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Citation for final published version:

Rostami-Tabar, Bahman , Hong, Tao and Porter, Michael D. 2022. Guest Editorial: Forecasting for social good. *International Journal of Forecasting* 38 (3) , pp. 1173-1174.

Publishers page:

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# Guest Editorial: Forecasting for Social Good

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The forecasting literature has historically emphasized advancing the methods and techniques of forecasting to improve forecast accuracy. There has been much less attention on the purpose forecasts should serve and who should benefit from forecasting. Most of the organisations in which a more professional and analytical approach to forecasting is employed have economic and financial goals, such as minimising costs or maximising profits. Alternative goals may also be served by improved forecasts. Forecasts could, for example, be used *to inform decisions that prioritise the thriving of humanity over the thriving of economies by enhancing the social foundation and ecological ceilings that impact the public as a whole on both global and local levels*. This is what we define as ‘Forecasting for Social Good’ (F4SG). F4SG can be considered as a self-contained area of inquiry that can lead to increased appreciation of forecasting as a worthwhile tool for various beneficiaries and their communities.

This special section aims at highlighting high-quality research publications and impactful examples on Forecasting for Social Good. Our intentions are (1) to highlight the contribution of the forecasting community to forecasting for social good, (2) to motivate researchers and practitioners to direct more attention and effort toward these problems, and (3) to encourage organizations to consider societal and environmental impact of forecasting, beyond cost and profit.

This special issue solicited research studies in various areas of application such as Health and healthcare, Wellbeing, Humanitarian operations & Disaster relief, Education, Social services, Environment, Sustainability, Public welfare, Fraud, collusion, and corruption, Government, Public safety and security, and Poverty & Inequality. We received over 20 submissions in the areas of healthcare, humanitarian operations, third sector, public security, politics, and inequality. Following the peer review process, eight articles have been accepted for publication from which six are in healthcare and humanitarian operations, one article focuses on the definition, scope and attributes of forecasting for social good and the other one is on mega projects.

Rostami-Tabar, Ali, Hong, Hyndman, Porter and Syntetos conceptualise Forecasting for Social Good and discuss its scope and boundaries in the context of the “Doughnut theory”. They present key attributes that qualify a forecasting process as Forecasting for Social Good. They also position FS4G in the wider literature on forecasting and social good practices and propose an FS4G maturity framework as the means to engage academics and practitioners with research in this area.

Altay and Narayanan conduct a structured literature search on forecasting research in the humanitarian context to identify what has been done so far, and where are the needs for further research. They highlight three case studies as exemplary research in forecasting within the humanitarian context and list seven future research streams including forecasting disasters, forecasting supply, forecasting demand, forecasting errors in the humanitarian context, forecasting

in the disaster management cycle, forecasting process and humanitarian trends and forecasting. They further identify specific research needs in each stream.

Twumasia and Twumasi compare various machine learning approaches to forecast and backcast a blood demand data with missing values and outliers from a government hospital in Ghana. They consider K-Nearest Neighbour regression (KNN), Generalised Regression Neural Network (GRNN), Neural Network Auto-regressive (NNAR), Multi-Layer Perceptron (MLP), Extreme Learning Machine (ELM) and Long Short-Term Memory (LSTM) models via a rolling-origin strategy. They show that KNN performed well in forecasting blood demand (12.55% error); whereas, ELM achieved the highest backcasting power (19.36% error).

Nikolopoulos, Petropoulos, Sanchez Rodrigues, Pettit and Beresford propose a disaster response model combining preparedness and responsiveness strategies. The selective response depends on the level of accuracy that the forecasting models can achieve. In order to decide the right geographical space and time window of response, forecasts are prepared and assessed through a spatial-temporal aggregation framework, until the optimum level of aggregation is identified. The research considers major earthquake data for the period 1985–2014. Building on the produced forecasts, they develop accordingly a disaster response model. The model is dynamic in nature, as it is updated every time a new event is added in the database.

Wicke, Dhimi, Önköl and Belton examine the relationship between scenarios and forecasts in the context of the Syrian refugee crisis. Forty Turkish students who had been trained to use a brainstorming technique generate scenarios that might follow within six months of the Turkish government banning Syrian refugees from entering the country. The participants generate 3–6 scenarios. Even though no forecasts were requested, the participants' first scenarios contain 0–17 forecasts. The mean forecast accuracy is 45%, and this is unaffected by the forecast quantity. This study demonstrates that brainstorming can offer a simple and quick way of generating scenarios and forecasts that can potentially help decision-makers to tackle humanitarian crises.

Bracher and Held propose a revised multivariate count time series model for analyzing and predicting the spread of infectious disease. They consider the endemic-epidemic framework, a class of autoregressive models for infectious disease surveillance counts and replace the default autoregression on counts from the previous time period with more flexible weighting schemes inspired by discrete-time serial interval distributions. They use three different parametric formulations, each with an additional unknown weighting parameter estimated via a profile likelihood approach and compare them to an unrestricted nonparametric approach. They use the dengue fever incidence in San Juan, Puerto Rico, and a spatiotemporal study of viral gastroenteritis in the 12 districts of Berlin to examine the performance of the proposed approaches. They assess the predictive performance of the suggested models and several benchmarks at various forecast horizons. They show that the performance of the endemic-epidemic models is considerably improved by the proposed weighting schemes, assessed on both applications.

Rostami-Tabar and Ziel propose a forecasting model to generate both point and probabilistic daily forecast of ED attendance. They model the impact of special events on ED attendance by considering real-life ED data. They benchmark the accuracy of the model against three time-series techniques and a regression model that does not consider special events. They show that the proposed model outperforms its benchmarks across all horizons for both point and probabilistic forecasts. Results also show that the proposed model is more robust with an increasing forecasting horizon. Moreover, they provide evidence on how different types of special events may increase

or decrease ED attendance. The proposed model can easily be adapted for use not only by EDs but also by other health services. It could also be generalised to include more types of special events.

Litsiou, Polychronakis, Karami and Nikolopoulos evaluate the effectiveness of judgmental methods for successfully forecasting the accomplishment of specific megaproject objectives, where the measure of success is the collective accomplishment of such objectives. They compare the performances of three judgmental methods used by a group of 69 semi-experts: unaided judgement (UJ), semi-structured analogies (s-SA), and interaction groups (IG). The empirical evidence reveals that the use of s-SA leads to accuracy improvements relative to UJ. These improvements are amplified further when the pooling of analogies through teamwork in IG is introduced.

We believe that there is still a large gap in linking forecasting to social foundation and ecological ceiling metrics in both research and practice and this should be a priority in the F4SG agenda. Moreover, while benefits of forecasting in the healthcare and humanitarian operations may remain an important part of F4SG, research should diversify to include topics such as ethical consideration and harm, bias, fairness & criminal justice, climate change, international migration and cross-border mobility, public policy, and ecosystems & wildlife.