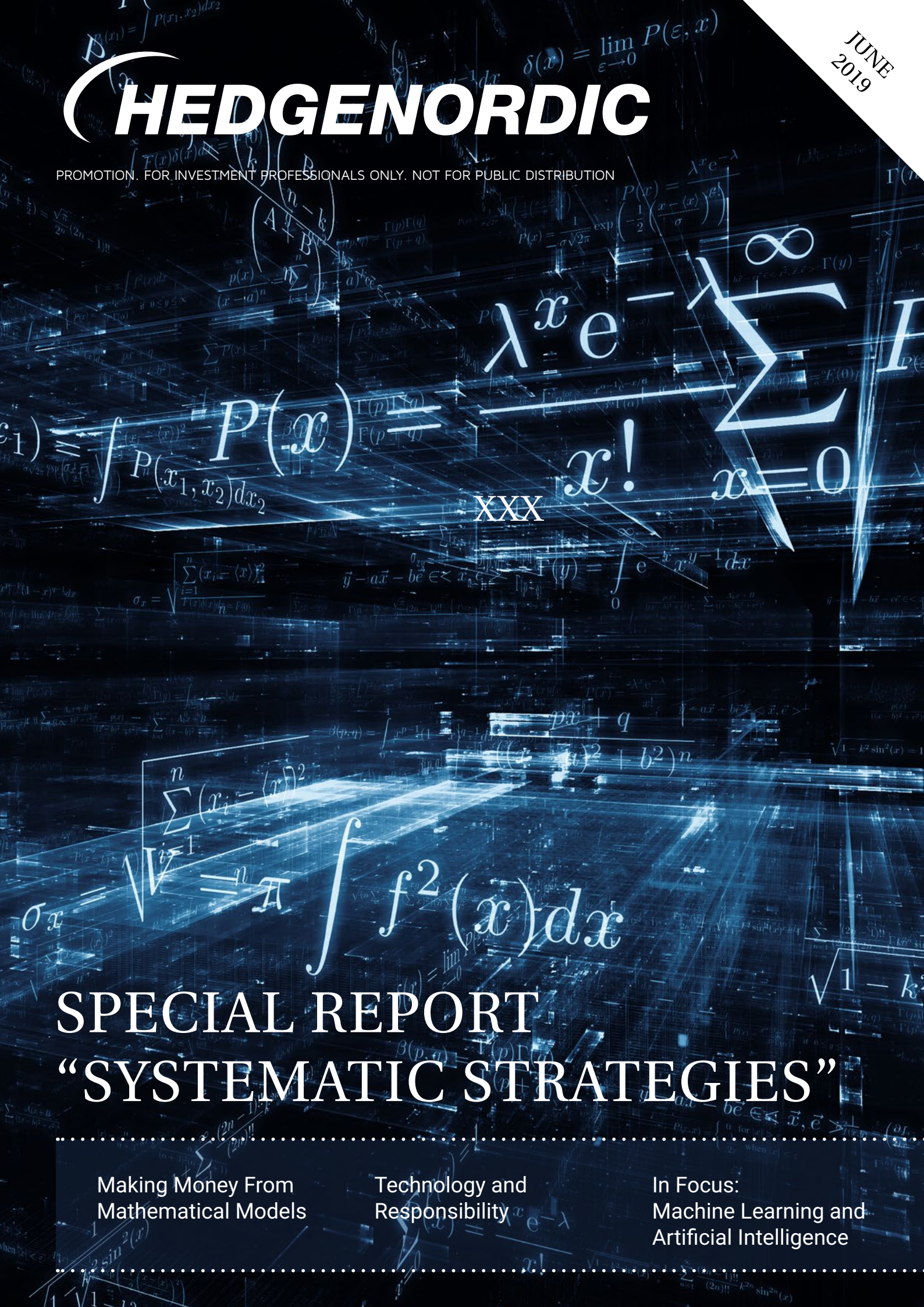

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SPECIAL REPORT "SYSTEMATIC STRATEGIES"

Making Money From Mathematical Models

Technology and Responsibility

In Focus: Machine Learning and Artificial Intelligence

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INTRODUCTION

HedgeNordic is the leading media covering the Nordic alternative investment and hedge fund universe. The website brings daily news, research, analysis and background that is relevant to Nordic hedge fund professionals from the sell and buy side from all tiers.

HedgeNordic publishes monthly, quarterly and annual reports on recent developments in her core market as well as special, indepth reports on “hot topics”.

HedgeNordic also calculates and publishes the Nordic Hedge Index (NHX) and is host to the Nordic Hedge Award and organizes round tables and seminars.

PUBLICATION PLAN 2019:

September:	Equity Strategies
October:	Norway
October:	Value Investing
November:	Alternative Fixed Income
December:	ESG and Alternatives

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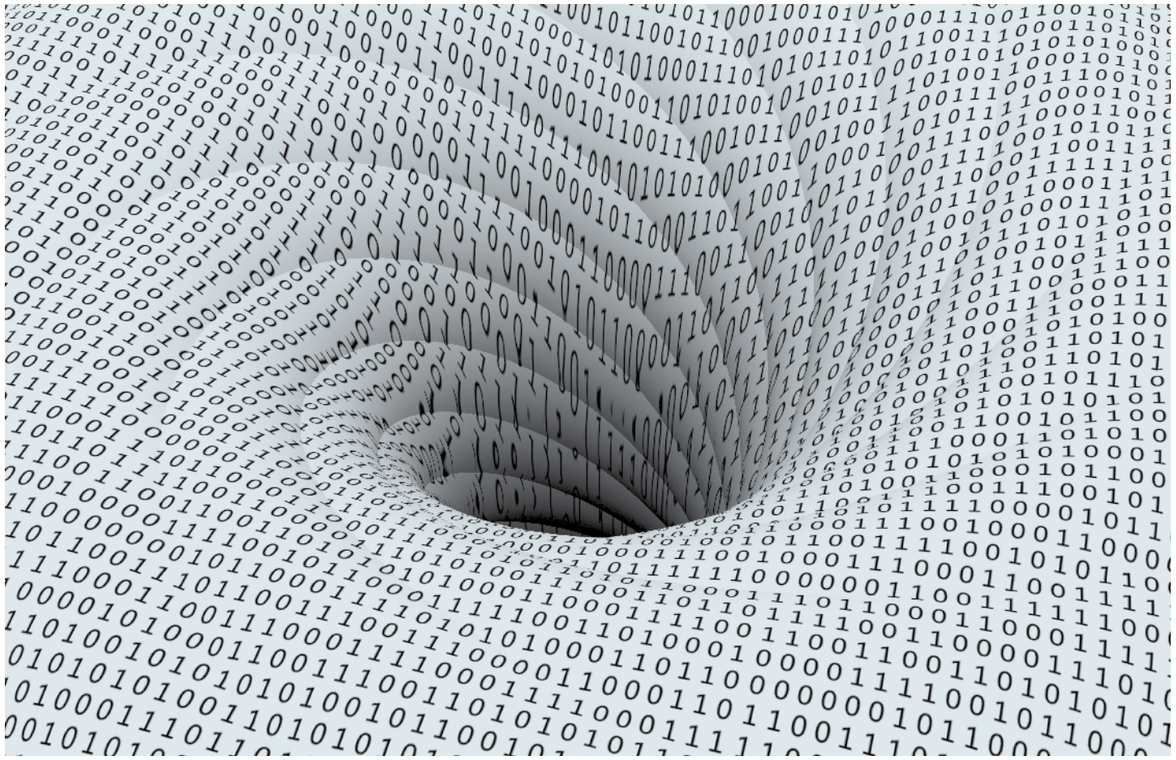

Editor´s Note...

A Numbers Game

"While it may be fair to contrast systematic and discretionary approaches, they by no means are necessarily opposites."

While the Nordic region braces itself and prepares for a long period of summer hibernation, at HedgeNordic we are wrapping up our final special report, before we too, head out to work up a fashionable tan.

One of the first areas HedgeNordic focused on, and gained significant traction and recognition on were Managed Futures, when we launched nearly ten years ago. Managed Futures are an area clearly associated with, and dominated by systematic investment approaches, or quant driven strategies. We wanted to look further, broader and deeper where else in the asset management business quant strategies are having an impact.

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What does it actually mean, to have a systematic trading model? Our "In Focus" section of the magazine lies on machine learning, and artificial intelligence, two segments that are playing an ever increasing role in quant driven strategies, asset management and our lives as a whole.

Over the years, two main approaches have evolved in active management: systematic and discretionary investing. To put it simply: systematic (often associated with the term 'quant') generally applies a more repeatable and data-driven approach, relying on computers to identify investment opportunities across many securities. A discretionary approach, in contrast, typically involves in-depth, human brain and hand-on analysis across a smaller number of securities and relies more on information that is not always easily codified.

The terms 'systematic', 'quantitative', and 'rules-based' are often used interchangeably and fade into another in some shades of grey. They, arguably, represent an investment approach that is often perceived to be in direct opposition to what a 'fundamental', 'discretionary' or 'stock-picking' approach may be.

While it may be fair to contrast systematic and discretionary approaches, they by no means are necessarily opposites. Indeed, both systematic and discretionary managers pursue the same objective and both can be fundamentally-oriented. In fact, they can often use very similar inputs, but in different ways, to try and achieve the singular goal of improving investment performance.

The primary goal for active managers is to generate excess returns through active risk taking — however, the way in which various managers do this can be quite different. One of these differences is about how they utilize information when constructing portfolios, whether systematically across a broad set of securities or discretionarily on a narrow subset.

A concentrated discretionary manager typically creates the opportunity for outsized excess returns, while a diversified systematic manager creates the potential for more consistent performance. Ultimately, investors should focus on identifying managers that can outperform — whether they happen to follow a discretionary or systematic process. While we believe that repeatable, transparent investment processes offer a long-run edge, diversifying across high-quality managers using both systematic and discretionary approaches is arguably the most reliable road to long-run investment success.

Wishing you a relaxed and happy summer, with some easy reading!

KAMRAN GHALITSCHI
CEO & PUBLISHER HEDGENORDIC

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Making Money From Mathematical Models


David Harding, Founder, CEO and Co-CIO, Winton Group

By David Harding

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This paper is a discussion of the scientific significance and nature of mathematical models generally, and in finance theory in particular; of the relation of such models to a postulated 'reality'; of the sufficiency of the empirical grounding of such models to the task of drawing useful inferences about such a reality; and of the danger of unwittingly propagating erroneous conclusions about this reality in the absence of such a grounding. Some suggestion as to how the current empirical grounding of mathematical modelling in finance can be enriched.

1. INTRODUCTION

There is a little remarked upon dissonance between the philosophy of mathematics and that of the natural sciences. Mathematics is an abstract philosophy with an essentially aesthetic nature. Many mathematicians and philosophers have asked whether it is best to describe mathematics as having been discovered or invented. Perhaps more pragmatic mathematicians would be inclined to follow Wittgenstein's advice and pass over in silence that of which they cannot speak! The choice between these options is one with no profound consequences for the practice of mathematics.

Natural science has no such incipient philosophical argument at its heart. The philosophy of natural science may not be generally well understood but it is, to my knowledge, relatively uncontentious.

The natural scientist observes naturally occurring phenomena and attempts first to classify and subsequently to model them (in a theory) by a process of metaphor and analogy. If such a description seems at first puzzling, we must reflect on the logic of the fact that the theory cannot be the reality; it can at best only be a near perfect simulation of that reality. At any time the reality to be modelled consists of the universe of recorded observations, a universe which as long as mankind continues to progress expands so that even a model in accordance with every known observation could not properly be described as 'true' in the sense that it is necessarily identical to the postulated reality.

The discipline which, in my opinion, has made the philosophy of natural science so productive for mankind is the agreement that such a model must be capable of producing empirically falsifiable predictions and must thus be capable of being subjected to an unbiased test of its value within its own conceptual framework. A theory's utility is then determined by the quality of the predictions it makes and the accuracy with which these accord with empirical observation. No natural scientist can ever really be excused, however, of believing or stating that such and such a theory is 'true' according to the most puritanical interpretation of that word, or 'represents reality' or other such sentiments. It is utility that is the distinguishing touchstone of the philosophy of natural science in its competition with other philosophies.

The mathematician does not, by necessity, share this philosophical basis with the natural scientist, and yet the startling practical successes of natural science over the past 300 years have been achieved by generations of natural scientists working with

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the 'armoury' provided by mathematicians and still being vigorously expanded today. The natural scientists have 'subverted' mathematics for their own modest but determined aims: to construct models with the greatest and richest power to illuminate and draw inferences about the nature of postulated reality.

The mathematician's criterion of virtue is by contrast an aesthetic one and when working with the natural scientist this should be emphasized. We may perceive reality as beautiful and mathematics as beautiful but it would not be logically correct to infer that mathematics is reality, that the elegant solution is necessarily the best.

This should be commonplace among natural scientists, but the success of the scientific method over the past 300 years is such that these essential philosophical foundations are insufficiently well remembered. A particularly grotesque mutilation of scientific philosophy is performed by those who claim that particular scientific theories are true 'to all intents and purposes'. Newtonian mechanics explained the movements in the heavens to a degree sufficient for all practical purposes. However, quantitatively speaking the tiniest chink in the accordance of the theory's prediction with reality was sufficient to open the way for the einsteinian revolution. The discovery of such a chink had to await the considerable technological advances in optics and instrumentation of the nineteenth century before it could be perceived. The atomic bomb is not a negligible consequence of the tiniest imperfection in a 'nearly true' theory. Out of a tiny inconsistency between observed reality and an aesthetically complete theory arose not just enormous practical consequences, but a revolution in our understanding of the relation between the natural sciences and the reality that is perceived as their subject. In science, as in other areas of life, ladders must be climbed only so as to be kicked away. The father of natural science was Plato, whose notion of an absolute reality capable of limitless investigation through reason has inspired centuries of effort to elucidate this reality. Yet Heisenberg's, as yet unrefuted, theory is arguably consistent with the idea that such an absolute reality can never be observed. The idea that models are nearly true or are true for all practical purposes must be rejected as forcefully as the idea that they are true. If they look true we must look for the explanation. For them to be true in the strictest sense demands the impossibility of an observation out of accordance with them; a position unworthy of further discussion.

> "The discipline which, in my opinion, has made the philosophy of natural science so productive for mankind is the agreement that such a model must be capable of producing empirically falsifiable predictions and must thus be capable of being subjected to an unbiased test of its value within its own conceptual framework."

It is the empirical success of natural scientific philosophy more than any other body of ideas that has made the modern world much more than a mere continuation of the ancient. The industrial revolution is Great Britain would have been impossible without the spread of natural scientific philosophy in the 17th and 18th centuries. In a letter to Adam Smith commenting upon The Wealthof Nations, dated 10 September 1759 Edmund Burke wrote, 'A theory like yours, founded on the nature of man, which is always the same, will last, when those that are founded upon his opinions, which are always changing, will and must be forgotten.'

Natural science provides an independent method of arbitration between views, and this more than any other factor has enabled the replacement of sterile conflict and assertion with constructive argument and benign progress.

On the human timescale, however, we must not fail to appreciate that the philosophy of natural science is still new. Political, theological and economic organization and activity have thrived through the long ages of history under the sway of less modest philosophies and where political and theological ideologies or economic interest have collided with the timorous ambitions of the natural scientist, it is often the latter who, in the short term, has had to yield. These philosophies and ideologies influenced by the competitive successes of the natural sciences have sought the company of mathematics, perhaps in an attempt to bathe in the reflected light of reason. But mathematics has not prospered in such company as it has with the philosophy of natural science, which has provided it simultaneously with a raison d'etre and a continual source of fresh stimuli. Mathematics does not need natural science, but it thrives on its company.

2. SCIENTIFIC METHOD AND MODELLING MARKET BEHAVIOUR

Now let us apply these thoughts, slightly randomly, to developments in the mathematical modelling of market behaviour. I have already referred to Adam Smith who was among the first to formalize a model of the growth of economic and social systems founded on the philosophy of natural science. For those who know of market economics only by ill-repute it may perhaps come as a surprise to learn that Smith's mode of construction, as Burke's words testify, was deeply empirical, founded on detailed and analytical observation of the nature of human society. From this construction, the establishment of freely determined market prices in both agricultural and manufactured goods emerges as the optimum method for establishing values where the aim is to foster the maximum rate of that quantity, economic growth, which is seen as a natural consequence of a society in which people are free to interact economically and when the rule of law and the defence of property are guaranteed. This model, its laws of supply and demand and its concept of the division of labour have played the role slightly akin to that Newton's laws of motion played in physics in the development of the science of economics since. But although Newton's ideas were taken up to extraordinary effect by those studying a nature that does not talk back, in economics as in other social sciences, progress has been held back by the sheer practical difficulty of employing the experimental method. It has rarely been possible to experiment in a controlled fashion with society as a whole, and when something resembling experimental conditions are created, the 'adjudicator' of natural science is unlikely always to be respected by the larger part of the jury. Thus, today rather than being seen as the 'progenitor' of economic modelling, in the way that Stephenson is the 'progenitor' of the steam train or Brunel the 'progenitor' of civil engineering, Smith is seen as a 'political' figure and his excellent, and in my opinion, proven, contribution, scientifically undervalued. This is not to take sides in the modern political debate which is often concerned with multidimensional problems beyond the scope of Smith's work but is merely to observe that Smith's models did give rise to empirically testable, interesting and often counter-intuitive predictions about the world and which in the messy social laboratory of the past three centuries have received far more support than contradiction. That the experiments took a long time to perform, that they are always necessarily less conclusive than controlled experiments and that any analysis made of them will not necessarily be accepted by social scientists are reasons progress in the field of social and political science has been so much less impressive than in the physical or biological sciences. In the physical sciences the object of study does not have a mind of its own!

I mention Adam Smith because his models were constructed long enough ago for them to have been tested for robustness under a wide range of conditions. The evolution of social systems proceeds at a slower pace than that at which we are nowadays accustomed to living and thus it is much more realistic to judge the usefulness of models developed some time ago, without

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“In economics and the study of markets there can be no more incorruptible measure of utility than profit accrued by arbitraging the predictions of a model against the common view (the market).“

prior knowledge, than it is to assess their possible contemporary equivalents. Had Smith lived through the subsequent centuries there would have been many occasions on which he would have been able to profit handsomely by exploiting the difference between his theories' predictions and the common opinion and that is the ultimate judge of the utility of his model, of its value as a scientific theory.

I have stressed that a theory or model is scientifically valueless unless it is capable of making empirically falsifiable predictions. In economics and the study of markets there can be no more incorruptible measure of utility than profit accrued by arbitraging the predictions of a model against the common view (the market). The quest to 'beat the market' is thus more than a venal desire for money or an egotistical desire to win, it is also a means of obtaining the most ruthlessly honest evaluation of the scientific utility of a model or method.

Speculari, the Latin root of the verb to speculate, has the literal meaning 'to observe'. And a study of speculation will show that most successful speculators can be well described as 'observers'. To be successful, this observation must of necessity be detached and unemotive and thus, where great social and moral issues are at stake, it is perhaps not surprising that this viewpoint should arouse some distrust and hostility among the general population (particularly when the speculator profits at a time of general discontent). Yet this detached observation is clearly in the spirit of the natural scientist and the act of speculating for money is in the spirit of the empirical scientist's restless yearning to add to empirical knowledge and put theories to the test. Thus, making money from mathematical models is in one sense less about the corruption of intellectual endeavour than about the appropriate statistical test of the utility of such models for the development of scientific theory.

3. THE UTILITY OF THE EFFICIENT MARKET THEORY

It is in this context that I wish to consider the scientific utility of the 'efficient market theory'. The various versions of the theory begin essentially by asserting that it is impossible to make money by applying mathematical modelling to the science of speculation. What, then, is its utility as a scientific theory? On the one hand its predictions of market price are of the null variety - that no better estimate of tomorrow's price than today's can be discerned - and not very interesting. On the other hand, a concrete prediction that future returns will be drawn from a known distribution whose parameters can be estimated appears falsified; the empirical evidence points to the return process in all markets being ultimately non-parametric and certainly non-stationary. Its great strength is that it is consistent with one of the most profoundly useful insights about market behaviour: it is very difficult to make money consistently. Such consistency, however, it not a unique feature of this model over a universe of alternatives.

What of the practical evidence? Because every major bank and securities house now has its option software and its rocket scientists surely they must be making money from the models thus indirectly confirming their utility. But how is this money made ? First through arbitrage - using the model to assess the relative value of various forms of derivatives of the same asset or assets - a test that is relatively insensitive to the crucial distributional assumptions underlying the theory; second, through what we may (not necessarily derogatorily) call merchandising: banks and brokers selling at marked up prices derivative instruments that can only be created because of the existence of the theory. These profits do not ultimately refute the theories' scientific utility. If this sounds contrived consider the case of portfolio insurance. Some made personal fortunes from selling advice based on the theory (in good conscience) but to compensate, after the market crash of 1987, their pension fund clients incurred losses greater than they otherwise would have done. Thus the widespread use, found for the theory, is not strong evidence of its scientific utility but more for its marketability. None of this is to denigrate the contribution of the theory towards improved practice in and greater understanding of investment but it is to point out sharply its limited ambition and limited utility as a scientific theory and to undermine the perception of confirmation its widespread usage suggests. It is no surprise of course that speculators should be in conflict with the theory because it explicitly denies the possibility of their existence.

4. CONCLUSION

Having aired my doubts I now have some positive comments on how to make money from mathematical models or perhaps more properly how I have observed money being made. I believe there are three distinct paths that can be followed.

1. Be a purveyor of derivative instruments or shareholder in such an activity. This has all the intellectual purity of selling vegetables!

2. Be a rocket scientist arbitrageur. The efficient market theory is sufficiently robust with respect to relative values and some very challenging mathematics has been required to unlock new arbitrage potential in the globalizing financial markets. This can be challenging and satisfying but its assumptions may be unsound.

3. Speculate, which I believe to be the intellectual front line. One may study and observe the world so as to seek phenomena amenable to classification and to form ideas as to the metaphors and analogies that are components of a model that can make interesting and falsifiable predictions.

The disincentive to a mathematician of pursuing course 3 is that observation and classification are not the mathematician's job! But any mathematician motivated by the philosophy of science will not find a shortage of opportunity in this course. Efficient market theory has at least partly driven the charlatan from the investment stage. Perhaps this has created the opportunity for the scientist to take to that stage and to push further back the frontier of ignorance for the betterment of humankind.

CTA Style Evolution

Kathryn M. Kaminski, Ph.D., CAIA and Robert W. Sinnott, CAIA - AlphaSimplex

“At the aggregate level, we find that managers have added more trading styles over time and that trend speeds have slowed down.”

Over the past few decades, the systematic CTA space has evolved as markets change, competition increases, and new tools and techniques are applied to find trends and other opportunities. Strategies and approaches that were once highly innovative have become more mainstream, more publicized, and better understood by investors. In this note, we use a set of over 50 systematic strategies to measure differences and themes in CTA styles both over time and across managers. Our approach allows us to document two key themes in the CTA space: trading speeds and style tilts. At the aggregate level, we find that managers have added more trading styles over time and that trend speeds have slowed down. We also find that style choices do vary across managers.

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Analyzing CTA Styles

Quantitative CTA managers trade a range of different identifiable strategies, commonly known as risk premia, in an attempt to capture certain features of market returns. The most common investment styles are momentum, carry, and value. The implementation of these styles can be either directional (dir) or cross-sectional (cs). Directional models allow for a net long position or net short position across time whereas cross-sectional models often have market neutral exposure over time.[1] Figure 1 provides a summary of these styles. Arguably, the most common strategy is long risk premia which involves simply holding an asset.

To encompass a wide range of potential style choices available to a systematic manager when creating a strategy, we consider four key dimensions:

(1) **Investment strategy or style** (momentum, carry, value, and long risk premia);

(2) **Implementation approach** (directional or cross-sectional);

(3) **Time horizon** (ranging from 2 weeks to up to 5 years);

(4) **Asset class allocation** (equities, fixed income, currencies, and commodities).

Given a manager's returns, we follow an iterative process to find the set of factors and their corresponding allocation tilts that best describes the return series (for more information, see endnote). The result of this process is a "factor representation" with risk loadings and selected factor sets to represent a CTA portfolio. These factor sets can then be used to better understand what styles, speeds, and asset class tilts may be driving the manager's returns.

Analyzing Styles Across Time

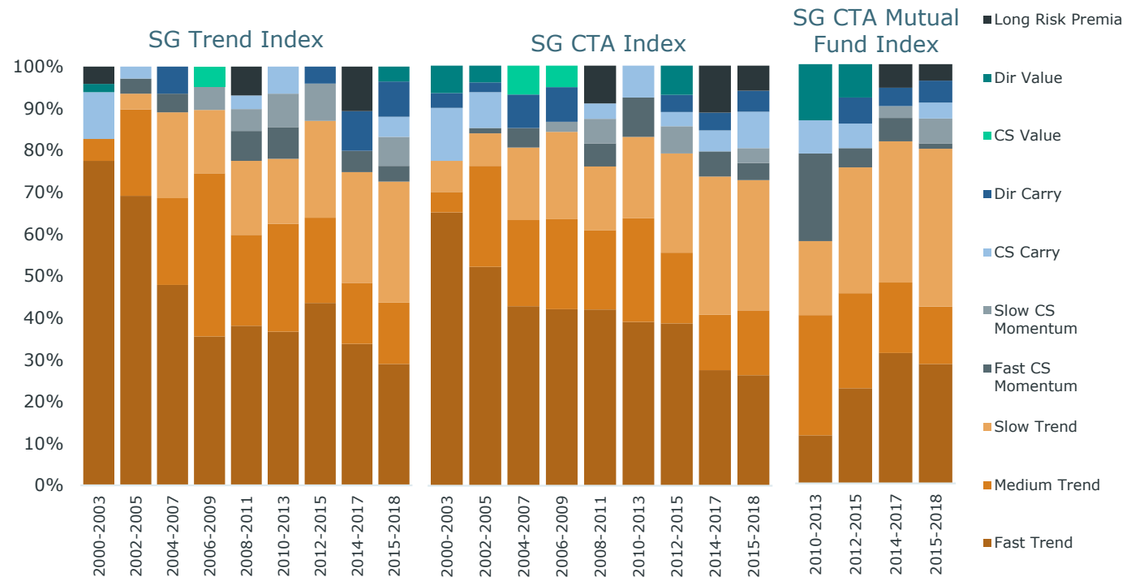
Over the last few decades, the CTA industry has grown from a boutique industry to one of relative scale. Some have claimed that over time CTA managers have evolved from pure trend into a more multi-style approach. One simple way to examine this conjecture is to consider how the average CTA's strategic factor weights and styles have changed over time. To do this we take short slices of CTA index returns and examine their "factor representations." Using the SG Trend Index, SG CTA Index, and the somewhat newer SG CTA Mutual Fund Index, we divide return histories into four-year intervals and examine how the style of CTA strategies may have changed. Figure 2 plots the style decomposition in percentage terms for each of these indices over time.[2] These factor loadings are grouped together by theme to simplify the 50+ possible factor choices.

Taking a closer look at Figure 2, we can make several key observations. First, the average speed of trend appears to have become more evenly diversified across time horizons. During the most recent period, the overall influence of long risk premia seems to be more pronounced in the SG CTA and SG CTA Mutual Fund Index. Outside of trend strategies, there appears to be a moderate amount of momentum, carry, and value being used in the CTA space.

Figure 1

Summary of common trading styles in Managed Futures.

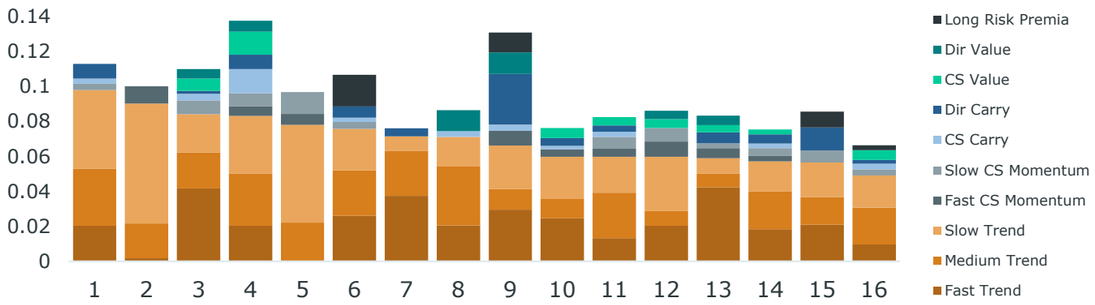
Figure 2: Style Factor Risk Loadings Across Time



Risk factor loadings grouped by style of trading for three CTA indices (SG Trend Index, SG CTA Index, and the SG CTA Mutual Fund Index). Factor loadings are estimated using daily return data over 4-year horizons for the period of 2000-2018. The SG CTA and SG Trend Indices began in 2000 while the SG CTA Mutual Fund Index began in 2010. Risk varies over time; the proportion of the total risk of each index explained by strategic factors as a fraction of the total risk explained by all factors is plotted for clarity. Source: Bloomberg, Societe Generale, AlphaSimplex.

From Figure 2 we can also see that since 2000 there has been a clear reduction in the speed across the space towards slower trend speeds. For the recent periods, programs in the SG CTA Mutual Fund Index have seemed to focus more on long-term trend (9 to 12 months) and short-term trend (2 weeks to 4 months) with medium-term horizon trend (5 to 8 months) showing less risk weight. For investors interested in the potential for "crisis alpha" or risk mitigation, several studies suggest that (1) faster trend speeds tend to navigate crisis better and (2) non-trend strategies tend not to be as successful in crisis periods as trend. The presence of long-only asset class risk premia also suggests the potential to be negatively exposed to any crisis event in exchange for better performance outside of crisis periods.

Figure 3: Mutual Fund Managers by Total Trend Loading



Risk factor loadings grouped by style of trading for 16 Mutual Fund Managers, ranked by overall risk weight to trend strategies. Factor loadings are estimated using daily return data from 2015-2018. Source: Bloomberg, Societe Generale, AlphaSimplex.

Comparing Styles Across Managers

Given the style drift over time across the industry, as measured using the index returns, we consider how style choices vary across a set of managers over the recent period. Using daily return data from 23 Managed Futures 1940 Act mutual fund managers from 2015-2018, we consider their representative factor loadings. Figure 3 plots the factor loadings for 16 managers with at least a 40% R-squared value from our two stage iterative process.[3] The Mutual Fund managers are ranked by their overall risk weight to trend strategies. From this graph, we can clearly see that some managers use more non-trend strategies than others, including cross-sectional momentum and strategies such as value or carry. There are several managers with long asset class risk premia exposure. The ratio between trend and non-trend strategies varies across the space. For example, Manager 2 has mostly trend driving returns whereas Manager 9 has a roughly even split between trend and non-trend strategies. Figure 3 also shows that the trend speeds seem to vary substantially across managers from fast trends to slow trends.

Figure 3: Risk factor loadings grouped by style of trading for 16 Mutual Fund Managers, ranked by overall risk weight to trend strategies. Factor loadings are estimated using daily return data from 2015-2018. Source: Bloomberg, Societe Generale, AlphaSimplex.

Summary and Conclusions

Systematic managers in the CTA space incorporate a wide range of trading styles across time horizons, implementation style, and asset classes. These styles vary both over time and from manager to manager. Using over 50 factors across trading styles, time horizons, trading approaches, and asset classes applied to CTA index-level return data, we estimate how CTA styles have evolved over time and find that (1) trend speeds have slowed down and (2) more non-trend and long risk premia seem to be present in CTA strategies in the recent past. These results represent the aggregate trends in the industry but may not be representative for each individual manager. We also consider daily returns for mutual fund managers and examine how styles vary from one manager to another. We find that the trend speed and ratio of non-trend strategies also vary across managers.

1) Managers may define market neutrality differently, e.g., sector beta neutral, volatility adjusted position neutral, or net position neutral.

2) Since the volatility profile for CTAs has come down since 2000, we use the percentage contribution for each factor to compare them directly.

3) Managers with low R-squared values or short history were removed from the evaluation, as the factor loadings do not represent the performance of these funds. The funds that were removed were often short-term only or have a short history.

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Endnote

Our factor specification is an iterative process that includes two main stages, inspired by classic Expectation-Maximization techniques. First, the entire factor set (50+ factors) is winnowed to an initial factor set using penalized non-negative regression. Second, these factors are fit, on a factor by factor basis, to determine the asset class allocation mixture for each factor that best describes the residuals of the fund/index return series after regressing the remaining selected factors. Finally, after each factor's asset class allocations are identified, a final non-negative factor selection process is used and factor weights that are no longer significant are dropped from the factor set. Non-negative regression helps deal with the high correlation across different factors where we assume that managers only go long quantitative strategies and do not go against the underlying investment strategies. This means the managers do not take the opposite sign of the classic set of risk premia strategies; the managers may take long or short positions.

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Technology and Responsibility

By Harold de Boer, Managing Director / Head of R&D, Transtrend

"The experience of living with the expanded powers of the techno-lifeworld calls for enlarged measures of responsibility."

Carl Mitcham

Transtrend aims to contribute to well-functioning, well-organized and reliable markets. This ambition plays a prominent part in our responsible investment policy. When we wrote this policy back in 2010 we dedicated a few pages to the role of active investors in the marketplace and how we strive to fulfill that role. But we didn't write a single word about the use of technology and the responsibilities involved. Which doesn't mean that we did not feel responsible for our technology and its potential impact – this just wasn't a big thing 10 years ago.

Since then the power of technology has continued its rapid expansion. Technology is changing our lives every second, often without us realizing it. And the general attitude towards technology is also changing. On one side we have the avid adopters, on the other a growing group of people who are becoming increasingly suspicious of technology. Especially the increased use of technology based on machine learning techniques – artificial intelligence – raises concerns. Are organizations still in control of what they are doing? Will humanity be respected by machines?

In and around the marketplace the impact of technology is scrutinized as well. And some market participants believe that computerized trading undermines the functioning of markets. A recent event that received some media attention, for instance, was the uptrend in the cocoa market early 2018, on which we provided some additional color via an

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earlier publication. We cannot deny that technology has changed market dynamics. Markets – and especially their participants – need to adapt to this new reality.

The public attention to the role of technology in markets – and its potentially undesirable impact – gained momentum since the 2010 Flash Crash. The market surveillance bodies of regulated exchanges saw themselves forced to re-evaluate and redefine their policies with regard to error trades, market disturbance and market manipulation, among other things. Supranational authorities also felt the need for new regulation to address the risks resulting from the use of technology. An example of such new regulation is the chapter on Algorithmic Trading that became part of MiFID II.

A fundamental question underlying all these new rules and regulations: Who is responsible? Should we regard people as the unwilling victims of machines? Or should we treat people as the responsible masters of their machines? To clarify our stance on this and related matters, we amended our responsible investment policy with the paragraph Human responsibility below.

In addition to this new section on technology and alongside a few smaller amendments we also added a section on trading (futures on) indices, which has been added to the paragraph on Price discovery.

Human Responsibility

Before we move on to the source of investment return and the role of investors in society, we'd like to clarify what exactly constitutes Transtrend. Yes, we are a Dutch company based in Rotterdam, managing assets of investors from all over the world and active in markets all over the world. But most importantly, we are a group of people. A group of specialists working together, sharing a passion for investing, and sharing responsibilities. As a systematic asset manager we use a lot of technology, process huge amounts of data, apply a technical & quantitative investment approach and use algorithms for trade execution. But at the end of the day, the responsibility and accountability for all of Transtrend's actions – and their impact – lies with us, the people constituting Transtrend.

Nowadays, it may often feel like technology is gradually taking over human responsibility – but that isn't really the case. A person driving a car is responsible for driving

> "Computers are exceptionally good in counting, but they will never be accountable."
>
> Harold de Boer

that car. That didn't change when cars got equipped with ABS. That didn't change when road maps got replaced by built-in navigation systems. And that didn't change with cruise control. In fact, this responsibility will grow exponentially when cars become even more autonomous, for instance due to the application of self-driving technology.

The crucial element: no matter the level of sophistication, technology lacks awareness. It can be amazingly efficient in achieving the specific purpose and goals it has been designed for, but it does so in a completely unconscious way. Which is actually part of its efficiency – its activity is never interrupted by second thoughts. Technology can be compared to a dog. If trained to chase strangers away from your property, it will also chase the distant family member who is bringing you a surprise visit. That's not really a problem as long as the dog only barks. But it becomes a serious responsibility if the dog is also trained to bite.

What applies to technology in general also applies to the increased use of technology in the financial and commodity markets. The more people rely on technology in their decision-making process and the execution of their decisions, and the more sophisticated and autonomous this technology becomes, the greater the human responsibility for the well-functioning of the technology used.

But who, at the first instance, should be responsible then? Is it the user of the technology? The owner? Or the manufacturer? This is not always a simple matter. Our baseline: Technology does not do anything without someone allowing it to. Therefore, "It just ran out of control!" is no valid excuse for the person who is expected to control the technology. From a responsibility standpoint, the person to turn to should be the user. Going back to the car example: someone who gets hit by a car should be assured that the person driving the car will take all responsibility for the accident (assuming the person who got hit is not to blame). Whether or not the driver wants to seek redress from the owner of the car or the car manufacturer does not change his responsibility towards the person who got hit.

At Transtrend, we hold ourselves fully responsible for all technology we use. That's an important reason for designing, developing and/or installing all technology at the core of our business ourselves. And also for closely monitoring its functioning, keeping a keen eye on potential undesired (market) impact. We expect the same level of responsibility from other market participants. When the functioning of a market is temporarily disrupted due to a 'computer glitch', for instance, we believe it's fair that the market participants who are using software that caused the disruption shouldn't be compensated for their losses if their software did precisely what they could have known it would do in the specific circumstance. And surely not at the expense of other market participants who were not responsible for the software used. We hold ourselves responsible for the behavior of our dogs. We expect other market participants to take full responsibility for the behavior of their dogs.

We aim to invest in a responsible manner. At Transtrend, this means being an active investor, conscious of the role we have in the marketplace, aware of the impact we can have on markets, and aware of the fundamental role that markets have in our society. Our use of technology doesn't replace our responsibility but increases it instead.

"We don't make claims that our machine learning models are supernatural, however, they are equipped with an ability to detect patterns in financial markets that are deep, non-linear and extremely difficult to find for humans."

Martin Källström

Partner and Senior Managing Director – Lynx

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The Journey Towards Constellation

Lynx is set to launch its first pure play endeavor into machine learning – a strategy that has been in the making for a decade.

By Kamran Ghalitschi – HedgeNordic

Artificial intelligence, AI, has been around as a scientific area of research since the 1950s. However, it's not until recent times that AI and its subset machine learning, has been described as the hottest thing in tech, with practical applications such as self-driving cars around the corner – all thanks to ever-increasing access to data and the exponential growth in computer processing power.

A quick look at Google Trends, a website that analyzes internet search queries, shows that the interest in machine learning has more than quintupled in the past five years. This might suggest that we are at peak interest in the phenomena of machine learning.

As Lynx is set to launch Lynx Constellation, in the fall of 2019 it might look like its jumping on the artificial intelligence-bandwagon. In fact, Lynx has actively worked on machine learning models since 2009. It can even be argued that the appeal of creating a machine learning model for predicting market prices played a role leading up to the very foundation of Lynx in 1999. It was in the early 1990s that one of Lynx founders, Jonas Bengtsson, came across an article about physicists and mathematicians working on a machine learning method for predicting financial market prices. Bengtsson, who was studying for a PhD in Atomic Physics, thought that he might be in a comparatively unique position to explore the possibilities outlined in the article given his personal interest in science and the stock markets. It was not until a few years later though, whilst a quantitative analyst at Nordbanken, that Jonas Bengtsson along with Martin Sandquist, attempted to experiment with so called neural networks, modeled on the way the human brain operates, to achieve purchase signals for financial instruments.

"The results at that time were not what we hoped for which lead us to focus on more conventional models", says Jonas Bengtsson.

The foundation for Jonas Bengtsson and Martin Sandquist, along with CEO Svante Bergström, to set up Lynx in 1999 was however established during their time at Nordbanken. Though initially using traditional quantitative models, a keen eye continued to track the advancements in machine learning according to Jonas Bengtsson.

"In 2005 we saw an increased amount of works on the topic of AI and machine learning as advancements in technology was being made. This led up to a project in 2009 in order to explore the potential of utilizing machine learning techniques in the Lynx Program", says Bengtsson.

This initiative coincided with the first hiring of a machine learning expert who was recruited from Google. In June 2011 the first machine learning model was deployed into the Lynx program.

The Stars have Aligned

The Lynx program is currently the longest running active hedge fund in Sweden and now includes twelve machine learning models. Martin Källström, partner and Senior Managing Director at Lynx, believes that the time is right for broadening the company's offering with its third separate strategy, the machine learning fund Lynx Constellation.

"The total number of machine learning models in the main program has increased over the years and we have excess capacity that is not being used by the flagship program. As we are determined to retain the trend following dominance in the Lynx Program, with the ability to counter market downturns, the machine learning models have therefore been capped", says Martin Källström.

The machine learning components of the main program has been an element that has differentiated Lynx from its peer group. According to Källström, machine learning is a part of the program that's frequently discussed with investors, particularly given the strong performance of the models.

"We have a surplus of capacity in models that have been generating attractive, differentiated risk-adjusted returns, so, simply put, we believe the time is right for launching Lynx Constellation and it's an opportunity for meeting client demand and interest", Källström believes.

Källström, who previously was head of alternative investments at Swedish Pension Fund AP1, says that there are few if any similar strategies globally using advanced machine learning algorithms to predict futures markets.

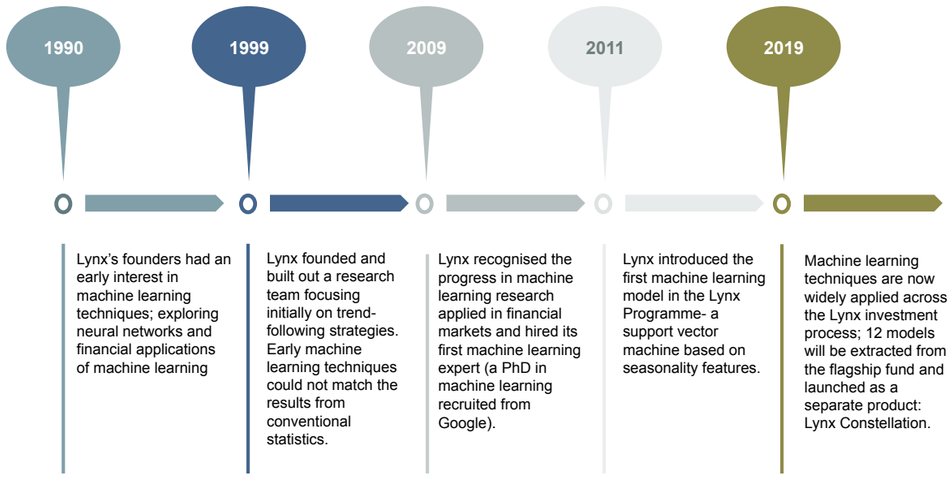
"The more established managers offering funds utilizing machine learning techniques are typically trading equities with a big data approach, this strengthens my view that Lynx Constellation will be quite unique."

What's in a Name

Lynx Constellation refers to a pattern of stars in the northern hemisphere. In several mythologies the Lynx-cat is considered as having supernatural eyesight. So, when the Polish astronomer Johannes Hevelius identified and named the star pattern in the 17th century he gave it the name Lynx due to its indistinct pattern as he challenged future stargazers to find it, saying that only those with great eye sight, the 'lynx-eyed', would be able to detect it.

"We don't make claims that our machine learning models are supernatural, however, they are equipped with an ability to detect patterns in financial markets that are deep, non-linear and extremely difficult to find for humans", says Källström.

The journey to Lynx Constellation



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Lynx Approach to Machine Learning

The concepts and applications surrounding AI and machine learning and how they can be used in asset management are understandably shrouded in mystery for some. Traditional quantitative models are programmed much like any computer program – consisting of a set of rules or instructions. The information needed for a computer to distinguish that a digital 8 is in fact an 8 is limited to a single byte of information. Now, imagine instead that you would have a computer identify pictures of crosswalks, store fronts or cars. The amount of different ways in which these objects might look like are near endless and so would the corresponding programming needs be.

With the help of machine learning techniques, the task of identifying more complex objects or dependencies between objects becomes manageable by means of using mathematical statistics aimed at estimating whether for example something is a cross-walk or not. The more samples that the computer would be given, the greater the likeliness that the computer would be able to distinguish useful rules to identify a crosswalk correctly.

When Things get Noisy

So, what is the equivalent of a crosswalk in finance? This is where things get tricky, or rather, noisy. In science the term signal-to-noise ratio is defined as the ratio of a signal power to noise power. Financial markets can be described as extremely noisy, with a very low signal-to-noise ratio.

"The low signal-to-noise ratio is inherently present in financial markets and it impacts every investment manager in a profound way. In essence it means that the prediction accuracy of any investment decision will be much lower than what is typically the case in the physical world. Combining the domain knowledge of financial markets, quantitative trading and machine learning has been essential to our success", says Källström.

Over the years Lynx has developed a robust process for introducing new machine learning models in a highly collaborative manner. At launch the twelve underlying models in Lynx Constellation will be trading in approximately a hundred different financial instruments with wide diversification cross asset classes. The models are tasked to identify complex non-linear patterns and relationships between multiple datasets/features. Therefore, a model may build positions like a trend-follower at one point, a contrarian trader at another, and a relative value spread trader at yet another all dependent on historical corollaries and co-dependencies. The perfect model, a ten so to say, would be a model that is complex while at the same time making sense from both a logical and a statistical approach with a high signal-to-noise ratio not easily detectible by others due to its complexity.

Two main components stand out in Lynx approach to machine learning over the years;

1. Analyzing large data sets

– Lynx focuses primarily on analyzing large data-sets that they can observe independently or obtain from multiple providers, as data quality is an imperative. While experiments have been made with alternative data sources, the results have been less compelling.

– Attempts to reduce noise in the data is accomplished by employing dimensionality reduction techniques, such as principal component analysis – a process of reducing a large set of variables into smaller ones while keeping most of the information in the large set and avoiding random variables.

2. Advanced algorithms

– Advanced algorithms are designed to detect multivariate, linear and non-linear relationships by learning from features; models retrain and adapt to new regimes.

– Initially highly curated, Lynx has gradually moved towards more complex techniques having gained confidence in the approach.

– Lynx now utilizes powerful and deep neural network enabling the models to detect complex dependencies.

Anoosh Lachin, Portfolio Manager at Aspect Capital

Alternative Data and Macro Trading

How to be a Connoisseur of Data

By Hamlin Lovel – HedgeNordic

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How can macro hedge fund managers choose amongst thousands of alternative datasets?

"Most alternative datasets are geared towards trading single securities, but we want market level data covering whole currencies, countries or regions, which is relevant to systematic macro trading", says Aspect Capital portfolio manager Anoosh Lachin.

For any and all data used by Aspect, "the first criterion is the smell test: is it reasonable, ethical and legal. Even our trial data needs to be approved by the legal department. We are very strict and careful in rejecting data where we cannot get comfortable with where the insight comes from", says Lachin. "The next step is to try and secure enough data on a trial basis to test its efficacy, and this can prove surprisingly difficult. We cannot understand why some vendors are reluctant to give us historical data. We are not asking for the very recent data, and are not going to reverse engineer what they do. Fortunately, this is changing a lot because vendors realize that we will not proceed with the data without testing it", he continues.

Once Aspect has secured data, its research agenda starts to prioritize the testing process, which is comparable to traditional data in terms of productivity. "We have been testing more data than ever before, but our hit rates have not changed. Only about one in ten or one in twelve hypotheses tested find their way into the portfolio. It is more interesting to work with alternative data, but from a value perspective it yields the same kind of efficacy", he explains. The systematic macro team use traditional, hypothesis-based, statistical time series techniques to test both traditional and alternative data.

Alternative data does not necessarily cost more than some traditional datasets, such as data behind pricing option surfaces, which can be very expensive, but cost efficiency always needs to be heeded. There are also internal costs, which can include cleaning the data. Some fund managers outsource part or all of the data scrubbing function to data engineering companies, but Aspect cleans and manipulates the data in house, with the help of a team of data scientists, who are very sought after in the job market right now.

Alternative data can be updated somewhat more often than traditional data. "When I started in the industry 20 years ago, we used to rebalance systematic macro portfolios monthly. It then moved to weekly, then daily, and we now do so three times a day", says Lachin. "We are experimenting with more and more intraday datasets.

"We have been testing more data than ever before, but our hit rates have not changed. Only about one in ten or one in twelve hypotheses tested find their way into the portfolio."

"...four years of daily data could be better than eight years of monthly data..."

Some alternative datasets, are by their nature new so have shorter histories. Here, the number of observations as well as the length of the history are relevant, so "four years of daily data could be better than eight years of monthly data", explains Lachin. At the same time, he acknowledges that, "any datasets shorter than twelve years will not have included the great financial crisis (GFC), and a qualitative judgement would need to be made about how they might perform under such conditions".

Though some alternative data can be sourced from internet, and Aspect does employ a "data scout", the firm has not found web data very useful. Aspect does not disclose which data vendors it is working with, but generic examples of types of data providers could range from custodians, to travel companies, or those monitoring shipping traffic. Idea generation on the alternative data side can come from conferences, and Aspect recently participated in the CME Group's Uncorrelated Investor Forum, held in conjunction with The Quant Group on May 22, 2019 in London.

Alternative and traditional data

Some managers claim to derive most value from alternative data when it is combined with traditional data, so that the whole is greater than the sum of the parts. "We are finding alternative data more useful to provide more timely verification of relationships that are known to exist, based on traditional data where alpha has decayed due to delays or the low frequency of data.

The systematic macro strategy delivered c.15% in USD in 2018, and received awards including The Hedge Fund Journal's "UCITS Hedge" award for best performing UCITS launch. The systematic strategy now has assets of over USD 500 million, in managed accounts and two comingled vehicles – a Cayman fund and an Irish UCITS, which are run pari passu. The strategy was launched in 2017 after Aspect hired a team of three from Auriel Capital in 2016. The systematic macro team has since then doubled in size to six individuals. "We enjoy the luxury of focusing exclusively on research, safe in the knowledge that other functions such as operations, compliance and execution are handled by experts in their own fields", says Lachin.

Aspect is agnostic on the direction of future research into alternative data. "We have a promising research agenda which will hopefully yield some interesting new models for the strategy" reveals Lachin.

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Enigma, the German cipher machine created for sending messages during World War 2. Enigma's settings offered 150,000,000,000,000,000,000 possible encryptions. On display in Bletchley Park, Milton Keynes, Britain

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Machine Learning and Artificial Intelligence

By Hamlin Lovell, HedgeNordic

Growing adoption in front, middle and back offices

The earliest use of machine learning as a concept has been credited to UK wartime codebreaker, Alan Turing, who devised a machine called Bombe, which cracked the Nazis' Enigma code. The earliest use of the phrases "Machine learning, and "Artificial Intelligence", probably date back to the Dartmouth Conference of 1956, organized by computer scientist, John McCarthy. The earliest image classification system may have come a year later in the form of Perceptron, while the first natural language application might have been discovered in 1964, and applied to algebra. A notable fictional manifestation of AI was the talking computer named "Hal" in Stanley Kubrick's 1968 movie, entitled "2001: A Space Odyssey", which was at the time classified as "science fiction".

Techniques were applied to robots in the 1960s and the early 1970s, and then progress slowed down until the mid-1990s – a generation that has been dubbed the "AI Winter". Interest perked up when IBM's Deep Blue machine defeated Garry Kasparov at Chess in 1997 and growing computer power allowed internet companies such as Google, Amazon and Baidu to apply techniques to mine vast amounts of customer and search data.

The first hedge fund managers using AI around the same time are thought to have included Jim Simons' Renaissance Technologies (RenTec), and David Shaw's D.E.Shaw. It is probable that funds were experimenting with AI/ML techniques some years before they began talking about them; it is typical for systematic and quantitative funds to "incubate" new techniques, often using proprietary capital, for a number of years before rolling them out to external investors.

Pure play or partial ML/AI

Over 1,000 systematic and quantitative hedge funds now exist (1,360 according to Preqin), but one should not assume that they are exclusively using ML or AI techniques. Though an AI hedge fund index - the Eurekahedge AI hedge fund index – now exists, it has just 16 constituent funds, and "pure play" ML or AI funds are thought to be rare. They are often said to include Sweden's award-winning Taaffeite Capital Management; Hong Kong-based Aidiyia Holdings, or Cerebellum Capital and Numerai, which are both located in San Francisco, near the tech hub of Silicon Valley. Also US-headquartered, Millburn Ridgefield Corporation, which was one of the first trend-following CTAs back in the early 1970s, has been gradually adapting its systems to the point where 100% is now based on statistical or machine learning, as of 2019.

If pure AI remains rare, Barclayhedge's July 2018 Hedge Fund Sentiment survey found over half of respondents using ML/AI to inform investment decisions, with over a quarter using it for trade execution. A significant proportion have just started using it over the past year or two. A 2018 Greenwich Associates survey also found 56% of managers were planning to integrate AI into their process. Managers including multi-billion shops, Man Group, Winton and Aspect Capital in Europe, and Two Sigma and Acadian Asset Management in the US, are applying it selectively.

It is not only systematic funds who are using AI. Many managers that also run discretionary strategies, including Blue Mountain, are also hiring teams of data scientists to crunch data and inform both systematic and discretionary investment processes. And at groups such as Man Group, there can be valuable idea-sharing between the systematic units (Man AHL and Man Numeric) and the discretionary part (Man GLG). Some erstwhile discretionary managers may have even morphed into quants: Paul Brewer's Rubicon Capital Management reportedly shut down a discretionary macro strategy, but is still running an AI-based strategy.

"Though an AI hedge fund index - the Eurekahedge AI hedge fund index – now exists, it has just 16 constituent funds, and "pure play" ML or AI funds are thought to be rare."

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AI, ML and data types

A key use case of ML/AI is turning 'Big Data' including unstructured data – such as satellite images, news, or social media postings – into structured data that can be more easily used to generate trading signals. For news or corporate earnings releases, Natural Language Processing (NLP) techniques can be used. Indeed, some managers who espouse ML/AI, also enthuse about alternative data, but the two are quite different: the data is the fuel, and the technique is the engine. It is possible to apply ML/AI to traditional data, or to apply traditional, hypothesis-based analysis to alternative data.

AI is also being used to select funds and managers, by firms including FQS, which was set up by Robert Frey, who worked at RenTec in the early days. Multi-manager platforms can also use AI to assess individual traders.

None of these fashionable new techniques are guaranteed to make a profit however. Many hedge funds shut down after a few years, and ML/AI based strategies are no exception. Large teams of highly trained scientists, sometimes including eminent academics, have devised models that lost money. New asset management companies, and funds within larger platforms have been closed down. It is natural that any new field of research will experience some trial and error, but AI/ML might have a higher success rate when applied to non-investment functions.

Back and middle office

EY's 2018 Global Alternative Fund Survey (previously named its Global Hedge Fund and Investor Survey) has identified that AI has seen the most spectacular growth in front office functions – 300% year on year. But the survey finds it is also relevant to the back and middle office processes, such as confirmations, reconciliations and regulatory reporting.

Many other service providers, including most naturally technology firms, and also custodians; administrators; depositaries; shadow accounting firms; and providers of outsourced back and mid office solutions, are developing AI/ML solutions.

The back office may be more amenable to AI/ML because financial markets are "noisy", in the sense that it is difficult to separate signals from random noise when hundreds of factors including "unknown unknowns" could affect asset prices. But other problems in a back office environment, such as confirmations, reconciliations or currency hedging, are much closer to being what mathematicians call a "closed form solution".

It is possible to pre-define most, if not all, reasons for trade breaks, or errors in reconciliations or currency hedges. The glitches could come from power cuts; internet outages; inconsistent naming conventions; erroneous ISIN codes, or inverted exchange rate quotes, for instance. And a computer program could be written to identify these and other sources of errors, reduce human time spent, and speed up NAV calculations. The program could be trained to recognize recurring patterns in the data, and in some cases, automatically correct them. In other cases, some manual human intervention may still be needed to investigate the problems.

Office furniture

Indeed, there are still limits to the applications of computing power and paradoxically it is some apparently simple tasks that may elude automation. What follows may sound flippant but it makes a serious point. Assembling office furniture from IKEA could take advanced robots half an hour, and involve errors and broken parts, according to 2018 experiments in Singapore.

The reason is that manual dexterity cannot yet be programmed into a machine. Humans and other animals learn manual dexterity through trial and error when they are young, making millions of movements and often falling over before finding their balance. Though computers have been programmed to learn the rules of Chess – and more recently in 2016, Deep Mind's Alpha Go beat champion Lee Sedol at a more difficult game, Go – an office table can be more reliably and efficiently assembled by a human being, or possibly another primate, such as a chimpanzee.

Björn Österberg, CIO and Head of Research – IPM

Lars Ericsson, Acting CEO – IPM

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By Hamlin Lovell – HedgeNordic

GLOBAL MACRO: SYSTEMATIC OR DISCRETIONARY?

Within the tactical trading space, CTAs were traditionally systematic and used technical data while global macro funds were discretionary and used fundamental data. These boundaries have become blurred in many cases as managers broaden out their data inputs and blend data types - and some discretionary managers have quantitative sub-strategies. IPM – Informed Portfolio Management, which marked its 20th anniversary in 2018, has been consistently systematic and fundamental. IPM's approach differs from traditional, discretionary fundamental macro managers in many respects, but also has some overlap.

"As a systematic manager, I believe we have a broader view of the economy across all geographies and asset classes, whereas discretionary managers are often more focused on a few particular themes that are in vogue at the moment", says IPM's CIO and Head of Research, Björn Österberg. IPM, which now runs the largest liquid single hedge fund strategy in the Nordics, nearly always has active positions in all the markets it trades: equity indices; volatility index; government bonds; developed market currencies and emerging market currencies. Positions are driven by a wide number of themes, whereas some discretionary macro managers can be concentrated into four or five themes.

This is because, "IPM's models are designed to identify a broad set of inefficiencies that may be off the radar screen of discretionary managers looking at big themes", he adds. "IPM focuses on items out of the spotlight", says acting CEO, Lars Ericsson (the new CEO, Arne Hassel, starts in July).

"Our models are also based on a consistent view of historical relationships between fundamentals and asset prices, whereas discretionary managers are more likely to be forming new expectations based on beliefs about the future", Österberg continues.

When market regimes change suddenly, the best discretionary managers may have an edge. Österberg acknowledges that good discretionary managers may be adept at interpreting new events, such as Trump's election victory, or other political surprises, and they may outperform during such phases. Equally, a potential pitfall of discretionary investors, identified by behavioural finance, is overconfidence: "discretionary managers may be tempted to form an opinion in situations where they do not have a comparative advantage, such as political or geopolitical events where it is hard to claim an informational edge over the aggregate market", he says.

"We are very theory-based. When we model things, we always make sure we incorporate a prior belief."

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"Discretionary managers may be tempted to form an opinion in situations where they do not have a comparative advantage, such as political or geopolitical events where it is hard to claim an informational edge over the aggregate market."

Positioning

IPM is also different from directional discretionary macro managers in that 85% of IPM's strategy's risk budget is based on relative value, with only 15% taking an outright, directional view. IPM's four families of relative value models take views within its four asset classes, and also take care to avoid accidental beta bets which can come about through exposures such as the currency carry trade. "For instance, going long of emerging market currencies has an implicit beta of 0.5 to global equities", explains Österberg. IPM's directional sleeve can however result in the portfolio becoming net long or net short of emerging versus developed market currencies; equities; bonds, or the VIX, but these wagers are fairly small.

Models

IPM's four families of models contain a total of 85 distinct ideas. The number has grown over time and each individual idea evolves over time.

Two of IPM's families of models – valuation and risk premia – gauge fair value, yield and income rather than predicting market direction. The allocations to models move up and down according to the opportunity set. For instance, the risk premia models have a greater weighting when risk premia are higher, whereas other managers often size position based on risk contribution. IPM's opportunistic approach to risk-taking is probably more typical of a discretionary manager whereas many systematic managers target constant volatility.

IPM's biggest model family is macroeconomic, based mainly on traditional economic data such as trade and leading indicators. The market dynamics model acknowledges that investment decisions are not always driven by hard economic data – and therefore looks at risk sentiment and flows.

IPM provides transparent performance attribution, including by asset class and model. In recent years, a short stance in the Swedish Krona has been a big winner for IPM. In 2019 year to date the strategy's winning positions have included longs in the British Pound, Mexican Peso and Russian Rouble, paired against shorts in other currencies. Its losing positions have included being long of European equities versus US equities, and being short of Australian Government bonds vis a vis other government debt.

Data and modelling

Data inputs are one area of common ground between IPM and discretionary macro managers. IPM's fundamental data inputs include macroeconomic releases, prices, news, sentiment, estimates, and forecasts.

"Even with nowcasting, the data is rather low frequency and the information content is sparse and slow moving", says Österberg. This most naturally explains why IPM tends to trade over multi-month time horizons.

The time lags and gaps in data also mean it does not make sense to follow, say, an unsupervised machine learning/statistical learning approach, which might 'let the data speak' and let models identify possible relationships between data and markets. In common with a typical discretionary manager, a plausible and intuitively sensible hypothesis is the starting point for IPM's models. "We are very theory-based. When we model things, we always make sure we incorporate a prior belief", he points out.

The data landscape is rapidly evolving. "Our database is growing exponentially, with a lot of new datasets becoming available, and we have a whole team dedicated to scouting for new data".

IPM makes use of some alternative datasets, including unstructured data such as satellite images, which have been structured by data vendors. "We plan to add at least four new datasets this year", he says. Even so, the alternative data basket is less than 10% of the total. Some 70% of data inputs are classic economic data, and 20% are more advanced economic data..

"We expect data costs will continue to rise. These costs are paid out of management fee income", says Ericsson.

Portfolio diversification

"Systematic and discretionary macro are complementary approaches", says Österberg. Indeed, IPM's return profile has historically shown no correlation to global macro, (and nor to CTAs, other hedge fund strategies, nor conventional asset classes). IPM is also lowly correlated to nearly all other systematic macro managers.

"But this is just one of the dimensions. Historically our primary objective was to help diversify traditional portfolios of equities and bonds. Nowadays the lack of correlation versus other diversifying strategies is probably more important.", he points out. Many allocators will place IPM in their systematic, tactical trading bucket, which could include systematic macro, CTAs, short-term traders and possibly strategies based on machine learning and artificial intelligence).

IPM's client base now spans the globe, including institutions in the US, Canada, Australia, and China.

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An Orchestra of Agents: Upcoming Swedish fund applies AI to FX markets


Left to right. Hugo Langéen (CIO, Co-founder), Niklas Höjman (COO, Co-founder), Hans Nelfelt (CEO), Jimmy Carlsson (CTO, Co-founder), Håkan Gullstrand (CSO)

By Jonathan Furelid - HedgeNordic

A five-person team out of Malmö looks to create the next generation hedge fund by applying machine learning algorithms to the FX market. Talking to the company´s CTO, Jimmy Carlsson, HedgeNordic took a deep dive into the world of CenturyOne – the soon to be launched AI fund powered by Century Analytics.

"We have just received approval from the Swedish Financial Supervisory Authority allowing us to officially launch the fund. We are currently in discussions with various institutional investors regarding seed money and our goal is to have the fund up and running in the autumn of this year", Jimmy Carlsson, one of three founding partners of Century Analytics, explains.

Carlsson, a serial entrepreneur having 15 years of experience developing AI-applications for the military defence industry as well as machine learning systems for FX trading, met with the other two founding partners Hugo Langéen and Niklas Höjman while they were working on setting up what is today Century Analytics.

Höjman worked for Goldman Sachs in London but decided to head back home to work on a system for FX trading together with Langéen. Langéen and Höjman had met while Höjman was finishing his university degrees in law and economics. They had a mutual passion for trading the FX market and started a collaboration to develop systematic trading strategies around it.

The career path of Langéen deserves a word on its own. Starting out as a professional bassoon player in the Malmö opera orchestra, he began playing online poker to make ends meet. By applying systematic strategies using big data and behavioural analysis, he managed to become one of the world's best high-stake poker players. Having played professionally for almost a decade, he went on to manage his now sizeable portfolio in the FX market.

¬"We come from different backgrounds but with some obvious linkages. Höjman and Langéen with a deep knowledge of currency markets and myself adding the technological backbone of machine learning systems to

> "It is not a question of man versus machine but rather how machines and humans can interact in order to create a self-learning system that look at the relevant parameters."

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exploit opportunities that arise in FX markets, mainly as a result of psychological factors," Carlsson says.

Since the firm was founded, additional persons have been added to the team. One addition is the firm's CEO Hans Nelfelt, with extensive background from the finance industry as a former COO of the Swedish investment Bank Carnegie and CEO of Carnegie's Swedish Fund Management Company. "The additions are important pieces in becoming a market leader within the field", Carlsson adds.

MACHINE LEARNING APPLIED TO FX MARKETS

At the core of the trading system underlying the CenturyOne fund is what the company describes as an orchestra of "agents" – many of which use machine learning to become experts on specific tasks. The agents in turn report to a supreme agent called the "conductor" who makes optimized decisions based on the information received by the agents.

"The conductor is a so-called reinforcement learning system, which means that it operates within a defined set of choices. For every correct decision it takes, maximizing the expected return while controlling for risk for each trade, it gets rewarded. As a result, the system learns from its actions as it always strives to increase its reward. Over time it becomes a self-improving system," Carlsson explains.

The so-called agents are looking at everything from historical extreme points to changes in volatility and price momentum. In essence, what these agents aim to do is describing the market dynamics, which in turn helps the conductor to make informed trading decisions based on psychological factors that trigger price movements. The conductor never looks at price data but relies entirely on what is reported by the agents, resulting in a system with two levels of information.

"We have found this to result in more robust investment decisions taken, being less affected by random events in the currency market," Carlsson says.

The system trades intra-day and very seldom holds a trade from one day to another. It currently trades some of the most liquid currency pairs. Answering the question on why these currency pairs were chosen, Carlsson says: "Due the low transaction cost and the vast amounts of data generated by these currency pairs, it translates into a strong capability for us to deliver an attractive risk-adjusted return."

MULTI-FACETTED RISK MANAGEMENT APPROACH

Century Analytics employs a fully automatic risk management system that continuously monitors the fund's exposures, especially before and after a trade is executed. The primary focus is to limit downside risk and to avoid cluster risk. There is no discretionary override in times of extreme market moves but there is a "kill all" functionality that could get triggered should market action merit such action.

"We are extremely diligent when it comes to risk management. Before entering a position, the risk-adjusted exposure and the leverage used is closely monitored in order to stay within pre-defined risk budgets. We also monitor the correlation structure between currency pairs closely to make sure we don't overestimate diversification effects. We hold no positions over weekends in order to limit gap risk", Carlsson explains.

MAN AND MACHINE

According to Carlsson, one of the common pitfalls in building a self-learning trading system is to not understand the foundation it is built upon. This will eventually make it very difficult to understand what market characteristics that makes the model trigger buy and sell orders, translating into an over-engineered black box strategy.

In order to overcome this problem, Century Analytics guides the models to find relationships of market parameters that have a logical foundation often based on sound economic principles, an exercise that, according to Carlsson, requires extensive market experience. These relationships are then continuously evaluated through an iterative process to make sure that the model captures the market inefficiencies it is supposed to.

"It is not a question of man versus machine but rather how machines and humans can interact in order to create a self-learning system that look at the relevant parameters. The iterative process is key when creating this system. We are continuously aware of the specific inefficiencies the trading system is targeting to generate returns."

"We believe market psychology many times drive prices, creating inefficiencies that can be exploited systematically as there are recurring price patterns that our models are quick to detect and exploit"

DEFYING THE ZERO-SUM GAME

Being one of the most heavily traded markets, currencies offers ample liquidity and an extreme amount of data points, which according to Carlsson makes it a suitable market for machine learning systems. At the same time, it is one of the most efficient markets making it increasingly difficult to extract alpha from it.

"We believe market psychology many times drive prices, creating inefficiencies that can be exploited systematically as there are recurring price patterns that our models are quick to detect and exploit. This has been done historically by quantitative firms. However, as computational power has increased alongside execution speeds and access to information, the competition has become harder and is one of the reasons to the declining performance of many of the traditional quantitative firms. Our view is that new technology is needed to be able to explore the inefficiencies of today", Carlsson says and continues: "For us, being at the forefront of technology, both in terms of model design and execution platform, it is key to remain competitive in this marketplace. The fact that we use self-learning systems that evolve over time is an important factor to stay abreast of changes in market dynamics and to potentially detect new opportunities and models as time goes by. Furthermore, by establishing external research collaboration with research institutions we can scale up our research effort."

ENCOURAGING RESULTS

The Century Analytics team has traded the strategy live throughout the year, and the results are well in line with the long-term expected annual return target of 10 percent to a volatility of 8-12 percent, according to Carlsson.

"There have been no mishaps along the way so far and the models behave like we expect them to. For now, the main focus is on getting the fund started with the required seed capital."

PHILIP ENGEL CARLSSON
CEO AT CALCULO CAPITAL

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Robots Decide When to Sell

By Eugeniu Guzun – HedgeNordic

> "Our approach is based on our extensive knowledge about the way commodities markets are technically traded. Our knowledge is the core of the systematic approach."

Stockholm (HedgeNordic) – The decision as to when to take profits or cut losses is considered one of the most challenging decisions investors have to make. Danish trend-following commodity fund Calculo Evolution Fund uses artificial intelligence to make the hard-to-make sell or no-sell decisions.

Calculo Evolution Fund is a trend-follower specialized in commodities that acts on trading signals generated by a rules-based algorithm designed by Philip Engel Carlsson. With around 15 years of experience in commodities, Carlsson had all the ingredients to set up his own fund: a fundamental understanding of commodities, some tech savviness and ability to code, as well as a strong interest in machine learning.

Carlsson tells HedgeNordic that "our approach is based on our extensive knowledge about the way commodities markets are technically traded," emphasizing that "our knowledge is the core of the systematic approach." In essence, Carlsson quantified and translated the entirety of his knowledge about commodities trading into a rules-based investment approach. "This is not a strategy based on optimization and big data crunching; it is based on our trading approach incorporated into a rules-based system."

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Where AI Comes into Play

Calculo Evolution Fund relies on a pre-defined set of rules to identify trading signals in the most liquid commodities such as energy, metals, and agricultural commodities, as well as softs such as coffee, cocoa, sugar and others. "All signals are automatically calculated every day based on the systematic rules-based approach, and all signals are automatically executed," explains Carlsson. Once the fund enters a position to catch a trend, internally-developed machine learning algorithms start running to get a better understanding of trends and achieve better profit-generation from riding trends.

"Our machine learning components cut trends into smaller trends, which helps minimize false signals and mistrades," explains the founder, adding that this approach "is particularly helpful when markets go sideways or are very choppy." One idea behind the use of machine learning is to catch the "meat" of the move without getting stopped out in choppy markets. One area Carlsson believes Calculo is particularly strong at and makes good use of machine learning is taking profits in trending markets.

"Machine learning helps identify "profit takers" and starts to take money off the table even when the trend is still intact, before momentum comes down and the trend weakens," explains Carlsson. "Many more traditional CTAs would often give up on some of the profits on their books, as stops could be quite far away from market prices in trending markets. A sharp reversal could, therefore, wipe out much of the gain." All in all, machine learning helps Calculo Evolution Fund navigate better once positions have been initiated. The fund does not use machine learning in the process of selecting signals. Instead, Calculo uses "data to find patterns that signal a weakening in the foundation of our positions."

This combination of static rules and artificial intelligence "is what makes our strategy unique," claims Carlsson. "We believe our approach is somewhere unique as it relies on our rules as well as number crunching through our machine learning," he says, adding that "most managers are either macro, systematic or apply a full quant approach, which relies heavily on data with no sanity checks toward market psychology."

"Machine learning helps identify "profit takers" and starts to take money off the table even when the trend is still intact, before momentum comes down and the trend weakens."

Commodities – Part of the Diversifying Toolkit

Looking back at the fund's performance since launching in August last year, Carlsson says "the adaptive artificial intelligence-assisted approach on when to exit, either take profits or cut losses, has made a huge impact" on performance. This approach "allows little room for bad trades and the strategy does not incur large losses per trade or position," says Carlsson. Calculo Evolution Fund returned 7.4 percent in less than one year, exhibiting a correlation with the MSCI World of only 0.06. The pure commodity focus is one reason the fund has proven immune to the market turmoil in the fourth quarter of last year.

"Commodities are especially good when it comes to developing trends, or break out signals," claims Carlsson, further emphasizing that "the ability to ride trends up or down just doubles opportunities." Explaining the trendiness characteristics of commodity markets, the founder of Calculo says that "a very regional event, like a hurricane in the Gulf of Mexico, could have global consequences on the price of crude. A rainy or particularly dry period in some areas of the world can shift prices on agricultural markets with global impact." One of the beauties in commodity markets, Carlsson highlights, is that "the large ones trade across the globe, and around the clock. That minimizes the chance of surprises in the morning."

Many CTAs boast with the number of markets and various contracts they trade and carry the claim to be active on 100, 130 or 160 markets as a quality seal. Carlsson sees no value in over-diversifying, saying that "the seventeen markets we currently trade are the largest and most liquid ones, and we do not put too much focus on more exotic, illiquid markets or OTC" for the time being. "There are huge opportunities in the commodity space many investors don't realize yet," further adds Carlsson.

Final Thoughts on Artificial Intelligence

Speaking about the future of artificial intelligence in the asset management arena, Carlsson reckons that "artificial intelligence is here to stay," and not many will disagree on that. "The interesting part is how to benefit from this development," he says. "Creative minds will always be able to find new ways to navigate, outperform, and deliver value to investors."

Discussing the emergence of artificial intelligence-assisted funds, Carlsson reckons that the success of these funds depends on the brainpower behind the development of these machine learning algorithms. The next step in machine learning will come from humans iterating on their previous work rather than the machines learning by themselves. In the end, everything comes down to who designs and manages these algorithms and "their agility and creativity in how to create alpha."

what we want and what we expect new strategies to do for our overall portfolio before we invest," he concluded.

Gernot Heitzinger,
Managing Director - SMN

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A Long-Term Perspective on Systematic Trend Following

by Jonathan Furelid – HedgeNordic

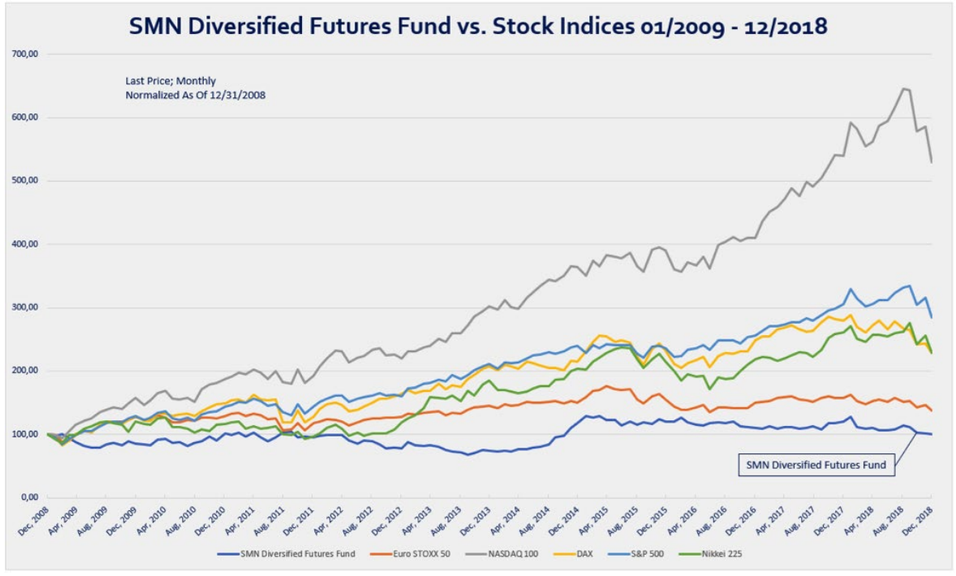
”It is tempting to judge systematic trend following based on recent performance, however it is not very relevant. CTA returns tend to be lumpy and has over time proven its benefits as one of very few efficient diversifiers in multi-asset portfolios.”

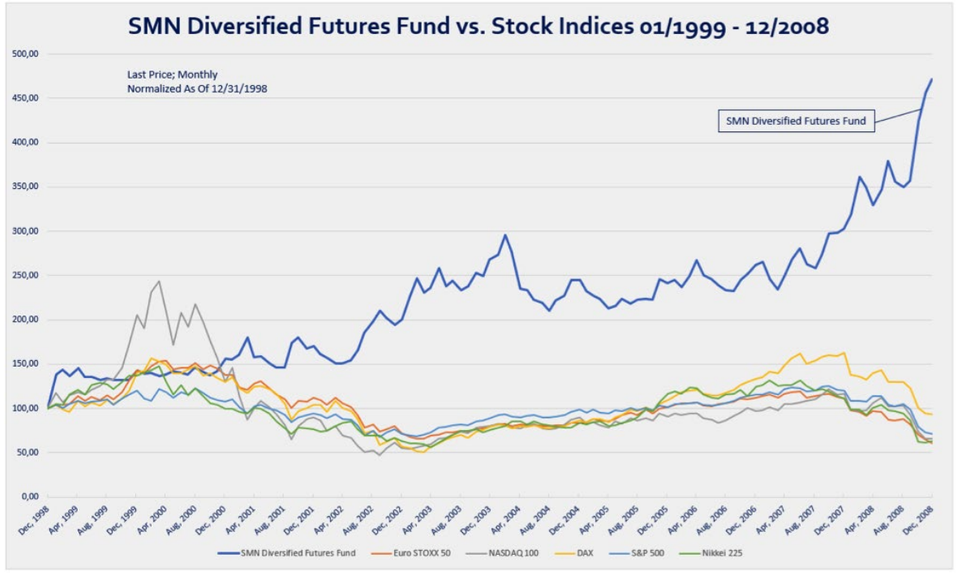
Quantitative trend following strategies, commonly known as CTAs, have had difficulties generating any meaningful returns post the financial crisis period. In 2018, the SG CTA Index, a widely used benchmark for the CTA industry, had its worst year since launching in 2003. Gernot Heitzinger, managing director of Austrian CTA manager SMN, calls for a long-term view when assessing the benefits of the strategy.

”It is tempting to judge systematic trend following based on recent performance, however it is not very relevant. CTA returns tend to be lumpy and has over time proven its benefits as one of very few efficient diversifiers in multi-asset portfolios”, says Heitzinger.

”If you break down the last twenty years of CTA returns, it becomes clear that the period between 1998 and 2008 holds very different characteristics compared to the last ten years. The post financial crisis era has been challenging for the strategy, but that is not to say that the coming ten years will be difficult for CTAs”, he continues.

In a recent note to investors, SMN revisited the performance of their flagship program since 1998, putting it in the context of equity market returns during that same period. By comparing numbers decade-by-decade, the changing landscape of equities versus CTA performance was highly visible and points to some important conclusions, Heitzinger argues.





"I think first and foremost it underscores the importance of taking a long-term strategic view of your CTA investment. The last ten years have been very lucrative for equities, especially in the US. This comes on the back of solid economic performance and the stimulus imposed by governments and central banks, but is also a result of the – in hindsight – very low equity market valuations in 2009. During this period CTAs, SMN included, have failed to identify sufficiently stable trends."

"In the previous decade however, CTAs, SMN included, fared extremely well on the back of extended crisis periods such as the dot-com bubble burst and the 2008 financial crisis. During these periods, the CTA industry clearly showed its benefit as a portfolio diversifier managing to significantly cushion the losses from equities within a portfolio context. The problem is that there is simply no way to foresee these major events and market shifts, which is also a reason not trying to time your CTA investment."

According to Heitzinger, there is no evidence of financial markets becoming less inclined to show trending behaviour today compared to two decades ago, suggesting that the opportunity-set for the strategy has not changed at its core.

"What we have seen during the last ten years is somewhat unusual in that the levels of volatility have been etremely low overall. This environment has occassionally been interupted by short term spikes due to unforeseen events typically linked to politics. We saw that in the latter part of 2018 for example."

"This is typically a very challenging environment for CTAs, where longer term trends suddenly reverse forcefully, making trend following system give back gains. What CTAs need is some level of volatility and sustained directional moves. Those are typically linked to crisis events, because that is when markets become irrational prompting all sorts of behavioral biases to kick in."

Over the last twenty years, Heitzinger argues that market dynamics have changed as new pariticipants have come to play an increasingly important role in global financial markets. The rise of passive investmens is one such trend.

"To some extent I think the underlying dynamics of the markets are more interesting for CTAs today than they were twenty years ago. One example is the amount of passive investing that has entered the market. Short-term, these flows could be disturbing since they tend to reinforce trend reversals when markets go from risk-on to risk-off. However, should we be in for a long term bearish market sentiment, passive investors are likely tp reinforce this trend as they tend to sell as markets turn against them, thereby putting pressure on index constituents."

Heitzinger further highlights the fact that there is a larger set of markets accessible through futures contracts today compared to only ten years ago, meaning that trends can be exploited over a broader range of instruments, and even allow for constructing synthetic exposures.

"The increased number of markets has allowed us to significantly improve the diversification of our strategy. Today, so-called synthetic markets are included as an important part of what we do. In other words we can exploit trends between two different contracts instead of playing momentum in isolated markets."

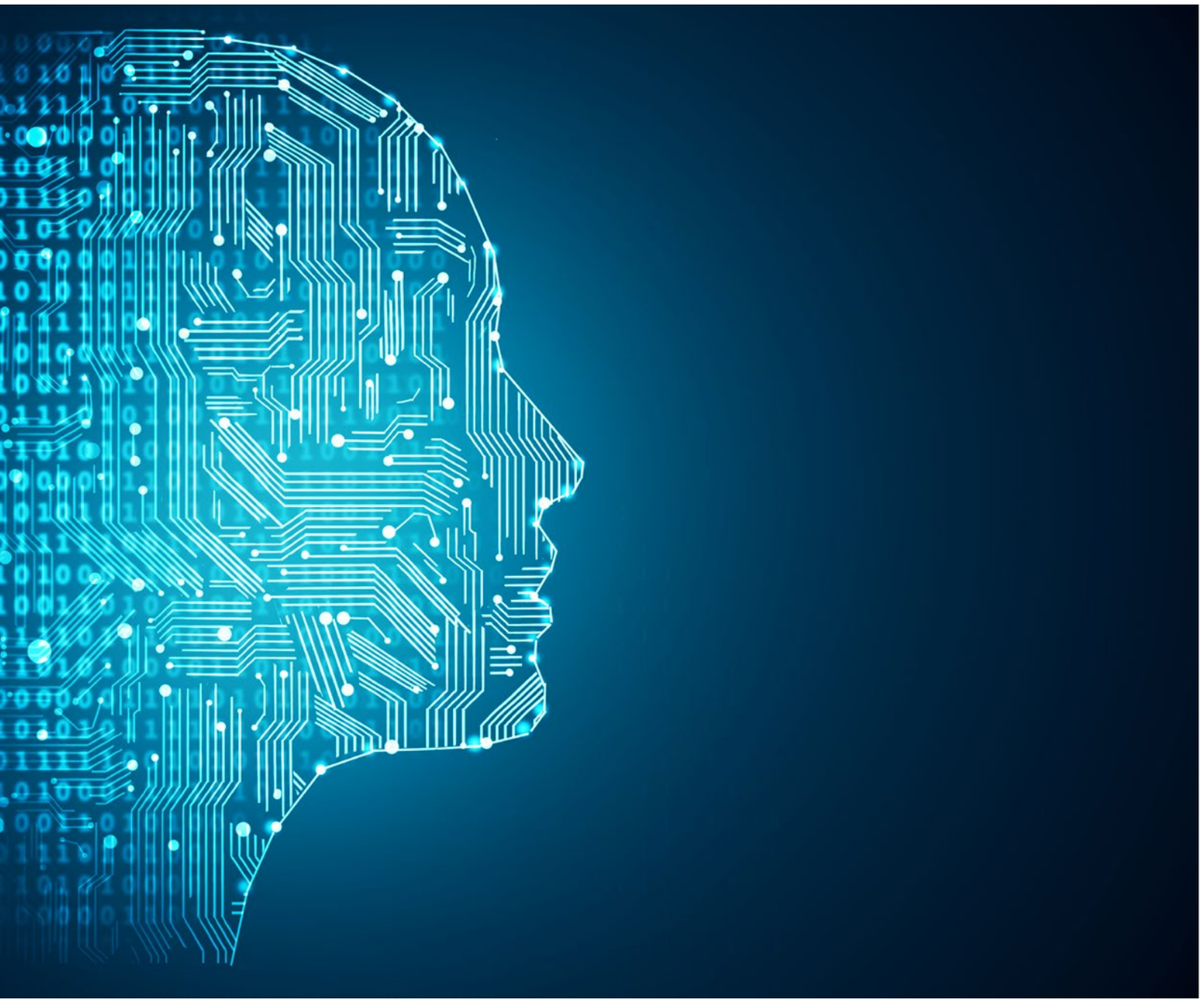
"The wider range of futures contracts has also introduced many smaller and less liquid markets. As we are a small and more nimble manager compared to the industry's giants, we can relatively quickly start trading these contracts if we find them interesting and sufficently liquid. This broadens our investment universe further, potentially offering more trends to exploit."

The fact that CTAs have had a rough path in recent years has resulted in assets leaving the strategy. According to Barclayhedge, industry assets dropped from USD 355 billion in 2018 to USD 323 billion in the first quarter of 2019. Heitzinger argues that investors tend to flee the industry at exactly the wrong points, which he says is due to an inherent bias.

"Market psychological findings indicate that market participants have a clear preference for those investments that have been able to deliver in the recent past. Conversely, investments are avoided or sold that have performed badly lately. This is an essential explanation for why trends in markets can even arise. However, at the moment it may also be an explanation for trend-following strategies not being highly ranked in investors' favor, as they have disappointed in recent years."

"Quantitatively, there is no indication for the latter. Returns from trend following funds are not statistically autocorrelated, which means that past returns cannot be used to derive any accurate forecast for the future. Looking at the last two decades, the question arises if the following decade will show more similarities to the last ten-year period or rather to the previous decade. Only when writing the review for the strategy in 2029 we will know the answer."

"It's obvious that AI has a huge role to play in boosting AuM, as its extraordinary analytical power can transform your ability to collect and act on relevant information."



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How AI Can Shape-Fund Marketing And Help Boost AuM

By Paul Das, Managing Director - ProFundCom

Like it or not, AI is set to play an ever greater role in the fund marketing sector. It's extraordinary analytical power makes it a true game-changer and – sooner or later – all marketing departments will come to rely on it.

So, the question is not if you should introduce AI into your marketing strategy – it is a question of when, how quickly and to what extent you are going to introduce it.

The rise of AI in this sector is an inevitability, yet many people in fund marketing still shy away from it. This is perhaps because of a fear that it will somehow 'take over' and lead to mass redundancies - or even render the whole marketing department obsolete.

But, while it is true that AI – by its very definition - is doing tasks that used to require human intelligence, this fear is unfounded. Introducing AI into your company does not mean opening the door to some kind of autonomous super-computer bent on global domination. It's just a computer system and, just like any other computer system, AI needs people to be effective. And this is especially true with fund marketing. It is there to help people – not replace them.

And the most important thing to remember in this regard is that the extraordinary analytical capability of AI actually creates work, as by quickly and effectively managing vast amounts of data, it in turn creates vast amounts of information for people to work on.

The only thing that changes after the introduction of AI are the tasks that falls to those in the marketing department. With AI in place to analyse data, you can kiss goodbye to the painstaking work of picking through databases and reports to identify key data that can keep you informed about prospective and existing investors. AI does all this for you. So, your marketing team are left with the – potentially much more profitable - job of turning the information that AI has produced into something actionable.

So, you should think of AI as augmented, rather than artificial, intelligence as it is there to help you, and will actually improve the capability of your staff – not get rid of them.

In short, AI is a force for good and one that should be embraced – not feared.

There are four major ways in which AI can help you to raise and preserve assets under management:

1. Flag up vital information

The beauty of AI is that it can analyse huge amounts of data in seconds to establish which communi-cations are resonating most with your audience.

So, you can use your AI engine to scour through all your data and uncover the information that is most pertinent to your quest to boost funds under management, such as:

• Prospects who have just started reading and interacting with your material (so could be ready to invest with you)

• The most active prospects within your database – those who are reading and engaging more than any others (and so are almost certainly thinking about investing with you)

• Existing investors who have stopped reading and interacting (and thus may be looking to redeem their assets)

• Existing investors who have suddenly started reading and engaging again (and thus may be thinking about increasing their existing investment)

• Existing investors who are potentially interested in other funds and products (and so there is a possible cross-selling opportunity)

When this sort of information is flagged up by AI, it can be checked by your marketing team, who can then pass through the hot leads to your sales team, who will then take action.

One of the major benefits of AI is that it spots this type of information incredibly quickly – whereas, if this had to be uncovered by a laborious manual process it could be too late by the time the prospect or client is actually contacted by a member of your sales team.

2. Identify client personas

You can take data analysis up a level by teaching your AI engine how to automatically spot client personas as soon as they enter your system.

If you take the trouble to sit down and identify the typical persona of an investor in your fund, you can then use AI to spot these people as soon as they enter your system, based on certain common characteristics. Then your marketing and sales teams will be aware of their presence and can interact with these valuable prospects as appropriate.

3. Prevent fraud

AI also has a big role to play in the fight against financial fraud. According to research by The Annual Fraud Indicator, the UK loses £190billion each year to fraud - and financial institutions are obviously a major target.

But AI can protect you from this threat by detecting and reporting suspicious activity by analysing data. It doesn't rely on the rules-based method usually used to detect fraud, where activity is flagged up as suspicious when it breaks certain rules. Instead, its uses systems to learn from data - instead of encoded rulesets - and analyses all features of accounts and transactions, instead of just a few, to identify anomalous and possibly criminal behaviour.

This can result in much more effective fraud prevention, which obviously helps you keep assets under management.

4. Talk to your prospects

Quick and effective communication is a key factor in persuading prospects to invest with you. And AI can be deployed to great effect in this regard by running a live chat facility, also known as a chatbot, on your website.

Your website has a major part to play in attracting investment – as it is where both potential and existing investors will go to find an interactive and useful experience, which helps them to discover more about your brand and your company. And by using a chatbot to offer information and answer simple questions, you provide a useful source of information for people who are considering investing with you.

Of course, a chatbot is never going to replace the personal communication from your sales team, which is when actual buying decisions are made. But, harnessing the power of AI to enable initial communication with a potential investor could be the difference between someone choosing to find out more about your fund, or moving onto then next one on the list.

How To Change Your Team To Get The Most From AI

It's obvious that AI has a huge role to play in boosting AuM, as its extraordinary analytical power can transform your ability to collect and act on relevant information.

But actually setting up, implementing and running artificial intelligence within your company is no easy task. It involves highly complicated technology that demands the attention of an expert in the field.

And that is why you need the services of a data scientist in your marketing team.

What exactly is a data scientist?

Basically it's someone who explores data, makes predictions and finds structure. So, typical tasks for a marketing data scientist may include:

Measuring: Determining the impact, positive or otherwise, of your marketing and ad campaigns

Optimising: Recommending changes in marketing tactics and ad spend to improve results

Experimenting: Designing and carrying out tests to find out what works and what doesn't

Communicating: Taking the results derived from data and showing how they can lead to better decisions

Segmenting: Using data to identify groups and subgroups of prospective and existing investors

Modelling: Constructing predictive computer models to improve on response rates

In addition – just like AI itself – a data scientist is not there to take jobs away. He or she will complement and build on the skills and experience of the rest of your marketing team, not replace them.

How to work with a data scientist

Keep in mind that one of the chief attributes of a good data scientist is curiosity. They are likely to have a thirst for exploration and will want to find ways to use data to improve results, even if this is beyond your normal scope of operations.

So, you must be careful to feed this and provide opportunities for data scientists to learn on the job and explore speculative ideas that tap into their curiosity. Don't try and make them fit a pre-set role – they are a valuable resource and should be given some freedom to experiment.

Don't forget, data science is one of the most marketable skills in the business world at present, so if you don't look after your data scientists – someone else will quickly snap them up.

Conclusion

Not so long ago anything to do with AI or data analysis was seen as the preserve of the IT department – a process that took place in back rooms to keep the company running, which only those with vast technical knowledge were able to comprehend.

But times have changed and they have changed quickly. Within the space of just a few years AI and its data analysis ability has become vastly more important and companies must now prioritise this technology in order to succeed. Because, whether you like the idea or not, artificial intelligence is here to stay and no-one in the fund marketing sector can afford to ignore its significance, or its potential.

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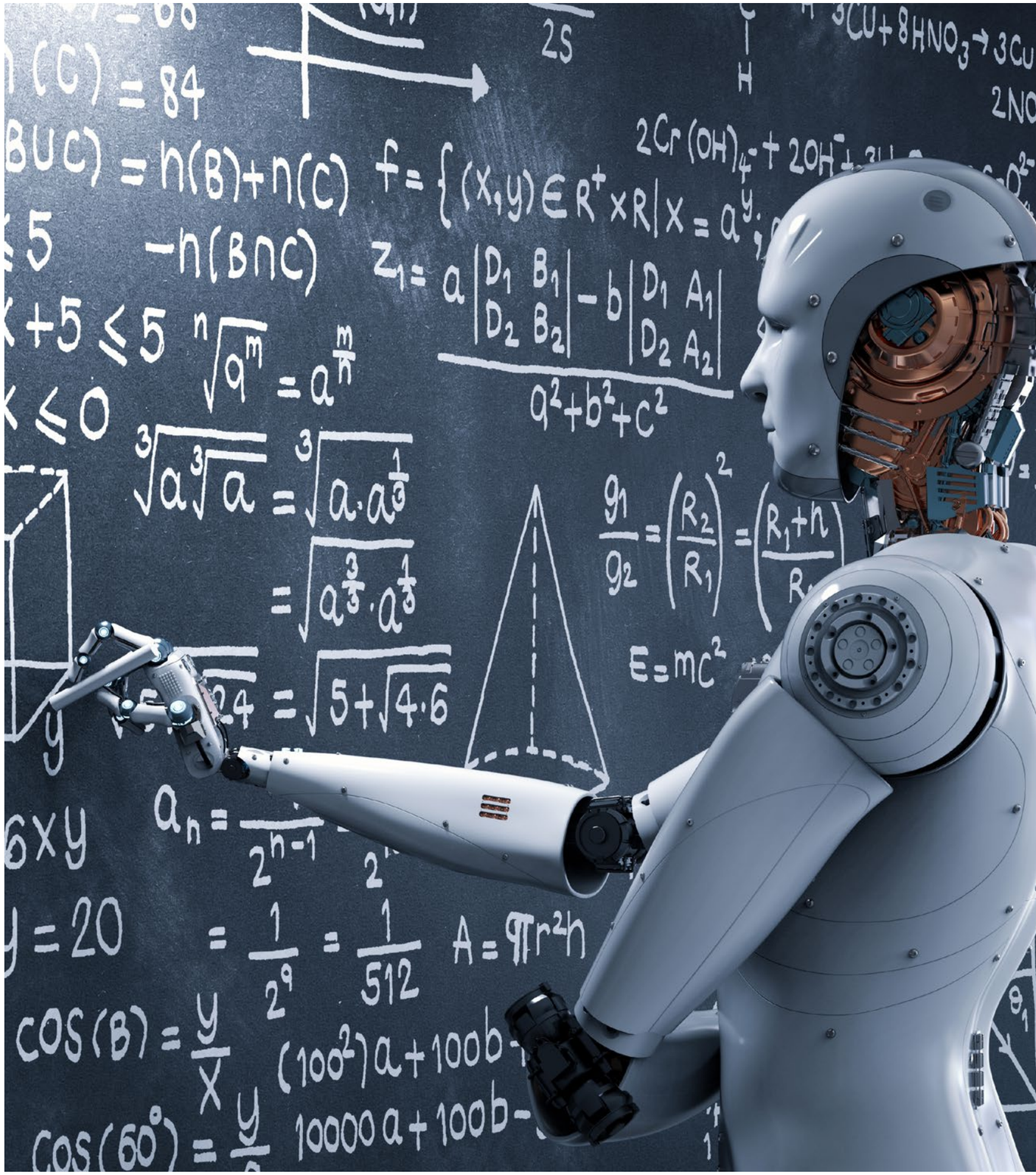
Is Artificial Intelligence a Fad?

By Eugenie Guzun – HedgeNordic

Stockholm (HedgeNordic) – There is a new wave of hedge funds that have their analysis, security selection and trading processes controlled and steered by machine learning algorithms. But will the latest rush to embrace artificial intelligence (AI) disrupt the hedge fund industry? Whereas some believe that AI will unsettle the asset management industry, others consider that the impact of AI-powered automation will be limited to certain areas of the industry that rely on big data and systematic, fast-paced trading.

The use of AI in the Nordic hedge fund industry has been accelerating quite dramatically in recent months and years. Calculo Evolution Fund, Minastir Currency Fund, Lynx, Volt Diversified Alpha Fund, and Innolab Capital are just several vehicles in the industry that make use of AI as part of their strategies. And more AI-assisted hedge funds are set to come on the market later this year, at least one from Lynx and another one from Innolab.

HedgeNordic talked to Michael Halling, a Professor of Finance who also holds a PhD in Computer Science, and several players in the Nordic hedge fund industry in an attempt to formulate a conclusion on the impact of AI on the asset management industry.



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THOUGHTS ON HOW AI WILL CHANGE THE INDUSTRY

Michael Halling states that machine learning algorithms are "a new kind of quantitative models the industry applies," adding that artificial intelligence "will not fundamentally change the industry in the sense that asset managers will be gone and robots will run everything." Halling, who is not new to the frontier between finance and technology, argues that machine learning algorithms are "a new technique to look at data and analyse data."

Cliff Asness, the co-founder of quantitative investment firm AQR, corroborates Halling's opinion, having previously said that "machine learning is basically a way to find more and more patterns" in a more efficient manner by processing large amounts of data. Halling argues that "AI is not going to be a revolution," but he reckons that machine learning algorithms "are pretty good at pattern recognition and finding deviations from standard patterns." This implies jobs that "process a lot of data to find patterns are obviously at risk due to the emergence of these machine learning techniques."

According to Patrik Säfvenblad, chief investment officer at Volt Capital Management, "machine learning is a tool that provides two main benefits: scalability and adaptability." Explaining the notion of scalability, Säfvenblad says that machine learning allows the investment process to be "scaled to cover many inputs, signals, and instruments." At the same time, adaptability stemming from the use of machine learning enables the investment process to react more quickly to market regime changes over time. "This is particularly important in macro trading, where market regimes shift regularly," explains Säfvenblad, adding that "these shifts are often difficult to handle for discretionary managers as previously-successful models might fail."

The just-mentioned benefits are particularly relevant for systematic strategies relying on big data. "In my expectation, machine learning will be used to improve the scalability and adaptability primarily of systematic strategies," Säfvenblad tells HedgeNordic. He expects trading-oriented strategies such as global macro, short-term trading, statistical arbitrage, and quantitative equity market-neutral to benefit from the use of artificial intelligence. Machine learning algorithms may have "some applications for discretionary managers," reckons Säfvenblad, but "the benefit is mostly time-saving in nature. It will not really impact the underlying strategy."

THE IMPLEMENTATION OF AI: GRADUAL PROCESS

Although the discussions around artificial intelligence have been enjoying a significant resurgence in recent months, Säfvenblad considers that "any change to the industry will be gradual as market participants learn where machine learning adds value and where it does not." Thomas Jacobson, the founder and portfolio manager of AI-assisted Minastir AI Currency Fund, believes that "moving forward, there will be a natural process where companies start experimenting with AI and try to implement AI in their existing systems to see how that can work out." Whereas AI helps the currency-focused trading approach at Minastir, "for others, AI does not really work" according to Jacobson. "Others may not find how AI could add value to them."

WHY SO MUCH ATTENTION NOW?

Peter Smedegaard, who is planning the launch of a fully autonomous AI market-neutral fund in the second half of 2019, believes artificial intelligence has more transformative potential in the asset management industry. "I see AI transforming most of the hedge fund and asset management industry gradually but steadily," Smedegaard tells HedgeNordic. "We are aware of the

PETER SMEDEGAARD - INNOLAB CAPITAL

rise of artificial intelligence systems that meet and exceed human abilities," says the CEO of Innolab Capital, arguing that the rise of AI stems from "the exponential increases in data storage and computing power over the past couple of decades."

Michael Halling, on the other hand, does not completely understand why artificial intelligence receives so much attention these days. "Currently there is a lot of attention to AI, but in the end, it is not so obvious why the attention is coming now," says Halling, arguing that "most of these techniques in machine learning have been around for at least 20 years." Although he acknowledges the argument that the discussions around AI "are booming now because data is more available; that could be the case," but equally important, "many text archives, news archives, balance sheet archives have been around for many years."

THE ROLE OF TRADITIONAL ANALYSTS AT RISK

Leaving aside the question of why AI is receiving so much attention now, Smedegaard says "artificial intelligence has already created waves in the industry, as assets managers find out that the ability to extract value from big data is going to be a key differentiator." He also reckons that "AI and machine learning will remain and will undoubtedly replace the roles of many traditional analysts," arguing that AI-powered strategies "adapt quickly to rapidly changing market conditions, whereas humans do not." Whereas machine learning and artificial intelligence systems may indeed be able to respond quickly to changing market conditions, Halling argues that "for standard ML and AI approaches, it is actually doubtful whether they are able to respond quickly to changes in the underlying data structures."

On the debate about the role of traditional analysts, Halling suggests that the role of most analysts may have been under question even without machine learning. "Whether you need artificial intelligence or machine learning to make that claim, the question surrounding the role of analysts has already been researched in the academia," says Halling. "I am not an expert on this literature, but the bottom line is that only some star analysts appear to have some skill in predicting, but not the majority."

Smedegaard, meanwhile, already notices the effects of AI playing out in the asset management industry. "The rise of robo advisors is the biggest example of how AI is enabling changes in investment," he tells HedgeNordic. "Robo advisors and fully autonomous funds now perform all the functions of a financial advisor and enable passive investing at different price rates." Smedegaard also considers that investment advisors who learn to integrate AI into their decision-making are in a better position than competitors to succeed in this new investment landscape. "As AI continues to grow, it will also start moving into active investing because of the cheaper computational power and advances in software, hardware, and data storage," argues Smedegaard.

Marble Bridge in Nyhavn, Copenhagen

NINE MISTAKES TO AVOID

WHEN USING SYSTEMATIC TRADING SYSTEMS

By Niels Kaastrup-Larsen and Rob Carver – TopTradersUnplugged.com

Humans are terrible at trading. Evolutionary instincts, hard wired into our brains, make us rush into making bad decisions. Our grey matter is loaded with emotional baggage which leaves us predisposed to repeatedly making the same mistakes. Nobel prize winner Daniel Kahneman and his colleague Amon Tversky call these items of baggage cognitive biases.

They made sense when we were hunting woolly mammoths; but are positively unhelpful when we hunt for elusive profits in today's complex financial markets. These biases form the basis of the theory of behavioural finance. This theory explains why investors and traders often behave in ways which classical financial theories (that assume perfectly rational behaviour) cannot predict. We believe the best solution is to hand over your portfolio to a system which decides what, and when, to buy or sell.

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But the process of creating and using trading systems is fraught with dangers. The biases that affect us when we trade can also result in serious mistakes being made when designing trading systems. The result is a strategy which is heavily exposed to large losses. Here are nine mistakes you should try and avoid when building your trading system.

1) Overconfidence

The biggest mistake you can make is to be overconfident. People consistently over estimate their own abilities, both in absolute terms and relative to others. In the jargon of behavioural finance relative overconfidence goes by the catchy title illusory superiority. Feeling a sense of illusory superiority is extremely dangerous. Studies frequently show that more than 90% of drivers believe themselves to be above average. It's likely that 90% of traders, and those designing systematic trading systems, also believe they are in the top tier. Clearly most of those people are kidding themselves.

Overconfidence manifests itself in nearly all the other mistakes listed below. If you think you are better than the rest of the market you are more likely to trade too often and take too much risk, or to design a system which makes those errors. According to market lore the very best discretionary traders are those who are humble enough to admit they are wrong and cut their position when it moves against them. The same humble attitude is necessary for those creating trading systems.

2) Living in an ivory tower

Many people who design trading systems don't come from a trading background, but from a scientific discipline, such as physics, mathematics or engineering. This can be a good thing, for a couple of reasons. Firstly they are more likely to be able to design robust automated trading systems. Also if you have been trained in the dark statistical arts then you should do a better job of fitting your trading system than a novice who is blindly using a piece of back testing software they do not understand.

However those who are scientific black belts but neophytes at trading are prone to making serious errors. Some of the biggest blow ups in trading history have been caused by extremely clever and well qualified

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people making mistakes. The meltdown of Long Term Capital Management in 1998 happened despite the fund having two Nobel prize winners on their staff. Derivatives backed by subprime mortgages were radically overpriced before they crashed in value in 2008, thanks to traders using a clever model created by a very smart guy with a Phd. Other examples include the quant quake of summer 2007, and the losses suffered in the Swiss France devaluation of January 2015.

In all these cases the rocket scientists had created a model which was a good approximation to reality most of the time, but ignored the very different dynamics of a market crisis which were missing from their data history. Experienced traders, bloodied by numerous market crashes of the past, are more likely to design trading systems that can cope with these extreme situations.

Other common screw ups by those short on practical experience include underestimating the costs of executing an order, and ignoring a critical element of market structure such as stock splits or short selling constraints. A successful systematic trader will have both a good grasp of theory and a big dollop of market savvy.

3) Over complicating

Rocket scientists have another fatal flaw – the tendency to over complicate. If you're very smart then it's tempting to think that to beat other people in the market you have to exploit your intelligence – after all that is the 'edge' that you supposedly have. Also creating a simple, run of the mill, trading system is far too trivial a task for someone with a PhD in signal processing or nuclear physics. Using your scientific knowledge to produce a wonderfully elaborate strategy is much more fun.

Over complication can also happen when you start with a relatively simple trading rule. After testing this you discover that it doesn't perform as well as you'd hoped. So you adapt it, fine tuning it to improve its performance by adding some bells and whistles. A few more iterations and you have something that is far too complicated (This is also a form of over fitting; another mistake discussed next).

The bad news is that complex systems are generally outperformed by simpler alternatives. Complexity is also bad because it makes the system opaque. A good trading system is predictable. If the market moves in a particular way, you should be able to predict roughly what your strategy should do. If you understand your system you are more likely to trust it, and let it run unimpeded.

4) Over fitting

Another manifestation of over complicating your system is the use of complex backtesting and fitting techniques. Neural networks, support vector machines, artificial intelligence and all things big data are very popular right now. These methods make it very easy to over fit. This is where you train your system to do extremely well in your past data, but end up with something that won't be robust to market conditions changing slightly. Inevitably over fitted trading systems are unprofitable when actually implemented.

Over fitting is not a disease limited to those using fancy data mining tools, even very simple techniques are vulnerable, although with a simple method it is usually easier to know if you are over fitting. For example, consider the simplest form of fitting: 'test and throw away'. Here you consider each possible variation of your trading strategy in turn, discarding those that are not sufficiently profitable. The more variations you test, the more likely that you will discover an apparently wonderful trading rule just by chance.

5) Under diversifiying

Discretionary traders often concentrate on a few markets; perhaps a few stocks, a couple of currency markets or a handful of commodity futures. When they come to designing trading systems people usually stick to what they know and understand. However the benefit of a systematic trading strategy, particularly one which is automated, is the ability to trade large numbers of markets simultaneously. Because each instrument doesn't need time consuming manual analysis the size of your portfolio is limited only by the amount of trading capital you have to deploy. It's fun and interesting to indulge yourself in coming up with more esoteric ways to predict the price of your favourite markets. Much less fun is devoting yourself to the tiresome task of uploading past data so you can use your existing trading rules on new markets. However relatively simple systems which are diversified over large numbers of instruments are

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likely to perform significantly better than a complex system running on only a few assets. This is because the returns of the diversified simple systems are likely to be relatively uncorrelated, resulting in higher benefits from portfolio diversification.

6) Over trading

Another manifestation of over confidence is trading too much. An unrealistic back test might show that you could earn serious money if you buy and sell dozens of times a day. When combined with unrealistically low expectations of trading costs the result is a system that will make someone a lot of money. Unfortunately, it will be your broker and the market makers that will benefit from your largesse, not you. You should have realistic expectations of what your likely returns will be, and ensure that these will cover a conservative estimate of trading costs several times over.

7) Over betting

Over betting - taking too much risk - is a mistake made by many discretionary traders. Designers of trading systems are just as likely to be convinced by the siren song of high returns that can be earned when leverage is increased.

Suppose your back test shows you could have made 50% a year with a maximum drawdown of 10%. Then it seems obvious that you should leverage the system up by say a factor of 5, so you can earn 250% a year with a bearable 50% drawdown. Those kinds of back test numbers are very unrealistic. Sooner or later someone running with this much leverage will see an unexpectedly large adverse price movement, and the rapid depletion of their account will follow.

It's much better to be realistic, and even pessimistic, about the likely returns and losses of your trading strategy, and to run your system at a relatively low risk target.

8) Lacking commitment

Having a well-designed trading system is a complete waste of time if you aren't committed to it. Your system signals a buy, but you ignore it as you think the market will pull back. When it doesn't you enter the buy order but end up paying a higher price. Then there is a sell off and the system commands you to close. Petulantly you ignore it; only to see the price collapse, putting you in a deep hole.

You should either be a discretionary trader or a systematic trader. Either you have a system, or you don't. A trading strategy will only work if you commit to it entirely.

You can't pick and choose the trades that you like and ignore the rest. Fully automating your system so it trades automatically is one way to make commitment easier; but it still leaves you open to meddling, which we discuss next.

9) Meddling

Lacking commitment and completely ignoring your system is very dangerous, but there is a more subtle and insidious form of interference that we like to call meddling. This is where you make numerous changes to your system parameters to change its behaviour.

Suppose there is a non-farm payroll number coming out later today. You are nervous about the amount of risk in your portfolio, so you adjust the variable that controls your overall leverage. Lo and behold the system issues a series of closing trades. Strictly speaking you are still blindly following your system; but then you've already altered the strategy so its positions are more in line with what you think they should be!

Meddling can be justified as risk management as in this example, or as an 'improvement' or 'adaptation' to the system. A well designed system will do its own risk management. Also if sufficiently well designed it should not need 'improving'; at best an improvement will be of marginal value and not statistically significant. Unless you are trading very quickly it's unlikely that even several years of live trading will provide enough evidence that your system needs 'adapting' to new market conditions.

Changing your system should be a rare event. At best you will incur extra trading costs from frequent changes; and at worse you'll significantly reduce the returns that your system could have made if left alone.

"It's much better to be realistic, and even pessimistic, about the likely returns and losses of your trading strategy, and to run your system at a relatively low risk target."

About the Authors

Robert Carver worked in the City of London for over a decade. He initially traded exotic derivative products for Barclay's investment bank, and then worked as a portfolio manager for AHL, one of the world's largest systematic hedge funds before, during and after the global financial meltdown of 2008. He was responsible for the creation of AHL's fundamental global macro strategy, and then managed the funds multi-billion dollar fixed income portfolio before retiring from the industry in 2013. Robert, who has bachelors and masters degrees in Economics, now systematically trades his own portfolios of futures and equities.

Robert blogs about finance and investment at qoppac.blogspot.com. He is the author of Systematic Trading: A unique new method for designing trading and investing systems, which was published by Harriman House in September 2015. For more information see http://www.systematictrading.org

Niels Kaastrup-Larsen is a Swiss-based dad, husband, entrepreneur and hedge fund manager turned podcaster. His podcast TopTradersUnplugged.com is the leading podcast within the hedge fund industry.

Niels divides his professional time between, his full time job at DUNN Capital, his podcast and his family's charity kidsheart.org. Niels wants to revolutionize the hedge fund industry as well as the way schools are equipped to handle cardiac arrests and other heart related emergencies following his own son's cardiac arrest in 2011.

The bio could be much longer, but in the end, all you really need to know is that Niels is a father, a husband, passionate about hedge funds and CTAs and a man who cares deeply about, loves, and admires those closest to him and is humbled and grateful for the opportunity to create, to connect and to serve.

BEST-PERFORMING HEDGE FUNDS IN 2018 BY COUNTRY AND STRATEGY

FUNDS OF FUNDS:
1. AIM Diversified Strategies 2.4%
2. Merrant Alpha Select USD 2.2%
3. Atlant Multi-Strategy 1.8%

FIXED-INCOME:
1. Scandinavian Credit Fund 7.3%
2. HP Hedge Danish Bonds 5.3%
3. SEB Eureka Fixed Income Relative Value 4.1%

FINLAND:
1. Estlander & Partners Presto 8.0%
2. AIM Diversified Strategies 2.4%
3. HCP Focus Fund 1.7%

NORWAY:
1. Mjeltevik Invest 10.2%
2. Sector Healthcare Fund 3.6%
3. Borea Høyrente 3.5%

MULTI-STRATEGY:
1. Formue Nord Markedsneutral 13.6%
2. Ress Life Investments 9.9%
3. Atlant Protect 5.3%

DENMARK:
1. Formue Nord Markedsneutral 13.6%
2. Calculo Evolution Fund 7.3%
3. HP Hedge Danish Bonds 5.4.%

CTA:
1. Shepherd Energy Portfolio 13.8%
2. Estlander & Partners Presto 8.0%
3. Volt Diversified Alpha Fund 7.9%

EQUITIES:
1. Gladiator Fond 19.7%
2. Mjeltevik Invest 10.2%
3. Adrigo Small & Midcap L/S 8.7%

SWEDEN:
1. Gladiator Fond 19.7%
2. Shepherd Energy Portfolio 13.8%
3. Ress Life Investments 9.9%

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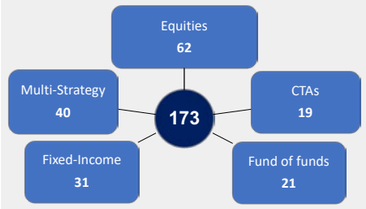
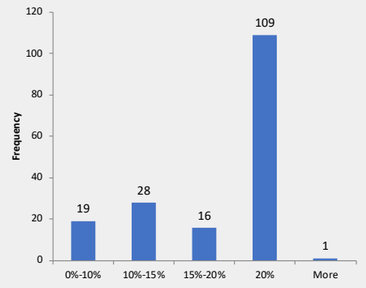
NHX KEY FACTS AT A GLANCE

Figures and data below are drawn from the HedgeNordic databse covering the constituents of the Nordic Hedge Index.

Strategy Breakdown



Performance Fees



Country Breakdown

Dispersion ITD Returns

10.1%

Top 30%
+10.2%
Bottom 30%
-0.9%

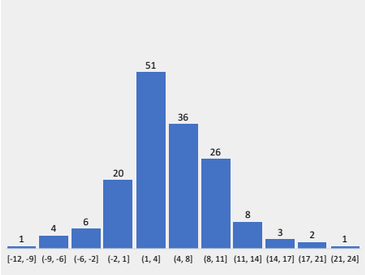
Active Hedge Funds

Largest Hedge Fund

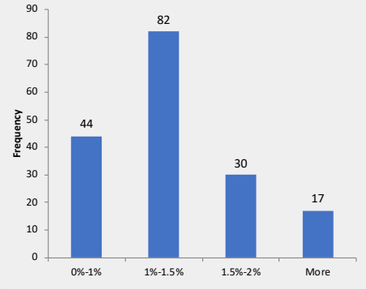
Brummer Multi-Strategy
EUR 3.4 Billion

As of February 2019

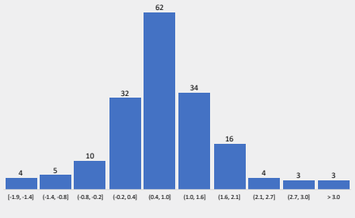
Average Annual ITD Returns



Management Fees



ITD Sharpe Ratios



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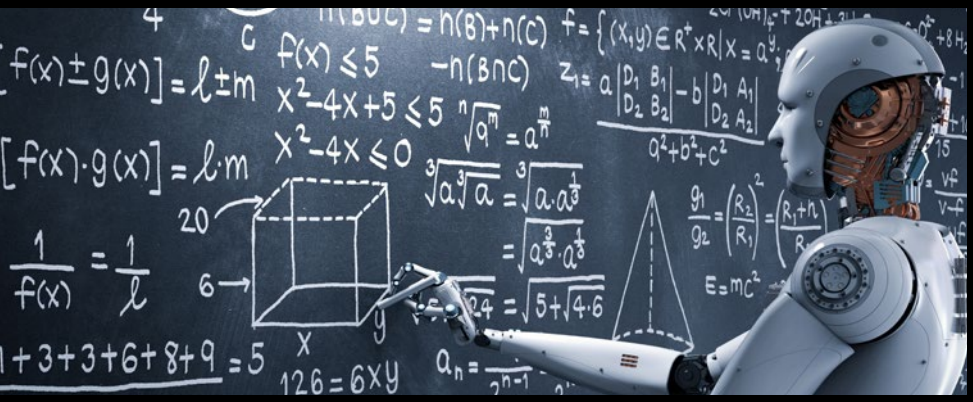

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