IBP Special Topic Webinar
Statistical Forecasting
Tod Stenger and Anna Linden
February 17, 2016
Agenda

Forecasting Processes

What can IBP do?

Demonstration

What is in each IBP module

Wrap-up
Forecasting Processes
SAP Integrated Business Planning solution

Supply Chain Control Tower
“End-to-End Visibility, Monitoring and Alerting”

IBP for Sales & Operations
“Strategic and Tactical Decision Processes“

IBP for Demand
“Demand Sensing and Statistical Forecasting”

IBP for Inventory
“Multi-Stage Inventory Optimization”

IBP for Supply
“Constrained and Unconstrained Supply Planning”

IBP for Response *
“Allocations Planning and Order Rescheduling”

Unified SAP HANA Platform for Cloud Deployment

*Planned
Why Forecast?

- Lead time for decision making
- Forecast external, uncontrollable events such as economies or competitors
- Align decisions with internal events, such as price strategies or marketing campaigns
- Establish linkages among the forecasts made in different divisions and align with the overall company goals
Stakeholders for Forecasts

Management

“Demand Planners aren’t, and shouldn’t be, statisticians.”

“We need to align our demand plan with our sales and operations plan.”

Demand Planner

“I really need to focus on adding business insights to the forecast.”

“The system should pick the best statistical model.”

Data Scientist

“I need more powerful statistical tools.”
From Statistical Forecasting to a Consensus Demand Plan
Granularity: Demand Planning or S&OP (Weekly or Monthly)

- Sales History and other historic data
- Statistical Forecast (Output from Algorithms)
- Consensus Demand Plan
  - Input from Sales Departments
  - Input from Marketing Departments
  - Input from local Demand Planners
From Statistical Forecasting to a Consensus Demand Plan
Granularity: Daily

Consensus Demand Plan → SAP’s Demand Sensing Algorithms → Daily Sensed Demand Plan

- Shipments
- Sales Orders
- Trade Promotions (Planned)
- POS Data (Future)
- ...

SAP’s Demand Sensing Algorithms

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Different univariate forecasting methods can be assigned based on regular and intermittent demand patterns.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Constant</th>
<th>Trend</th>
<th>Trend - Season</th>
<th>Others</th>
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</thead>
<tbody>
<tr>
<td>Single Exponential smoothing</td>
<td>Moving average</td>
<td>Weighted moving average</td>
<td>Double Exponential smoothing</td>
<td>Linear regression</td>
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<td>Exponential smoothing</td>
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<td>Croston (sporadic demand)</td>
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**Causal Analysis**
- Multiple Linear Regression (MLR)
- Influence variables
- Climate (e.g., temperature)
- Price
- Advertising
- Distribution
- ...

**Composite Forecast**
- Combine different forecasts
- Weight each forecast
What can IBP do?
Forecasting in IBP

SAP Integrated Business Planning (IBP)

= 

“Traditional” Demand Planning
(mid- or long-term forecasting)

+ 

Demand Sensing
(short-term forecasting)

+ 

Vision: Predictive / Forecasting Analytics Techniques
Demand Planning vs. Demand Sensing
Periodicity and Planning Period

**Demand Planning**: For example, executed monthly in weekly or monthly buckets

**Demand Sensing**: In general done daily in daily buckets

Difference between short-term forecast and consensus mid-long-term forecast
Statistical Forecasting Methods in IBP

**Pre-Processing algorithms:**
- Substitute missing values
- Outlier correction
- Promotion Elimination (Planned)
- ...

**Time Series algorithms:**
- Single Exponential Smoothing
- Adaptive Response Rate Single Exponential Smoothing
- Double Exponential Smoothing
- Triple Exponential Smoothing
- Automated Exponential Smoothing with parameter optimization (Planned)
- Croston’s Method
- Simple Average
- Simple Moving Average
- Weighted Average
- Weighted Moving Average
- ...

**Regression based algorithms:**
- Multiple Linear Regression (MLR)
- ...

PAL Help Portal:
Algorithms available for Demand Sensing

**Pre-Processing algorithms:**

Promotion Elimination
Planned for Q1/2016

**Demand Sensing algorithms:**

Demand Sensing (Full)
Run Weekly
Calculation of regression weights

Demand Sensing (Update)
Scheduled Daily
Uses regression weights from Weekly run
Updates sensed demand based on new information
Outlier Correction with Ex-Post Method

QTY

Historic Data
Ex-Post Forecast
Tolerance Area

Tody
Demand Sensing - example

**National DC**
Weekly forecast of 40 units

**East DC**
Daily Replenishment Schedule w/ updated forecast

**West DC**

**Daily Demand Trend**

**Weekly Demand Trend**
Demand Sensing – example

Sales trends are picked up with Demand Sensing and updates short term forecast.
What planning processes does Demand Sensing impact?

Illustration of the different planning horizons

- **Inventory Optimization**
  - Deployment and transportation decisions
  - Production and packaging sequences
  - Material purchasing

- **Today** to **Short Term Planning Horizon**
Process - Step 1: Load Historic Sales Data

Load historic sales information (e.g. Sales Orders, Confirmed QTY, Delivered QRY, etc) via the WebUI

Load historic sales information (e.g. Confirmed QTY, Delivered QTY, etc) via the HANA Cloud Integration (HCI)
Process - Step 2: SAP Fiori apps for Forecast Model Assignment & Forecast Model Maintenance
Process - Step 3: Run Statistical Forecasting via the Excel Add-In
Process - Step 4: Solve Alerts and Adjust Statistical Forecast

 Alerts reported via Monitor Alerts app*

 Additional input manually added in Excel
 Sales
 Marketing
 Other departments

 Final consensus demand plan can be a calculated key figure

*Supply Chain Control Tower required for some alerts

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Step 5: Load Planned Independent Requirements to APO SNP

The mid-to long-term demand plan, generated in SAP Integrated Business Planning for demand, can be loaded as Planned Independent Requirements in APO SNP (Supply Network Planning) for further processing.

The integration is done via SAP HANA Cloud Integration (HCI):

[Diagram showing the integration process]

- Customer environment
- Firewall
- SAP cloud environment
- Scm
- Dp
- Snp
- Hci
- Data Load
- Write-back
- Calculation View
- Staging Tables
- Integrity check
- Aggregate
- Core Tables
Demonstration
What is in each IBP module?
# Statistical Forecasting Functionality

**IBP for sales and operations**

<table>
<thead>
<tr>
<th>Pre-Processing</th>
<th>Statistical Algorithms</th>
<th>Post-Processing</th>
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<tr>
<td>None</td>
<td>Simple Moving average</td>
<td>RMSE</td>
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<td>Single Exponential smoothing</td>
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## Statistical Forecasting Functionality
### IBP for demand

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<th>Demand Sensing Algorithms</th>
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<tbody>
<tr>
<td>Outlier Detection</td>
<td>Automated Exponential Smoothing (Planned)</td>
<td>Demand Sensing (Full)</td>
<td>MPE</td>
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<td>Substitute Missing Values</td>
<td>Single Exponential Smoothing</td>
<td>Demand Sensing (Update)</td>
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<td>Promotion Elimination (Planned)</td>
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<td>Simple Average</td>
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<td>Weighted Moving Average</td>
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<td>Weighted Average</td>
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### IBP for Demand vs IBP for Sales & Operations

<table>
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<th>Algorithm</th>
<th>IBP for Demand</th>
<th>IBP for Sales and Operations</th>
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<tbody>
<tr>
<td>Automated Exponential Smoothing</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Single Exponential Smoothing</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Adaptive Response Rate Single Exponential Smoothing</td>
<td>✓</td>
<td>✗</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Triple Exponential Smoothing</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Simple Moving Average + Simple Average</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Simple Average, Weighted Moving Average &amp; Weighted Average</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Demand Sensing</td>
<td>✓</td>
<td>✗</td>
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</tbody>
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Thank you

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