Gewinnen beim Monopoly® Spiel – Alles nur Zufall? Oder gibt es doch ein paar Muster, die man kennen sollte?

21. KSFE, Krefeld, 9.-10. März 2017

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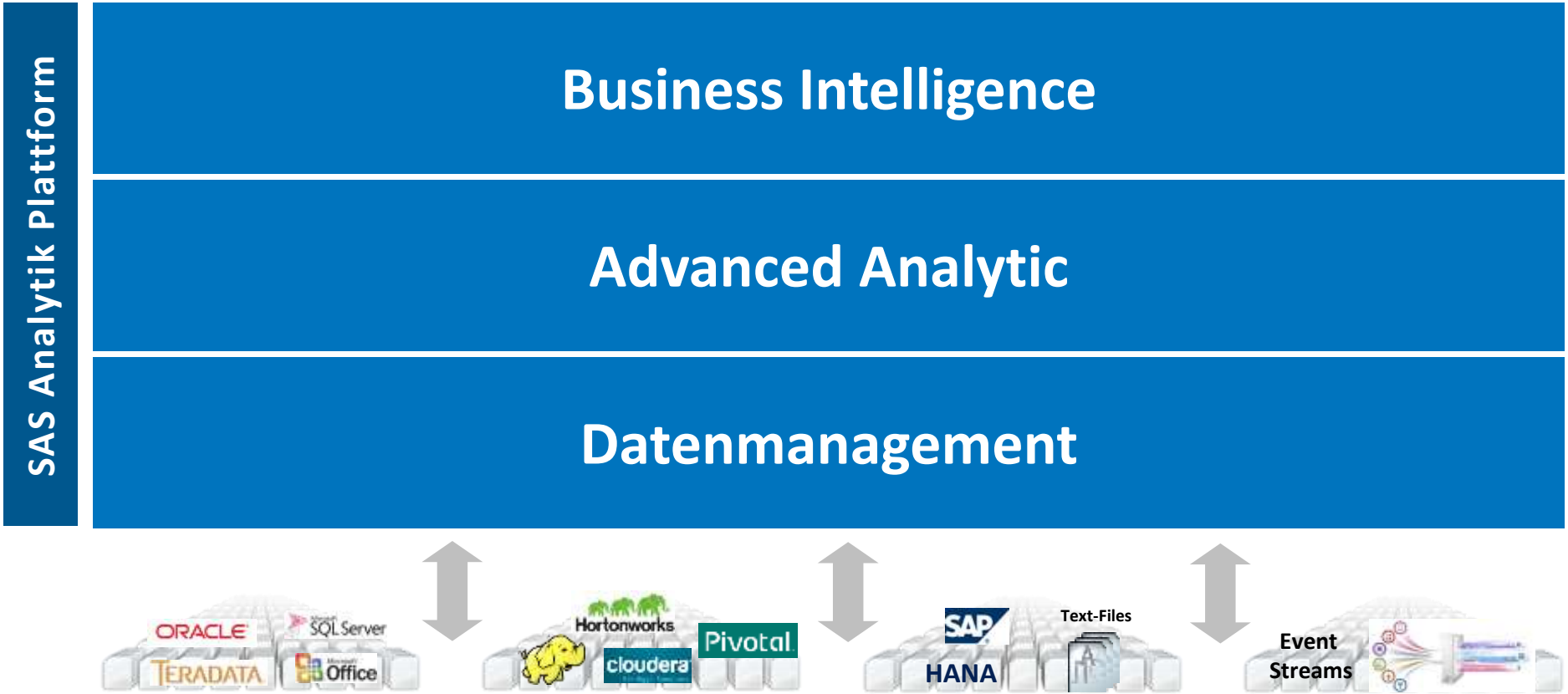
Die Vortragsfolien sind online → Google: Gerhard SAS Samples

SAS Analytik Plattform

Unterschiedliche Layer aus konzeptioneller Sicht



SAS Analytik Plattform

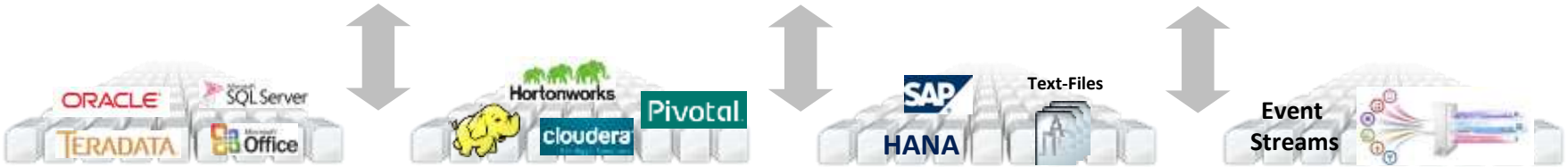
Advanced Analytic Layer

SAS Analytik Plattform

Business Intelligence

Data Mining | Statistical Analysis | Forecasting | Text Analytics | Optimization & Simulation

Datenmanagement



The Monopoly® board game is a complex system

Set of Complex Rules

Framework of Opportunities and Events

Monetary Dimension

Additional Instructions

Random Components

Dynamic Component

Questions of Interest

- What is the distribution of visits on the fields of the board game?
- Which fields are most profitable?
- Which fields to have a high variability in profitability?

- **These questions can be transferred to many other simulations studies of complex systems.**

Locating the Token – Influential Factors

Sum of
2 Dice

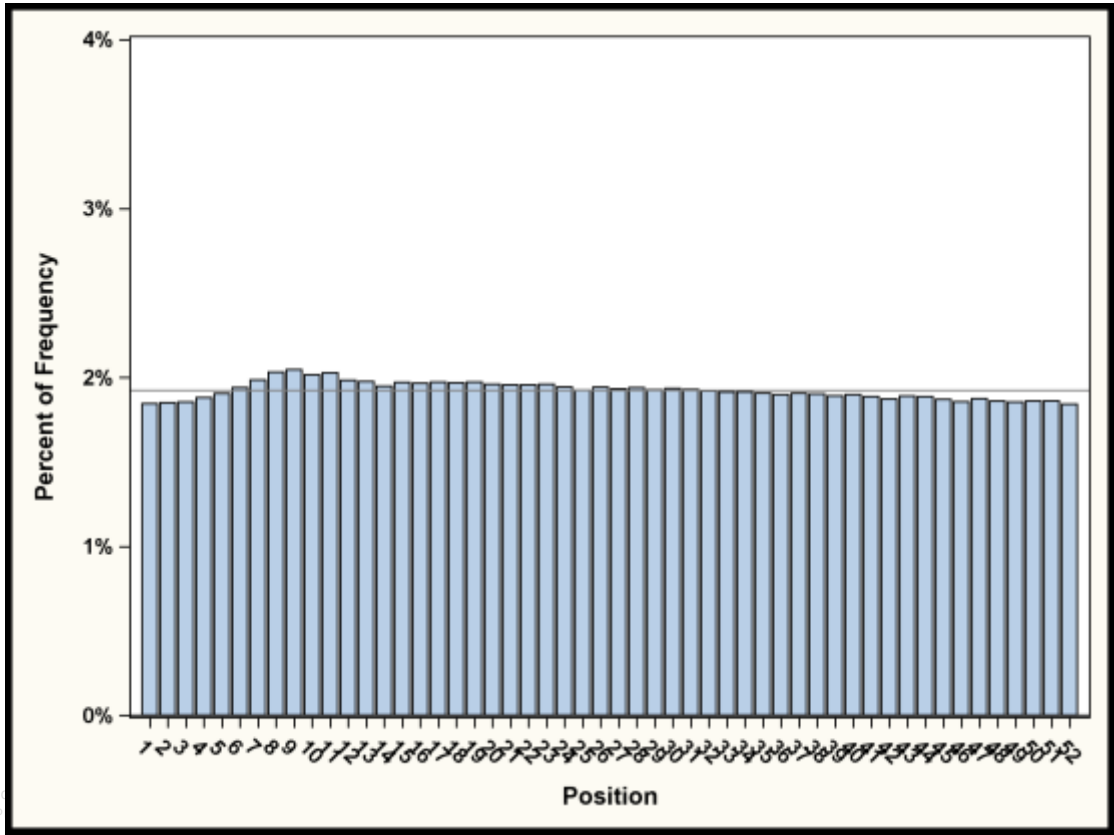
Go to Jail!

Event Fields

Accelerator
Dice

Almost Even Distribution

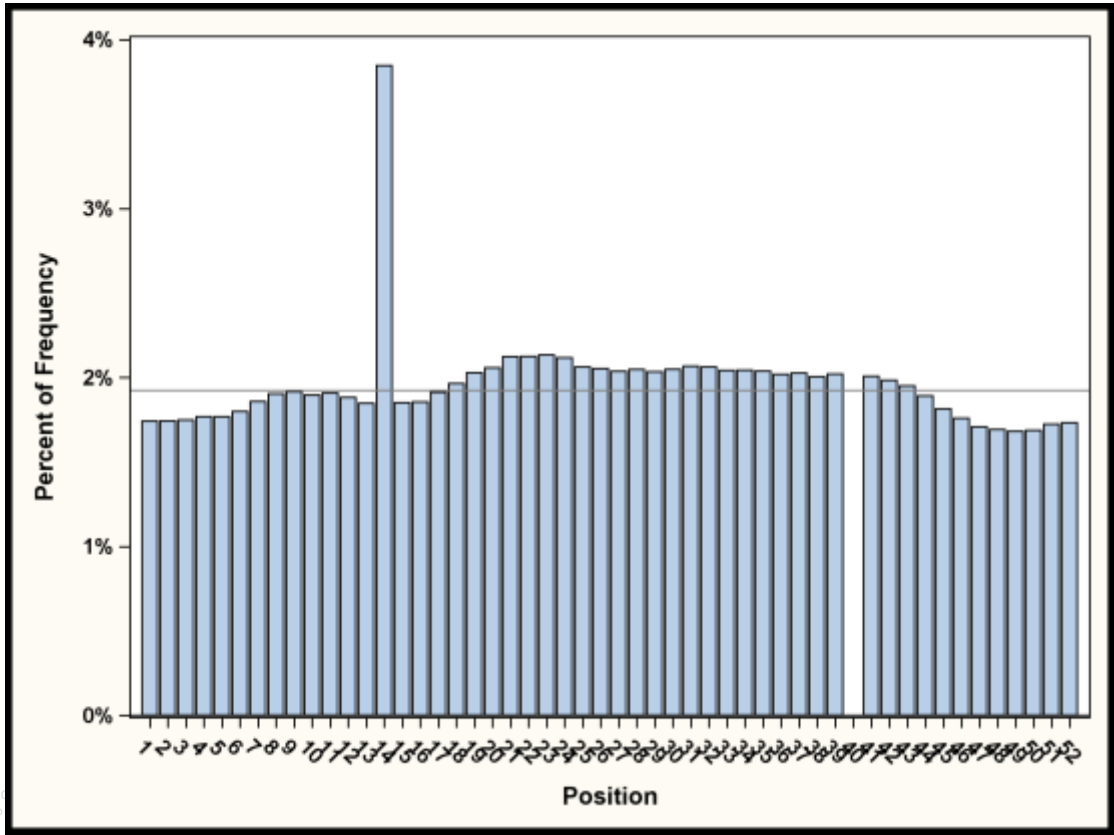
Sum of
2 Dice



All Field-40 visits are relocated to 14

Sum of
2 Dice

Go to Jail!

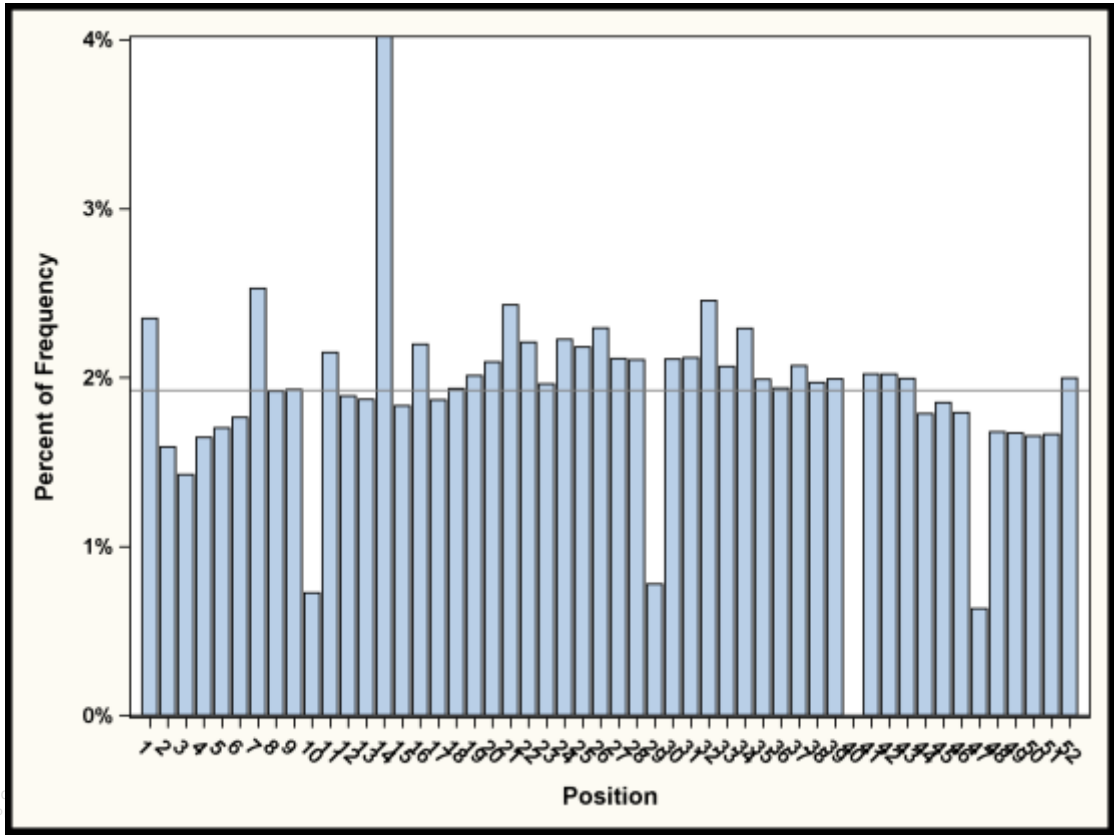


Event Fields relocate to other fields

Sum of
2 Dice

Go to Jail!

Event Fields



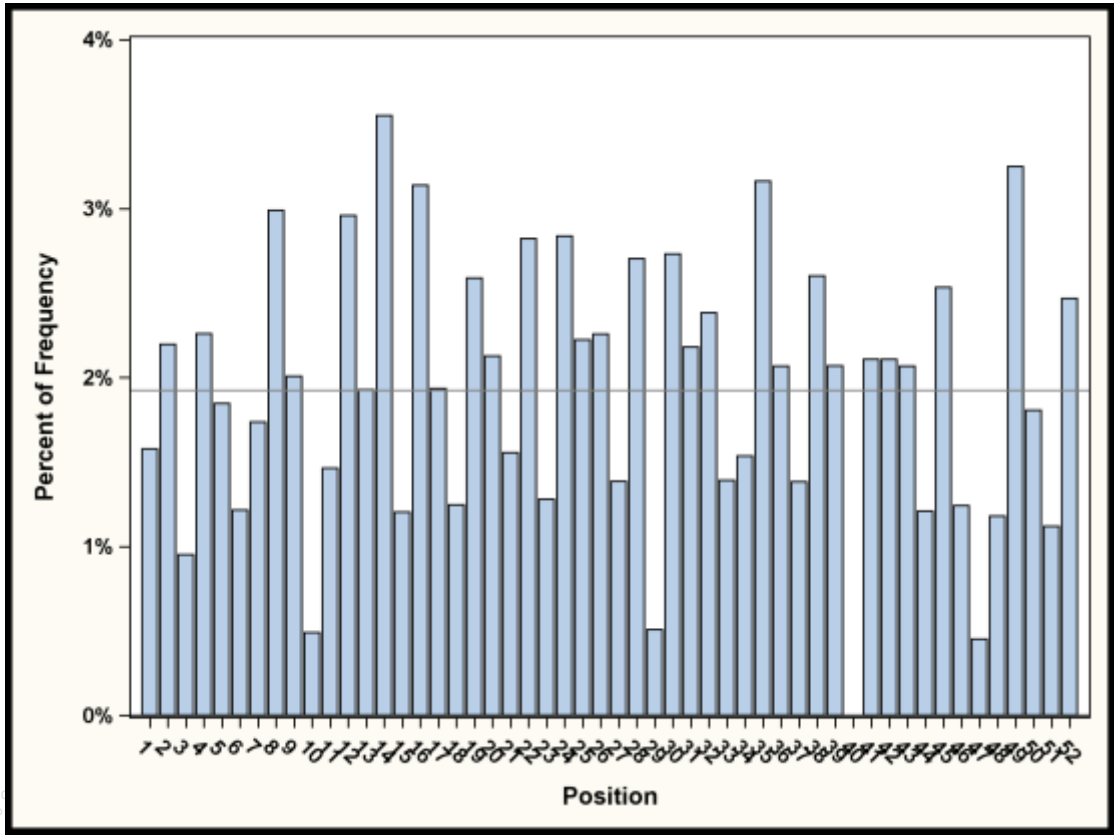
Red Dice introduces high variability

Sum of
2 Dice

Go to Jail!

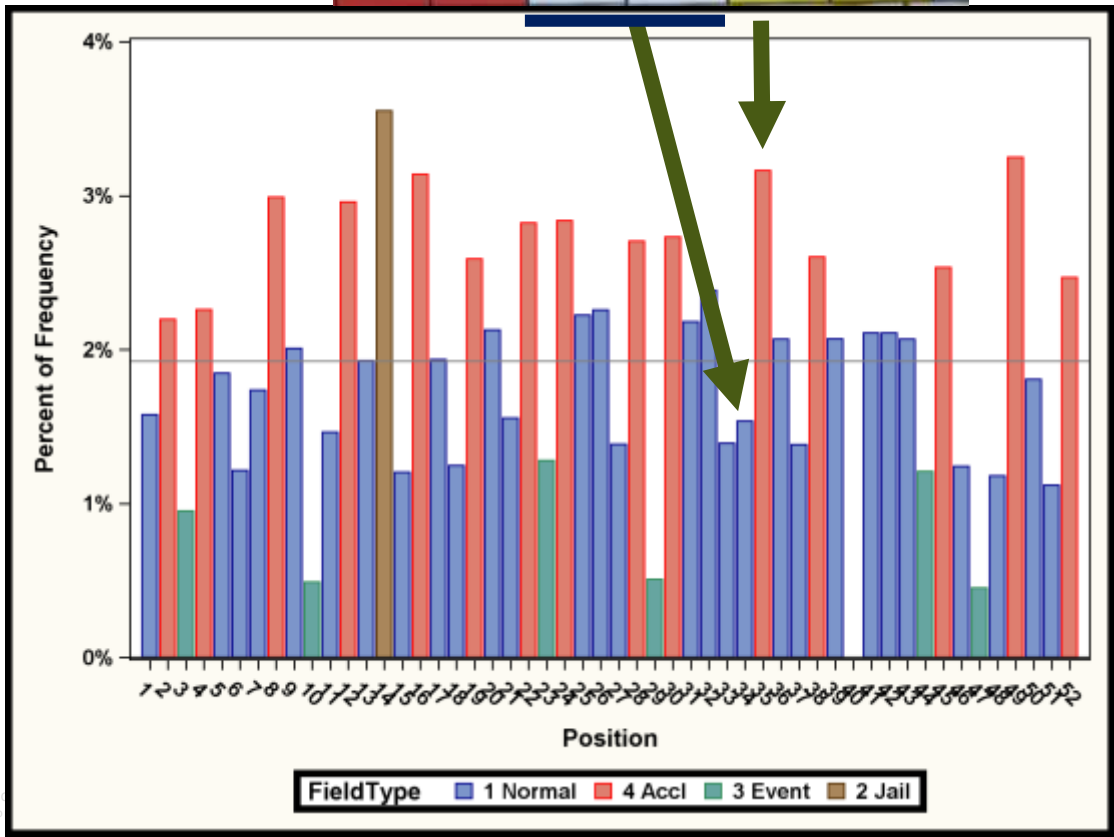
Event Fields

Accelerator
Dice

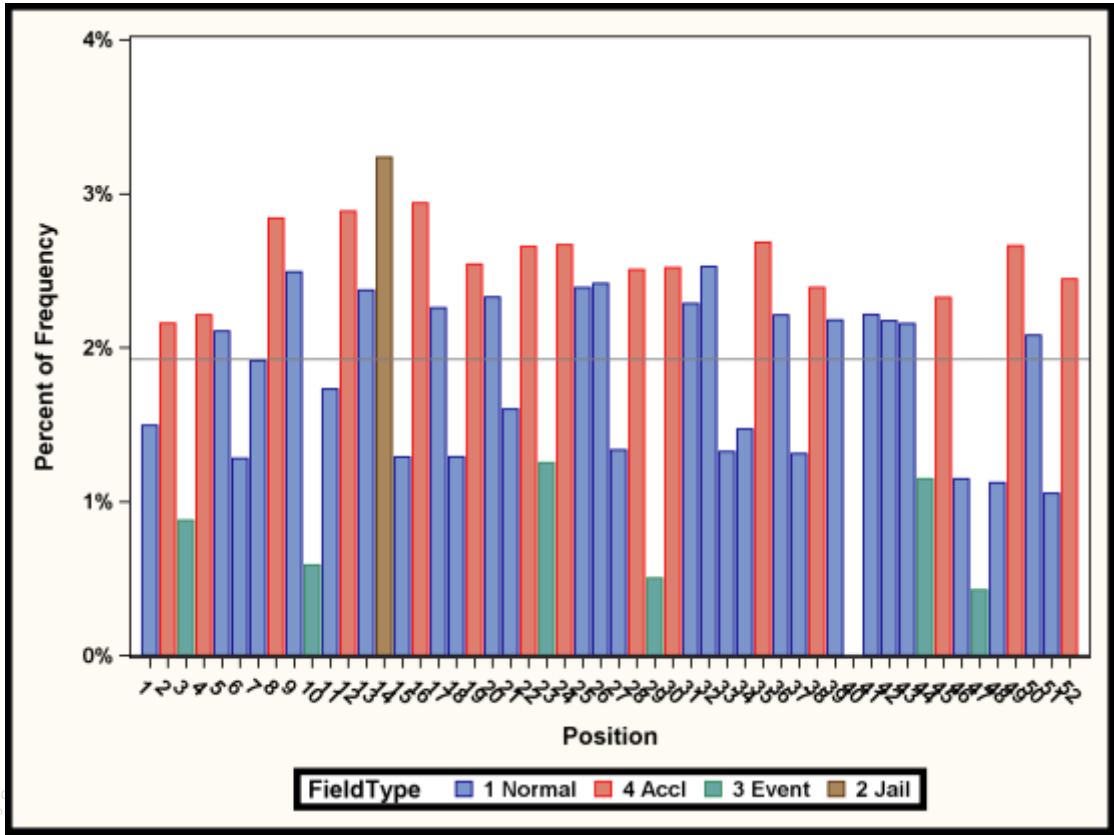


Example for a Relocation

- If the 3rd dice shows the Monopoly® man:
  - Move forward to the next free property-field
  - The next property field if all are sold



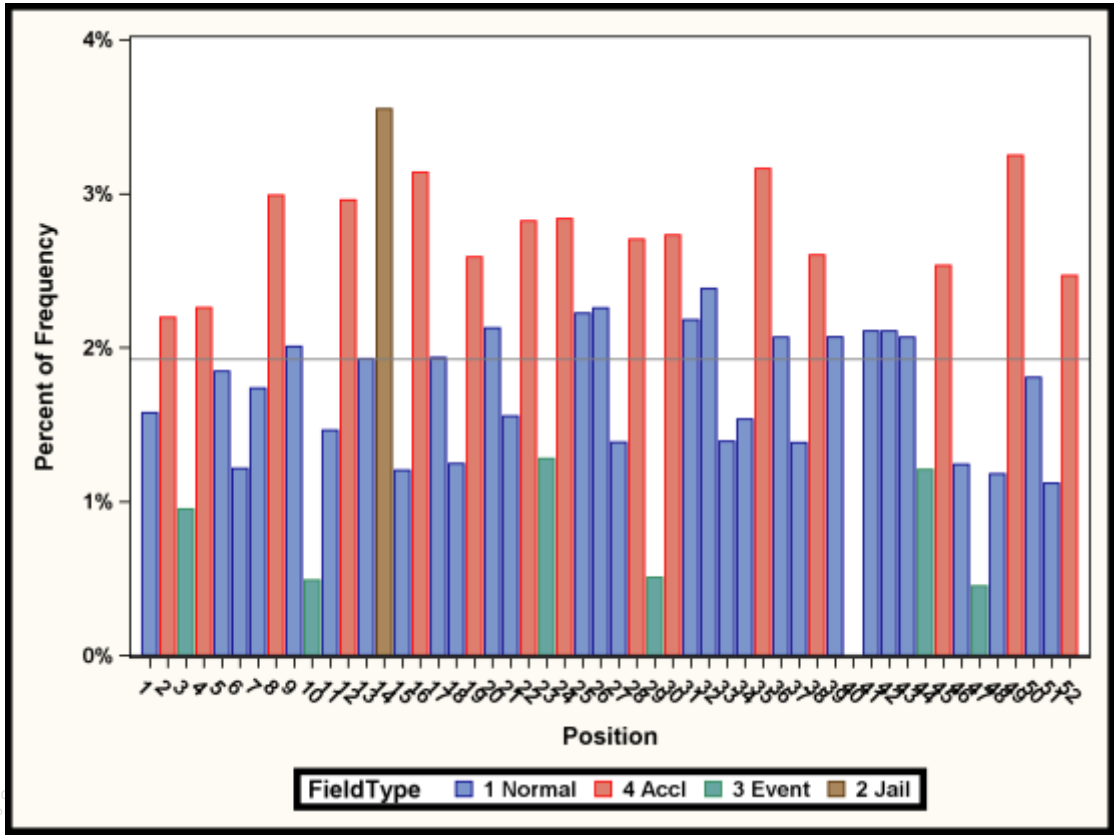
Effect of the accelerator dice after 20 rounds



Effect of the accelerator dice after 70 rounds

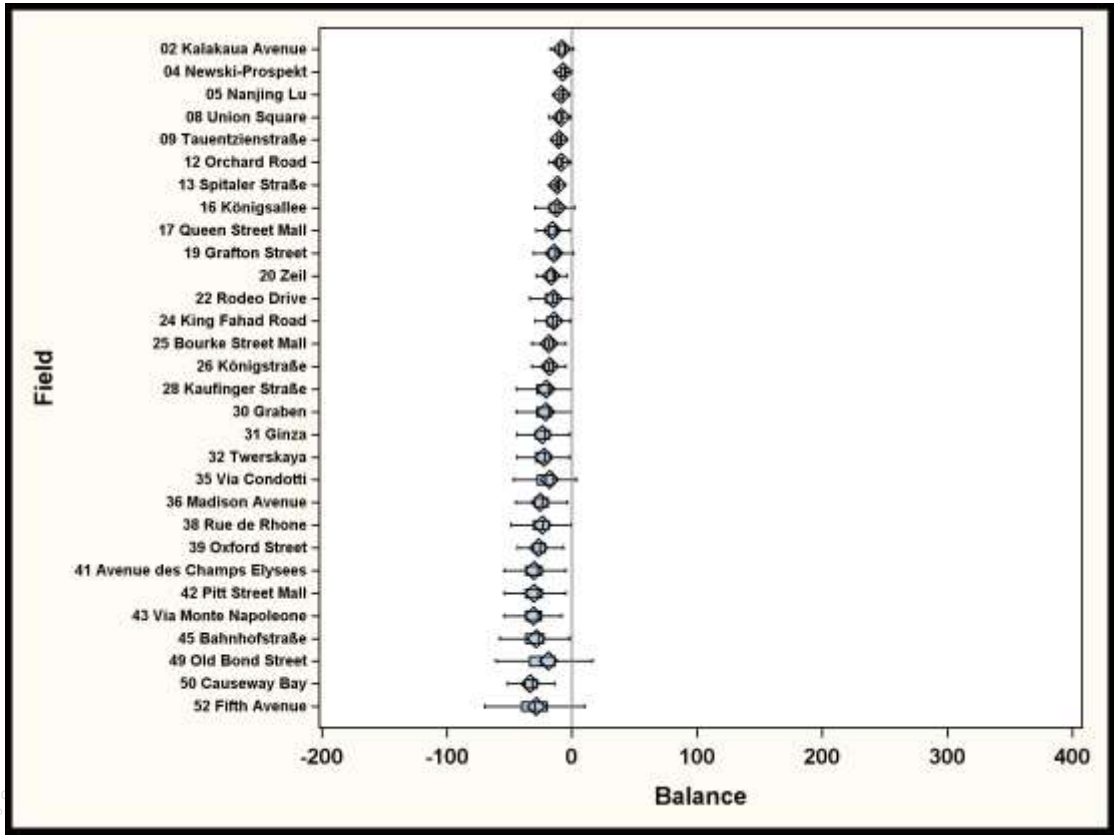
- „Dynamic Component“
- Effect of the rule changes in the course of the game

Dynamic Component



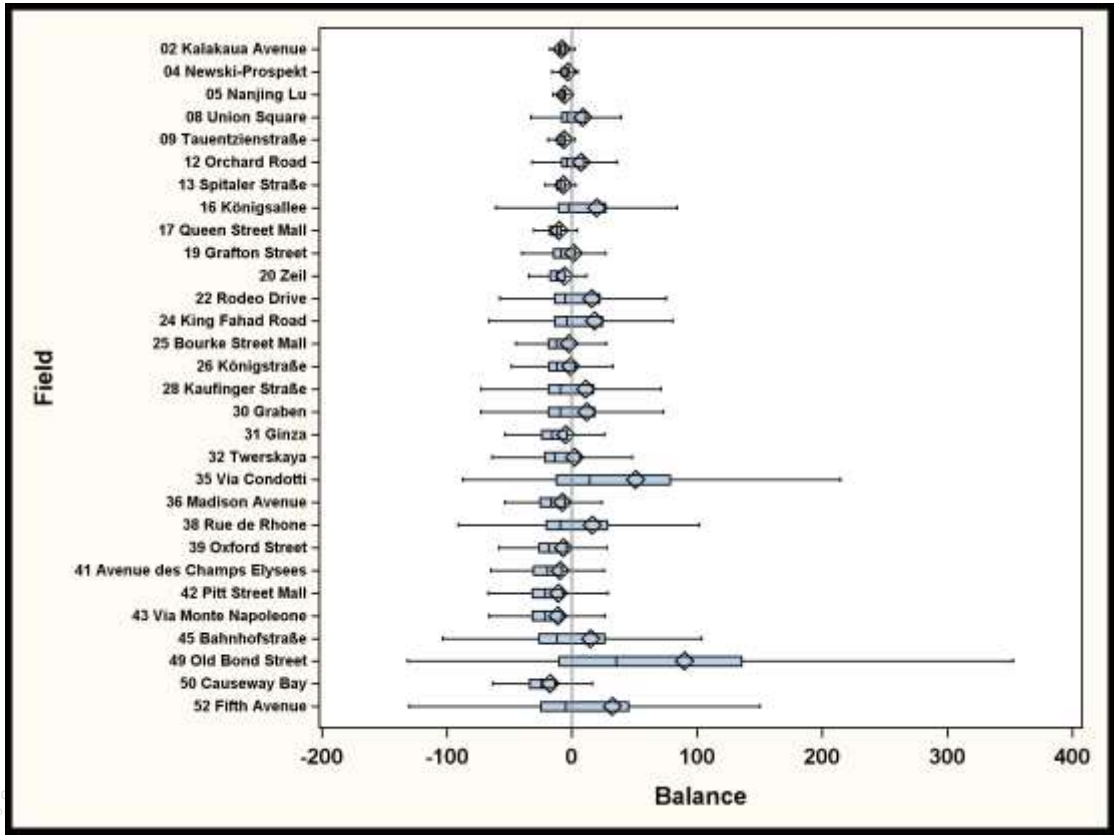
Profitability Distribution after 40 rounds

- Profitability simulation allows you to understand the distribution of the simulation



Profitability Distribution after 70 rounds

- The expected duration of the game impacts the profitability of different fields



Implementation in SAS


```
data Monopoly;
 array PlayerPos {4} PlayerPos1 - PlayerPos4;
   do Game = 1 to 10000;
     do Round = 1 to 70;
       do Player = 1 to 4;
          Dice1 = ceil(rand('Uniform')*6);
          if PlayerPos[Player]=40 then
                          PlayerPos[Player]=14;
          output;
       end;
     end;
   end;
run;
proc transpose data=Monopoly ...;run;
proc sgplot data=Monopoly_TP;
```

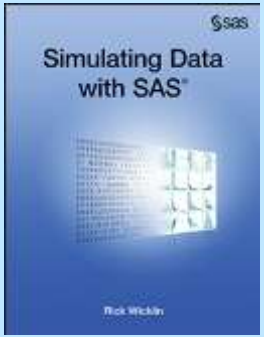
Summary

- Applying advanced analytical methods to big data allows you to better understand relationships in the underlying processes.
- You receive results that would otherwise remain undiscovered.
- SAS offers a full set of methods to handle big data in advanced analytics applications

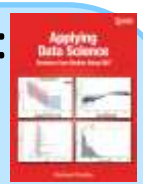
Links

- Patrick Hall: “Overview of Machine Learning with SAS Enterprise Miner” http://support.sas.com/resources/papers/proceedings14/SAS313-2014.pdf

- Rick Wicklin: Simulating Data with SAS http://support.sas.com/publishing/authors/wicklin.html



- Gerhard Svolba: **Applying Data Science: Business Case Studies Using SAS** (SAS Press, expected 2017)



http://www.sascommunity.org/wiki/Applying_Data_Science_-_Business_Case_Studies_Using_SAS