Trends in Accounting Research Conference (TARC) 2019

Investment Appraisal Methods in Practice

Status Quo and historical trends for German-speaking Countries

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Structure

1 **Objective / Motivation**

2 **Available empirical studies**

3 **Deduction of hypothesis**

4 **Conception and implementation of the empirical survey**

5 **Evaluation of the survey**

6 **Critical observation and outlook**

Appendix

Literature

Jonen, A. / Harbrücker (2019): Investitionsrechenverfahren in der Praxis: Aktueller Stand und historische Entwicklung. In: Mannheimer Beiträge zur Betriebswirtschaftslehre, Mannheim 2019.

1. Objective / Motivation

- **History:**
  - **Business theory** has been dealing with investment appraisal methods for **many decades**
  - Beginnings of methods in **German-language literature** can be found since the **1930s**
  - In the following years **more and more exact methods** were developed to answer questions regarding investment decisions

- **Importance:**
  - **Investment quote** (investments/GDP) in **Germany** has remained stable at **over 20%** in recent years
  - Investment planning is an **essential basis** for the economic **success** of companies
  - **Careful assessment** of investments for companies is necessary due to
    - prevalent long-term character
    - associated complexity and risk
    - high costs associated with reversibility
    - inability to invest in other projects due to tied up capital

GDP: Gross Domestic Product

1. Objective / Motivation

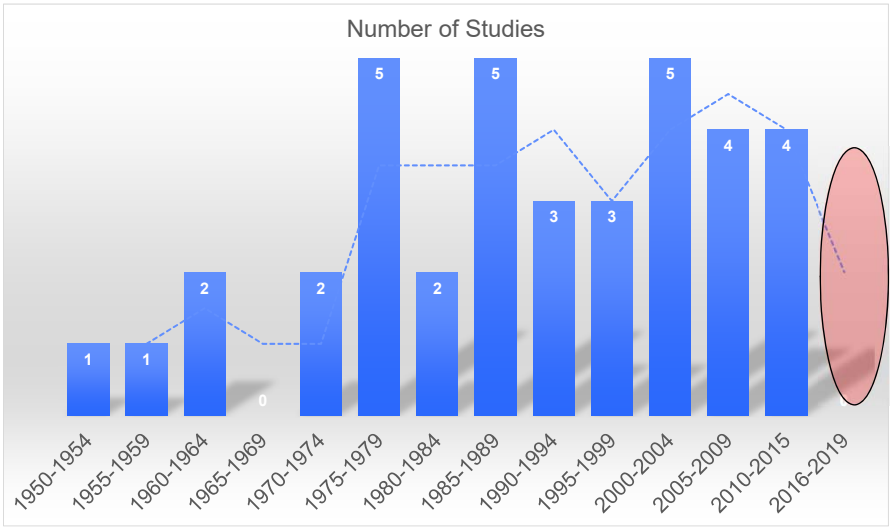
- **Result of studies in the past**: "mismatch between theory and practice"

- **Status quo of empiric analysis:**
  - Last 15 years: relatively few studies on this topic have been carried out
  - Focus relatively seldom on factors / reasons (size, investment intensity,…) for relatively low use of theoretically superior methods

- **Target / Research question**:
  - Evaluation of status quo
  - Detection of factors influencing choice of methods

See Arnold, G. C./Hatzopoulos, P. D. (2000): p. 612f.

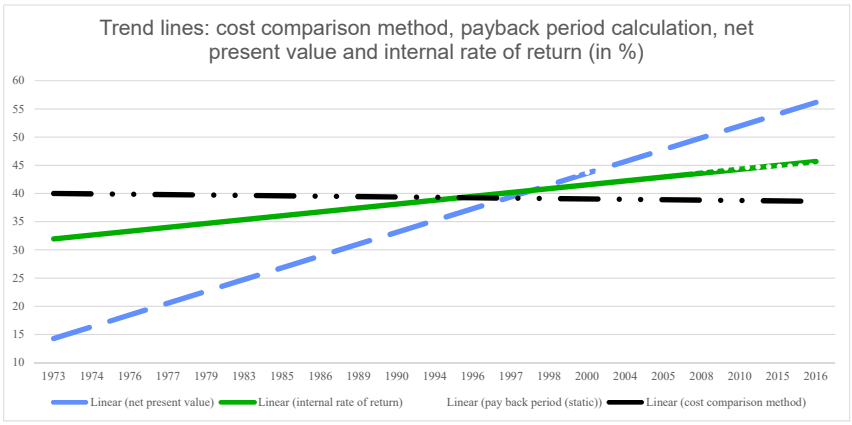
2. Available empirical studies



➔ Thirty-seven investigations since 1954
➔ Low amount of studies in the last few years

2. Available empirical studies

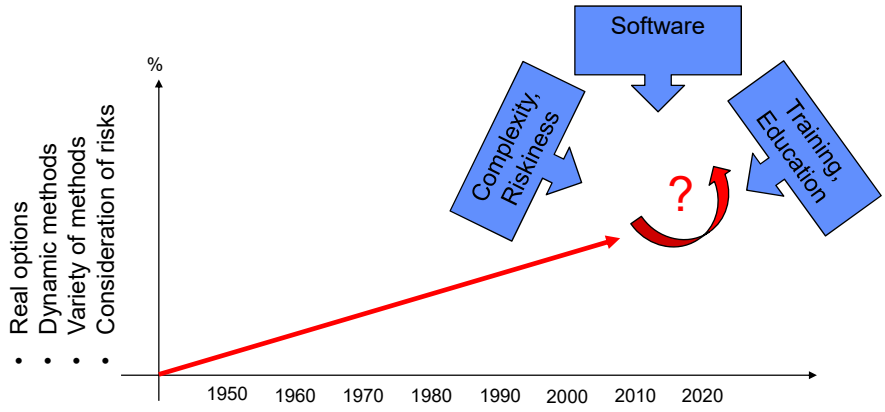
Main Results of historical studies



➔ Trend towards higher use of dynamic methods
➔ Parallel usage of methods must have increased (several methods show intensive raise in use)

3. Deduction of hypothesis

Historical Development



3. Deduction of hypothesis

Research Model

Independent variable
Size (LSE vs. SME)
Investment volume
Investment quote

Depended variable
Quality of methods
Knowledge of methods
Variety of methods
Integration of risks

Depended variable
Quality of methods
Knowledge of methods
Variety of methods
Integration of risks

Independent variable
Success

Volkart, R. (1998): p. 20, Heidtmann, D./Däumler, K.-D. (1997): p. 22, Walker, M. C./Klammer, T. P. (1984): p. 138, Gitman, L. J./Forrester, J. R. (1977): p. 68f. and Petry, G. H. (1975): p. 61f.

LSE: large scale enterprise / SME: small and medium sized enterprises

4. Sample description

General

- **Time period**: March – July 2018
- **Contacted Companies / Sample**:
  - Partner companies of Baden-Wuerttemberg Cooperative State University Mannheim
  - +500 largest German companies
  - ➔ 1.191 companies
  - Technical realization: Email + Website survey
  - 276 useable data sets (23.2 % return rate)

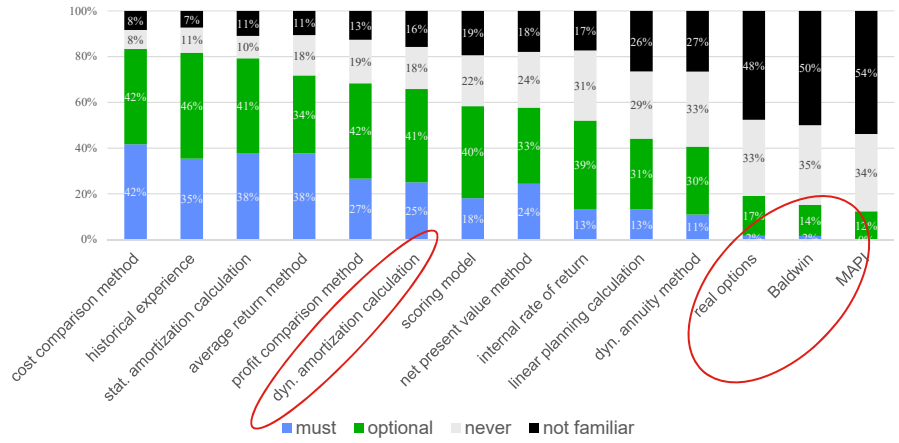
4. Sample description

Representativeness

Sector distribution	significant correlation between sample and German companies
Age distribution	Predominant part of companies exists more than 10 years (~97 %)
Size distribution	Large companies over-represented
Profitability (self assessment)	46 % better than branch average, 44 % on branch average, only 10 % worse than branch average
Bias	
Non-response bias	Okay
Information bias	Okay

5. Evaluation of the survey

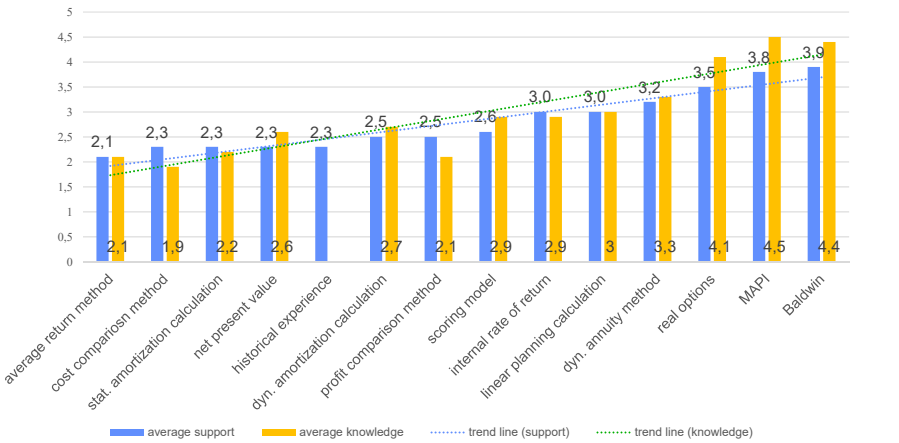
Application of investment appraisal methods



➔ Static methods most often used (must and optional)
➔ First dynamic method (dynamic amortization calculation), sixth place
➔ Real options, Baldwin and MAPI seldom used

5. Evaluation of the survey

Decision support and knowledge of methods (school grades)

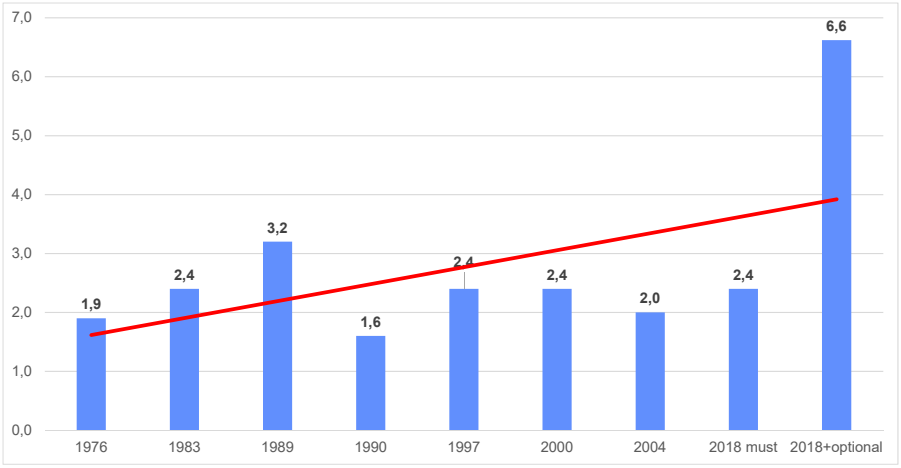


➔ Static methods first three ranks, fourth place first dynamic method (net present value)
➔ High correlation between knowledge of methods and application

Hypothesis testing: Historical development

#	Hypothesis	Result
1	**More intensive** use of **dynamic methods**	• Significant increase in three of the four dynamic methods (significance level 0.01 and 0.05) • significant increase with only one of four static methods (significance level 0.01)
2	**Variety** of methods ("must" and "optional") has **grown** further, which can be shown by a higher number of methods used in parallel	• Increase over time can be clearly seen ➔ see diagram (next slide) • Increase can be confirmed at a significance level of 0.05
3	Growing knowledge of **real options** and better technical support leads to a more intensive use	• “must” method: 2% • “optional” method: 17% • Highest number ever reported • No significant correlation between size of company and use of real options

Hypothesis 2: Variety of methods over time



➔ Increase of variety over time (but not significant for past 20 years)

➔ highest value in actual analysis (but not all studies included optional methods)

5. Evaluation of the survey

Hypothesis testing: Size

#	Hypothesis	Result
4	Quality of investment appraisal methods used is higher in **large** enterprises than in **SMEs**	• "grade of quality of methods used" was related to size classes of enterprises (based on turnover) • Significant correlation (significance level of 0.01)
5	The **larger** the company, **the more methods** are used to include **risks**	• Data analysis shows a correlation between size of companies and intensity of inclusion of risks (0.05 significance level)

5. Evaluation of the survey

Hypothesis testing: intensity of investment, company success

#	Hypothesis	Result
6	The higher the **quote of investment**	
	the higher the **knowledge** of investment appraisal methods	• Correlation (-0.162) • Not significant
	the more intensively methods with higher **quality** are used.	• No correlation
	the higher the **variety** of methods	• Significant correlation (significance level: 0.05)
7	The more **intensive the analysis** of **investments** the more companies are **successful**	• Significant correlation (Spearman 0.01)

5. Evaluation of the survey

Success factors: multiple regression analysis

influencing factor		correlation	significance
methods	variety	0,327	*0,004*
	quality of applied methods	0,111	*0,128*
	level of knowledge	-0,224	*0,010*
interest rate update		0,057	*0,291*
risk consideration		0,198	*0,034*
coverage rate of investments		-0,110	*0,102*
rejection of projects with negative results		-0,017	*0,434*
inclusion of tax aspects		-0,083	*0,203*

➔ Three factors were included in multi-regression analysis

➔ Highest value was achieved if only the variety of methods was used as influencing factor (corrected R-square)

5. Evaluation of the survey

Summary

- **Historical Comparison**:
  - Significant increase of use of dynamic methods
  - No increase for static methods
- In comparison to all empiric analysis/ analytic surveys conducted in the past, **real options** have never been claimed to be used as much as this survey showed (with about 19%)
- **Variety of methods:**
  - Highest usage rate ever detected
  - Significant correlation between success of companies and variety of investment appraisal methods used
- **Contribution:**
  - Education: stronger impact on wrong decisions which can occur using the wrong method
  - Focus on correct risk integration doing investment decisions
  - Motivation: Investments in Investment appraisal methods can lead to a higher probability of success

6. Critical observation and outlook

- **Criticism:**
  - **Representativeness** not given for: success and size ➔ usage of company pool
  - Especially enterprises that have **advanced knowledge** of investment appraisal methods **take part** in the survey (positive reinforcement)
- **Outlook:**
  - **Significance**: a p-value less than 0.05 just signifies a result worth studying further ➔ Deeper analysis of investment appraisal methods as a company **success factor**
  - Evaluation of connection between **economical situation** and usage of methods
  - **Processes** for **disinvestments** or the **break-up** of investments
  - Effect of expertise of management on usage of methods

Appendix A

Hypothesis: Summary

#	Area	Cause	Effect
1	Historical development	• Complexity, Riskiness • Computer Technology • Training Education	• Real options • Dynamic methods • Number of methods • Consideration of risks
2	Company size	• SME • LSE	• Quality of methods • Risk evaluation methods
3	Volume of investment	• Absolute volume of investment	• Dynamic methods • Number of methods • Risk evaluation methods
4	Success	• Intensity of investment analysis • Dynamic methods • Risk evaluation • Knowledge of methods	• Company success

Appendix B

Representativeness

Category	Result
Response rate	23.2% (in relation to the 36 studies on the subject of investment appraisal methods that have been analyzed since 1954 in German-speaking countries, this study has the sixth highest number of returns (276))
Structural representativeness in terms of size and sector distribution	• Only minor deviations for the sectors • Sizes classes: Large companies are over-represented and smaller companies under-represented

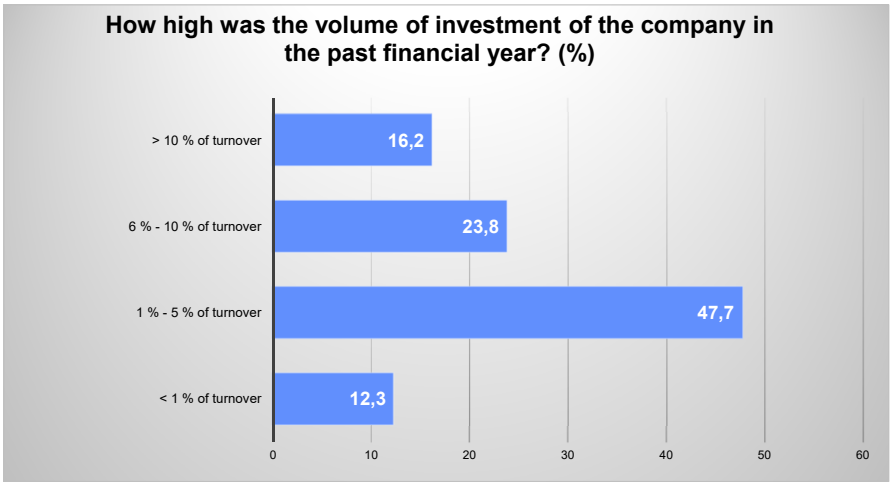
Appendix B

Representativeness

Category	Result
Test for 'non-response bias', i.e. to what extent the non-participating companies falsified the result	• Comparison of answers of the groups of of early respondents, late respondents and others • Only 5.1% of the attributes (each question is one attribute) tested showed significant differences be-tween the groups.
Test for 'informant bias', i.e. the extent to which differences occur depending on the functional areas or hierarchy levels of the participants	• response behaviour of the respondents from investment-intensive sectors compared to that of respondents which marked "other" • Deviation could only be identified for 6% of the relevant attributes, so that it can be assumed that no 'informant bias' is present

Appendix C

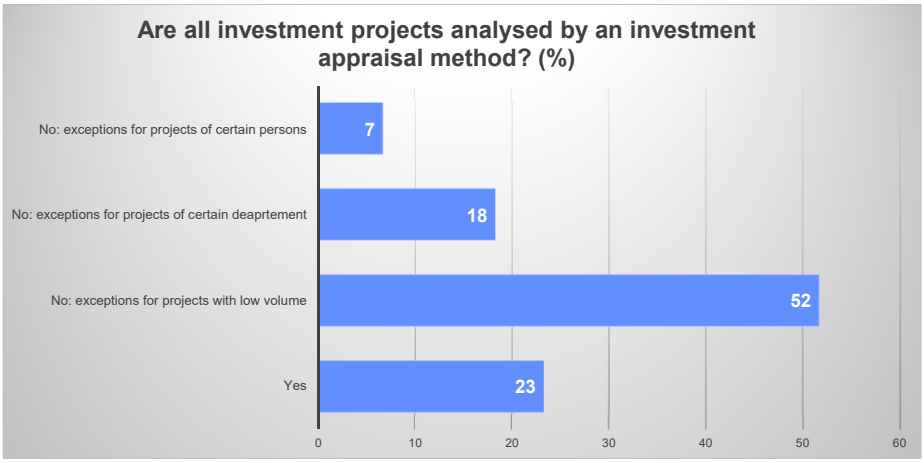
Volume of investment



➔ investment intensity of the participating companies is significantly higher than the average for companies in Germany

Appendix D

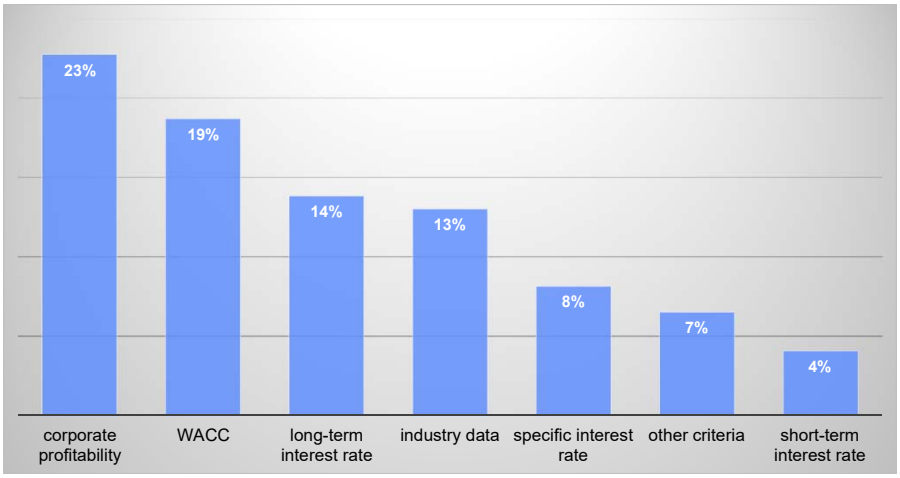
Coverage of projects



➔High number of companies do not analyse all projects with investment appraisal methods (>75%)

Appendix E

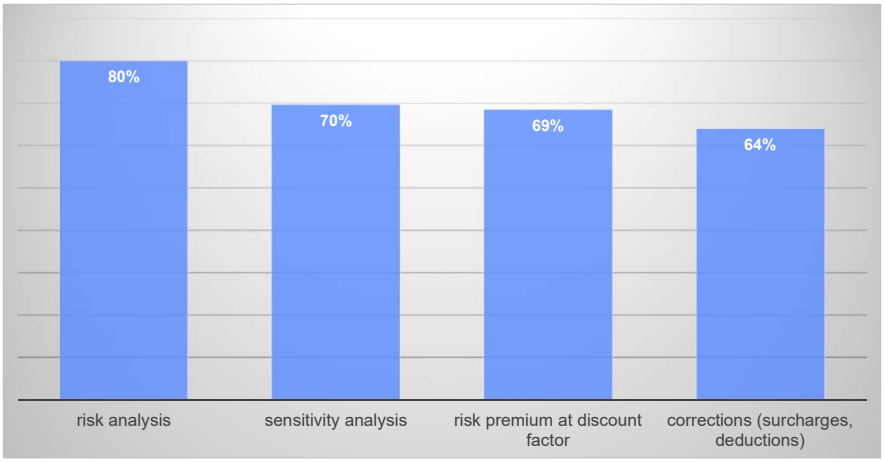
Determining discount rate



➔ Majority: corporate profitability and weighted average cost of capital (WACC)

Appendix F

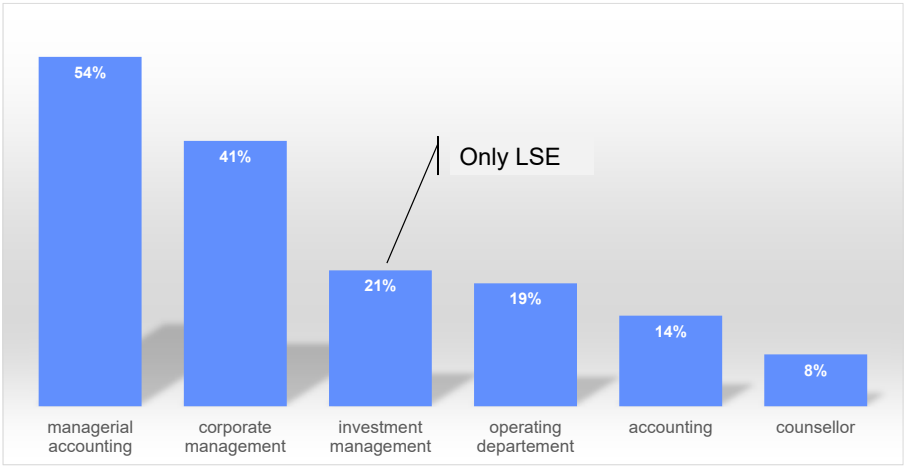
Risk consideration in the context of investment appraisal methods



➔ Often use of parallel methods

Appendix G

Responsibility for investment analysis?



➔ Responsibility for more than half of the companies with managerial accounting

➔ Majority of SME: corporate management

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