

A Signum Special Report

THE
AI
INVASION

How the Tech Titans are Using
Artificial Intelligence to INFILTRATE,
DISRUPT & COLONISE the Global
Financial Industry

Contents

The Birth of a New Utility	// 3
Invasion of the Tech Titans	// 8
The Coming Arms Race in AI	// 17
Market Shocks & Shutdowns	// 24
The Information War	// 31
A Reset of the Financial System	// 37
Appendix 1: AI Platform Stocks	// 70
Appendix 2: AI Security Stocks	// 74

Preface//

**The Birth of a
New Utility**

IN SEPTEMBER 1879, Thomas Edison announced he would use a new and novel force - electricity - to light up the financial district of New York for the first time.

Few believed he could do it. Inventing light bulbs was one thing - but making and distributing electricity on a commercial scale had troubled inventors and industrial giants for decades.

So journalists and politicians were left blinking in disbelief when he used underground mains to flood his Menlo Park laboratory with light. And just a few years later the crowds swarmed into Pearl Street power, as Edison instructed his chief electrician to throw a switch – sending electricity bounding along underground tubes to light up the city’s financial district for the first time.

In that moment, the electricity utility was born.

One group of observers remained unconvinced – the city’s big manufacturers. After decades of building mammoth waterwheels and electric generators to power their factories, they were reluctant to risk their businesses on the promise of universal access to electricity. So they continued to use their own power supplies. And for a while they were proved right.

Battle of the Currents

But the invention of the first battery by Alessandro Volta enabled the storage and transport of electricity in a continuous flow.

And the discovery of Alternating Current (AC) by Nikola Tesla made electricity cheap, powerful, reliable, and capable of travelling long distances. Suddenly the idea of wasting six months and lots of cash on building a giant waterwheel no longer appealed. Despite Edison's best efforts to halt the progress of AC power, sales of electricity surged. Thousands of waterwheels, steam engines and electric generators were rendered obsolete.

By 1907, more than 40% of America's electricity came from central power stations, and new mass-market industries sprung to life.

Today, something similar is happening with AI. Right now, just about every industry is experimenting with some branch of AI and many are discovering that they can trust algorithms to do a better and cheaper job than humans.

There are many competing standards...Deep Learning... Bayesians... Genetic programmers... but once again we are witnessing a radical remodeling of society by those who have harnessed this new power. Using vastly superior computing resources and AI, Tech Titans – including **Amazon, Google, Alibaba, Baidu, Tencent** – have moved into advertising, media, car manufacturing, retail, hardware, healthcare, agriculture.

Next stop: The Financial Industry

We believe that the financial system is next. In this report, you'll learn how these Tech Titans plan to invade every corner of the industry.

They will attempt to repurpose banking, insurance, retail investing, fund management, venture capital.

And Artificial Intelligence is central to this plan. AI has created a new logic of data accumulation that feeds the information capitalism of the Tech Titans: allowing them to predict and modify financial behaviour as a means to boost revenue and assert market control.

Each of the Tech Titan leaders has their own competing AI agenda. Jeff Bezos wants to install AI in our homes, cars and workplaces. Ginni Rometty wants to lease us intelligence through the Cloud. Larry Page and Sergey Brin want an all-knowing AI. Elon Musk wants an Open AI that everyone experiments with.

What they have in common is an ideology that favours AI over human intelligence. They want AI to proliferate across society and, crucially, they want to be the ones to feed it to us.

There is an epic struggle in prospect that pitches **Amazon, Facebook, Google, Apple, Microsoft** and in China's **Tencent, Alibaba** and **Baidu** against existing banks, hedge funds and governments for control of the financial system.

We believe the next five years will be dominated by a struggle for control between two competing and deeply flawed ideologies....

Financial Ideology	Tech Ideology
Based on financial leverage + human intelligence	Based on computing power + machine and human intelligence
Decreasing Returns to scale as opportunities are arbitrated	Increasing Returns as companies benefit from feedback loops, network effects
People are identical, rational actors	People have different capacities, access to capital and technology
An Economy based on 19-century physics (equilibrium, stability, efficient dynamics)	An Economy ruled by complex systems (self organisation, improvising elements in a violent and constantly mutating ecology)

There will be plenty of mischief. A great deal of disturbingly new behaviour in the stock market.

We see five key disruptive mega trends...

1//

Invasion by the FinTech Titans

WITH THE BIGGEST COMPUTING SCALE and the most advanced AI, the tech titans will invade and repurpose the financial system.

Right now, the Chinese are taking the lead with **Alibaba** emerging as the most innovative financial company, using AI to target Millennials and SMEs. What we are seeing is the commercial world is moving towards a platform-based approach that integrates information, banking and investment services.

Tech Titans are also partnering with financial incumbents – with **IBM**, **Google** and **Amazon** feeding AI and computing power to banks, funds and Fintech companies through the cloud.

As we will see in a moment, this signifies the first stages of Cloud-based AI as the first new utility of the 21st century.

We believe that the Tech Titans are setting themselves up as AI utility providers to the financial system: feeding AI to a new ecology of AI-driven hedge funds, investment houses, FinTech start ups that leverage fast evolving intelligences.

Banks, fund managers, hedge funds need to take action fast if they are to survive and evolve...

Ex-Barclays CEO Anthony Jenkins has warned that the big banks are facing a 50% reduction in their staff and a 60% drop in profitability. That is consistent with the scale of destruction when Tech Titans invaded other information industries: advertising, media, chip manufacturing, retail and publishing.

Now it has to be said that the Tech Titans are not easy bedfellows. There is plenty of bad blood here. As Bruce Sterling says in the Epic Struggle for the Internet of Things: “All the Big Five -- Facebook, Apple, Google, Microsoft, Amazon -- ache to disrupt one another, to disrupt intensely, until their rivals vanish from the map without a trace.”

What unites them is their recognition that if, like Edison, they control the infrastructure, they can control and repurpose industries across the board.

They share a spirit of infrastructure imperialism - constantly investing heavily in new computing scales and new frontiers of AI in an effort to achieve their specific missions.

And just as electricity proliferated across society...machine learning algorithms will become metered and commodified as every financial professional experiments with whatever AI they can get their hands on.

This power and intelligence will be delivered over the Cloud – the constantly evolving system of servers that optimises the flow of information across the globe. This is where more of the world's intelligence will reside – available to all for hire on demand and as needed.

Tech start-ups are already hooked. **Snap Inc**, the “most successful IPO in history” that soon sank below its issue price, recently signed a \$2bn five year contract with **Google** for its cloud services -- which includes storing data on Google servers, access to the App Engine for developing apps, BigQuery for data analysis, and a suite of machine learning tools. It also has a \$1 billion contract with Amazon.

We expect the same to happen in the financial industry.

At the moment, Google's cloud business is tiny, and trails Amazon Web Service's \$12.2bn and Microsoft Azure's \$2.7bn annual run rates. Look out for a huge increase in demand for AI delivered over the cloud in the coming years.

As Kevin Kelly points out in *The Inevitable*: "The AI on the horizon looks like Amazon Web Services – cheap, reliable, industrial-grade digital smartness running behind everything, and almost invisible except when it blinks off. This new utilitarian AI will also augment us individually as people (deepening our memory, speeding our recognition) and collectively as a species."

There is one crucial point of departure with the electricity analogy however. With electricity, the utilities could meter and distribute power to everyone, but once it was used it was burned off.

With AI, the tech utilities benefit from a feedback loop that allows continual learning. The more we use their AI, the more powerful they become, the more entrenched their monopoly.

And so a Tech Titan with billions of online transistors, harvesting exabytes of real-life data, can quickly learn how to control and modify the behaviour of millions of users on its network.

You only have to look at **Alibaba** -- which has been using AI to target financial services to Millennials and SMEs -- to see how useful AI can be in advancing the financial ambitions of a Tech Titan.

Alibaba is the Future of FinTech Platforms

The Tech Titans making the most aggressive moves into financial services are Chinese. In fact, we'd argue that **Alibaba** is the most innovative financial service operation in the world right now. It offers its services across China but is also expanding into huge addressable markets in India and Africa.

In 2014 the BATs (**Baidu**, **Alibaba** and **Tencent**) were granted bank licenses. They have since used mobile and social network platforms to become trusted utility providers of transport, taxi booking, home deliveries, ticket purchases and much else besides. And these services have been integrated into one-stop shops that have enabled an increasing variety of financial services such as wealth management and low cost - if highly volatile - money market funds.

Again, artificial Intelligence is fundamental to this story.

By constantly drawing data on daily habits, **Alibaba** is increasingly steering small, medium sized business and younger generations towards financial services on their platforms -- offering fast payments, loans, money market funds, wealth management tools, personal guidance from always improving artificial intelligence. In the process, they are eating into bank revenues and affecting the banks' cost of capital as deposits moved on to their online financial platforms.

Alibaba is also offering a suite of online support services offered to the tens of millions of global SMEs. And this is a huge market: SMEs could be responsible for \$1.7 trillion of new money flow by end-2018, according to the Disruption House.

Chinese Tech Titans Lead the First Wave

Tencent is also using machine learning in its hugely successful WeChat mobile app, which **Facebook** is desperately trying to emulate, and also in personalised search and news recommendations. **Tencent** has attracted over 50 AI researchers so far and commands huge volume of available data from which its AI systems can 'learn', generated by nearly 900 million active WeChat users.

Tencent is following in the footsteps of China's premier search company **Baidu**, which over the last 3 years has invested at least \$300 million to create world class AI operations in Silicon Valley, although it will be interesting to see what happens now that their AI 'superstar' Andy Ng has announced his resignation.

Crucially, these Titans benefit from **having backing from the Chinese state**. This clears a regulatory path for the Titans to invade the financial sector and expand into new markets globally.

In fact, every Chinese citizen will soon receive a "Citizen Score", which will determine under what conditions they may get loans, jobs, travel visas -- monitoring individual's web histories and interactions with people on their network.

A Cloud-Based AI Invasion of Financial Markets

There is the same appetite for services from Tech Titans in developed markets. In the UK, there is already a deep mistrust of banks amongst Millennial – who'd rather see a dentist than listen to what their bank is saying (Source: [Millennial Disruption Index](#)).

Amazon already has 23 million users for its payment tools and has always signaled its ambition to be a one-stop shop for all goods that its customers want to purchase.

The company – shades of Alibaba – is seeking to turn login, payment credentials and shipping information into a seamless e-commerce system for SMEs, offering instalment credit and exploiting its financial datasets to undercut banking services. “You can make a 20-30 per cent return on that data without necessarily having to open a branch,” Peter Simon, head of information at Barclays told Computer Business Review.

Amazon is looking to establish Alexa as the command console in your house, constantly communicating with other connected devices. With Alexa, Jeff Bezos will be able to collect huge streams of financial data. It has huge and swelling 'gate kept' populations -- individuals and companies -- in its thrall.

In prospect: Amazon recommendations on loans, funds, stocks and wealth management tools on the basis of a personal data, private risk profile and the appetite for financial services among people in your demographic.

However, we believe the Tech Titans have even greater ambitions.

While the Chinese titans are explicit in ambitions to take over banking and wealth management services by targeting Millennials and SMEs, **Amazon, Google, Microsoft** will quietly build their profile as AI utilities, supplying computing power and intelligence to fund houses and aspiring fintech startups to become vital power brokers in the financial system.

Amazon is already offering its Cloud services through AWS to the likes of **Capital One**, **Nasdaq** and **Pacific Life**.

Microsoft, which is offering its predictive engine to the likes of \$77bn asset house Arcadia, recently helped launch ClearBank — the first new clearing banks in the UK for 250 years. And recently, Eric Schmidt has been aggressively pushing **Google**'s cloud services – arguing that small businesses can now rapidly scale to compete with established companies by leaching power and intelligence from their servers.

IBM has been following this strategy for some time.

The inspiration for the HAL computer in Kubrick's *2001 Space Odyssey* is now supplying AI services over the cloud to a bewildering list of financial companies.

IBM aims to develop its Watson DeepQA technology into the ultimate financial services assistant. Watson is a cognitive system able to answer questions posed in natural language, which it reads and interprets and uses to interrogate a rich domain specific database for insights, decision support, and guidance.

A hint of what is brewing is this month's announcement that Japan's **Fukoku Mutual Life** is to replace 34 claims staff with Watson, which will read, assess and compare their complex of claims documents and reports to calculate payouts to policyholders.

It will cost \$1.7 million to set up and \$128,000 a year to run...and **Fukoku** will save \$1 million a year in staff costs.

The big unknown in this story is what the Tech Titans will do with all this financial intelligence...

They may continue to pursue a strategy of radical platform adjacency, moving everyone to their networks, learning to monetise and modify investor behaviour based on a constant stream of fresh information.

But what big moves might they make?

Google has been probing financial services for some time. So far we've seen Google Ventures invest in startups across lending, payment security, analytics and blockchain. The company is exploring where it can make the biggest impact, seeking out new ventures at a time when ad blockers are threatening online advertising revenues.

As Paul Schaus, founder of banking consultancy CGG Catalyst, recently pointed out: *“Once Google finds its best value proposition in financial services, it could cause the biggest shake-up in the industry of anyone in the market.”*

Could we see a Google Brain extracting data from every corner of society into an all-knowing AI -- Hoovering up gains in the market before anyone else can react (to wars, to bombs, to social unrest, distressed debt and credit meltdowns)?

TAKE ACTION:

- ❑ Buy the new platform companies: Alibaba, and Tencent. See Appendix 1 for more details

- ❑ Review financial holdings not investing in AI immediately.

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The AI Arms Race

THE BEAUTY OF BEING AN AI UTILITY PROVIDER today is that you don't have to work too hard to market your services. People right across the financial industry are prepared to experiment with self-investing algorithms. Consider **Paul Tudor Jones**, the legendary fund manager.

Last year, his funds were struggling for performance and investors started pulling out – there were \$1bn in redemptions in the first quarter alone. He admitted that after thirty years in the business he couldn't trust himself to run the money anymore and brought in 20 macro traders, but they failed to stop the rot.

So recently he's bringing in the machines – hiring data scientists and coders to develop machine-learning models that will find the patterns in the data where his macro managers have failed.

He's told his remaining staff that *“no man is better than a machine and no machine is better than a man with a machine.”*

As customers/clients/investors learn to trust self-learning algorithms we will see investment professionals delegating critical decisions.

This will herald the arrival of investing intelligences so useful and accurate, customers and clients will trust them to assess risk, manage portfolios and direct our daily decisions.

We Will Soon Trust Code Over Human Intuition...

This story is playing out across the investment community.

Hedge funds, macro funds, investment houses of every description are experimenting with AI, seeking to discover new patterns, new opportunities, in some cases even going so far as to fire staff and replace them with self-learning, self-evolving algorithms free of human intervention.

New AI driven funds threaten the dominance of existing investment houses and will create a ruthless ecology of deceptive, self learning, non-human intelligences that will aid, disturb and definitely frustrate professional investors.

We believe we will also see a flood of new entrants into fund management as they leverage AI available through cloud services offered by the Tech Titans.

This heralds an epic transformation: all-purpose automation of investment, trading and portfolio management...

AI to Play Vital Role in Managing Risk

Technology's ability to crunch huge amounts of data quickly will impact how all institutions respond to risks. As MIT Professor of Financial Engineering Andrew Lo says: "Now, when investors are faced with headline risk, they can actually take action from an algorithmic perspective rather than waiting for a trader to get in, read the news and then make a decision based on his or her assessment."

AI Becomes Key Financial Research Tool

Or take Kensho -- a robot analyst used by **Goldman Sachs** and many other investment houses. In a recent response to the escalation of the Syrian crisis for example, a trader could pull up a group of events -- 16 instances of “Escalations in Syrian civil war” -- narrow the search to the time period and investments, such as FTSE stocks, crude or Asian currencies, then click Generate Study and deliver a few pages of relevant charts: showing the prices of crude underperforms for weeks after escalation, while Asian stocks and the dollar outperform.

Generating a similar query without automation, according to Kensho, “would have taken days, probably 40 man-hours, from people who were making an average of \$350,000 to \$500,000 a year.

AI Transforms Portfolio Management

Can AI outperform humans in more complex investment decisions? We should be cautious here.

Despite inevitable hype, machine intelligence will continue to lag human decision makers on complex tasks such as asset allocation and long-term risk assessment for some time.

However, the early evidence is that some of the new breed of self learning algorithms, when charged with large databases of financial information, are learning to spot successful trades over longer horizons—hours, days, weeks, even months into the future.

In fact, AI-driven hedge funds around the world already appear to be doing pretty well. A EurekaHedge gauge of 12 such funds has gained almost 7 percent this year, including a 1.8 percent advance during the Brexit-fueled market turmoil in June.

Two Sigma is one of the early adopters.

The hedge fund has enjoyed considerable success using machine learning algorithms to digest and analyse 22 million gigabytes of data from 10,000 data sources round the clock to help **Two Sigma** find patterns, and, in time, fed with enough training data, these algorithms are growing increasingly autonomous.

As co-founder and MIT alumnus David Siegel likes to point out: "*the human mind hasn't got any better in the last 100 years*" while in the last ten years alone a real time, densely networked world has sprung to life, one that is saturated with useful financial data.

Sentient Technologies – who sell their software to a long list of financial partners – have developed a system inspired by evolution.

Thousands of machines run simultaneously around the world, algorithmically creating what are essentially trillions of virtual traders that it calls "genes."

The genes that are unsuccessful die off, while those that make money are spliced together with others to create the next generation. Thanks to increases in computing power, **Sentient** can squeeze 1,800 simulated trading days into a few minutes.

Sentient typically owns a wide-ranging batch of U.S. stocks, trading hundreds of times per day and holding positions for days or weeks.

Hong Kong AI investment operation **Aidyia** is another example. It is using AI to process news articles, social media posts, and company data by ingesting the variety of inputs -- prices, volumes news -- and running evolutionary programming and probabilistic logic on them.

They then study how these various factors have interrelated historically in order to isolate an output with predictive value. There are a multitude of new connections that can be made in real time. Software that can gather satellite images, for example, could see how full a retailer's parking lot is. That's likely to correlate to the company's revenue, which should correlate with the stock price.

The Floodgates Will Open

In time, we believe AI will accelerate the fragmentation of the big financial institutions with talent leaving to set up AI-driven funds and boutique firms.

This will be possible because of the infrastructure put in place by the Tech Titans. Ambitious funds will need data scientists. They'll need unusual trading strategies. They'll need to leverage AI and computing power through the cloud.

This will lead to an explosion in new types of investing intelligences – creating a ruthless ecology of self-learning algorithms that compete, frustrate and augment professional investors.

The good news for the Tech Titans is while everyone is experimenting with AI and disrupting incumbents, they could be earning huge utility fees.

And this is a huge disruption. There has been considerable investment in fintech startups since 2008 with the expectation that financial services could be fixed with apps, peer-to-peer models, but it's the Tech Titans that are likely to have the most success in repurposing the financial industry. The Tech Titans have no such resource shortages and when they enter a market they can wipe out competition because they have the tools and platforms to completely reinvent services.

Investment Professionals

Face 3 Hard 'Truths'

1) You can't compete for scale

One big advantage Tech Titans will maintain have over incumbents is that they have the vast computing scale to deploy algorithms that are constantly learning, searching and mutating.

2) Codified data is the new currency

Over the last decade, tech titans have built server farms to support, planted sensors to draw data and trained algorithms to siphon off useful information.

This has created a vast cross-border flow of digital data — e-com, web searches, online video, digital payments, M2M interactions — which has grown 45X over the last ten years and is projected to grow even faster over the next few years, according to the McKinsey Global Institute. Tech Titans have access to data sets that already dwarf those of financial titans.

3) You can compete by scaling up investments in AI

Consider using **Kensho** to scan documents -- weather, macro-economic, company results, CEO comments – and conduct instant analysis.

AlphaScan—a JPM spin-out— could help uncover overlooked but critical data points from the rush of new financial data. **Dataminr** and **iSentium** find actionable alerts amid Twitter and social media streams. **Cerebellum** constantly creates and re-creates new models to divine how markets will move.

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Stock Market

Shocks and

Shutdowns

THE TRANSITION TO THE AI INFRASTRUCTURE will be bumpy. In a paper called “*Abrupt rise of new machine ecology beyond human response time*”, a research team led by physicist Neil Johnson concluded that the stock market had actually crashed and spiked 18,000 times between 2006 and 2013.

These spikes and crashes are largely the result of microsecond errors that result from high frequency trading (which by some estimates accounts for 70% of trading on stock exchanges).

The key issue is that the rush of new machine intelligences will compete with humans (and other machines) on longer time horizons – first minutes then hours, then days and months.

We can expect more flash crashes, shutdowns and malicious attacks as the system powers up. The rush to introduce new AI, many of them mis-programmed, naive, or mischievous, will replace human stupidity with a great deal of machine stupidity.

We will also see rogue AI, dramatic AI-driven turns in the market, strange AI experiments that cause a spike in daily volumes...an increasingly hostile and fragile stock market.

In the 1940s, the American mathematician Norbert Wiener invented the field of Cybernetics. Wiener believed that the behavior of systems could be controlled by the means of suitable feedbacks. And his followers imagined controlling the economy and society according to this basic principle, once the necessary technology available.

That dream of a stable system will never come to fruition. Just recently...

- The British pound dropped 6.1% in value in seconds on Oct. 7, 2016, partly because of currency trades triggered by algorithms.
- An internet slowdown swept the East Coast of the U.S. on Oct. 21, 2016, after hackers bombarded Dyn DNS, an internet traffic handler, with information that overloaded its circuits, ushering in a new era of internet attacks powered by internet-connected devices.
- Internet security expert Bruce Schneier warned in September that: “Someone Is Learning How to Take Down the Internet: Over the past year or two, someone has been probing the defenses of the companies that run critical pieces of the Internet. These probes take the form of precisely calibrated attacks designed to determine exactly how well these companies can defend themselves, and what would be required to take them down. We don't know who is doing this, but it feels like a large nation state. China or Russia would be my first guesses.”

And what happens when not just banks, but everyone is releasing self learning AI onto the market...Google, Fund managers, criminals, terrorists, hackers, hostile governments, retail investors...millions of algorithms that cause the stock market to lurch and skid and swing until everyone decides to migrate to other platforms?

There is huge scale for disruption in the stock market.

In 2013, a mysterious algorithm of unknown origin consumed 10 percent of the bandwidth of the US stock market, "*running like a bat out of hell on crystal meth,*" as David Leinweber wrote in Forbes.

"It generated 4% of U.S. stock market quote activity," but the program "didn't make a SINGLE TRADE, cancelling every order."

Leinweber suspects that the culprit was a new algorithm being tested, but that's just a guess—no one knows for sure, least of all the SEC. It used up "*10% of the communications capacity of our overly wired market. Ten of these guys could use the whole market.*"

With the explosion in connected devices there is now a vast attack space for hackers. Millions of objects -- including cameras, dvrs and printers -- were used to launch the Dyn attack and there seems to be very little friction in the system, with relatively small networks of devices and computers being used to flood a key part of the infrastructure.

No wonder it's rumoured that banks are buying bitcoin to pay for more DDOS attacks.

Or that a Los Angeles hospital has admitted to paying over bitcoin to get patient data back.

Or that **Nevsky Capital**, a London-based hedge fund, earlier this year closed down in part because the "current algorithmically-driven market environment is one which is increasingly incompatible with our fundamental, research-oriented investment process".

The Weaponisation of Code: a Doomsday Scenario...

While nuclear scientists have moved the doomsday clock to just 2 and a half minutes to midnight, the closest since 1955, the most imminent threat to world order may come from a rogue algorithm or targeted hack attack rather than the use of tactical nuclear weapons by Pakistan in Kashmir or North Korea.

In 2013, a hacker group identifying themselves as the Syrian Electronic Army caused mayhem in markets by simply hacking the twitter feed of media outlet Associated Press and publishing news that Obama had been injured after a series of explosions at the White House.

Investing algorithms – tuned to social media and sentiment – reacted immediately to the fake news, wiping billions off the markets. The more machines dominate the conversation in the stock market, the less legible the system will be to humans.

There's already disturbing evidence that the system is mutating...

In his recent book *Overcomplicated*, Sam Arbesman quotes engineers who believe that code and algorithms are already mutating beyond our control.

Complex programs, they say, contain fragments of “dark code” that nobody programmed, running applications in way that nobody expects. This is the reason why **Delta** and **American Airlines** have had to ground their planes for significant periods of time in the last year.

And it's why we are seeing a spate of flash crashes in markets - many of them unexplained.

Just as Lehman exposed the networked complexity of the financial system, there is now a serious risk of a systemic event due to a cyber attack, with one network knocking out a number at once -- the grid, banking, aviation -- causing immense damage to the economy and our trust in the stability of the internet.

The grid is particularly vulnerable. As we hitch networks together from vastly different domains, we are placing our trust in an ever more fragile infrastructure.

Kevin Poulsen, who was the very first hacker to get banned from using the Internet, has an interesting perspective on how we might begin to address the cybersecurity crisis.

As he puts it: *"Information is secure when it costs more to get it than it's worth"*.

This is a useful idea because it acknowledges several realities about cybersecurity...

First, the cost of conducting a hack — in terms of labour, the time it takes to achieve a goal and the risk of getting caught — is now extremely low.

Secondly, the attack surface is getting larger. Thirdly, valuable information continues to stockpile on corporate servers, providing lucrative targets for criminals, with little hope of protection from overstretched security staff.

The goal of cybersecurity, then, is not to make successful attacks impossible, but to make it more costly for cybercriminals to access critical data.

This is not a job fit for humans.

That's why for the past two years, the most advanced cybersecurity systems have been using machine-learning algorithms to spot and direct responses to suspected breaches.

Machine learning has been used in the financial sector for some time to identify potential fraud. The large datasets collected on credit card use, for example, have allowed algorithms to learn how to recognise normal behaviour, and in turn to highlight anomalies in the system.

IBM researchers working with a large US bank claimed a 15% increase in fraud detection with a 50% reduction in false alarms and a total savings increase of 60%.

TAKE ACTION:

Buy AI security companies who will be tasked with securing a ruthless ecology of competing intelligences.

See Appendix 2 for more details

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The Information

War

THESE DISTURBANCES COME AT A DELICATE TIME for the financial system.

What is essential to markets and to keeping the wheels of the world economy turning is vanishing before our eyes -- trust: between governments, between governments and their populations, between financial institutions and the 99%, between the 'uber wealthy' and the rest, and between the generations.

Each is a lot weaker than it was in 2008 and eroding further, fast.

In her study of the history of technology, Carlota Perez demonstrates that the shift from installation to deployment for every major technology is marked by a chaotic transitional phase of wars, financial scandals, industrial mayhem and deep anxieties about civilisational collapse.

Sound familiar?

Just take the example of the railroad revolution of the nineteenth century: which saw a transitional period marked by social chaos, a bloody civil war in the United States, and extensive patterns of disguised change — such as the rise of urban living, grocery store chains, and meat consumption — with the emergence of cheap rail transport as the root cause.

We believe this transition will be defined by a brutal information war.

As philosopher Daniel Dennett has recently argued: we will see a proliferation of tools and techniques for information warfare in the coming years: campaigns to discredit sources, pre-emptive strikes, stings, and more.

All of this will be aided by AI: “We can predict the introduction of chaff made of nothing but megabytes of misinformation. It will quickly be penetrated, in turn, by more sophisticated search engines, provoking the generation of ever more convincing chaff. Encryption and decryption schemes will continue to proliferate as well, as organizations and individuals struggle to preserve their privacy and reputations”.

One early avenue of attack against the platform pioneers may be anti-trust legislation.

In a series of recent research papers, antitrust prosecutor Maurice E. Stucke and Ariel Ezrachi of Oxford University have put their finger on how platform companies could be said to be abusing their power...

“Once a harbinger of a new kind of capitalism, Silicon Valley has since become a place where “a handful of winner-takes-most companies have taken over the world’s most vibrant innovation centre...In the home of the entrepreneur, the number of startups is lower than it has been at any time since the 1970s. Founders dream of selling their firms to one of the giants rather than of building their own titans.”

The issue now is that the platform companies control the gateway. And as we increasingly abdicate our decisions to their digital assistants, there is huge scope for these companies to distort reality and crush competition...

“Within big data and artificial intelligence, network effects can raise barriers to entry, enabling big platforms to engage in behaviors such as collusion, behavioral discrimination and frenemy dynamic.

Think of the 1998 American movie *The Truman Show* – a controlled environment which is nothing more than a façade, but has the potential to deliver relative joy to its subjects. The main beneficiary, of course, is the one who controls the ecosystem. We, like Truman, may think that we're ordinary consumers with ordinary lives with unremarkable purchases. We have no idea about how, and the extent to which, we are being exploited by the digitalized hand."

We see a gathering backlash against the serial monopolists. The regulators are starting to ask: are these guys too powerful?

We foresee fines for misbehaviour on the way, increased regulations in the US and the EU and even perhaps a campaign by the Feds to break up perceived monopolies.

Hacking Reprisals

You have to also ask what cybersecurity resources are available to the big banks.

One thing we do know is that it is very easy to hack and redirect algorithms. Recently computer scientists at Cornell published a paper titled "*Stealing Machine Learning Models*", which details how they reverse-engineered the most sophisticated black box systems used by Amazon by simply sending them queries and analysing the responses.

Meanwhile there is a growing concern about the scale of Trojan ransomware being discovered across major US companies, which in some instances have been in place, undiscovered, for five or six years. Many data centres used for finance and stock markets could be compromised.

Our outlier forecast for 2017: an organisation will take over a major trading firm and go wild with their algorithms for a hours if not days, costing trillions in damage and funding more such adventures for 2017 and beyond.

Black Swan Risk: Credit Contagion

And the financial industry is not alone in its antipathy towards Silicon Valley.

This is important in meeting out the respective implications of an industrial war during a major transitional period for the economy. In the early 1900s, fossil fuel magnate John D. Rockefeller reacted to the growing popularity of electricity, which would displace the oil-based technology of kerosene lamps, by backing Henry Ford's motor car company.

There will be mayhem as industrial cultures blindsides Silicon Valley -- leading to sudden price wars.

Alibaba and **Tencent** may find their advance halted. The all-powerful US Treasury Committee on Foreign Investment in the US <CFIUS> has been busy for over two years blocking Chinese moves to acquire US semiconductor companies, such as **Micron** and **Western Digital**, for example.

The really big issue however, is credit contagion.

Because what we cannot predict is the pace of progress with AI, which seems to already be catching machine learning experts by surprise.

And as companies battle it out over advanced AI, there will be sudden breakthroughs that threaten the solvency of mature companies that have spent decades building up debt as a substitute for innovation.

We are already seeing this in energy where battery technologies starting to disrupt the electricity and automobile industries may also emerge as a trillion-dollar threat to credit markets, according to Fitch Ratings.

A quarter of outstanding global corporate debt, or as much as \$3.4 trillion, is linked to the utility- and auto-industry bonds that rely on fossil fuel activities.

Batteries have the potential to “*tip the oil market from growth to contraction earlier than anticipated,*” according to Fitch. “The narrative of oil’s decline is well rehearsed -- and if it starts to play out there is a risk that capital will act long before” and in the worst case result in an “*investor death spiral.*”

The same is true for legacy, debt-heavy financial stocks.

5//

Total

Reset of

The Financial

System

DESPITE THE BACKLASH IT IS CLEAR THAT AN ALTERNATIVE AND MAKESHIFT MODEL SEEMS to be emerging to the ultimately disastrous 'financialisation of the world' model spawned in the 1980s.

This new model is being driven by a network of tech engineers, what computer scientists Jargon Lanier calls the "thousand geeks" -- who might drive the financial system towards new silos.

What will this new system look like? A number of questions interest us...

- Could wide scale AI drive us towards a radically open source system where all proprietary investment research is freely hacked and exchanged?
- What technology does this new extremely fragile financial system need to stabilise? New chips? New scales of computing power? New AI to police, secure and support the financial system?
- Could the stock market be circumvented completely?

We make the case that are in the midst of a rush away from traditional finance -- heralding an alternative financial system driven by a tech ideology, in direct opposition to the dominate debt-fuelled system.

Tech Titans Have Built a New Infrastructure

Tech Titans have certainly laid the tracks for a new financial system, based on code over human intuition.

This took years of investment by the Tech Titans. It required vast computing power to deliver AI to society on a mass scale.

It required years of work by the very small pool of machine learning scientists with the expertise to train and deploy self-learning AI: machine intelligence that is learning to recognise images, read natural language, spot human flaws.

And more than anything else, it required vast streams of information.

The Tech Titans have spent two decades mapping environments -- using satellites, phones, drones and self-driving cars -- all so that they could feed raw information to these algorithms.

With the essential infrastructure now in place, a vast, automatic and evolving global network of algorithms can go to work...

Live feeding information about the world to analysts, traders, investors...

Performing comprehensive and instant analysis on everything from construction to mining, civil wars and pandemics...

Even taking responsibility for tasks that were previously the preserve of high-end investment professionals...pricing risk, allocating assets, shorting, spotting odd opportunities that no humans had picked up on.

And just as the industrial giants of the electricity era abandoned waterwheels, steam engines and generators, so the financial industry will abandon a great many analysts, advisors, asset allocators, strategists.

Those that adapt quickly will participate in the emergence of new investment industries.

Millennial Investors

Migrating to The Fitch

Titan Platforms

The **Alibaba** example suggests that with the adoption of AI on its platform-based digital banking can very quickly expand into investment services...

Alibaba's Ant Financial for example, has grown to become a \$60bn company in just three years. Millennial with no prior knowledge or experience of investing have found it easy to use their mobile apps to earn small change, and emboldened they are signing up to more risky money market funds and wealth management apps.

Yu'eobao, a PayPal like start up owned by **Alibaba** has lowered the investment threshold to just RMB1.

Research by Soto Institute says that 44.5% of users are between 20 and 29 years of age, and 39% are between the ages of 30 and 39, and the average balance is around RMB 5,000 (around £560).

Fitch Giants to Can Rapidly Expand Into New Services

Yu'ebao was formally launched in 2013 and promoted as “the fund for masses”. Soon after, it started accelerating its expansion into financial services.

Although it targets small investors and its rate of return has been declining from a heady 7% to below 4%, **Yu'ebao** is still the fund with the largest number of customers in China

Alibaba has built platforms that allow it to jump into ‘adjacent’ markets at virtually zero marginal cost -- and we believe it will continue to expand its wealth management and financial advice services with timely, personalised offerings to highly active users.

These Services are Global

And **Alibaba** has serious global ambitions.

Ant Finance affiliate spent \$680 million to acquire India’s biggest online payment operation **Paytm** and bought 20% of Thailand’s Ascent Money, and recently made a bid to enter the US by acquiring **MoneyGram** for \$880m.

Aliped – Alibaba’s online payment service – has 450 million registered users and accounts for nearly 70% of all mobile payments in China, while **Alibaba**’s **MYbank** is making its mark by offering small loans to its customers.

It operates on a Cloud Computing platform, with no bank staff involved in giving loans.

Big data is used to calculate the loan amounts. The whole process is quick and easy by the standards of even western banking. And it is expanding into new markets across India, Africa, even the US and UK.

Can We Trust AI?

Now we are nowhere near discovering what branch of AI, if any, will dominate.

And as Cathy O’Neill points out in *Weapons of Math Destruction*, there are very real concerns about the way algorithms are being used, with evidence that biased algorithms are locking consumers, inmates, teachers and investors into feedback loops that are further eroding trust.

Still there is an almost religious belief among Tech Ideologists in the digital system that is emerging -- and it looks like that sentiment is shared with Millenials and most likely the generations that will follow them.

This story of collapsing trust runs through much of the research Signum has been undertaking in recent months...

Collapse of Trust in Financial Professionals

We could also see a collapse in the power of banks, funds and professionals as their information supremacy is challenged first by Tech Titans developing deep learning and applying that AI to extremely rich data sets, and finally by machine learning algorithms that come to dominate trade and investment on the market.

Collapse of Trust in Traditional Finance

As we witness an explosion in the variety of software that can be used as money — cryptocurrencies, smart contracts on Blockchain platforms, Kenyans using mobile minutes as credit — we will witness a rush away from traditional finance.

Money is a soft technology — it can take the form of coins, notes, cards — but software is a soft technology with an infinite variety of forms, we have only seen a handful emerge so far.

On Ethernet for example, we are seeing entrepreneurs issuing their own blockchain-based tokens to raise money for their networks, sidestepping venture capital.

Using this new model, entrepreneurs can create token that represent ownership of the network. And as the network expands, disproportionate gains accrue to early holders, feeding a new ownership structure that feeds back on itself.

This raises the serious question of whether the stock market could be circumvented completely — though obviously, we have yet to see how these networks scale.

Collapse of Trust in The Financial System

Ultimately, we should be concerned about the risk of new systemic crises.

The biggest concern is that we are creating systems that are not legible to humans. What's more, they have the potential to radically lower the barriers to entry, subvert hierarchies and generally frustrate professionals across the investment community.

We live in a world of radically integrating systems that are becoming increasingly dependent on each other.

As complexity scientist Dirk Helbing says, *"We are creating highways for disaster spreading. We will see many extreme events, we will see problems such as the Flash Crash, or financial crisis. That is related to the fact that we have interconnected everything."*

Within the next five years, we believe there is the basis for a radical reinvention of the entire financial system, as math, code and encryption are developed to work in vast new trust networks.

That potential is also complicated by the political tensions: between banks and tech giants, between banks and the Nerd Nation, between traditional finance and radical transparency across global networks.

The implications of this economic warfare are staggering.

Appendix

AI Platforms to own

Alibaba: Many investors avoid Jack Ma's box of tricks due to governance issues, questions about share ownership, and the group's opacity.

But it is clear on the basis of its huge active user base and its comprehensive suite of online platform services that Alibaba will be a dominant force in global financial services--notably for the 25 million SMEs with exposure to China -- and along with Tencent in the domestic Chinese fintech market, which is growing at 40% a year and likely to reach nearly \$70 billion by 2020.

The big question for investors is under what terms and when the group's spun-off Ant Financial, which includes Alipay and newly acquired MoneyGram, will IPO. The consensus is that Ant has a value of \$60 billion. As and when it floats, probably in HK or mainline China, it is expected that Alibaba shareholders will share in 37.5% of the action and future profits. It's a case at the moment of 'this year, next year, sometime.'

Tencent The first of the Chinese BATs to gain a banking license and expected to share 25% of the fast growing Chinese fintech market -- on track to reach nearly \$70 billion by 2020 -- Tencent is especially strong in mobile payments.

With its huge base of 900 million in its WeChat gated community, Tencent has a critical mass of fast moving and finely grained personal data that is second to none in China.

The data feeds the AI algorithms it's developing to further strengthen its business: bearing in mind that it still positions itself as the world's biggest computer games company rather than the mobile lifestyle social networking company Facebook is driving to emulate.

Amazon The surprise is that Amazon hasn't yet made a serious foray into fintech, beyond e-com, like Alibaba, on the back of its huge customer base and volume of captive merchants.

The company has an unmatched Cloud operation, bigger than its top two rivals <Microsoft and IBM> combined and it has a complement of over 1000 AI, data and computer science specialists working on AI apps such as conversational computing.

Its much-lauded Echo/Alexa home hub signals where the company may go to provide anticipatory, supremely customer friendly voice-driven financial services.

IBM With its core Watson expert system based AI, IBM is widely seen as the world's leader in cognitive computing.

The company expects a billion people to be using or benefitting from Watson by the end of the year-- whether for medical diagnosis and prescription, financial analytics or cybersecurity.

As such Watson is pivotal to the company's shift from classic revenue declining IT to what it calls 'strategic imperatives'--big data, analytics, cloud, mobile, social and security.

The latter cluster now accounts for over 40% of group revenues and growing.

IBM's Cloud business, while still behind Amazon's, is growing at 35% a year and its fintech penetration, notably through its early leadership in blockchain technology for industry using the IIoT as well as for financial companies is 'future filled.' IBM is morphing into a cognitive solutions and cloud platform company.

And it pays good dividends!

AI Security

Splunk is widely perceived to be the leader in middleware that extracts operational intelligence from huge volumes of fast moving machine generated data.

The company has over 1000 customers ranging from Blackrock and Coca Cola to Symantec and Vodafone. Splunk will attract a high media profile as it develops its cyber business. Splunk has cut a dash in a key arena and is set fair for sustained growth, while being an obvious candidate for a roll-up or acquisition by one of the big dog IT conglomerates.

CyberArk: A small cap specialist in the key area of privileged access ID management. Over 90% of cloud attacks are down to privileged access breaches.

The company counts BT, Barclays, Novartis and Deloitte among its blue chip clients. One of the most logical take-outs in the sector.

Palantir: is an machine learning security pioneer that is already at the forefront of the business of mining massive, dispersed datasets and connecting the dots of almost invisible but highly significant activity on networks.

Valued at \$20 billion and birth funded by **PayPal** founder (and Trump intimate) Peter Thiel, the CIA's investment arm **Q-tel** and ex-Soros partner Stanley Druckenmiller. The company is likely to IPO this year.

Darktrace: co-founded by Mike Lynch of **Autonomy** fame in 2013, has attracted over \$100 million in funding from Merrill Lynch, KKR and Softbank and is valued at \$400 million.

Its technology was built in part by former members of M15 and GCHQ and uses unsupervised machine learning algorithms to train find abnormalities in networks.

Illusive Networks: This Israeli start-up introduces guile and table turning to the fray by installing decoy data on to laptops, DTs, and servers and false information about the victim's network resources.

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