Crunching Metrics

from Public Data Sources

Metricon 4
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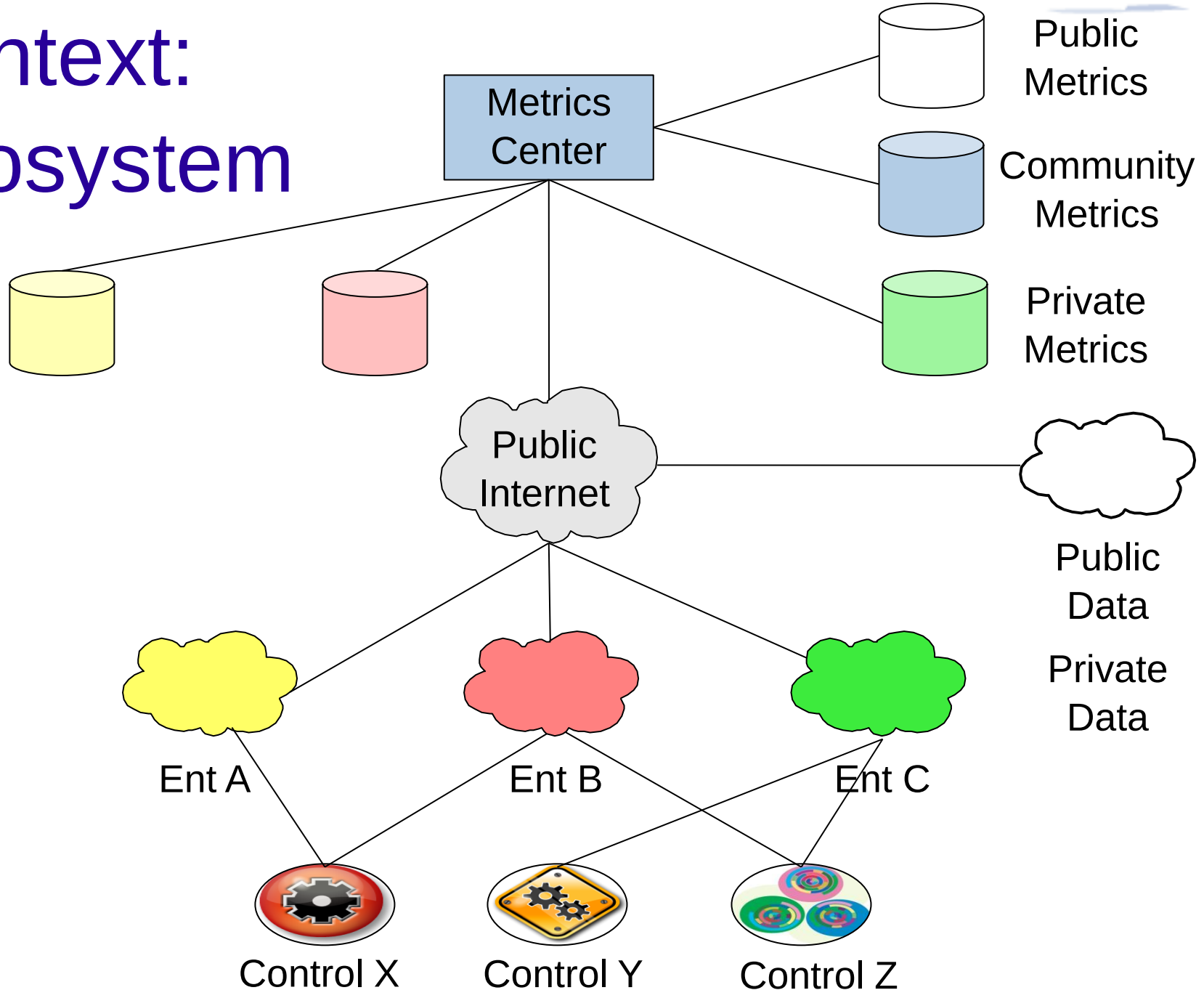
Outline

- Context(s)
- Questions
- Metrics + Models
- Conclusions

Context: Ecosystem



Context: Individual Business

- Breaches impact the business
- Total Impact = Impact(Expense) + Impact(MktCap)
  - Impact(expense) ~ Frequency + TotalAffected
  - Impact(mkt cap) ~ StockPrice
  - StockPrice ~ market movement + reputation
- Why should I care?
  - Stock price is clearly important. Is there any hard evidence that breaches do affect stock price, say within 60 days of breach?
  - Breach source: Inside vs Outside may imply differing controls or investments in people, process, technology

Context: Public Data Sources

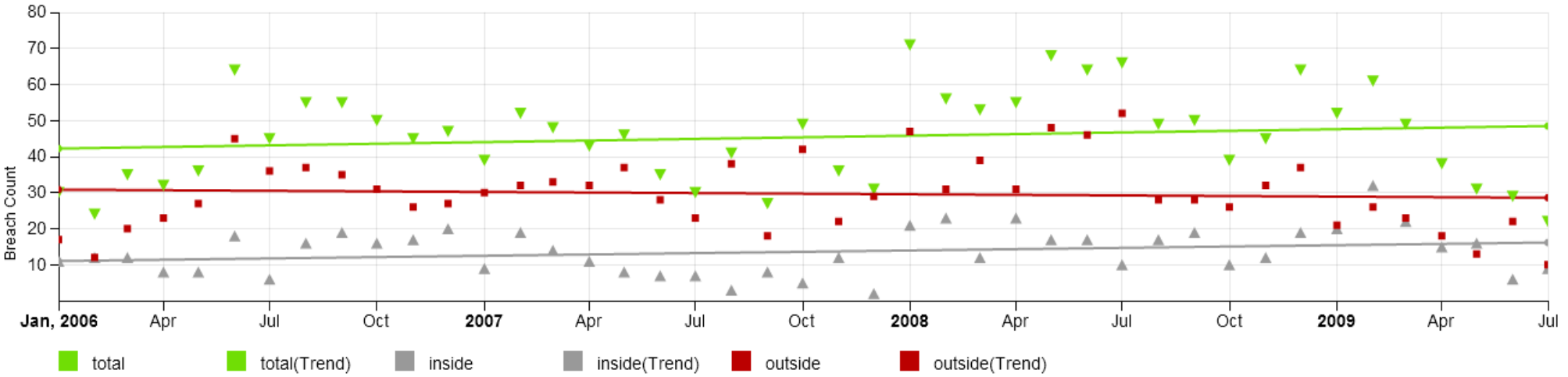
Google™

Questions

- Is Breach Frequency Increasing?
  - Frequency (Inside + Outside + Unk) is increasing
  - Frequency (Inside) is increasing
  - Frequency (Outside) is increasing
- How do Breach Frequency and Total Affected compare for Inside vs Outside sources?
  - Frequency (Inside) > Frequency (Outside)
  - TotalAffected(Inside) > TotalAffected(Outside)
- How does a breach affect stock price?
  - StockPrice(before) > StockPrice(after) for N days
  - StockPriceGradient changes sign from before(+) to after(-)

Breach Frequency

BreachCount/Month

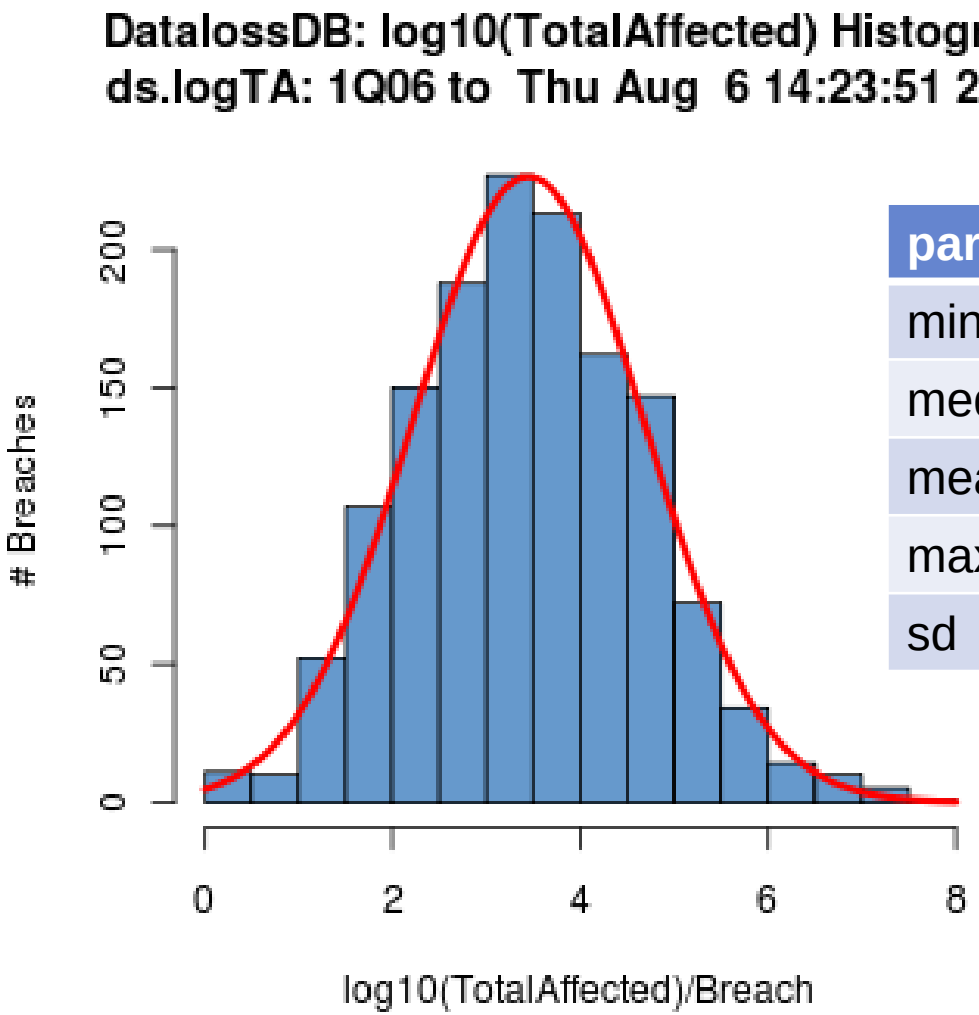


- Frequency (Inside + Outside + Unk) is increasing
- Frequency (Inside) is increasing
- Frequency (Outside) is increasing
- Frequency(Inside) > Frequency(Outside)

From the linear regression model:
Confidence > 80% that all of the above hypotheses are false.

Total Affected

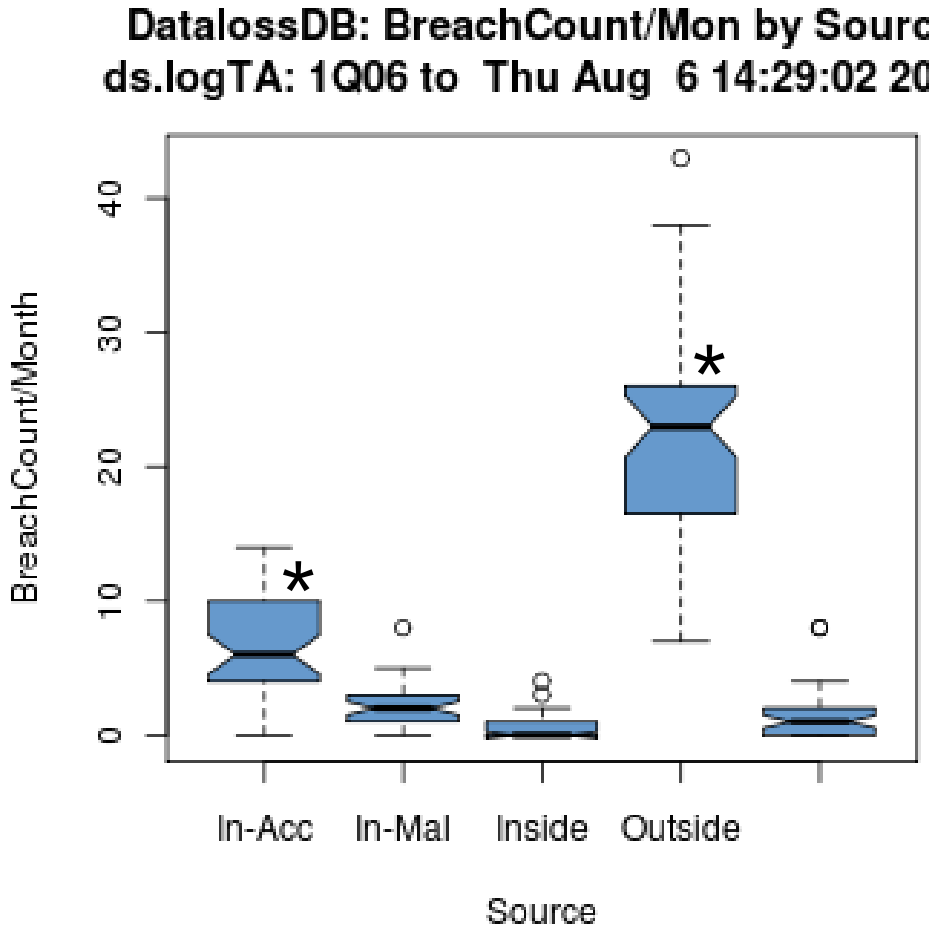
Frequency Histogram



parm	TotalAffected(TA)	Log10(TA)
min	0	1
median	663	3.48
mean	185,800	3.51
max	94,000,000	7.97
sd	2,614,917	1.23

Frequency by Source

Whisker Plot

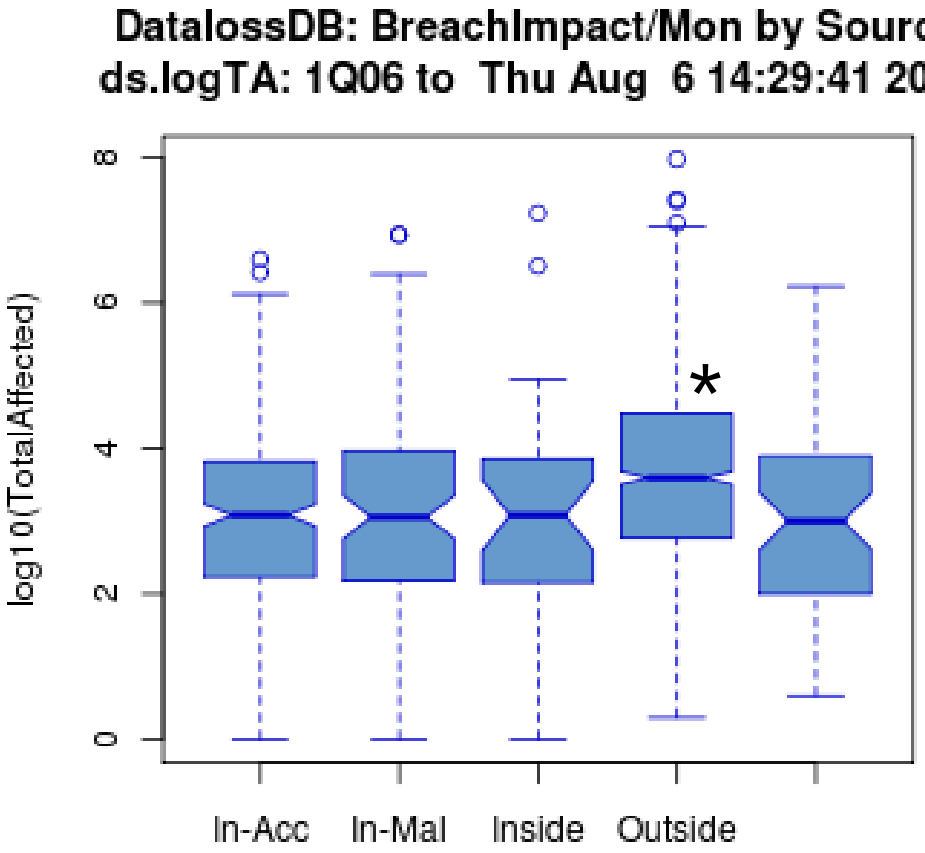


* Statistically significant differences

- Outside breaches occur much more frequently that inside ones
- Inside-Accidental breaches occur much more frequently than Inside-Malicious ones.

Total Affected by Source

Whisker Plot

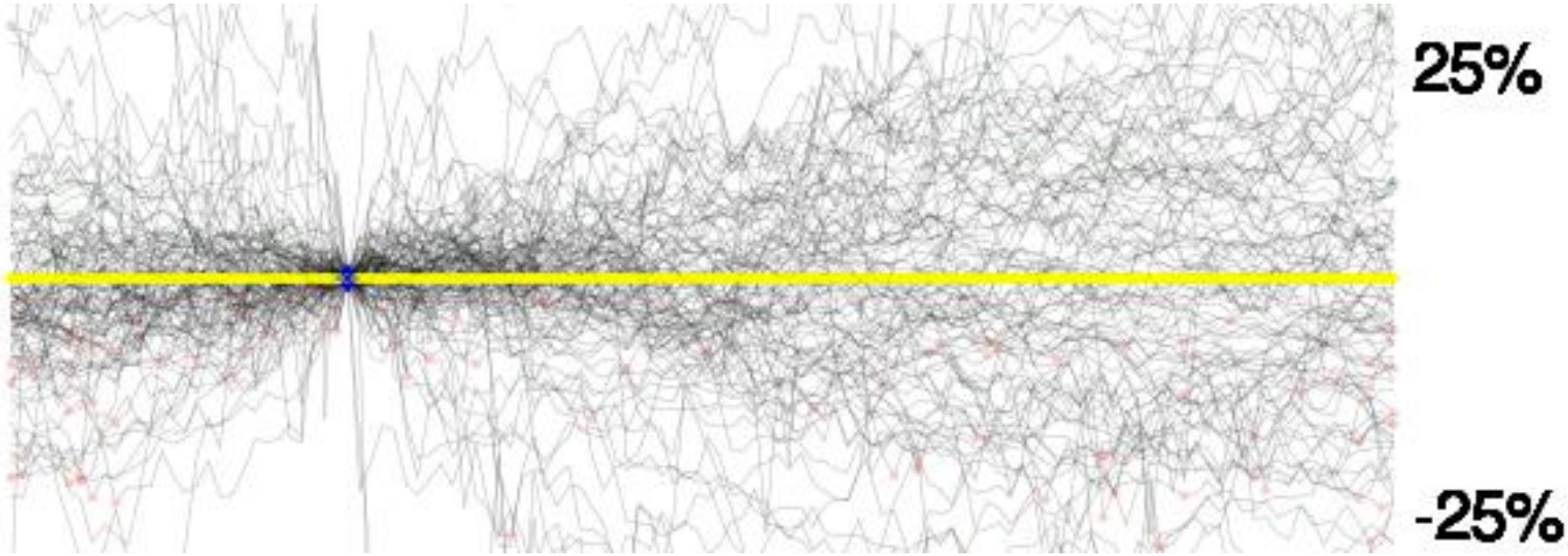


* Statistically significant differences

- Outside breaches affect more individuals than inside ones
- The number affected from Inside-Accidental, Inside-Malicious, and Unknown do not differ significantly

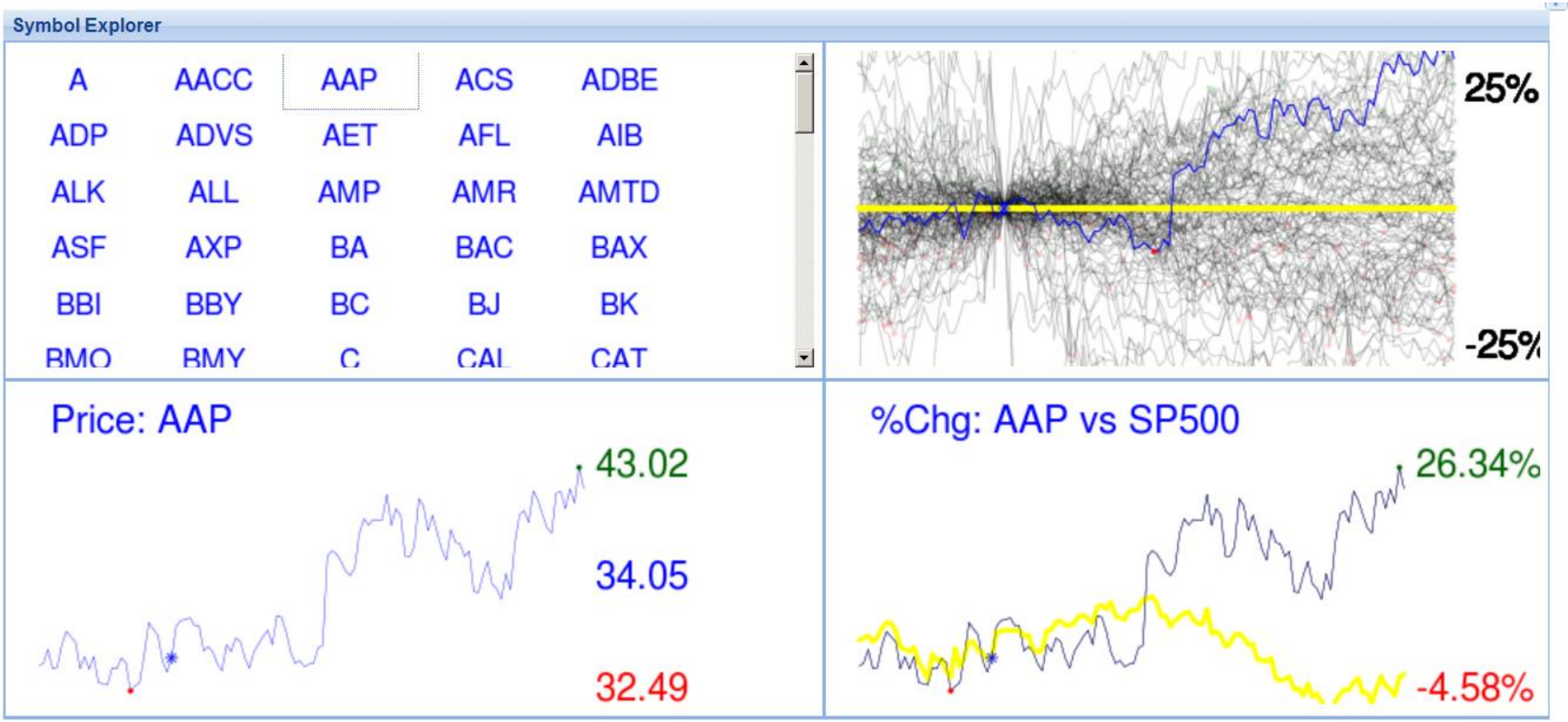
Stock Price Impact

Overlaid Sparklines: %ChgVsMkt



- 116 public companies with available, consistent ticker data
- Time Interval: [breachDate – 30 days, breachDate + 90 days]
- s=symbol; Price(s) = StockPrice(s);
- BreachPrice(s) = Price(s) @ BreachDate
- %Chg(s) = (Price(s) – BreachPrice(s)) / BreachPrice(s)
- %ChgVsMkt(s) = %Chg(s) - %Chg(SP500)

Interactive Symbol Picker



- Selector in upper left cell triggers updates to other three cells
- Price is sourced from www.google.com/finance
- Proxy for SP500 is SPY

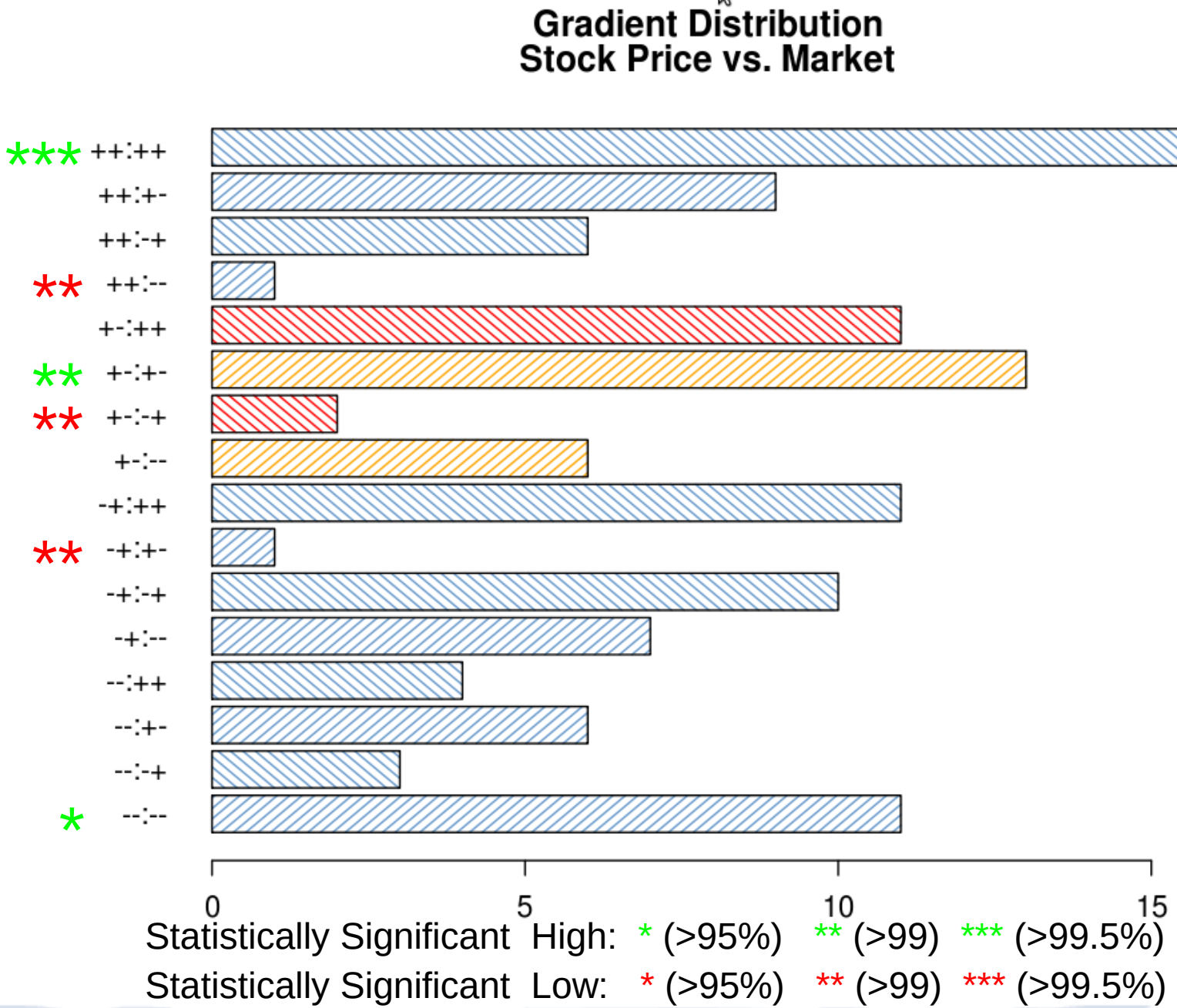
Stock Price Gradient Analysis

16 possiblities: 116 observations

Before (s)	After(s)	:	Before(mkt)	After(mkt)
++	--	:	--	++
++	-+	:	-+	++
++	+-	:	+-	++
++	++	:	++	++
+-	--	:	--	+-
+-	-+	:	-+	+-
+-	+-	:	+-	+-
+-	++	:	++	+-
-+	--	:	--	-+
-+	-+	:	-+	-+
-+	+-	:	+-	-+
-+	++	:	++	-+
--	--	:	--	--
--	-+	:	-+	--
--	+-	:	+-	--
--	++	:	++	--

Symbol stock price is increasing in the 30 day period before and decreasing in the 90 day period after the breach.

Stock Price Impact Analysis



Conclusions: Company Context

- Is Breach Frequency Increasing?
  - Frequency (Inside + Outside + Unk) is increasing FALSE (80%)
  - Frequency (Inside) is increasing FALSE (80%)
  - Frequency (Outside) is increasing FALSE (80%)
- How do Breach Frequency and Total Affected compare for Inside vs Outside sources?
  - Frequency (Inside) > Frequency (Outside) FALSE (>90%)
  - TotalAffected(Inside) > TotalAffected(Outside) FALSE (>90%)
- How does a breach affect stock price?
  - StockPriceGradient changes sign from before(+) to after(-)
    - With market TRUE (>90%) with Market
    - Against market FALSE (>90%)

Conclusions: Ecosystem Context

- Public data can provide insight
- We are actively seeking additional data sets to analyze
- Community metrics can provide significant value via benchmarking and peer-to-peer comparisons
- Enterprise metrics programs can benefit
  - By incorporating insights from public data
  - By selective sharing of internal results

Appendix: Statistical Analysis

- 16 possible observations; 116 companies
- Hypotheses:
  - H0: Pr(observaation) <= 1/16
  - H1: Pr(observation) > 1/16
- n=# obs=116; p0=1/16, q0=(1-p)=15/16; npq = 6.9
- Npq>5 → Use normal distribution as an approximation to the binomial distribution for hypothesis testing
- $Z = \frac{p - p_0}{\sqrt{p_0 q_0 / n}}$ yeilds the # sd's from mean for each obs.

Appendix: p-values

Gradients	# Obs	p-value
--:--	11	.08
--:-+	3	.95
--:+-	6	.69
--:++	4	.54
-+:--	7	.15
-+:-+	10	.08
-+:+-	1	.99
-+:++	11	.69

Gradients	# Obs	p-value
+-:--	6	.69
+-:-+	2	.98
+-:+-	13	.01
+-:++	11	.08
++:--	1	.99
++:-+	6	.69
++:+-	9	.26
++:++	16	.0005

The p-value indicates the probability of rejecting a true H0, namely that the probability of any of the above possible observations is 1/16 or less.

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