

11. November 2016

PwC's Predictive Analytics Suite (PAS)

Always one step ahead.

DGI-Praxistage 2016



PwC's Predictive Analytics Suite



Always one step ahead!

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From Descriptive Analytics to Prescriptive Analytics

“ Why do we employ **hundreds of controllers** who **generate forecasts** which are either just a **gut feeling** or **out of date** when consolidated or, at worst, both? For this reason, we now launched various D&A test pilots from **predictive analytics** to **autonomous planning**.

Head of Controlling – German Blue Chip

What should be done?

Prescriptive Analytics

- Establish and automate interlinkages between big data, statistical analysis, machine learning and company data
- Derive measures to optimize business on the basis of forecasts
- e.g.: Forecast models can be integrated to optimize production and its logistics distribution

What will happen?

Predictive Analytics

- Apply statistical methods and econometric models in order to gain insights from digital data sources and forecast future developments
- Conversion of raw data into useful and usable information
- Use of data to determine possible future scenarios through forecasts in confidence levels
- e.g.: Based on a forecast of the sugar price (among others), the sales figures ('Poncho') for the coming period can be predicted

Why did it happen?

Diagnostic Analytics

- Gaining a deeper insight, e.g. correlations in a complex system
- e.g.: An analysis reveals dependencies between sugar price and 'Poncho' sales

What happened?

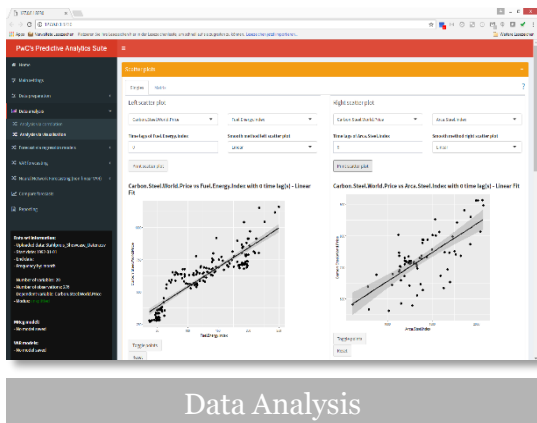
Descriptive Analytics

- Visualization and analysis of raw data (from the past)
- e.g.: Data indicates an increase in sales figures for 'Poncho'-products

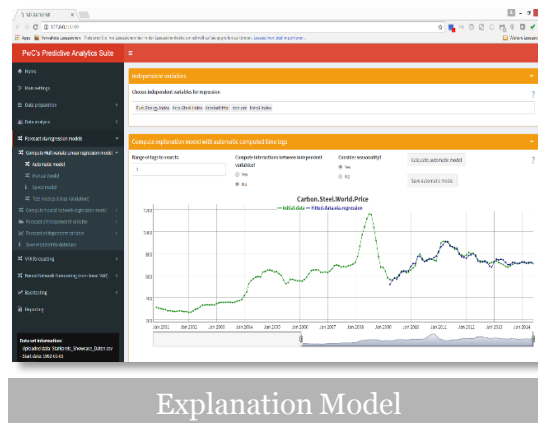
Predictive Analytics Suite (PAS) – Look and Feel



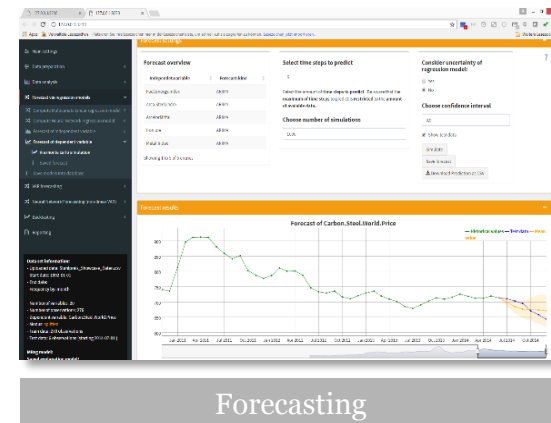
Integration, preparation, analysis and visualization of raw data



Generation of explanation models



Creation of sound forecasts in prediction bands



Predictive Analytics Suite (PAS) – Forecasting Techniques



Econometric Models

- Idea: Forecast the future by parameters (drivers) that are closely related to the parameter of interest
- Challenges: Find drivers that are quantifiable, realize well in advance (i.e. lagged) of and ideally causally linked to the parameter of interest
- Application: Internal and External drivers to be set as explanatory variables in time-series regression

$$y_t^f = c + \phi_1 y_{t-1}^f + \dots + \phi_p y_{t-p}^f + \theta_1 e_{t-1} + \dots + \theta_q e_{t-q} + e_t$$

ARIMA

- AR: Variable of interest is regressed on its own lagged values (time dependency)
- I: Data values are replaced with the difference between actual and previous values (fitting)
- MA: Regression error is a linear combination of error terms (at different times in the past)

$$\begin{aligned}\hat{y}_{t+h|t} &= \ell_t + h b_t + s_{t-m+h} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1} \\ s_t &= \gamma(y_t - \ell_{t-1} - b_{t-1}) + (1-\gamma)s_{t-m},\end{aligned}$$

Exponential Smoothing

- Weighted average of past observations; weights decay exponentially as observations are further in the past
- Generate quick and reliable forecasts for a wide range of time series
- Select key components (trend and seasonal)

$$\begin{aligned}y_{1,t} &= c_1 + \phi_{11,1} y_{1,t-1} + \phi_{12,1} y_{2,t-1} + e_{1,t} \\ y_{2,t} &= c_2 + \phi_{21,1} y_{1,t-1} + \phi_{22,1} y_{2,t-1} + e_{2,t}\end{aligned}$$

VAR

- Vector autoregressive (VAR) models capture linear interdependencies among multiple time series
- Different to structural models, VAR uses simultaneous equations to hypothesize (also intertemporal) effects among each other



Neural Networks

- Series of interconnected neurons that can be activated along a linear pathway
- Function and thresholds to trigger neuron activation have to be specified



Live Demo “PAS”

Team structure – please get in touch



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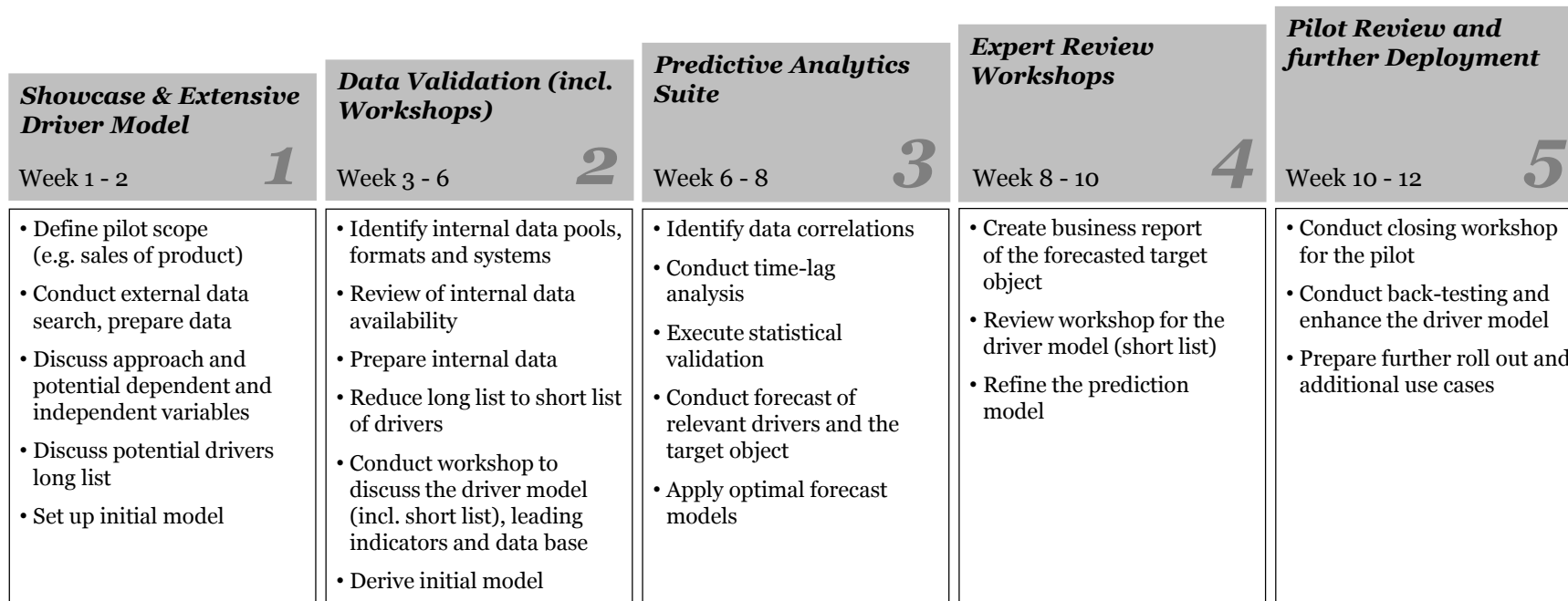
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Backup Predictive Analytics Suite

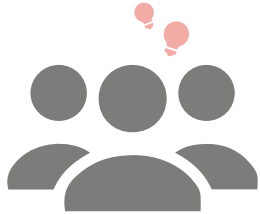
PAS Use Case Project Approach

Illustrative

Use Case Project Approach



Lessons Learned



No. 1

A comprehensive driver model
is key

No. 2

Data sourcing is time-
consuming

No. 3

Use of internal data is crucial

No. 4

It is 'Man' & 'Machine', not
'Man' vs. 'Machine'

No. 5

Predictive Analytics is an art

No. 6

Define a specific forecasting
object

No. 7

Predictive Analytics is an
interlinking discipline

No. 8

Data quality over data volume

No. 9

Discuss the results with
Business Specialists

No. 10

It works!

Technical Ecosystem and Operating Model

