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Relative performance of methods for forecasting special events

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ABSTRACT

Forecasting special events such as conflicts and epidemics is challenging because of their nature and the limited amount of historical information from which a reference base can be built. This study evaluates the performances of structured analogies, the Delphi method and interaction groups in forecasting the impact of such events. The empirical evidence reveals that the use of structured analogies leads to an average forecasting accuracy improvement of 8.4% compared to unaided judgment. This improvement in accuracy is greater when the use of structured analogies is accompanied by an increase in the level of expertise, the use of more analogies, the relevance of these analogies, and the introduction of pooling analogies through interaction within experts. Furthermore, the results from group judgmental forecasting approaches were very promising; the Delphi method and interaction groups improved accuracy by 27.0% and 54.4%, respectively.

1. Forecasting special events

Forecasting the timing and impact of special events such as natural catastrophes, conflicts, and economic meltdowns like the 2008–2009 recession can be challenging because of the limited amount of historical information from which a reference base can be built. The study here evaluates the performance of different methods of forecasting special events by presenting empirical results for two real examples of policy implementation. To forecast the impact of new policies, governments use impact assessments (IAs) and cost–benefit analyses (CBAs). Both techniques are lengthy and costly processes that are typically outsourced and rarely contain any type of quantitative forecast of the impact of the introduced policy. Savio and Nikolopoulos (2013) propose a solution to this problem and suggest that forecasts should be prepared with simple judgmental forecasting methods before the employment of IAs or CBAs. Thus, although forecasting methods are not an alternative to IAs and CBAs, they might be used as a simple screening tool to indicate which policy implementations should be tested further with the complex and more expensive IA and/or CBA methods.

Although the empirical evidence in this study was derived from a governmental decision-making context, the results may be generalized and applied to a variety of business situations in which the proposed forecasting methods might be used to successfully forecast project outcomes, investments or even more regular events, such as marketing communications (Nikolopoulos, Goodwin, Patelis, & Assimakopoulos, 2007).

The rest of the paper is structured as follows. Section 2 surveys the relevant literature on policy implementation and forecasting. Section 3 explains the methodological approach employed in selecting the cases, methods, and evaluation metrics, as well as in choosing the experts and deciding their level of expertise. Section 4 presents the results, and Section 5 discusses the findings. Finally, the last section offers concluding remarks and roadmaps for future research.

2. Background literature

2.1. Sophisticated simplicity

The application of the simplicity principle to theories is sometimes defended as an application of Occam's Razor, that is, "accept the simplest theory that works" (Simon, 1979). Zellner (2007) believes that complicated problems are solvable by the application of a few powerful, simplifying concepts, which he called "sophisticated

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simplicity". These powerful and simplifying concepts have been implemented by researchers in a myriad of industries and services. Simplicity also plays an integral role in shaping decision-making heuristics. Gigerenzer (1996) argues that decision-makers can eliminate biases that stem from heuristics by utilizing particular methods in a suitable context.

2.2. Policy implementation

In governmental decision-making, finding simple tools that generate the same quality results as more complex tools is sometimes difficult. Additionally, the fact that public expenditures are involved makes decision makers less inclined to use methods that might seem simplistic in the eyes of the watchdog. Impact assessment (IA) is an aid to political decision making that aims to identify and assess the effectiveness of policies and objectives pursued (European Commission, 2009). IA consists of a set of logical steps leading toward the formulation and preparation of proposals through a balanced appraisal of political impact. Policies concerned with new technologies and innovations are often assessed with their adoption and diffusion rates, which are typically measured in terms of the proportion of agents using the new technique compared to those using older techniques (Askarany, 2006).

2.3. Public value

The main goal of modern paradigms of public administration, such as public value management, is to enhance public values through forces that do not rely solely on traditional reformative norms (Stoker, 2006). Thus, public value management emphasizes the feasibility and value creation of individual actions. The core idea of adding value to the public domain by ensuring that policy objectives are met while improving the efficiency of the public policy process is consistent with the fundamental notion of this research (Pitts, 2007; Talbot, 2009). Public value management would effectively require any government to base its decisions on a priori forecasts of policy effectiveness, which is defined as the extent of change in the current situation in the direction of the policy target. Ex-ante evaluations of policy effectiveness typically involve a mixture of impact assessment and cost benefit analysis.

2.4. Policy impact assessment tools

IA may be performed by using a variety of different models (European Commission, 2009). The selection of a particular model is dependent on the availability of data in each particular case (De Gooijer & Hyndman, 2006; Savio & Nikolopoulos, 2009); IA is a rather costly and resource-extensive tool (Savio & Nikolopoulos, 2010, 2013).

Although CBA is a useful tool, this tool is limited because CBA only evaluates policies in terms of economic efficiency (Maas, 1966; Simpson & Walker, 1987). Both IA and CBA are tools that can be used after a specific policy implementation has been decided upon (Savio & Nikolopoulos, 2013). As a result, they are not used in the preliminary screening of alternative policy implementations, which leads to the space for simple and fast forecasting approaches that estimate the effectiveness of policies that may be implemented. Consequently, those forecasts might be used to select which alternative to implement, and then IA or CBA would be employed.

2.5. Judgmental forecasting

The standard benchmark in judgmental forecasting is unaided judgment (Green & Armstrong, 2007a) in which individuals are not given guidance as to proper forecasting procedures. The unstructured employment of panels of experts (Savio & Nikolopoulos, 2010) has several limitations (Lee, Goodwin, Fildes, Nikolopoulos, & Lawrence, 2007), such as the inability of forecasters to recall analogous cases and the recollection of unusual or inappropriate past cases. Thus, the adoption of structured approaches is seen as a better way to overcome these limitations and fully capitalize on expert judgment (Green & Armstrong, 2007b).

The Delphi method (Rowe & Wright, 2001) is a multiple-round survey in which experts participate anonymously and provide their forecasts and feedback. At the end of each round, participants receive a report, including descriptive statistics of the forecasts provided. The Delphi method is completed after a predefined number of rounds or whenever a desired consensus level is reached. Generally, four key features tend to define a Delphi a group procedure — anonymity, iteration, controlled feedback, and the statistical aggregation and presentation of group responses.

Conversely, the interaction group method suggests active interaction with a group of experts until a consensus forecast is reached through debate and discussion. A key driver in this method's success is the pooling of information. However, potential problems arise from group biases introduced by the face-to-face contact of the experts, such as the 'central tendency' and the 'dominant personalities' effects (Van de Ven & Delbecq, 1971). Evidence of the forecasting potential of interaction gGroups is not consistent (Armstrong, 2006; Boje & Murnighan, 1982; Graefe & Armstrong, 2011). Group-based approaches incur extra costs resulting from multiple rounds in the Delphi setup or the need for meetings in the formulation of interaction groups. This fact renders these methods relatively more costly than other methods that group-based approaches are competing against.

3. Method

The Special Events examined in this study are two policy implementations (PIS — a term introduced in Savio & Nikolopoulos, 2013) provided by an EU country's Special Secretariat for Digital Planning, a governmental body that focuses on controlling budgets that aims to accelerate the use of IT.

3.1. The policies

The first policy (PIS A) was entitled "See Your Life Digitally" and aimed to promote the laptop purchases among undergraduate students in universities. The government was willing to provide a subsidy of up to 400€ for the purchase of a laptop computer. With the 400€ incentive and the overall policy budget that was to be allocated, decision makers were interested to forecast the following:

(PIS A — Q1): What percentage of eligible students will buy a laptop?(PIS A — Q2): How many weeks will it take for 50% of eligible students to participate in the scheme?

The second policy (PIS B) was entitled "Parents.eu" and aimed to train and certify parents of high school pupils in "Internet safety". Parents had free online access to a distance-learning platform and free home tuition from instructors. Moreover, the policy budget funded a two-month subscription to a broadband service chosen by the parents and covered the expenses and fees for their certification exam. The policy makers in this instance were interested in obtaining forecasts for the following:

(PIS B — Q1): What percentage of eligible parents will receive training?(PIS B — Q2): What percentage of eligible parents will receive certification?(PIS B — Q3): What percentage of eligible parents will obtain broadband Internet access (using the funding provided by the policy scheme)?

Table 1 presents the actual results from the implementation of the two policies, and these outcomes will be used to evaluate the accuracy of the forecasts.