Plotinus Asset Management

Redefining the Wall Street Cogito

Understanding the Growing Impact of Artificial Intelligence in Financial Markets

March 2020

Plotinus Asset Management

Introducing Plotinus

Our Company

- Plotinus Asset Management is a Cayman Islands based fund manager established to deploy the proprietary Artificial Intelligence trading technology of Plotinus Ltd.
- Plotinus Asset Management is registered with the US Commodity Futures Trading Commission as a Commodities Trading Advisor and as a Commodities Pool Operator. The firm is a member of the US National Futures Association.

We seek to exploit information and understanding inefficiencies, not capture market inefficiencies.

CJ Finnegan CEO Plotinus

Our Heritage

- Plotinus Ltd is a Northern Ireland based Artificial Intelligence advanced technology firm founded in 2013 with the support and backing of Invest Northern Ireland, a UK Government Regional Development body, and the EU European Regional Development Fund.

Our Services

- Plotinus Asset Management provides investment advice and fund services to private clients and institutional investors.

Our Differential

- The world is changing. Artificial Intelligence is the next threshold moment in the development of technology. Across all sectors of industry this technology is transforming the way business is done.
- Plotinus provides investors with the opportunity to avail of this technology and bring an AI component into their investment portfolio.

Introduction

In 1637 when Rene Descartes uttered the Cartesian Cogito, "*Je pense, donc je suis*"[1], "I think, therefore I am" he started a philosophical debate around "Being" that has raged ever since.

After many years in development and many false dawns Artificial Intelligence has moved from science fiction to science fact. Although the term is still subject to being properly defined and is open to much interpretation (a loose definition that spans a breadth of areas, anything from machine learning, to natural language processing and beyond), the era of autonomous decision-making machine processes not requiring human input has truly arrived. The question, though, of AI as a "thinking" machine "therefore having being?" is a philosophical one for another time.

Investors are naturally curious and concerned as to what the impact of this new era of technology will be on the world of finance. In this paper we shall explore this question and hope to shed some light on the topic from an insider's perspective, as builders of AI technology and practitioners using this technology in asset management for trade decision making.

We examine the following topics:

A New Era of Opportunity

1. A Growing Market — Page 4
2. Artificial Intelligence and Efficiency — Page 6
3. Indirect AI Investment — Page 11
4. Direct Investment, AI in Asset Management — Page 14
   - AI Assisting-the-Process
   - AI Decision-Based Trading

Cautions and Dangers

5. Potential Regulatory Implications — Page 22
6. Fear, Mistrust and Alienation — Page 26

Future Vision

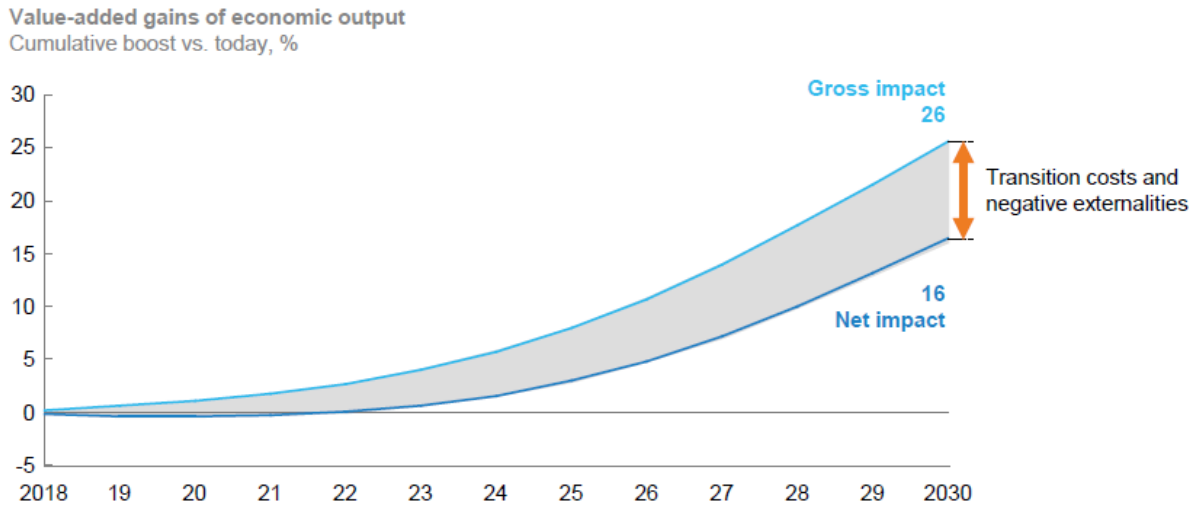
7. Changing Face of Wall Street — Page 30
8. Value of Human Influence — Page 32

A New Era of Opportunity

A Growing Market

According to a 2018 McKinsey survey[2] CEOs anticipate that 70% of all companies globally will be using some form of AI by 2030 and believe that this will result in a 16% increase of global GDP. Their other notable observation is the expectation that there could be a five-to-ten year run in/build up period prior to AI's full impact being felt. This has the potential to cause some investors to miss the opportunity by thinking that there is too much hype centered around AI. This makes it all the more likely that early adopters would reap the lion's share of the rewards as subsequent adopters scramble to catch up.

Don't Miss the Boat – The Potential Accelerating Economic Impact of AI



NOTE: Numbers are simulated figures to provide directional perspectives rather than forecasts

SOURCE: McKinsey Global Institute analysis

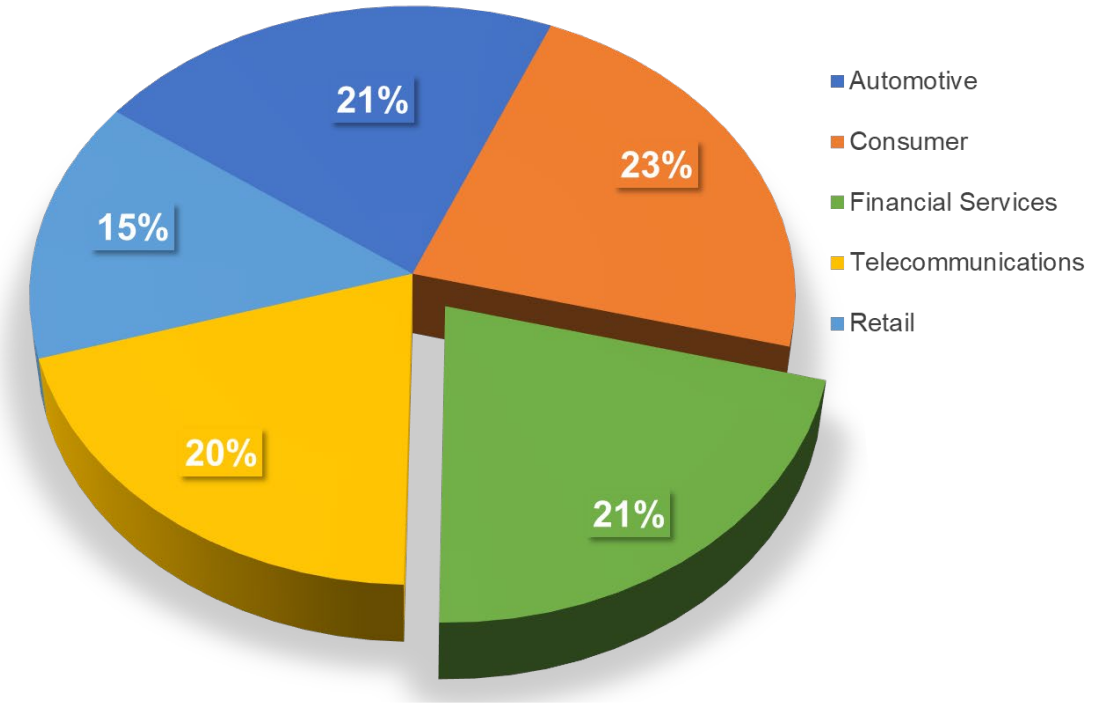
We are of the opinion that with AI technology we are looking at something akin to the computer, an edge case technological development, that went on to be era defining as it transformed and seeped through all sectors of the economy.

In order to appreciate the potential depth of influence, it is perhaps helpful to view AI in comparison to what was broadly termed information technology in the 70's and 80's which came to define a transformational era. With Artificial

Intelligence, we are entering another such era. AI is currently a broad term that crisscrosses many disciplines both in terms of science and in terms of business sectors. We should be left in no doubt that we have entered into the era of the "thinking" machine, irrespective of the philosophical/academic debate on quite how we define this "thinking." The technology and capacity have arrived that make this a reality and the most pertinent questions for investors to answer is: How can they identify and select the areas of this field that are likely to have the most significant investment benefits?

In its most recent report Tractica[3] identifies the financial sector as one of the top three industry sectors with the strongest opportunity to benefit from what they estimate will be a sector growth in revenue to $126 B by 2025.

Anticipated Market Share of Major Global AI Software Revenue Sectors 2025



SOURCE: Chart: Plotinus Asset Management, Data: Tractica

AI and Efficiency

It is not a coincidence that banking, in its attempts to be profitable, has over the last number of years consistently been at the forefront of spending on AI development, motivated primarily by the need for cost reduction.

There is perhaps no better model for the adoption of automated technologies (including AI) than the banking sector. This is due to several factors; the nature of the work of the banking industry and the strict operating confines within which that work takes place. The bank worker is the stereotypical definition of the clerical worker and it is this type of work that is particularly suitable for adoption by automated technologies.

Unsurprisingly the human interface that banking once represented is being rapidly replaced by direct access technological interfaces. The human content of the work, so to speak, has been shifted from the bank onto the client. With the bank ensuring that the automated process, as represented by their new interfaces, error checks sufficiently to assist the client to follow the correct steps (which the client will have to learn individually, at no cost to the bank).

This has had enormous benefits for the banking sector as it removes layers of human inefficiency and removes the potential of human error on the part of the bank itself, with the onus and responsibility being on the client. It also removes the physical inefficiencies, for example, of traveling or queuing.

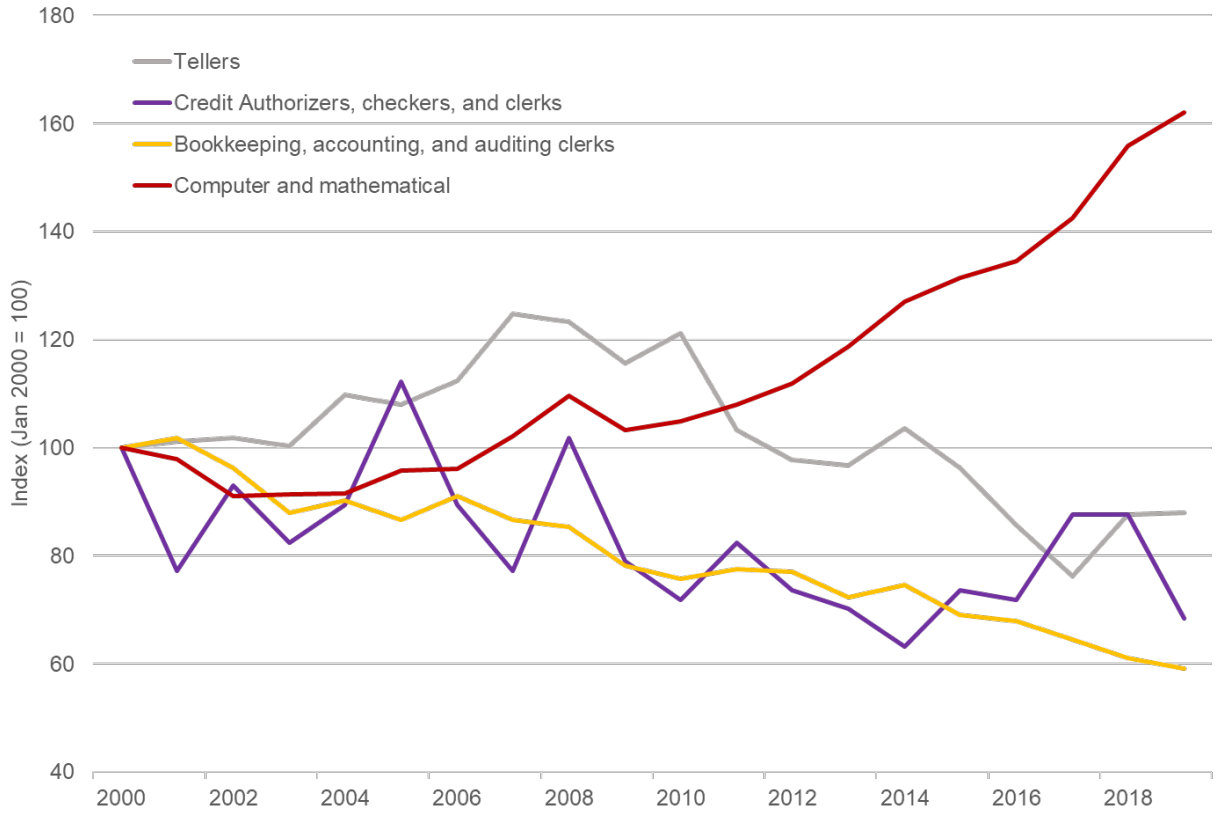
Estimated Job Losses by 2030 Due to AI Adoption Within the Banking Sector

SOURCE: Autonomous Research LLC

With an estimated 1.2M job losses in the banking sector due to AI technology adoption by 2030, the cost reduction drive would appear to be most effective in the reduction of the sector's human wage bill.

This chart illustrates the difference between various fields of employment in the US over the last 20 years.

Banking Related US Full Time Employed Wage and Salary Workers Since 2000



SOURCE: Chart: Plotinus Asset Management, Data: U.S. Bureau of Labor Statistics

The pressures on certain types of clerical occupations relevant to the banking/financial sector are clearly shown.

If you look for instance at bookkeeping, accounting and auditing clerks, this is a field that from a services perspective has had a constant demand during this 20-year period which has however, suffered a 40% decline in terms of employment. With there being no less need for the services, the difference is where these services are being acquired. They are increasingly being acquired at an automated non-human level.

By way of contrast look at the 68% increase in computer mathematical employment. This is reflective of the growth of the algorithm production – which in effect is what has contributed to the automation of the clerical occupation and the diminution of its associated jobs.

A Double-Edged Sword?

As technology progresses, a key area of artificial intelligence development is the area of self-programing. It is logical to think that even employment growth due to the blossoming of the technology sector (as illustrated by the computer and mathematical occupations) may in due course become a victim of its own success, as these jobs too, ultimately reach the point of being better done by machines. This in a sense highlights the vulnerability of knowledge-based task occupation – there is no substance to such employment, there is only information. Because it is virtual, it is particularly prone to its valuation being determined only in terms of efficiency.

Questioning Efficiency

Efficiency is an awkward concept with somewhat of an elastic definition. In business terms, money in for money out is as close as it gets to the physics ratio of energy in for work done – unlike the world of physics there is no law of conservation of energy to simplify the ramifications of that equation. Technological efficiency in the workplace mostly comes through the devaluation of work in, to reduce the money in, and technology is very good at scaling, thus rapidly devaluing that work.

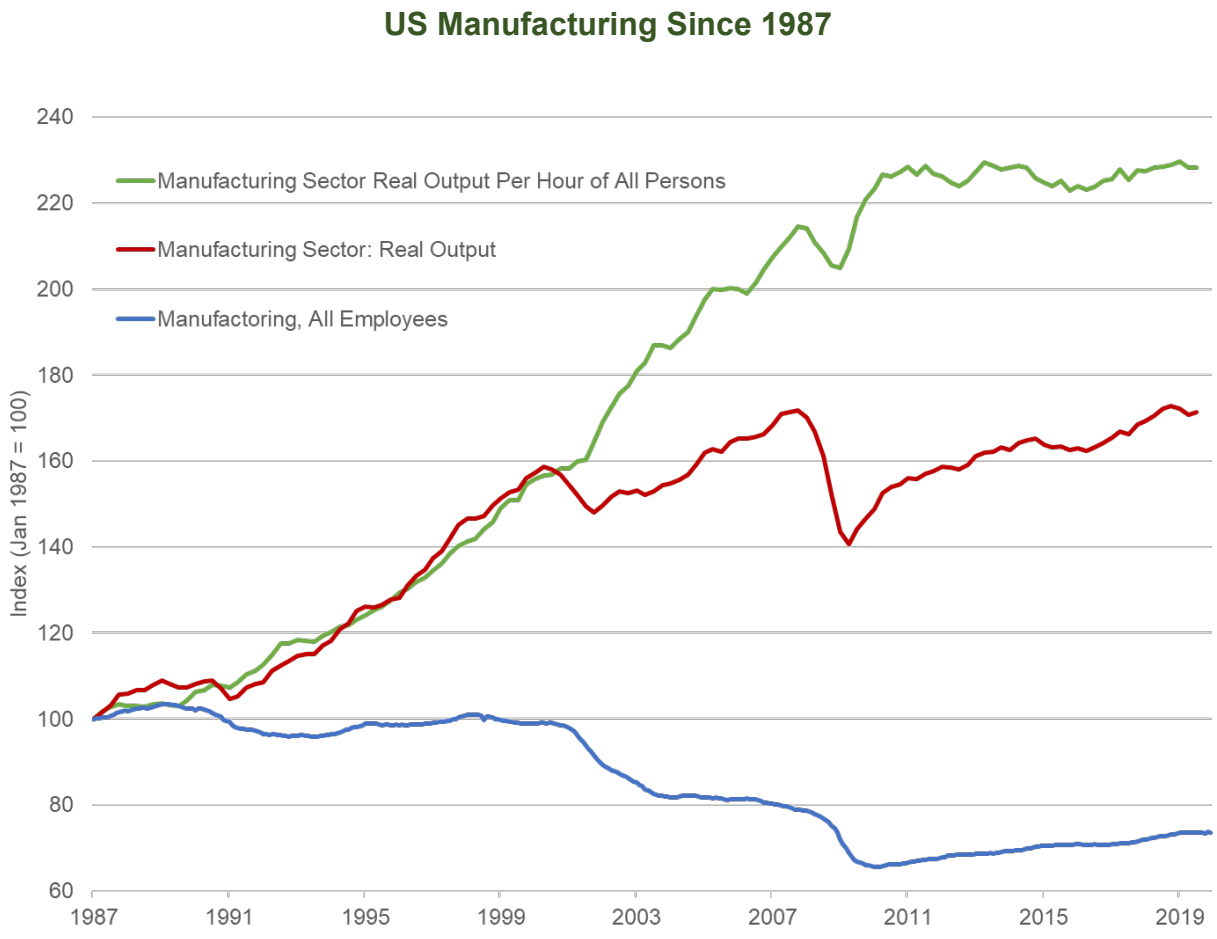
In business terms, money in for money out is as close as it gets to the physics ratio of energy in for work done.

If efficiency in the workplace is ultimately only defined in terms of profit, then technological advancement is practically guaranteed to replicate on the virtual

production line of knowledge-based jobs, automation's decimation of manual labor on the manufacturing production line. This does not mean the end of human employment but a severe reduction in the numbers of those currently employed in such tasks.

Does looking at previous technological impacts serve a function in helping us understand the potential for labor-market disruption which could be caused by AI?

The next chart illustrates Manufacturing since 1987 as viewed from three standpoints, Labor, Real Output and Worker productivity.



SOURCE: Chart: Plotinus Asset Management, Data: U.S. Bureau of Labor Statistics

With Labor, there is the clear decline of more than 25%, in 2019 it stood at 73.6% of its 1987 level, reaching a crisis low of 65.7% in 2009.

On the other-hand overall Real Output from the sector increased by 71.3% by 2019. So, as employment declined, output increased – this being reflected by the enormous jump in worker productivity (real output per hour) which increased a massive 128.3% over the period.

Interestingly, although overall real output and employment have come close to, they have yet to recover fully to their pre-crisis 2007 levels. Closer examination of the period from each crisis low provides a further observation. Since their respective crisis low real output has increase by 22%, employment has increased by 12% and worker productivity by 9%. The clearest conclusion is that in contrast to the decline in labor in the 20 years pre-crisis, the post-crisis period saw job growth with considerably slower gains in productivity compared to its previous leap forward.

Accepting that this is very much a macro overview, this post-crisis period indicates a stabilization of the effects of automation in manufacturing as growth in real output can be attributed to more workers, who are more productive with the assistance of technology.

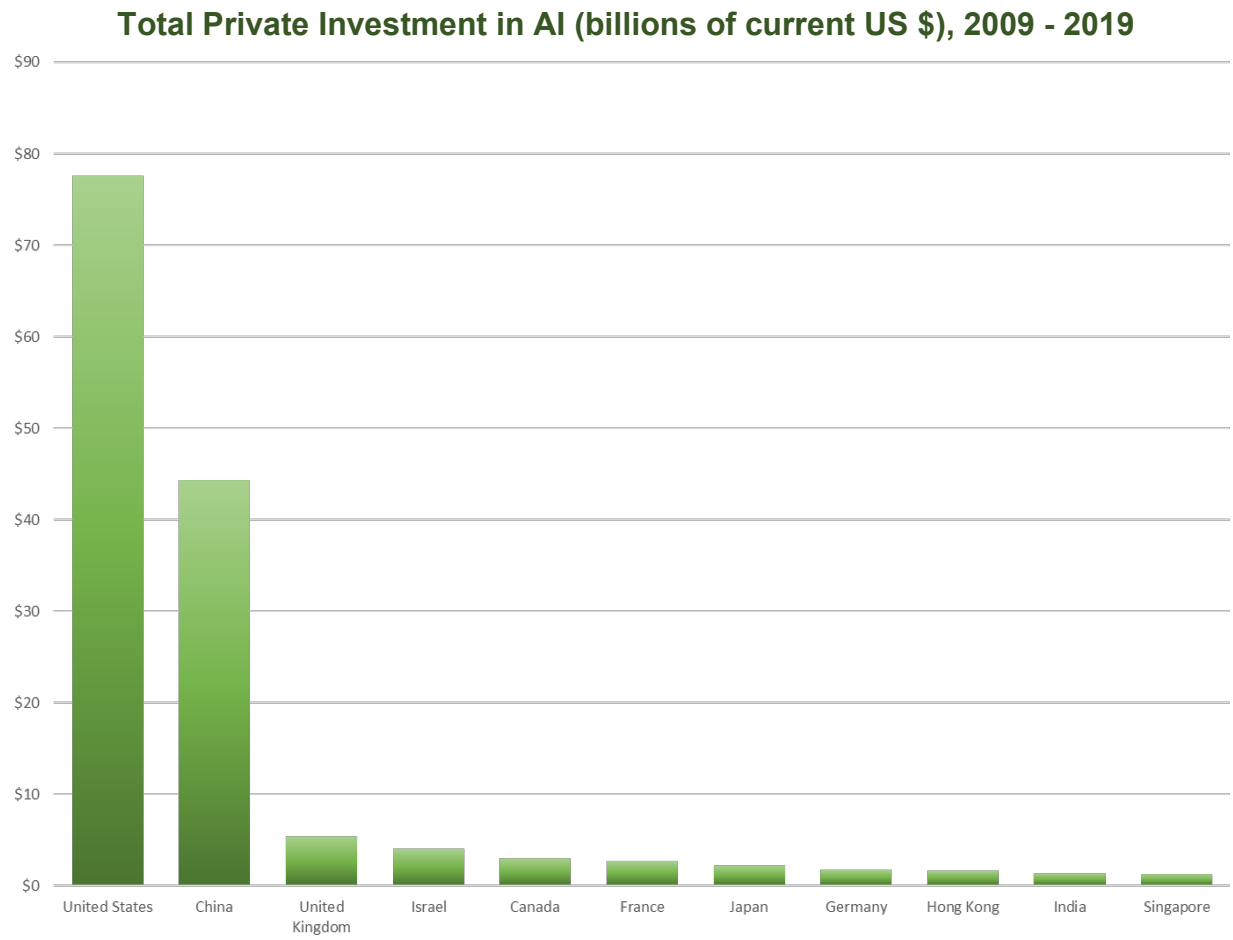
This perhaps can offer some solace to those in other sectors that potentially see AI technology as a threat to their livelihoods.

That said, as the first chart indicates with the bookkeeping, auditing and clerk sector the outlook is bleak for the classic back office staff, they have been decimated, dropping more than 40% in 20 years. This is a much more dramatic loss than manufacturing ever experienced and even more worryingly for those working this field, they have seen no recovery during the post-crisis period.

This area appears to be in terminal decline, with algorithms completely devaluing the knowledge value of such employment. Unsurprisingly Wall Street has been affected by this development of tech and AI, in one of its most unglamorous and boring manifestations. It is symptomatic of other specializations such as analysts and fund administration.

Indirect Investment

Considering that AI technology is a young field in terms of investment it is perhaps best to view its growth from the perspective of startup activity. In the past decade the US has been the leader in terms of private investment in AI startups.

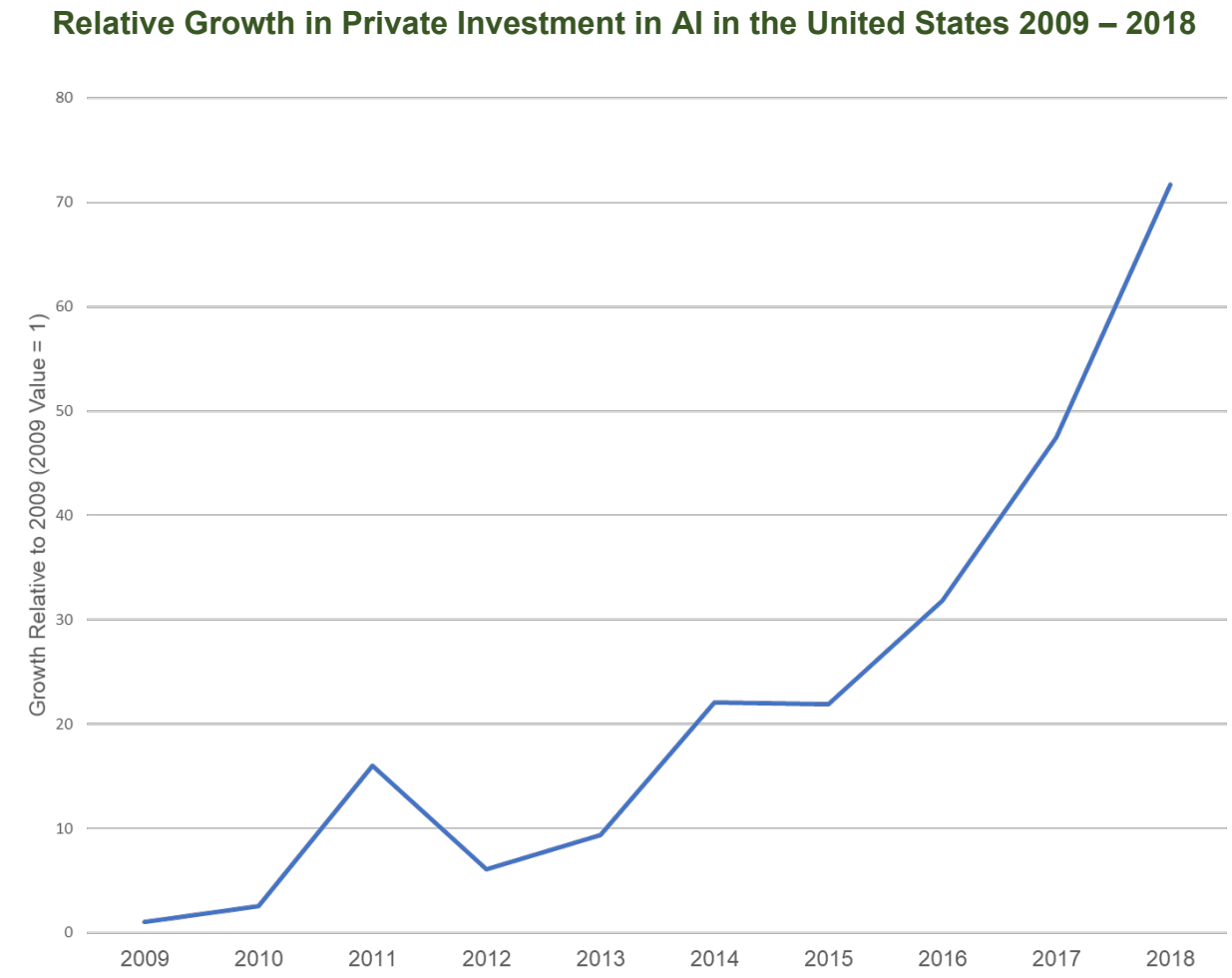


SOURCE: Chart: Plotinus Asset Management, Data: Stanford Artificial Intelligence Index Report 2019, CAPIQ, Crunchbase, Quid, 2019

Viewing this data specifically from the US, it is clear that we are in a surging growth phase of investment, post the false dawn of 2011. US private investment in AI in 2018 at $18.7 Bn was 70 times greater than it was in 2009.

Beyond private investment, the most likely way for investors to participate in investing in AI technologies is through preestablished tech/communications companies, as AI increasingly forms a cross spectrum part of their offerings. In a sense this is likely to be where AI as a distinct concept will over time become diluted into a generalized non-identifiable blur – where any mention of tech will necessarily imply the use of AI technology. It is also not surprising to see the

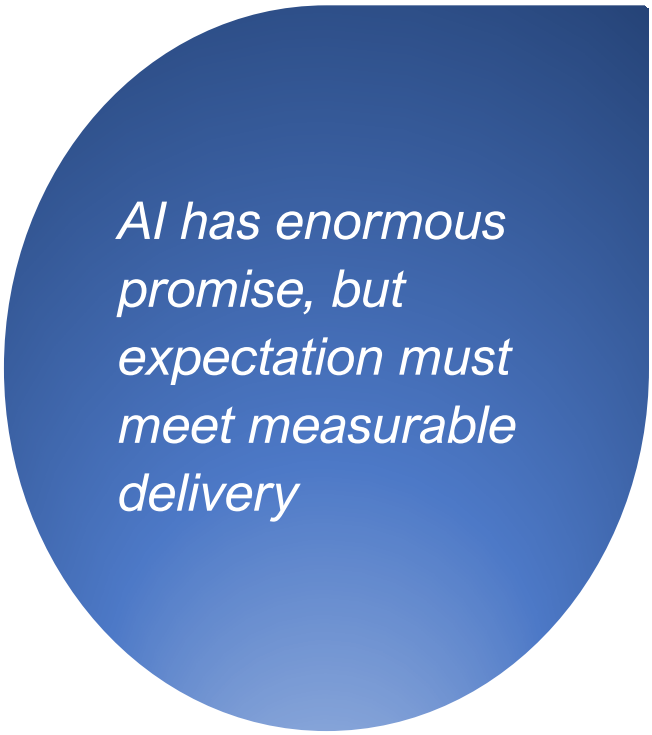
familiar names like Alphabet, Intel, Microsoft, Samsung, NVIDIA as leading corporate investors in startup AI companies.



SOURCE: Chart: Plotinus Asset Management, Data: Stanford Artificial Intelligence Index Report 2019, CAPIQ, Crunchbase, Quid, 2019

This being the case investors need to look at how they can invest in AI. Is the best route to this through the traditional technology companies or are there other opportunities? As investors confront a technology field that can be incomprehensible, how can investors identify good investments? The fact that technology will tend to be consolidated by the established quasi-monopolies conversely, has created opportunities for smaller specialist firms who are innovators, to stake their claim on niche sectors which fall outside of the generalized remit of the larger companies.

Investable Indices



There has also been the development of AI investment indices. These types of indices blend a composite of companies in the fields of tech/robotics/biomedicine etc. Take for example the NASDAQ CTA Artificial Intelligence Index. These composite indices, though, have a definition problem. Considering the overlap and lack of clear distinction between how the constituent companies are selected versus others in the same traditional sector where they are already included (e.g. technology), how are the specific benefits from their use of AI quantifiable, to justify their inclusion in such an index? Also, with the likelihood that AI technology will have the expected broad permeation across all sectors, any current definition will tend to become more difficult to define and therefore less meaningful.

These types of AI investment indices are at risk of becoming a hodge-podge of many things to many people. AI has enormous promise, but expectation must meet measurable delivery. From the perspective of the investor who is looking to spot the real growth area in AI, we believe that it is in those firms who have defined, restricted expectation of what benefits an AI technology can bring. If you identify what the AI edge is, then you can find more suitable, familiar benchmarks by which to gauge and validate performance and gain investor confidence.

This has been our own experience in the field of AI trade decision making. Validation is imperative for any new trading approach. Investors are long past being over-awed by technology and are much more affected by results from its application. Investors want tangible, familiar, relatable benchmarking. There is no value in hiding behind the black box.

Direct Investment, AI in Asset Management

There needs to be some clarity in how to identify when and where Artificial Intelligence is being used as the driver of investment. Two distinct groupings exist: AI assisting-the-process and AI decision-based trading.

AI Assisting-the-Process

Many of what could be considered the household names in quantitative or systematic hedge funds are using AI technology in their process. Considering that these firms already have a long tradition in their field, it should be emphasized that AI is a further tool in the toolkit to help them refine and improve their already established investment process. This perhaps would be best classified as AI assisting-the-process, not specifically AI-driven trading.

An investor is not making their investments in these types of funds because of the use of AI technology. They are investing in a well-established investment process (that predates the present era of AI) from an investment house with whom they have a familiarity, which has a tradition of utilizing technology and innovation to help them attain their investment goals.

It is not for the most part, possible to extract the actual benefits that AI is bringing to the investment process at the recognized systematic houses because it is not necessarily helpful to separate it as being distinct from the overall investment approach of the given house.

AI Decision-Based Trading

AI-driven trading is a new field and as a result there are less candidates for an investor to consider. What can you measure the performance of an AI driven trading fund against?

The Eureka Hedge AI Index is an attempt to define this challenge, but it clearly runs into the identification problem and as a result has adopted quite a broad definition from which to form an index, which includes a mix of AI assisting-the-process and AI decision-based funds.

This leaves practitioners like us, who are using systematic AI decision-based trading with a benchmarking problem. As a result, we think that it is necessary to provide clarity to investors and to benchmark by application.

The Eureka Hedge AI Index can serve a broad function, albeit a questionable one, for the genre, but we are of the opinion that this index is not particularly helpful for investors who have little awareness or feel for it as a benchmark and who are seeking to understand where the investment benefit of AI lies.

This is where explanation is vital – to provide investors with a context for understanding AI decision-based trading.

Tangible Benchmarking

There is a question as to what should determine a legitimate comparison. Is it the technological approach used in trading? Or should it be by trading style? We believe it should be both.

By declaring that AI technology is being used, asset managers are claiming that the technology used is improving results. Thus, it is necessary to find a comparison using this technological approach. Again because of the newness of the field, finding purely AI executing approaches is difficult, as investors are limited by both available information and available data. This must however be accompanied by the identification of trading objective, since one has to have a familiar benchmark to act as control for the pros and cons of the technology.

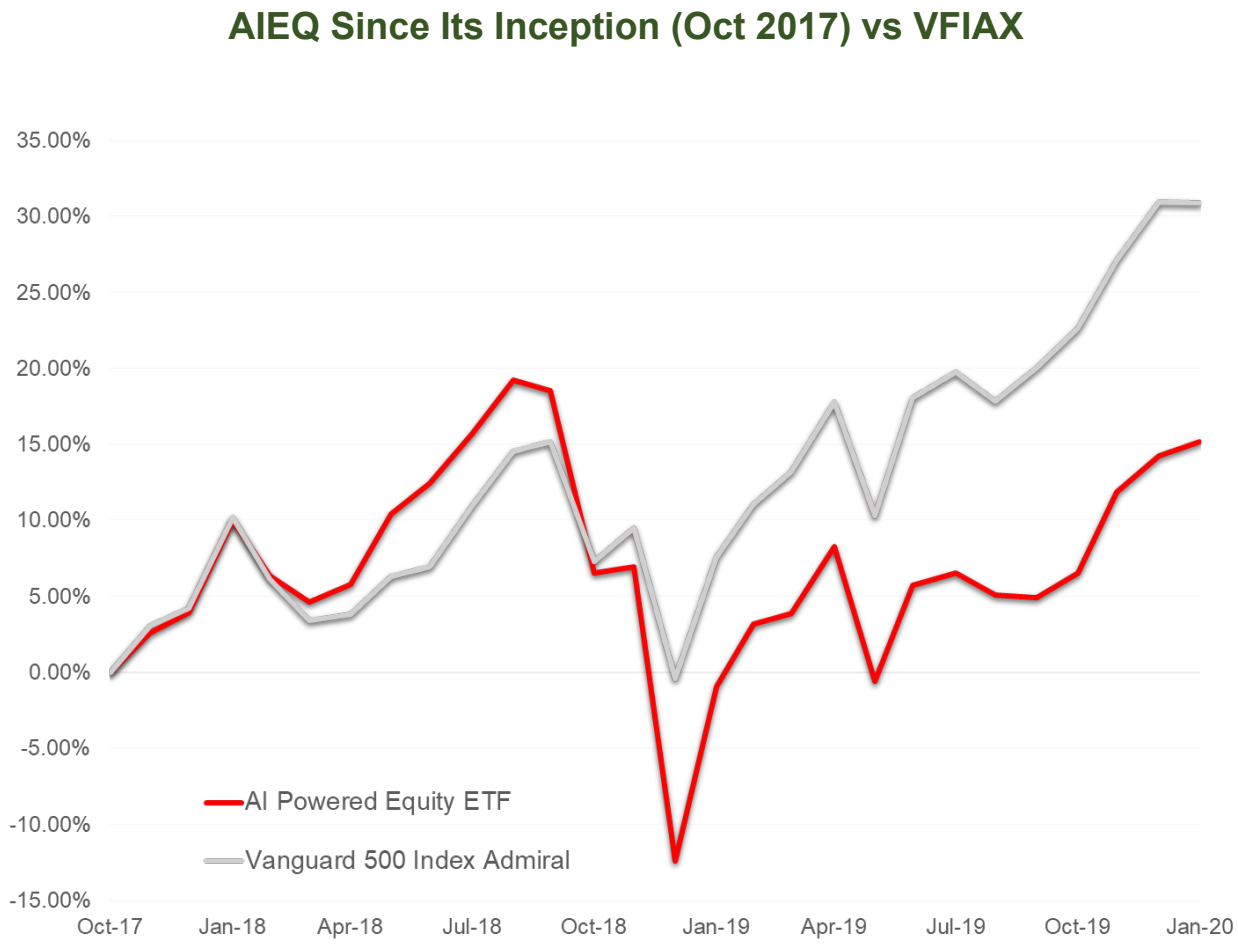
Case Study

For the purposes of examination, we look at an example of AI decision-based trading deployed to trade US equities: The EquBot AI Powered Equity ETF (NYSE: AIEQ), an ETF emanating from use of IBM's super-computer Watson.

The Bad is More Relevant than the Good

Given the newness of the approach, short track records provide a limited field of data, so it is sensible to look at the overall context of the market over that period of time. 2019 was an uncommonly good year for S&P500 returns and this had the unfortunate blurring effect of having the rising tide lifting all ships. Thus, the stock picking merits of any trader cannot be fully verified – this is just as true for the

managers using AI decision-based trading. Within the short timeframe it is more helpful to look at the worst performing period in the market. In recent times, this is exemplified by the slump from September to December 2018. Although short-lived this perhaps may shed light on some AI executing trader's Achilles heel – potential data overfitting – which can be great when the going is good, but can be devastating when times are bad.



SOURCE: Chart: Plotinus Asset Management, Data Courtesy of Morningstar

If we look at EquBot's AIEQ AI Powered Equity ETF you can see that it fell into the September - December 2018 problem and like any active manager the yardstick that they must to measure up against is a passive S&P tracker fund (the chart above shows the Vanguard VFIAX).

AIEQ vs VFIAX (Since Inception Oct 2017)

	Return	Max Drawdown	Drawdown Duration	Annualized Volatility
VFIAX	30.87%	-13.97%	Sep – Dec 2018 (3 month)	13.84%
AIEQ	15.13%	-26.53%	Aug – Dec 2018 (4 month)	20.03%

You can see that what was a three month -13.97% drawdown for the VFIAX, was a four month -26.53% drawdown for the AIEQ. Furthermore, the additional volatility that the AIEQ brings, 20.03% annualized compared to the VFIAX 13.84% annualized for the period makes the AI stock picker even less attractive.

Problems Monitoring Strategy Drift

The other issue for the stock picking variety of AI executor is when and where does selection start and end? Unless there is a clear, specified investment process with regards to the holdings in these funds, they are susceptible to strategy drift due to a lack of consistency in investment process.

Consider the competition, primarily the passive index tracking funds. These funds have a clear rigidly defined investment process, a Vanguard index tracker will not begin the year with 500 constituents and end it with 132 or 694 because it was determined that this would produce a better return.

One of the benefits (if you might call it that) of the limitations of an old-style human stock-picking active manager was that the selection of picks had to remain humanly comprehensible and manageable. Thus, if strategy drift was emerging, it was quickly apparent, and it had to be accounted for and explained to investors.

So, the basic question for an AI execution strategy is not “How it has managed to follow the market up in good times?” but rather “Why did it under-perform the market by a factor of X when it was doing badly?” As can be seen from the chart, matching the market in good times does not compensate for badly under-performing it in its downturn.

Deploying Artificial Intelligence With Derived Data

In the Plotinus 2π Enhanced Index, the Plotinus overlay hunts investment opportunity in trading the S&P 500 Index. By applying proprietary derived data generated from its bespoke AI-based quantitative analytics system, it seeks to separate statistically significant tradable signals from noise. The Plotinus overlay trades *E-mini S&P 500 futures contracts (ticker: ES).*

The technology has applicability and deployment capabilities across different asset classes. For instance, the approach works with other international equity indices, such as the Chinese CSI 300 index or with commodities, including oil.

Explicable and Comparable

AI has to be conveyed to the investor as a clear helpful assistance to their investing. It must be specific and relatable, not only in performance terms (which is easy to see) but more importantly in investment process terms which is where things can become opaque and inconsistent.

We believe that an AI investment manager must have a strong philosophy in terms of both investment and scientific discipline. This has to take into consideration that the field of AI has a heritage of not settling, as the technology itself continues to advance. There is a temptation to seek increasingly large quantities of data to help, what may be disparagingly described as complex, better curve fitting. Whilst this works in modelling, it does not lend itself so well to the real world of investing where investors really do feel the pain of loss, not a simulated version of it. Their tolerance and fear of uncertainty can be just as important as their tolerance and fear of loss. Investors must be offered task specific AI decision-based trading that can illustrate benefits which, given as already mentioned the short track record of these approaches, must show that it is safer than its passive equivalent.

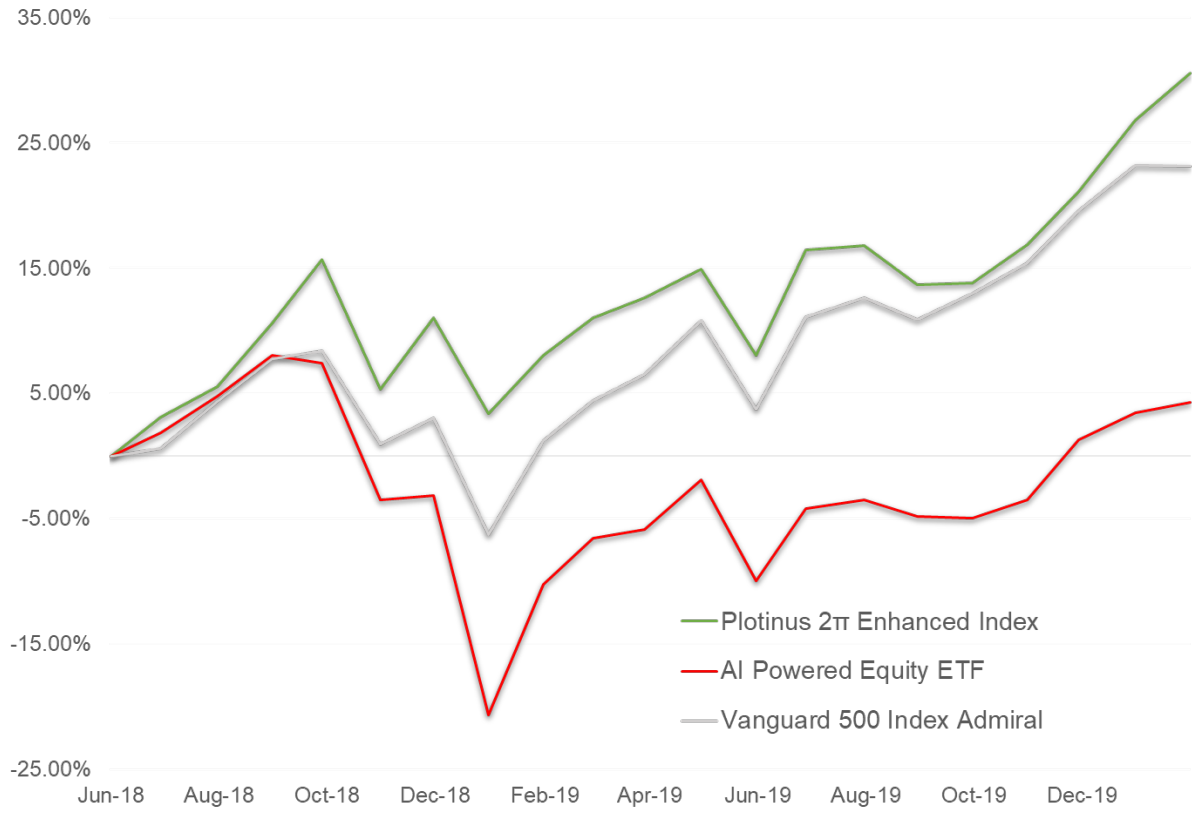
To this end, we have created the Plotinus 2π Enhanced Index which deploys AI execution by trading the S&P 500 Emini Futures.

We offer the investor an alternative to their S&P 500 index tracker fund for those who

require the returns but are concerned about their degree of exposure to the index. Our work offers the investor returns similar to those of the tracker fund whilst reducing exposure to the index by 25%.

This approach has the same issue of the short track record like others in the AI decision-based trading field. It has an inception date of June 2018 but fortunately it has been through the aforementioned September – December 2018 slump.

Plotinus 2π Enhanced Index Since Its Inception (Jun 2018) vs AIEQ vs VFIAX



SOURCE: Chart: Plotinus Asset Management, Data Courtesy of Morningstar & Plotinus Asset Management

The chart illustrates the drawdown spanning the same three-month period experienced by the S&P 500, but its depth is considerably less at -10.63% than those of the VFIAX and the AIEQ.

We believe what is crucial is that by having a clearly defined investment process our enhanced index does not suffer from the mobility problems of choosing from a varied selection of stocks to be picked. It is able to be genuinely and comfortably compared with the S&P500 Total Return. This means that investors have a process that can be understood, but perhaps more significantly they have a benchmark that they fully understand. As a result, they can perform a like-for-like comparison to easily assess whether AI execution as a new technology can offer them measurable investment benefits.

Cautions and Dangers

Potential Regulatory Implications

There are deep philosophical questions pertaining to how or whether to define, or distinguish, thought, from awareness, from being. Descartes' famous "I think, therefore I am" can itself be a source of discomfort when contemplated in the context of a "thinking" machine. This discomfort reflects the uncertainty and distrust surrounding the role of AI in our daily lives.

Wanted - Sheriff

Alphabet's CEO Sundar Pichai's recent comments on the necessity to regulate the use of AI[4] can only be interpreted as preemptive strike to take the moral high ground and in the process regulate the regulation. The move smacks of self-interest.

It is worth taking note of the need to quell the disquiet around the technology. Put simply, people can find it very disconcerting to experience a machine effectively "read their minds" when it comes to selective suggestions. Without getting carried away though, this must be understood contextually. This type of AI technology operates in extremely constrained circumstances where you as the user, perhaps without being fully cognizant of it, are providing endless information that provides layer after progressive layer of data that can be used to algorithmically distill with considerable accuracy a predictive result.

The moral mire opens up with the unsolicited acquisition of personal data which can be taken, scrapped, bought and sold beyond one's control or permissions and

may be used for whatever purpose the acquirer decides, whether nefarious or otherwise.

The scandal surrounding Clearview AI[5] is likely just the tip of a brewing iceberg of similar issues. It is one thing to have a 70% accuracy rate for predicting whether you really wanted to buy a yellow raincoat, where being wrong is not going to be the end of the world, and on the other hand, being 70% accurate at identifying a potential criminal to law enforcement which could have genuinely life and death implications.

From an investor perspective, it is necessary to interpret the implications of what this might mean going forward. How will Wall Street as a whole and the savvy investor, pick their way through the minefield, as the wild-west mentality on data and AI inevitably matures and enduring solid investments distinguish themselves?

Regulation is a certainty – we need look no further than the EU for guidance on a regulatory approach – GPDR (implemented in 2018) is just the beginning of a definition of ownership of data. The growth of a clear definition of ownership will, in turn, define use, permissions, sale and probably most importantly, theft.

The vast majority of what is considered AI technology has developed hand-in-glove with Big Data. In fact, much of it is inextricably linked to obtaining data *ad infinitum* and in order to maintain edge-advantage will require exponentially expanding quantities of data. Thus, as the dust gradually settles on an increasingly regulated environment, the key questions will be what data can and cannot be used? and who if anyone, owns those permissions?

The public reaction to Clearview AI's activities is a pre-regulation litmus test for this type of situation, with all the usual suspects from Twitter, to Google and latterly Facebook, issuing cease-and-desist letters in response, as an attempt to block Clearview AI.

Once the data lawlessness ceases – like all business sectors before it the established players with the capacity to purchase the rights and permissions will be able to exert their control. Hence one should not be surprised by Alphabet's current benign advocacy of regulation.

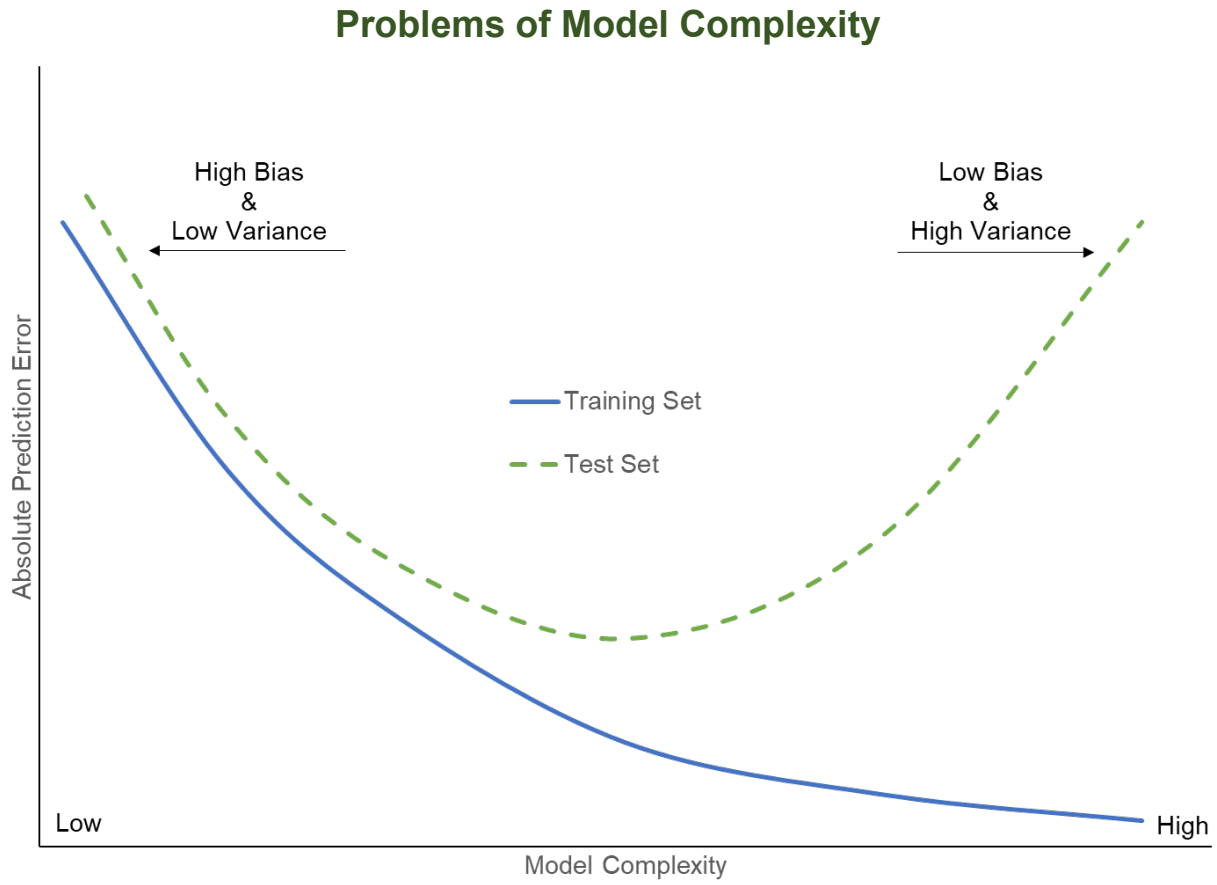
Death by Regulation

The explosion of fields like “alternative data” may at first sight appear as very attractive new investment opportunities. Investors would be well advised to view them very tentatively, not only from a quality and relevance criteria (they are prone to rapid deterioration, becoming retrospectively inaccurate and/or obsolete) but also from a regulatory standpoint. They are potentially highly vulnerable to being made defunct through a sudden forced inability to use, or to afford to use, a key dataset as result of regulatory restrictions.

Another factor that investors should be aware of is where regulation could potentially undermine some AI technologies’ effectiveness due to certain kinds of approaches that are used by AI systems.

The out-of-the-box AI solutions are what could be termed “cauldron” solutions. One keeps adding the data and stirring the pot, to conjure up the magic potion, the answers the AI is being used to seek. The key issue here is that what is being valued and sold is correctness – the better the answers the more valuable it is.

The problem with the cauldron approach is that this correctness is a constantly waning property and it has to be continuously chased. The pursuit and maintenance of correctness is achieved by acquiring increasing amounts of data and adding increasing complexity.



SOURCE: Plotinus Asset Management

AI technology has the capacity to deal with and manage ever increasing complexity, but on the downside this increased complexity makes tracing the relevance and impact of any given data more and more difficult due to the complex interrelationship of data sets – which essentially becomes humanly incomprehensible. This can be because it is not explicable, or more commonly because it is too time consuming to unravel. Often this means that it becomes highly inefficient to store these dense background calculations. The distance therefore that is created between data in, and answer out, compounds the loss of the ability to trace and error check. Hence, the answer to the question "Why is the AI system giving the correct answer?" realistically becomes "Because it is."

The danger with this, is that if for some regulatory reason a data set, or sets, or partial set becomes inaccessible as input, there is no way of confidently identifying the impact this will have on a given AI system.

Regulatory Inoculation

To protect themselves from these future regulatory dangers, Investors need to look for AI firms' robustness in terms of data independence. It is important from a due diligence perspective to be able to determine the established permissions for data that systems use. Preferably to establish that data has been legitimately acquired and that data license agreements exist, clearly defining acquisition and use.

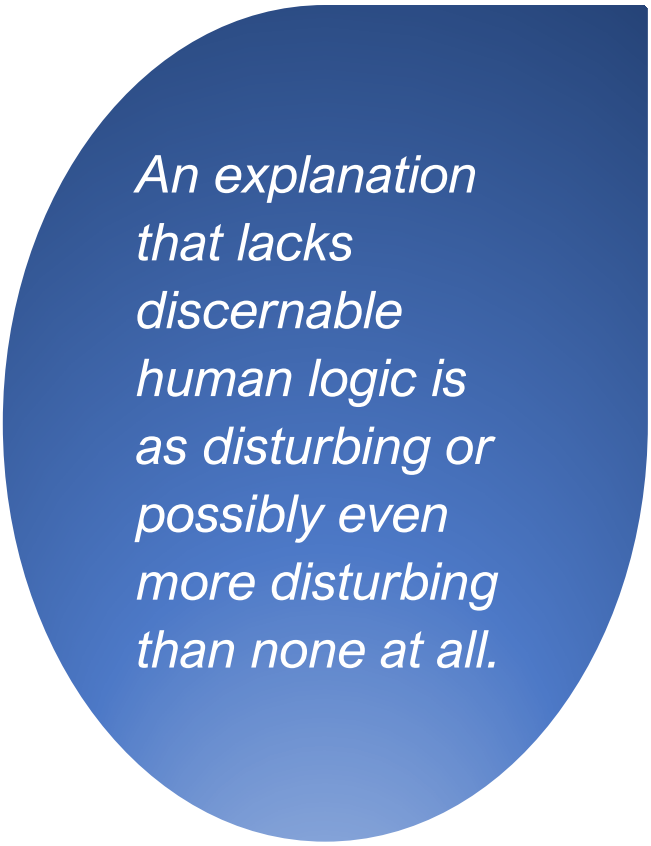
Beyond this, perhaps the most valuable characteristic that an AI firm can have to maintain data independence is its generation of bespoke derived data. The real value add that thoughtful derived data can bring should not be underestimated. The creation of, for example, bespoke derived data as inputs to an AI system means that the firm fully own and control those proprietary inputs thus regulation cannot stop them from being used. Furthermore, to generate derived data, the firm necessarily has to know why it is being created and why it is important. As a result, the problem of loss of meaning, direction and explanation through increasing complexity is averted.

Fear, Mistrust and Alienation

AI as a technology has a careful path to tread. The positive bias toward reliance on technology is already well established[6], the so-called automation bias where humans tend to defer their better judgement to the assisting machine. AI has suddenly elevated the question of decision-making to another plateau. We are transitioning from machine-prompted human decision-making to machine decision-making informing the human what they should think, or probably more accurately, what they should have thought.

This transition crosses a fundamental line – that of control and, as should be well appreciated, human loss of control has to be managed properly or it can combust. The question for proponents of AI is: Are they prepared to recognize this and deal with it?

In its prior manifestations the old deferral to “the machine is right” control remained, and automation was an option selected by a human user to help them. This is a very different scenario than a human experiencing themselves as being irrelevant and being told like a child what to do or worse still, having it done for them. The simultaneous lack of tangible explanation compounds this problem by emphasizing the lack of direct human involvement when engaging the technological interface. Companies in the field are not unaware of this problem and are taking steps to deal with it. The recent emphasis on explainable AI (XAI) by Microsoft illustrates how seriously this issue is being treated. The focus is an attempt to deal with the danger of failing to describe process, intimidating people and generating distrust.



For firms involved in AI in our opinion, explanation is a necessity, “not an option”, but this has to be managed. An explanation that lacks discernable human logic is as disturbing or possibly even more disturbing than none at all. Given the magnified sensitivity of the investment industry to the consequences of success and failure as measured by profit and loss, it is very important that firms using AI in the financial sector, for example, those managing clients’ money, take full account that this monetary sensitivity is human. The use of technology demands an ethics from its promoters that recognizes what purpose it is being used for. In the case of investment management, the preservation and growth of client’s assets is that purpose. Clients deserve to be extended a clear, humanly relatable investment process, regardless of the technical complexity that underlies it.

Building Trust

To be clear, society's successful adoption and use of AI does come down to an issue of trust. Our already preestablished reliance on technology is vast. A significant sector of global economic activity depends on it, mismanaging technological advancement in a way that causes exclusion and alienation has the potential to provoke a Learyesque reaction to "switch off and tune out." It is dangerous to simply assume that progress is linear and continuous. The sacking of Rome in 410 C.E. by the Visigoths – considered the uncivilized barbarian horde – marked the beginning of the unraveling of the Western Roman Empire and was instrumental in undoing hundreds of years of technological advancement, resulting for instance in the disappearance in Europe for 1000 years of technologies such as urban networks of heated piped water. Impossible though it may seem, technologies can be abandoned and forgotten.

Future Vision

Changing Face of Wall Street

The financial world has two faces, one of cautious conservatism as represented by central banks and the other of Wall Street, emphasizing the daring edge of finance. As such, Wall Street is no stranger to change or innovation and has over the course of its life been a rapid adopter of technology, benefitting its investor-participants.

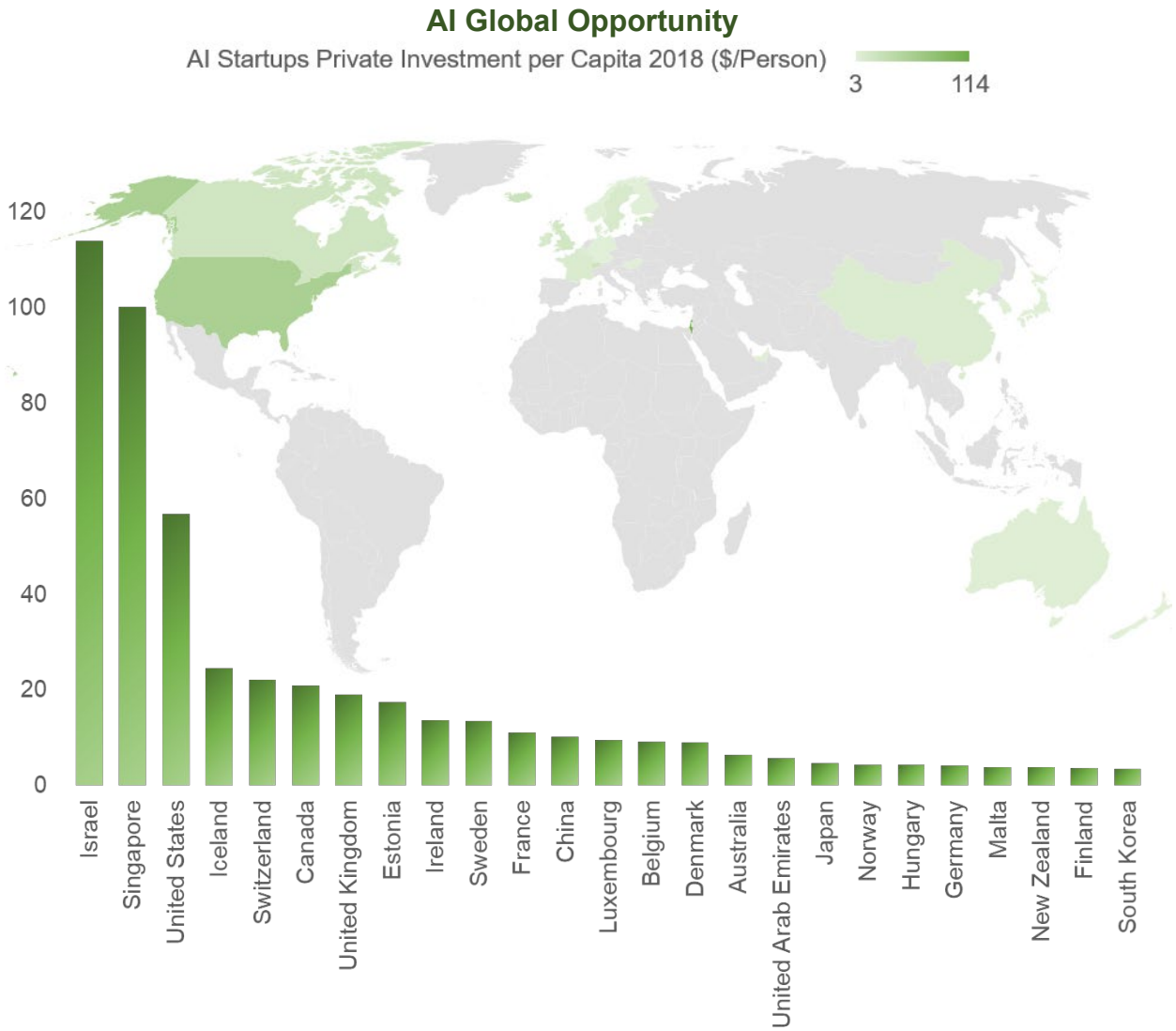
In this vain, AI as a new era technology is becoming part of that world. However, unlike other previous technological adoptions, the technology itself will likely lead to the gradual deprecation of some of the traditional roles in finance.

That a single individual, Peter Tuchman, has become the face of the Wall Street Trading Floor is illustrative of the numerical drop in traders on the floor as trade has become increasingly algorithmic. It is the layers of professionals, the unknown faces beyond the trading floor, who are likely to find increasing pressure from technology devaluing their labor.

Capital only has conscience as an afterthought, so results and efficiencies will determine the degree of impact AI will have on the financial sector's labor market. On the other hand, this new technology will breed a new type of financial professional and opportunities abound for those who identify the human value add that can work in tandem with and improve the technology's ability to generate results.

Wall Street International

AI technology opens up the financial world to further decentralization which, in turn, creates opportunities for secondary financial ecosystems to operate and participate powerfully in the industry. The days of a tripartite sector, spread across New York, London, and Tokyo, is a thing of the past. In contrast to the current climate of increasing protectionism and industrial nationalism – the international money system is more fluid than ever, and its interconnections and dependencies are continuously evolving.

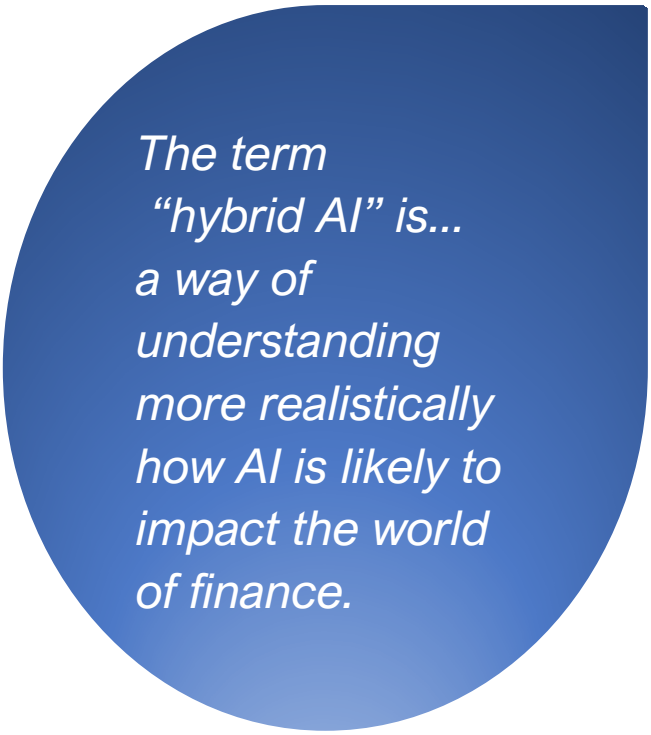


SOURCE: Chart: Plotinus Asset Management, Data: Stanford Artificial Intelligence Index Report 2019, CAPIQ, Crunchbase, Quid, 2019

With AI's ability to improve knowledge-based task efficiencies, the financial world (where much of its activity is knowledge-based and in a sense virtual) offers enormous possibilities for firms to benefit through the use of the technology.

Value of Human Influence

Capitalism is a human construct. The financial sector is governed by the human emotions emanating from gain and loss, so when we look at the prospects for a deeper automated future on Wall Street, these human emotions will continue to govern it.



AI should not be met with fear, but rather the confidence that it is just the next progression of human ingenuity. The financial world is never static and there is no magic formula for success with an infinite shelf life. Permanent innovation is part-and-partial to finance. The world of perfectly predicting technology would in effect mean that all participants would be capable of second guessing each other, thus eliminating the market. So, rest assured, if technology reaches that point, human innovation will add some skew to the mix and in so doing recreate and maintain the market.

The exciting prospect for the financial sector is that as AI technology interrupts some of the traditional jobs and roles, it also offers new possibilities for those who can identify how and where best to lever the power of the technology for financial gain.

The term hybrid AI is prone to creating the Sci-Fi imagery of the half human/half machine but it is perhaps a way of understanding more realistically how AI is likely to impact the world of finance. Assistive technologies that work in conjunction with, and for people, rather than being viewed as their competitor or

replacement, will likely have a broader, more receptive audience and thus be more likely to succeed in the long term. Those envisaging the replacement of the human should caution themselves not to underestimate the complexity of what human "being" is and our own vast ignorance of it and its workings.

Efficiency is useful but it would be foolish to ignore the importance of redundancy, which can be easily forgotten in the hubris of the technological rush. There are many more avenues to be explored if the definition of "Intelligence" is expanded beyond that of a human comparator. Nature provides an enormous depth of intelligent task-based systems that can offer insight for developing AI.

We are of the opinion that AI technology, as it becomes cheaper and more commonplace, will deteriorate in quality – not in terms of task (as this is likely to improve) but in terms of edge benefit. Value will be maintained by those firms with the capacity to think beyond. The advantage for current firms in the field is that they have already proven foresight and are ahead in situating the application of the AI technology.

This thoughtfulness, in truth, is not going to be provided for with a better machine, but from the value add of creative human capital. Increased automation brings with it the danger of increasing streamlining and with it the unknown built-in assumptions that cloak systemic vulnerabilities.

Investors can discern these qualities from companies that are cognizant of the dangers, and have already built features such as data independence, into their business to enhance its robustness.

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[1] Rene Descartes, Discours de la méthode
[2] McKinsey Global Institute, Notes from the AI frontier: Modeling the impact of AI on the world economy
[3] Tractica, Artificial Intelligence Market Forecasts
[4] Financial Times, January 20th 2020
[5] New York Times, January 18th 2020
[6] Skitka, Mosier, Burdick (1999) Does automation bias decision making? International Journal of Human-Computer Studies. 51, (5), 991-1066

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