OPALESQUE

Opalesque Roundtable Series '17

CHICAGO

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Editor's Note

Crypto-Currencies, Emerging Managers & The Endgame in AI

AON Hewitt is launching a hedge fund managed account platform specifically devoted to sub-two billion-dollar managers to address the growing appetite for smaller, more nimble managers. The platform has no stated minimum AUM for a manager (most are sub-half a billion, with many right around $100m-$200m) and no geographical focus. Also Lighthouse Investment Partners and 50 South Capital (a wholly-owned subsidiary of Northern Trust) – both represented at this Roundtable as well – are offering managed account and partnership solutions which are very attractive for both investors and managers, focusing on pockets of opportunity that typically cannot be accessed through traditional low-cost or long-only products. These platforms can even partner with a manager prior to starting his/her business (page 7-8).

CME has recently launched bitcoin futures trading on its platform, aiming to get an early movers' advantage in the volatile but fast-growing asset class. Out of a total limit of 21 million bitcoins which can be mined, based on the existing protocol, the current bitcoins in circulation stands around 16.7 million. With the growth in supply slowing down, the trading of bitcoin futures provides a solid opportunity for exchanges.

The craze for crypto currencies is of course a global phenomenon. Google registered the most searches for bitcoin from: 1. South Africa 2. Nigeria 3. Slovenia 4. Austria 5. Netherlands 6. Singapore 7. Australia 8. Ghana 9. Bolivia 10. Switzerland – and 17. USA. This Roundtable discusses when and how professional investment managers will trade cryptocurrencies and bitcoin (page 25-29).

Gaining conviction in Artificial Intelligence, but limits apply

This Roundtable also shows when and why investors have gained conviction about investing in quantitative strategies based on machine learning (page 9-18). However, they also find that at least until now, **most of these opportunities occur over shorter term horizons,** in particular in the futures space, while machine learning approaches applied over longer term timeframes often lead to concentrated or filtered momentum exposure. At the same time, overexcitement about new things is ultimately what gets many groups into trouble, and therefore caution is warranted. Find our more how investment managers and investors judge and use machine learning and AI in their investment strategies.

The Opalesque 2017 Chicago Roundtable, sponsored by CME and supported by RCM Alternatives, had the following speakers:

1. Adam Butler, CIO, Resolve Asset Management
2. Anthony Lombardi, Associate Partner, Aon Hewitt
3. Craig Weynand, Chief Operating Officer, NuWave Investment Management
4. Jeff Malec, CAIA, Managing Director, RCM Alternatives
5. John Schabilion, Vice President, Hedge Fund Research, 50 South Capital
6. Markian Zyga, CFA, Investment Analyst, Lighthouse investment Partners
7. Scott Billington, Co-Founder, Covenant Capital Management

The group also discussed:

- How do modern managed account solutions interact with managers (page 6-8)?
- Which strategies are investors looking for today (page 7-8, 18)?
- What should investors do when a strategy crosses a point of diminishing return (page 8)?
- How do you identify degradation within a machine learning approach? (page 11)?
- Is AI in finance a brute strength approach or something else (page 11)?
- What's the endgame in AI? Will at some point everything be fully turned over to a machine (page 12)? What happens when everyone has the machines (page 14)?
- *Big data*: Why systems where humans curate the data are likely to prove most meaningful (page 13-15)
- How the *growth of ETFs* (73% by 2020) affects active managers (page 18-21)
- What to do with the *crowded VIX trade* (page 20-25)?

Enjoy!

Matthias Knab
Knab@Opalesque.com

Participant Profiles

(LEFT TO RIGHT):

Jeff Malec, Markian Zyga, Craig Weynand, John Schabilion, Colby Borders, Anthony Lombardi, Adam Butler, Scot Billington, Matthias Knab

Introduction

Jeff Malec
RCM Alternatives

I'm Jeff Malec, one of the partners at RCM Alternatives and formerly the CEO and founder of Attain Capital Management. RCM is growing, and we have a few different business lines now. The core business remains matching up investors and managers in the global macro and managed futures space, while other areas focus on providing services such as clearing, execution, and fund outsourcing. We have also added a professional trading group which caters to prop firms unique clearing and collateral needs, and a group of quants focused on building execution algos in the futures space.

I focus on business development and am the editor of our popular alternative investment blog, which I encourage all of you to read, where we highlight allocators, investors, managers, and all of the wants, needs, and issues they are going through.

Personally, I was born in Chicago, but grew up in Florida and went to school in Upstate New York before making my way back here to Chicago as a clerk over at the Board of Trade until I figured what the guys upstairs are doing, and that I wanted to be up there where the real decisions are made.

Scot Billington
Covenant Capital Management

Scott Billington, I co-founder of Covenant Capital Management in 1999. I traded on the floor with the CBOE as a market maker in the OEX pit for three years. Born and raised in Louisville, Kentucky. I went to college in Ohio and now I live in Naperville, just outside of Chicago.

Craig Weynand
NuWave Investment Management

Craig Weynand from NuWave Investment Management. NuWave is a systematic futures and equity manager founded in 2000 by Troy Buckner. The firm utilizes a sophisticated form of behavioral science theory to identify repetitive patterns of price behavior across a diversified blend of futures and cash equity markets. I joined NuWave in 2009 as Chief Operating Officer, with the goal of institutionalizing the firm's operational infrastructure.

I started my career in 1990 at Dean Witter Reynolds – later Morgan Stanley – where I held various positions within the Managed Futures Department over more than 13 years, culminating as head of CTA selection and due diligence, allocating more than $2 billion across approximately 20 CTAs via a number of publicly offered commodity pools. In 2003, I joined Campbell & Company as General Counsel, responsible for all aspects of legal and compliance, before joining Graham Capital Management as Director of Investor Services from 2006 through 2009.

John Schabilion
50 South Capital

My name is John Schabilion, I am an analyst at 50 South Capital which is a wholly-owned subsidiary of Northern Trust [Corporation] overseeing approximately seven billion in hedge fund and private equity assets globally. Our approach focuses on identifying smaller, newer managers and investment strategies which tend to be more nimble and unique when compared to their larger peers; however, we do not set any rigid guidelines around strategy size or length of track record which gives us broad flexibility to identify and invest with the best talent globally.

At 50 South Capital, I am part of the team overseeing event-driven, credit, relative value, systematic, and global macro strategies. Prior to joining 50 South Capital in 2016, I spent ten years at Aurora Investment Management where I was most recently a senior analyst on the research team.

Markian Zyga
Lighthouse Investment Partners

I'm Markian Zyga from Lighthouse Investment Partners, a global alternative investment management firm established in 1999, which offers hedge fund solutions to investors who are looking to diversify their asset mix and realize growth with a lower correlation to traditional equity and fixed income allocations. At Lighthouse, we look to drive idiosyncrasy in our portfolios with the goal of seeking to generate uncorrelated risk-adjusted returns for our fund investors. We manage approximately

$10 billion in hedge fund assets and actively invest across a diverse range of hedge fund strategies.

I joined Lighthouse in 2008. Today, I'm responsible for sourcing, analyzing, and monitoring quantitative equity and futures-related strategies as well as discretionary macro and commodity-based investments.

Anthony Lombardi
AON Hewitt

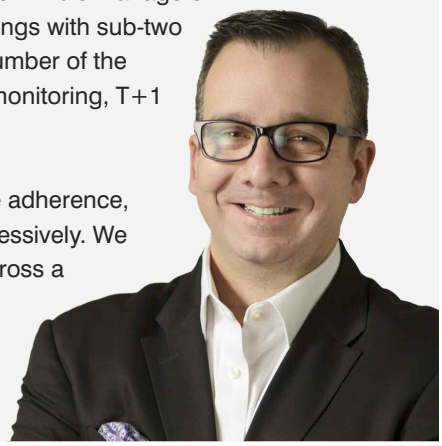
Anthony Lombardi, I work for AON Hewitt here in Chicago and work with two colleagues to spearhead an effort aimed at building and launching a hedge fund managed account platform specifically devoted to sub-two billion-dollar managers. Prior to that, I've worked in the managed account space for Man, BNY Mellon and Wilshire Associates prior to joining Aon. I got my start in the business on the floor here at the Chicago Mercantile Exchange. Prior to all this, I went to college here in Chicago and grew up on the West coast.

Adam Butler
ReSolve Asset Management

I'm the chief investment officer of ReSolve Asset Management out of Toronto. ReSolve is an emerging manager with about $250 million dollars in systematic quantitative strategies. We focus on multifactor multi-asset strategies incorporating ETFs and futures. We specialize in portfolio optimization based solutions, which maximize integrated exposure to the most economically significant risk factors, while minimizing expected shortfall.

Matthias Knab We have three very prominent allocators at this Roundtable today. Can you share with us what you are doing or researching at the moment? Maybe we start with Anthony, can you please tell us more about the hedge fund managed account platform you are currently building out at AON Hewitt?

Anthony Lombardi: Our team's focus is to address the growing appetite for smaller, more nimble managers. Myself and my two colleagues, Paul Sylvia and Rishi Awatramani, have been taking meetings with sub-two billion-dollar managers for the past four years. We built a platform to directly address a number of the issues surrounding investing in smaller managers (access fees, transparency, guideline monitoring, T+1 reporting) in the right construct.



This being said, investors will receive T+1 reporting while the platform monitors guideline adherence, which is essential for running any managed account platform, and we have priced it aggressively. We have developed strategy sleeves that enable investors to allocate to several managers across a strategy and take advantage of each manager's niche in that space instead of putting all their allocation eggs in one basket, if you will.

Matthias Knab Tony, is there a minimum AUM for a manager to get on your platform? And secondly, do you have a geographical focus such as the US or is this global?

Anthony Lombardi: There is no stated minimum AUM for a manager. Most of the managers are sub-half a billion, and there are many right around a hundred to two hundred million. The more liquid they are, the larger, in general, is their capacity. We also don't have a specific geographical focus, so we are agnostic toward that item regarding the managers. We just want to see like a really good thesis as this is what we want to deliver to clients.

Markian Zyga: Lighthouse has been investing via managed accounts since the firm's inception. The growth and development of a scalable managed account program has been a strategic initiative since 2005. **Investing via managed account offers several advantages,** one of which includes increased transparency and potentially a deeper understanding of a manager's strategy.

Additionally, our managed account program provides an ability to engage with portfolio managers in a variety of ways.

So often, the first word I share with prospective managers that I am evaluating for investment is **flexibility;** specifically, that we can engage with a manager during any stage of the hedge fund life cycle. *Today, we can even partner with a manager before that life cycle has started, prior to the manager having started his/her business.* Lighthouse can partner with managers by not only providing initial capital but also in setting up infrastructure. Managers therefore can leverage our platform and suite of service providers to gain access to administrative, middle and back office, legal/compliance, trading, and external "street" resources.

And turning to your original question of what are we focused on or what are we trying to do, quite simply, we are trying to find uncorrelated portfolio managers targeting idiosyncratic and high risk-adjusted returns across nearly all hedge fund strategies. I believe our structure provides enhanced flexibility in the ability to partner with talented portfolio managers globally and our structure also allows us to allocate capital in a mutually beneficial way. Speaking specifically to my area of focus, quantitative strategies and macro, I am focused on investing in unique strategies as opposed to traditional and more widely traded factor-based approaches. Within our quant allocation today, we have attempted to allocate our core exposure to those strategies we believe are *primarily idiosyncratic* and those that are less commonly applied. Examples of these approaches may include strategies based on machine learning techniques, signals developed off of what the portfolio managers and Lighthouse believe are perceived unique data sets, or strategies which attempt to benefit from the price impact of trading flows of larger hedge fund or institutional investment managers.

Matthias Knab This is certainly a very valuable value proposition for start up managers because as we know the biggest hurdle for them is raising capital and bringing their AUM to a certain level so that their business is sustainable. Maybe you can share with us more details or examples how you are helping managers grow their assets?

Markian Zyga: I believe an advantage of the Lighthouse managed account platform is that we can exhibit flexibility in the structure of our relationships with the managers to whom we allocate capital, and hopefully come up with a mutually beneficial relationship which incentivizes both parties. For example, we have managers that trade exclusively for us and we also have managers that we allocate to on a non-exclusive basis.

If we can define some type of quantitative or qualitative edge in terms of a manager's trading strategy, hopefully both, we can then provide the needed support for the manager to focus on monetizing the identified opportunity set.

The portfolio managers that tend to partner with us on a more exclusive basis have a very entrepreneurial spirit; they want to have ownership of their business and often do not want to deal with all the middle and back office headaches associated with running a business. In this manner, we are providing managers with capital and the ability to focus on investment performance and developing a track record as opposed to dedicating material time to non-investment activities such as marketing meetings.

John Schabilion: At 50 South we really focus on identifying talent early-on. We are not constrained to only the early phase of a fund's lifecycle but when possible we favor getting involved with managers early when they are in the wealth-creation phase of their investment careers. Additionally, we think engaging with groups on the commingled fund side benefits us in terms of negotiating economics and other favorable treatment as managers often prioritize getting these products to-scale.

Today we oversee a wide range of products across our platform including a number of customized portfolios for larger institutional groups, as well as a mix of commingled portfolios that fit different needs for investors – essentially we provide everything from return enhancement portfolios to strategies designed to add diversification to long-biased equity and/or fixed income portfolios.

In terms of the current opportunity set, on the risk seeking side we are looking for *pockets of opportunity that people cannot access through traditional low-cost or long-only products.* The list of opportunities that we like today includes things such as middle market credit, small-cap European equities, emerging market debt, and Chinese equities which are more difficult for investors to access through traditional investment products. For example, there is no ETF that gives you access to lower middle market stressed and distressed credit which makes it a good illustration of the kinds of smaller, unique opportunities where we receive an enhanced return for the allocation of our investors' capital. Many of the opportunities in this bucket do come with some correlation to markets; however, the enhanced return we receive provides a greater margin of safety relative to traditional risk assets.

On the diversification side, we are looking for managers and strategies that can produce uncorrelated, alpha-oriented returns independent of markets. Our strategy mix in the space today includes things such as low-net long/short equity, relative value commodities, municipal bond arbitrage, reinsurance, and systematic equity market neutral.

Jeff Malec: It seems like there could also be a certain **point of diminishing return** when adding and finding these new return drivers, and then there's also concentration risk on the other side. Say you find something that has been working the past three years and you're adding it, then adding more of it, and then all of a sudden you could be concentrated in a certain way, I wonder, do you have a core you stick with and then add some satellite strategies, or how do you address the issue of not getting too far away from your main mission, so to speak?

Markian Zyga: As I think about the Lighthouse investment process today, it is a direct beneficiary of the experience of the firm and the investment team. Lighthouse's flagship fund has been managed by our President and co-CIO, Sean McGould, since 1996. Sean, as well as other senior individuals at Lighthouse, had previously worked in different functions at Trout Trading, a well-known CTA. As a result, Lighthouse has extensive experience sourcing and investing in quantitative strategies.

As it relates to quant, my personal belief is that it is **challenging to time our exposures** to these strategies. We want our managers to be proactive in the ongoing implementation of their research and not reactive in managing their programs. Hopefully over time there is a certain level of evolution and enhancement that our quantitative managers are pursuing, and that these changes are organically improving our underlying portfolios.

At this time, we maintain only a satellite allocation to popularly known and widely traded managed futures and quantitative equity factors. Within managed futures, factors may include: trend following, short-term momentum or mean reversion, and carry, so the common approaches that are traded across the industry. But where we really want to focus our allocation is to approaches that we believe are truly idiosyncratic to commonly traded factors and which potentially can be more capacity constrained. This is where our structure allows us to access capacity constrained strategies with a large enough exposure to impact our broader portfolios.

I will be the first to admit that it is definitely challenging to find these types of strategies, but I believe that we have an edge due to our collective experience and collaborative global team which is focused on sourcing new managers.

Matthias Knab Markian, you said that Lighthouse is also looking at managers who are applying artificial intelligence and machine learning. What have you found?

Markian Zyga: We have gained meaningful experience investing in quantitative strategies based on machine learning techniques and have **gained conviction** in these approaches over the last five years. Analyzing the performance of our quantitative strategies, we have found that strategies based on machine learning approaches in both quantitative equities and futures have been *some of the most consistent and profitable performers, both in risk adjusted and absolute return terms, over the past five years.*

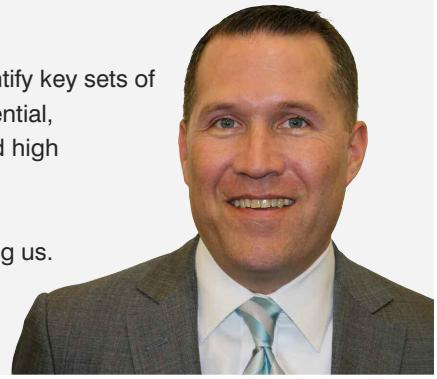
We conduct thorough due diligence on every manager ahead of investing; and we have spent just as much effort on developing a proprietary risk system toward monitoring our managers once they are trading. Due to the transparency of the managed account structure, we can then develop a whole new level of conviction as it relates to a manager's trading strategy.

And it's true both in equities and in futures that the machine learning strategies in which we have invested in have exhibited, in our opinion, unique trading approaches and at times an enhanced ability to capture the market opportunity set relative to traditional factor based approaches. And I think it's probably important to mention that most of these opportunities occur over shorter term horizons, in particular in the futures space. Our experience has been that *machine learning approaches applied over longer term timeframes often lead to concentrated or filtered momentum exposure* which, as I mentioned earlier, we have capped appetite for the total amount of trend following exposure that we desire.

Craig Weynand: At NuWave, we have long considered ourselves somewhat of a pioneer in the application of artificial intelligence and machine learning techniques to the financial markets, having first developed such concepts as far back as 2001. Of course, with significant advances in computing power and AI modeling concepts, things have come quite a long way in the last 15 years.

For example, think back to the state of *speech recognition applications* 10 or 15 years ago … early on, there was only a rudimentary understanding of the spoken word – you would call an automated customer service line and the only response it understood was "Yes", "No" and "Representative." A few years later, the range of identifiable responses was somewhat broader – perhaps consisting of a few words strung together or even a few specific sentences. Today, you are simply prompted to state the reason you are calling, and the machine is able to "understand" virtually any free form response. Consider the advances made by personal assistants, such as Siri or Google Assistant - both are able to understand queries, gather information, perform tasks, follow instructions, etc. - all from understanding the spoken word.

In much the same way as advances in AI and machine learning have transformed speech recognition, we have tried to apply similar concepts to better **understand the language of the financial markets.** The markets, after all, speak to all of us every day, and we are all trying to understand what it is saying to predict or forecast where it is headed. We may use different means or methods, or focus on different aspects or data to figure out what the market is saying, and predict where it may be headed, but that is essentially the goal of every investment manager. Each piece of market data, whether technical or fundamental, is like an individual syllable that is spoken, and multiple data points, like multiple syllables, form words and sentences, and a collection of words and sentences in turn form descriptive paragraphs – all of which can lead to important inferences, meaningful predictions, informed forecasts, etc.



For example, artificial intelligence and machine learning techniques can be utilized to identify key sets of characteristics or variables – whether they be directional, volatility-based, seasonal, sequential, fundamental, etc. – that are meaningful and informative, and that, collectively, tend to yield high probability outcomes or opportunities.

Simply put, today we have the means to better understand what the markets may be telling us.

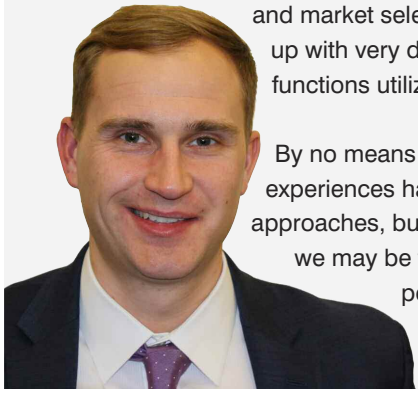
Adam Butler: Consider Quantopian, for example, which was seeded by Steve Cohen for $250 million, and experienced steady losses after launch. The challenges with unsupervised AI type approaches are: *how do you benchmark it? How do you know if the strategy has run its course? How do you determine whether there are sustainable barriers to arbitrage if you don't have good tools that allow you to identify when the alpha sources have decayed to the point where they no longer cover trading costs?*

We have kicked around a lot of these techniques, mostly supervised because we like to think about things bottom-up. Colloquially, we like to identify the sucker in advance. It sounds to me like some of the strategies that you have allocated to take a similar approach, arbitraging known flows for long-term trend followers, that type of thing. But to what extent does that quality of identifying the sucker in advance factor into your allocation process? And how do you think about sustainable barriers to arbitrage, and how to identify when the anomalies are no longer profitable?

Markian Zyga: I'll begin by commenting on how I qualitatively think about these types of approaches. I absolutely agree, and it is something to consider in all systematic trading approaches, but most meaningfully in the situation where signals are changing on an ongoing basis: *how do you identify the point of degradation within a machine learning approach?* I do not have a perfect answer. We aim to understand qualitatively and quantitatively how these different approaches historically have performed across different market environments through ongoing discussions with our portfolio managers and then mutually agree on a pain threshold, a stop-loss level, at which exposure will be reduced. Just as importantly we attempt to allocate across a diversified set of these approaches.

The point made about Quantopian is an interesting one, and they are not the only group that is pursuing the path of crowd sourcing trading strategies. I think one of the most meaningful and exciting developments within the quant space over the past several years has been the enhanced computational fire power that exists today. And also the proliferation of open source libraries that allow the quantitative community to pursue the research and testing of new strategies more quickly and efficiently than in the past. These developments also provide **new challenges in terms of defining research that is not over fit.** Perhaps most intriguing, if we are to assume that new strategies can now be more quickly developed, or that the development process is now becoming more commoditized, how should these different strategies be constructed within a portfolio, and how can you be confident that they are actually different from one another?

Despite these potential issues, what is very exciting to me is that despite greater sharing of information and resources, I believe greater potential exists in developing different quantitative trading strategies. Previously, within the managed futures industry, most managers were pursuing trend following approaches, and differentiation was driven by timeframe and market selection, whereas today, two researchers applying similar machine learning methods can end up with very different strategies based on the parameters selected, and optimization routines and fitness functions utilized.



By no means do I think there is a silver bullet as it relates to quantitative investing. I think for us, if our experiences have taught us anything, it is maintaining a diversified allocation across these different approaches, but then also hopefully having developed long term partnerships with our managers so that we may be thoughtful, convicted, and measured during the inevitable more challenging periods of performance.

Jeff Malec: It seems to me that at this point AI at this stage of machine learning is just a **brute strength problem,** no? They are analyzing millions of combinations that would have taken a team of humans much longer to do, so it's just brute strength to quicken the process. And it's supervised, so it's still inputs from the humans or human driven. To me, the key to all of this, and when AI in investments will get really exciting, is when the machines can figure out the switch of regimes and such things.

There was a big article a while back on Man AHL and their applications of artificial intelligence, and the two examples of the AI's great trades were buying the stock market dips in 2015 and after the Trump election. So, to me that's not all that mind blowing where we all need to be like *"Oh my God, that computer is so smart!" Nearly everyone was already on that trade…* So it's rather like "Well, we bought the dip because that had worked the past 20 times looking back at this time period." So to me, that's a little worrying, or perhaps the term is unimpressed. And my punch line whenever talking about AI is that I won't totally believe in it until Facebook and internet ads don't show me ski sock ads in June -- I already bought them, I've already gone skiing, I don't need the socks.

Scot Billington: When I think about AI, first off, I would say there's no reason that a carbon electro chemical system would be better than silicon.

And frankly, we know that already know that computers do almost everything way better than we do. Driverless cars are going to reduce accidents by a factor of hundred thousand and planes are flown almost entirely by computers now, while we on the other hand we love feeling like we're in control. One of the biggest blocks to driverless cars will be that we are afraid to let someone else drive the car.

For me AI means that the machine is learning something from its inputs and that it is also able to make inferences that we couldn't make. When you think of the computer that beat everybody at Go, it basically played itself a billion times over say a three-day weekend and lo and behold, those billion trials made it a lot better at Go than someone human who may have played 10 thousand games at a maximum. Of course, games like Go and chess are bounded environments that certainly lend themselves to machine learning.

Jeff Malec: What about in poker, say in a World Series of Poker, would the machine beat us now?

Scot Billington: That's maybe a little less bounded environment than a game of Go or game of chess, but ultimately that seems to come down to experience, meaning that machines play 10 billion games and we've played 10 thousand. And then there's the factor of brute force computing and memory, where the computers are vastly superior to humans.

As it comes to trading, I think that a couple of things are very important. One, I think it's interesting that Markian made a short-term versus long-term point. In trading, the AI approach assumes that there are inefficiencies that a machine could learn, certain anomalies and things that can be predicted from whatever inputs there are. Whether we are taking price or fundamental inputs, there has to be something that a machine could evaluate and say, "Oh look, X and Y mean a higher probability of Z." That of itself is pretty questionable. So I think one of the most interesting questions is: *are there really things that can be learned?*

And the other issue is that if I start overriding my driverless car, I will probably increase the number of accidents dramatically. The question here is can we step out of the way and let the machine drive the entire decision process?

So what's the endgame of this? Will at some point everything be fully turned over to a machine? I don't think we will see this happen in our generation. I'm a skeptic here, but when it comes to major paradigm changes, I think people from my generation rarely change their minds. Let's just take a look into our own families. Again, I am exaggerating here, but my kids never bought anything meaningful NOT on a computer. Both my sons trade Bitcoin and they think they're George Soros right now. They couldn't be more thrilled with themselves. There is an ease with which younger people deal with machines because as digital natives they have been much more intimate with technology in their lives than our generation.

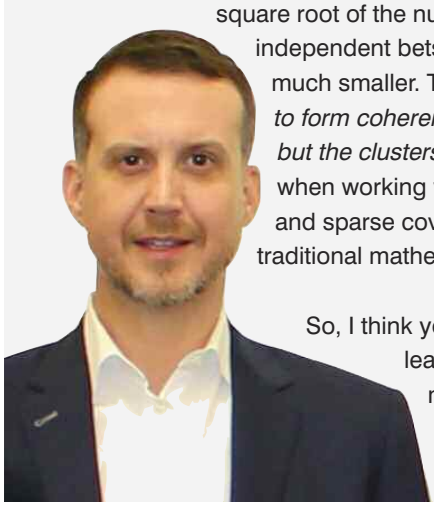
So there are some fundamental questions I am asking myself. Are these machines eventually going to be eviscerating every potential market edge? Or to start, are there even market edges that a machine could pick up?

Adam Butler: Nevermind AI. Let's first take Scott's question head-on: can the problem be solved? Consider the case of relatively simple complex systems like three moving bodies in a gravitational field. Using the most sophisticated dynamic programming and computational power, it is *impossible to forecast* where these bodies are going to be with meaningful precision just a few steps in the future. And this is a system where we have a very good physical understanding of the underlying mechanics. Moreover, the rules of this system don't change by virtue of the fact that we have grasped them. Now extend this metaphor to the case of many bodies. The problem becomes intractable very quickly.

Consider a common use case for machine learning: **big data.** A large feature space, i.e. many data sets sliced and diced with many conditionalities, leading to combinatorial dimensionality. This characterizes many unsupervised machine learning projects. There isn't enough computational power in the universe, notwithstanding potential quantum computing applications, to effectively mine the data. But even if computational resources were unbounded, new data sources typically deployed in these projects have much too limited data histories to provide statistically meaningful relationships. Lastly – and this is the true limiting step – most potentially profitable market relationships are fleeting, so once a relationship is identified there is no way to tell when it stops working.

Now, there is much greater potential for machine learning to be useful in a supervised framework, i.e. systems where humans curate the data are likely to prove most meaningful. In which case, *man-machine partnerships* are likely to prove quite fruitful. My baseline assumption is that there are a handful of truly persistent anomalies at work in markets, and we have a reasonably good grasp of what these are. Momentum, trend, convergence, volatility, investment, and a few others of lesser significance. These anomalies have strong fundamental underpinnings linked to identifiable behavioural and structural mispricings. From the perspective of machine learning, there are good proofs that show **thoughtful machine weighted combinations of curated signals will at least outperform equally weighted signals.** That is, equal weighting of factors represents the lower bound. This is an area that is ripe for innovation.

From a portfolio perspective, what we want to do is add many diverse investments, because the information ratio scales as a square root of the number of independent bets. Now, trading 100 financial futures doesn't mean you have 100 independent bets. Many markets are highly correlated, so the true dimensionality of the opportunity set is much smaller. There are very creative ways to use *machine learning techniques to group assets together to form coherent clusters, where the assets in each cluster are all driven by the same underlying forces, but the clusters themselves are driven by fundamentally different forces.* This is quite useful, especially when working with large investment universes, as portfolio optimization becomes very noisy with large and sparse covariances. These methods may produce significantly more useful and stable results than traditional mathematical rotations like principal component analysis or singular value decomposition.



So, I think you have to pick and choose where you employ this type of supervised or unsupervised learning. There's all these tricky degrees of freedom, including hyper parameters, in the machine learning problem that I find fascinating, but also that I think merit caution.

Craig Weynand: Recognizing, then, that there are often issues associated with certain newer, or alternative, data sets, perhaps it's best to focus on more traditional data sets – at least until the alternative data sets are more mature.

There are probably an endless number of ways to parse or aggregate something as basic as time series price data, different ways to define or categorize traditional data sets and different combinations of relevant data sets that may be indicative of behavioral outcomes. If you were to define a unique matrix of logical and mathematical values associated with a given time series – basically,

develop a descriptive "profile" of current price behavior for a specific market or stock - then machine learning techniques can sift through history and compare similar and different "profiles" – How different is too different? Are there historical profiles from which a meaningful inference or forecast can be made? Are you able to identify historical analogs – or similarities – that are meaningful? If so, perhaps you can forecast directional price behaviors.

Essentially, by learning how market participants have responded to events in the past, we may be able to assess the probability of similar behavioral outcomes in the future, and machine learning is an important element of that process.

Jeff Malec: I'll put on my Philosophy major hat here and ask the philosophical question of *what happens when everyone has the machines?* Can one machine be smarter than the other with the same hardware and physical restrictions? In a future world where the machines create their own hardware and software to improve their intelligence – will that necessarily mean they will all come to the same conclusion theoretically? If they do, will, at some point, the human inputs matter again when all the machines are equal?

John Schabilion: Investors in systematic strategies should understand that *even if a machine predicts a probability of a trade one or two percentage points better than a fundamental manager, this does not necessarily mean that the trade will be profitable.* The issue at hand really centers on the difficulty of the questions being asked and investors should always remember that over short time periods in markets luck or randomness often dominates skill regardless of whether you are executing a strategy on a discretionary or systematic basis. I think the biggest thing for allocators getting into the systematic space is making sure that they really understand what the machine is capable of and what it isn't capable of, so that expectations are set appropriately.

One of the interesting things researchers find when they study the relationship between humans and machines is that *when machines get something wrong humans are very quick to discredit or discard that machine or system. However, if a person gets something wrong people are much more likely to give them a second chance.* I think this difference really has to do with the fact that you can sit across from a person, see the contrition in their eyes, and receive an explanation of what happened and why. But with a machine, especially in the sense of unbounded AI, it may not be immediately intuitive why the machine was positioned a certain way. Additionally, markets can and often do experience exceptional events, which have never been seen previously, and therefore can result in large scale losses for both discretionary and systematic strategies. All of this takes us back again to the requirement that investors **be diversified** across a number of different markets and strategies including having allocations to a mix of systematic as well as traditional fundamental investment approaches.

In the end, having a strong risk management framework is really the key to long-term successful investing and something we spend a lot of time thinking about at 50 South. Investors always need to be thinking about and reviewing new strategies and investment opportunities but *overexcitement about new things is ultimately what gets many groups into trouble.* For example, they see a new technology or strategy and often rush in with an allocation that is too large. Then the minute the strategy becomes challenged or struggles, even if it is due to an exceptional market event, investors rush back out and end up crystallizing losses that they should have never experienced because they either took on too much risk initially or did not fully understand the strategy on the way in. I think the challenge of ongoing manager coverage and portfolio risk management oversight is why it is often best for hedge fund investors to utilize a firm that is dedicated to the space and has deep experience evaluating and investing across a wide-range of strategies.

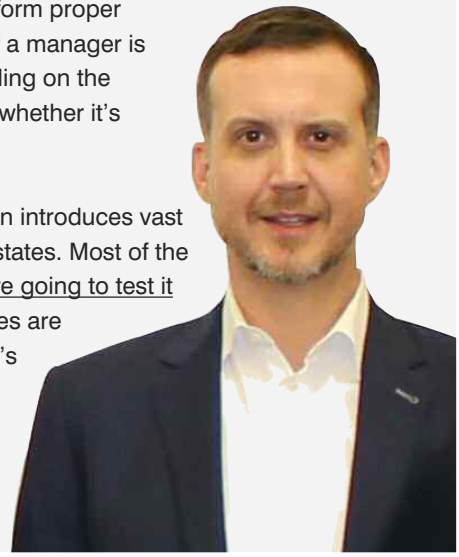
Markian Zyga: I believe that there are a greater number of principal components which explain variance in market price action over shorter timeframes, whereas over longer time frames momentum will be more prevalent. Qualitatively, this explains to me why we should be targeting investment in AI approaches over these time frames as the opportunity set is potentially greater.

I think it was touched upon a little, but one of *my biggest concerns with machine learning based strategies relates to market regime changes.* Many of these strategies have performed and have been developed during a period of developed market central bank quantitative easing, which I think a number of us would agree that is potentially not representative of a normal, or at least historical market environment. What happens if we were to move back into a higher volatility environment?

All of those questions do mean to me that there needs to be trust between us as investors and the researchers and portfolio managers that are applying these processes.

I thought Adam made an interesting comment on data, and the idea of big data is another popular topic. We get asked about it a lot, and I am sure you all do as well. I am curious how the managers here think about researching new data sets? A lot of times it is hard to obtain clean datasets or a long enough history to actually have statistical significance. And also, how do managers think about how long an alpha based on a unique data set will be expected to perform before degrading?

Adam Butler: We haven't directly explored the opportunity in big data, but we have zeroed in on it. I mean, it's so funny because there's so much dimensionality just in the traditional factor strategies. We've done factor decompositions on a variety of the larger hedge funds and just run it against two or three different definitions of cross-sectional and longitudinal carry, different scales of trend, that sort of thing, then applied trend and carry indexes or benchmarks for attribution analysis. My experience suggests that the problem is so noisy and nonlinear that you can't even perform proper attribution analysis when you know generally what the manager is up to. For example, if a manager is primarily trend based, that can mean almost an infinite variety of different things depending on the number of samples the manager is taking, how the manager is optimizing the portfolio, whether it's incorporating other signals as well, etc.



My point is, to branch out and try to introduce other nontraditional sources of information introduces vast degrees of freedom. All of a sudden, you're introducing a large number of new system states. Most of the data is only available over the past 10 years or less, in which case 90% of the data you're going to test it on came from one major economic environment. Worse, central bank dominated regimes are presumably the exception, not the rule. And I don't care if it's high frequency data or if it's monthly data. If you're testing it over the period from 2007 to 2017, you're testing it on one regime. So this whole idea of having a larger sample size if you've got higher frequency data may be profoundly misguided.

Craig Weynand: In terms of big data, we share a lot of the same concerns. How far does the data go back, what has the environment been, is it readily available, what is the quality, is there a lag, etc. Perhaps an even more important question is whether the data will be meaningful to your process or methodology - or, from another perspective, can you develop a process or methodology for which the data will be meaningful, or does the data merely confuse the issue and create more noise – more trees and a larger forest, but that may only make it harder to find the quail.

Scot Billington: I think it's interesting to talk about the model development side of things. At the end of the day, you try to talk about the future and you're hoping that there's something in the past that rhymes with whatever happens in the future. So I've got to take some input whether it's price change or some kind of supply-demand curve or weighing of geopolitical factors. I'm going to take these inputs and then I'm going to have to assume the model generates some output that translates to the future.

My general thought is that there are very, very few anomalies or mispricings. I don't think the markets are particularly efficient in the random walk down Wall Street terms. But I do think that there's so much noise – I mean, probably the dirtiest little secret of our industry is that every five-year performance record you're looking at is driven 90% by luck. It's not too dissimilar to my children buying bitcoin. And I hope they get really lucky because college is expensive and I would not hesitate to have them pay for it.

Looking at past performance is no different from looking at some kind of modeling or back testing. I always think that when I make a decision based on what has happened previously, which ultimately I have to do, there's a realistic chance that I'm picking something that has done better than its future expected results.

And I can risk adjust them a thousand different ways. Hopefully we're using ways that make mathematical sense. Ultimately, we're trying to serve as judge. I don't get to go back to '99 to start trading or else we'd all be rich. Is this model really going behave in the same manner going forward that it did from point X to now?

The shorter-term occurrences are a little easier to predict. I'd rather attempt to predict tomorrow's weather than predict the climate 50 years from now. And I'd try to think of making broader statements like, "I think it'll be warmer June 12 than December 12." I'm not trying to predict a specific absolute outcome, but rather I've created this relative relationship between the two and I can make a broad, more robust statement. It is not as specific and may not seem as useful in some ways, but there is still a lot of value in being able to draw those types of conclusions, especially when you begin to combine them.

Craig Weynand: Much of that speaks to the importance of the modeling process, potential biases, testing environments, assumptions, etc. More recently, we've focused our efforts on intra-day and shorter-term model sets, as well as development of fully automated signaling and execution engines that look beyond basic momentum concepts and incorporate a wide range of higher order factor analyses and advanced machine learning concepts.

Jeff Malec: To Scot's point, the more interesting thing to me would be a manager who has all the datasets coming in and then works sort of like an AI based macro manager. Instead of focusing just on one market or sector, the AI could be saying, "Hey, bitcoin is up, I'm moving into bitcoin. Toronto real estate's up. I'm moving into Toronto real estate, there's no volatility in currencies, I'm avoiding those for now" for example, and so the manager could be shifting resources that way and always be in what's working. But from what I see this is not done, it is still "I'm trying to figure out this dataset with AI," instead of "I'm having AI analyze all the datasets to find out where I want to be." The interesting thing to me would be an **unconstrained AI** where you just give it the instruction – find the best risk adjust return. Full stop. It has to figure out where and how much to invest.

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John Schabilion: In addition to reviewing new managers and investment strategies we also spend time asking - "How does a new product or strategy change the market participant structure? What are investors prioritizing today? How much capital can a particular investment opportunity or strategy bear?" It could be that there is a lot of residual explanatory power in some of the unknown risk factors that AI can discover but overall the opportunity may not be entirely scalable or the cost to identify and harvest these returns may be greater than the return benefit to end investors. **Capacity** is really the biggest question and unknown when looking at many of these newer strategies.

To date with AI, I think we have seen the most power and successful application in its ability to identify investment skill over a large pool of perspective investors or brokers. This has allowed certain groups to isolate lower cost investment skill in areas of the globe or market place where there is often lower penetration of traditional investment capital or fewer institutions focused on elevating investment talent. So AI may be helpful in finding investment skill on the other side of the world or opening up new talent pools.

In terms of broader investor behavior, there has been an interesting shift in markets post-2008 where investors have increasingly moved into two extreme camps. One camp prioritizes very high levels of liquidity and therefore is only looking at investment strategies that are daily, weekly, or monthly liquid. These investors have increasingly pushed into ETFs and UCITS as a way to reduce management costs and enhance portfolio liquidity. On the other side of the ledger we have investors that have moved into very illiquid strategies such as private equity or private credit with the goal of earning excess return while avoiding mark-to-market volatility.

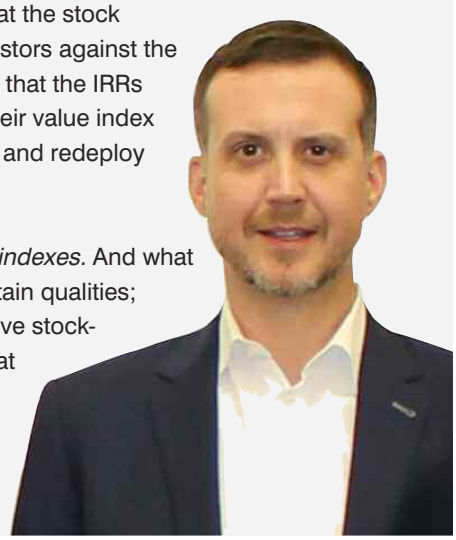
What you are left with in the middle of these camps is a *very interesting pool of credit, international, and small-cap equity opportunities that have been orphaned in the sense that they no longer have a natural holder.* They can't really be owned by ETFs or daily liquid players, because there not enough liquidity to facilitate daily transactions. On the flip side these assets possess mark-to-market risk and therefore can't be owned in size by the private credit or private equity players. Previously prop-trading groups and investment banks had transacted in and held these securities but with banks closing down their prop-trading operations there is a need for a new group of holders to come into the market. We find that despite the recent run-up in risk assets there are *still areas within lower middle market credit, emerging markets, and small-cap international equities that remain inefficient.* This abandonment of certain segments of the market for technical rather than fundamental reasons is really one of the more interesting dynamics that is emerging on the back on increasing ETF investment by public market investors.

Adam Butler: A really great ETF that would attract billions in assets would be one that allocates to mid cap stocks sorted on enterprise value to EBITDA that marks-to-market quarterly with a quarter lag. I think that that would really raise a huge amount of assets. You basically capture the entire private equity premium, and also provide that autocorrelation and low month-to-month volatility that they get out of their private equity sleeves. I'm going to grab the symbol FUPE right now.

Matthias Knab Ernst & Young just said that until 2020, so in just three years, ETF assets will grow 73%. What do you guys as active allocators, active managers make out of that?

Adam Butler: It is *useful to think of the alpha pool as a closed system where wealth is systematically transferred from weak hands to strong.* Strong players rely on participation by weak players to transfer enough wealth to cover the fixed costs of active management, and provide enough profit to make the exercise worthwhile. Investors who migrate from active funds to market cap weighted indexes are explicitly choosing not to participate in the alpha pool. As more weaker players leave, the pool of alpha shrinks. Worse, **the active players that are left are incrementally stronger.** Eventually, active management ends up being a competition between the smartest, most capable players. Is it any wonder that less than 20% of active mutual funds beat their respective indexes over a typical five-year period?

Of course, there is abundant evidence that investors who abandon active management at the stock selection layer just end up trading indexes. If you compare the realized IRRs of ETF investors against the returns that they would have received from simply holding the underlying ETFs, you see that the IRRs are zero and the underlying index returns are meaningfully positive. Investors redeem their value index product, for example, because it underperforms the cap weighted index for a few years, and redeploy funds into quality or low volatility products because they've had a good run.



The big picture is that the *"dumb money" that previously traded stocks are now trading indexes.* And what are indexes? They are just baskets of stocks, bonds or other types of securities with certain qualities; sectors; diversified asset classes. Our working hypothesis is that this migration from active stock-picking to active indexing ends up magnifying Samuelson's dictum, which is the idea that *markets are micro efficient, but macro inefficient.* To harvest this new alpha pool, you've got to trade indexes, futures, macro instead of trading at the individual stock level.

Scot Billington: Ultimately, if I'm trading indexes, I'm sort of trading stocks too, although just in baskets, right?

One of the things I think is interesting about the ETFs relates to the *short VIX ETF, SVXY*. When I look at it I see what seems to be a disaster percolating. Obviously the VIX has a carry and it's generally going down. But the SVXY actually sells VIX future. So they are short 100,000 and 200,000 contracts, somewhat perpetually. Let's imagine the VIX went up X amount of points. They have to buy 45,000 at the end of the day.

There's something there that I think is exploitable, but perhaps only in a very niche manner. I can't manage $20 Billion doing it – Citadel won't care about it, but the Billington family might care about it. *Trading around these ETFs that have published formulaic rules that they have to follow in the exchange of their underlying instruments, whatever they might be, can be meaningful.* I do think that can create a number of potentially exploitable inefficiencies. And then perhaps so many people come in and try to do that that other inefficiencies appear elsewhere.

So I do think that the ETFs, particularly when they get huge, can create some interesting trading inefficiencies. I like your business model of saying we're going to find these managers that can take advantage of these anomalies. And it's not that they could manage $8 billion, but they could trade $50 million or $100 million with this or even $25 million and I'm going to go get 12 people doing that instead of one person trading something that has to be more liquid by definition.

I think the ETF concept is actually great for people that are looking for different, weird, niche-y anomalies that can be taken advantage of. And I think that VIX ETF is a perfect example. At some point, it may be 22 years from now, the VIX is going to go up a lot. And they're going to have to buy tens of thousands of contracts at the end of the day, plus any redemptions they get. So you could imagine if the VIX ever doubled in a day, will they be at zero?

Jeff Malec: But when?

Scot Billington: Of course it's still a matter of "if" or "when". And if I knew for certain I probably wouldn't tell you. But if the VIX went from to 12 to 25 in a day, they're more than likely going to have a negative balance.

Craig Weynand: I agree that there are a host of niche inefficiencies that can be exploited, whether it be in ETFs, indices, commodities, calendar spreads, etc. – when the footprints of certain participants in a market get particularly large, there is usually money to be made from tracking those footprints.

Markian Zyga: I agree with the point that anytime you have a large change in the population of market participants, this is both a potential risk and opportunity. I previously mentioned that on the machine learning side, I prefer trading horizons across shorter time frames, but as it relates to ETF flows, perhaps it means that prices take longer to get to fundamental fair value, and in this context a longer term approach would be warranted.

Regarding the VIX trade, I am in complete agreement that there is a lot of negative convexity right now in terms of a trade that's being pursued by many members of the hedge fund community. Also worth noting is XIV, which is a popular trade for the retail community in holding short volatility exposure. If you actually look at the ETF fund documents, investors can be stopped out if a certain percentage decline occurs. Should a sharp intraday market decline occur, there is a lot of negative asymmetry given the amount of investors holding short positions in the VIX today.

Within the managed futures space, I can understand the appeal to trading the VIX. Most CTAs are trading momentum and mean reversion strategies which are reliant on volatility, and an allocation to short VIX exposure will diversify their risk allocation.

However, we have sought to contractually restrict our momentum managers from holding short VIX exposure as I do not find the risk to reward of this trade at the current levels of market volatility attractive. *The VIX trade is the one crowded trade that I would point to within the managed futures industry today presenting concerning risk.*

Anthony Lombardi: When we talk about managers who are looking to exploit certain interests in the market, I mean that's the whole point investing with emerging managers. Capacity is a term that means different things to different people. For the team, we view this as where the manager can stop allocating to his or her core strategy. The larger managers cannot generally take advantage of smaller opportunities and this is a strength of the emerging managers. These managers can take advantage of this. They're nimble. No one is bashing larger managers, but for those investors looking for hedge funds that can successfully operate in these scenarios, then smaller managers are the answer.

Craig Weynand: Basically, it takes a long time to turn the aircraft carrier around... and that's what the $35 billion CTA is. To Tony's point, I know from my days as an allocator that some of the larger CTAs offered a financial, metals and energy portfolio AND a diversified portfolio, but the difference between the two was that the diversified portfolio had less than a 2% allocation to the "other" commodities markets. Is that a meaningful difference... or is that just marketing?

John Schabilion: In terms of ETFs, I agree that it is an enormous transition and managers have to pay attention to it. Over the near-term the transition into ETFs is likely to continue and may even accelerate, resulting in technical investment opportunities for managers focused on trading and market making activities. Longer term, this trend will likely create **fundamental valuation-based distortions** that active managers will be able to monetize at some point. I think investors have to be careful to disaggregate the two effects and not confuse the long-term distortions and the short-term technical opportunities. Groups can get into a lot of trouble saying, "This fundamental distortion is being created because X company is not in a particular ETF that most of the money is flowing to" but miss the fact that there may be no near-term catalyst which will change this trend.

I anticipate that there are going to be **valuation-based investment opportunities** created because of the way ETFs are constructed and how they tend to prioritize liquidity and size rather than fundamentals, but at the same time, we may actually still be in the early stages of ETF adoption, so investors need to understand that they can't stand in the face of this transition until there is an identifiable catalyst that will result in a paradigm shift. It is always important to think about the technical aspects of where money is flowing and the event path for potential changes over both the short-term and long-term.

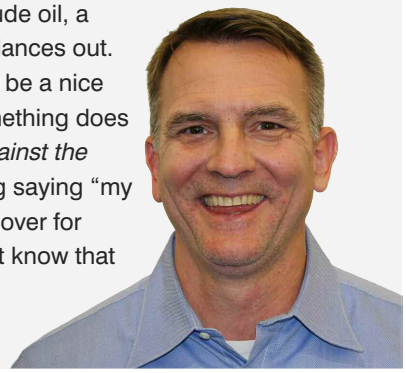
The key is that investors can't be stubborn and just say, "I'm going to invest on valuations", while positioning yourself against some very strong technical dynamics. And on the flipside, investors can't hold onto the technical trades forever, because eventually, there will be a large scale correction. As Markian said earlier, flexibility will be an important aspect for successful strategies.

Jeff Malec: Back to the ETFs, any of you who are familiar with Reformed Broker, Josh Brown's blog? He had piece about a year ago about the relentless bid, he calls it that, and it was basically about all these asset shifting into ETFs, shifting from transaction-based stockbrokers to wealth advisors that are fee based. And he was saying this is creating this relentless bid that month-in, month-out there's money coming into buying long-only stock index ETFs. And I think, we're all discounting a little bit just what that structurally could mean. It's interesting to consider what happens with active vs passive or whether ETFs are structurally setup to handle mass redemptions, and so on. But what nobody seems to be talking about is what this flow is doing for the shape of the market, and more specifically its volatility. I think, maybe more so than quantitative easing and all the rest, that *this low vol environment is caused by this relentless ETF bid and the fact its just constant, that no matter what happens, there's more money coming in the door.*

As for the VIX, I ran the numbers before we came here. And actually on the short volatility products, the assets just switched over sometime recently. In short VIX ETFs there's 2.25 billion, in the long VIX ETFs, there's 1.92 billion now. So it had been roughly 3 billion in long vol products and 1 billion in short vol less than a year ago, and it just has gone – all of a sudden, it's crossed over. And I put this to anyone selling VIX, is the tail now wagging the dog on the short VIX trade? *Are we all getting ahead of ourselves with institutions and even typically long vol managed futures programs now adding short vol as a type of 'asset class'?* What happens when there's more insurance sellers than insurance buyers? And they always point to well, the implied is higher than the realized. So, until that evens out or goes negative, which I don't know if that is even possible, but until that happens, know the trade is still there.

So, we'll see how long insurance buyers remain out there, with more and more sellers showing up every day.

Scot Billington: It's odd that the short would go over long because you have a world that's long equities by definition. Equities are the only markets in which there's not a natural short. If we were talking about crude oil, a consumer needs to buy some crude and a producer needs to sell it, so everything sort of balances out. On the equities side you would think that people would have more long VIX because it might be a nice hedge to some of the natural long equity exposure, but this just goes to show that when something does well enough for long enough that it becomes hard to dismiss. *This might be an argument against the dominance of AI taking over in the next decade.* I have a hard time imagining someone going saying "my phone tells me I should keep losing 2% a month in this even though my brother in law came over for Christmas in his new Porsche and he made 2% a month in this. I'm going to stay." I just don't know that that will happen.



Adam Butler: Just circling back to what Markian said in our discussion about having banned your trend followers from being short VIX -

Markian Zyga: To be precise, trend followers or anyone trading momentum strategies with a longer timeframe.

Adam Butler: Right. I think the mathematics of strategies like short VIX can be interesting to explore. So, just think about a very small allocation to a dynamic volatility premium strategy, in the neighborhood of two or three percent of capital. You acknowledge that, at any given time, you may lose two, three, or even four times your investment, even trading the second or third contract. Over an infinite horizon, the probability of this type of outcome approaches 100%. *But in the intervening period, you have an opportunity to capitalize on a strategy with a 1.5 Sharpe at 30 percent annualized volatility, which generates 45% annual excess returns.*

The key to success is skimming the growth from the volatility sleeve to maintain the small target position at all times. Even if you model a meaningful probability of a loss equal to two or three times your invested capital every five or ten years, this strategy ends up being a positive long-term contribution to the overall portfolio. Even better, if you run the strategy long-short, you have the potential to be long volatility into the teeth of a sustained crisis, with excellent tail-hedge potential.

Scot Billington: Income overtakes the downside.

Adam Butler: Exactly!

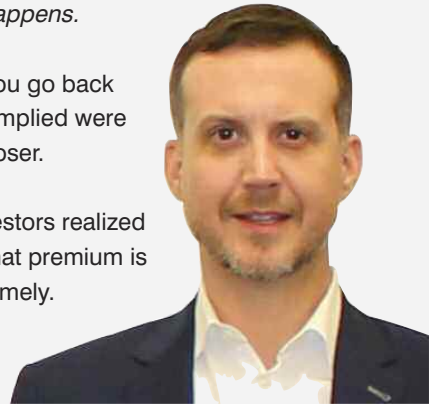
And the kicker is that, once you work through a major volatility shake-out, the premium resets at a much higher level. I mean, the carry you earn on that volatility premium over the subsequent five or ten years is going to be absolutely monstrous, if you manage you position sizing, and have the capital to redeploy once the crisis passes.

Scot Billington: You don't let the investment compound.

Adam Butler: Correct, the investment doesn't compound, you just keep harvesting the gains.

Scot Billington: And the massive loss sets you up for bigger future prices.

Adam Butler: Precisely, *you can re-up on that sleeve of the portfolio after the shake-out happens.*

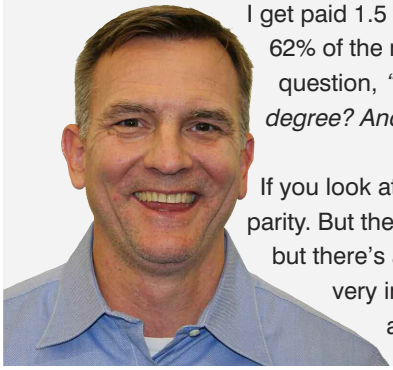


I also want to revisit the assertion that there's always been a volatility premium. In fact, if you go back and examine the realized versus implied volatility prior to 2008, you see that realized and implied were basically the same, and a short volatility strategy from 2004 through 2007 was a massive loser.

So it wasn't until A) volatility instruments became liquid enough to be tradable, and B) investors realized that they should buy tail insurance, that the volatility risk premium became attractive. So that premium is going to change through time and I think we've got to be prepared to harvest it when it's timely.

Scot Billington: One of the things I think is interesting about options and volatility is that I could buy an option from Adam. He could hedge. I cannot hedge and we can both win, and I can think, "I can't believe he sold me that thing for 650," and he might think, "I sold a call, bought the futures and they grinded right up to my price and I raked both ways."

It's interesting that with options that both people on other side can win or lose unlike any other transaction. The other thing is that these options have to adhere to a lot of different masters. I think put-call parity is always going to be first in line. We're going to have to adhere to that because it's easily arbitraged out. From there you next have to consider the skew. I may not be exactly correct, but I don't think there was a skew until the '87 crash. In straight option theory, there's only one realized volatility. But if you look at the volatilities using the SPX as an example, you look at the volatility skews. The skew actually fits the observed distribution unbelievably well. Meaning, if I sold a risk reversal 10 points away and bought the future, I get paid 1.5 to 1 because I can sell the put for that much more than a call, but the market goes up in like 62% of the months. In theory, the market should not have adjusted to that, but it has. Then that begs the question, *"Well, is the distribution going to continue the same way into the future or to the same degree? And then, how quickly will the market adjust to those things?"*



If you look at the VIX options, the at the money put and call are going to have to be equal due to put-call parity. But the put, particularly right now, how much can it make? It could obviously go almost anywhere, but there's a pretty decent floor there, and the call is obviously unbounded. So it really introduces a lot of very interesting trading potential if you know outcomes or situations that perhaps can be taken advantage of, particularly when you have so many different rules in play.

I've got a VIX, I've got a VIX future, I've got SPX, I've got S&P futures, and all of these things have to relate. They have so many different masters that they have to obey; I don't think they can necessarily obey them all perfectly. And that maybe the kind of strategy that allows for taking advantage of these imperfections. Again, I probably can't trade $2 billion in them, which I think is important. Because when we're looking at a new strategy, there's a natural inclination to ask "Why isn't Citadel doing this?" They are a thousand times smarter than me, they've definitely seen everything I might ever see in the market, why aren't they doing it? Why isn't Goldman Sachs doing this?

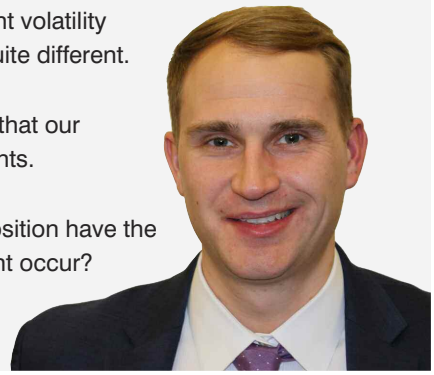
And the answer needs to be, it isn't worth their time. By the time they set up a desk, this doesn't make enough money for them to care. And then I'll always say, "Enough money for me to care!" In your bigger strategies that can handle the AUM, the larger managers are probably going to dominate. They've got the tip of the spear in technology, the tip of the spear in brainpower, the tip of the spear in operational efficiencies and things like that. They can commoditize them and charge the least fees and still deliver a very competitive product. That's the case across almost every industry.

I think for smaller groups much of the future is in these smaller niche strategies. If you look at any other industry, generally what happens is it consolidates. Target and Walmart dominate, and then there are some little smaller specialty stores that are local enough and special enough that Target doesn't bother competing with them. But a lot of those stores make a nice amount of money. And I almost think that alternative investments have gone that route in many ways.

Craig Weynand: The industry has generally become a barbell shape, particularly in the CTA space – lots of small managers exploiting niche strategies on one end and a handful of behemoths who dominate in terms of asset gathering on the other end... with the number of mid-tier managers dwindling as they struggle to gain traction with the institutional set.

Markian Zyga: I already made the comment about not desiring short exposure in the VIX from our trend followers purely based on what I define as the asymmetry within that type of exposure given the level of volatility today. Here we are also benefiting from our structure: investing via managed accounts allows us to understand what each individual manager is doing, but also what that individual manager's exposure is within the context of a broader portfolio, understanding how everything fits together and what risks we are really taking or willing to take. This is important because as it relates to common factors, common betas – so any known market return driver that can be accessed efficiently and cheaply by investors – we are not really providing value by putting our client's capital in those types of things.

And so, the VIX I think is another example of a cheap market factor, i.e., we can find very cheap ways to be short volatility should we desire that exposure. Understanding what the impact is of market participants trading the VIX on the markets that our managers are trading is very important. In addition to that – we previously talked about investor flows and how they can generate trading opportunities – there are different ways to more effectively cap risk within the VIX. This could include the use of option structures. Also if at a future point in time, if we move to a different volatility environment, my view of the risk and reward of trend followers trading the VIX may look quite different.



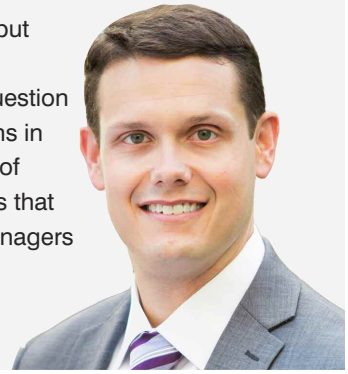
Regarding our quantitative futures exposure, we hope to have a long volatility profile, and that our underlying managers should have an opportunity to perform in higher volatility environments.

And if a trend follower is holding a 5% net short position in the VIX, does the risk of that position have the potential to have an outsized impact on the manager's performance should an outlier event occur?

Adam Butler: I think they'll complement an active volatility strategy and an intermediate or longer term trend following strategy.

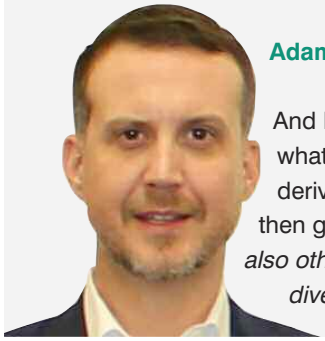
Markian, I'm interested to hear your thoughts on that, because our research suggests that while trend following does tend to have a long volatility profile, this long volatility profile takes a little while to manifest. Take a typical impulse factor of around 60 or 70 days for an average diversified trend strategy. Well, an initial move in the market is not going to move the needle in terms of shifting the direction of portfolio bets. But if you are also trading an active VIX trading strategy, then you're going to aggregate signals from changes in the futures term structure, changes in the spot term structure, changes in the curvature of the term structure, changes in realized versus implied, etc. These signals operate at a different time horizon, and harness orthogonal information that can complement standard trend signals. This means your volatility strategy may flip from short vol to long vol long before your trend strategies end up exhibiting the sort of long volatility profile that we all hope that they're going to exhibit in the context of a crisis.

John Schabilion: Volatility is one of the more controversial asset classes that people trade today but with **cryptocurrencies and bitcoin** set to become a more investable asset class via futures and potentially ETFs in the future it would be great to get everyone's thoughts on the space. So, my question for the managers at the table, is this something that you will look to as an addition to your programs in the near future and how would you go about the evaluation process? What are the pros and cons of being early and how much track record do you need? For the allocators here, is this an asset class that you would consider including in your portfolios and how would you react if one of your current managers decides that they are going to enter the space?



Markian Zyga: If it is an exchange cleared futures market with adequate liquidity, continues to exhibit meaningful volatility, can be traded similarly from the long and the short side, and has a material retail presence, it may be an attractive market for our CTAs to trade. I would want our managers to trade it on a volatility adjusted basis prudently as they would trade any other futures market.

Anthony Lombardi: I think people are jumping the gun right now. This is the "new-new thing". I want to see this market get a little bit established. If a manager was to trade it I would want to see that exposure limited as a percentage like any other product they'd be trading in a trend following or any other strategy.



Adam Butler: Well, I don't think we have any idea what this thing is.

And I don't think we have any idea about what its true underlying liquidity is. I don't believe you can tell what the liquidity in bitcoin is from examining the traded volume. And so once you start layering derivatives on top of something that is as derivative as you could possibly get, the level of complexity then gets compounded. *I personally would want to see the instrument go through a full market cycle and also other competitive instruments go through similar market cycles and see the degree to which they diversify, the degree to which some recover and others don't.*

I'd love to say it's just a price series and we should find a way to trade it, but I don't really think it's a price series in the same way as the established, centrally cleared markets that we all are used to, that have already been tested in very hostile environments. I think I would need a lot more time to observe the behavior of cryptocurrencies during more hostile conditions, before I would want to consider any sort of meaningful allocation.

Jeff Malec: I'll counter you there and say if you are willing to do the VIX by assuming a large loss possibility, you could do the same in Bitcoin, no?

Adam Butler: Right, I said it can be a several-times loss possibility, absolutely, and you need to model all of them.

Jeff Malec: So in theory, you could set your model as that and say, "Okay, I'm going to trade bitcoin as I traded VIX with just with that parameter," right? So, I think that's what you'll see out of most managers. I'm not crazy about it, so I am putting very tight bounds on it, but I really like the volatility and the short term and longer term momentum, so I'm going to look to access those.

We're actually launching a **principal protected bitcoin fund,** using the futures as a way to give people exposure, so it will be something like 15% to 30% of the upside with no downside, and a term obviously to get the principal protection. I've gone to a few crypto hedge fund meetings, there's a guy who used to work at Tiger who's launched an interesting fund that's investing in the ICOs, and it's just to me, the biggest part of this as I understand it is that you can't invest in HTTP or TCP/IP, all these protocols that the web is built on, but this is digital a protocol that you can invest in.

So, in theory, this is the main logic of crypto, that you can invest in this Blockchain protocol that all this other stuff is going to be built on. How it's worked up to this point in the digital space is that the protocols made no money and all the companies on top of them, Google, Facebook, et cetera made all the money. And as the argument goes in this new environment, it's the protocol will make the money and the companies will be on top of the protocol.

And then that argument goes into Ethereum and these others coins that offer things like smart contracts which are built right into the currency or into the Blockchains. So, yeah, it's definitely interesting from a personal intellectual level to me -- but to me wearing my alternative investment pro hat, I'm excited to see some managers saying, "Okay, it's just a price series and I would like the volatility and let's figure out a way to harness it without blowing out".

I think the more interesting thing is the Interactive Brokers founder saying, "Hey, this is a threat to the whole futures ecosystem that we all live in. What happens if some people or letting people do it with not much margin up and it blows out of smaller FCM which you know, trigger some other bankruptcies." So, that to me is the bigger danger. But the good folks here at the CME will figure that out.

Scot Billington: I think bitcoin is a legitimate currency and I don't doubt for second that some cryptocurrency will replace or maybe share a place with gold ultimately. It's much more efficient because you don't have to store it, and neither of them has any real value. But frankly, a fiat currency doesn't really have any value either, other than that I can pay my taxes with it. I think that a non-bank generated currency or store of wealth – and again, gold is the best example for that – is very much desired, and that one of these cryptocurrencies may even replace gold. That having been said, this frenzy reminds me a very much of the **internet stocks in 1995,** almost exactly. And the funny thing is that we all remember the failure of Pets.com at that time. But now, some reborn Pets.com just sold to Google for like $900 million, so Pets.com worked, it just was too early in 2000.

The whole situation is very binary to me. One of them is going to be worth a very large amount and all the rest are going to be worth zero. While in my mind the endgame is a binary outcome of it, I also believe that it is probably tradable as long as it has liquidity, and so I agree with Adam's question how do we know that it's got the liquidity?

The other thing I noted that people sometimes make mistakes distinguishing between Blockchain and bitcoin. Blockchain is the tool that has an infinite number of uses. I just heard Steve Wozniak speak and he loved Blockchain. That technology changed his mind about AI.

Jeff Malec: Just three quick data points. One; 0.15% of the world's electricity right now is used to mine and transact Bitcoin which for sure, that can't be scaled, right? Two; there are more accounts on Coinbase now than Schwab. They opened up 100,000 accounts just in the last one or two months. And three, there are about 2 million monthly searches on Bitcoin terms versus like 2,500 or so for managed futures. You know, and even more than futures trading so –

Scot Billington: I've never been more bullish in managed futures!

Jeff Malec: So, from a liquidity standpoint, I think that there's more than enough interest now that the retail traders are coming out of the woodwork.

Craig Weynand: I would generally echo many of Adam's concerns regarding the trading of cryptocurrencies – at least for now. While we are interested, we are not ready to pull the trigger any time soon. Will the liquidity be there... is there enough history to test... how will it react to different environments or crises over time... how will regulation effect the marketplace – these are all questions for which there are no answers right now.

As we know, bitcoin is often associated with funding the black market economy, money laundering, terrorist financing, etc. In a world in which every national, state and local government seems to be drowning in debt, and combatting terrorism and money laundering is a top global security priority, it is hard to imagine that there will not be a marked increase in government oversight and regulation of bitcoin. Who knows how that will affect the cryptocurrency market. Also, how are you going to custody these things? I don't know if it's accurate, but I recently read that about 20% of bitcoin is stolen. These are all issues that will need to be addressed at some point, hopefully sooner rather than later.

Jeff Malec: Apparently some 10% of all bitcoins are lost forever because people misplaced their keys and cannot access their wallets any more.

Craig Weynand: Right. So, for all of these reasons, that's an awful lot of uncertainty in terms of liquidity, in terms of data, in terms of regulation, in terms of theft, and then you have to consider that bitcoin is merely one cryptocurrency, and that there are seemingly countless new cryptocurrencies being created. Will bitcoin be the dominant form... or ethereum... or litecoin... or some other one?

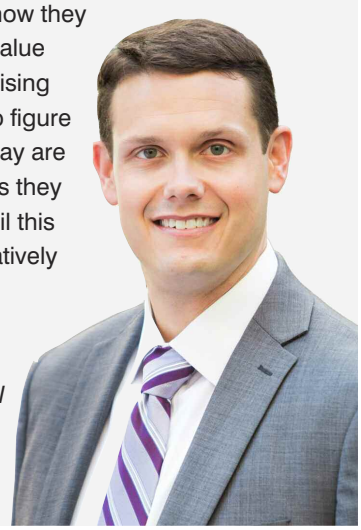
Jeff Malec: Beyond trading it, another thing that needs to be addressed shortly is the investment of bitcoins. There will be funds trading it as part of their portfolio strategies, for sure, but it can't be too far off in the future where someone comes to a manager and says, *"I've got Bitcoin that I want to invest with you!"*

There are many people who made large amounts of money, hundreds of millions of dollars up to billions in the case of the Winklevoss brothers, as it was reported recently. Some of them may say, "I'm ready to invest or trade or diversify, and I want to do it with you, and I want to do in bitcoin." Those bitcoins then need to have a way to be paid into a fund, and the fund needs a way to use them to post margin, and so on and so forth. Who's ready to tackle all of that?

John Schabilion: Just to be clear up front, 50 South does not have any managers trading or investing in cryptocurrencies today; however, I do anticipate we could have exposure in the future, if futures trading proves viable, and think that allocators will have to consider and address many of questions mentioned above as this asset class moves more into the mainstream.

I see two uses or investment approaches emerging today: *Investors can either trade the technical aspects of the market or invest in the asset as a long-term store of value.* In terms of futures trading, investors will probably want to see a certain amount of liquidity established on exchanges before reviewing and need to closely consider how the high volatility dynamic fits within their current portfolios. Also, because of the way Bitcoin is traded today and the intensity of clearing trades, market participants in futures need to understand how liquid the underlying asset ends up being. It remains to be seen if high trading volumes for bitcoin are sustainable or if another currency with better liquidity dynamics ends up stealing away the tradable float.

In terms of technicals, the near-term event path favors ongoing price appreciation in bitcoin as more market participants gain access, but longer term there are questions regarding the utility aspect of cryptocurrencies and how they should be valued. The most natural argument is that cryptocurrencies will be used as a store of value most similar to gold or the US Dollar but this market may also become an alternative means of raising money for special investment projects. The challenge for investors is that it is still way too early to figure out who the winners and losers will be. This is why I think most people involved in the market today are not investing in a particular cryptocurrency based on a potential long-term "use case" as much as they are speculating or trading for short-term profit. Investors would also do well to remember that until this market gets more critical mass, it is an asset that can be pushed around or manipulated by a relatively small number of well-resourced traders, many of whom do not reside within US jurisdictions.



Long-term profits in the space will likely resemble VC investing where there will be a few large winners who picked the right coins early-on and end up becoming multibillionaires, and there will be a ton of people who pick the wrong coins and are never heard from again. And so, cryptocurrencies are probably one of these situations where the winners write history and

therefore investors will tend to focus-on the success stories, while forgetting about all of the money lost in bad investments or in the case of some ICOs outright frauds. So for me, whether or not it's a long-term viable investment remains to be seen, but as allocators it's certainly a fascinating space to review.

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