

VALUETRUST

Valuation of Technology Companies for IFRS Accounting Purposes

J.P. Morgan and McKinsey Technology M&A Workshop

February 7, 2018

ValueTrust Financial Advisors SE

www.value-trust.com

Agenda

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1. Start-up versus high growth companies

Start-up versus high growth companies

Still the dark side of valuation?

Start-up

Characteristics



- Innovative business model
- High uncertainty
- High growth rates and negative cash flows
- Tax losses
- Equity financed and liquidation preferences
- Often no benchmarks
- In some cases a real option exists

Valuation issues



- Discount rate for negative cash flows
- Scenario analysis
- Changing risk profile over time
- Incorporation of insolvency risk in cost of equity or decision tree valuation approach
- Modeling of convergence from start up to high growth company

High growth

Characteristics



- Technology, IP and brand mostly key value drivers & differentiators
- Often in the group of market leaders
- High investments in intangible assets
- Partial debt financed (but often still liquidation preferences before IPO or sale)
- Decreasing insolvency risk and changing capital structure over time
- Declining growth rates and ROIC excess returns mid and long term

Valuation issues



- Adjustment of cost of equity to decreasing operational risk profile
- Cost of debt and tax shields are unsecure
- Convergence rate for revenue growth and ROIC
- Appropriate planning horizon
- Determination of long term growth rate and cost of equity

2. The Drillisch and 1&1 merger as case study

Drillisch and 1&1 Telecommunication merger

Valuation Opinion

Valuation expert to the
management board of



on the acquisition of



Provided a valuation opinion in connection with
the contribution in kind and assessed the
appropriateness of the proposed exchange ratio

Background

- In May 2017, Drillisch and United Internet entered into a Business Combination Agreement governing the **acquisition of 1&1 Telecommunication by Drillisch** under United Internet.
- With the acquisition, the two companies merge Drillisch's and United Internet's business to create a **strong fourth player in the German mobile market**.
- United Internet transferred 1&1 Telecommunication shares to Drillisch in a **capital increase by way of contribution-in-kind** under the **exclusion of subscription rights**. In return, United Internet received new Drillisch shares.
- The **valuation of 1&1 Telecommunication** is agreed at **EUR 5.85 billion**, while **Drillisch is valued at EUR 2.99 billion**.

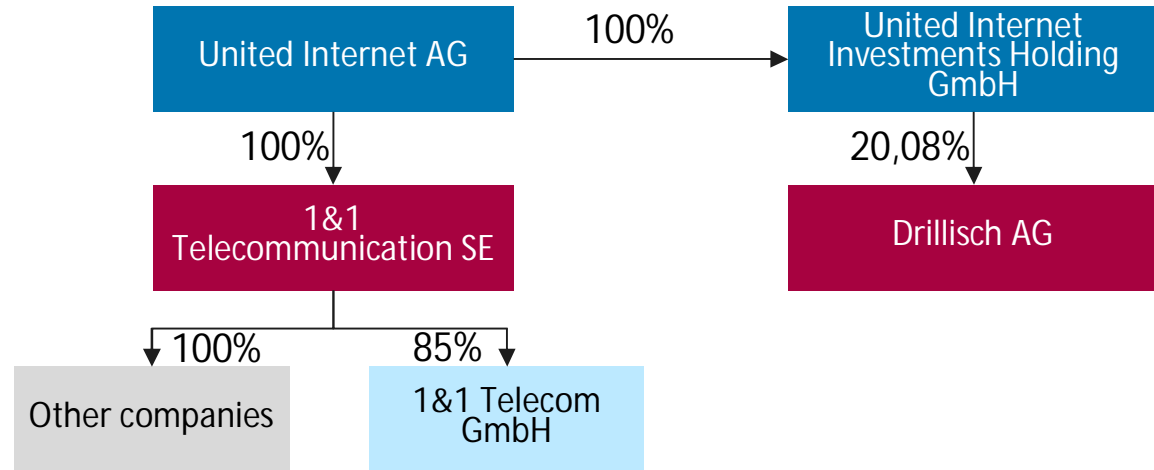
Assignment

ValueTrust has been retained to perform the following tasks to support the management:

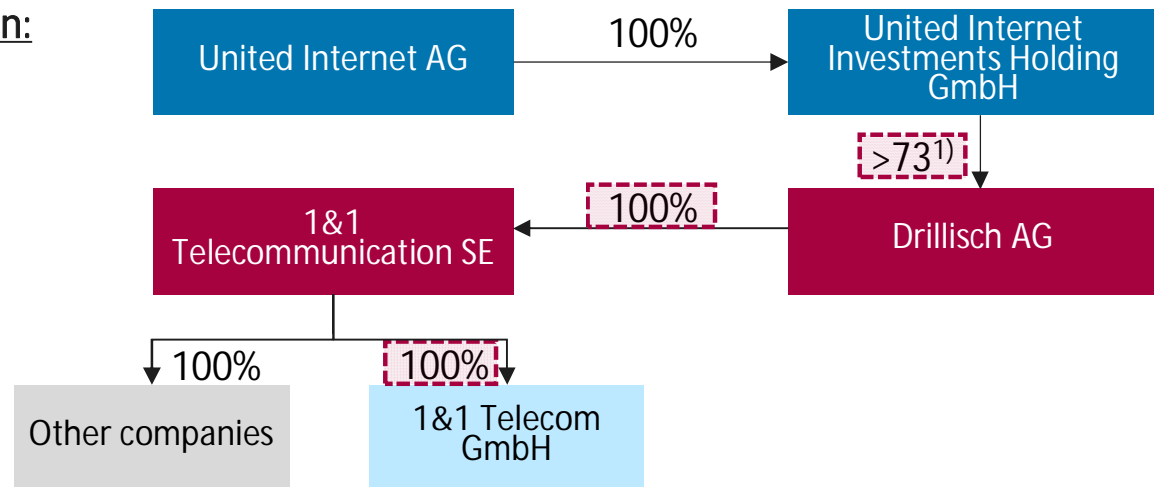
- **Assess the appropriateness of the proposed exchange ratio** for shares in Drillisch and 1&1 Telecommunication in the context of the contribution in kind
- **Analysis of the business plans** including benchmarking and KPI analyses for both companies
- **Value Drillisch and 1&1 Telecommunication** in accordance with the valuation standard of the Institute of Public Auditors in Germany (IDW S 1) as well as DVFA
- Thereby **using different valuation methods** especially Discounted Cash Flow (DCF) after personal taxes according to IDW S 1, DCF before personal taxes according to DVFA and different industry multiples in the market multiple approach

Transaction structure

Corporate structure prior to transaction:



Corporate structure after successful transaction:



¹⁾ Status as of Q3 2017.

Drillisch valuation is based on a two-phase model for reporting purposes



in EUR m	Planning period					TV
	2017	2018	2019	2020	2021	
Gross Performance	699	823	953	1,045	1,125	1,286
<i>Growth (in %)</i>	23.4%	17.7%	15.7%	9.7%	7.6%	<i>n.a.</i>
Gross Profit	326	391	436	477	516	522
<i>Margin (in %)</i>	46.6%	47.5%	45.7%	45.6%	45.9%	40.6%
EBITDA	174	235	278	313	348	300
<i>Margin (in %)</i>	24.8%	28.5%	29.2%	29.9%	31.0%	23.4%
EBIT	125	201	247	286	325	243
<i>Margin (in %)</i>	17.9%	24.4%	25.9%	27.3%	28.9%	18.9%
Net Income	89	139	173	198	224	168
<i>Margin (in %)</i>	12.7%	16.8%	18.1%	18.9%	19.9%	13.1%

$g = 0.5\%$

External view

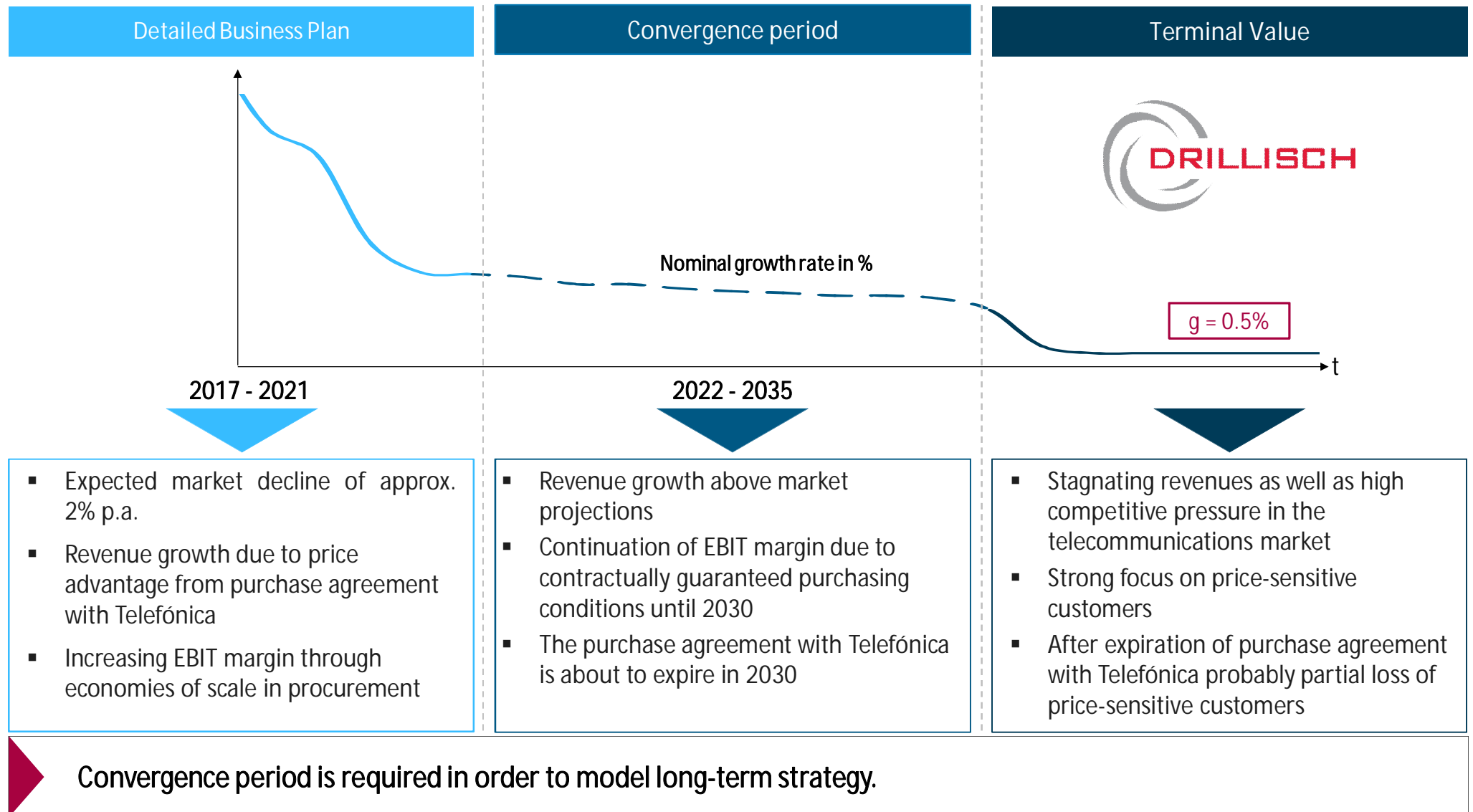
- Five years planning period + Terminal Value (TV)
- Traditional auditors approach

Internal view

- 14 years convergence + TV
- Convergence required to model beneficial contract expiring in 2030
- No disclosure of confidential company information beyond planning period

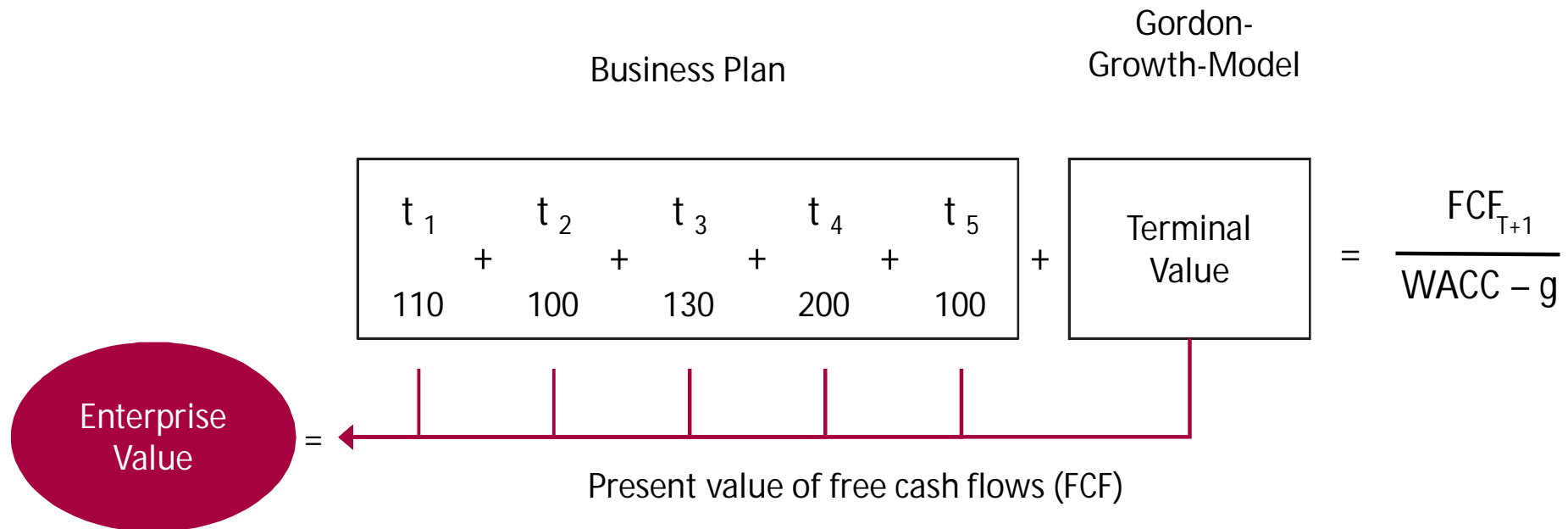
Timing of terminal value application should not affect equity value.

Implementation of a convergence phase (three-phase-model) and estimation of the appropriate Terminal Value growth rate



3. Convergence period and consistent terminal value calculation

Traditional two-phase DCF-model uses Gordon-Growth-Model for TV calculation



The future cash flows are discounted with the „cost of capital (WACC)“; discounting converts the value of future cash flows into the value of the cash flows at the valuation date.

The enterprise value corresponds to the total amount of all discounted cash flows.

Calculation of terminal value within the WACC approach (Gordon Growth Model)

$$TV = \frac{IC \cdot (ROIC - g)}{WACC - g}$$

mit: $FCF = IC \cdot (ROIC - g)$

FCF:	Free Cash Flow
NOPLAT:	Net Operating Profit Less Adjusted Taxes
IC:	Invested Capital
ΔIC :	Change of Invested Capital
ROIC:	Return on Invested Capital (NOPLAT / IC)
g:	Growth rate of IC / FCF

Implicit assumptions in the Gordon-Growth-Model for the WACC approach:

- Constant leverage

- ROIC [!] \geq WACC

- $g_{WACC} = ROIC \times I_e$

- (Expansion-) Investment ratio: $I_e = \frac{\Delta IC}{NOPLAT} > 0$

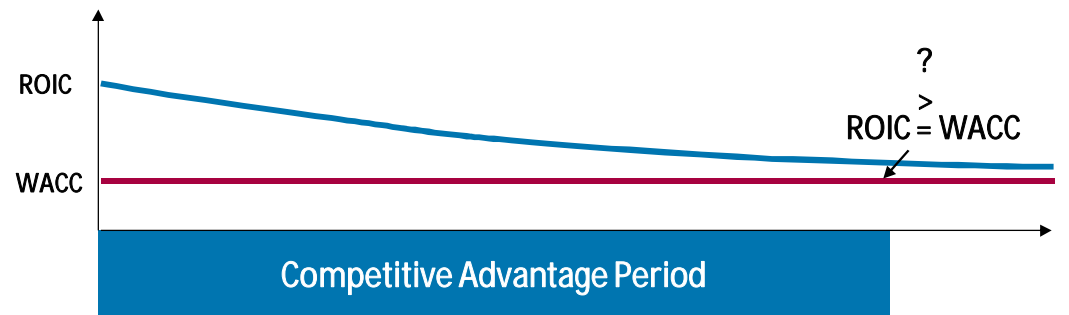


Key: When are all variables constant?

Competitive advantage period determines the planning horizon

The competitive advantage period (CAP) is the period during which the company achieves a return above the cost of capital. It can be seen separately from the length of the detailed planning horizon.

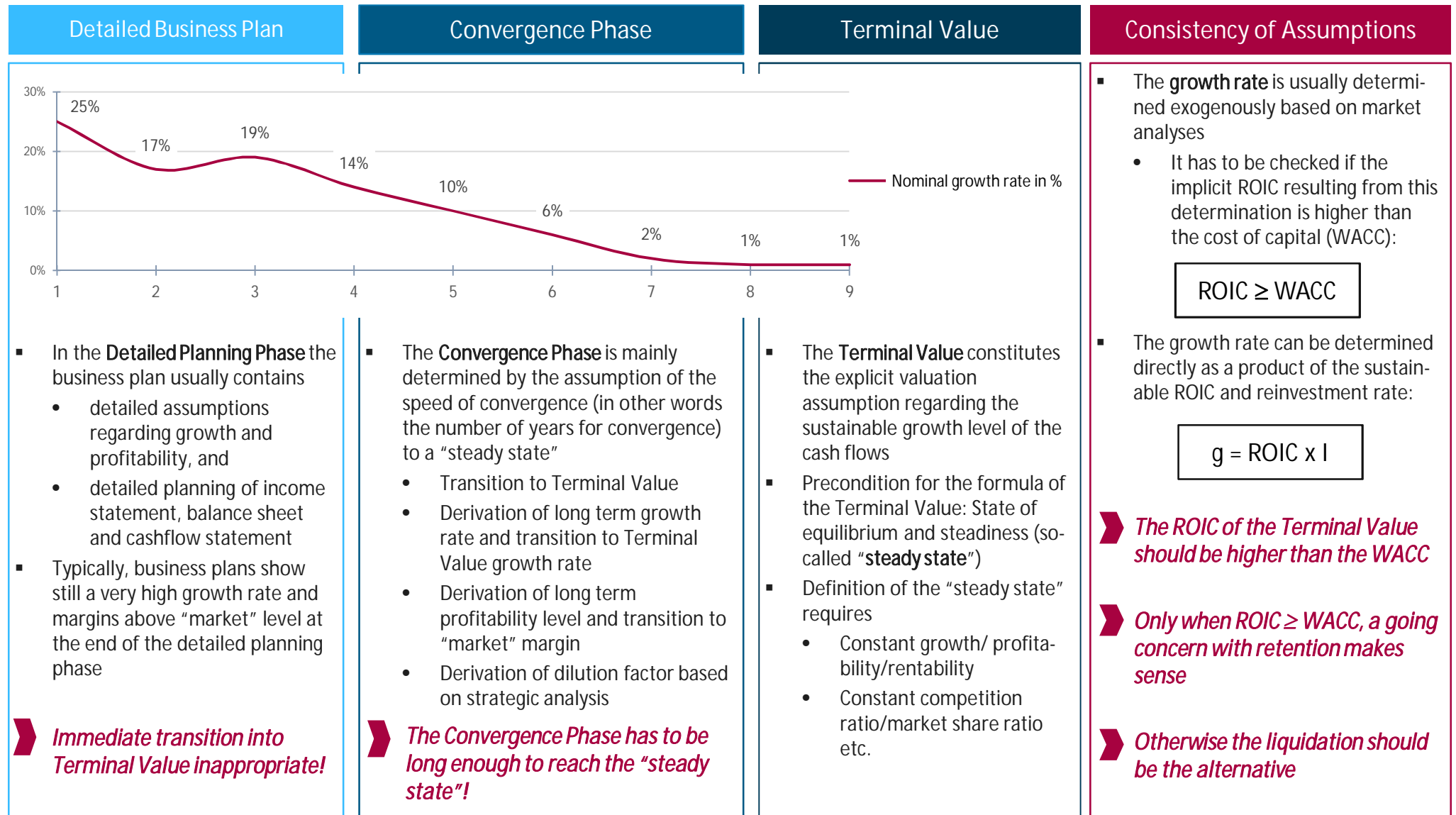
Economic reality:
Competitive pressure reduces profitability over time



Implementation of a convergence period for modelling purposes using the DCF method:



Implementation of convergence phase and estimation of the TV growth rate



Nominal growth rate in Terminal Value is driven by multiple value drivers

$$g = \text{ROIC} \times \text{reinvestment rate (I)}$$



4. Valuation for Impairment testing

IAS 36: Impairment of assets

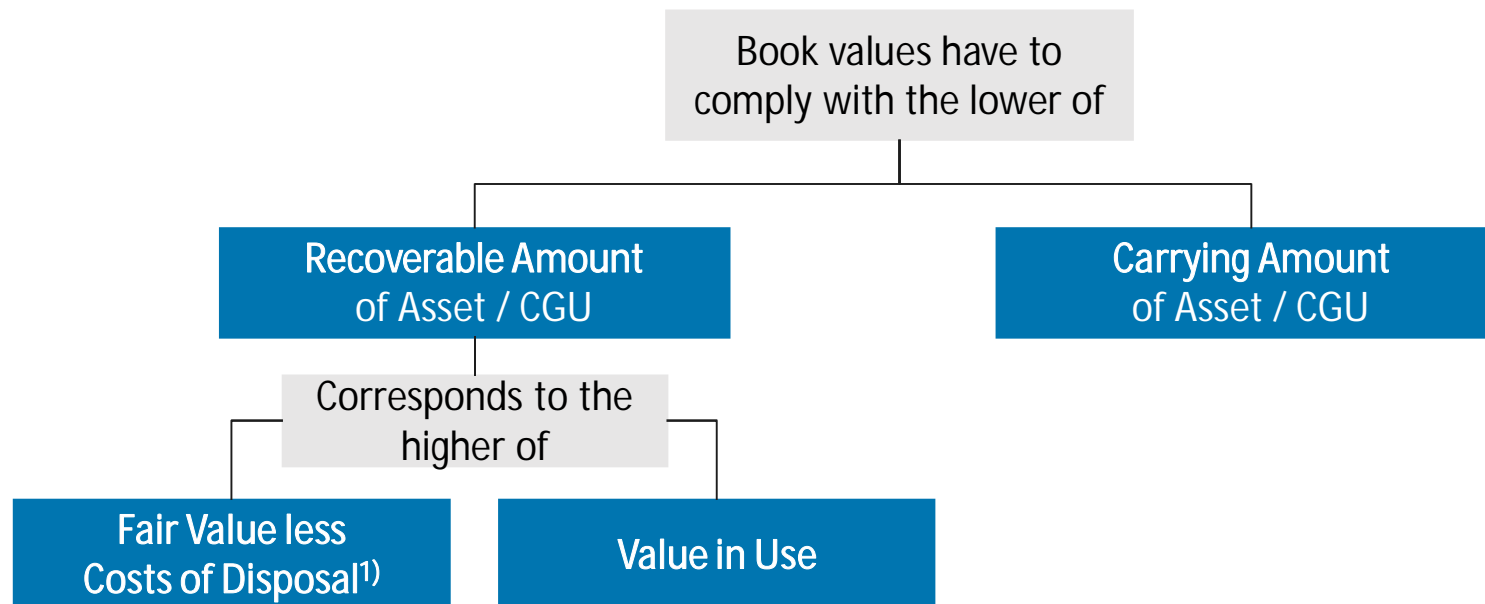
Impairment Test

- IAS 36 *Impairment of Assets* seeks to ensure that an entity's assets are not carried at more than their **recoverable amount**.
- The impairment test may be conducted for an individual asset or a '**cash-generating unit**' (CGU) where an asset does not generate cash inflows that are largely independent of those from other assets.
- Entities are required to conduct tests for specific assets, in case there are any indications of impairments (triggering events).
- **For goodwill and intangible assets with an indefinite useful life or intangible assets not yet available for use, an annual impairment test on CGU level is required.**

Comparison of recoverable amount vs. carrying amount

Impairment

- An **impairment** exists, if the **carrying amount of an asset or CGU exceeds the recoverable amount**.
- Consequently, the carrying amount of an impaired asset or CGU is written down to the recoverable amount.



An **impairment loss** is the amount by which the carrying amount of an asset/CGU exceeds its recoverable amount. The **impairment loss** is recognized as an **expense**.

¹⁾ Prior to consequential amendments made by IFRS 13 *Fair Value Measurement*, this was referred to as 'fair value less costs to sell'.

4. i. Value in use

Determination of value in use

Value in Use

"...the present value of future cash flows expected to be derived from an asset or cash-generating unit." [IAS 36.6]

- The calculation of value in use should reflect the following elements [IAS 36.30]:
 - an estimate of the future cash flows the entity expects to derive from the asset
 - expectations about possible variations in the amount or timing of those future cash flows
 - the time value of money, represented by the current market risk-free rate of interest
 - the price for bearing the uncertainty inherent in the asset
 - other factors, such as illiquidity, that market participants would reflect in pricing the future cash flows the entity expects to derive from the asset

- Cash flow projections should be based on reasonable and supportable assumptions, the most recent budgets and forecasts, and extrapolation for periods beyond budgeted projections. [IAS 36.33]

IAS 36.33 requirements and implication for planning horizon

- IAS 36.33 states that:

In measuring value in use an entity shall:

- (b) base cash flow projections on the most recent financial budgets/forecasts approved by management, but shall exclude any estimated future cash inflows or outflows expected to arise from future restructurings or from improving or enhancing the asset's performance. Projections based on these budgets/forecasts shall cover a maximum period of five years, unless a longer period can be justified.
 - (c) estimate cash flow projections beyond the period covered by the most recent budgets/forecasts by extrapolating the projections based on the budgets/forecasts using a steady or declining growth rate for subsequent years, unless an increasing rate can be justified. This growth rate shall not exceed the long-term average growth rate for the products, industries, or country or countries in which the entity operates, or for the market in which the asset is used, unless a higher rate can be justified.
- IAS 36.33 (b) presumes that budgets and forecasts for the planning period of a company should not go beyond five years.
 - Due to IAS 36.33 (c) an extrapolation of cash flows of the last planned year with a stable or decreasing growth rate for the following years is required by IFRS after the detailed planning period.

The requirement of sustainable parameters for a terminal value after only 5 years is normally a contradiction in terms due to a lack of immediate steady state after the detailed planning period.

IAS 36.33 requirements and implication for planning horizon

- IAS 36.33 states that:

In measuring value in use an entity shall:

- (b) base cash flow projections on the most recent financial budgets/forecasts approved by management, but shall exclude any estimated future cash inflows or outflows expected to arise from future restructurings or from improving or enhancing the asset's performance. Projections based on these budgets/forecasts shall cover a maximum period of five years, unless a longer period can be justified.
 - (c) estimate cash flow projections beyond the period covered by the most recent budgets/forecasts by extrapolating the projections based on the budgets/forecasts using a steady or declining growth rate for subsequent years, unless an increasing rate can be justified. This growth rate shall not exceed the long-term average growth rate for the products, industries, or country or countries in which the entity operates, or for the market in which the asset is used, unless a higher rate can be justified.
- **Precondition for terminal value from valuation perspective: a steady state** has been reached, where cash flows only fluctuate marginally and a clear trend is observable.
 - Since the steady state is seldom accomplished after the detailed planning phase, **an extrapolation of cash flows through a convergence** phase is used for modeling purposes to smooth future cash flows towards the long term steady state (i.e. **terminal value**).

In order to meet the IFRS requirements and resolve the contradiction of sustainable parameters, it can be appropriate to use a convergence phase exceeding 5 periods and discount the present value **equivalent with an annuity conversion factor** of all future cash flows after a planning period of five years.

Value in use: Practical example of present value conversion

Impairment Test - Valuation CGU Example, Inc.											
	PLAN	PLAN	PLAN	PLAN	PLAN	CONV	CONV	CONV	CONV	STEADY STATE	TV
<i>Financials in EUR m (unless otherwise stated)</i>	YTG 2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2026
	31.12.2017	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022	31.12.2023	31.12.2024	31.12.2025	31.12.2026	31.12.2026
Value in use calculation and impairment test											
Revenues	49.6	710.2	749.0	824.8	893.2	951.0	995.2	1,023.3	1,033.5		1,043.8
Growth (yoy)		n/a	5.5%	10.1%	8.3%	6.5%	4.6%	2.8%	1.0%		1.0%
Gross profit	12.3	200.8	225.0	250.9	267.0	279.3	287.0	289.7	287.2		290.0
Gross margin (%)		28.3%	30.0%	30.4%	29.9%	29.4%	28.8%	28.3%	27.8%		
EBIT	4.0	90.7	103.0	116.6	121.6	124.4	124.9	123.1	118.9		120.0
EBIT margin (%)		12.8%	13.8%	14.1%	13.6%	13.1%	12.6%	12.0%	11.5%		11.5%
- income taxes	-1.1	-25.4	-28.8	-32.6	-34.0	-34.8	-35.0	-34.5	-33.3		-33.6
NOPLAT	2.9	65.3	74.2	83.9	87.5	89.6	90.0	88.6	85.6		86.4
+ D&A	1.4	19.6	24.0	28.5	30.1	31.1	31.7	31.6	31.0		31.3
- Capex	-4.9	-57.8	-53.5	-46.1	-46.1	-44.9	-42.7	-39.5	-35.4		-35.8
- Change in NWC	3.5	-1.7	-8.8	-10.4	-19.0	-16.0	-12.2	-7.6	-2.6		-2.9
- Others (incl. change in provisions)	-1.7	7.8	2.8	3.5	2.8	2.1	1.4	0.7	0.0		0.0
Cash flow	1.2	33.2	38.6	59.5	55.3	61.8	68.1	73.8	78.5		79.0
discount factor	1.00	0.94	0.89	0.84	0.79	0.75	0.71	0.67	0.63		0.59
Present value of cash flow	1.2	31.2	34.3	49.8	43.7	46.2	48.1	49.2	49.4		47.0
Present value CF plan & conv											400.1
Present value CF terminal value											969.5
Value in use of CGU Example											1,369.6

Impairment Test - Valuation CGU Example, Inc.						
	PLAN	PLAN	PLAN	PLAN	PLAN	TV
<i>Financials in EUR m (unless otherwise stated)</i>	YTG 2017	2018	2019	2020	2021	2022
	31.12.2017	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022
Additional calculation: Conversion to 5 year planning period						
Revenues	49.6	710.2	749.0	824.8	893.2	1,048.4
Growth (yoy)			5.5%	10.1%	8.3%	17.4%
Gross profit	12.3	200.8	225.0	250.9	267.0	292.7
Gross margin (%)		28.3%	30.0%	30.4%	29.9%	27.9%
EBIT	4.0	90.7	103.0	116.6	121.6	122.0
EBIT margin (%)		12.8%	13.8%	14.1%	13.6%	11.6%
- income taxes	-1.1	-25.4	-28.8	-32.6	-34.0	-34.2
NOPLAT	2.9	65.3	74.2	83.9	87.5	87.8
+ D&A	1.4	19.6	24.0	28.5	30.1	31.7
- Capex	-4.9	-57.8	-53.5	-46.1	-46.1	-37.1
- Change in NWC	3.5	-1.7	-8.8	-10.4	-19.0	-4.2
- Others (incl. change in provisions)	-1.7	7.8	2.8	3.5	2.8	0.2
Cash flow	1.2	33.2	38.6	59.5	55.3	78.4
discount factor	1.00	0.94	0.89	0.84	0.79	15.42
Present value of cash flow	1.2	31.2	34.3	49.8	43.7	1209.4
Value in use of CGU Example						1,369.6



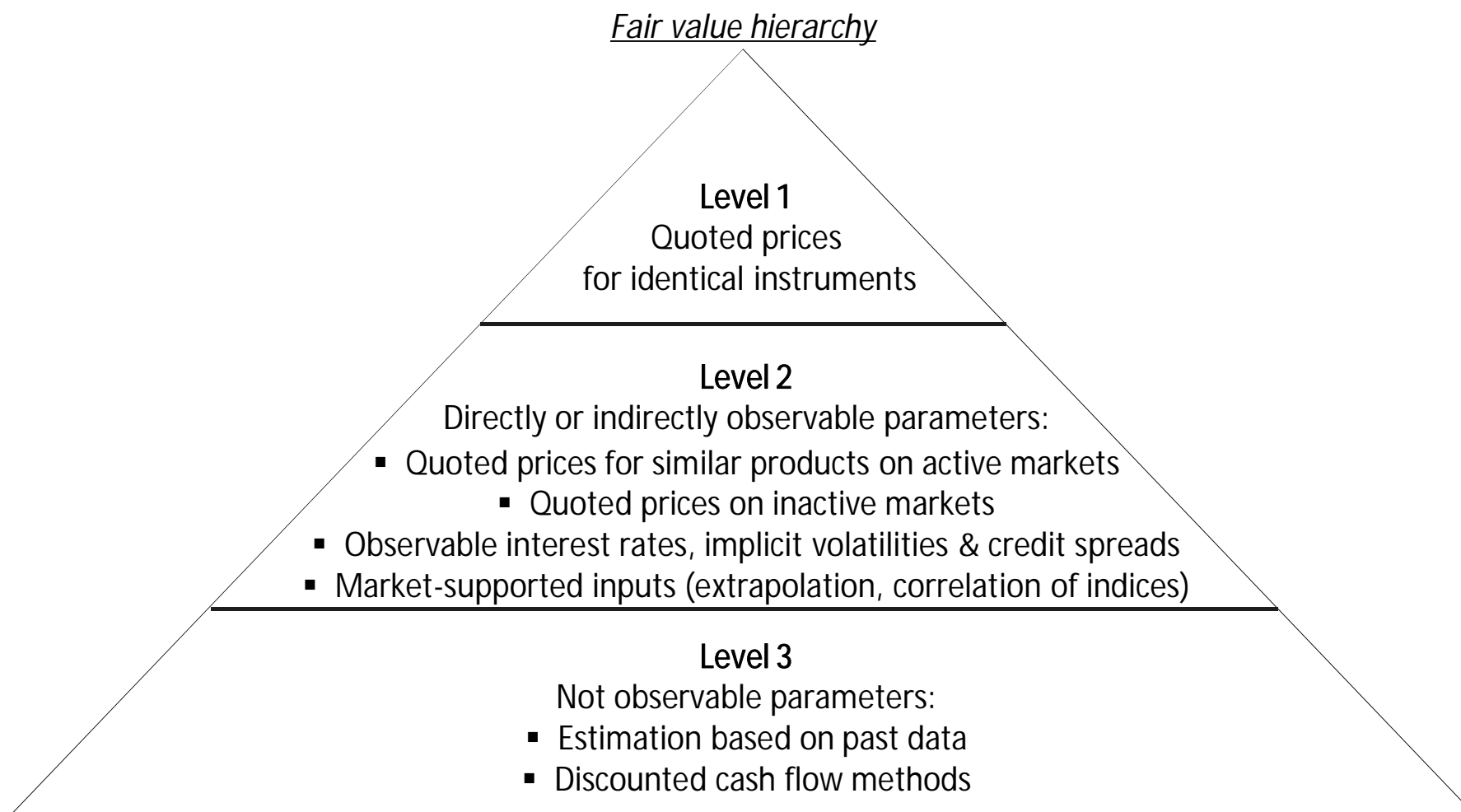
Present value of all discounted future cash flows (convergence period and terminal value) leads to same value in use

4. ii. Fair value less costs of disposal

Determination of fair value less costs of disposal

Fair value

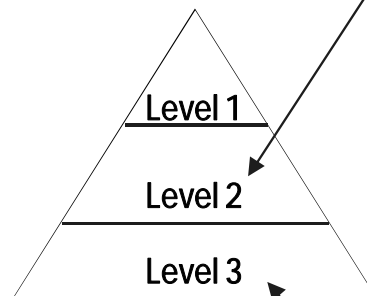
"Fair value is the price that would be received to sell an asset or paid to a liability in an orderly transaction between market participants at the measurement date." [IFRS 13]



Examples for fair value hierarchy

Fair value

"Fair value is the price that would be received to sell an asset or paid to a liability in an orderly transaction between market participants at the measurement date." [IFRS 13]



*"The recoverable amount of the CGU is determined through a fair value less cost to sell calculation. [...] As AIXTRON has only one CGU, market capitalization of AIXTRON, adjusted for a control premium, has been used to determine the fair value less cost to sell of the CGU. This is level 2 in the hierarchy of fair value measures set out in IFRS 13."
(AIXTRON SE, Annual Report 2016)*

*"The recoverable amount or the fair value less cost of sale [...] is calculated based on the budget for 2017 as well as four subsequent budget years derived from company's medium-term forecasts. Income beyond the five-year period has been extrapolated based on a steady growth rate of 1.00%. The fair value determined for both segments is assigned to Level 3 in the fair value hierarchy."
(Nordex SE, Annual Report 2016)*

Fair value less costs of disposal vs value in use

	IAS 36: Fair value less costs of disposal	IAS 36: Value in use
Valuation object	CGU/asset	
Perspective of valuation	Typified market participant's view	Reporting company's view
Valuation method	IFRS 13: Market approach, Income approach (DCF)	Income approach (DCF)
Planning period	Market participant's view	In general 5 years
Synergies	Synergies of market participant	All synergies
Cash flow: Consideration of expansion investment and restructuring measures	Measures which would be undertaken by market participant	Not to be considered
Cost of capital	WACC-Approach: Capital structure of peer group, cost of debt and beta; In practice: Consideration of taxes (WACC after taxes)	
	n/a	Recursive determination of pre-tax WACC
	Long-term market growth rate	Limited long-term growth due to non-consideration of expansion capex

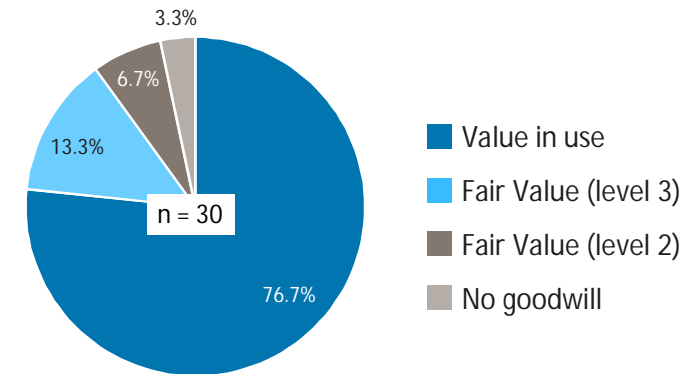
5. Empirical analysis of tech and high growth companies

Key observations: TecDAX companies

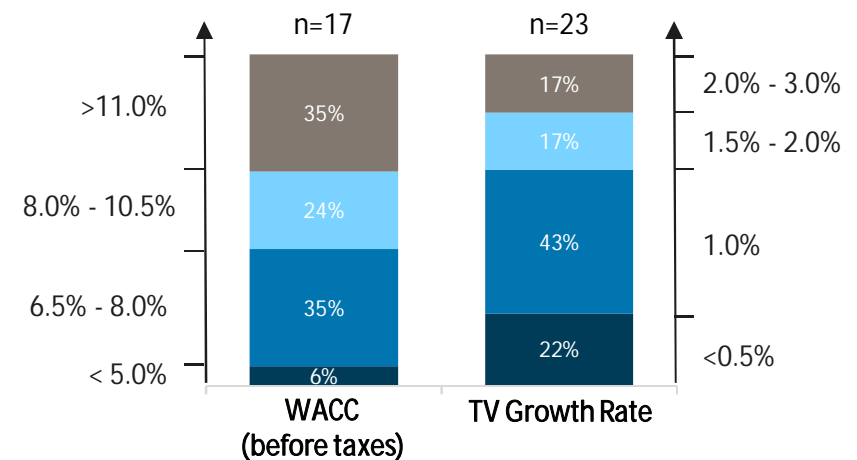
Analysis of impairment testing among TecDAX companies

- The analysis is based on **the 30 companies from the TecDAX Index**.
- The **value in use** concept was mainly used as recoverable amount in order to conduct a goodwill impairment test of CGUs. Consequently, the fair value less costs of disposal was rarely observed and often stated to be lower than the value in use.
- **The vast majority of the analyzed TecDAX companies (23 of 30) used the value in use as recoverable amount**, while six entities applied the fair value less costs of disposal. According to the fair value hierarchy of IFRS 13, four fair values were derived using level 3 and two using level 2.
- **The WACC (before taxes) for the analyzed TecDAX companies amounted on average to 9.7%**, while the observed terminal value growth rates were on average 1.2%.
- Planning periods are usually **5 years or shorter**, as generally required by IAS 36. However, especially for **project-related CGUs there is a tendency towards longer planning periods** (e.g. 22 years for EVOTEC).

Recoverable amount calculated as:



DCF-model parameters:



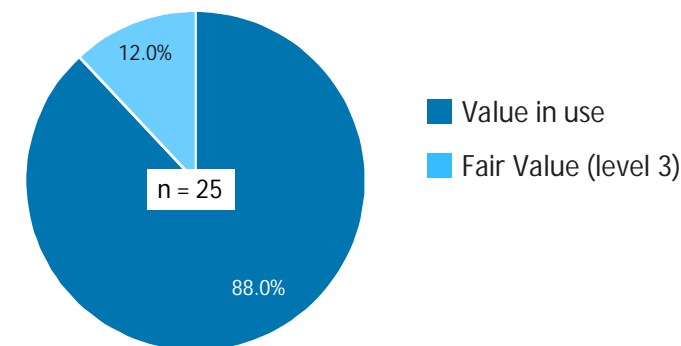
Procedure for **goodwill impairment testing** in TecDAX companies is diversified, with a majority of companies applying the **value in use** concept (77%). Discount rates (average of 9.7% before taxes for value in use) and terminal value growth rates (average of 1.2%) are on moderate levels.

Key observations: MSCI Europe Small Cap Index

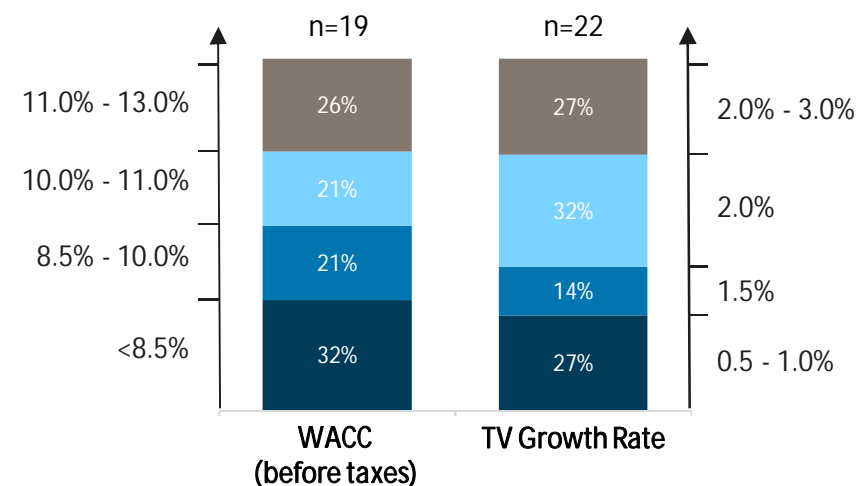
Analysis of impairment testing among MSCI Europe Small Cap companies

- The following analysis of high growth companies examines **25 companies from the MSCI Europe Small Cap Index**.
- Selection criteria: Above average with regard to **market capitalization and 3-year revenue-CAGR** compared to the other index companies.
- The **value in use** concept was mainly used as recoverable amount in order to conduct a goodwill impairment test of CGUs.
- Three entities of the analyzed MSCI Europe Small Cap companies applied the fair value less costs of disposal (level 3).
- The **WACC (before taxes) for the analyzed companies** amounted on average to **9.5%**, while the observed terminal value **growth rates** were on average 1.8%, fluctuating around **target inflation rate of 2%**.
- **Planning periods** are on average **4.4 years**, as generally required by IAS 36.

Recoverable amount calculated as:



DCF-model parameters:



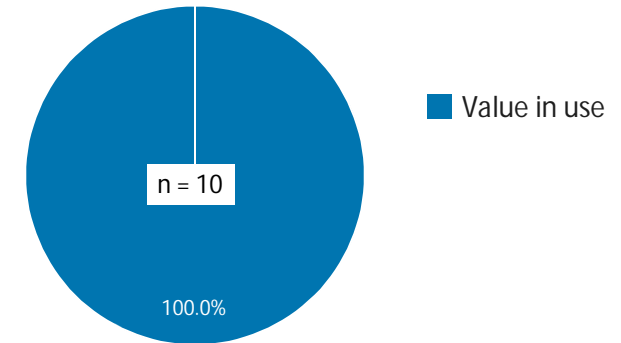
The **terminal value growth rates** of selected companies included in the MSCI Europe Small Cap Index are **on average 1.8%** and, therefore, **higher than the observed growth rates of TecDAX companies**.

Key observations: Additionally selected growth companies

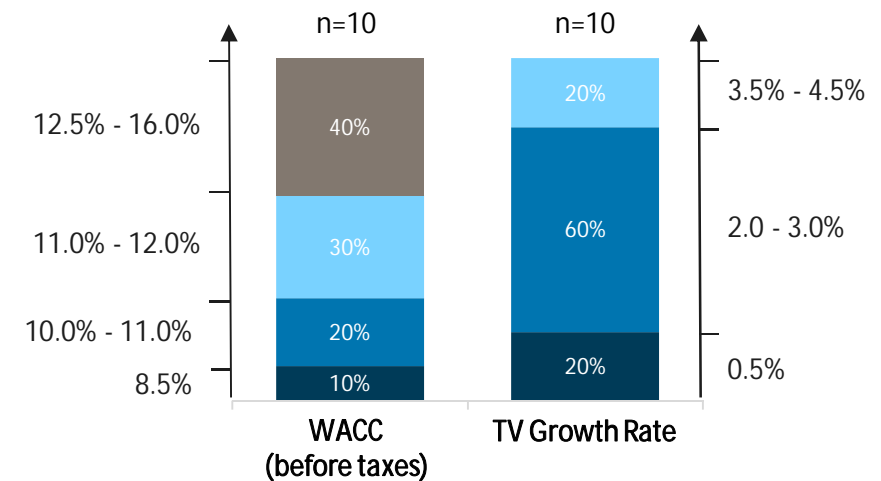
Analysis of impairment testing among high growth companies

- The following analysis examines **10 additionally selected European growth companies**.¹⁾
- Only the **value in use** concept was used as recoverable amount in order to conduct a goodwill impairment test of CGUs.
- The **WACC (before taxes) for the analyzed companies** amounted on average to **11.9%**, while the observed terminal value **growth rates** were on average 2.4%.
- **Planning periods** are on average **4.6 years**, as generally required by IAS 36.

Recoverable amount calculated as:



DCF-model parameters:



The **terminal value growth rates** of additionally selected European growth companies are **on average 2.4%** and, therefore, **higher than the observed growth rates of selected MSCI Europe Small Cap Index companies**.

¹⁾Criteria: Market capitalization > EUR 1bn; 3-year-revenue-CAGR > 20%.

Analysis of goodwill impairment and corresponding transaction

Purpose: Examining the relationship between goodwill impairment and the corresponding transaction

1. Selection of the company base to be analyzed:

- 30 companies based on the S&P Capital IQ database mainly with following criteria: latest market capitalization > EUR 500m, geographical location Europe, goodwill impairment > EUR 50m, all industries except Financials
- 15 companies based on findings of diverse impairment and cost of capital studies (Duff & Phelps, KPMG, etc.)
- Over 20 companies based on further information sources (company reports, google search, press releases, newsletters, etc.)
- The companies selected are located in Europe and are reporting under IFRS. In addition to these, we analyzed 6 acquisitions of famous big-cap companies from the USA and Japan that led to significant goodwill impairment
- The analysis comprises financial reports of the observation period 2005-2016

2. Analyzing the company database:

- The annual and interim financial reports of the selected companies were examined with regard to goodwill impairment date and volume, the related transaction date and volume and the initial goodwill recognition as well as the reasons for the goodwill impairment

Overall **more than 70 companies** were selected for the analysis purposes. The annual and interim **financial reports of the companies** were examined with regard to goodwill impairment, the related transaction and the time period between the transaction and the **impairment.**

Analysis of goodwill impairment and corresponding transaction

Main findings:

- The number of financial reports **with sufficient disclosures for analysis purposes is strongly limited**
- In most cases the companies refer to cash generating units and **do not specify the transaction the goodwill impairment relates to**

Buyer	Geographical location	Target	Transaction date	Transaction volume In m EUR	Initial goodwill amount of transaction In m EUR	Goodwill Impairment date	Amount of goodwill Impairment In m EUR	Reasons for Impairment
ACEA S.p.A.	Europe	Crea Group	n.a.	n.a.	n.a.	FY 2010	3.4	n.a.
Adidas AG	Europe	Reebok Int. Ltd.	03.08.2005	3,800	1,165	FY 2012	265	Adjusted growth assumptions
Deutsche Telekom AG	Europe	T-Mobile UK	n.a.	n.a.	n.a.	FY 2009	1,800	Economic slowdown, tough competition, regulatory decisions in the UK

- In some cases the **goodwill was written off even within one year** after the transaction was closed

Buyer	Geographical location	Target	Transaction date	Transaction volume In m EUR	Initial goodwill amount of transaction In m EUR	Goodwill Impairment date	Amount of goodwill Impairment In m EUR	Reasons for Impairment
Rocket Internet SE	Europe	Grupo Yamm Comida a Domicilio S.L.	26.01.2015	80.4	70.1	FY 2015	3.7	n.a.
Rocket Internet SE	Europe	WEBS S.r.l.	30.01.2015	51.3	45.2	FY 2015	14.4	n.a.
SMA Solar Technology AG	Europe	Jiangsu Zeyersolar New Energy Co. Ltd.	12.03.2013	22.1	12.9	FY 2013	12.9	Change in the sales estimate incorporated into the company's planning

- Famous multinational companies recorded **significant goodwill charges** due to unsuccessful acquisitions

Buyer	Geographical location	Target	Transaction date	Transaction volume In m USD	Initial goodwill amount of transaction In m USD	Goodwill Impairment date	Amount of goodwill Impairment In m USD	Reasons for Impairment
HP Inc.	USA	Autonomy	13.10.2011	10,395	6,600	FY 2012	5,700	Accounting improprieties, misrepresentations and disclosure failures by the previous management
Sumitomo Corporation	Japan	Edgen Group	20.11.2013	820.2	323	FY 2016	178	Decline in demand resulting from drop in oil prices

Only few companies disclose detailed information concerning the goodwill impairment and the related transaction in their financial reports. Goodwill impairment shortly after acquisition is observable, but seldom.

6. Practical implications and conclusion

Practical implications and conclusion

Conclusion

- In practice, auditors and regulators interpret IFRS rules more flexible and focus on underlying value and growth drivers
- Companies should not limit flexibility by focusing on only one valuation concept (e.g. Value in use)
- Three-phase-models are frequently used to derive sustainable free cash flows and accurate DCF values and do not contradict IFRS principles
- Documentation is key!
 - Underlying technology cycles and growth assumptions should be properly documented and linked to cash flow planning
 - Benchmarking with market data adds reliability to chosen valuation concept and establishes value ranges
- German auditors have a specific standard (and methodology) to check plausibility of business plans (IDW Praxishinweis 2/2017)
- Documentation of planning accuracy helps to build trust with auditors

Appendix

Empirical analysis of high growth companies

Detailed analysis of companies from the TecDAX Index (1)

Overview of key inputs for goodwill impairment testing of CGUs located in developed markets (2016)

TecDAX companies (1)	Recoverable amount derivation	Discount rate (WACC before taxes)	Terminal value growth rate	Planning period	Auditor
Bechtle	Value in use	4.5%	1.9%	2 years	Ernst & Young
Carl Zeiss Meditec	Value in use	-	1.0%	5 years	Ernst & Young
CompuGroup Medical	Value in use	7.5 – 10.2% (after taxes)	1.0%	5 years	PWC
Dialog Semiconductor	Value in use	11.2 – 14.3%	2.0%	3 years	Deloitte
Drägerwerk	Value in use	7.3% (after taxes)	1.0%	5 years	Deloitte
Evotec	Value in use	6.6 – 10.8% (after taxes)	0.0%	5 – 22 years	Ernst & Young
Jenoptik	Value in use	5.8 – 8.3% (after taxes)	0.9 – 1.1%	5 years	Ernst & Young
Nordex	Fair value less costs of disposal (IFRS 13 level 3)	8.9 – 9.6%	1.0%	5 years	PWC
Siltronic	Value in use	10.4%	0.0%	-	KPMG
United Internet	Fair value less costs of disposal (IFRS 13 level 3)	5.0 – 8.0% (after taxes)	0.5%	12 years	BDO
Wirecard	Value in use	7.5 – 9.9% (after taxes)	1.0 – 2.0%	5 years	Ernst & Young
Cancom	Value in use	7.0%	0.0%	5 years	S&P
RIB Software	Value in use	6.9 – 8.1%	1.0%	5 years	BW Partner
Sartorius	Value in use	7.9 – 8.8%	1.5 – 2.5%	4 years	KPMG
Xing	Value in use	7.9%	2.0%	3 - 5 years	PWC
Telefónica Deutschland ¹⁾	Fair value less costs of disposal (IFRS 13 level 2)	-	-	-	Ernst & Young
Drillisch	Value in use	5.7 – 9.4%	0.5%	5 years	BDO
freenet	Fair value less costs of disposal (IFRS 13 level 3)	6.0 – 7.4% (after taxes)	0.0 – 1.0%	4 years	PWC
Software Aktiengesellschaft	Fair value less costs of disposal (IFRS 13 level 3)	6.4 – 7.6% (after taxes)	0.0 – 2.0%	3 years	BDO
Pfeiffer Vacuum Technology	Value in use	7.8 – 10.3%	1.5%	3 years	Ernst & Young

¹⁾Fair value derived from current market cap.

Empirical analysis of high growth companies

Detailed analysis of companies from the TecDAX Index (2)

Overview of key inputs for goodwill impairment testing of CGUs located in developed markets (2016)

TecDAX companies (2)	Recoverable amount derivation	Discount rate (WACC before taxes)	Terminal value growth rate	Planning period	Auditor
S&T	Value in use	8.4 – 22.3%	1.0%	4 years	Ernst & Young
Aixtron ¹⁾	Fair value less costs of disposal (IFRS 13 level 2)	-	-	-	Deloitte
SLM Solutions ²⁾	-	-	-	-	PWC
GFT Technologies	Value in use	11.2 – 11.4%	1.0%	4 years	KPMG
ADVA Optical Networking	Value in use	6.8 – 8.3%	0.0%	3 years	Grant Thornton International
Morphosys	Value in use	11.9 – 12.2%	1.0%	10 - 30 years	PWC
SMA Solar Technology	Value in use	13.4 – 14.7%	1.0%	3 years	Deloitte
Medigene	Value in use	9.9% (after taxes)	-	20 - 24 years	Ernst & Young
Nemetschek	Value in use	10.9 – 13.8%	1.9%	3 - 4 years	Ernst & Young
QIAGEN	Value in use	6.8%	3.0%	5 years	KPMG
Average ³⁾ (value in use)	n/a	9.7% ⁴⁾	1.2% ⁵⁾	4.1 years ⁵⁾	n/a
Average ³⁾ (fair value less cost of disposal)	n/a	9.3% ⁴⁾	0.8% ⁵⁾	4.0 years ⁵⁾	n/a

¹⁾Fair value derived from current market cap. ²⁾no goodwill in the balance sheet. ³⁾In order to estimate bandwidths, the average was chosen. ⁴⁾Average without considering after-tax values.

⁵⁾Average without Evotec, United Internet, Morphosys and Medigene (planning periods of > 5 years).

Empirical analysis of high growth companies

Detailed analysis of selected companies from MSCI Europe Small Cap Index (1)

Overview of key inputs for goodwill impairment testing of CGUs located in developed markets (2016)

Selection from Index ¹⁾ (1)	Recoverable amount derivation	Discount rate (WACC before taxes)	Terminal value growth rate	Planning period	Auditor
Rheinmetall	Value in use	9.3 – 10.9%	1.0%	3 years	PWC
Aalberts Industries	Value in use	9.7 – 15.7%	1.0%	5 years	Deloitte
Moncler	Value in use	8.3%	2.0%	3 years	KPMG
Informa	Fair value less costs of disposal (IFRS 13 level 3)	8.9 – 14.9%	1.9 – 3.9%	5 years	Deloitte
Hiscox	Value in use	6.6%	-	5 years	PWC
Compagnie Plastic Omnium	Value in use	7.5 – 9.0% (after taxes)	1.5%	4 years	EY
Ald	Value in use	5.0 – 12.4%	2.0%	5 years	Deloitte
Rubis	Value in use	4.8 – 11.5%	1.0%	3 years	Mazars Group
SSAB	Value in use	7.1 – 10.3%	2.0%	5 years	PWC
Hapag Lloyd	Value in use	8.2% (after taxes)	1.0%	5 years	KPMG
LEG Immobilien	Fair value less costs of disposal (IFRS 13 level 3)	3.2%	0.8%	5 years	PWC
OCI	Value in use	10.5 – 13.6%	1.5%	7 years	KPMG
DS Smith	Value in use	9.5%	1.5%	2 years	Deloitte
Orpea	Value in use	6.5%	1.5%	5 years	Deloitte
YOOX Net-A-Porter Group	Value in use	8.3% (after taxes)	2.5%	4 years	KPMG

¹⁾Criteria: Top 25 Index companies by market capitalization and 3-year-revenue-CAGR.

Empirical analysis of high growth companies

Detailed analysis of selected companies from MSCI Europe Small Cap Index (2)

Overview of key inputs for goodwill impairment testing of CGUs located in developed markets (2016)

Selection from Index ¹⁾ (2)	Recoverable amount derivation	Discount rate (WACC before taxes)	Terminal value growth rate	Planning period	Auditor
NMC Health	Value in use	8.5%	3.0%	5 years	Delgawi
Rentokil Initial	Value in use	8.0% – 13.0%	0.9 – 5.0%	5 years	KPMG
Temenos Group	Value in use	10.8%	1.0%	4 years	PWC
Kingspan Group	Value in use	7.8% – 9,5%	2.0%	5 years	KPMG
Halma	Value in use	8.8% – 12.5%	1.9 – 2.6%	4 years	Deloitte
Austriamicrosystems INH ²⁾	Fair value less costs of disposal (IFRS 13 level 3)	-	2.0%	5 years	KPMG
Melrose Industries	Value in use	11.0% – 12.8%	2.2 – 3.0%	4 – 5 years	Deloitte
Just Eat	Value in use	9.3% – 16.1%	1.5 – 3.6%	5 – 8 years	Deloitte
Trelleborg Group	Value in use	7.2% (after taxes)	2.0%	5 years	PWC
Gemalto	Value in use	9.5% (after taxes)	2.0%	4 years	KPMG
Average ³⁾ (value in use)	n/a	9.7% ⁴⁾	1.8%	4.3 years ⁵⁾	n/a
Average ³⁾ (fair value less cost of disposal)	n/a	7.6% ⁴⁾	1.9%	5.0 years	n/a

¹⁾ Criteria: Top 25 Index companies by market capitalization and 3-year-revenue-CAGR. ²⁾ fair value via multiples; DCF for plausibility. ³⁾ In order to estimate bandwidths, the average was chosen. ⁴⁾ Average without considering after-tax values. ⁵⁾ Average without JUST EAT and OCI (planning periods of > 5 years).

Empirical analysis of high growth companies

Detailed analysis of additionally selected growth companies

Overview of key inputs for goodwill impairment testing of CGUs located in developed markets (2016)

Selected company ¹⁾	Recoverable amount derivation	Discount rate (WACC before taxes)	Terminal value growth rate	Planning period	Auditor
Micro Focus Internat. ²⁾	Value in use	11.4%	1 – 5%	5 years	PWC
Paddy Power Betfair	Value in use	9.0 – 13.5%	2 - 5%	3 – 10 years	KPMG
YOOX Net-A-Porter Group	Value in use	8.3 (after taxes)	2,5%	4 years	KPMG
Basic-Fit	Value in use	10.3 – 13%	0,5%	5 years	Ernst & Young
Takeaway.com	Value in use	10.1 – 10.2%	0,5%	5 – 10 years	Deloitte
JUST EAT	Value in use	9.3 – 16.1%	1.5 – 3.6%	5 – 8 years	Deloitte
Keywords Studios	Value in use	12.5%	2%	5 years	BDO
NMC Health	Value in use	8.5%	3%	5 years	Delgawi
RPC Group	Value in use	10 – 12%	0 – 4%	3 years	Deloitte
Sanne Group	Value in use	10.4 – 16.7%	4 - 5%	5 years	Deloitte
X5 Retail Group	Value in use	15.9%	-	10 years	Ernst & Young
Average ³⁾	n/a	11.9% ⁴⁾	2.4%	4.6 years ⁵⁾	n/a

¹⁾ Criteria: Market capitalization > EUR 1bn; 3-year-revenue-CAGR > 20% ²⁾ FY 2017 ³⁾ In order to estimate bandwidths, the average was chosen. ⁴⁾ Average without considering after-tax values.

⁵⁾ Average without Paddy Power Betfair, Takeaway.com, JUST EAT and X5 Retail Group (planning periods of > 5 years).