

Decomposition of contextual information for forecast adjustments

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17th June 2019

Marketing Analytics
and Forecasting



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Human role in forecasting

- Demand forecasting at the core of behavioural operations:
 - ▶ In retailing, manufacturing and services;
 - ▶ Delivered through a forecasting support system (FSS);
 - ▶ Handled by demand planners/forecasters.

Human role in forecasting

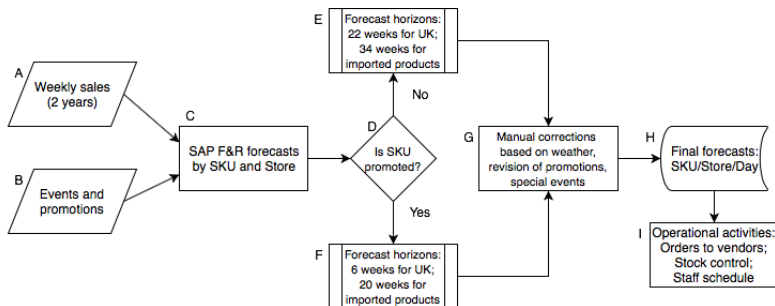
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- We know a lot about the algorithms:
 - ▶ New methods (e.g. machine learning).

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- We know a lot about the algorithms:
 - ▶ New methods (e.g. machine learning).
- But almost nothing about how these methods are used
 - ▶ Human input from choosing software to amending parameters.

Our objective: to understand how forecasting algorithms are used in FSS and to propose improvements

Forecasting process: a case study



- UK-based retailer with 50k SKUs and 400 stores
- 2 years of sales and 10 types of promotions
- Statistical model in the SAP F&R includes promotional dummies
- Around 60% of all SKUs are being adjusted due to seasonal events, promotions and weather

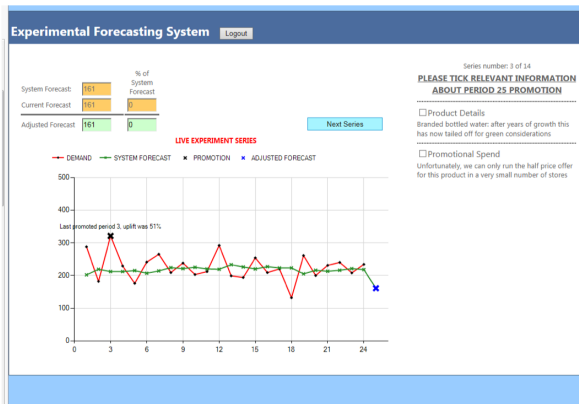
Interface used in practice



Contextual information is handled outside of the system

The null case-experiment by Fildes et al. (2018)

Use and misuse of information in supply chain forecasting of promotion effects (IJF, 2018): *“participants were distracted from the 50% base rate by the previous promotion uplift and by the reasons given, despite this information having either no or unknown diagnosticity.”*



Our previous experiments

- What is the effect of contextual information on adjustments?
- Baseline forecasts vs statistical model with promotional effects



Decomposition approach

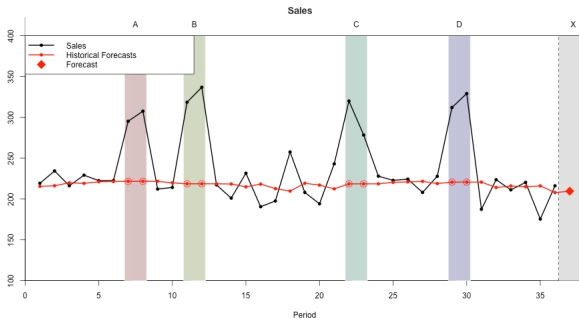
Decomposition of information

a strategy to split the task into smaller parts (sub-problems) in order to reduce cognitive load, which could enhance the forecasting process (Armstrong et al., 1975; Wright and Goodwin, 1993)

- Decomposition of judgments about trend/seasonality components (Edmundson, 1990);
- Presenting information selectively and sequentially in FSS improves accuracy (Webby et al., 2005): not substantially when the amount of information to be process increases (from 4 to 8 pieces).

Experimental setting

Trial series - Product 1 of 10
Health care product which has been long established; sold into many supermarkets, chemists



Forecast Adjustment

System Forecast: 209.54

Adjusted Final Forecast: 209.54

Adjustment: 0 units (0 %)

Adjustment as a % of system forecast

Information for Forecast Period

X

We have this information about the promotional campaign: 'Sales staff have been in discussions with the supermarkets. The good news is that they have agreed to display the product prominently during the campaign.'

Click box if this information is useful ☐

Market research suggests: 'In a qualitative discussion we exposed people to competitors' newspaper advertisements and our own promotional advertisements. Few people said they'd choose our product after seeing these ads.'

Click box if this information is useful ☐

'Sales' gut feel says that we are going to be toasting success when we look back at the sales generated by this promotion.'

Click box if this information is useful ☐

Description of Historical Promotions

A

No information from the team.

B

We have this information about the promotional campaign: 'No in store support is made available to overcome consumer resistance.'

Market research suggests: 'Focus groups have been quite negative about the promotional packs, but we can't change these at this late stage.'

C

We have this information about the promotional campaign: 'No in store support is made available to overcome consumer resistance.'

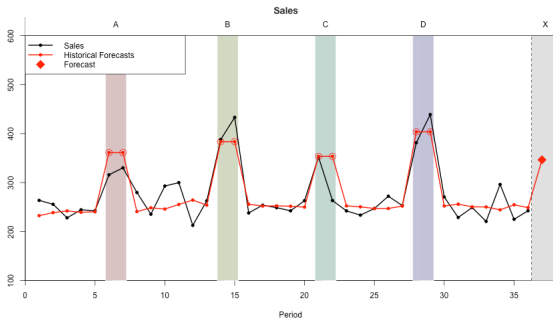
Market research suggests: 'It's too late to cancel the TV advertisements, but our latest market research found that most people thought they were uninteresting.'

- Control group with possible information overload;
- Baseline forecasts vs Statistical promotional model

Experimental setting

Trial series - Product 1 of 10

Health care product which has been long established; sold into many supermarkets, chemists



Promotional Information

Marketing Research

Other

Promotional Information for Forecast Period

X

We have this information about the promotional campaign: 'We were hoping for a celebrity endorsement of our product as part of the campaign, but negotiations have not been successful and, unfortunately, we will have to run the campaign without this endorsement.'

Click box if this information is useful ☐

Description of Historical Promotions

No information from the team.

A

No information from the team.

B

We have this information about the promotional campaign: 'We were hoping for a celebrity endorsement of our product as part of the campaign, but negotiations have not been successful and, unfortunately, we will have to run the campaign without this endorsement.'

C

We have this information about the promotional campaign: 'Advertising is co-ordinating a major campaign at the same time as the promotion, featuring a special offer on this product.'

D

Forecast Adjustment

System Forecast: 346.39
Adjustment: 0 units (0 %)

Adjusted Final Forecast: 346.39

Adjustment as a % of system forecast

0

Submit

- Decomposed contextual information;
- Baseline forecasts vs Statistical promotional model

Hypotheses

- H1: Adjustments to statistical forecasts in a case of information decomposition will deviate from a control group.
- H2: Users revise their adjustments when they see new pieces of soft information.
- H3: Any type of decomposition will influence the magnitude of anchoring (e.g. last promotional uplift, current statistical forecast).

Implementation of the experiment

- We assume that the average uplift for promotional periods is 50%;
- Promotional, marketing and hypothetical information for the upcoming period is provided;
 - ▶ Hype and marketing information do NOT have predictive value for forecasters;
 - ▶ Promotional information is diagnostic;
- Baseline statistical forecast is $SES(0.2)$;
- 2-period promotions: 4 historical + 1 upcoming

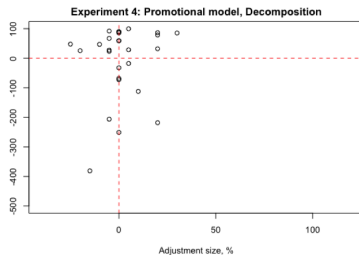
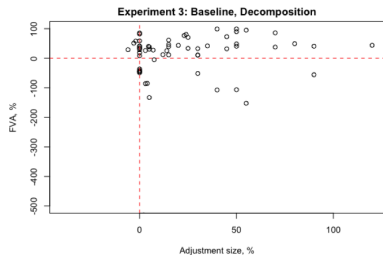
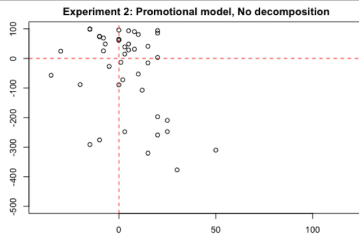
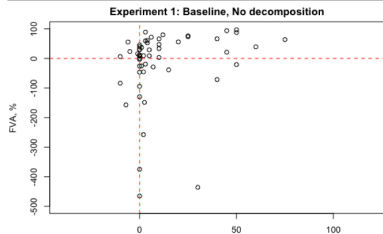
Descriptive statistics

- Trial run: 25 people (mainly students);
- Between subjects;
- Repeated measures data: 200 observations

Table 1: Descriptive statistics.

	Overall	Experiment type			
		1	2	3	4
Statistical forecast		Baseline	Promotional	Baseline	Promotional
Decomposition		No	No	Yes	Yes
Participants	25	7	6	8	4
Adjustment size	X	11.38%	3,08%	22.57%	0.09%
Adjusted cases	X	73%	93%	73%	72%
FVA	X	4.7%	-2.73%	6.12%	1.59%

Accuracy



Conclusions

- Given the role of human judgment in forecasting, how can we help a forecaster to deal with a flow of contextual information?
 - ▶ To filter and use it;
 - ▶ To evaluate forecast value added.
- Using a decomposition approach to contextual information, we find more consistent results.

Next steps:

- 1 To gamify the experiment;
- 2 To promote it online in order to get more participants;
- 3 To analyse adjustments and value added using regression modelling.

Thank you for your attention!

Any questions?

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