What Artificial Intelligence Might Do to Finance

Dr. Yves J. Hilpisch

PyConf Hyderabad | Keynote | 08. October 2017

"Pichai said that as an 'AI first' company, this is a 'unique moment in time' for Google to combine hardware, software and artificial intelligence. 'It's radically rethinking how computing should work', he said."

Business Standard, "Google Ramps up Hardware Business", 06. October 2017.

Introduction

Wiley Finance Series

Derivatives Analytics
with
Python

*Data Analysis, Models, Simulation,
Calibration and Hedging*

YVES HILPISCH

WILEY

O'REILLY®

Python
for Finance

ANALYZE BIG FINANCIAL DATA

Yves Hilpisch

Wiley Finance Series

Listed Volatility
and Variance
Derivatives

A Python-based Guide

YVES HILPISCH

WILEY

http://books.tpq.io
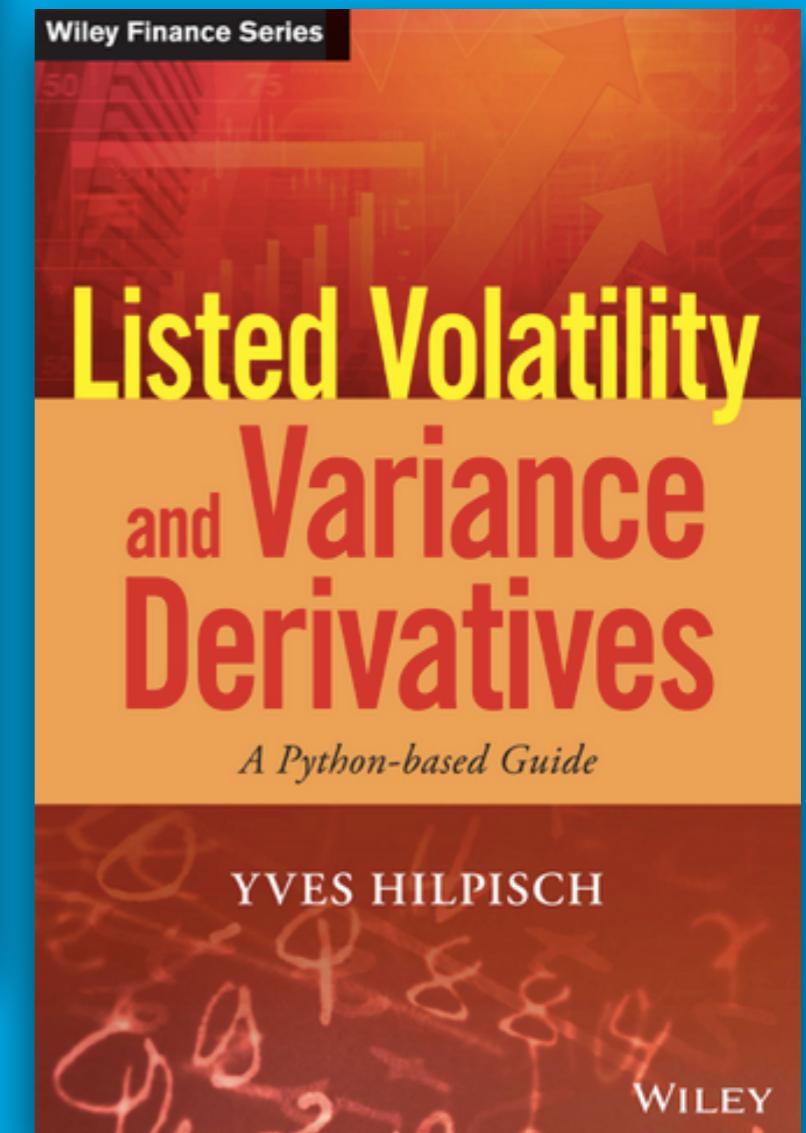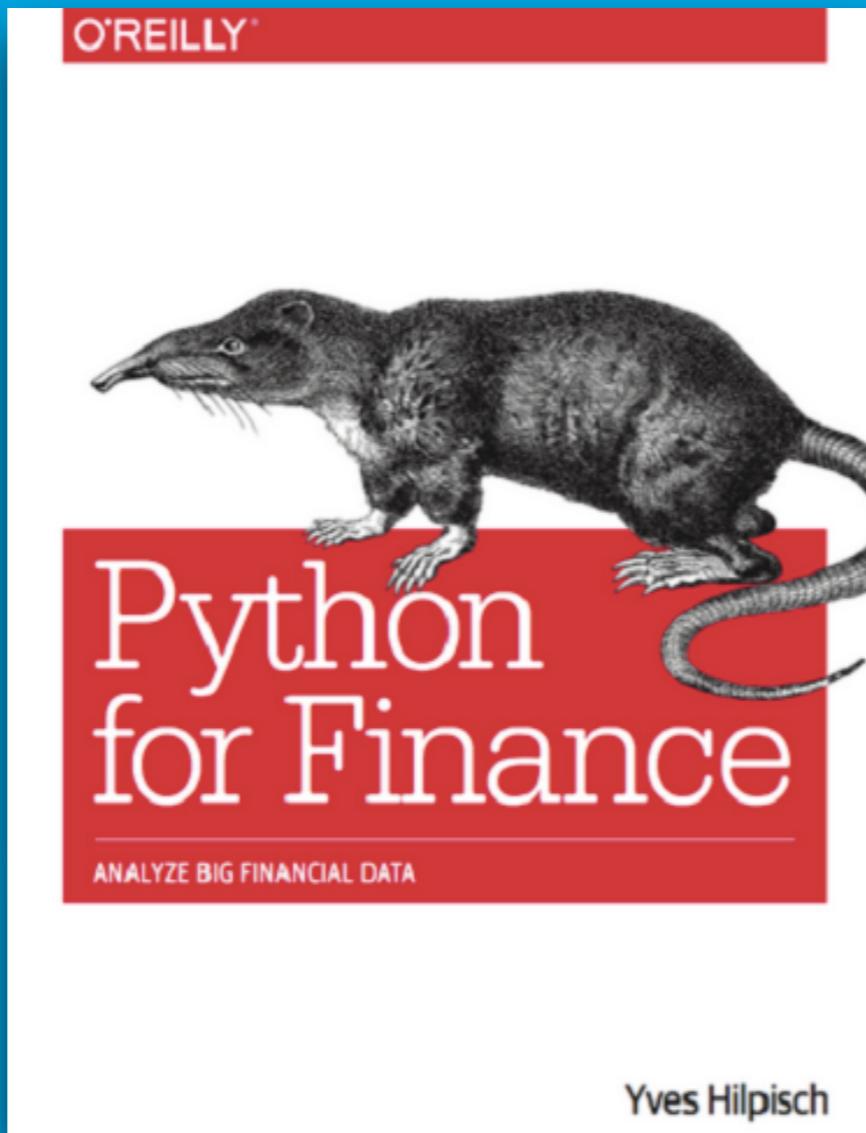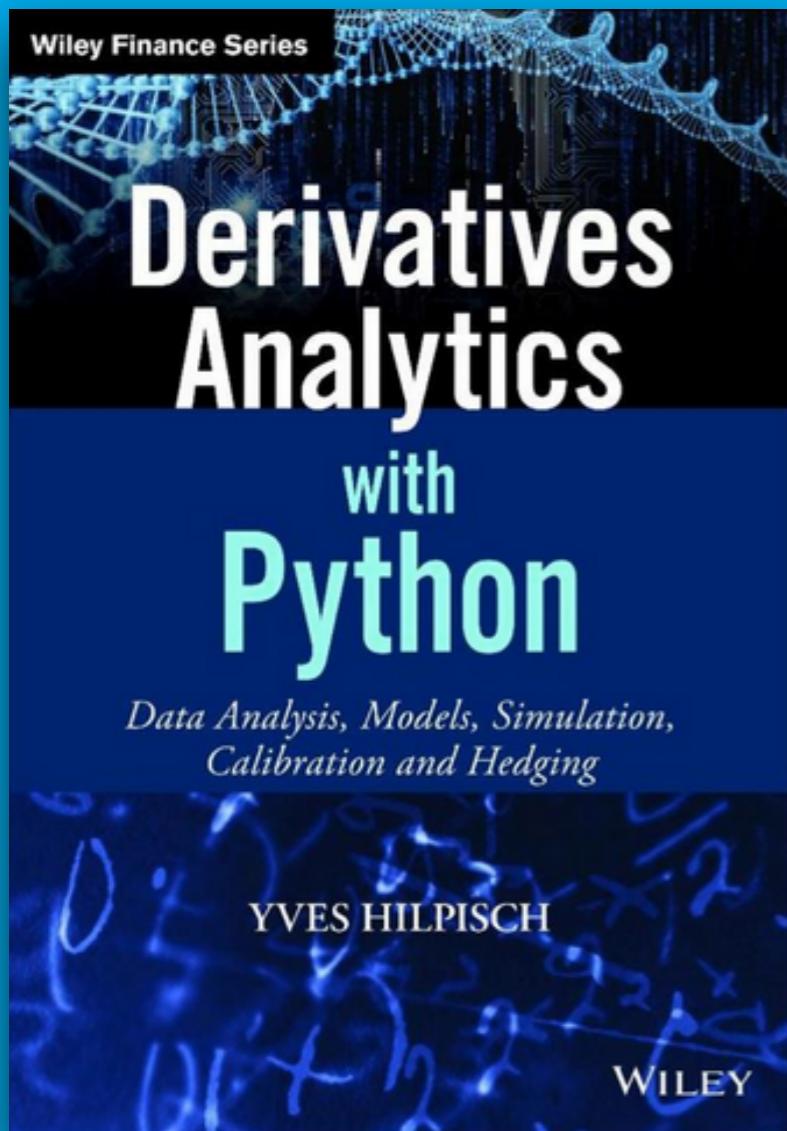
UNIVERSITY CERTIFICATE IN PYTHON FOR ALGORITHMIC TRADING

THE PYTHON QUANTS

PROGRAM DIRECTOR

Dr. Yves J. Hilpisch is founder and managing partner of The Python Quants (http://tpq.io), a group focusing on the use of open source technologies for financial data science, algorithmic trading and computational finance.

He is the author of the books:

He is the author of the books:

- Python for Finance (O'Reilly)
- Derivatives Analytics with Python (Wiley)
- Listed Volatility and Variance Derivatives (Wiley)

He has written the financial analytics library DX Analytics (http://dx-analytics.com) and organizes conferences and Meetup events about Python for finance and algorithmic trading in Frankfurt, London and New York. He has given keynote speeches at technology conferences in the United States, Europe and Asia.

The Python Quants GmbH

recognized by Banking CIO Outlook magazine as

TOP 10
Banking Analytics
SOLUTION PROVIDERS - 2017

An annual listing of 10 companies that are at the forefront of providing banking analytics solutions and impacting the marketplace

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April 2017

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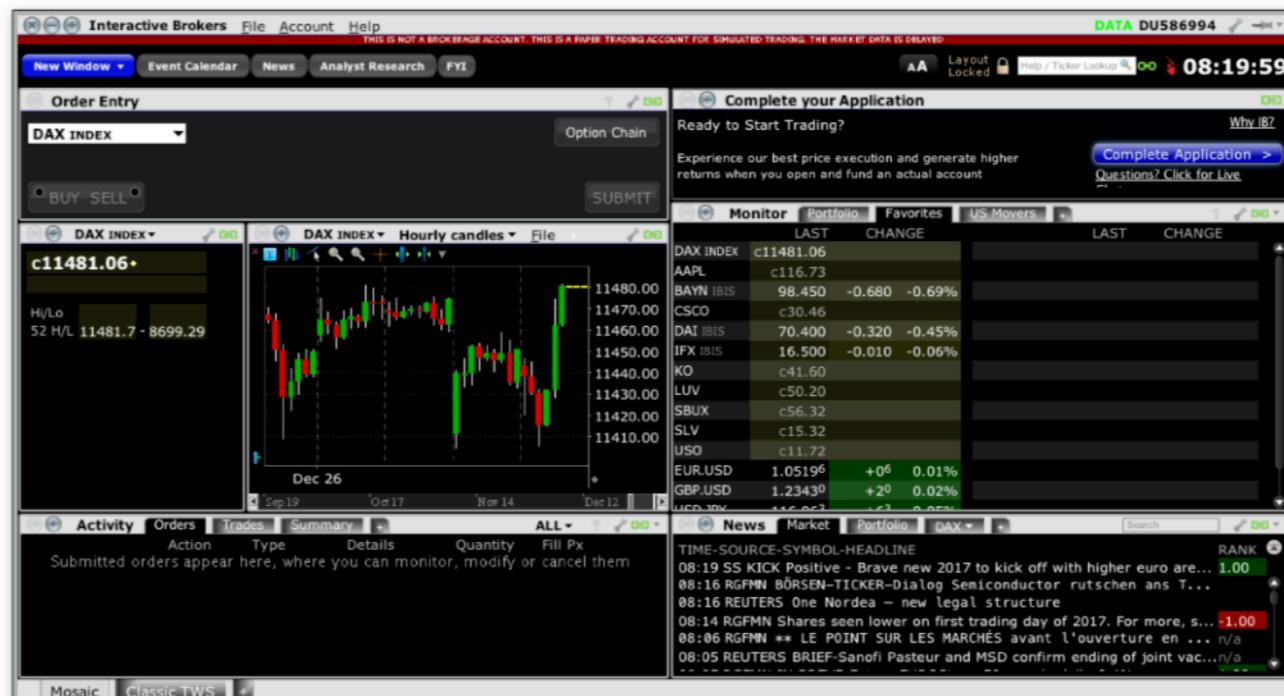
Banking CIO Outlook

FEBRUARY, 2017   BANKINGCIOOUTLOOK.COM

Top 10 Banking Analytics Solution Provi[ders]

Today's data-driven banking industry portrays a scenario where analytics is paving a productive path for banks, by offering meaningful insights on their underlying data. Although basic reporting and descriptive analytics are prevalent in the banking sector, the need of the hour is advanced predictive and prescriptive analytics.

Sophisticated technologies—like the emerging cognitive analytics for instance—are enabling banks to make better decisions and achieve profitable growth quarter-on-quarter. At the same time, with enhanced visibility into intricate information, such as individual financial health and behavioral patterns, banks now have the upper hand in risk mitigation and fraud prevention that help them comply with mandatory regulations.

With the Blockchain gaining mainstream attraction, digital currencies such as Bitcoin and Ethereum are doing their rounds among consumers for payments and other transactions. To that end,

banks are leveraging analytics to [...] these digital currencies, by verif[...] with an unprecedented level of [...]

Identifying the numerous b[...] constant quest to find solutions [...] in a timely and accurate manner [...] whole new level.

To help CIOs and CFOs [...] solution provider, a distinguis[...] CFOs, VCs, analysts, and the Ba[...] has selected top players from th[...] demonstrate an ability to dev[...] methodologies along the bank [...] outstanding customer service.

We present to you Banking [...] Analytics Solution Providers 20[...]

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An annual listing of 10 companies that are at the forefront of providing banking analytics solutions and impacting the marketplace

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Company:
The Python Quants Group

Description:
Focused on Python and Open Source Technologies for Financial Data Science, Algorithmic Trading and Computational Finance

Key Person:
Dr. Yves J. Hilpisch
Managing Partner

Website:
tpq.io

The Python Quants Group
Enhance Financial Analytics

TOP 10 Banking Analytics SOLUTION PROVIDERS -2017

Over the years, the ecosystem of scientific, numerical and data analytics packages available for Python has grown rapidly and has finally made it [...] finance [...] have [...] ing and [...] rather [...] Python [...] potential [...] before [...] ing and [...] analytics [...] focus has [...] tion and [...] financial [...] nce and [...] Hilpisch, [...] Quants. [...] financial [...] ignore [...] trends [...] or open [...] it there [...] nterpart [...] Python [...] omes to [...] ployment, [...] nks and [...] ervices. [...] nologies [...] s and individuals to do financial and data analytics in real-time and on a highly customized basis as well as to rapidly develop new financial applications and deploy them based on weekly or even daily cycles. "We support financial institutions in introducing, training and deploying Python and a major building block in this regard is our Quant Platform," adds Hilpisch. "Our training offerings are based on more than 10 years of

experience with Python for Finance and provide a hands-on learning experience, making heavy use, for instance, also of our Quant Platform."

The company's Quant Platform makes central, standardized Python deployment an easy and efficient affair while mitigating risks and reducing maintenance costs considerably during deployment. Based on modern web technologies and deployment techniques like Docker containers, the Quant Platform provides a full-fledged suite of development tools via the web browser without the need to install any kind of open source software locally on desktop or notebook computers.

In an instance, Eurex, one of the leading derivatives exchanges, wanted to support investors, traders, market makers and quants in the understanding and trading of their listed volatility and variance products. Eurex decided to use Python for this project and The Python Quants were tasked to create the content and in particular the Python codes accompanying it. While the content itself became part of the Eurex website, all Python codes were provided to Eurex partners and other interested parties on a Eurex-labeled version of the Quant Platform for easy code access and execution. "Deploying open source technologies, like Python, is often a tedious and sometimes even a risky process, with our services and products we help our clients to make this process more efficient and mitigate risks," adds Hilpisch.

Another product of The Python Quants Group assisting organizations to model, price and risk manage complex portfolios of (multi-risk) derivatives with potentially complex correlation structures

Dr. Yves J. Hilpisch

is DX Analytics. Being an open source derivatives, portfolio and risk analytics library written exclusively in Python— it makes heavy use of the capabilities of Python and the capabilities of its numerical and data analytics libraries.

> Our major focus has always been on the use of Python and open source technologies for financial data science, computational finance and algorithmic trading

As the Python ecosystem sees tremendous momentum, The Python Quants Group's near-term focus will be on machine and deep learning techniques, technologies emerging in algorithmic trading as well as on cryptocurrencies and blockchain. "We will improve our value proposition in particular for hedge funds and other buy side players for the days to come," concludes Hilpisch.

http://hilpisch.com/bcioo_tpq.pdf

The Python Quants GmbH Bringing a new approach to financial analytics with Python

The present day banking industry is data driven. It depends on predictive and prescriptive analytics solutions to gain meaningful insights from the underlying data that paves the path for productivity and development. With the expansion of technology into trading in the recent years, algorithms are responsible for making rapid split-second trading decisions, faster than humans could make. As technologists look to bring a greater exposure of technology to banking, Python and its eco-system of powerful packages emerged as the technology platform of choice in the financial market. The Python Quants Group realized this and developed a business model around Python for Finance & Algorithmic Trading enabling organizations and individuals to do financial and data analytics in real-time and on a highly customized basis as well as to rapidly develop new financial applications and deploy them based on weekly or even daily cycles.

The company was set up to benefit from new open source technologies, the Python ecosystem in particular, as well as new financial methods

and approaches like large scale Monte Carlo simulation in finance. The Python Quants Group is active in the areas of technology, know-how & research, and services & community. It focuses on Python for Financial Data Science, Algorithmic Trading and Computational Finance and also offers consulting, development and training services in all financial capitals, e.g., Frankfurt, London, New York, Singapore. It helps its clients to use Python for Quant Finance to solve specific problems or to conduct ambitious and path-breaking projects.

Providing valuation capabilities based on Monte Carlo Simulation with DEXISION

The first product that the company launched was DEXISION, a Python- and simulation-based financial engineering and derivatives pricing platform with "Derivatives Analytics On Demand" being the tag line. It was developed keeping the market needs in view to design, manage and price complex financial derivatives. The company

Python-based financial analytics library

The Python Quants Group has been engaged in the Python and open source communities from

also added features based on

implements what is sometimes called the global valuation of derivatives instruments.

Python arrived late in the financial industry. But since it is used now strategically by many of the biggest financial institutions in the world like Bank of America Merrill Lynch or JP Morgan, the need for professional Python education has been growing steadily. The company reacted to it by offering Python for Finance events like the For Python Quants Bootcamp in London and New York as well as by offering an integrated suite of online training

classes and courses in Python for Finance. Its focus here lies on Financial Data Science, Algorithmic Trading and Computational Finance. In addition, the company has given customized corporate training classes for some of the biggest hedge funds and asset managers in the industry.

Promising a new level of productivity

The two trends that the company focuses on for its growth are the browser as the operating system and the cloud. After turning the SaaS offering DEXISION into the open source library, DX Analytics, they started building the Quant Platform, their PaaS product. It allows for scalable, collaborative financial analytics in the cloud based on tools like Jupyter Notebook and many other proprietary elements that have been added over time. The Quant Platform has close to 10,000 registered users. They use it for general purpose financial analytics tasks or to access codes

from the three books by Yves Hilpisch, namely Python for Finance, Derivatives Analytics with Python and Listed Volatility & Variance Derivatives.

Although it is a small company and located in Germany, it has global reach due to its available technologies. It uses the CRM software, Highrise HQ, to manage all relationships in an integrated manner. All sign-ups for the platform and email lists land there. Probably more than 95% of its platform users have free accounts with the company. It is the first to offer an official University Certificate in Python for Algorithmic Trading in co-operation with the htw saar University of Applied Sciences in Germany. The company has also launched a new training course "Finance with Python". This course teaches finance from basic principles and Python from the very beginning.

For more information:
http://tpq.io

> "Both in terms of technology and community we have build one of the biggest platforms in the Python for Finance field."

Knowing the CEO, Dr. Yves J. Hilpisch

Dr. Yves J. Hilpisch is the **Founder** and **CEO** of The Python Quants, a group focusing on the use of open source technologies for financial data science, algorithmic trading and computational finance.

Yves has a Ph.D. in Mathematical Finance and lectures on computational finance at the CQF Program, on data science at htw saar University of Applied Sciences and is the director of the first online training program leading [to a] University Certifi[cate. He h]as written the financial [... and] organizes meetups [... for] quantitative finance in [... .] He has given keynote [... talks/conferen]ces in the United States,

Dr. Yves J. Hilpisch, Founder & CEO

THOMSON REUTERS

FitchLearning

CQF | INSTITUTE

htw saar   Hochschule für
Technik und Wirtschaft
des Saarlandes
University of
Applied Sciences

A Bit of Background

machine & deep learning

data

algorithms

hardware

optimization,
training &
learning

testing

validation

prediction
("self-driving car")

automation

trading
("money making
machine")

algorithmic trading

The Benchmark Case
of Random Walks

"For many years, economists, statisticians, and teachers of finance have been interested in developing and testing models of stock price behavior. One important model that has evolved from this research is the theory of random walks. This theory casts serious doubt on many other methods for describing and predicting stock price behavior—methods that have considerable popularity outside the academic world. For example, we shall see later that, if the random-walk theory is an accurate description of reality, then the various "technical" or "chartist" procedures for predicting stock prices are completely without value."

Eugene F. Fama (1965): "Random Walks in Stock Market Prices".

"A market is efficient with respect to an information set S if it is impossible to make economic profits by trading on the basis of information set S."

Michael Jensen (1978): "Some Anomalous Evidence Regarding Market Efficiency".

If a stock price follows a
(simple) **random walk**
(no drift & normally distributed returns),
then it rises and falls with
the same probability of 50% ("toss of a coin").

In such a case,
the best predictor of tomorrow's stock price
—in a least-squares sense—
is today's stock price.

Technological Singularity

NICK BOSTROM

SUPERINTELLIGENCE
Paths, Dangers, Strategies

'I highly recommend this book'
BILL GATES
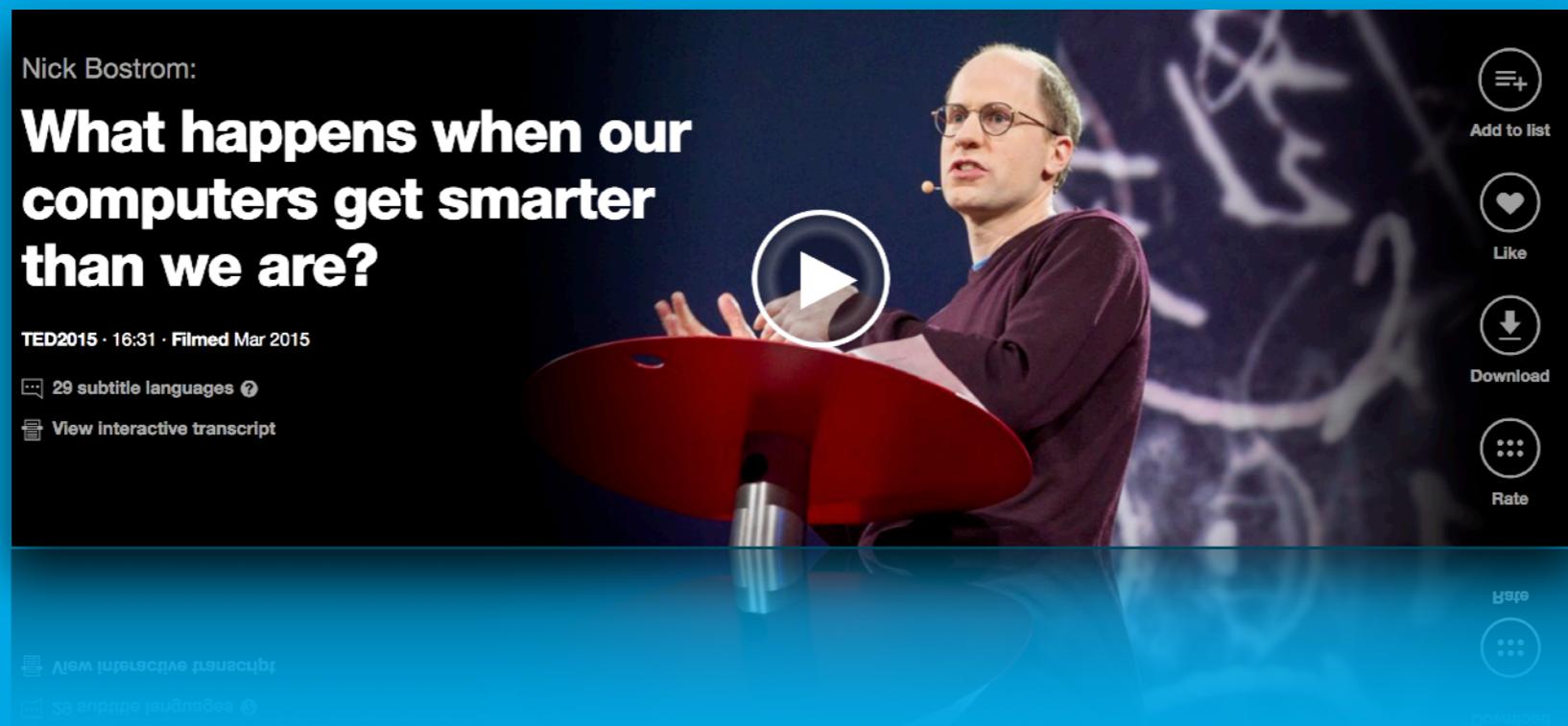
"There are things in this book that could mess with your head."
—VERNOR VINGE, computer scientist; essayist, "The Coming Technological Singularity"

SINGULARITY RISING

in a Smarter, gerous World

Nick Bostrom:

What happens when our computers get smarter than we are?

TED2015 · 16:31 · Filmed Mar 2015

29 subtitle languages

View interactive transcript

"Vast increases in biological and machine intelligences will create what's being called the Singularity—a threshold of time at which AIs that are at least as smart as humans, and/or augmented human intelligence, radically remake civilization."

James Miller (2012): Singularity Rising. BenBella Books.

Google.ai

Google.ai

Our work   Tools

Google.ai

Bringing the
benefits of AI to
everyone

Our mission is to organize the world's inform
useful, and AI is enabling us to do that in inc
users, our customers, and the world.

AI makes it easier for you to do things every
you love, breaking down language barriers, o
personal digital assistant. But it's also provid
and helping transform how we work and live
everyone can access it.

TensorFlow

Cloud TPUs – Google.ai

https://google.ai/tools/cloud-tpus/

Google.ai   Our work   Tools

Cloud TPUs

Google's second-generation Tensor Processing Unit is coming to Cloud
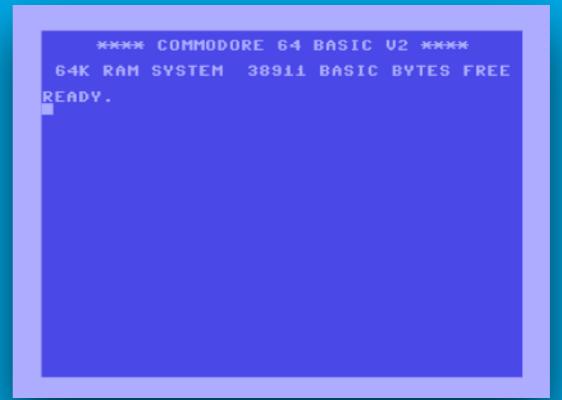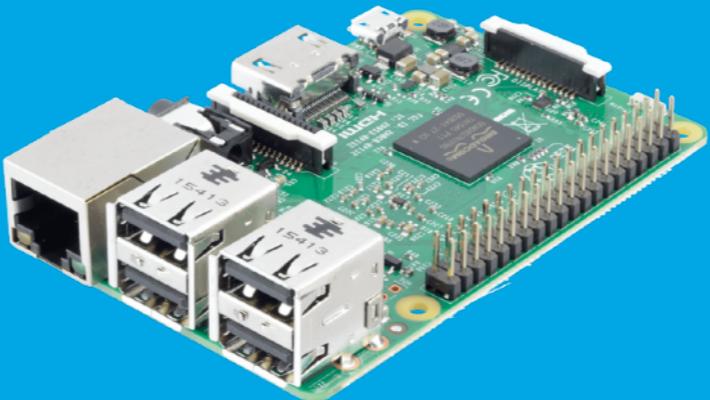
SIGN UP TO LEARN MORE

Training state-of-the-art machine learning models requires an enormous amount of computation, and researchers, engineers, and data scientists often wait weeks for results. To solve this problem, we've designed an all-new ML accelerator from scratch — a second-generation TPU, or Tensor Processing Unit — that can accelerate both training and running ML models.

Each device delivers up to 180 teraflops of floating-point performance, and these new TPUs are designed to be connected into even larger systems. A 64-TPU pod can apply up to 11.5 petaflops of computation to a single ML training task.

We're extremely excited about these new TPUs, and we want to share this technology with the world so that everyone can access their benefits. That's why we're bringing our second-generation TPUs to Google Cloud for the first time as Cloud TPUs on GCE, the Google Compute Engine. You'll be able to mix-and-match Cloud TPUs with Skylake CPUs, NVIDIA GPUs, and all of the rest of our infrastructure and services to build and optimize the perfect machine learning system for your needs. Best of all, Cloud TPUs are easy to program via TensorFlow, the most popular open-source machine learning framework.

Emulation
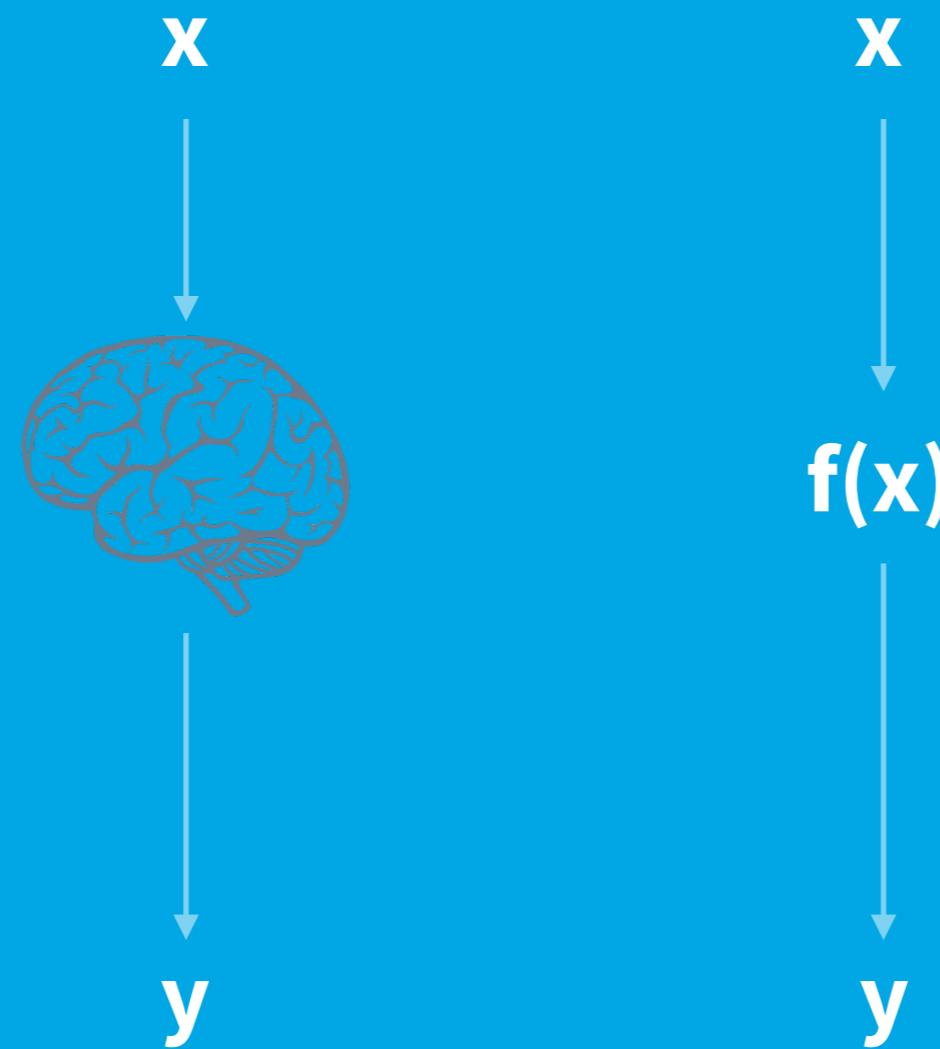
powerful
hardware &
software

human level
AI

Humans

x

y

Algorithms

x

f(x)

y
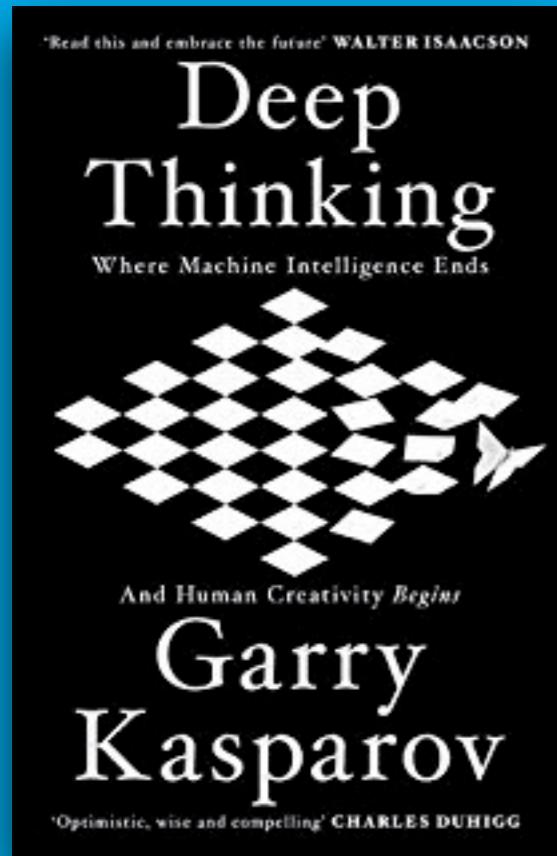
Chess Singularity

Chess singularity is a a threshold of time
from which on chess programs play better chess
than any human being.

Deep Thinking

Where Machine Intelligence Ends

'Read this and embrace the future' WALTER ISAACSON

And Human Creativity Begins

Garry Kasparov

'Optimistic, wise and compelling' CHARLES DUHIGG
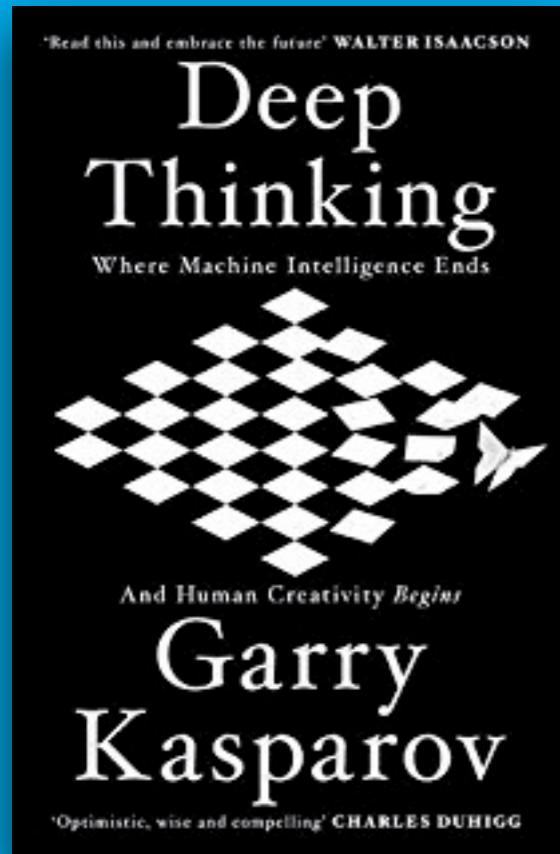
"It was a pleasant day in Hamburg in June 6, 1985, … Each of my opponents, all thirty-two of them, was a computer. … it didn't come as much of a surprise, …, when I achieved a perfect 32—0 score."

"Twelve years later I was in New York City fighting for my chess life. Against just one machine, a $10 million IBM supercomputer nicknamed 'Deep Blue'."

"Jump forward another 20 years to today, to 2017, and you can download any number of free chess apps for your phone that rival any human Grandmaster."
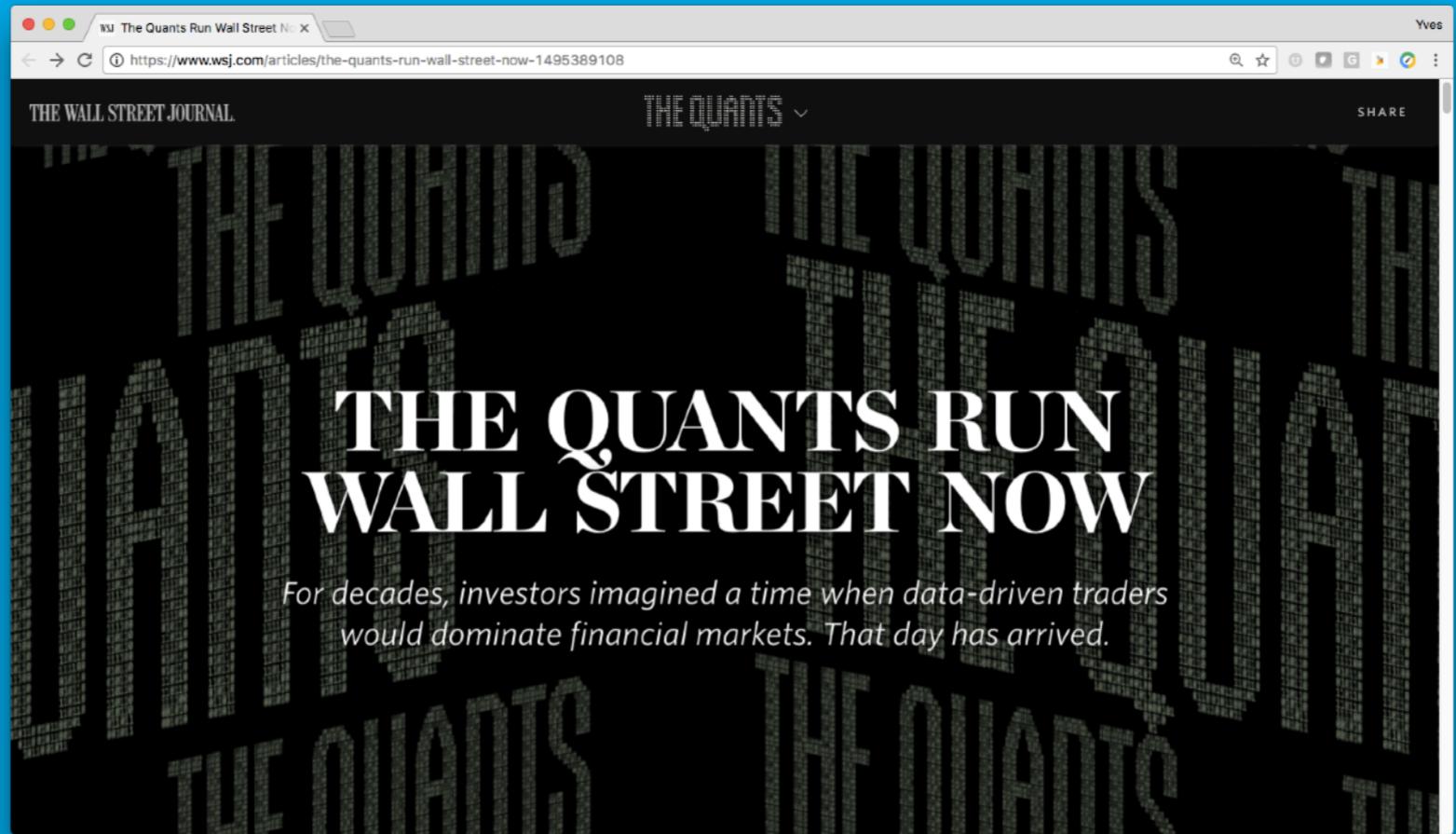
Did the human race resign
and stop playing chess?

Deep Thinking

'Read this and embrace the future' WALTER ISAACSON

Where Machine Intelligence Ends

And Human Creativity *Begins*

Garry Kasparov

'Optimistic, wise and compelling' CHARLES DUHIGG

"The world is changing too quickly to teach kids everything they need to know; they must be given the methods and means to teach themselves. This means creative problem-solving, dynamic collaboration online and off, real-time research, and the ability to modify and make their own digital tools."

"We are fantastic at teaching our machines how to do our tasks, and we will only get better at it. The only solution is to keep creating new tasks, new missions, new industries that even we don't know how to do ourselves. We need new frontiers and the will to explore them."

Financial Singularity

THE QUANTS RUN
WALL STREET NOW

For decades, investors imagined a time when data-driven traders would dominate financial markets. That day has arrived.
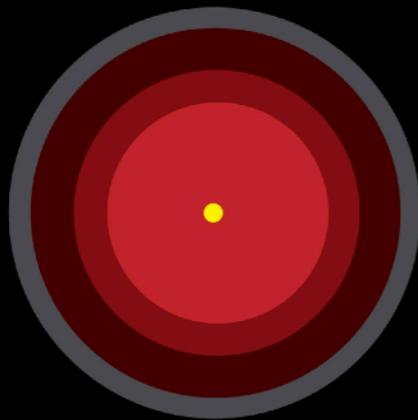
"Financial singularity is the point at which all investment decisions are made by intelligent machines rather than human agents. … When all human fallibility is eliminated from markets, efficient markets, which have only existed so far in theory, could become a reality."

Read more: Financial Singularity Definition | Investopedia
http://www.investopedia.com/terms/f/financial-singlularity.asp

THE TECHNOLOGICAL SINGULARITY

MURRAY SHANAHAN

"Today's algorithmic trading programs are relatively simple and make only limited use of AI. However, this is sure to change. Artificial intelligence is beneficial in any domain where patterns have to be found in large quantities of data and effective decisions have to be taken on the basis of those patterns, especially when the decisions have to be taken rapidly."

Murray Shanahan (2015)

Dutch Speed-Trader Turns to Currencies After Conquering ETFs

Flow Traders wants to colonize markets with its approach to trading, but its core business is coming under attack

by **Will Hadfield**

14 June 2017, 06:01 CEST

From **Bloomberg Markets**

The bottom shelf of the fridge is laden with Heineken and Corona. The Corona is on rotation, but the Heineken is a permanent fixture: This is Amsterdam. A few strides away there's a dark, well-stocked in-house pub.
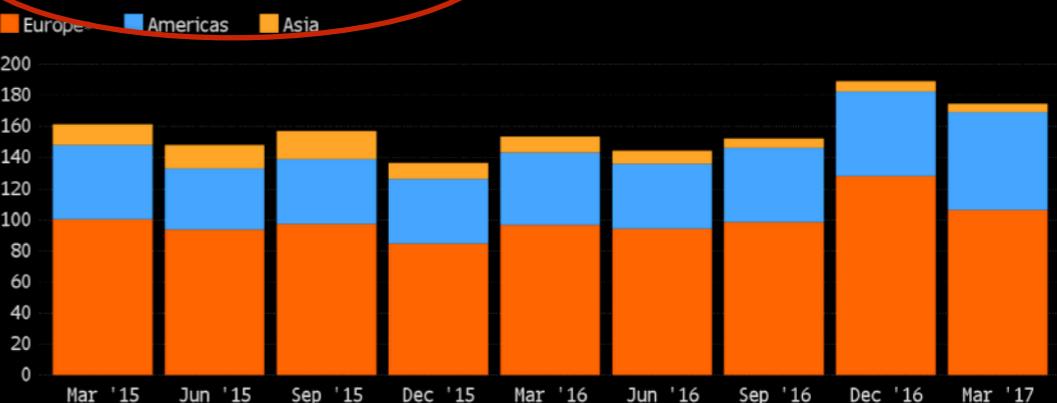
Up one flight of stairs, the atmosphere is very different. Behind a door that can only be opened with a security pass is by far the largest trading floor for exchange-traded funds in Europe. The 110 traders here, along with 30 colleagues in offices elsewhere, traded €640 billion ($719 billion) in ETFs last year and at least that much in futures, commodities, bonds, stocks, and foreign exchange.

The trading volumes are those of a major Wall Street bank, but the refrigerator—and especially the pub, with its arcade games, pool table, and giant television—is pure startup. This isn't an investment bank; this is Flow Traders NV, one of the world's most successful algorithmic trading firms.

This year the firm will undergo its biggest transformation since it opened for business in 2004. Flow, which handles about a third of all ETF trades in Europe, is seeking to do to currency markets what it's already done to its core business. The firm's strategic calculation is that high-speed foreign exchange traders should be able to offer better prices than banks, which typically adjust their bids and offers based on their customers' creditworthiness and the amount of business they do with the lender.

34 Months Without a Loss
Flow Traders' value traded in exchange-traded funds, billion euros

■ Europe　■ Americas　■ Asia

Source: company
* Includes Middle East and Africa

Bloomberg

Rietberg and Dijkstra say the move into currency trading is a natural evolution of the business. That may be, but Flow also badly needs to find a new way to grow: Its shares languish below €32—the price when it went public almost two years ago. In the first three months of 2017, its profit dropped 41 percent as quiet markets reduced its ability to earn money from trading. What's more, Flow needs to adjust to a changing landscape. In some markets, the pool of income available to algo trading firms is shrinking as competition increases from established trading companies looking to expand into new asset classes.

source: https://www.bloomberg.com/
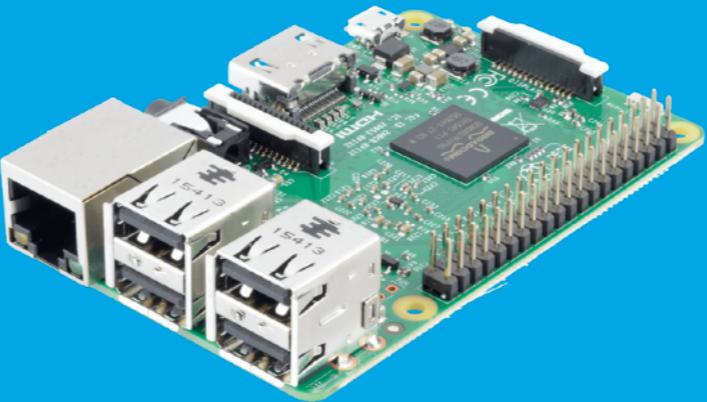
Flow is at a crossroads. Its distinctive approach to algorithmic trading could enable it to colonize other financial markets—or it could shrivel as rivals attack its core ETFs business. "Flow could be multiple times the size it currently is in 20 years," says Joost de Rijk, an analyst who covers the company for Amsterdam-based merchant bank Kempen & Co. "But it could also be gone. I think they will reevaluate every year whether this is working. That's the DNA of the company."

When you make only 0.028 percent on a trade, you need to make a lot of them.

Announcing its first-quarter results in May, Flow reported that it hadn't lost money on a single trading day in the preceding 34 months. It attributes the stellar run to its use of deterministic modeling, which produces definite outcomes, not probable ones. Most of its rivals calculate prices by means of statistical, or stochastic, modeling, producing hedges that probably (but not definitely) protect them from any downside.

Emulation

powerful
hardware &
software

complete market
replication with
all agents

Markets & Agents

Algorithms

x

x

f(x)

y

y

Man + Machine

ZERO
to
ONE

NOTES ON STARTUPS, OR
HOW TO BUILD THE FUTURE

Peter Thiel
with BLAKE MASTERS
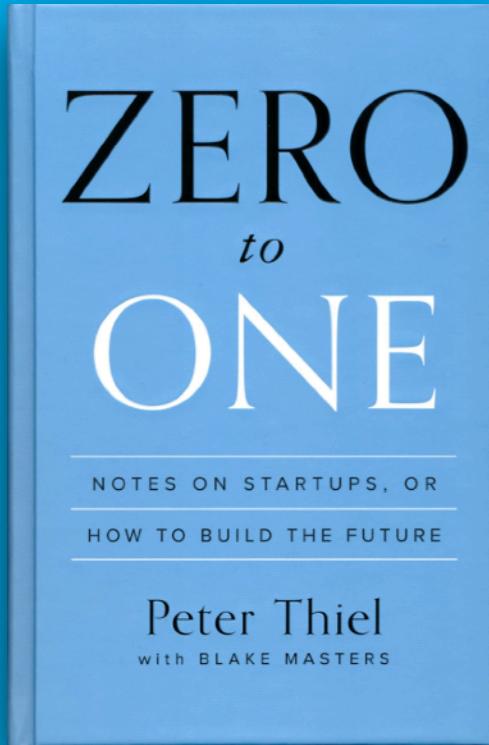
"We are impressed by small feats accomplished by computers alone, but we ignore big achievements from complementarity because the human contribution makes them less uncanny."

"Watson, Deep Blue and ever better machine learning algorithms are cool."

"But the most valuable companies of the future won't ask what problems can be solved with computers alone. Instead they'll ask: *How can computers help humans solve hard problems*?"

Data as the Driving Force

FINANCIAL TIMES

TUESDAY 3 OCTOBER 2017   MIDDLE EAST

Las Vegas reels from worst US mass shooting

A casualty is carried from the scene after a gunman opened fire on concert-goers in Las Vegas on Sunday night. More than 58 people were killed and over 515 wounded, making it the deadliest mass shooting in US history.

Las Vegas police said the suspected gunman, 64-year-old Stephen Paddock, fired shots from his 32nd-floor room in the Mandalay Bay hotel and casino into the crowd of 22,000 people attending the Route 91 Harvest festival.

In televised remarks, Donald Trump, the US president, called the shooting "an act of pure evil" but made no reference to guns. He plans to visit the city on Wednesday to meet the families of the victims and law enforcement officials. Report page 2

Catalan president urges Brussels to mediate in independence clash

● Region seeks to avoid 'traumatic split' from Spain ● EU says dispute is 'internal matter'

MICHAEL STOTHARD — BARCELONA
IAN MOUNT — GIRONA

The Catalan government said it wanted to avoid a "traumatic split" from Spain and appealed to the EU to mediate with Madrid in sign it was holding back from out early declaration of independence after Sunday's secession referendum.

Carles Puigdemont, the Catalan president, said that after Sunday's vote, when 90 per cent of the 2.3m ballots cast were in favour of independence, Catalonia now had the right to be free from Spain. But he hinted that this would not happen immediately.

"There is no button to push for independence, it does not exist," said Mr Puigdemont at a press conference. He called on the EU to help broker negotiations: "It's obvious we need mediation."

He added: "We don't want a traumatic break . . . We want a new understanding with the Spanish state."

Breaking with its previous reticence to speak out on Catalonia, the European Commission condemned the violent clashes between police seeking to block the poll and voters. It urged both sides to reach an agreement.

As Mariano Rajoy, Spain's prime minister, met other party leaders, his government gave little sign it was open to talks as long as the separatist Catalan government pushes for full independence from Spain.

Fernando Martinez-Maillo, a senior member of the governing Popular party, said the election had been a "great farce" and the Catalan regional government has been "delegitimised".

Rafael Catala, the justice minister, said that the government would use all the tools at its disposal — including if

points. Sunday's referendum, while illegal and invalid under Spanish law, was also a historic challenge to the authority of the Spanish state that threatens to plunge the country into a political and constitutional crisis.

There were also hawkish calls by Albert Rivera, the head of the liberal Ciudadanos party which supports the PP government, to suspend Catalonia's autonomy immediately.

Mr Puigdemont demanded the central government withdraw the national police reinforcements it deployed to the region over the weekend to thwart the poll, forcibly in many instances.

The Catalan leader has still left the door open to a unilateral declaration of independence unless talks with Madrid can start.

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Editorial Comment page 10
Gideon Rachman page 11
Short View page 15

necessary the suspension of Catalonia's autonomy — to enforce the rule of law.

Scientists who unwound the workings of human body clock win Nobel Prize

CLIVE COOKSON — SCIENCE EDITOR

Three American scientists have won the Nobel medicine prize for discovering the molecular workings of the "body clock" in humans and animals that synchronises with the Earth's cycle through night and day.

Jeffrey Hall, Michael Rosbash and Michael Young worked out how a biochemical feedback mechanism maintains a circadian rhythm, the 24-hour cycle of sleep and wakefulness, feeding behaviour, hormone release, blood pressure and other physiological functions.

Their research was carried out mainly during the 1980s and 1990s, working with fruit flies as a "model organism" at Brandeis University in Boston and Rockefeller University in New York. The body clock works in essentially the same way across the animal kingdom,

from insects to mammals. Plants too have a similar timekeeping system.

Thomas Perlmann, secretary of the Nobel Assembly, said he reached Professor Rosbash by phone shortly before the announcement was made public in Stockholm. "He was silent and then he said, 'You are kidding me.'"

The fundamental discovery of the three laureates was that a pair of genes called "period" and "timeless" set up a feedback loop, in which their activity is inhibited in their protein products build up. The result is a biochemical oscillation over a 24-hour cycle — a body clock that is then regulated by external cues such as light and darkness.

Juleen Zierath of the Nobel Assembly said the research helped to "raise awareness of the proper importance of sleep hygiene and the importance of really making certain we allow ourselves to go to bed at an hour that's suitable".

When we travel across several time zones there is a mismatch between our internal clock and external environment, which produces jet lag. While some people take the hormone melatonin to reset the body clock, scientists are working on a more effective remedy.

Carlos Ibanez of the Karolinska Institute said: "Since the seminal discoveries . . . circadian biology has developed into a vast and highly dynamic research field, with important implications for our health and wellbeing."

Briefing

► **Puerto Rico calls for billions in aid**
Raul Maldonado Gautier, Puerto Rico's treasury secretary, says the island will need "tens of billions" of dollars in aid from the US as it struggles to recover after Hurricane Maria — PAGE 2

► **Portugal's Socialists reap benefits**
Portugal's ruling Socialists reaped the rewards of a recovering economy by winning a decisive victory in local elections midway through the first term of an anti-austerity government. — PAGE 3

► **Uber's UK head quits as chief flies in**
Jo Bertram, Uber's UK boss, has quit the company a day before a visit to London by Dara Khosrowshahi, chief executive, to meet regulators over a threat to revoke the ride-hailing app's licence in the capital. — PAGE 10

► **Koike faces Japan election dilemma**
Tokyo governor Yuriko Koike is under pressure to stand in Japan's general election later this month, amid fears she and her party lack the resources to beat Shinzo Abe, the prime minister. — PAGE 4

► **Equifax defends silence over hack**
Credit reference agency Equifax has claimed ahead of a hearing at the US Congress later today that disclosing that it had been hacked would have encouraged "copycat" cyber attacks. — PAGE 12

► **Western envoys warn on Kenya re-run**
Western ambassadors have condemned President Uhuru Kenyatta and Raila Odinga, opposition leader, for undermining the electoral commission's ability to restage its election this month. — PAGE 4

► **Huawei beats Apple as top China choice**
Huawei has for the first time beaten Apple to top spot for intended smartphone purchases in China, according to a survey of 1,000 consumers. — PAGE 14

Datawatch

US manufacturing purchasing managers' index

THE WALL STREET JOURNAL.

Deal Brings Stability to U.S. Budget

Congressional Negotiators Avert January Shutdown and Soften Sequester Cuts; Airline Fees to Climb

BY JANET HOOK

House and Senate negotiators, in a rare bipartisan act, announced a budget agreement Tuesday designed to avert another economy-rattling government shutdown and to bring a dose of stability to Congress's fiscal policy-making over the next two years.

who struck the deal after weeks of private talks, said it would allow more spending for domestic and defense programs in the near term, while adopting deficit-reduction measures over a decade to offset the costs.

Revenues to fund the higher spending would come from changes to federal employee and military pension programs, and higher fees for airline passengers, among other sources. An

extension of long-term jobless benefits wasn't included.

The plan is modest in scope, compared with past budget deals and to once-grand ambitions in Congress to craft a "grand bargain" to restructure the tax code and federal entitlement programs. But in a year and an institution characterized by gridlock, lawmakers were relieved they could reach even a modest agreement.

"In divided government, you don't always get what you want," said Mr. Ryan.

Ms. Murray joined him in welcoming the prospect that lawmakers would steer away from a crisis-driven budget process. "We have lurched from crisis to crisis, from one cliff to the next," she said. "That uncertainty was devastating to our fragile economic recovery."

The deal, which goes to the

House and Senate for approval in the coming days, marks a major change in the 2011 budget-cutting law, which set in motion 10 years of fiscal austerity, including across-the-board spending cuts known as sequestration.

The annual discretionary spending target will be raised to

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Thousands Honor Memory of South Africa's Liberator

REST IN PEACE: A boy attended the memorial service for former South African President Nelson Mandela at a soccer stadium in Johannesburg on Tuesday that drew celebrities and dozens of heads of state, including President Obama, along with thousands of other mourners. A12

China Spins New Lesson From Soviet Fall

PARTY DISCIPLINE

BY JEREMY PAGE

BEIJING—The Communist Party boss in eastern China's Jiangsu province summoned local officials recently to a compulsory study session. Their task was to watch a six-part documentary on the Soviet Union's collapse.

The film begins with images of the Soviet Union in its heyday, but quickly cuts to graphic footage of unrest in China's northern neighbor in the 1990s, set to ominous music and punctuated by Russian communists lamenting their nation's fate.

When the screening in Jiangsu ended, state media reported, local party chief Luo Zhijun exhorted the assembled officials to "correctly understand the lessons of history." The film's message: The Soviet Union didn't

fall apart because of the communist system itself, but because of individuals who betrayed it, especially Mikhail Gorbachev.

The film is part of an ideological campaign launched by China's new leader, Xi Jinping, to re-energize the party and enforce discipline among its members. It has been shown at dozens of political meetings since September.

The frequent showings suggest Mr. Xi believes China needs to reinforce its Leninist political system rather than limit the party's powers. Party insiders and academics say it is part of an effort to combat what is portrayed as an American conspiracy to overthrow the party through "peaceful evolution"—the spread of Western ideas via media, academia and popular culture.

The office in charge of Mr. Xi's campaign didn't respond to questions about the film, called "20th Anniversary of the Death of the Soviet Party and State: As the Russians Relate," but said the campaign drew on experiences from China and rest of the world. The film, which was produced by a retired Chinese major general, has drawn criticism from some Chinese scholars of Soviet history, including some within the party. They argue that Moscow's mistake was to overlook deep flaws in the Soviet political and economic systems that emerged long before Mr. Gorbachev.

The film "lacks rational analysis, is mainly aimed at defending the Stalinist system and is illogical in many places," wrote Zuo Fengrong...

Please turn to page A18

Bank Rule Challenges Wall Street

BY JUSTIN BAER
AND JULIE STEINBERG

A broad new government rule to limit risk-taking by Wall Street will force banks to rethink virtually every aspect of their trading activities, setting the stage for more tumult at the largest U.S. financial institutions.

The so-called Volcker rule, approved by five federal regulatory agencies on Tuesday, could lop as much as $30 billion total in yearly pretax profit from the eight largest U.S. banks through lower revenue and higher compliance costs, according to estimates from Standard & Poor's.

The 953-page edict, part of the 2010 Dodd-Frank financial overhaul, codifies and restricts the way banks trade securities. It curbs banks' ability to bet with their own capital and forces

Please turn to page A6

Here's Your Holiday Bonus, Now Start Running

Workers Win All-They-Can-Grab Sprees From Companies; 'Supermarket Sweep'

BY RACHEL FEINTZEIG

On Thursday, Alan Comley will get the holiday gift he never knew he always wanted: two minutes at a Texas Costco.

The 27-year-old wasn't even a member of the wholesale warehouse store until a few days ago. But his employer, coupon website RetailMeNot Inc., takes a cue from the game show "Supermarket Sweep" when it comes to rewarding employees. As a prize for his work as a software engineer, Mr. Comley will have 120 seconds to run unbridled through the big-box store's aisles, grabbing a plasma television, a videogame console and almost anything else that he can hoist onto his cart.

"I'm looking to break a record," he says.

At a time of year when many workers anticipate a Christmas bonus check or a holiday ham, some companies say one of the best ways to reward outstanding performance and inspire employee loyalty is a chance to go 'til they drop.

Jordan, Nicholas, Elliott Inc., a Florida company that runs several restaurants, unleashes high performers on a Lakeland, Fla., Winn-Dixie, where they get two to four minutes to fill their carts as co-workers race alongside. Still other companies hit the mall—one gives workers $150 and an hour to buy what they like, while an Ohio health-care system awards 20-year employees a $300 trip to a shopping center, after which they strut down a

Please turn to page A18

What's News

Business & Finance

■ **GM** named its first female CEO, tapping company veteran and product chief Mary Barra to run the auto maker. A1

■ **Financial regulators** approved the Volcker rule, which curbs banks' risk-taking and could slash their profits. A1

■ **The FDIC** board approved a draft plan to keep parts of a failing financial firm open without a taxpayer bailout. A1

■ **Finance ministers** from big euro-zone nations reached an understanding on winding down failing banks. B3

■ **Discovery** is considering a bid for Food Network majority owner Scripps, presaging a possible wave of TV deals. B1

■ **Stocks declined** as investors weighed the potential impact of reduced Fed stimulus. The Dow dropped 52.40 points. C4

■ **OTC stock trading** was halted for about an hour because of a hardware error. C4

■ **Smith & Wesson** said profit and revenue rose just past 2%, as gun sales slowed from their recent torrid pace. B2

■ **Pacific trade talks** adjourned without a deal amid discord between the U.S. and Japan. A17

■ **Italy pulled out** of a two-year contraction in the third quarter, posting flat GDP. A13

■ **Three Swiss banks** agreed to participate in a U.S. tax-evasion-disclosure program. C3

■ **LightSquared** can proceed with a suit against Dish over a debt purchase, a judge ruled. B3

■ **Monsanto** is teaming up with a Danish firm to develop useful microbes for plants. B4

★ ★ ★

World-Wide

■ **Congressional negotiators** struck a budget deal that would allow more domestic and military spending and include deficit-cutting measures. A1, A8

■ **Ukrainian forces** stormed a protesters' encampment in Kiev, hours after Western diplomats called for a nonviolent end to the political crisis. A13

■ **Obama's disapproval** rate hit 54%, the high for his presidency, amid the flawed health-law rollout, a Wall Street Journal/NBC poll found. A4

■ **World leaders** gathered to honor Mandela. In a rare encounter, Obama shook hands with Cuba's Raul Castro. A12

■ **Senate Democrats** confirmed an Obama appeals-court pick and the head of Fannie and Freddie's overseer. A6

■ **A key Senate Democrat** said he would back the Obama administration's request to delay new Iran sanctions. A17

■ **Supreme Court justices** expressed sympathy for the EPA approach to air pollution that crosses state lines. A2

■ **An AIDS group called** for a probe to see if HIV-infected patients were discouraged from enrolling in health plans. A6

■ **Uruguay's Senate** voted to legalize marijuana. The president plans to sign the bill. A15

■ **France's leader** flew to the Central African Republic after two French troops died. A13

■ **Singapore police** charged 24 Indian citizens in connection with a night of rioting. A13

■ **Died:** Jim Hall, 83, acclaimed jazz guitarist.

CONTENTS
Business & Fin.. B1   Leisure & Arts... D5
Corporate News... B2-6   Markets............ C4
Crosswords....... D6   Opinion........... A19-21
Global Finance.... C3   Sports.............. D7
Heard on Street... C14   U.S. News....... A2-6
Home & Digital... D1-4   Weather Watch... B10
In the Markets.... C4   World News..... A12-17

Longtime Insider Is GM's First Female CEO

BY JEFF BENNETT
AND SARA MURRAY

DETROIT—General Motors Co. tapped product chief Mary Barra as its next chief executive, smashing a century-old gender barrier while choosing a longtime insider who grew up steeped in Detroit's car culture.

Ms. Barra will succeed Dan Akerson as CEO next month and become the first woman to run a major global auto maker. The 51-year-old joined GM 33 years ago as a college intern, eventually becoming an engineering manager before running one of its big U.S. assembly plants. She gained deep experience managing human resources and, more recently, the company's world-wide product development group.

She will become the 22nd woman currently running a Fortune 500 company.

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• Milestone is hailed, but women continue to face obstacles... B7
• Heard on the Street... C14

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NEW   Welcome to the new faster, more powerful Company Overview. See what's changed   Revert to previous version   Send feedback

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BUSINESS SUMMARY ›

Apple Inc. designs, manufactures and markets mobile communication and media devices, personal computers and portable digital music players. The Company sells a range of related software, services, accessories, networking solutions, and third-party digital content and applications. The Company's segments include the Americas, Europe, Greater China, Japan and Rest of Asia Pacific. The Americas segment includes both North and South America. The Europe segment includes European countries, India, the Middle East and Africa. The Greater China segment includes China, Hong Kong and Taiwan. The Rest of Asia Pacific segment includes Australia and the Asian countries not included in the Company's other operating segments. Its products and services include iPhone, iPad, Mac, iPod, Apple Watch, Apple TV, a portfolio of consumer and professional software applications, iPhone OS (iOS), OS X and watchOS operating systems, iCloud, Apple Pay and a range of accessory, service and support offerings.

NEWS ›

28-Dec-2016

10:24:36	Apple dominerade julhandeln mätt i antalet aktiverade enheter	FNW
10:15:18	UPDATE 3-S.Korea fines Qualcomm $854 mln for violating competition laws	RTRS
09:42:52	Corea del Sur multa a Qualcomm con 854 mlns dlr por violar leyes de competencia	RTRS
06:00:10	RPT-Wall Street cale une fois de plus au seuil des 20.000 points	RTRS
03:30:18	Aumento del gasto de último minuto impulsa a temporada de ventas de fin de año ...	RTRS
01:50:14	Last-minute spending surge lifts U.S. holiday shopping season	RTRS

27-Dec-2016

23:33:16	Reuters Insider - Tech stocks could take the Dow to 20k	CNBC
23:32:28	Reuters Insider - History suggests Dow could hit 20k by Friday: Technician	CNBC
22:55:29	LEAD 2-Wall Street cale une fois de plus au seuil des 20.000 points	RTRS
22:09:39	Apple, Cisco Lead DJIA Higher Tuesday	WALLST

EVENTS ›   Upcoming | Past

24-Jan-2017 » 30-Jan-2017

| NTS | Q1 2017 Apple Inc Earnings Release | 📅 |

24-Feb-2017 » 28-Feb-2017

PRICE PERFORMANCE ›

Open	
Prev. Close	
Bid / Ask	
VWAP	--
Turnover	
Volume	
Short Interest	0.90%
YTD	
Beta (5Y Monthly)	1.29
Mkt Cap	USD 625.27B
PE (LTM)	14.12
Div Yield	1.94%
DR	BRL 📋 AAPL34.SA (1:0.1)
DR Type	--
DR Bank	--

Free Float	5.32B	Asset Type	Ordinary Share
Outstanding	5.33B	Share Class	--
IPO Date	12-Dec-1980	Lot Size	
First Trade Da...	12-Dec-1980	Voting Rights	1

AAPL.O 115.190000   Price USD

117.260000

115.00
110.00
105.00
100.00
95.00
90.00
85.00

Dec-31   Mar-31   Jun-30   Sep-   14-Dec-2016

| Today | 5D | 3M | 6M | 1Y | 5Y | No Benchmark ⌄ |

52Wk: 89.47   118.69
12-May   11-Oct

📅 Next Earn Report: 24-Jan-2017

		📋 5 yr CDS	26.980 bps
		Δ Today	-0.07%
		Δ 1 Week	-0.074

FUNDAMENTALS ›

	AAPL (Sep-2016)	Growth		Industry
Gross Margin	38.02%	(4.71%)	4Q	38.91%
Operating Margin	25.10%	(11.59%)	4Q	5.75%

Tick Data

```
In [23]: tick = ek.get_timeseries(['AAPL.O'],
                                   fields='*',
                                   start_date='2017-07-11 16:00:0000',
                                   end_date='2017-07-11 16:15:0000',
                                   interval='tick')
```

```
In [24]: tick.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 1898 entries, 2017-07-11 16:00:00.686000 to 2017-07-11 16:14:59.708000
Data columns (total 2 columns):
VALUE     1892 non-null float64
VOLUME    1898 non-null float64
dtypes: float64(2)
memory usage: 44.5 KB
```

```
In [25]: tick.tail()
```

Out[25]:

AAPL.O	VALUE	VOLUME
Date		
2017-07-11 16:14:59.693	144.9900	100.0
2017-07-11 16:14:59.693	144.9900	100.0
2017-07-11 16:14:59.693	144.9900	100.0
2017-07-11 16:14:59.707	144.9899	
2017-07-11 16:14:59.708	144.989	

LIVE DEMO

News

```
In [29]: news = ek.get_news_headlines('R:            :LEN', count=5)
         news
```

Out[29]:

versionCreated		text	storyId	sourceCode
2017-08-18 16:46:19	2017-08-18 16:46:19	U.S. STOCKS EXTEND GAINS AFTER NEW YORK TIMES ...	urn:newsml:reuters.com:20170818:nL4N1L44L9:1	NS:RTRS
2017-08-18 15:53:08	2017-08-18 15:53:08	CORRECTED-U.S. STOCKS PARE LOSSES, TRADERS CIT...	urn:newsml:reuters.com:20170818:nL4N1L44IK:1	NS:RTRS
2017-08-18 15:16:27	2017-08-18 15:16:27	US STOCKS-Wall St lower on growing concerns ov...	urn:newsml:reuters.com:20170818:nL4N1L44F2:5	NS:RTRS
2017-08-18 11:24:30	2017-08-18 11:24:30	US STOCKS-Futures flat amid growing concerns o...	urn:newsml:reuters.com:20170818:nL4N1L43RR:5	NS:RTRS
2017-08-17 17:09:05	2017-08-17 17:09:05	US STOCKS-Wall St extends losses on Trump poli...	urn:newsml:reuters.com:20170817:nL4N1L34N1:5	NS:RTRS

```
In [30]: storyId = news.iloc[4, 2]
         storyId
```

```
Out[30]: 'urn:newsml:reuters.com:20170817:nL4N1L34N1:5'
```

```
In [31]: from IPython.display import display, HTML
```

```
In [32]: display(HTML(ek.get_news_story(storyId)))
```

- Gary Cohn resignation rumors knocked down
- Wal-Mart drops after reporting margin fall
- Indexes down: Dow 0.81 pct, S&P 1.03 pct, Nasdaq 1.39 pct

Updates to early afternoon

By Sruthi Shankar and Tanya Agrawal

Aug 17 (Reuters) - U.S stocks hit session lows in early afternoon trading on Thursday as investors worried about President Donald Trump's ability to

Outlook

Monopoly

Oligopoly

Perfect Competition

**Deep Blue 1997
("complete pie")**

**Bitcoin Miners Today
Hedge Fund Industry Today
("piece of the pie")**

**Chess Today
("only crumbs")**

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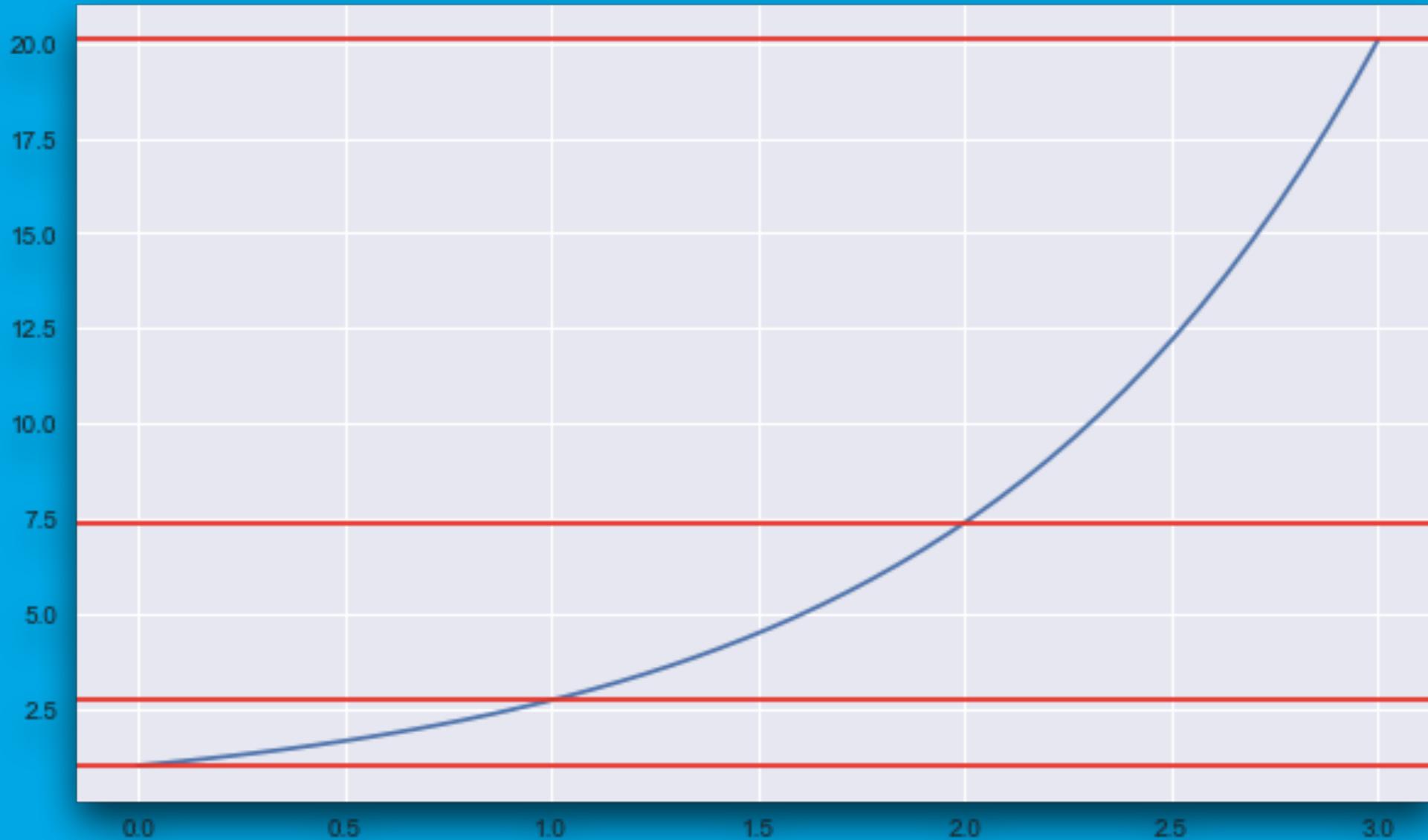
Data Science

The race to AI utilization in finance is a marathon, not a sprint

🐦　in　f　✉
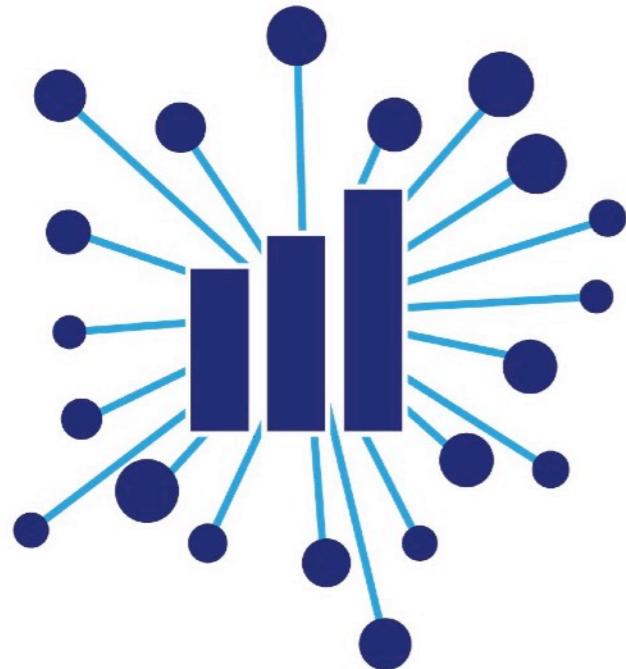
Bloomberg Professional October 4, 2017

Development and deployment of artificial intelligence (AI) in financial services has accelerated. In particular, quantitative funds are increasingly applying programming and advanced statistical methods to generate alpha and automate trading strategies. Despite the hype and frequent headlines extoling the virtues

exponential forces at work:
- technology improvements
- capital accumulation
- talent accumulation

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