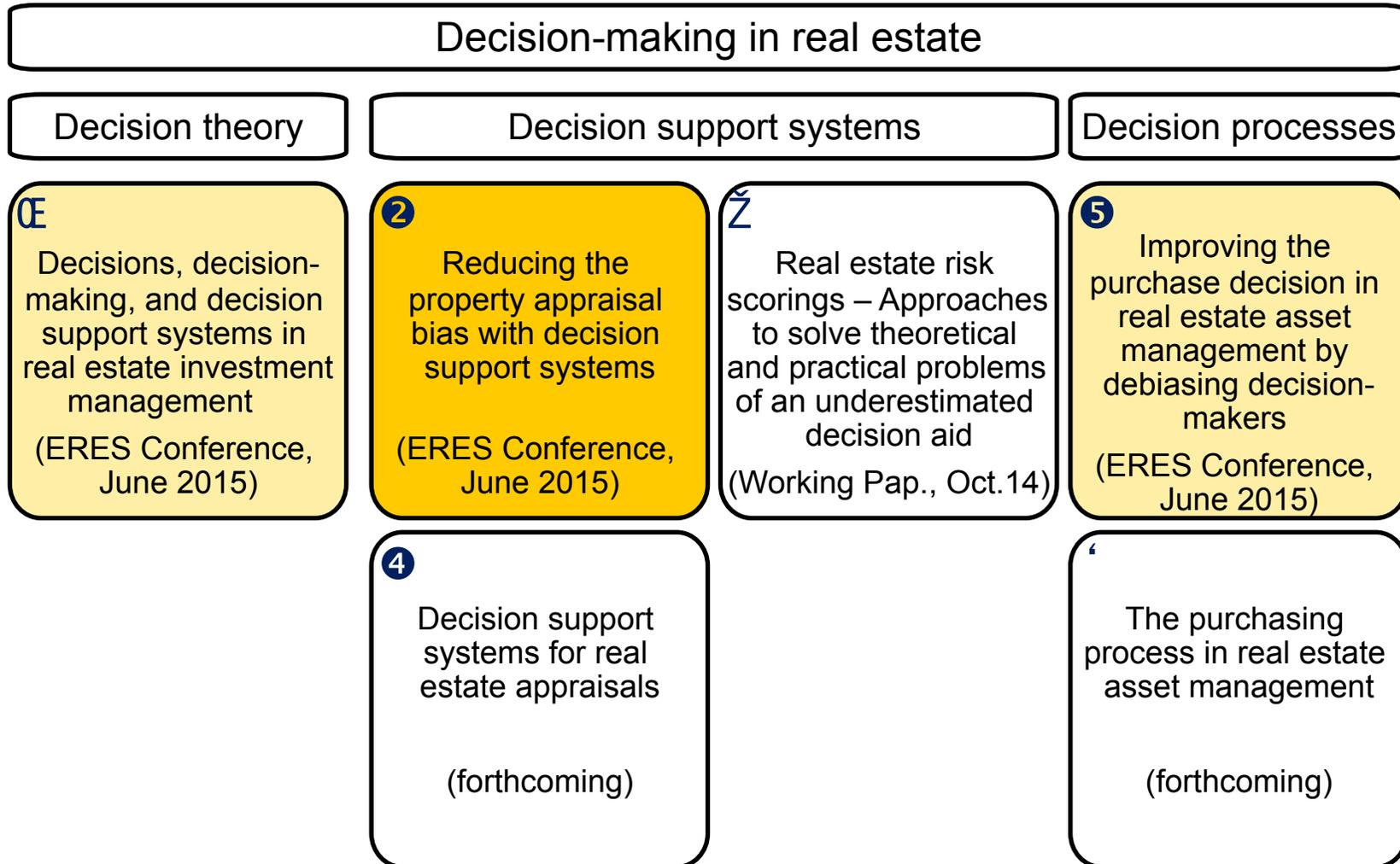


Outline

- I. Idea and goals
- II. Literature review
- III. Methodology
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- V. Hypotheses and results
- VI. Summary and future research

Research project



Idea and goals

Any appraiser is subject to many potentially biasing influences which compromise the accuracy of the appraisal. One of these possible biases is the so called **anchoring heuristic**: Appraisers are involuntarily influenced by (anchor to) reference points such as their previous value opinion, the value opinion of the seller, or property transaction prices.

While many studies have proven the existence and importance of the anchoring effect in real estate appraisals, very few studies have suggested practical means to counter it.

GOALS:

- Literature review
- Applying knowledge from psychology, computer science, and real estate research to valuation practice
- Development of a valuation software which supports the valuer in making decision and thus reduces the anchoring effect (= decision support system, DSS)
- Testing the software in various settings, e.g., with different properties

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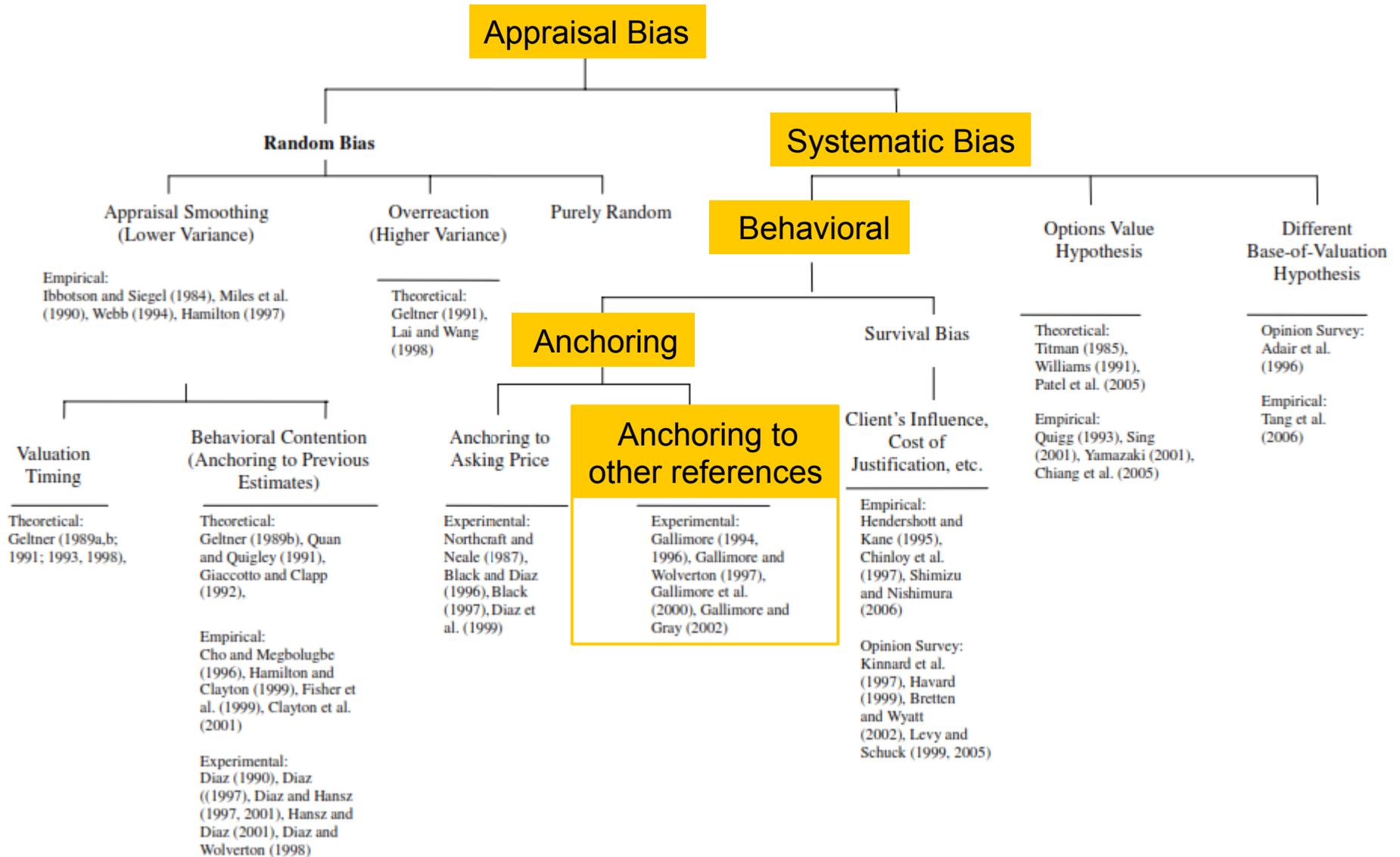
Literature review: Anchoring effect in valuation known for almost 30 years, but only recently suggestions for countermeasures

Three distinct streams within the real estate valuation literature:

- (1) In the 1980s a discussion on **valuation accuracy and variation** started in the UK which led to the concept of the “margin of error”. It is generally accepted that different appraisers come to different results, but that the variance should be kept to a minimum. [Exemplary studies: Hager/Lord (1985), Crosby (2000)]
- (2) Later many studies were undertaken to identify the reasons for valuation variation. Many of them looked into **behavioral issues of valuation** and confirmed the prominent role of the anchoring effect. [Exemplary studies: Northcraft/Neale (1987), Diaz/Hansz (2001)]
- (3) In recent years more and more authors addressed the question how **technology** can help in debiasing. Drawing on findings from computer science, psychology and other fields, some of these studies suggest the use of decision support systems (DSS). [Exemplary studies: George/Duffy/Ahuja (2000), Bhandari/Hassanein/Deaves (2008), Tidwell (2013)]

No need to prove or measure the anchoring effect or the benefit of a DSS. Instead: Demonstrating that small alterations can transform a standard MS Excel spreadsheet into a tool which effectively supports the appraiser and improve appraisal accuracy.

Forms of appraisal bias (according to Yiu et al. 2006, p. 323)



Current valuation software does not support the decisions of the valuer in the valuation process

Market Leasing Assumptions

Category:

Lease Status:

	New Market	Renewal Mkt	Unit of Measure
Renewal Probability		75%	
Market Rent	8		\$/SqFt/Yr
Months Vacant	6	0	Months
Tenant Improvements	3	2	\$/SqFt
Leasing Commissions	5%	3%	Percent
Rent Abatements	0		Months
Security Deposit	None	None	
Non-Weighted Items			
			Unit of Measure
Rent Changes			
Retail Sales			
Reimbursements	Net		
Term Lengths	5	Years	

OK Cancel Detail...

Example: Argus[®], one of the most widely used valuation systems worldwide

- ☺ Very flexible
- ☺ Technically and methodologically sound
- ☺ Many features that enhance ease of use and efficiency

BUT...

- ☹ „Advanced pocket calculator“, i.e. no decision support functionalities for...
 - choosing between different sources of market data,
 - weighing divergent information,
 - deciding on the correct cap rate,
 - protecting against human biases and errors, etc.
- ☹ Not suitable for beginners

There are several decisions to make in a valuation process, especially in the German form of the income approach

South African Income Approach

	Potential Gross Income
-	Vacancy and Collection Losses
=	Effective Gross Income
-	Operating Expenses
	Maintenance costs
	Management costs
	Utilities
	...
=	Net Operating Income
x	Multiplier
=	Income Value

German Income Approach (*Ertragswertverfahren*)

	Potential Gross Income (<i>Jahresrohertrag</i>)
-	Operating Expenses (<i>Bewirtschaftungskosten</i>)
	Maintenance costs (<i>Instandhaltungskosten</i>)
	Administrative costs (<i>Verwaltungskosten</i>)
	Utilities (<i>Betriebskosten</i>)
	Allowance for rental loss (<i>Mietausfallwagnis</i>)
	...
=	Net Operating Income (<i>Grundstückreinertrag</i>)
-	Return on land value (<i>Bodenwertverzinsung</i>)
	Land value (<i>Bodenwert</i>)
	Property yield (<i>Liegenschaftszinssatz</i>)
=	Net Operating Income from building (<i>Reinertrag d. baulichen Anlagen</i>)
x	Multiplier (<i>Vervielfältiger</i>)
	Property yield (<i>Liegenschaftszinssatz</i>)
	Remaining useful life (<i>Restnutzungsdauer</i>)
=	Income value of the building (<i>Ertragswert der baulichen Anlagen</i>)
+	Land Value (<i>Bodenwert</i>)
=	Provisional Market Value (<i>vorläufiger Ertragswert</i>)
+/-	Adjustments (<i>Zu- und Abschläge</i>)
	Deviation of actual rent from market rent
	Maintenance backlog
	Market conditions
=	Income Value (<i>Ertragswert</i>)

← Decisions

← Decisions

← Decisions

← Decisions

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Methodology: Valuation experiment with multiple properties and test groups

Three experiments with experts (= experienced valuers) and novices (= real estate students), in Germany and South Africa with real and fictitious properties

Participants were asked to do a mock valuation of an office building, based on a set of documents (rent roll, floor plan, pictures, real estate market report, etc.) and with the help of a self-made valuation software.

Three versions of the software with no/little/many features for debiasing:

- (1) **Standard** (= no support for identifying anchors): Standard income approach in MS Excel. The appraiser transfers the figures from the documents to the software, either directly or after some mental arithmetics. No hints are given to the nature of anchoring or the possible **anchor**, the book value of the property
- (2) **Modified** (= little support for identifying anchors): Same calculation core, but with a written warning which informs the appraiser about the anchoring effect.
- (3) **Decision support system** (= all-round support for performing the appraisal task): This version has several features that were found to reduce the anchoring effect in previous experiments, such as warnings, better information display, and help texts.

Similar information memoranda for the properties in Cape Town (South Africa), Hamburg (Germany), and Nuremberg (Germany)

1) General information

In preparation of an upcoming sale you are asked by the owner of the following property for a valuation using the income approach.

The office building is located in the center of Cape Town, with some 3.7 million inhabitants South Africa's second largest city.

The owner indicated that he is willing to sell the property for Rand 11 million, allegedly that was the result of a recent valuation by another valuer.

Owner: Legals Inc
 Name of the property: "Office 41"
 Address: 41 Keerom St, Cape Town
 Year of construction: 2004
 Valuation date: August 1, 2014
 Erf size: 400 sqm

At the moment four of the five rental units are leased to law firms. The unit on the third floor is currently vacant.

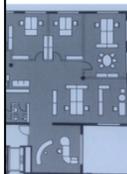
Current Rents and Expenses

Offices:		Rental & Recoveries			Lease Expiry
Area per floor		(per sqm, per month)			
		Rental	Rates, taxes etc.	Total	
Level 4	280 Sqm	111.67	16.95	128.63	06/2015
3	280 Sqm	vacant		vacant	
2	280 Sqm	110.00	15.00	125.00	08/2023
1	280 Sqm	114.27	9.35	123.63	08/2019
Ground Level	248 Sqm	114.27	9.35	123.63	08/2017
	1.368 Sqm				

Parking Bays		Rental
		(per bay, per month)
Tenant 1	6 Bays	850.00
Tenant 2	2 Bays	900.00
Tenant 3	2 Bays	900.00
	10 Bays	

Expenses	Actual annual
Rates and taxes	201,000
Insurance	12,000
Clearing & security	48,000
Leasing commissions	70,000
Maintenance allowance	65,000
Property management	102,000
	498,000

floor



The property is on the north west side of Keerom Street in the "legal district" on the western periphery of the Cape Town CBD and in close proximity to the High Court.

onerous conditions
shops.

July, 2014

appraised the
00; that's the

anticipate a new 10-
recoveries)

aving lighting, low
d after hours lighting
ble for use by

er, security appears
ing is under parked.
use is offices for
use
of the current
s due or any legal

dings in the locality



ents
space
y refurbished space
quality, small pockets of
quality space
standard, central
space – vacancies
eased significantly
nd asking rentals have
d.
m being asked for very
sites:
office space, central
t

between these and
et due to the amount
tenants. Parking

Business asking rentals R/m ²	
Max	Med
150.00	110.00
115.00	90.00
90.00	70.00

Under shade net	Open air parking
750	575

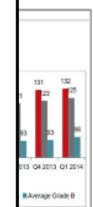
2014)

40.0% 50.0%

FIGURE 6: RTO INCOME RATIOS

(VAT)
contributor codes
GB, HP, JA, PL

Lang Lasalle &



search)

survey for Cape

11
25
53
58

Grade C: Multi-tenant		
mean	SD	n
2,4	0,0	5
2,0	-	1
-	-	-
-	-	-
-	-	-

The calculation core was identical in all three software versions; the basis for our software was a simple MS Excel® spreadsheet

Potential Gross Income		R 1,749,600
Rental income (offices):	R 100 * 1,368 m ² * 12 months =	1,641,600
Other income (parking lots):	R 900 * 10 bays * 12 months =	108,000
		<u>1,749,600</u>
- Vacancy and Collection Losses	5% * 1,641,600 =	-R 87,480
= Effective Gross Income		R 1,662,120
- Operating Expenses		-R 524,880
Rates and taxes:	211,849	
Insurance:	12,648	
Cleaning & security:	50,591	
Leasing commissions:	73,778	
Maintenance allowance:	68,508	
Property management:	107,506	
	<u>524,880</u>	
= Net Operating Income		R 1,137,240
÷ Capitalization Rate	9.50%	
= Provisional Market Value		R 11,970,947
+/- Adjustments		R 0
= Market Value		R 11,970,948

For the “modified“ and “DSS“ versions we added various features of decision support systems to the basic spreadsheet

Decision support systems are computerized aids designed to enhance the outcomes of an individual’s decision-making activities. They range from simple calculators to complex systems of artificial intelligence. For our purposes it seemed sufficient to incorporate some of the **features** which had proven useful before into our spreadsheet:

- Process orientation
- Data analysis
- Plausibility checks
- Explanations
- Information display
- Emoticons
- Warning messages

The screenshot shows a software interface titled "Calculation of market value as of August 1, 2014". It features a vertical axis on the left with tick marks at 200 and 250. A red warning message is displayed in the center: "Caution: Previous valuations, price expectations of the owner, market rumors, etc., should not affect a valuation. They cannot be verified, may be outdated or based on other assumptions. However, psychologists have found out that valuers are unconsciously influenced by them. This is called the 'anchoring effect' because such a value acts as an anchor and prevents an objective valuation." Below this, a blue text block reads: "Therefore please check your valuation again. If you think that the anchor value has unduly influenced you, you now have the opportunity to correct your valuation. With the help of the slider, move your value to the RIGHT, AWAY from the anchor." At the bottom, there is a green slider control with a vertical bar in the center. The slider is labeled "Reduce market value" on the left and "Increase market value" on the right. Below the slider, it says "Adjustment factor: 5%". At the very bottom, the text "Adjusted market value:" is followed by a box containing "R 12,569,495".

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Data collection: The first experiment in Germany is finished, the others are not

We are aiming at a minimum of 60 probands per country/method, equally divided over the three software versions and two groups. This was achieved in the first German experiment, which was carried out in June/July 2014.

Number of probands per software version and group

	Germany ("Ertragswert" Approach)
Standard version	28
Modified version	28
DSS version	33
Total probands	89
Students	46 of 54 (= 85.2%)
Experts	43 of 289 (= 14.9%)
Total probands	89

The experts were recruited via random sampling from the membership rosters of the most important professional bodies RICS, BIIS (Association of Investment Property Valuers). To enhance the response rate we also used personal contacts. The student sample was collected in property valuation courses at Nürtingen-Geislingen University.

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Hypotheses

Main hypotheses

- (1) The valuation variation is lower if the valuer is debiased and supported in his decisions
- (2) The anchoring effect is reduced if the valuer is debiased and supported in his decisions



Sub-hypotheses

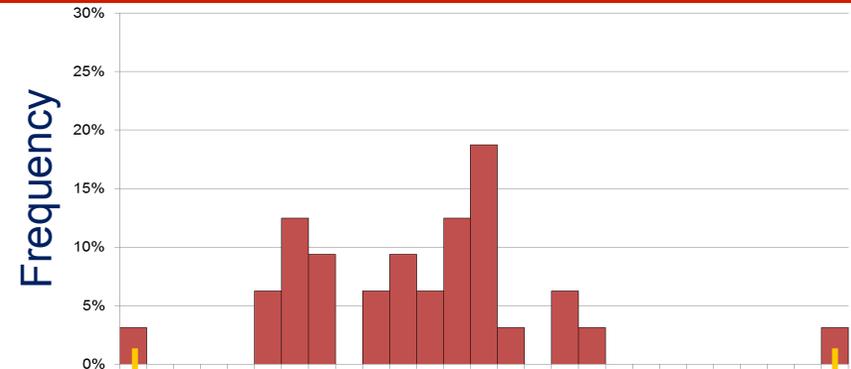
- (3) Lower variation of land values with DSS
- (4) Lower variation of market rents with DSS
- (5) Lower variation of operating costs with DSS
- (6) Lower variation of cap rates with DSS
- (7) More adjustments of market value with DSS
- (8) Longer processing time with DSS



Preliminary results from Germany show less variation in the market values = higher accuracy of valuations with DSS version

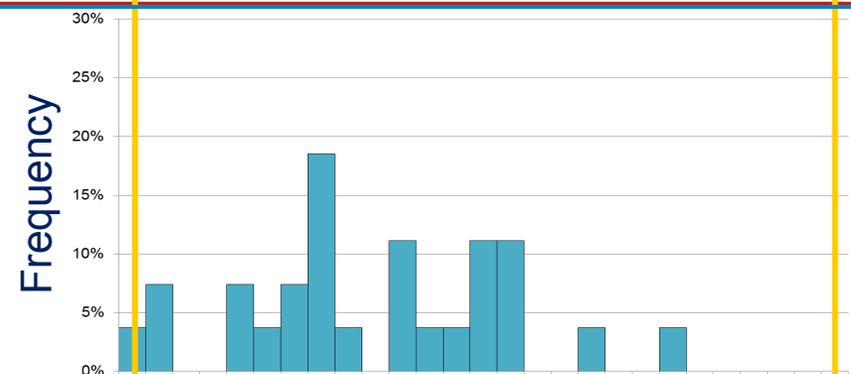
Standard version:

Mean: € 2.68
 Range: Min. € 1.6, Max. € 4.2 (160.6%)
 Standard deviation: € 0.50
 Variation coefficient: 19%



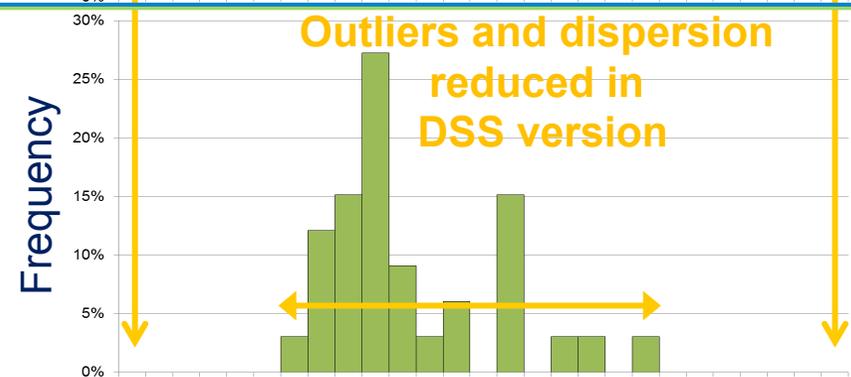
Modified version:

Mean: € 2.54
 Range: Min. € 1.6, Max. € 3.6 (122.5%)
 Standard deviation: € 0.50
 Variation coefficient: 20%



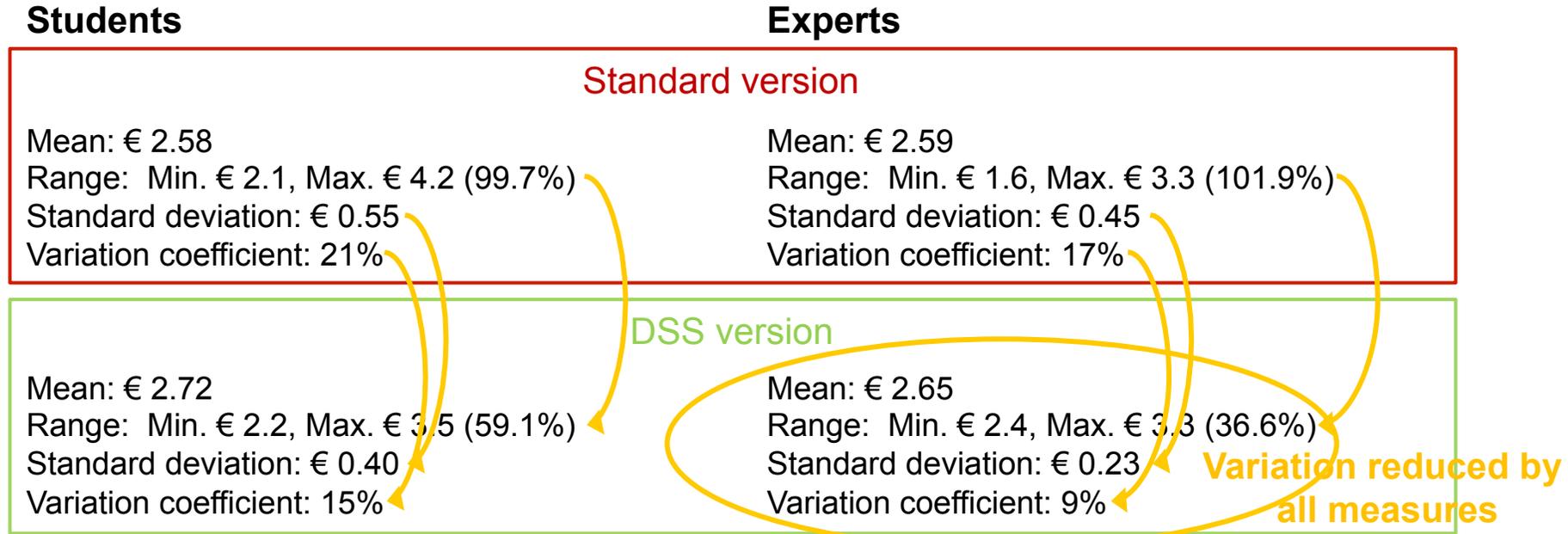
DSS version:

Mean: € 2.68
 Range: Min. € 2.2, Max. € 3.5 (59.1%)
 Standard deviation: € 0.32
 Variation coefficient: 12%



Market Value (€m)

The reduction of the variation was obvious in both student and expert groups; surprisingly it was greater in the expert groups



Experts using DSS version showed lowest variation of all subgroups; mean was closest to overall mean

The relative impact of the individual features cannot be determined. The results suggest that the reduction was caused by a mix of decision support and more intensive thinking.

Hypothesis 4: The variation of the market rents was significantly lower in the DSS version. Possible interpretation: In the DSS the valuers focused on the data sources that were more objective, current, and relevant. The software required a judgment regarding these criteria, and the consensus was fairly high.

Degree of consensus regarding data sources

	Objectivity	Currentness	Relevance
Source 1	74%	68%	52%
Source 2	77%	58%	87%
Source 3	65%	94%	81%
Source 4	71%	84%	58%

Hypothesis 2: A warning message was enough to significantly reduce the anchoring effect ... but only in the modified version, not in the DSS version. Possible interpretation: The DSS forces the valuer to think more about every decision so that the danger of anchoring towards an unreasonable anchor is diminished.

Effect of warning message on variation

	Version M		Version DSS	
	Before warning	After warning	Before warning	After warning
Range	139%	123%	59%	59%
Std. Dev.	0.56 €	0.50 €	0.30 €	0.32 €
Var. Coeff.	22%	20% 	11%	12% 

Hypothesis 8: The average processing time increased. Possible interpretation: The DSS required more reading and more data inputs, thus forcing the valuer to spend more time on decision-making.

Average processing time

Version Standard	18:25 min.
Version Modified	17:01 min.
Version DSS	25:04 min.

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Summary and future research

Preliminary findings (one country / one method):

- Most hypotheses could be falsified, i.e., it could be shown that a decision support system can effectively reduce valuation variation
- Our goal was not to measure the anchoring effect. Therefore it is not clear to which extent the anchoring effect and the appraisal bias could be reduced.

Caveats:

- Fairly large sample of randomly selected experts, but by no means representative.
- Real world case and software, but laboratory conditions which have limited validity for the practice of property valuation.
- Focus on the anchoring effect, other effects and their interrelation were ignored.

Suggestions for further research:

- Replication of the experiment with other properties / locations / valuation methods, and improved software
- Incorporation of other biases

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