRef\]](#)
- Fama, Eugene F., and Kenneth R. French. 2015. A five-factor asset pricing model. *Journal of Financial Economics* 116: 1–22. [\[CrossRef\]](#)



- Fama, Eugene F., and Kenneth R. French. 2020. The Value Premium, Chicago Booth Paper No. 20-01. Available online: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3525096](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3525096) (accessed on 27 October 2021).
- Fernández, Pablo. 2017. Is It Ethical to Teach that Beta and CAPM Explain Something? Available online: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2980847](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2980847) (accessed on 21 February 2019).
- Follert, F. 2020. *Zur Unternehmensbewertung im Spruchverfahren aus interessentheoretischer Sicht. Der aktienrechtliche Minderheitenausschluss im Lichte der Neuen Politischen Ökonomie*. Wiesbaden: Springer Gabler Wiesbaden.
- Franken, Lars, Werner Gleißner, and Jörn Schulte. 2020. Insolvenzzrisiko und Berücksichtigung des Verschuldungsgrads bei der Bewertung von Unternehmen—Stand der Diskussion nach Veröffentlichung des IDW Praxishinweises 2/2018. *Corporate Finance* 9: 84–96.
- Friedrich, Tobias. 2015. *Unternehmensbewertung bei Insolvenzzrisiko*. Frankfurt am Main: Peter Lang.
- Gleißner, Werner. 2010. Unternehmenswert, Rating und Risiko. *WPg* 63: 735–43.
- Gleißner, Werner. 2011. Risikoanalyse und Replikation für Unternehmensbewertung und wertorientierte Unternehmenssteuerung. *WiSt* 40: 345–52. [CrossRef]
- Gleißner, Werner. 2014. Kapitalmarktorientierte Unternehmensbewertung: Erkenntnisse der empirischen Kapitalmarktforschung und alternative Bewertungsmethoden. *Corporate Finance* 4: 151–67.
- Gleißner, Werner. 2017. Risikoanalyse, Risikoquantifizierung und Risikoaggregation. *WiSt* 46: 4–11. [CrossRef]
- Gleißner, Werner. 2019. Cost of capital and probability of default in value-based risk management. *Management Research Review* 42: 1243–58.
- Gleißner, Werner. 2020. Die Corona-Krise: Fakten, Prognosen und Risiken. *Corporate Finance* 11: 121–30.
- Gleißner, Werner. 2021a. Unternehmerische Entscheidungen. Haftungsrisiken vermeiden (§ 93 AktG, Business Judgement Rule). *Controller Magazin* 45: 16–23.
- Gleißner, Werner. 2021b. Simulationsbasierte Unternehmensbewertung: Methode und Nutzen. *BewertungsPraktiker*, 84–87.
- Gleißner, Werner, and Dietmar Ernst. 2019. Company valuation as result of risk analysis: Replication approach as an alternative to the CAPM. *Business Valuation OIV Journal* 1: 3–18. [CrossRef]
- Gleißner, Werner, and Endre Kamarás. 2020. Volkswirtschaftliche Risiken und deren betriebswirtschaftliche Konsequenzen (Teil 1). *Der Betrieb* 33: 1689–95.
- Gordon, Jeffrey N., and Lewis A. Kornhauser. 1985. Efficient Markets, Costly Information, and Securities Research. *NYU Law Review* 60: 761.
- Graumann, Matthias. 2014. Die angemessene Informationsgrundlage bei Entscheidung. *Das Wirtschaftsstudium (WISU)* 3: 317–20.
- Graumann, Matthias, Holger Linderhaus, and Jens Grundei. 2009. Wann ist die Risikobereitschaft bei unternehmerischen Entscheidungen “in unzulässiger Weise überspannt”? *BFuP-Betriebswirtschaftliche Forschung und Praxis* 5: 492–505.
- Hagemeister, Meike, and Alexander Kempf. 2010. CAPM und erwartete Renditen: Eine Untersuchung auf Basis der Erwartung von Marktteilnehmern. *DBW-Die Betriebswirtschaft* 70: 145–64.
- Haugen, Robert A. 2004. *The New Finance—Overreaction, Complexity, and Uniqueness*, 3rd ed. Hoboken: Pearson Prentice Hall.
- Hering, Thomas. 2000. Das allgemeine Zustands-Grenzpreismodell zur Bewertung von Unternehmen und anderen unsicheren Zahlungsströmen. *Die Betriebswirtschaft* 60: 362–78.
- Hering, Thomas. 2021. *Unternehmensbewertung*, 4th ed. München: De Gruyter Oldenbourg.
- Hüttemann, Rainer. 2016. Neue Entwicklungen bei der Unternehmensbewertung im Gesellschaftsrecht. *Corporate Finance* 7: 467–75.
- Jegadeesh, Narasimhan, and Sheridan Titman. 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance* 48: 65–91. [CrossRef]
- Jegadeesh, Narasimhan, and Sheridan Titman. 2011. Momentum. *Annual Review of Financial Economics* 3: 493–509. [CrossRef]
- Karami, Behzad. 2014. *Unternehmensbewertung in Spruchverfahren beim “Squeeze Out”*. Wiesbaden: Springer.
- Knabe, Matthias. 2012. *Die Berücksichtigung von Insolvenzzrisiken in der Unternehmensbewertung*. Lohmar: EUL Verlag.
- Kuhn, Thomas S. 1970. *The Structure of Scientific Revolutions*. Chicago: The University of Chicago Press.
- Kuznik, Thorsten. 2016. Risk Management in a VUCA World: Practical Guidelines Based on the Example of a Multinational Retail Group. In *Managing in a VUCA World*. Edited by Oliver Mack, Anshuman Khare, Andreas Krämer and Thomas Burgartz. Cham: Springer, pp. 77–95.
- Lahmann, Alexander, Maximilian Schreiter, and Bernhard Schwetzler. 2018. Der Einfluss von Insolvenz, Kapitalstruktur und Fremdkapitalfälligkeit auf den Unternehmenswert. *zfbf-Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung* 70: 73–123. [CrossRef]
- Lauber, Georg. 2014. *Das Verhältnis des Ausgleichs gemäß § 304 AktG zu den Abfindungen gemäß den §§ 305, 327 a AktG*. Münster: LIT Verlag.
- Lo, Andrew W. 2004. The Adaptive Markets Hypothesis: Market Efficiency from an Evolutionary Perspective. *Journal of Portfolio Management* 5: 15–29. [CrossRef]
- Lo, Andrew W. 2017. *Adaptive Markets: Financial Evolution at the Speed of Thought*, 2nd ed. Princeton and Oxford: Princeton University Press.
- Matschke, Manfred J. 1972. Der Gesamtwert der Unternehmung als Entscheidungswert. *Betriebswirtschaftliche Forschung und Praxis* 24: 146–61.
- Matschke, Manfred J. 1975. *Der Entscheidungswert der Unternehmung*. Wiesbaden: Springer.



- Matschke, Manfred J. 1979. *Funktionale Unternehmensbewertung, Band II, Der Arbitriumwert der Unternehmung*. Wiesbaden: Springer.
- Matschke, Manfred J., and Gerrit Brösel. 2021. *Business Valuation*. München: UVK Verlag.
- Platon, V., and A. Constantinescu. 2014. Monte Carlo Method in Risk Analysis for Investment Projects. *Procedia Economics and Finance* 15: 393–400. [\[CrossRef\]](#)
- Pourmansouri, Rezvan, Amir Mehdiabadi, Vahid Shahabi, Cristi Spulbar, and Ramona Birau. 2022. An Investigation of the Link between Major Shareholders' Behavior and Corporate Governance Performance before and after the COVID-19 Pandemic: A Case Study of the Companies Listed on the Iranian Stock Market. *Journal of Risk and Financial Management* 15: 208. [\[CrossRef\]](#)
- Quill, Tobias. 2020. Valuation Techniques Under Construction—About the Dissemination of the CAPM in German Judicial Valuation. *Schmalenbach Business Review* 72: 299–341. [\[CrossRef\]](#)
- Rossi, Matteo. 2016. The capital asset pricing model: A critical literature review. *Global Business and Economics Review* 18: 604–17. [\[CrossRef\]](#)
- Saha, Atanu, and Burton G. Malkiel. 2012. DCF Valuation with Cash Flow Cessation Risk. *Journal of Applied Finance* 22: 175–85.
- Sarin, Rakesh K., and Martin Weber. 1993. Risk-value models. *European Journal of Operational Research* 70: 135–49. [\[CrossRef\]](#)
- Spahn, Peter. 2016. *Streit um die Makroökonomie. Theoriegeschichtliche Debatten von Wicksell bis Woodford*. Marburg: Metropolis-Verlag.
- Spremann, Klaus. 2004. *Valuation: Grundlagen moderner Unternehmensbewertung*. Munich: Oldenburg Verlag.
- Toll, Christian. 2019. *Finanzwirtschaft und Unternehmensbewertung. Habilitation Treatise*. Hagen: Fakultät für Wirtschaftswissenschaft der FernUniversität in Hagen.
- Trigeorgis, Lenos. 1996. *Real Options: Managerial Flexibility and Strategy in Resource Allocation*. Cambridge: MIT Press.
- Velte, Patrick, and Marc Eulerich. 2021. Das geplante Finanzmarktintegritätsstärkungsgesetz (FISG). Eine kritische Diskussion aus Sicht der Internen Revision. *Zeitschrift Interne Revision (ZIR)* 56: 64–69.
- Walkshäusl, Christian. 2013. Fundamentalrisiken und Aktienrenditen—Auch hier gilt, mit weniger Risiko zu einer besseren Performance. *Corporate Finance biz* 3: 119–23.
- Walkshäusl, Christian. 2019. The fundamentals of momentum investing: European evidence on understanding momentum through fundamentals. *Accounting & Finance* 59: 831–57.
- Walkshäusl, Christian. 2020. Piotroski's FSCORE: International evidence. *Journal of Asset Management* 21: 106–18. [\[CrossRef\]](#)
- Zhang, Chu. 2009. On the explanatory power of firm-specific variables in cross-sections of expected returns. *Journal of Empirical Finance* 16: 306–17. [\[CrossRef\]](#)