Are you sure about what you mean by ‘uncertainty’? The actor’s perspective vs. the institutional perspective

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Abstract
This paper explicates theoretical and methodological differences between Archival Environmental Uncertainty (AEU) and Perceived Environmental Uncertainty (PEU). Conceptually, we discuss the controversial development of the concepts in a literature review. We propose a reconciling framework which emphasizes that AEU and PEU differ due to the specificity of the decision unit, the predictability of change, and the use of leading indicators. We conclude that future conceptual work could further refine AEU- and PEU-measures; especially a better distinction between AEU and ‘risk’ is warranted.

Empirically, we are the first ones to investigate the statistical association between prevailing measures of AEU (Tosi et al., 1973; Dess and Beard, 1984) and PEU (Miller, 1993). Our analysis combines archival data on AEU (annual reports) with survey data on PEU from top executives of the 110 largest listed German companies (55% response rate) by using time series-, factor- and correlation-analyses. Our findings show—as predicted—that AEU and PEU correlate moderately on a significant level. Yet, adjustment of the AEU-measure for predictable changes does not increase the strength of this correlation. This implies that future empirical work should focus more on the specificity of the decision unit and the use of leading indicators than on adjusting the predictability of change.

Keywords: Environmental uncertainty; perceived; archival; methodology; objective; correlation.

Acknowledgement: This paper is part of a larger research project on strategic management control (Burkert & Lueg, 2013; Lueg, 2008, 2009, 2010a, b; Lueg & Borisov, 2014; Lueg & Schäffer, 2010).
Are you sure about what you mean by ‘uncertainty’?
The actor’s perspective vs. the institutional perspective

The Actor-Reality Perspective in a Global Economy
(Second Conference)
Scuola Superiore Sant’Anna, Pisa (I) – Oct 25th-26th 2012
Boris Borisov & Rainer Lueg | Aarhus University

Uncertainty is the counterpart of risk
Uncertainty vs. risk

- Outcomes unknown
- Distribution unknown
- Many sub-concepts, e.g., Environmental Uncertainty

- Different possible outcomes are known
- Distribution of outcomes are known
- Many sub-concepts
Environmental uncertainty splits into archival (AEU) and perceptive measures (PEU) – SHOULD and DO they share reality???

Research question

Perceived Environmental Uncertainty
- Values: constructivist
- Uncertainty results from the interplay of an actor with the environment
- Based on facts and possibilities
- Communication: intuition, experience

Archival Environmental Uncertainty
- Values: positivistic
- Uncertainty exists independently from the perceptions of the actor
- Based on facts
- Communication: volatility of accounting data

RQ: What is the relationship between AEU and PEU?

Relevance?
- External validity
- Permanent revisions of ‘evergreens’

AEU is assessed by accounting measures, PEU by a survey – they are both measured at the industry-level

Instruments AEU and PEU

“How predicable is the environment in which your company operates?”
- The production/service technology is not subject to very much change and is well established (e.g. steel production).
- Demand and consumer tastes are fairly easy to forecast (e.g. milk industry).
- The rate at which products and services are getting obsolete in the industry is very slow (e.g. commodities like oil).
- Actions of competitors are quite easy to predict (e.g. pure price competition).”

10-year volatility of...
- Sales
- Earnings before interests and taxes (EBIT)
- Employment levels (in full-time equivalents, FTEs)
- Earnings After Taxes (EAT)
- Equity (book value)
- Total assets

* Tosi et al (1973): Standard error around the mean (includes predictable trends)
Dess & Beard (1984): Standard error of 10-year regression line divided by the mean (excludes predictable trends)
Based on the conceptualization, the relationship should be significant, but only moderately strong
Hypotheses 1: The relationship between AEU and PEU

Archival Environmental Uncertainty
- Relates to the whole company
- Comprises predictable and unpredictable changes
- Historic, objective information

Perceived Environmental Uncertainty
- Relates to a specific decision unit
- Comprises only unpredictable changes
- Historic and forward-looking, subjective information

Shared reality of OEU and PEU
- Salient information for decision units with direct contact to the larger environment
- Unpredictable change
- Historic information

H1: There is a weak but significant positive relationship between AEU and PEU.

Evidence on the relationship of AEU and PEU is inconclusive
Hypothesis 2: Adjustments in AEU (1/2)

No relationship
- Tosi et al. (1973, p. 31) vs. Lawrence & Lorsch (1967): "low and inconsistent correlation"
- Snyder & Glueck (1982, p. 191) vs. Tosi et al. (1973): "biasing effect of individual differences".

Relationship
- Sharfman & Dean (1991, p. 689) vs. Dess & Beard (1984): "in general, the correlations were significant and in the proper direction"

Suggested solution
"It is not change per se, or even a fast rate of change, that creates uncertainty about the environment; rather, it is unpredictable change that will be associated with this type of uncertainty. Thus, a lack of correlation between measures of environmental volatility and perceived environmental uncertainty is not, in and of itself, reasonable grounds for claiming that the perceptual measures are invalid."

--Milliken (1987, p. 135)
Is ‘unpredictable’ vs. ‘predictable’ change the missing link?
Hypothesis 2: Adjustments in AEU (2/2)

“The coefficient of variation would be the same for these two industries. However, the first industry would have a perfectly predictable growth trend, whereas the second industry would have a highly unpredictable growth pattern.”
—Boyd et al. (1993, p. 208)

H2: Adjusting* measures of AEU for predictable change will improve the relationship of AEU and PEU.

Data come from the annual reports and a top management survey of the German HDAX companies
Data source

<table>
<thead>
<tr>
<th>Employees</th>
<th>Sales (in mio. EUR)</th>
<th>Market capitalization (in mio. EUR)</th>
<th>Industry (1-digit-SIC)</th>
<th>Respondents (by function)</th>
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PEU correlates significantly with almost all AEU measures, and the strength is just moderate

Test H1: Correlations

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<th>Variation of:</th>
<th>PEU</th>
<th>2a</th>
<th>2b</th>
<th>3a</th>
<th>3b</th>
<th>4a</th>
<th>4b</th>
<th>5a</th>
<th>5b</th>
<th>6a</th>
<th>6b</th>
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<td>2b Sales</td>
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<td>0.007 **</td>
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<td>3a EBIT</td>
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<td>0.372 **</td>
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<td>3b EBIT</td>
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<td>0.230</td>
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<td>4a Employment</td>
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<td>0.785 ***</td>
<td>0.490 ***</td>
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<td>4b Employment</td>
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<td>0.273 *</td>
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<td>(Dess &amp; Beard, 1984)</td>
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<td>(Tosi et al., 1973)</td>
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<td>0.1032</td>
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<td>6a Equity</td>
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<td>0.315 **</td>
<td>0.670 ***</td>
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<td>0.032</td>
<td>0.045 **</td>
<td>0.142 **</td>
<td>0.066</td>
<td>-0.077</td>
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<td>0.032</td>
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<td>0.021</td>
<td>0.061</td>
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<td>6b Equity</td>
<td></td>
<td>0.361 **</td>
<td>0.423 **</td>
<td>0.179</td>
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<td>0.091 **</td>
<td>0.376 **</td>
<td>0.184</td>
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<td>(Dess &amp; Beard, 1984)</td>
<td></td>
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<td>0.097</td>
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<td>7a Assets</td>
<td></td>
<td>0.308 *</td>
<td>0.742 ***</td>
<td>0.248 *</td>
<td>0.303 *</td>
<td>0.158</td>
<td>0.048 ***</td>
<td>0.407 **</td>
<td>-0.024</td>
<td>-0.152</td>
<td>0.748 ***</td>
<td>0.451 ***</td>
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<td>(Tosi et al., 1973)</td>
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<td>0.000</td>
<td>0.005</td>
<td>0.015</td>
<td>0.112</td>
<td>0.000</td>
<td>0.001</td>
<td>0.413</td>
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<td>7b Assets</td>
<td></td>
<td>0.305 *</td>
<td>0.638 ***</td>
<td>0.461 ***</td>
<td>0.420 **</td>
<td>0.013</td>
<td>0.577 ***</td>
<td>0.516 ***</td>
<td>0.115</td>
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<td>0.629 ***</td>
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<td>0.052</td>
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<td>0.001</td>
<td>0.480</td>
<td>0.000</td>
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<td>0.143</td>
<td>0.435</td>
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</tbody>
</table>

*p<0.1; * p<0.05; ** p<0.01; *** p< 0.001 (one-tailed since hypotheses are directional).

Both AEU measures explain PEU well – Yet, the trend-adjusted measure of Dess & Beard (1984) does not outperform Tosi et al. (1973)

Test H2: Regression*; dependent variable is PEU (Miller, 1993)

Method not trend-adjusted...

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model 5a (Tosi et al., 1973)</th>
<th>Model 4b (Dess &amp; Beard, 1984)</th>
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<tbody>
<tr>
<td>Sales</td>
<td>0.392 ** (0.768)</td>
<td>0.212 † (16.719)</td>
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<tr>
<td>EBIT</td>
<td></td>
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<tr>
<td>Employment</td>
<td></td>
<td></td>
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<tr>
<td>Earnings</td>
<td>0.238 * (0.191)</td>
<td>0.205 † (0.260)</td>
</tr>
<tr>
<td>Equity</td>
<td></td>
<td>0.352 *(7.065)</td>
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<tr>
<td>Assets</td>
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<tr>
<td>Constant</td>
<td>2.977 *** (.327)</td>
<td>3.032 *** (.330)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.197 **</td>
<td>.185 *</td>
</tr>
<tr>
<td>D.f.</td>
<td>46</td>
<td>40</td>
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</tbody>
</table>
AEU and PEU are not perfect substitutes, but valid proxies at the level of the industry / top executives

Implications

Researchers

AEU and PEU should correlate moderately, but differ for three reasons:
- Specificity to decision unit
- Predictability of changes → We reject this empirically!
- Leading indicators

‘Real’ uncertainty does hardly exist
- Lacking correlation = inadequacy of PEU?
- Existing correlation = executives’ ‘correct’ understanding of AEU?
→ Based just a-priori beliefs, not on the empirical tests!

Executives

- Across decision units: AEU
  - Factual measures facilitate discussion
- Within one decision unit: PEU
  - Context specific
  - More easily available data
  - Ex-post data OK for evaluation, but not for decision making

We just investigate how facts and possibilities create shared realities – Future research should critically challenge values and communication

Limitations and future research

Values
- Rethink old measures of AEU/PEU
- Adjust uncertainty to context
- Look at other levels (hierarchies, functions, society)
- Clarify the difference of AEU and risk

Communication
- Do executives use different types of information on uncertainty (AEU, PEU) for different purposes like scanning, decision making, control and evaluation?
- How do external stakeholders (define and) communicate uncertainty, e.g., shareholders, banks, analysts or rating agencies?
References


