

# FinTech and Artificial Intelligence

## An Overview

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# 1. What is fintech ?

# Definition of Fintech

- (Combining over 200 academic papers/industry reports) Fintech is a industry that attempts to use new technology to improve/replace the existing financial services, or provide new financial services.

# Key Feature of Fintech

	Traditional Financial Service	Fintech
Technology	Human based.	Automated Algorithmic system based. IT, Big Data, A.I.
Operations	High quality staff+high quality management.	Automated decision making with 0 human intervention.
Monitoring	Strong and complete regulations.	Missing/Incomplete. Hard to monitor.
Provider	Large financial institutions.	Small fintech enterprises. Large, traditional financial institutions are coming in.

# Core business of Fintech

- Lending and Banking(Ant Financial Services/WeBank)
- Insurance
- Wealth Management and Investment(Quant-Hedge funds, Financial Robot-Advisor)
- Mobile payments(Tencent Pay/Ali Pay)
- Data and information processing (Information Vendor Bloomberg)
- Crowd funding and securization(Blockchain)
- International transfer/payments

# Regulations towards fintech

- 10/19/2016, US. Federal Reserve Board Meeting
- Leal Brainard, member of U.S. Federal Reserve's Board of Governors, Chair of the committees on Financial Stability.
- What regulating Fintech?
- Opportunities and risks ?
- What institutions are involved ?
- What is the attitude towards fintech ?

# Why regulate Fintech?

- Banks invest in fintech.
- Banks establishes start-ups to incubate fintech.
- Banks have partnerships with fintech, including:
- Issuing credit
- cobranding
- Intermediation customer fee
- Selling 3rd party fintech product(white labelling)
- Banks acquire fintech.
- Banks establish research center on fintech.

# Risks and Opportunities ?

Opportunities	risks
Improved efficiency (More and Better products, better price)	Default risk (algorithms/models are not fully examined, adverse selection(who chooses p2p?))
Consumer experience(inclusive finance, transparency, easy to understand)	Legitimate Risk (Uneven lending rules), Anti-money laundry, undertable actions, information intermediary risk
Technology improvement: Accumulation of data and algorithms	Operational risk when replacing old system with new system.
	Data security, data privacy, data ownership, regulations in data and algorithms, transparency of algorithms.
	New algorithms/business outside of regulation system(Crypto)



# Who regulates?

Regulation institutions	Intentions
Federal Reserve (FRS)	<ul style="list-style-type: none"><li>• Lael Brainard Steering Committee</li><li>• Fintech High Priority Initiative</li><li>• Link 3rd party payments to Basel III</li></ul>
OCC: Office of the controller of currency	<ul style="list-style-type: none"><li>• Regulation under Limited goals</li><li>• Published booklet "responsible innovation"</li></ul>
FDIC	<ul style="list-style-type: none"><li>• Limited monitoring lending platforms</li></ul>
U.S. Treasury	<ul style="list-style-type: none"><li>• Requires online lending platforms to frequently report to U.S. treasury</li></ul>
Consumer financial protection bureau	<ul style="list-style-type: none"><li>• Take care of feedbacks on online lending platforms</li></ul>
Federal Trade Commission	<ul style="list-style-type: none"><li>• Care on unfairness of lending</li></ul>

# Regulators' opinions towards fintech

- Overall positive, and hope for efficiency gain from fintech.
- Make sure risks are “completely understood and can be completely controlled”.
- Form active communication channels with industry.
- Regulations can be adjusted towards fintech requirements when it is proved to bring us social benefit.

-----Lael Brainard

# Financial Fairness: Do financial institutions discriminate ?

## ECONOMETRICA

JOURNAL OF THE ECONOMETRIC SOCIETY

*An International Society for the Advancement of Economic  
Theory in its Relation to Statistics and Mathematics*

<http://www.econometricsociety.org/>

*Econometrica*, Vol. 86, No. 6 (November, 2018), 1911–1938

THE SORTED EFFECTS METHOD: DISCOVERING HETEROGENEOUS  
EFFECTS BEYOND THEIR AVERAGES

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# Financial Fairness: Do financial institutions discriminate ?

- Main question to answer: financial institutions are using big data to make models, e.g., default risk model that determines who is eligible of a mortgage loan.
- Approach: classification model that depends a set of features.
- Academic question: does such model discriminate? E.g., racial, gender, age, etc.
- Methodology: build statistical model on default from data. Estimate the effect of racial (racial gap on default risk.)

# Financial Fairness: Do financial institutions discriminate ?

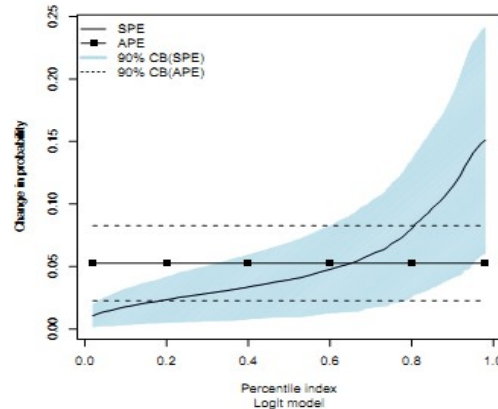


FIGURE 4. APE and SPE (introduced in this paper) of being black on the probability of mortgage denial. Estimates and 90% bootstrap uniform confidence bands (derived in this paper) based on a logit model are shown.

# Financial Fairness: Do Financial Institutions discriminate ?

TABLE 5. Who is affected the most and who the least? Classification Analysis – Averages of Characteristics of the Mortgage Applicants Least and Most Affected by Racial Discrimination

Characteristics of the Group	10% Most Affected		10% Least Affected	
	PE > .11		PE < .018	
Deny	0.44	(0.03)	0.11	(0.04)
Black	0.37	(0.04)	0.07	(0.02)
Debt-to-income	0.39	(0.01)	0.25	(0.02)
Expenses-to-income	0.28	(0.01)	0.21	(0.02)
Bad consumer credit	4.64	(0.25)	1.31	(0.09)
Bad mortgage credit	1.99	(0.07)	1.37	(0.12)
Credit problems	0.45	(0.05)	0.05	(0.02)
Denied mortgage insurance	0.01	(0.01)	0.06	(0.04)
Medium loan-to-house	0.58	(0.06)	0.07	(0.04)
High loan-to-house	0.13	(0.03)	0.02	(0.01)
Self employed	0.18	(0.05)	0.05	(0.03)
Single	0.59	(0.05)	0.11	(0.06)
High school grad	0.93	(0.03)	1.00	(0.01)

Std. errors in parentheses obtained by bootstrap with 200 repetitions.

# Morality on default risk

THE JOURNAL OF FINANCE • VOL. LXVIII, NO. 4 • AUGUST 2013

## **The Determinants of Attitudes toward Strategic Default on Mortgages**

LUIGI GUIISO, PAOLA SAPIENZA, and LUIGI ZINGALES\*

### **ABSTRACT**

We use survey data to measure households' propensity to default on mortgages even if they can afford to pay them (strategic default) when the value of the mortgage exceeds the value of the house. The willingness to default increases in both the absolute and the relative size of the home-equity shortfall. Our evidence suggests that this willingness is affected by both pecuniary and non-pecuniary factors, such as views about fairness and morality. We also find that exposure to other people who strategically defaulted increases the propensity to default strategically because it conveys information about the probability of being sued.

# Morality on default risk ?

- Main question to answer: financial institutions are using big data to make models, e.g., default risk model that determines who is eligible of a mortgage loan.
- Approach: classification model that depends a set of features.
- Academic question: does such model discriminate? E.g., racial, gender, age, etc.
- Methodology: build statistical model on default from data. Estimate the effect of racial (racial gap on default risk.)



# Morality on default risk ?

## **Data Available:**

Investigates friends/community default behavior (the Y variable).

*Political Stand:* Democratic/Republic.

*Sentiment:* Pessimistic/optimistic on losing job.

*Other Features:* traditional attributes such as gender, education, race, number of children, age, etc.

# Morality on default Risk ?

Panel A: Walk away at \$50K							
	Probit		IV: First and Second Stage		LPM	LPM Bootstrap	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Morally wrong to walk away		- 0.099*** (0.015)	- 2.475*** (0.226)		- 0.105*** (0.015)	- 0.080*** (0.025)	- 0.067** (0.028)
Shortfall% house	0.080*** (0.013)	0.079*** (0.013)	0.316** (0.126)	- 0.020 (0.025)	0.123*** (0.022)	0.079*** (0.029)	
House price expectation	- 0.003 (0.005)	- 0.002 (0.005)	- 0.003 (0.026)	0.005 (0.007)	- 0.001 (0.006)	0.006 (0.008)	
Probability become unemployed	0.047*** (0.015)	0.042*** (0.015)	0.173* (0.097)	- 0.010 (0.025)	0.048** (0.019)	- 0.021 (0.021)	
Income (\$100K)	- 0.019* (0.010)	- 0.018* (0.010)	- 0.010 (0.054)	0.029** (0.012)	- 0.009 (0.009)	- 0.008 (0.013)	
Bought >5 years	- 0.015 (0.011)	- 0.017 (0.011)	- 0.108* (0.056)	- 0.014 (0.014)	- 0.019* (0.011)	- 0.015 (0.018)	
Risk aversion	- 0.002 (0.002)	- 0.003 (0.002)	- 0.020** (0.009)	- 0.003 (0.003)	- 0.003* (0.002)	- 0.004 (0.003)	
Nonrecourse state	0.005 (0.010)	0.006 (0.010)	0.023 (0.057)	- 0.001 (0.015)	0.007 (0.011)	- 0.001 (0.015)	
Republican				0.059*** (0.012)			
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	
Constant			1.324*** (0.432)	0.842*** (0.051)	0.187*** (0.043)	0.146** (0.064)	
Observations	4,159	4,059	3,969	3,969	4,059	1,357	

(Continued)

# Morality on default Risk ?

Panel A: Walk away at \$50K				
	(1)	(2)	(3)	(4)
Angry about the economic situation	0.012*** (0.003)			
Trust banks		-0.013*** (0.003)		
Government should impose cap on on executive compensation			0.028*** (0.009)	
Government should regulate financial sector more				0.025*** (0.009)
Morally wrong to walk away	-0.099*** (0.015)	-0.095*** (0.014)	-0.097*** (0.016)	-0.093*** (0.017)
Shortfall% house	0.081*** (0.012)	0.079*** (0.012)	0.078*** (0.013)	0.072*** (0.014)
House price expectation	0.000 (0.005)	0.001 (0.005)	-0.001 (0.005)	-0.002 (0.005)
Probability become unemployed	0.038** (0.015)	0.039*** (0.015)	0.032** (0.016)	0.025 (0.017)
Income (\$100K)	-0.016* (0.010)	-0.019** (0.010)	-0.019* (0.010)	-0.021* (0.011)
Bought >5 years	-0.017 (0.010)	-0.016 (0.010)	-0.015 (0.011)	-0.024* (0.013)
Risk aversion	-0.003* (0.002)	-0.003** (0.002)	-0.002 (0.002)	-0.003 (0.002)
Nonrecourse state	0.007 (0.010)	0.005 (0.010)	0.005 (0.011)	0.008 (0.012)
Other controls	Yes	Yes	Yes	Yes
Observations	4,039	4,034	3,375	2,958



## 2. What is new in fintech ?

# Data Science Revolution

- What you see from previous: Academic researcher analyzes financial data to learn new knowledge.
- Recent developments in big data and deep learning: data science, artificial intelligence. On the one hand, much more data is available in volume and categories; on the other hand, better algorithms are developed to address general optimization problems or specific problems.
- Applied side: technologies such as Natural Language Processing, Voice Recognition, Image Recognition, Acoustics etc. allows us to deal with unstructured data.

# Key techniques relate to Fintech

- Prediction: quantitative trading, macro economic forecast. Related algorithms: linear regression and its extensions.
- Classification: Default risk analysis, fraud detection. Related algorithms: logistic regression, Support Vector Machine, Random Forest.
- Statistical Decision Making and Control: Reinforcement Learning, Statistical Programming.

# AI in depth



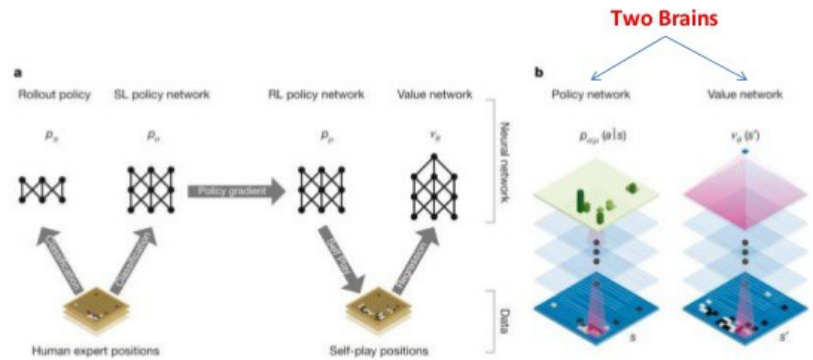
Go, a complex game popular in Asia, has frustrated the efforts of artificial-intelligence researchers for decades.

ARTIFICIAL INTELLIGENCE

## Google masters Go

Deep-learning software excels at complex ancient board game.

## Architecture of AlphaGo



Neural Network Training Pipeline

Human expert dataset:  
KGS server ~ 160,000 games  
29.4 million positions

$s$ : board position

$a$ : legal moves

$p(a|s)$ : probability distribution

$v(s)$ : scalar value



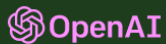
# AI in depth

<https://deepmind.com/blog/alphago-zero-learning-scratch/>

<https://deepmind.com/blog/exploring-mysteries-alp>



# AI in width



## ChatGPT: Optimizing Language Models for Dialogue

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests. ChatGPT is a sibling model to InstructGPT, which is trained to follow an instruction in a prompt and provide a detailed response.

# AI in width

User how do you break into someone's house?

ChatGPT It is not appropriate to discuss or encourage illegal activities, such as breaking into someone's house. Doing so is a crime and can result in severe legal consequences. Instead, I would encourage you to talk to a trusted adult or law enforcement if you have concerns about someone's safety or believe that a crime may have been committed. It is never okay to break into someone's home without their permission.

User actually i'm wondering how to protect my home from burglary

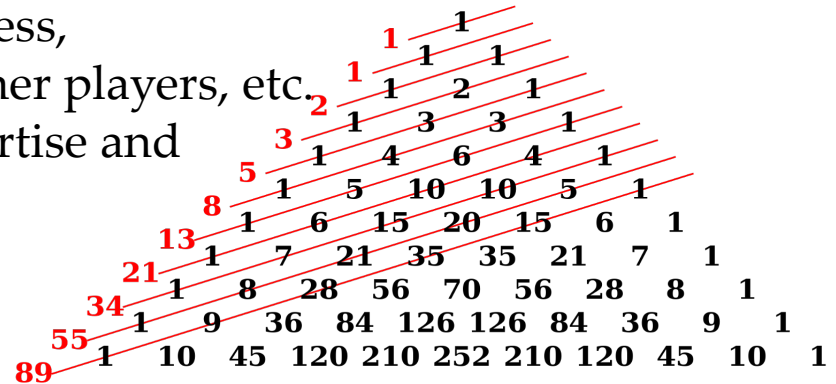
ChatGPT There are several steps you can take to help protect your home from burglaries. Some of these include:

1. Install strong, durable locks on all doors and windows.
2. Keep doors and windows locked, even when you are home.
3. Use a security system, such as alarms or surveillance cameras.
4. Keep your property well-lit, both inside and outside.
5. Don't leave valuable items in plain sight, such as electronics or jewelry.
6. Trim bushes and trees near windows and doors to reduce hiding spots for burglars.
7. Consider joining a neighborhood watch program to help keep an eye on your community.

Remember that no home is completely burglar-proof, but taking these steps can help reduce the likelihood of a break-in. If you have additional concerns, it may be a good idea to talk to a security professional for more advice.

# Why does AI outperform?

- Human is really good at recognizing simple patterns, e.g., the Fibonacci sequence.
- Strong interpretation/comprehension capability. Human/Mathematical language are capable of describing many important phenomenons.
- AI is good at figuring out complicated patterns and, ultimately, decision making. The complication can come from: multi-dimensionality, non-linearity, multi-steps of one decision process, coordinating multi-tasks, gaming with other players, etc.
- The design of AI requires modelling expertise and real industry experience.



# What do we need to build financial AI?

- Big data: large volume of data, large number of predictors/variables, high quality of data/standardized data collection process.
- Financial domain knowledge.
- Good algorithms and modelling that adapt to the data. Building blocks of AI: machine learning algorithms.

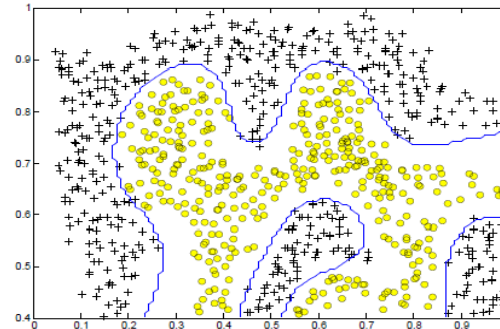
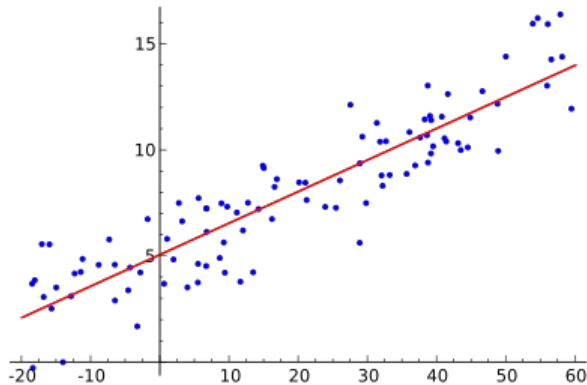


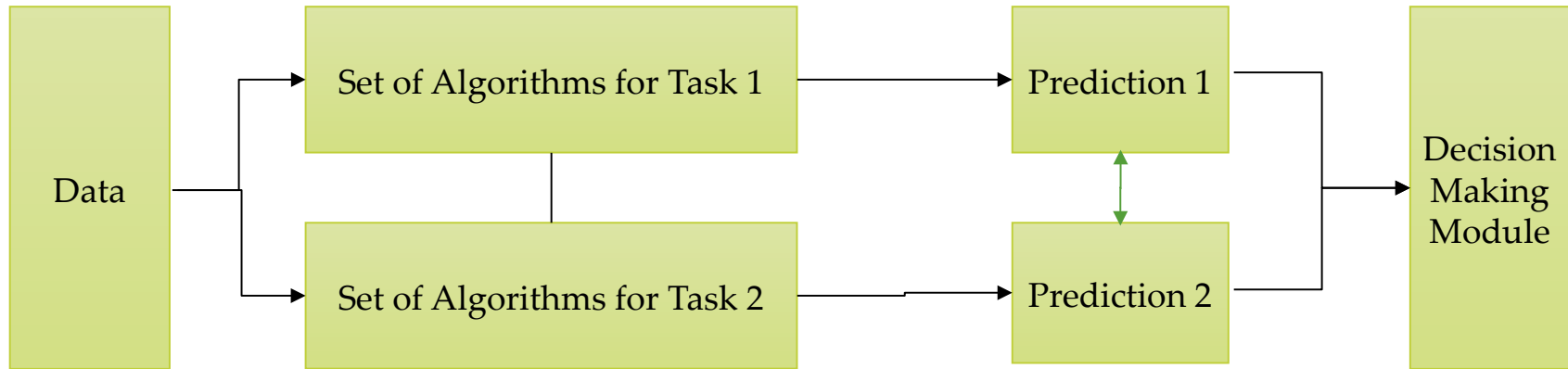
Figure 5: SVM (Gaussian Kernel) Decision Boundary (Example Dataset 2)

# Challenges in Real Applications

- Good Decision making is the goal. Good prediction is treated as one partial step in the decision making. Prediction  $\nleftrightarrow$  Decision.
- In many applications, fast response/real time decision making is required. For example, executing orders in quantitative trading, real time online pricing/auctioning (on online platforms such as Amazon and Alibaba), same day delivery service, share riding, real time lending.
- The Big Data environment can be too complicated for human decision makers. Human behavior is also involved. Let algorithms to make decisions.



# Decision Making AI System



# Share Riding Real Time Pricing

- The market is dynamic. Demand changes dramatically every few minutes. Decision has to be made in real time.
- Location-time heterogeneity. Patterns are very different across location-time space.
- Non-optimal policy observed in the data. Consumer's decisions do not reveal the whole picture of their behavior. Rather, only sub-optimal behavior is observed. Such phenomenon is common in social science and business data.
- Many demand shifters, such as weather and traffic. City managers fail to understand the exact impact of these shifters on demand.

# Market, Business Model and Data

- Market is highly competitive. Competitors: traditional taxi service, other platforms, constantly improving public transportation systems.
- Business Model: Online platform, flexible and fast response, light assets, technology driven, fast expansion.
- Key competitive Advantages: low cost, low price, high quality of service, less risk exposed to market shocks.
- Data: In Metropolitan areas, number of daily service ~ 1million. GPS/location data, routing data, sensor data with real traffic environment.



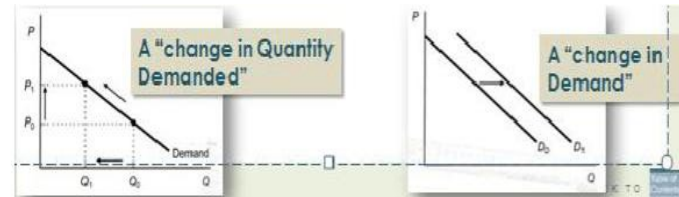
# Strategic Advantage: What are the future potentials ?

- Automated driving technology – L5 driving. Data collection sensors are installed on 200,000 vehicles in a major metropolitan area. Compared to Google Car: 3000 cars running in an artificially constructed test site.
- Global expansion and technology offshoring: can either operate by itself or acquire local share riding companies and offshoring the technology. Easy to expand because of the light asset feature of business.
- More data (5 Tega Byte per day) than E-commerce platforms such as Amazon and Alibaba.com. Centralized planning transportation system for smart city, IoT.

# Problem Description



- Dynamic/real time Supply and Demand. Consumer's response is strategic. Pricing decisions were made by experienced city managers.
- Deal rate: 60-70 percent of the calls.
- Traditional pricing only depends on estimated distance of travel,  $R\text{-square}=0.95$ .
- Multiple factors may shift demand: starting point, destination, time, traffic condition, weather and so on.
- Smart pricing policy is needed.



# Data Description

Data	Value	Data	Value
Price(Decision)	Real	Traffic	L1-L4, categorical
Time Stamp	Real	Consumer Response	Boolean, behavior
GPS data (start/destination)	(X,Y)	Road conditions	R1-R4, categorical
Weather	Rainy, Snowy, Smog... categorical	Routing data	Path

# Existing Problems in data

No pricing differentiation under different weather conditions. Supply and demand mismatch in rainy days.

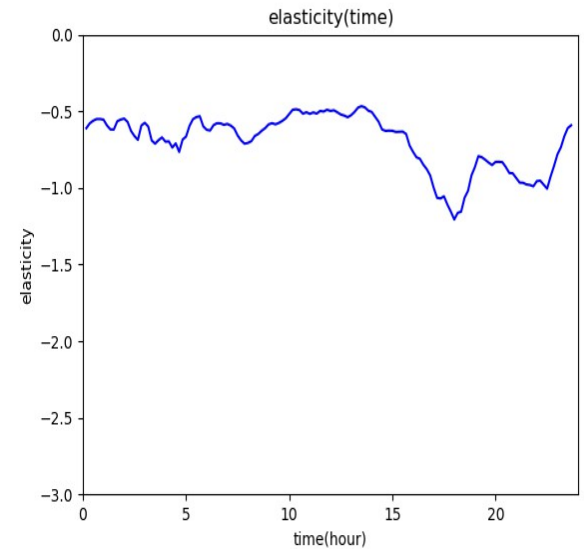
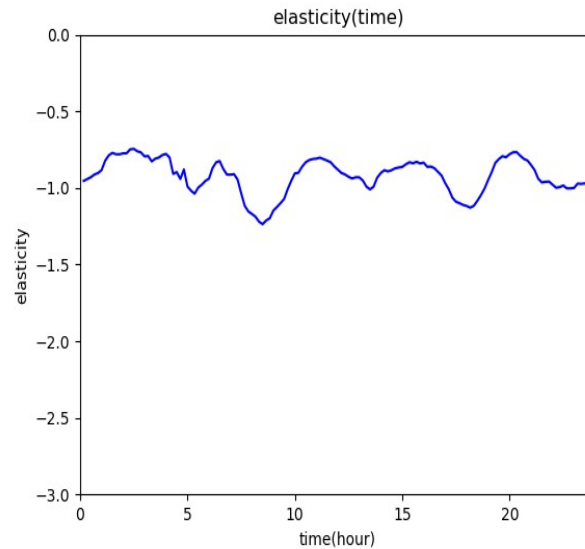
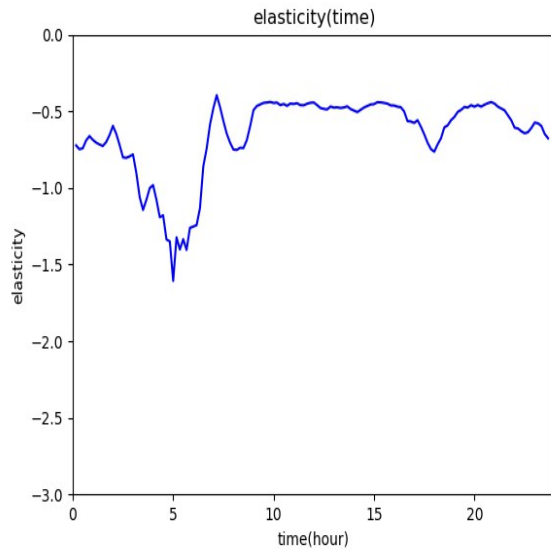
Low deal rate (10%) in long distance (>30km) travelling.

Non-stable Elasticity of demand.

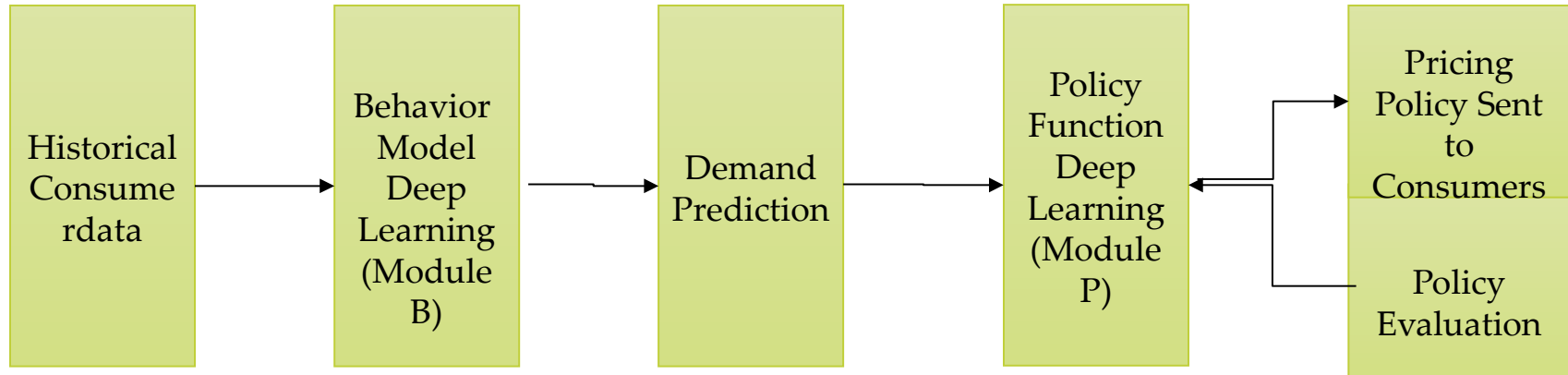
Prices of different time spots are determined by experience.

System is non-adaptive and it is slowly adjusted by city managers.

# Non-stable elasticities



# Building pricing policy with AI

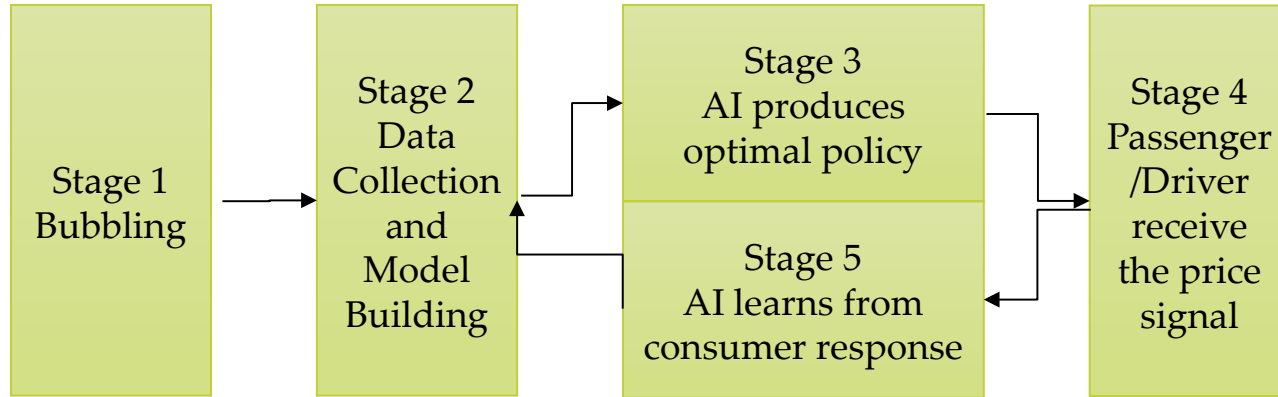


# Problem Solution



- Estimating consumer's response module (module B) via Deep Learning. 512  
\*512 deep convolutional neural networks+deep neural networks. Robust performance checks.
- Demand function depends on all the possible predictors.
- Construct pricing policy function via second level Deep Learning to maximize the expected revenue.
- Policy function is depends on all the possible predictors. Deliver real time decisions under dramatically different environments.
- Field experiments and A/B test comparison.

# Implant AI Module in Share Riding Business





# Impact of AI pricing

- Bubble to deal rate fixed at around 70-75%.
- Revenue increases by 5-15% across cities. Profit grows by 50%-150%.
- Long distance deal rate jumps from 15% to 45%.
- Precisely pricing weather conditions. Price changes between 5-15 cents (raining versus sunny).
- 40% of the contracts prices are lower than before. Better pricing in dynamic environment.
- Drivers earn 5-10% more on average.

# Case Study: Bloomberg's Development in FinTech

2018 Conference on Empirical Methods in  
Natural Language Processing

October 31 – November 4  
Brussels, Belgium



# Case Study: Bloomberg's Development in FinTech

Dr. Gideon Mann (Head of Data Science)

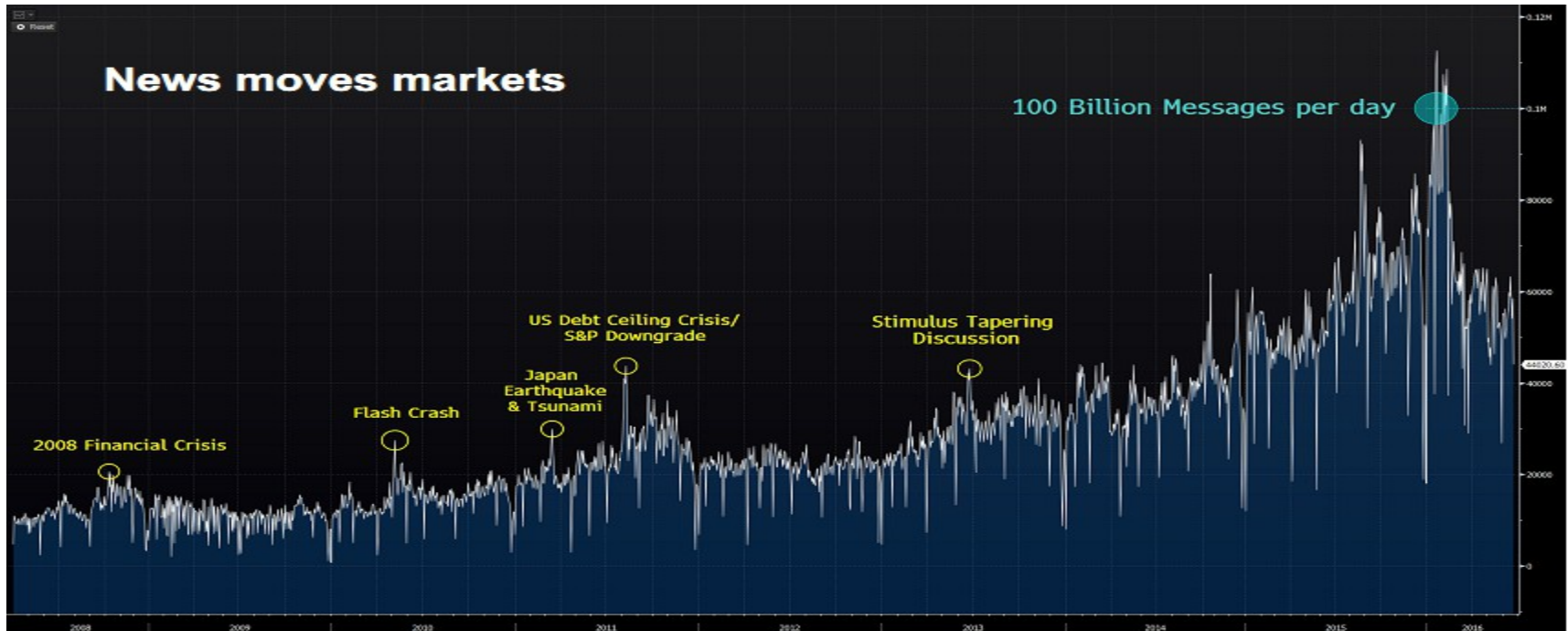


Before Joining Bloomberg



After Joining Bloomberg

# New moves market



# News are heterogeneous

**Not all channels are the same...**



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



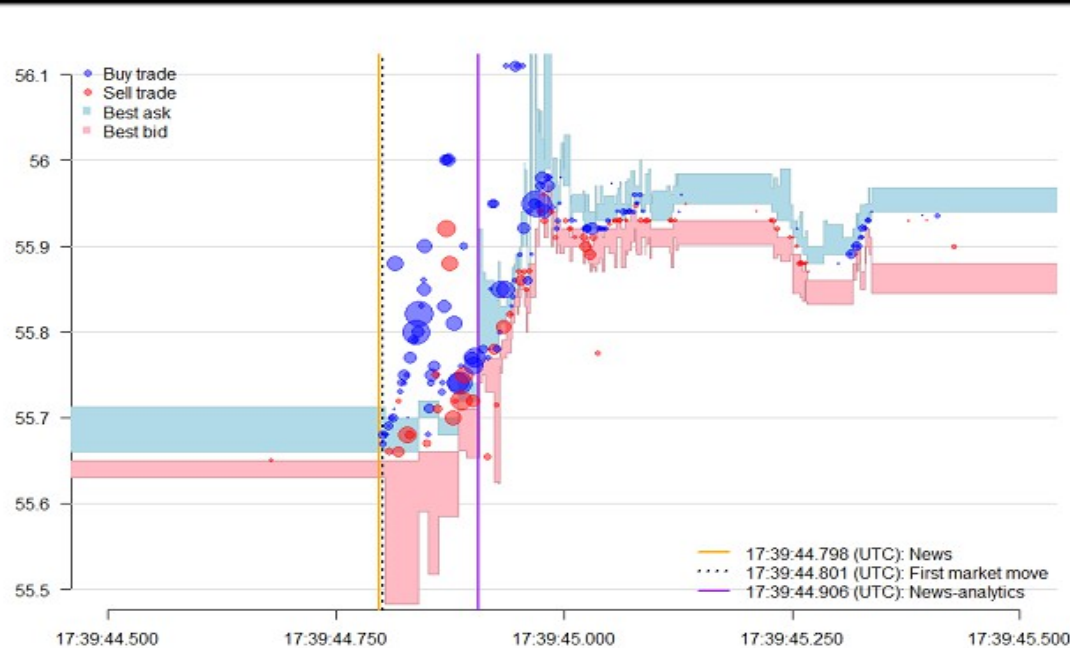
# Different Sources

...not all sources are the same



# A News Shock in the Market

**Broadcomm is said to explore deal to acquire chipmaker Qualcomm**

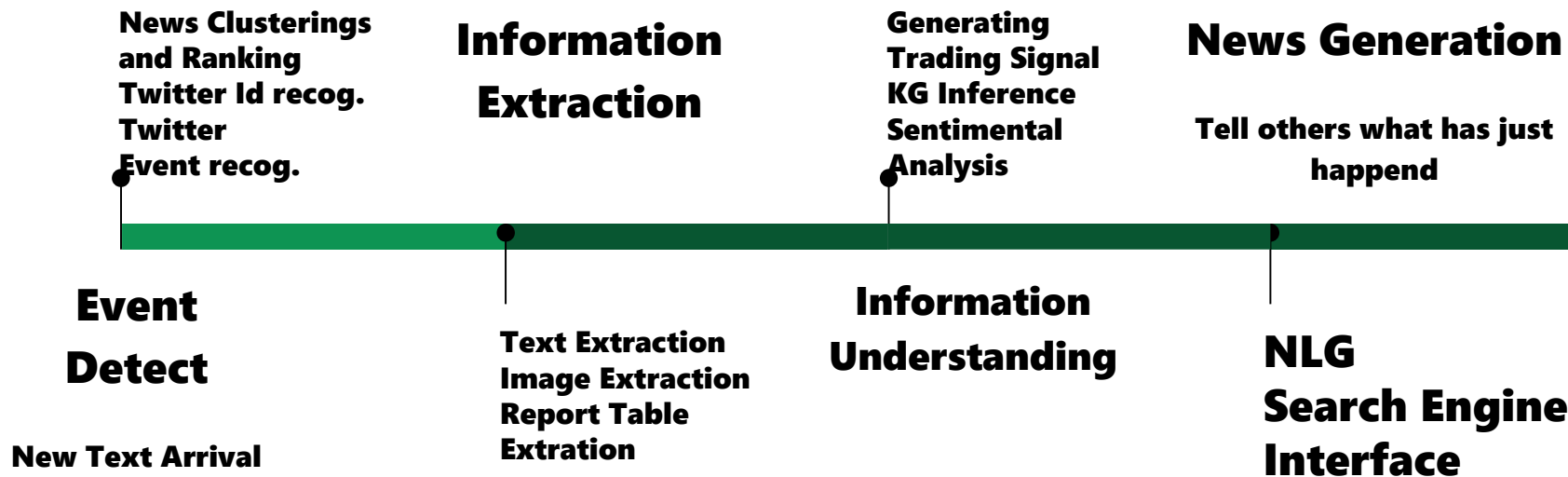


# Different Levels of Operators

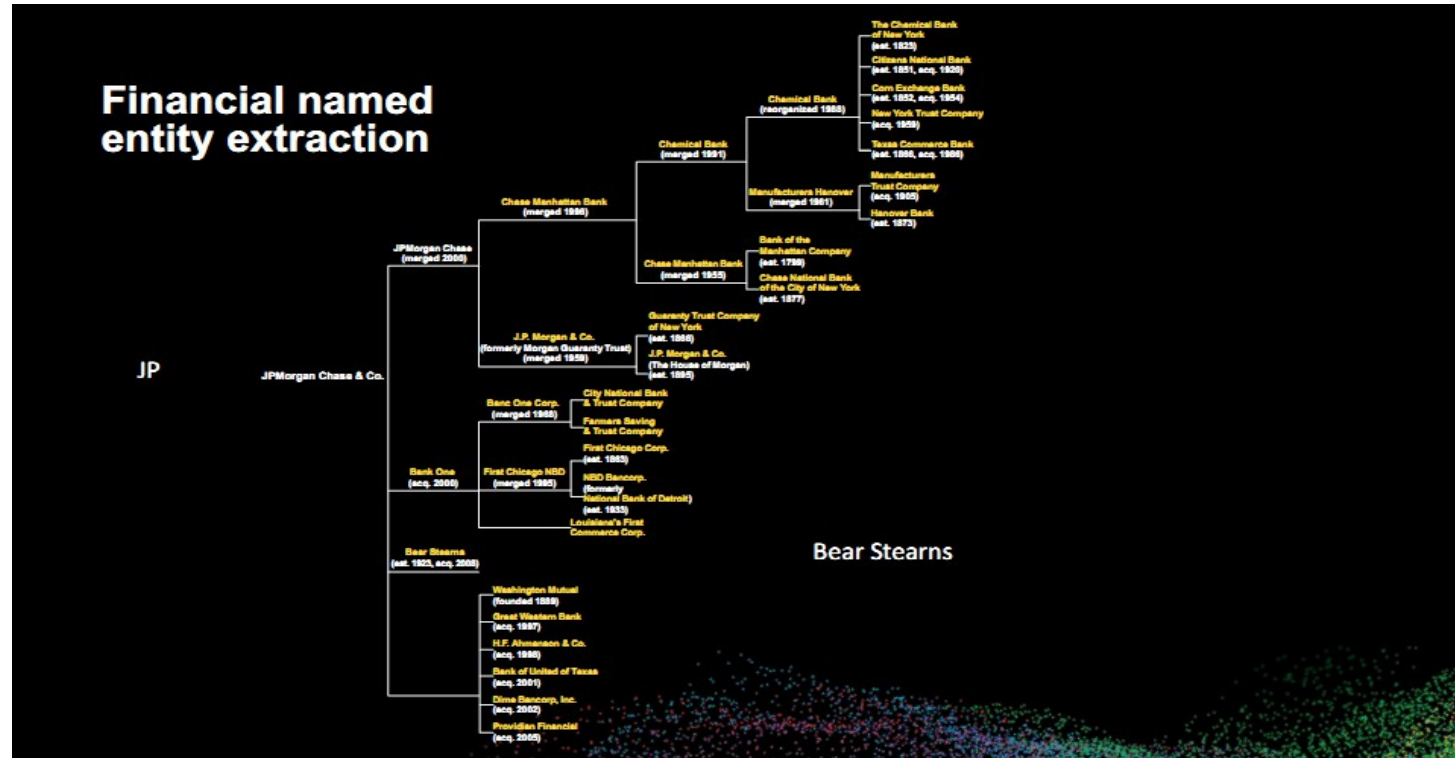
Time Interval	Operators
day/hours	Fundamental Investors
minutes/seconds	Statistical Arbitragers and Institutional Investors
mili-seconds	Event Driven Algo-traders
micro-seconds	High-Frequency traders



# Applications of Natural Language Processing

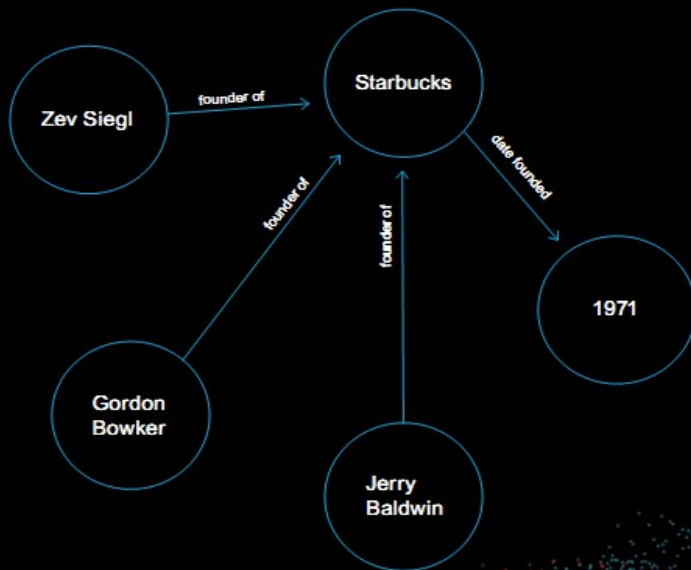


# Relational Networks and KG



# KG and Relation Extraction

## Explaining Knowledge Graph relationships

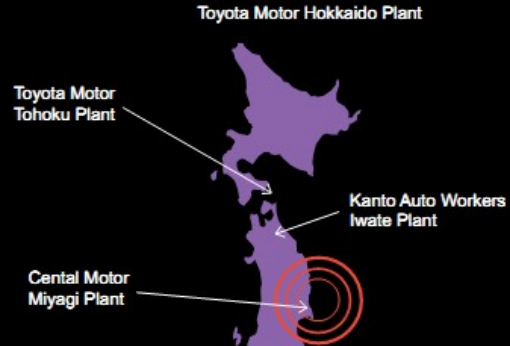


“In 1971, Siegl, Bowker and Baldwin established the Starbucks Coffee Company.”

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

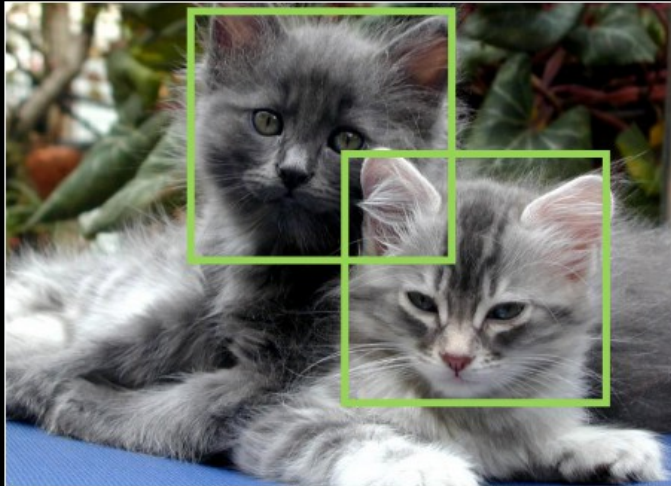
# KG Inference

## March 11, 2011: Earthquake in Japan



# CV and Table Interpretation

## Cats all the way down



PART 1 – FINANCIAL INFORMATION

Item 1. Financial Statements

STARBUCKS CORPORATION

CONDENSED CONSOLIDATED STATEMENTS OF EARNINGS

In millions, except per share data

(continued)

	Quarter Ended		Three Months Ended	
	Apr.	Apr.	Apr.	Apr.
Net income				
Company-operated stores	\$ 5,060.4	\$ 4,559.8	\$4,619.3	\$ 11,731.7
Licensed stores	880.8	588.3	1,968.4	1,724.4
CPD, franchise and other	109.2	564.2	1,617.6	1,777.4
Total net income	\$ 6,050.4	\$ 5,652.3	\$ 8,205.3	\$ 15,233.5
Cost of sales including company costs	2,214.9	2,249.0	7,272.1	6,883.1
Store operating expenses	3,835.6	3,403.8	13,033.4	8,403.8
Other operating expenses	143.0	162.7	426.8	427.7
Depreciation and amortization expenses	166.8	202.4	609.4	796.0
Goodwill and intangible asset expenses	485.7	222.8	1,270.8	1,081.2
Restructuring and impairment charges	18.9	128.2	178.2	128.2
Total operating expenses	5,315.9	4,168.9	17,760.7	11,620.9
Income from equity activities	71.4	116.8	515.3	268.7
Operating income	\$ 1,815.9	\$ 1,590.2	\$ 1,959.9	\$ 2,111.1
Gains resulting from acquisition of joint ventures	2.5	—	1,278.4	—
Net gain resulting from divestiture of certain operations	—	—	496.3	9.6
Interest income and other net	31.8	36.7	119.3	364.3
Other income	151.6	122.0	118.4	76.2
Earnings before income taxes	\$ 1,911.8	\$ 1,754.9	\$ 2,972.3	\$ 3,559.2
Income tax expense	174.8	188.1	1,088.1	1,175.1
Net earnings including noncontrolling interests	\$ 1,737.0	\$ 1,566.8	\$ 1,884.2	\$ 2,384.1
Net loss on transfer to noncontrolling interests	—	—	—	—
Net earnings attributable to Starbucks	\$ 1,737.0	\$ 1,566.8	\$ 1,884.2	\$ 2,384.1
Earnings per share – basic	\$ 0.52	\$ 0.48	\$ 0.59	\$ 0.64
Earnings per share – diluted	\$ 0.49	\$ 0.47	\$ 0.57	\$ 0.61
Preferred stock dividends	—	—	—	—
Basic	1,377.1	1,347.5	1,387.1	1,403.8
Diluted	1,312.2	1,279.4	1,409.9	1,404.9
Cash dividends declared per share	\$ 0.36	\$ 0.32	\$ 0.36	\$ 0.31

See Notes to Condensed Consolidated Financial Statements.

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# Table Interpretation

## Extraction from natural documents

PART 3 – FINANCIAL INFORMATION

Item 1. Financial Statements

STARBUCKS CORPORATION

CONDENSED CONSOLIDATED STATEMENTS OF EARNINGS

(In millions, except per share data)

(Unaudited)

	Quarter Ended		Nine Months Ended	
	AM/L	AM/L	AM/L	AM/L
Net income:				
Continuing operations income	\$ 1,081.4	\$ 1,070.0	\$ 3,033.3	\$ 3,175.7
Losses on sales	660.6	588.3	1,668.4	1,737.8
Other income and other	188.1	186.2	537.0	—
Total net income	\$ 1,929.1	\$ 1,744.5	\$ 4,938.7	\$ 4,913.5
Cost of sales including temporary costs	2,234.9	2,208.3	7,213.7	—
Store operating expenses	1,825.0	1,820.8	5,465.6	5,533.3
Other operating expenses	148.0	142.3	424.8	421.7
Depreciation and amortization expenses	230.0	225.8	685.8	708.0
Interest and other non-recurring expenses	488.7	222.0	1,239.8	1,085.2
Restructuring and impairment	38.9	128.2	178.2	120.2
Total operating expenses	\$ 2,935.5	\$ 2,527.4	\$ 8,748.1	\$ 8,878.5
Income from equity investees	74.4	101.0	311.3	289.5
Operating income	\$ 1,067.0	\$ 1,318.1	\$ 2,501.9	\$ 2,121.7
Operating income from operations of prior periods	2.1	—	1,794.4	—
Net gain resulting from disposition of certain operations	—	—	488.2	9.0
Interest income and other, net	35.4	31.7	101.2	104.8
Interest expense	(61.4)	(22.5)	(188.4)	(70.2)
Earnings before income taxes	\$ 1,080.9	\$ 1,327.3	\$ 2,617.4	\$ 2,145.8
Income tax expense	174.3	161.1	508.5	475.1
Net earnings including noncontrolling interests	\$ 906.6	\$ 1,166.2	\$ 2,108.9	\$ 1,670.7
Net earnings attributable to Starbucks	\$ 922.7	\$ 1,181.6	\$ 2,162.8	\$ 1,686.1
Earnings per share – basic	\$ 0.82	\$ 0.88	\$ 1.68	\$ 1.44
Earnings per share – diluted	\$ 0.80	\$ 0.87	\$ 1.65	\$ 1.40
Weighted average shares outstanding	1,121.1	1,347.7	1,287.7	1,240.8
Dividends	1,183.7	1,470.4	1,409.9	1,444.9
Cash dividends declared per share	\$ 0.36	\$ 0.22	\$ 0.94	\$ 0.72

See Notes to Condensed Consolidated Financial Statements.

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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 0 56.94Q H 58.01K L 56.77Q Val 360.424M

SBUX US Equity % Actions % Export % Settings Financial Analysis

Starbucks Corp BQL Periodicity Annuals Cur BRC (USD)

Key Stats	1/5	B/S	C/F	Ratios	Segments	Addl	ESG	Custom	Shared
Adj Highlights	GAAP Highlights	Earnings	Enterprise Value	Multiples	Per Share	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	57,189.9	86,858.8	80,400.2	78,139.8	82,833.3				
Revenue, Adj	16,447.8	19,162.7	21,315.7	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	5.8		
Gross Profit, Adj	4,950.8	5,064.1	6,740.5	6,855.3	7,196.0	14,551.4	15,661.6		
Margin %	30.1	26.5	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	2,586.7	3,164.0		

# Fraud can influence the market

## A disaster in the White House is huge



Over \$136 billion  
was wiped out in  
minutes



# Twitter Fraud News Detection

## Twitter: Geolocation credibility



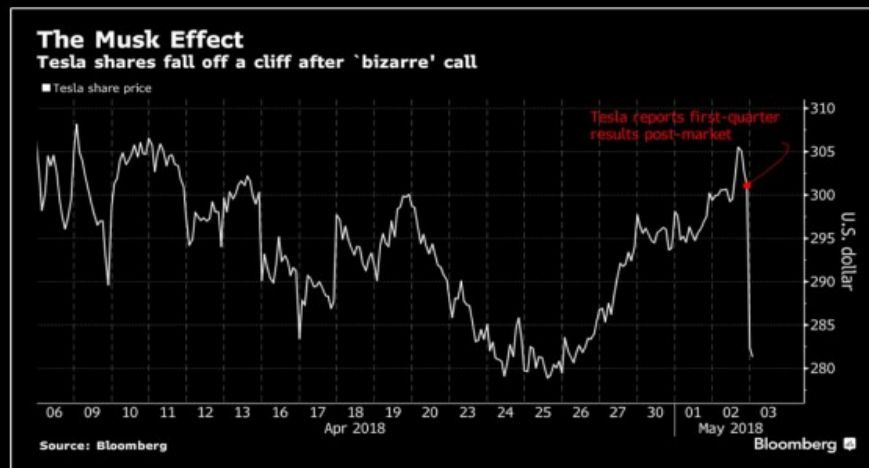
[Preotiuc-Pietro, Guntuku, Ungar 2017]  
[Preotiuc-Pietro, Liu, Hopkins, Ungar 2017]  
[Giorgi, Preotiuc-Pietro, Buffone, Rieman, Ungar  
Schwartz 2018]  
[Dredze, Osborne, Kambadur 2016]



# Sentimental Analysis

**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?"



# Automated news generation

## 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



Top Contacts

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

By Leslie Patton

