Quantifying the impact – Can the design of the study affect the results?

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Introduction

There is a need for a consistent framework for classifying studies used for evaluation and decision support. At first glance these studies look similar, but in reality they can be very different.

Studies done by analysts (AN) of decisions, products, technologies, or services often point in many different directions. As such, conclusions from these studies are undermined by derivative perceived uncertainty and obscurity in the minds of decision makers (DM) and investors.

Sometimes conclusions from studies seem to depend more on the AN doing the study than on the specific object that is studied.

Explaining why different ANs can arrive at sometimes very different conclusions for the same object will potentially also lead to reduced uncertainty and obscurity for DMs and investors.

Taxonomy for classification

Through literature studies of various scientific disciplines – including probability, statistics, economics, organization, and management – a taxonomy for the classification of different type of studies has been developed.

<table>
<thead>
<tr>
<th>Tangibility</th>
<th>Single-period (S) vs. Multi-period (M)</th>
<th>Retrospective (R) vs. Prospective (P)</th>
<th>Change</th>
<th>Value</th>
<th>Physical Value vs. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangible (T) vs. Intangible (I)</td>
<td>Tangible things can be touched and seen in the corporeal world. In contrast, intangible things are ideas or concepts. Only hypothesis and indirect evidence can be offered for intangibles.</td>
<td>This is a relative size scale. Micro is small compared with macro, but the absolute scale depends on the classification. For example, the CO2 emission of a factory in 2010. Multi-period information would be for more than one year – say, 2011, 2012, and 2013.</td>
<td>Retrospective studies deal with what happened in the past, while prospective studies involve an estimation of future events.</td>
<td>The baseline is business as usual, while a change is anything different from the baseline.</td>
<td>A physical quality is an actual location and quantity of matter and energy in time and space. Value refers instead to the relative worth placed on that same physical entity by one or more DMs.</td>
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Expected uncertainty of a study

\[ E(U) = (A, B, C) = f(U) \]

Classification matrix

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<tr>
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Conclusion and discussion

The design of a study can affect both the results themselves and the expected inherent uncertainty of the results. It is important to have a consistent framework that can classify and differentiate types of study.

The classification matrix can be used to create alignment between what the DM wants and what scientists can deliver. If the DM expects a study that reflects an AN→P approach, but instead receives a study reflecting, for example, a T→R→C approach, then there is no alignment between what the DM wants and what the AN delivers. This leads to increased obscurity, and therefore to distorted decision support.

Importantly, this presentation does not offer any guidelines for what we ought to do. Rather, the classification matrix is simply a way to better describe the types of study that can be used to evaluate a decision. That is, this presentation does not suggest what a study should do with limited resources (say, just a few months with one student). Should we try to make an ‘all-embracing’ study, as in the lower-right corner of the classification matrix, and accept the increased uncertainty? Or, would it be better to perform a more restricted study with lower uncertainty? Also, this presentation does not offer any recommendation for what level of uncertainty the DM should accept. Normally the accepted uncertainty level would be the decision maker’s own choice.

Biodiesel production study

This biodiesel study is fictive, but inspired by Herrmann et al. (2012).

References


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