

Understanding the News that Moves Markets

EMNLP 2018

November 3, 2018

Gideon Mann

Head of Data Science, Office of the CTO

TechAtBloomberg.com

Bloomberg

My journey: bad hair to no hair



What this talk is **not
about:**

How to make money on the stock market



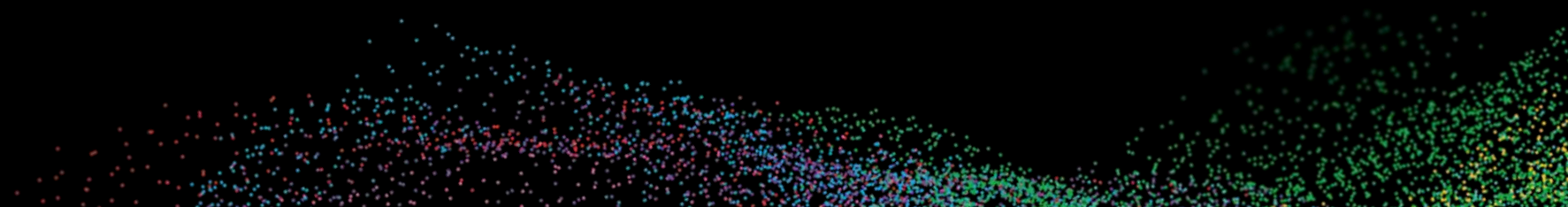
What this talk **is about:**

Financial technology

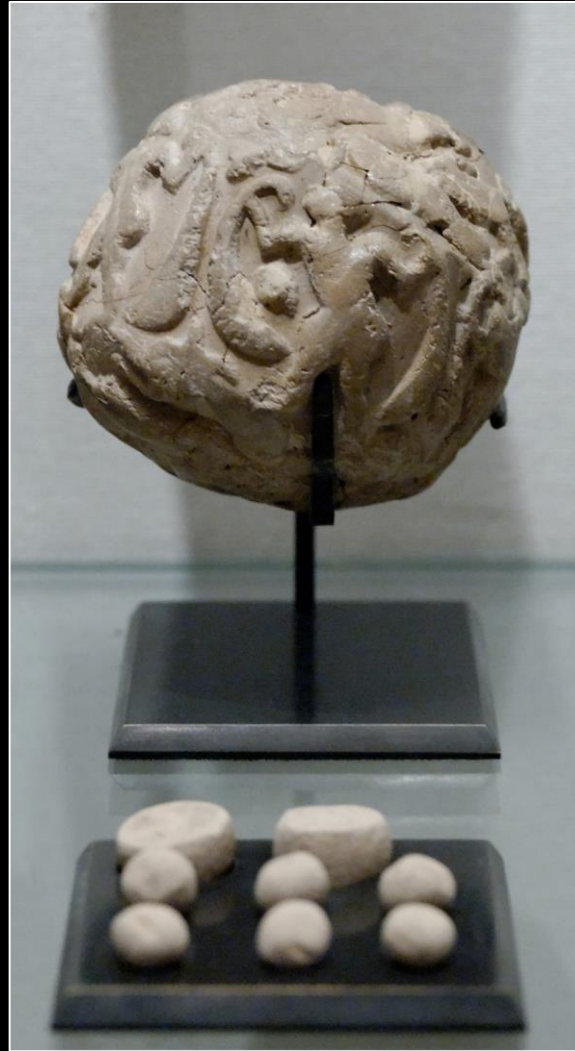
The news that moves markets

Computer Things

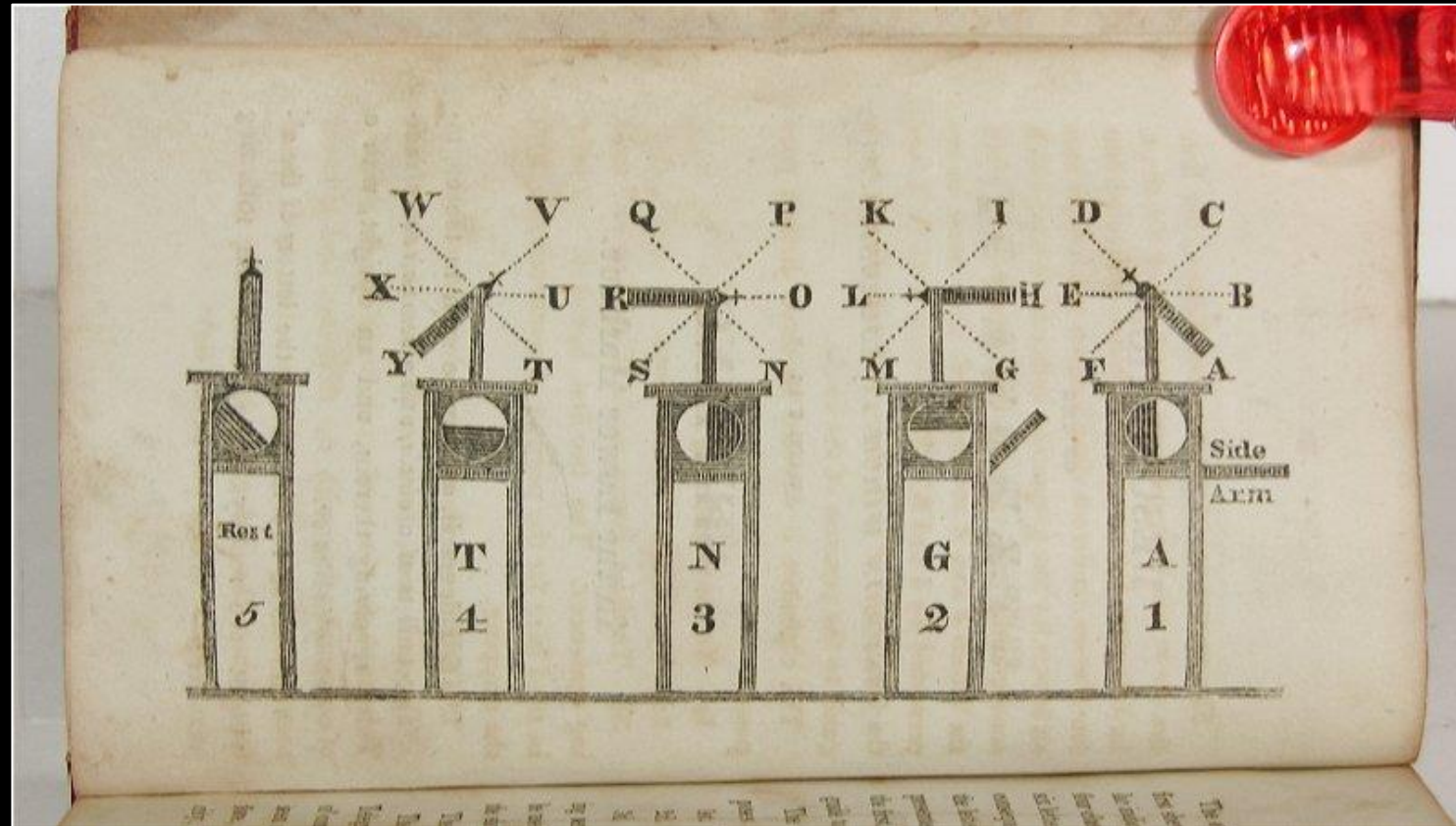
BlocksWorld



Financial Technology



Financial Technology II



Financial Technology III





What is the finance ecosystem?

Savers
(Companies, charities,
governments,
individuals - me and you)

Market:
Stock exchanges

Buy side

Wealth managers

Sovereign Wealth Funds
(Norway's "Oil Fund")

Insurance companies

Pension funds

Buy side

Investment Management firms
(Vanguard, Azimut)

Sell side

Investment banks and other brokers
(HSBC)

Fund Rating agencies

Investment consultants

Sell side analysts

Bloomberg

Government and companies

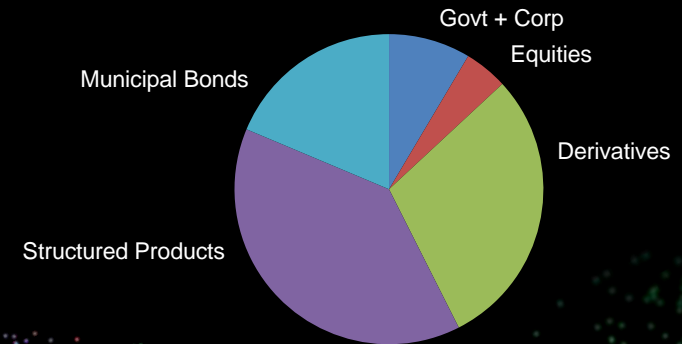
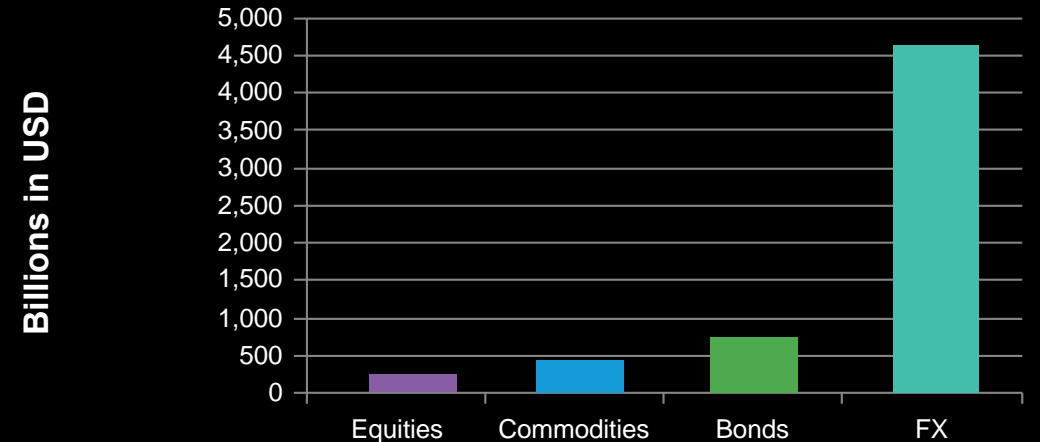
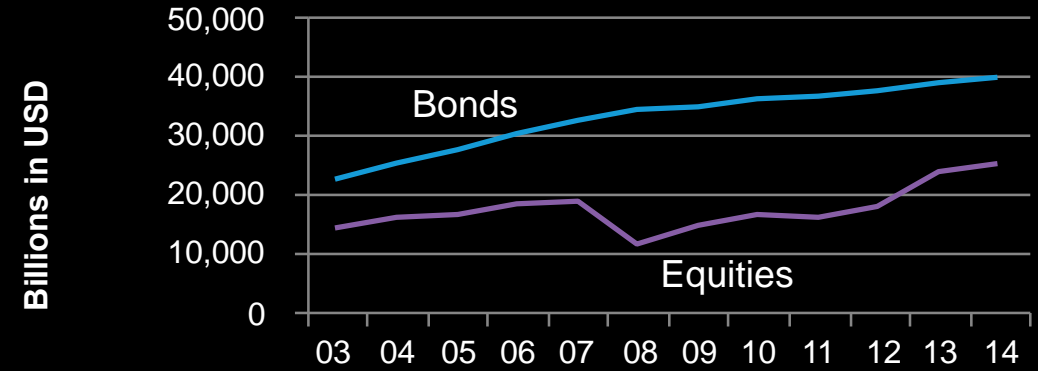
Credit rating agencies

Central Banks

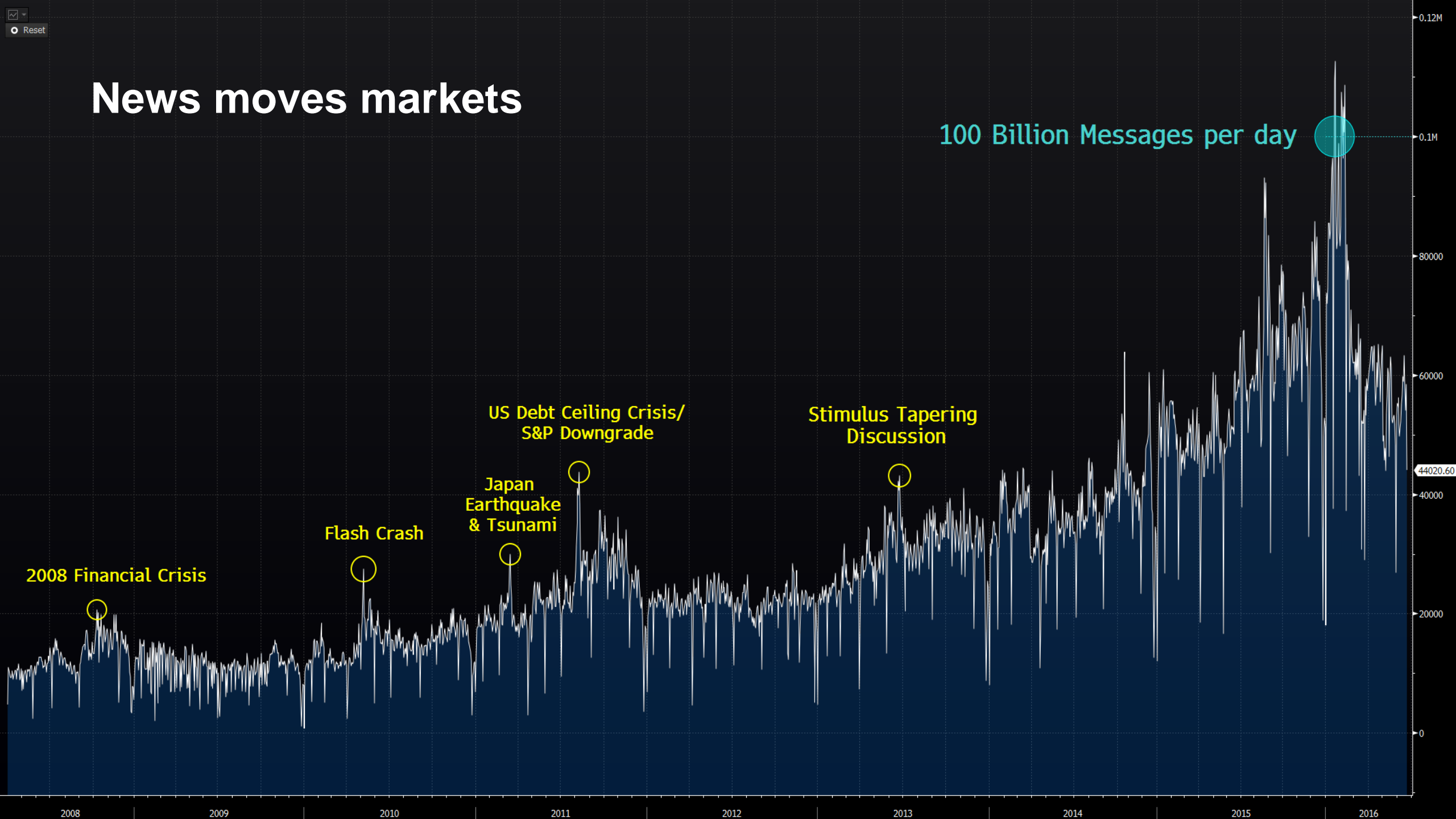
Bonds have more market value than equities

FX has the most daily notational volume

Vastly more structured products and derivatives than equities



News moves markets



2008 Financial Crisis

Flash Crash

Japan Earthquake & Tsunami

US Debt Ceiling Crisis/ S&P Downgrade

Stimulus Tapering Discussion

100 Billion Messages per day



2008

2009

2010

2011

2012

2013

2014

2015

2016

0.12M

0.1M

80000

60000

44020.60

20000

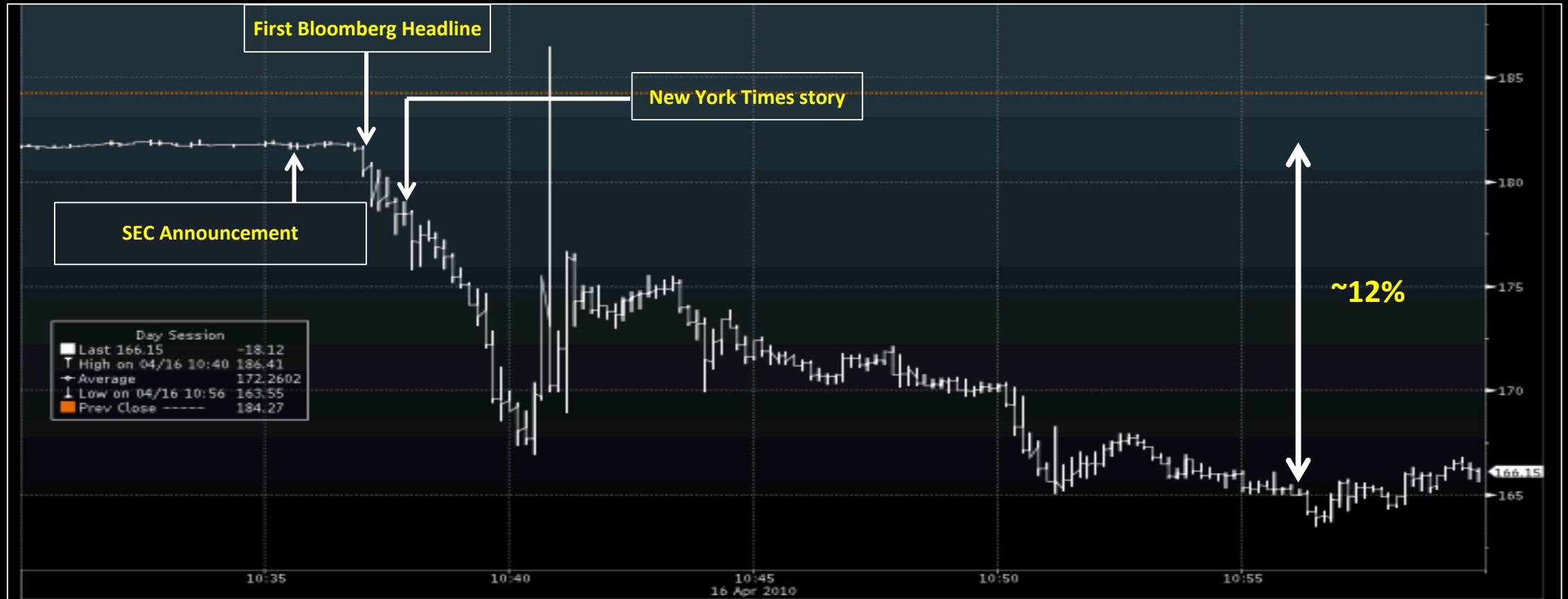
0

Not all channels are the same...

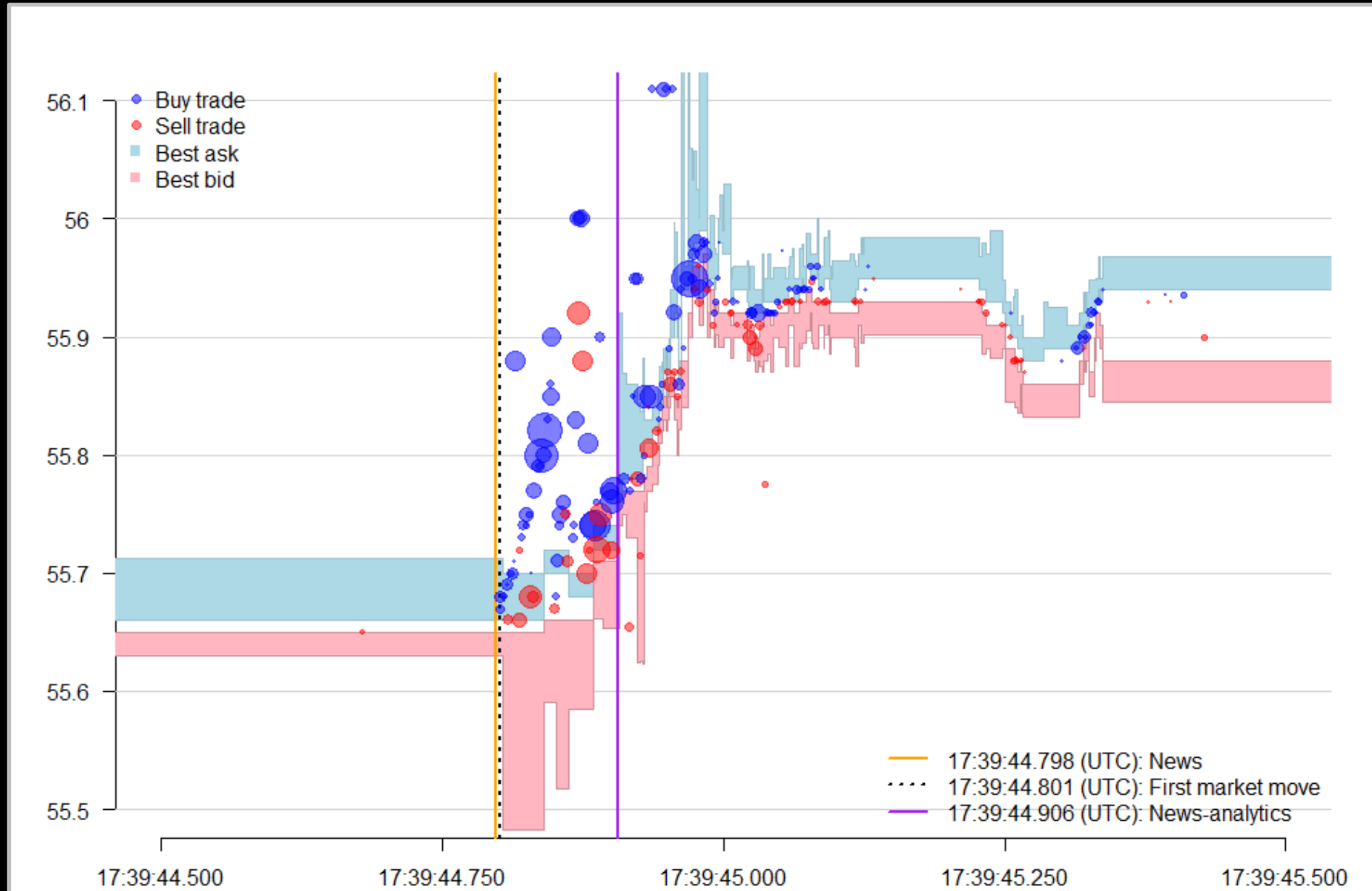


[Dredze et al. 2016]
[Osborne, Dredze 2014]

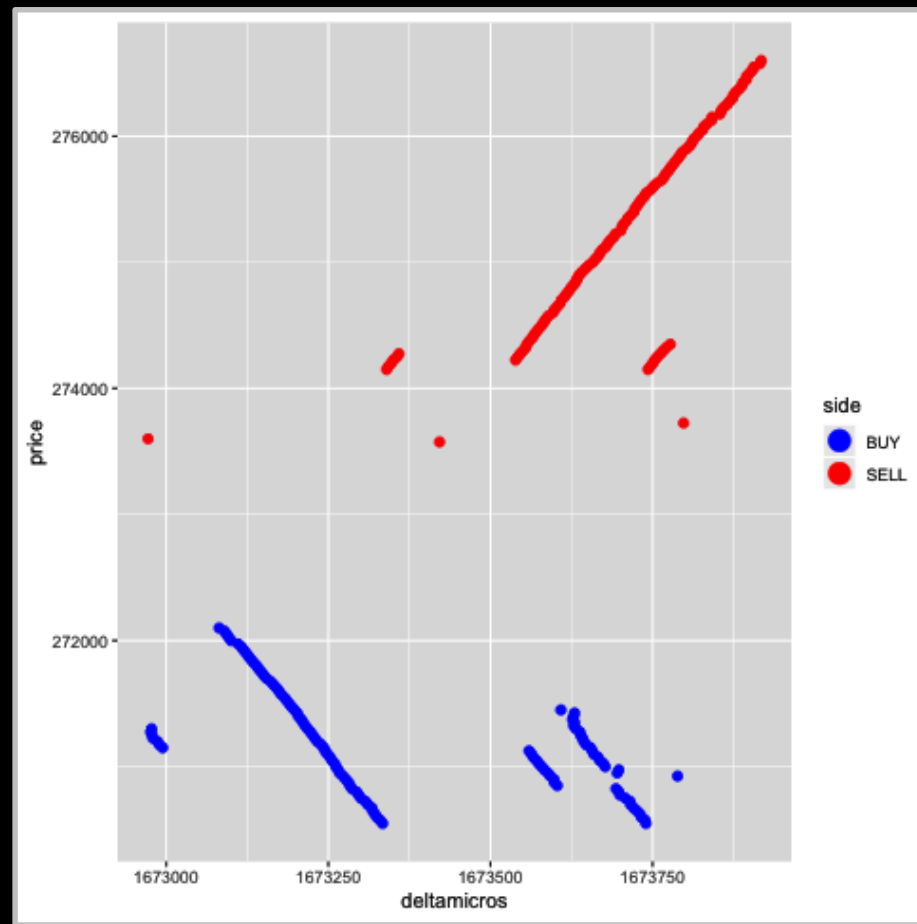
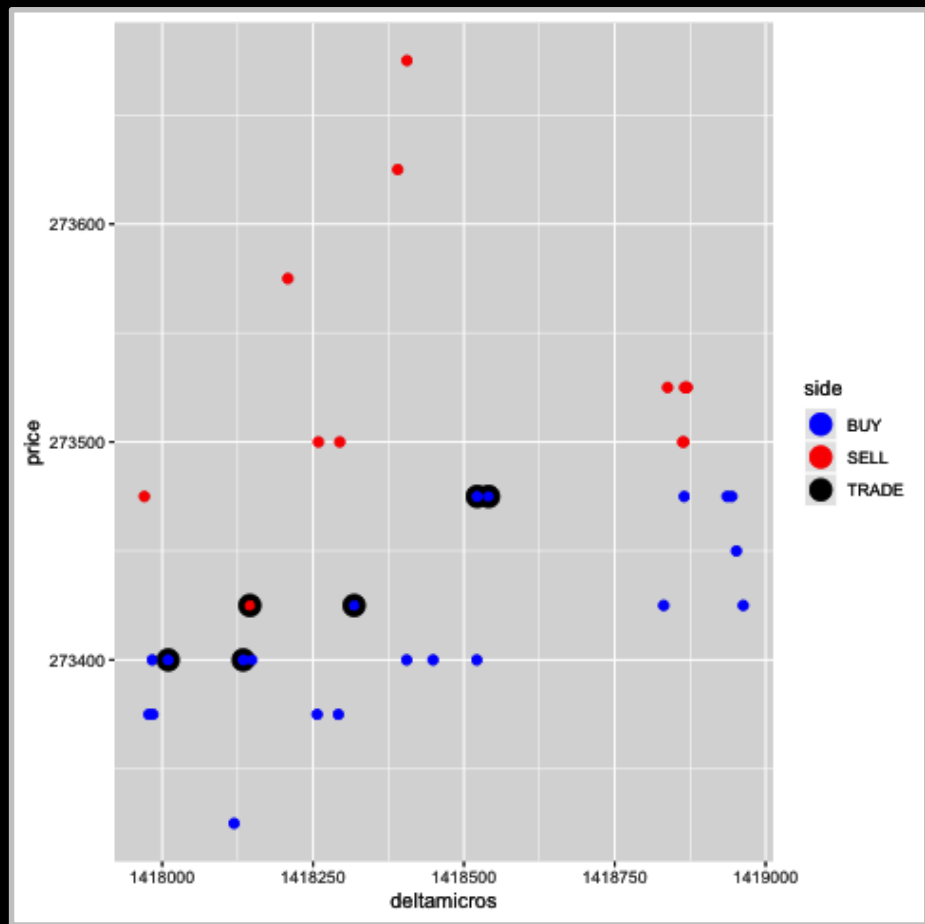
...not all sources are the same



Broadcomm is said to explore deal to acquire chipmaker Qualcomm



Human Language Technology, not Renaissance Technologies



Time is not a myth

Days & Hours

Fundamental Investor

Minutes

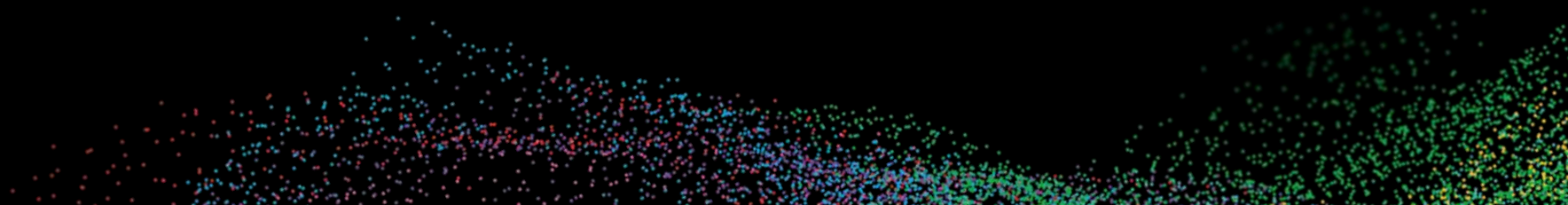
Institutional Trader

Milliseconds

Event Driven Algorithmic Trader

Microseconds

High Frequency Trading



Detection

New text arrives

Extraction

Extract structured
data from text

Interpretation

Relate new data to
existing data

Presentation

Inform the user on
what happened

Detection

Extraction

Interpretation

Presentation



Document ingest and search



The screenshot shows a news search interface. At the top, there is a navigation bar with 'Search News', 'Actions', 'Custom Searches', and 'Translate'. The current search term is 'Coffee'. Below the navigation bar, there are filters for 'All Sources', 'All Dates', and 'Time'. The results are divided into two sections: 'Top Ranked News' and 'Time Ordered News'. The 'Top Ranked News' section lists three items, and the 'Time Ordered News' section lists 19 items. Each item includes a rank, a title, and a source with a timestamp.

Rank	Title	Source	Time
1)	Engelhart Hires Former Sucden's Donovan to Bolster Coffee Team	BN	12:10
2)	SOFTS: Cocoa Advances on El Nino Concerns; Coffee, Sugar Climb	BFW	10/25
3)	Tata Coffee Earnings Teleconference TCO IN	BT	05:19
Time Ordered News			
4)	*SEC Short Sale Rule 201 is in Effect : YGYI (NASDAQ)	BSS	12:10
5)	Engelhart Hires Former Sucden's Donovan to Bolster Coffee Team	BN	12:10
6)	Mena Report: Tender For Sale Of Dried Coffee Berries.	NS8	11:36
7)	Mena Report: Supply Of Coffee.	NS8	09:45
8)	Mena Report: Coffee, Tea And Accompanying Products.	NS8	09:28
9)	The Columbian: Food & Drink: Kafix celebrates global coffee village	NS1	09:09
10)	Mena Report: Food, Beverages, Tobacco And Related Products (coffee Beverage, ...	NS8	09:05
11)	Stewart & Mackertich Research_WEEKLY Dossier 26-10-2018	SMK	08:46
12)	Tuoi Tre: Tea-based drinks outplay coffee in caffeine-loving Vietnam: report	NS6	08:18
13)	Intl Coffee Org: Visit from Ambassador of Angola	IN9	06:51
14)	AGRICULTURE WEEKLY AGENDA: Sugar Ethanol; Bali; Soy Crush; Bunge	BFW	05:45
15)	Asian News: GreenBrew all set to dominate Indian market with flavored green c...	RE6	05:28
16)	Tata Coffee Earnings Teleconference TCO IN	BT	05:19
17)	Commodity Online: India Coffee exports may fall as floods dent production	NS1	04:19
18)	*SEC Short Sale Rule 201 Not In Effect : YGYI (NASDAQ)	BSS	03:58
19)	Tata Coffee Earnings Q2 2019 Earnings Call Teleconference TCO IN	BT	02:38

Twitter: Ranking financial tweets


 **StockCats**
@StockCats [Follow](#)

we haven't had a Twitter takeover rumor all year, so he's got to come up with something

4:09 PM - 26 Jan 2017

1 Retweet 14 Likes 

 3  1  14 

 **zerohedge**
@zerohedge [Follow](#)

TWTR jumps 3.9% on rerun of Google acquisition rumor

2:52 PM - 31 Aug 2016

A disaster in the White House is huge

AP The Associated Press  

@AP

Breaking: Two Explosions in the White House and Barack Obama is injured

 Reply  Retweet  Favorite  Buffer  More

3,242 RETWEETS **153** FAVORITES

12:07 PM - 23 Apr 13



Over \$136 billion
was wiped out in
minutes

Credibility



Twitter: Geolocation credibility



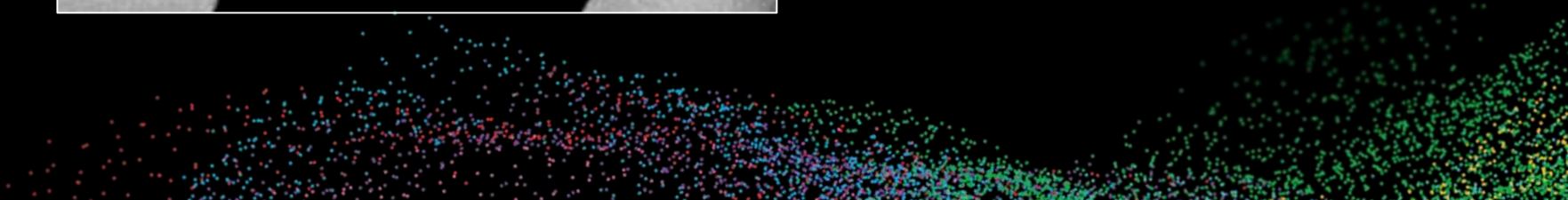
- [Preotiuc-Pietro, Guntuku, Ungar 2017]
- [Preotiuc-Pietro, Liu, Hopkins, Ungar 2017]
- [Giorgi, Preoțiu-Pietro, Buffone, Rieman, Ungar Schwartz 2018]
- [Dredze, Osborne, Kambadur 2016]

Detection

Extraction

Interpretation

Presentation



Extraction from natural documents

PART I — FINANCIAL INFORMATION

Item 1. Financial Statements

STARBUCKS CORPORATION

CONDENSED CONSOLIDATED STATEMENTS OF EARNINGS

(in millions, except per share data)

(unaudited)

	Quarter Ended		Three Quarters Ended	
	Jul 1,	Jul 2,	Jul 1,	Jul 2,
Net revenues:				16,688.5
Company-operated stores	\$ 3,060.4	\$ 4,509.0	\$ 14,630.3	\$ 13,173.7
Licensed stores	660.6	588.3	1,968.6	1,737.4
CPG, foodservice and other	589.3	564.2	1,817.0	
Total net revenues	6,310.3	5,661.5	18,415.9	16,688.5
Cost of sales including occupancy costs	2,554.9	2,249.1	7,573.7	
Store operating expenses	1,825.0	1,628.9	5,351.6	4,833.5
Other operating expenses	148.0	142.5	424.0	422.7
Depreciation and amortization expenses	330.0	252.6	920.4	756.0
General and administrative expenses	468.7	325.0	1,253.6	1,008.2
Restructuring and impairments	16.9	120.2	179.2	120.2
Total operating expenses	5,343.5	4,718.3	15,702.5	13,845.9
Income from equity investees	71.4	101.0	213.5	269.5
Operating income	1,038.2	1,044.2	2,926.9	3,112.1
Gain resulting from acquisition of joint venture	2.5	—	1,376.4	—
Net gain resulting from divestiture of certain operations	—	—	496.3	9.6
Interest income and other, net	31.5	31.7	155.2	114.1
Interest expense	(45.4)	(23.5)	(106.4)	(70.2)
Earnings before income taxes	1,026.8	1,052.4	4,848.4	3,165.6
Income tax expense	174.8	361.1	1,086.5	1,070.1
Net earnings including noncontrolling interests	852.0	691.3	3,761.9	2,095.5
Net loss attributable to noncontrolling interests	(0.5)	(0.3)	(0.9)	(0.6)
Net earnings attributable to Starbucks	\$ 852.5	\$ 691.6	\$ 3,762.8	\$ 2,096.1
Earnings per share - basic	\$ 0.62	\$ 0.48	\$ 2.69	\$ 1.44
Earnings per share - diluted	\$ 0.61	\$ 0.47	\$ 2.67	\$ 1.43
Weighted average shares outstanding:				
Basic	1,377.1	1,447.7	1,397.7	1,452.8
Diluted	1,388.5	1,459.4	1,409.9	1,464.9
Cash dividends declared per share	\$ 0.36	\$ 0.25	\$ 0.96	\$ 0.75

See Notes to Condensed Consolidated Financial Statements.

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STARBUCKS CORP Equity FA Related Functions Menu

SBUX US \$ ↓ 57.80 +1.05 Q57.80 / 57.81Z 15x11

At 14:57 d Vol 6,263,151 0 56.94Q H 58.01K L 56.77Q Val 360.424M

SBUX US Equity 90 Actions 97 Export 98 Settings Financial Analysis

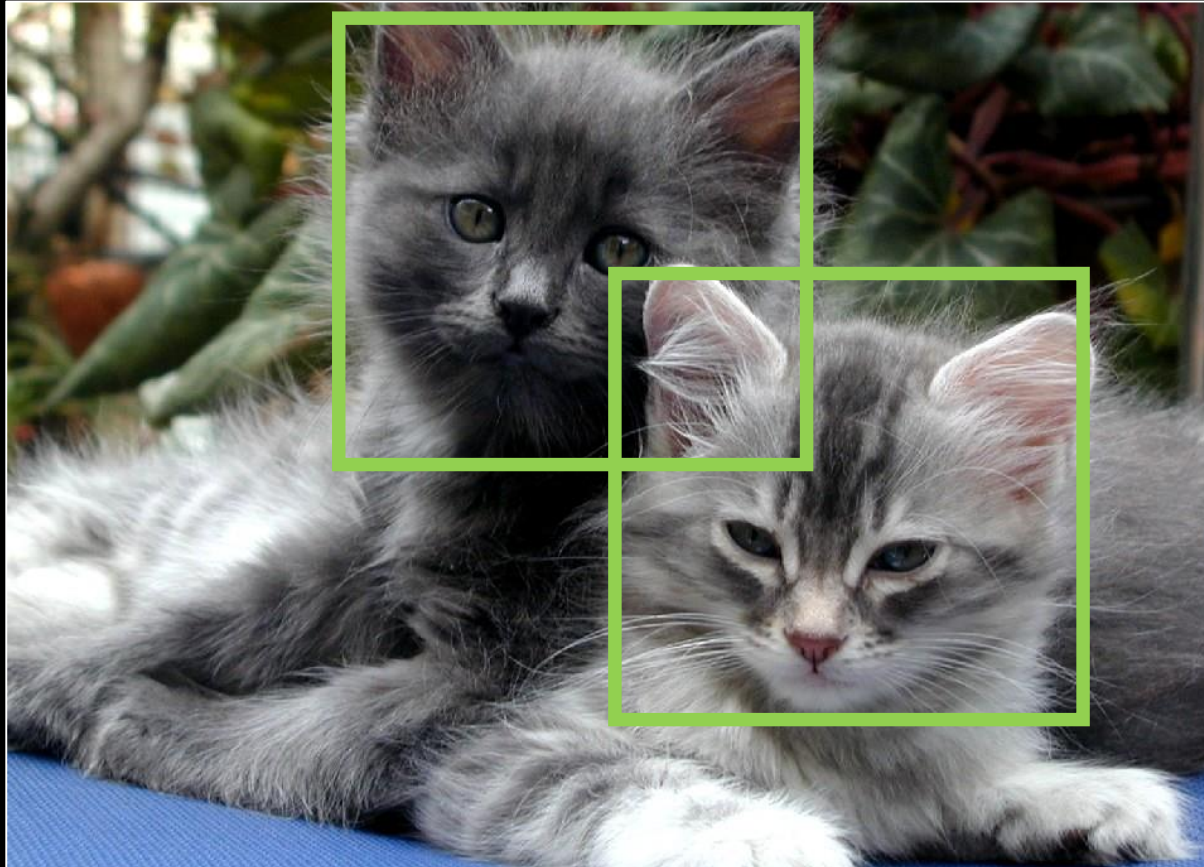
Starbucks Corp BQL Periodicity Annuals Cur FRC (USD)

Key Stats I/S B/S C/F Ratios Segments Addl ESG Custom Shared

1) Adj Highlights 2) GAAP Highlights 3) Earnings 4) Enterprise Value 5) Multiples 6) Per Share 7) Stock Value

In Millions of USD	2014 Y	2015 Y	2016 Y	2017 Y	Current/LTM	2018 Y Est	2019 Y Est
12 Months Ending	09/28/2014	09/27/2015	10/02/2016	10/01/2017	07/01/2018	09/30/2018	09/30/2019
Market Capitalization	56,343.7	86,120.9	79,071.5	76,891.2	78,005.0		
- Cash & Equivalents	1,843.8	1,611.4	2,263.2	2,690.9	1,976.6		
+ Preferred & Other	1.7	1.8	6.7	6.9	6.0		
+ Total Debt	2,048.3	2,347.5	3,585.2	3,932.6	6,798.9		
Enterprise Value	56,549.9	86,858.8	80,400.2	78,139.8	82,833.3		
Revenue, Adj	16,447.8	19,162.7	21,315.9	22,386.8	24,114.1	24,694.9	26,124.5
Growth %, YoY	10.6	16.5	11.2	7.7	10.3	5.8	
Gross Profit, Adj	4,950.8	5,964.1	6,740.5	6,855.3	7,196.0	14,551.4	15,661.6
Margin %	30.1	31.1	31.6	30.6	29.8	58.9	60.0
EBITDA, Adj	3,809.3	4,589.4	5,259.4	5,418.3	5,626.0	5,500.2	5,914.3
Margin %	23.2	23.9	24.7	24.2	23.3	22.3	22.6
Net Income, Adj	1,985.9	2,578.7	2,855.0	3,055.9	3,527.6	3,345.8	3,421.3
Margin %	12.1	13.5	13.4	13.7	14.6	13.5	13.1
EPS, Adj	1.30	1.70	1.93	2.09	2.48	2.41	2.64
Growth %, YoY	17.8	31.3	13.1	8.4	30.4	15.3	9.7
Cash from Operations	607.8	3,749.1	4,575.1	4,174.3	4,589.1		
Capital Expenditures	-1,160.9	-1,303.7	-1,440.3	-1,519.4	-1,901.9	-2,012.9	-1,926.4
Free Cash Flow	-553.1	2,445.4	3,134.8	2,654.9	2,687.2	2,686.7	3,164.0

Cats all the way down



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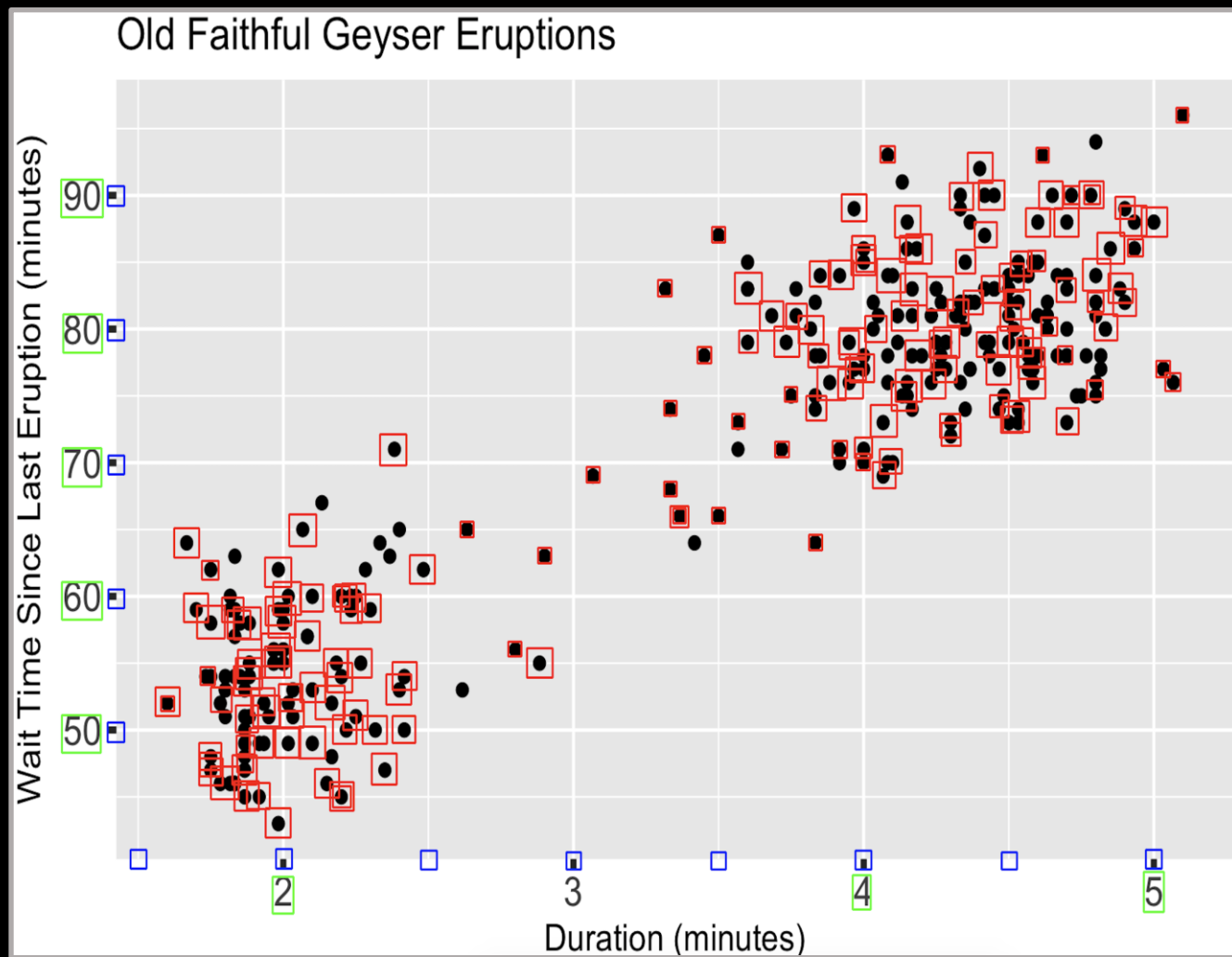
(unaudited)

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Store operating expenses	1,825.0	1,628.9	5,351.6	4,853.5
Other operating expenses	148.0	142.5	424.0	422.7
Depreciation and amortization expenses	330.0	252.6	920.4	756.0
General and administrative expenses	468.7	325.0	1,253.6	1,008.2
Restructuring and impairments	16.9	120.2	179.2	120.2
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See Notes to Condensed Consolidated Financial Statements.

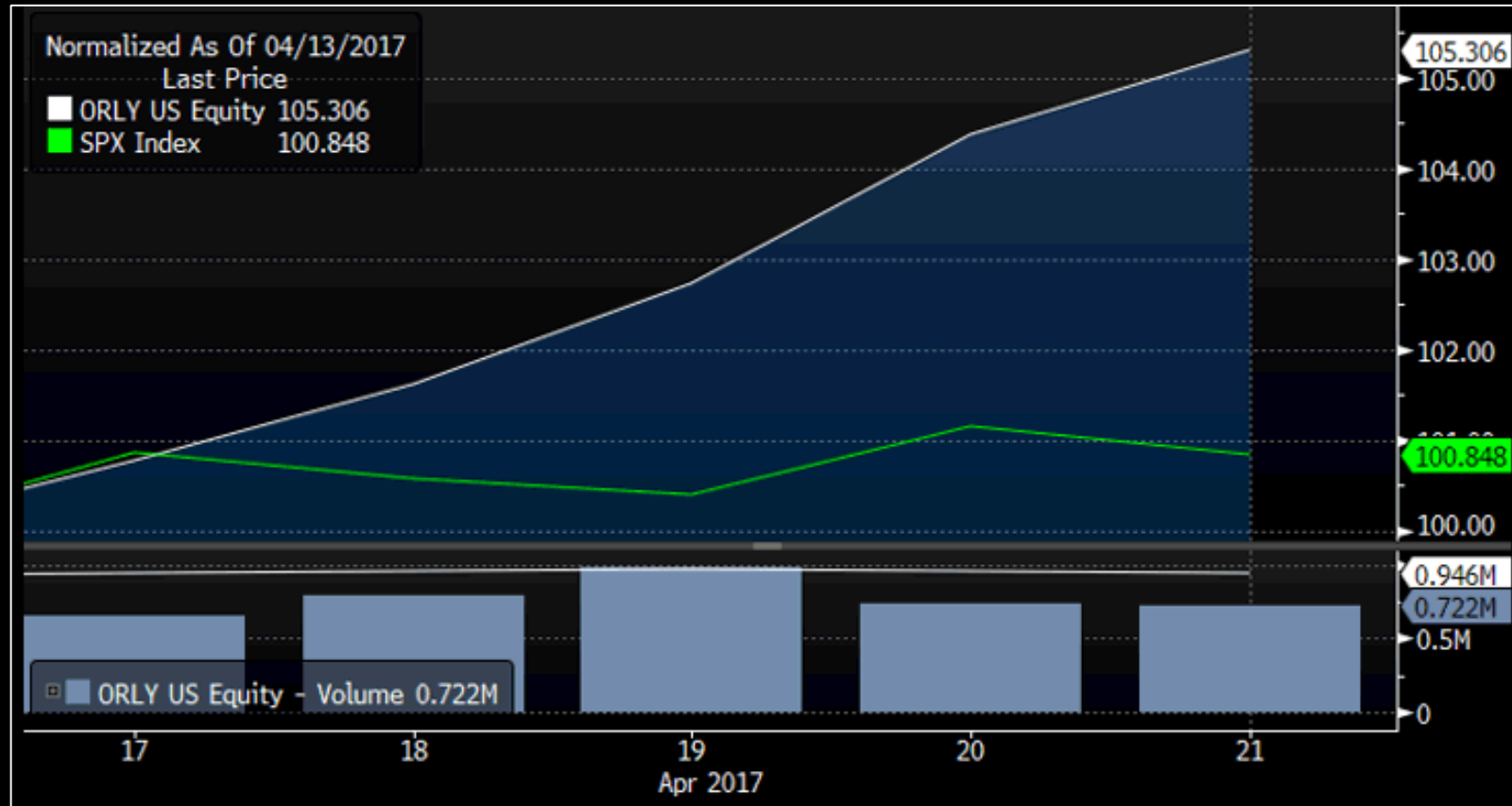
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Scatteract



[Cliche, Rosenberg,
Madeka, Yee 2017]

How Bill O'Reilly leaving Fox fired up O'Reilly Auto Parts stock

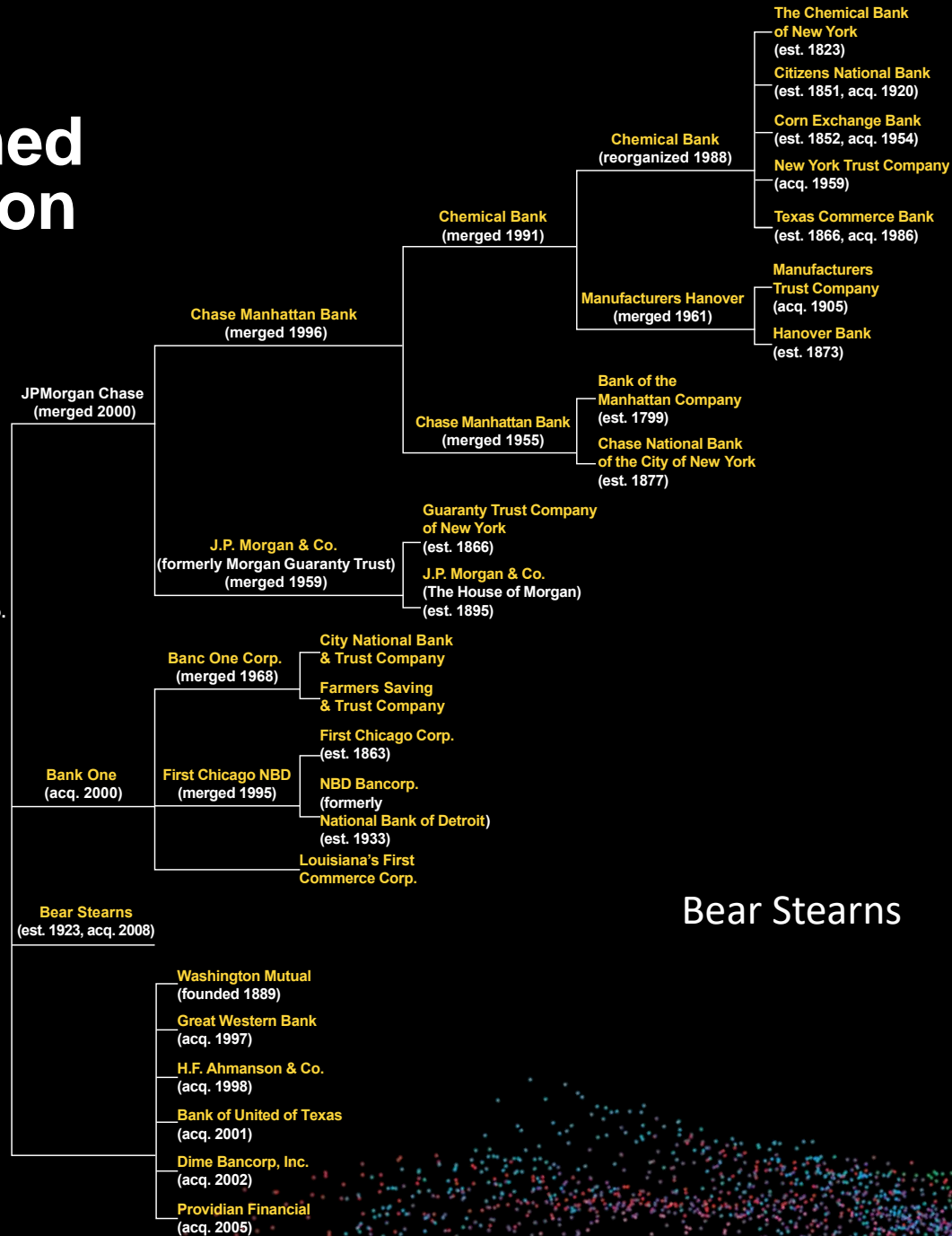


[Yang, Irsoy, Rahman 2018]
[Tsai, Roth 2018]

Financial named entity extraction

JP

JPMorgan Chase & Co.



Bear Stearns

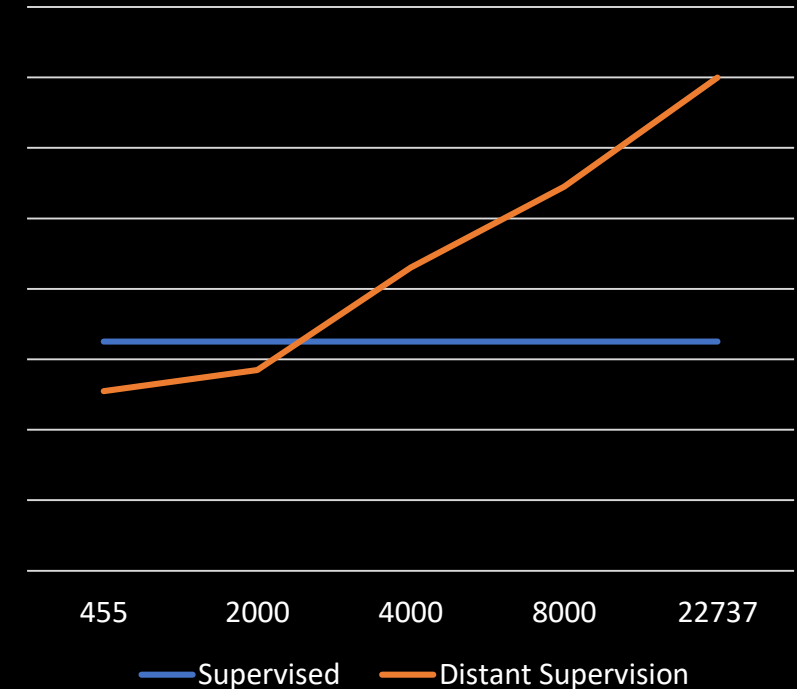
More data, more distant supervision for fact extraction

Starbucks reports 2017 fourth-quarter and three-month trailing results

Three-month trailing results

Three-month trailing net revenue of \$16,688.53

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Detection

Extraction

Interpretation

Presentation

+4.80
+4.15
4.52
0.16
81

27.65

43.58

16.31

98.76

27.65

27.46

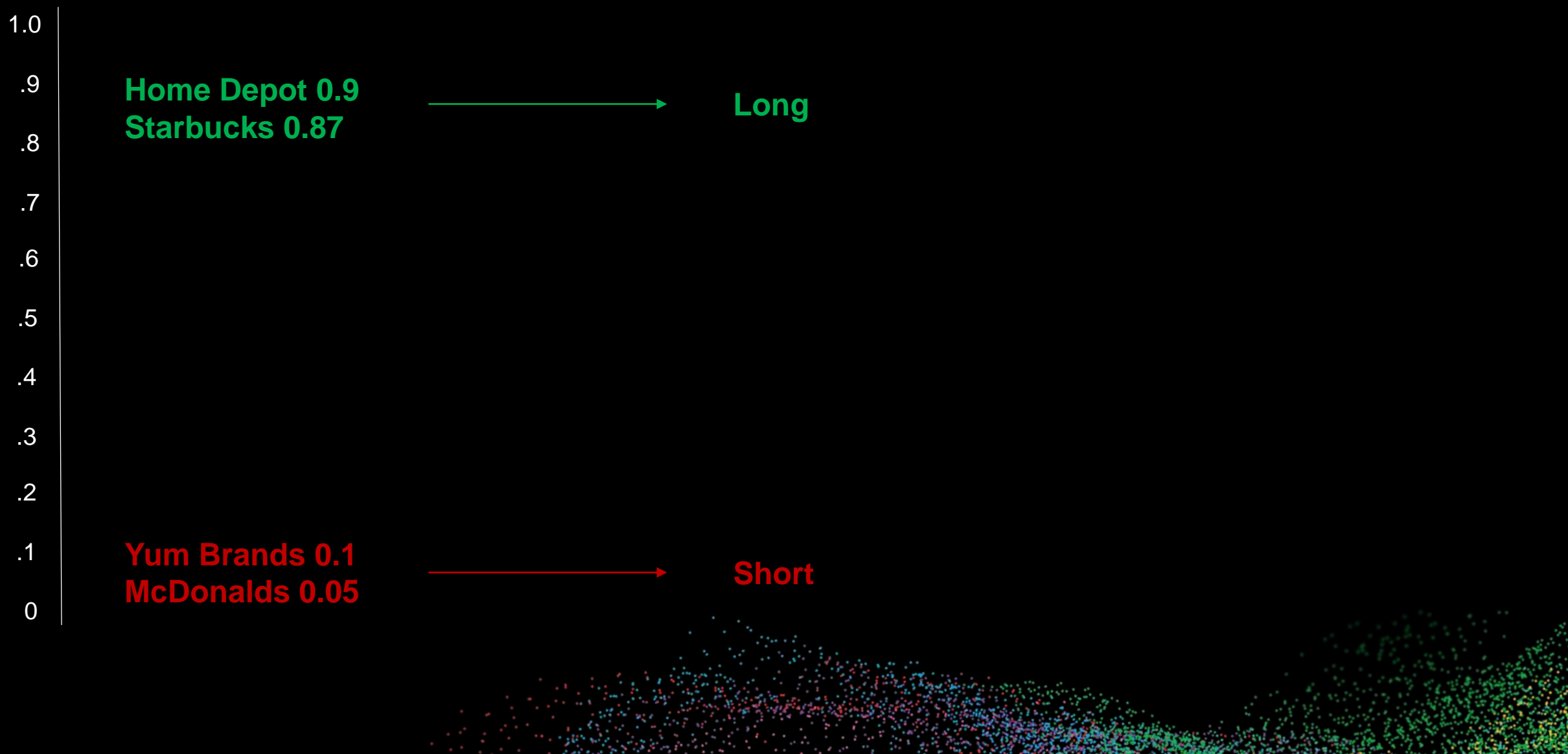
15.0

Sanford Bernstein's Toni Sacconaghi: "And so where specifically will you be in terms of capital requirements?"

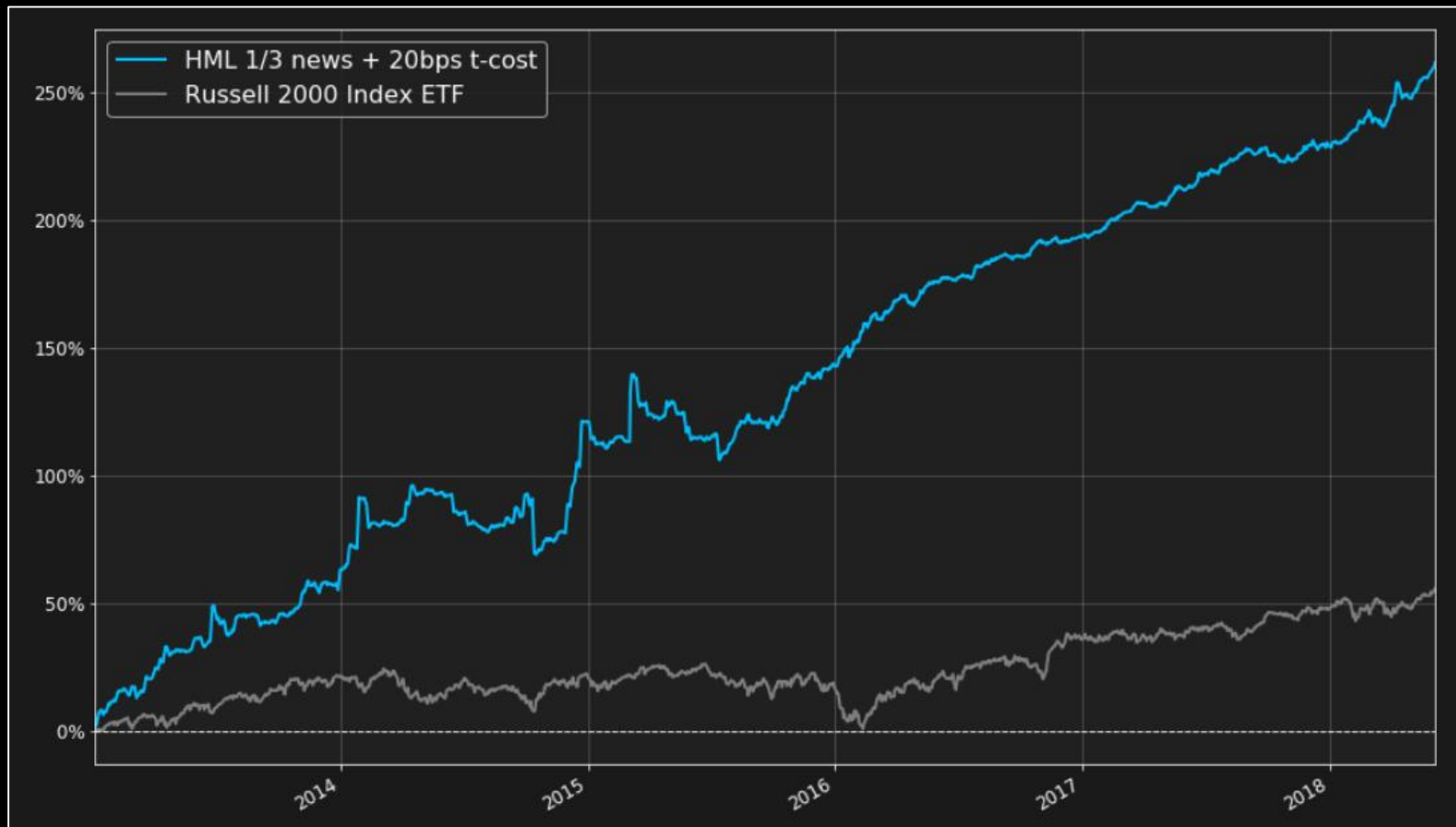
Musk "Excuse me. Next. Boring, bonehead questions are not cool. Next?"



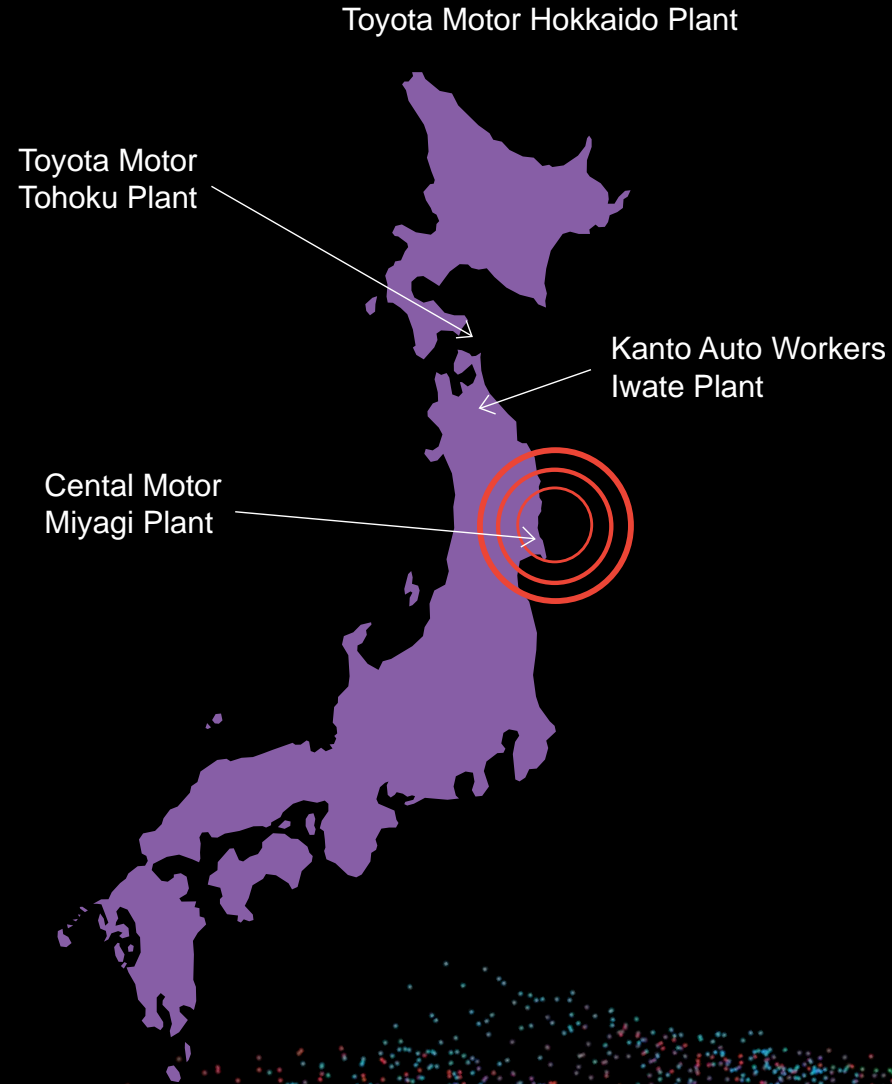
Constructing portfolio from a statistic: factor loading



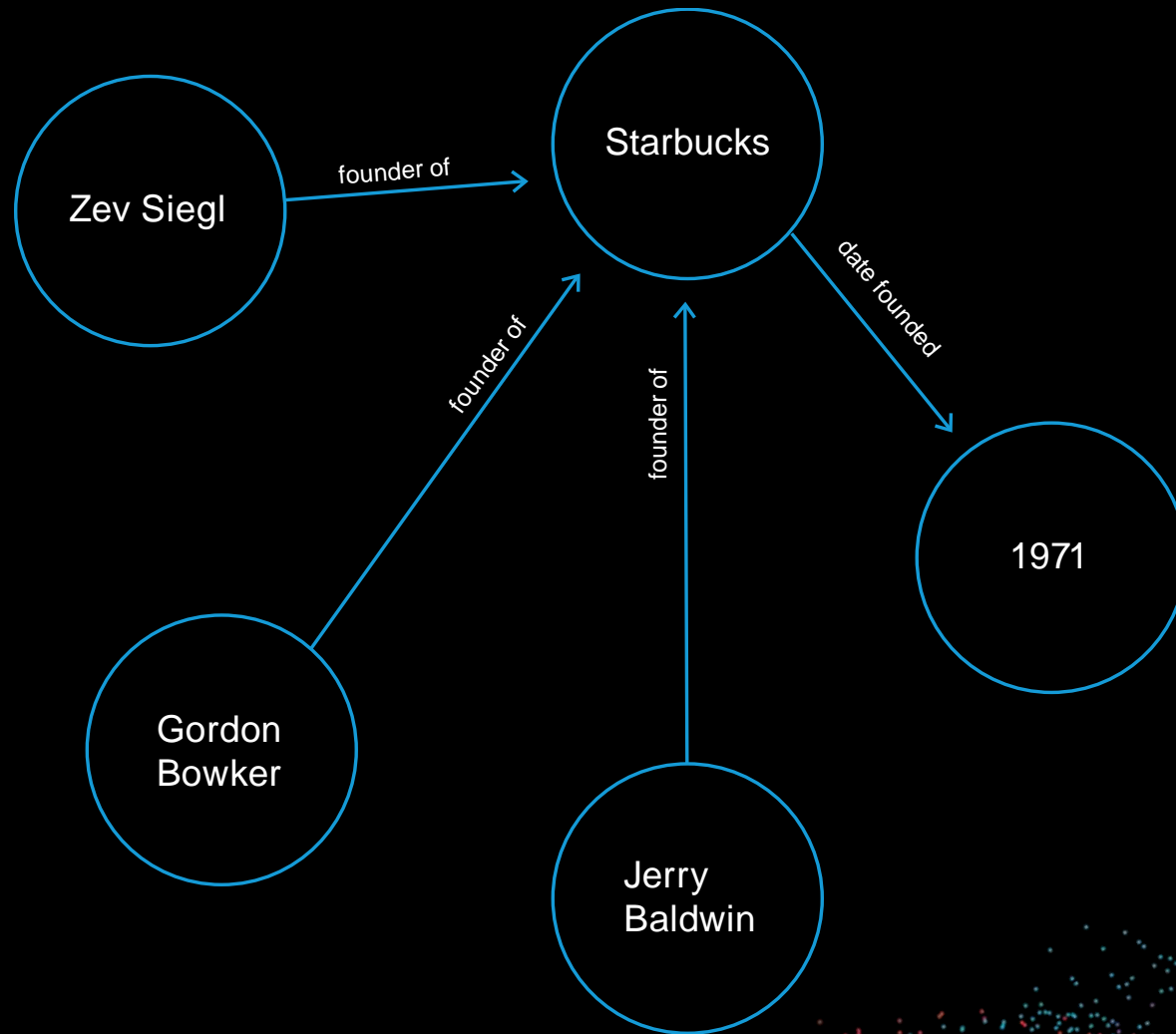
Sentiment Alpha: Russell 2000



March 11, 2011: Earthquake in Japan



Explaining Knowledge Graph relationships



“In **1971**, **Siegl**, **Bowker** and **Baldwin** established the **Starbucks** Coffee Company.”

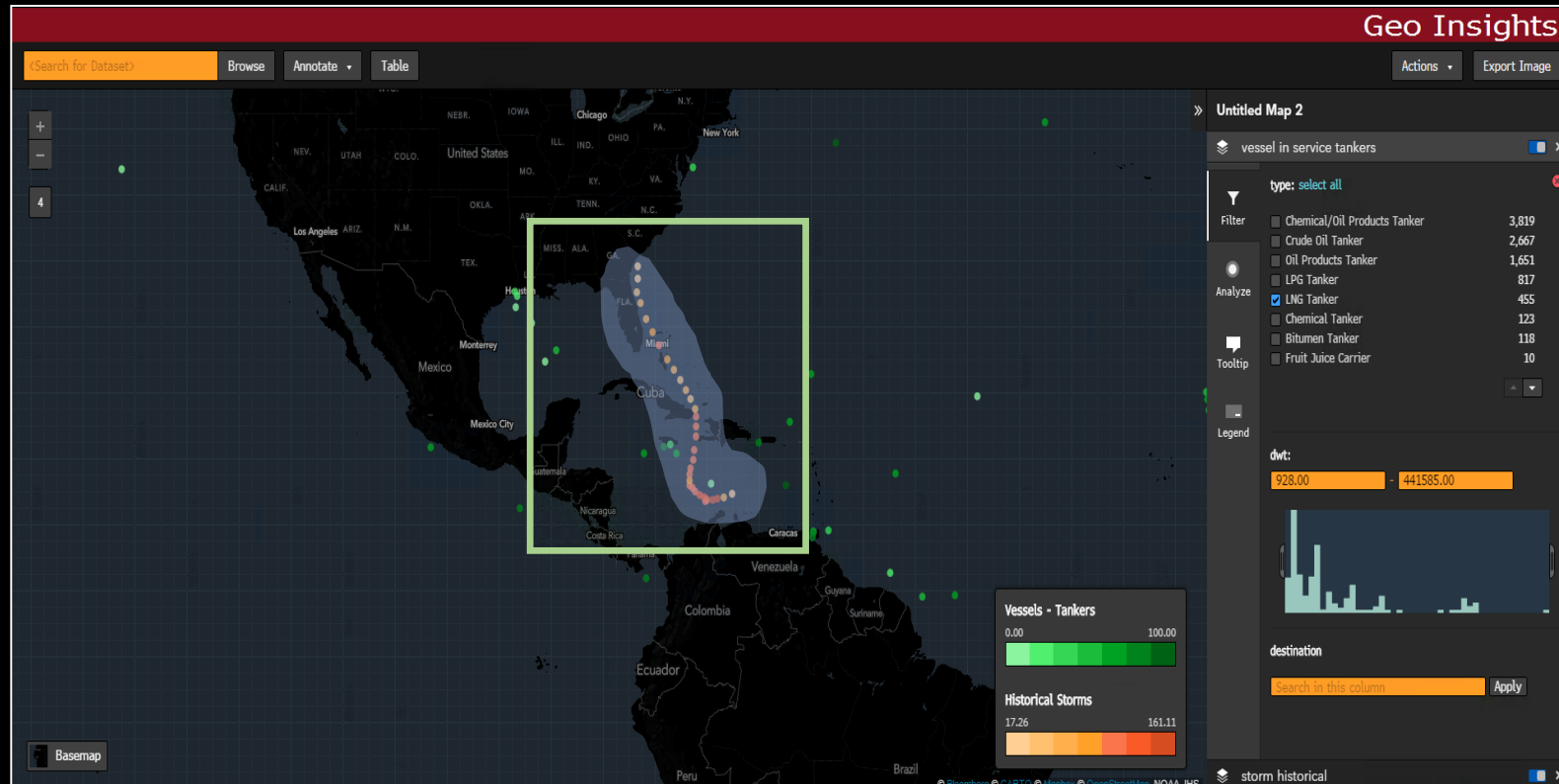
- [Stefanoni, Motik, Kostylev 2018]
- [Abujabal, Roy, Yahya 2018]
- [Voskarides, Meij, Reinanda, Khaitan, Osborne, Stefanoni, Kambadur, Rijke, 2018]
- [Voskarides, Meij, Rijke 2017]

Detection

Extraction

Interpretation

Presentation



Automated news

DEEP ECO: Starbucks Pressured, Industry Sales Slowest in 8 Yrs

By Bloomberg Automation [Feedback?](#)

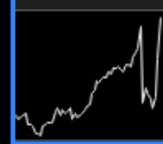
(Bloomberg) -- Starbucks Corp.'s revenue may be pressured after a U.S. Census Bureau report showed limited-service eating places nominal retail sales fell 0.1 percent in November, the first decrease in eight years.

- The monthly report may provide an indication of the performance of companies in the industry Bloomberg classifies as limited service restaurants; Starbucks gets 89 percent of its revenue from this industry.
- Analysts estimate the company's revenue will rise 8.2 percent in the current fiscal quarter.
- This retail sales index was up 1 percent in the first two months of the company's current fiscal quarter.
- Starbucks' first quarter started on Oct. 2, 2017.
- In the past six years, Starbucks' revenue has had a 0.7 correlation with this index, according to data compiled by Bloomberg.

SBUX US Equity
Graphic Dashboard»

1M Imp Vol 3M

28.07



Top Contacts

[Bijan Segha...](#)

[Nimish Patel](#)

[Joanna Fowl...](#)

[Steven Wats...](#)

[Greda E Irel...](#)

Starbucks Shares Fall After Chain's U.S. Sales Disappoint Again

By Leslie Patton



News on demand

The screenshot shows a financial news application interface. At the top, there's a navigation bar with 'STARBUCKS CORP Equity', 'AID', and 'Related Functions Menu'. Below this, the stock price is displayed as 'SBUX US \$ 57.86 +1.11' with a small green line graph. To the right, it shows 'Q57.85 / 57.86Q' and '9x6'. Further down, it lists 'At 14:55 d Vol 6,237,626 0 56.94Q H 58.01K L 56.77Q Val 358.948M'. A menu bar contains 'SBUX US Equity', 'Save as Note', 'Send via MSG', and 'Automated Insights on Demand'. The main content area has a timestamp 'Data generated at 03:10 PM EDT.' followed by a large orange headline: 'Starbucks Jumps 2%, Outpaces S&P 500 Index Gains'. Below the headline, there are three paragraphs of text in orange, providing context about the stock's performance relative to the S&P 500 and its historical volatility.

STARBUCKS CORP Equity AID Related Functions Menu Message

SBUX US \$ **↑ 57.86** +1.11  Q57.85 / 57.86Q 9x6

At 14:55 d Vol 6,237,626 0 56.94Q H 58.01K L 56.77Q Val 358.948M

SBUX US Equity Save as Note Send via MSG Automated Insights on Demand

Data generated at 03:10 PM EDT.

Starbucks Jumps 2%, Outpaces S&P 500 Index Gains

Starbucks Corp. rose 2 percent as the S&P 500 Index advanced.

The shares increased to \$57.86 from \$56.75. Trading volume was almost the same as the 20-day average for this time of day. Starbucks's move compares with the 2 percent rise in the Russell 3000 Consumer Discretionary Index and the 1.9 percent gain in the S&P 500 Index.

In the past year, the stock had a similar or greater gain 10 times and was little changed the next day. It advanced four times for an average 1 percent and declined six times for an average 1.2 percent.

The stock rose 5.7 percent in the past month, compared with the 0.5 percent increase for the company's Bloomberg peers, the 4.8 percent loss in its industry index and the 3.5

NL QA / structured extraction from databases

STARBUCKS CORP Equity FA Related Functions Menu Message

SBUX US \$ ↓ 57.80 +1.05 Q57.80 / 57.81Z 15x11
 At 14:57 d Vol 6,263,151 O 56.94Q H 58.01K L 56.77Q Val 360.424M

SBUX US Equity 90) Actions 97) Export 98) Settings Financial Analysis

Starbucks Corp BQL Periodicity Annuals Cur FRC (USD)

1) Key Stats 2) I/S 3) B/S 4) C/F 5) Ratios 6) Segments 7) Addl 8) ESG 9) Custom 10) Shared

11) Adj Highlights 12) GAAP Highlights 13) Earnings 14) Enterprise Value 15) Multiples 16) Per Share 17) Stock Value

In Millions of USD	2014 Y 12 Months Ending 09/28/2014	2015 Y 09/27/2015	2016 Y 10/02/2016	2017 Y 10/01/2017	Current/LTM 07/01/2018	2018 Y Est 09/30/2018	2019 Y Est 09/30/2019
Market Capitalization	56,343.7	86,120.9	79,071.5	76,891.2	78,005.0		
- Cash & Equivalents	1,843.8	1,611.4	2,263.2	2,690.9	1,976.6		
+ Preferred & Other	1.7	1.8	6.7	6.9	6.0		
+ Total Debt	2,048.3	2,347.5	3,585.2	3,932.6	6,798.9		
Enterprise Value	56,549.9	86,858.8	80,400.2	78,139.8	82,833.3		
Revenue, Adj	16,447.8	19,162.7	21,315.9	22,386.8	24,114.1	24,694.9	26,124.5
Growth %, YoY	10.6	16.5	11.2	5.0	7.7	10.3	5.8
Gross Profit, Adj	4,950.8	5,964.1	6,740.5	6,855.3	7,196.0	14,551.4	15,661.6
Margin %	30.1	31.1	31.6	30.6	29.8	58.9	60.0
EBITDA, Adj	3,809.3	4,589.4	5,259.4	5,418.3	5,626.0	5,500.2	5,914.3
Margin %	23.2	23.9	24.7	24.2	23.3	22.3	22.6
Net Income, Adj	1,985.9	2,578.7	2,855.0	3,055.9	3,527.6	3,345.8	3,421.3
Margin %	12.1	13.5	13.4	13.7	14.6	13.5	13.1
EPS, Adj	1.30	1.70	1.93	2.09	2.48	2.41	2.64
Growth %, YoY	17.8	31.3	13.1	8.4	30.4	15.3	9.7
Cash from Operations	607.8	3,749.1	4,575.1	4,174.3	4,589.1		
Capital Expenditures	-1,160.9	-1,303.7	-1,440.3	-1,519.4	-1,901.9	-2,012.9	-1,926.4
Free Cash Flow	-553.1	2,445.4	3,134.8	2,654.9	2,687.2	2,686.7	3,164.0

Detection

News classification
and ranking

Topic identification

Twitter user demographics

Twitter geolocation

Extraction

Natural document
understanding

Chart understanding

Information extraction

Distant supervision

Interpretation

Event studies

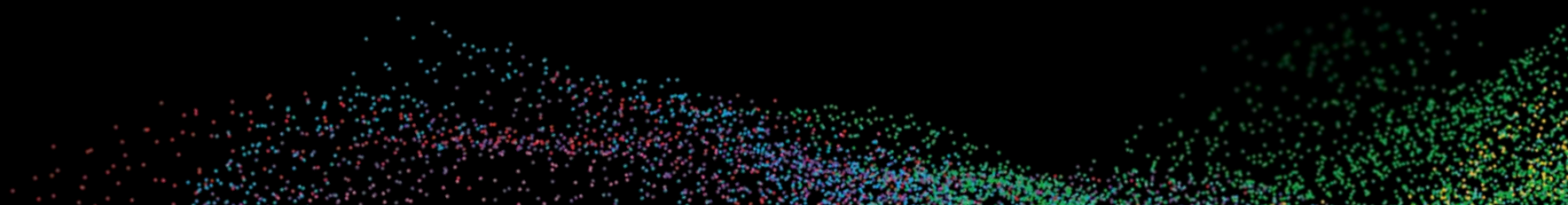
Signal construction

Knowledge graph
inference

Presentation

Natural language
generation

NL interfaces to
databases



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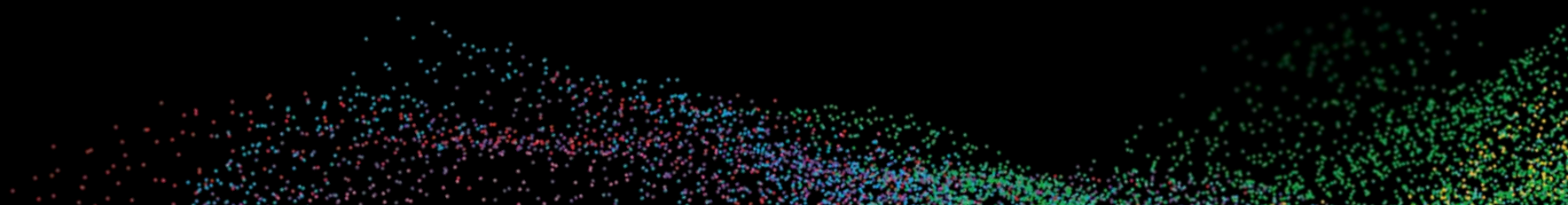
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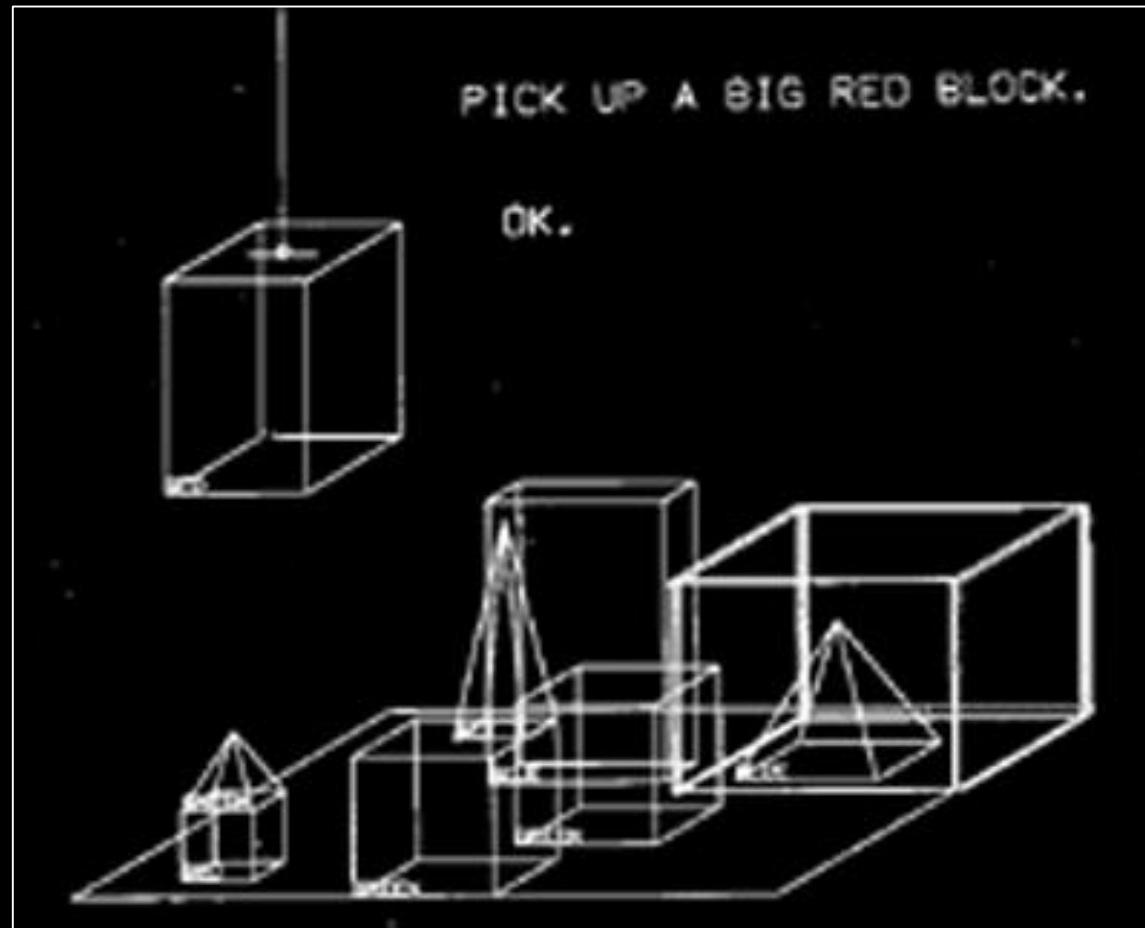
NL interfaces to
databases

Speed

Precision



We're not in BlocksWorld anymore



Lynette Hirschman on Reading comprehension

“A system has learned from a text if, by reading the text, it is able to answer questions it would not have been able to answer before having access to it.”



Bloomberg

Engineering

More Info:

<https://www.TechAtBloomberg.com/NLP>

Thank You!

TechAtBloomberg.com

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