GLOBAL VOLATILITY SUMMIT

January 2019 Newsletter

Dear Investor,

The Global Volatility Summit ("GVS") brings together volatility and tail hedge managers, institutional investors, thought-provoking speakers, and other industry experts to discuss the volatility markets and the roles volatility strategies can play in institutional investment portfolios. The GVS aims to keep investors updated on the volatility markets throughout the year, and educated on innovations within the space.

CFM has provided the latest piece in the GVS newsletter series.

Cheers,
Global Volatility Summit

Event

The tenth annual Global Volatility Summit ("GVS") is scheduled for Wednesday, March 13th, 2019 at Chelsea Piers in New York City. This year's event will feature fresh panel topics, manager discussions, keynote speakers, and a new US Politics panel. Space is limited, so we encourage you to register as soon as possible.

2018 Event Recap

The 9th Annual Global Volatility Summit was held on March 14, 2018 at Chelsea Piers in New York City. 14 hedge fund managers were joined by senior professionals from hedge fund consultants, the institutional investor community, and leaders in the industry to discuss volatility, tail hedging, macro and quant strategies within the investment context. Three keynote speakers, Lance Armstrong, David Gallo, and Ryan Holiday temporarily drove the conversation away from the central content to speak to volatility across other contexts including athletic competition and underwater astonishments. The event hosted the first-ever GVS Think Tank Panel, which featured three industry experts across East Asia policy studies, macro quantitative and derivatives strategies, and US politics. Among these panelists included Ryan Hass, Marko Kolanovic, and Demetri Sevastopulo.

2018 Manager Participants

36 South Capital Advisors
Argentière Capital
Artemis Capital Management
BlueMountain Capital
Capstone Investment Advisors
Capula Investment Management
Dominicé & Co
III Capital Management
Ionic Capital Management
JD Capital
Man AHL
Parallax Investment Advisors
Pine River Capital Management
True Partner

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August 2017

RISK PREMIUM INVESTING

A tale of two tails

Executive summary

Our recent research has shown that only negatively skewed, positive Sharpe ratio strategies should be classified as Risk Premia, with traditional investments in equities and bonds, therefore and according to this definition, also qualifying to be included in the Risk Premia category. Our experience is that investors tend to shy from investing in other 'non-traditional' sources of Risk Premia assuming that they will at best not help and at worst increase losses through the next crisis in combination with a traditional portfolio. In order to maximize the probability of achieving positive excess returns, however, investment in a well-diversified and risk-controlled mix of Risk Premium strategies is essential to building a robust portfolio through good times and bad.

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Introduction

In this note we introduce Risk Premia[1] as generically encompassing a set of strategies where investors are compensated for assuming risk. This compensation comes in the form of a regularly received premium and results in a strategy with a positive expected return. This positive performance continues until the moment the risk, which is being assumed, is realized, resulting in a sharp negative move. The argument generally invoked is that this premium is proportional to the risk or volatility of the investment or instrument being held, a measure which uses both sides of the return distribution. In this note we expand on the idea of a risk premium, with the help of a few example strategies, and show that the premium is in fact compensation for downside deviation or negative skewness risk, an idea which is justified with empirical evidence and also appeals to common sense.

Considering two investments of equal expected return and different levels of risk - a rational investor will choose the one with the lowest risk. This statement is often inverted as, given two investments offering differing levels of risk, the higher risk investment needs to provide a higher level of excess return, yielding more, in order to entice people in to invest. Within the Efficient Market Hypothesis (EMH), excess returns are only possible due to the existence of a risk premium. In fact EMH proponents will often explain away positive excess returns as being due to the existence of some form of hidden or latent risk. This risk, in financial parlance, is generally represented as the standard deviation (although sometimes other measures are used) of a time-series of returns. These standard measures of risk use both sides of the return distribution and do not distinguish up moves from down moves.

The existence of a risk premium as being compensation for assuming a volatile position makes sense. However, the idea does not satisfactorily account for investments exhibiting negatively skewed, asymmetric return streams. We instead, therefore, propose that a risk premium represents compensation for an investment that has a non-zero probability of selling-off sharply and we use the following example to illustrate our point. A short position in VIX futures is a profitable trade over a long back-test. At the onset of any crisis, however, experience tells us that it is a strategy that can have significant downside risk. A long position in VIX futures, though, has an equal amount of two sided risk or volatility to a short position, but with the opposite return profile. Are we to believe that a long position and a short position in VIX futures should have the same amount of risk premium? Clearly not and there is, therefore, a sign ambiguity which is resolved by considering risk premium as compensation for downside risk.

So, what does downside risk mean for a strategy? If we were to plot out the performance of a stream of returns with higher downside risk than upside risk we may see something like the curve plotted in **Figure 1**. We have also plotted a zero skewness (symmetric) strategy and a positively skewed (upside risk higher than downside risk) strategy for comparison. The negatively skewed investment is characterized by having frequent small positive returns and infrequent large negative returns. Figure 1 also shows the cross sectional profile of the returns of the strategies showing the differences between the three regimes. Any investor, given the choice between these return profiles, will prefer a positive Sharpe/positive skewness strategy and it is this bias against negatively skewed strategies that creates the risk premium.

In this note we present our approach to improving the skewness profile of a risk premium offering through diversification among un-coskewed Risk Premia (those that are uncorrelated in the downward moves) and even, counterintuitively, coskewed Risk Premia (those that correlate in the downward moves). We also mention the benefits of diversifying further with non-risk premium, behavioral anomaly strategies such as trend following.

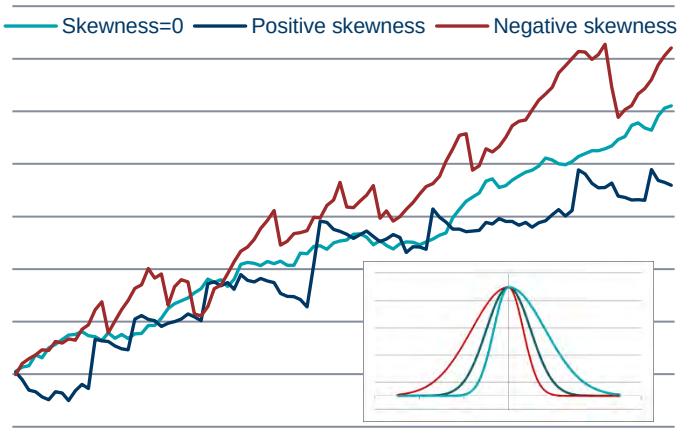

Figure 1: Three strategies with different skewness profiles (negatively skewed, zero skewed and positively skewed). The superimposed plot shows the cross sectional profile of the corresponding returns.

[1] In order to avoid confusion it is important to note we are using the term Risk Premia to refer to a class of strategies that are negatively skewed, delivering positive excess returns. It has become an industry standard to refer generically to all positive strategies as Alternative Risk Premia. Here we are simply making the distinction between those that qualify (negative skewness) and those that don't (zero skewness or even positively skewed returns).

Insurance – a classic example of a risk premium strategy

Insurance policies cover a multitude of outcomes from the theft of a car or a house burning down, to a professional footballer's capacity to play football. Most people are familiar with the concept of insurance, but less so with how insurance companies generate profit. Within an insurance company, actuaries attempt to evaluate the probability of an insured outcome occurring, and subsequently calculate a fair value for a given policy. A mark-up is applied to the cost of the policy representing the premium charged to the end client such that on average a profit is generated. The return profile for the insurance company is, therefore, a stream of positive payments from the premiums received and an occasional large negative move when the insured outcome actually occurs and requires a pay-out. An insurance company will not just rely on one policy to run its business, diversification is essential to the model in reducing the negative skewness profile of the returns and improving the comfort level of the company's shareholders. It is this decorrelation between the pay-outs that is crucial to reducing the downside risk of the firm, a point we will address below.

A concern of any insurance firm shareholder will be the potential for a non-diversifiable component of risk. For example, let's say that an insurance company has sold policies insuring houses across a country or continent. Let's also say, for the sake of argument, that a natural disaster occurs - a meteor destroying a large industrial area, or flooding that destroys homes and factories, or an earthquake, a tsunami, etc. It is the existence of these *correlated* events requiring an instantaneous profusion of pay-outs across many clients that represents an incompressible risk for the insurance firm. This risk has been addressed more recently with the introduction of catastrophe bonds to the market place. A hedge fund or pension fund may decide to offer the insurers insurance against these types of correlated pay-outs, but of course this insurance comes at a price![2] We discuss the idea of incompressible risk in a financial context below.

[2] Insurers may also invoke exceptional "Act of God" clauses in insurance contracts to avoid this risk

[3] We use the "non-parametric skewness" as defined by en.wikipedia.org/wiki/Skewness. This is a more stable measure than the third moment, a point which is discussed in [1].

A few examples of Risk Premia (and others that are not)

We begin with some familiar examples of risk premia from the world of traditional asset classes and investments. Holding equities is a well-known strategy and is often a big component of investor portfolios. Although the skewness of individual equities is quite small, when combining stocks together to form an index, the skewness becomes negative. This 'leverage effect' is well known, and is due to the fact that stocks tend to correlate in their downward moves, creating the negative fat tail for the index, and thus making long-only equities a risk premium strategy. Experience of stock markets tells us that they tend to drift upwards over long periods, albeit with weak Sharpe ratios, but can sell-off sharply. One can see the measured Sharpe ratio and skewness[3] in **Table 1**, showing that equity indices are our first example of a risk premium strategy.

Instruments/strategies	Skewness	Sharpe ratio
S&P 500	-0.5	0.5
DAX	-0.5	0.4
Nikkei 225	-0.1	-0.1
2 year US government bond	0.7	0.7
10 year US government bond	0.0	0.7
2 year German government bond	-0.4	0.7
10 year German government bond	-0.2	1.0
Corporate bond index (US B rated)	-1.8	1.7
Short equity index volatility	-1.6	1.3
Short 10 year bond volatility	-2.2	0.9
Short energy volatility	-2.2	0.4
Short metal volatility	-2.0	0.6
Short grain volatility	-1.4	0.5
Short FX volatility	-1.6	0.2
UMD US	-0.7	0.7
HML US	0.2	0.5
Trend following	0.4	0.8

Table 2: Skewness and Sharpe ratios for a set of instruments and strategies

Of perhaps more interest for this note is another traditional asset class - that of fixed income. Short dated government paper, issued by the most creditworthy governments such as the US and Germany[4], exhibits positively skewed returns due to the safe haven nature of the investment. In periods of risk-off and flight-to-quality, investors seek to hold these types of investments, even more so than cash (which necessarily involves being exposed to a potentially uncreditworthy bank!). The post 2008 climate of extreme, loose monetary policy has, however, pushed rates to record lows and investors to seek

[4] One may argue that Germany is now less creditworthy due to the fact it no longer controls its own money supply and can therefore not just print cash to pay off its debts

other sources of return. Indeed it is precisely for this reason that central banks employ such policies! A portfolio manager may, therefore, turn to the world of corporate bonds to try to get an extra 'pick-up' on his cash, with corporates needing to offer a higher level of return compared to a government in order to entice investors to buy their debt. Of course, the investor is fully aware of the fact that if things don't go well for the firm then the bond principal is at risk and may not be repaid. However, intuition is strong that this risk can be diversified away (we will describe this more quantitatively later) by buying a *basket* of corporate bonds offering a wide ranging mix of corporate debt. This approach allows the investor to diversify away a lot of their credit risk, whilst benefiting from the pick-up in yield versus government bonds. The investor may be exposed to a non-diversifiable risk that defaults correlate across firms. It is for this reason that an investment in a diversified basket of corporate debt will yield more than government paper, as compensation for the existence of this correlated default risk. In **Table 1** we summarize the case of US short dated government paper exhibiting a positive skewness meaning it is not a risk premium strategy, while longer dated government bonds and, certainly, corporate bonds stand-out as clear risk premium strategies.

Insurance selling in finance comes from the options market. If a big pension fund is holding a large equity portfolio and is fearful of adverse moves due to an upcoming FOMC, the pension fund may choose to protect its portfolio by buying down strike put options. In so doing, the investor is pushing option prices up, implied volatility up relative to realized volatility, and paying a premium to the option seller. The option seller is providing protection and so requires a premium for taking on the risk that the hedger wants to offload. If nothing happens through the FOMC then the option seller has made money by receiving a high price for the insurance. If, however, the move that the investor feared actually comes to fruition then the option seller faces a potentially large pay-out. This risk can again be mitigated and the negative skewness reduced by diversifying over many different options on many different 'underlyings.' When applied to this example, the idea of non-diversifiable or incompressible risk that we touched upon earlier corresponds to a volatility move that correlates across underlyings. In the biggest financial crises one observes that this is indeed the case, with losses being seen across asset classes. We do, however, see an improvement in the negative skew and Sharpe ratio characteristics from a short volatility portfolio that is diversified across many underlyings, which suggests that we are more able to diversify away this risk than one might imagine.

At the beginning of the 1990s, Eugene Fama and Kenneth French identified certain market neutral portfolios in the US stock market that seemed to exhibit positive excess returns. Here we focus on two Fama and French factors – UMD[5] and HML. UMD refers to 'Up Minus Down' as being a market neutral portfolio of the trend applied to individual stocks, exploiting the fact that outperforming stocks tend to continue to outperform while underperforming stocks continue to underperform. Measuring the skew of this strategy shows that the factor exhibits negative skewness. What is interesting, however, is that the large downside moves come from upside moves in the index. Despite the fact, therefore, that the strategy has negative skewness, it is a true diversifier in the sense that the negative skewness comes from risk-on environments occurring at times unrelated to the drawdowns of other risk premium strategies.

Let us now switch our attention to the HML factor. HML refers to 'High Minus Low', a market neutral factor that is long stocks that have a high book value[6] to price ratio and short stocks that have a low book to price ratio. The strategy is a classic 'value' strategy in that one exploits the fact that prices should move in tandem with a fundamental value metric such as book value. We find in this case that HML exhibits a positive skewness. A positive Sharpe ratio strategy with positive skewness is rare indeed. Our claim in this short note is that positively skewed, positive Sharpe ratio strategies do not come from the family of risk premia, but rather generate returns by exploiting some form of market anomaly. The case of the HML factor is curious, however, and not easily explained. The skewness of the strategy turns negative when using monthly data, adding to the confusion, and necessitating further work. **Table 1** summarizes the statistics for the two Fama French factors using stocks across a range of geographical zones.

The final example we will discuss here is another case of a strategy exhibiting positive skewness. Trend following is a special case due to its relationship with risk, as has been discussed in our paper on the subject [2]. Trend following will perform in times of market stress if the difficult period persists for a time comparable to, and ideally longer than, the timescale over which one trends. That being the case, a classic trend following system will short crashing equities and other risk sensitive instruments and will buy bonds and other flight-to-quality instruments. As long as the crisis period persists for longer than the trend timescale,

[5] UMD was not one of the original Fama French factors but was introduced in subsequent factor literature

[6] Book value is assets minus liabilities. In the absence of earnings it is a good starting point for valuing a company

there is a guaranteed payoff. This 'long volatility' component of trend following is what gives us a positive skew and was the reason for its success through the 2008 global financial crisis. We would argue that the trend is in fact not a risk premium strategy, but rather a genuine market anomaly arising out of the extrapolative tendencies of investors.

Many other examples of strategies have been studied and we invite interested readers to consult [3] for a more comprehensive list and description.

Risk Premium is compensation for negative skewness

We have presented our understanding of risk premium strategies as having positive Sharpe ratios and negative skewness, with the positive excess returns being the reward for assuming downside risk. This idea appeals to common sense, but can we show this to be the case empirically? The research presented in [3] culminated in the plot seen in **Figure 2**. We took as many standard, well-known, accessible strategies as we could, many of which are discussed in the previous section, and plotted the Sharpe ratio against the level of skewness. One sees a cloud of points that are dispersed around an explanatory line, suggesting that indeed, the higher the reward or Sharpe ratio, the higher the level of negative skewness. The suggestion is, therefore, that strategies that lie below the line have too much negative skewness compared to the level of excess return while, contrarily, strategies above the line have too much excess return for the level of negative skewness. This is indeed the case for the two strategies discussed above - trend following and the HML equity market neutral factor. One observes that both have positive excess returns with a positively skewed return distribution and, for this reason, our conjecture is that, rather than these strategies being Risk Premia, they instead represent genuine market anomalies.

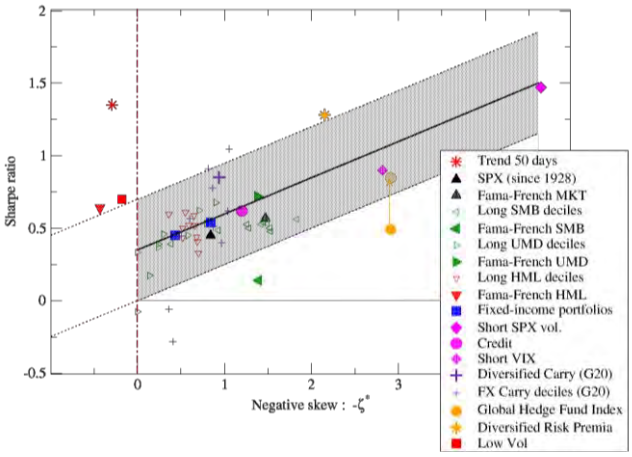

Figure 2: The "skewness rewarding line" showing a quasi-linear relationship between the Sharpe ratio (the reward) and the negative Skewness (the risk), for a set of strategies and instruments.

An interesting question is whether volatility (the standard deviation of returns) has the same explanatory power. What we see in [3] is that volatility surprisingly tends to do the opposite of skewness in that the low volatility strategies systematically outperform those with high volatility, a result which is at odds with an explanation of a risk premium being due to volatility. This fact also explains the 'low vol' effect [4], a recent 'hot topic' in the academic community. Interpreting risk premium, therefore, as compensation for downside risk rather than symmetric risk seems to be consistent with the data.

Classifying and diversifying negatively skewed strategies

As previously stated, we are putting forward the idea that a premium exists for holding a negatively skewed investment. The origin of this negative skewness can, however, be different across a range of strategies. Identifying the nature of the risk premium is important when trying to combine strategies together to produce a higher Sharpe ratio and overall better skewness profile (ideally making it positive).

Combining negatively skewed strategies together should reduce the overall negative skewness of the combination. In order to illustrate our point, we have taken a number of negatively skewed strategies which can be seen in **Figure 3**. Before we combine them together, it is crucial to note that the skewness is not correlated across the strategies, meaning that the down moves do not typically arrive together, simultaneously, across the strategies. We have superposed the combination of these *un-coskewed*

strategies on the same plot, and show that both the Sharpe ratio is improved and the level of negative skewness reduced. If we continue adding strategies then the Sharpe ratio will continue to rise and the skewness will fall to zero, meaning we end up with a symmetric return distribution. As discussed above, this is in the absence of non-diversifiable risk which may materialize itself as a correlation of downward moves across all strategies and an increase in negative skewness, something we are trying to avoid.

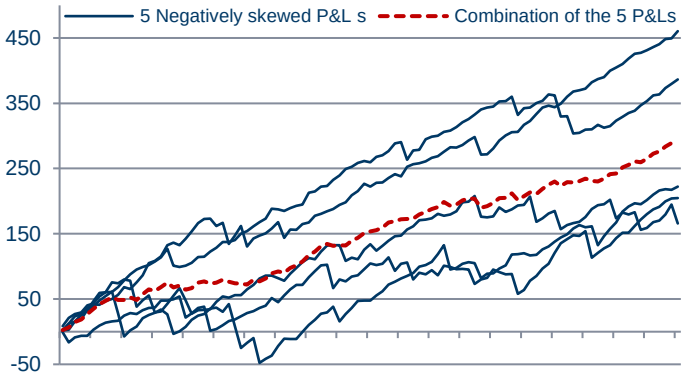

Figure 3: An illustration of the effect of diversification on skewness. The combination of a set of de-coskewed strategies with negative skews results in a combined strategy with better Sharpe ratio and close to zero skewness. The figure is based on simulated data and is for illustration purposes.

We listed several classic, well known strategies in the previous section. The question is when, on average at least, is a strategy more likely to sell-off? If the strategy expresses its risk with a sharp sell-off in a rising market, such as the UMD Fama-French factor, then we consider the strategy to be 'risk-on premium' whereas if the strategy sells off during a down market, such as a short option strategy, then we are receiving a 'risk-off premium'. Catastrophe bond buyers, on the other hand, take on 'catastrophe risk premium' which would incur losses following a natural disaster, which may or may not be correlated with a risk-off move (depending how big the catastrophe is!). The special case of trend following, which we are claiming to be a behavioral anomaly, is also useful in combination with risk premium strategies.

We would also like to bring the reader's attention to the 'Diversified Risk Premia' point in **Figure 2**, where we combine a portfolio of equity indices, a diversified portfolio of short options, an FX carry strategy and long the four CDS indices in the US and Europe. This point sits satisfactorily above the risk rewarding line and represents a diversified risk premium portfolio. It seems, therefore, that one is able to improve the Sharpe ratio/negative skewness characteristics of risk premium investing through diversification. The idea of non-diversifiable or incompressible risk, that we alluded to earlier in this paper, does not preclude us from improving the characteristics of the investment and, therefore, we favor this approach in building our portfolio. We have studied the possible existence of this incompressible, or 'Black Swan' risk, by attempting to identify the factors of the combination of all risk premium strategies that went into **Figure 2**. A dominant 'market' factor does not seem to exist, however, unlike the case of the market mode for a portfolio of stocks. Instead, two poorly separated and unstable factors emerge, suggesting the absence of a clear benchmark for risk premium investing. The idea of incompressible risk, nevertheless, seems plausible and we favor an approach of attempting to mitigate this risk, as previously stated, by combining and diversifying different sources of risk premia. The observation that the risk premium is proportional to the level of risk as measured by negative skew is crucial in building a portfolio of such strategies. For example, one may be inclined to run an optimization scheme to build a portfolio based on Sharpe ratios from backtested ideas and strategies. This may prove to be a dangerous approach, knowing that higher levels of Sharpe ratio are purely as a result of a higher level of risk reflected in the negative skew of the return stream. With this in mind a more stable robust portfolio is constructed by instead allocating equally to sources of risk premium.

A risk premium portfolio should, therefore, be made up of many diversified sources of risk premia. But, even if risk premium strategies are correlated in the fat left tail the performance of the combination will still improve. In order to demonstrate this point let's consider the 'tail risk'[7] of a portfolio as being the loss given a scenario of a drop of many multiples of volatility in an equity index for any given day, say a drop of 10% in an index with an annualised volatility of 15%[8]. This is trivial when holding the equity index but we can also, albeit less trivially, calculate this loss for another risk premium strategy, say holding a basket of CDSs. We now have two possible portfolios:

- An equity only portfolio with a tail risk of 10%, meaning if the equity index drops 10 times its "normal" volatility we lose 10%
- An equity portfolio with, say, a tail risk of 5% and a CDS portfolio with a tail risk of 5%.

Both of these scenarios will lose 10% in the case of our scenario if the returns are 100% correlated in the tails.

[7] It is easier to understand how Tail Risk combines in the case of two portfolios rather than the more complicated and involved calculations necessary when talking about skewness

[8] This corresponds to a 10 standard deviation move in the index

What is interesting, however, is to consider what happens on all the other days, when there are no extreme moves. Even if risk premium strategies are 100% correlated in their extreme moves or in extreme stressed markets, they are unlikely to be 100% correlated the rest of the time, offering the possibility of diversified and improved risk adjusted returns with the same level of tail risk.

Conclusions

Risk premium is compensation for assuming downside risk, and negative skewness seems to be a good explainer of the premium. Volatility does not explain the premium well and, if anything, there seems to be a premium for holding low volatility instruments, this being the basis of the much discussed 'low volatility' effect. We have demonstrated that negative skewness can be reduced in a portfolio by combining many un-coskewed strategies and even in the presence of correlated downward moves a risk premium portfolio's risk adjusted returns are improved by considering a basket of such strategies. We believe that this approach is what all good 'Alternative Beta' investment managers should strive to achieve.

References

[1] Errors on Statistical Measurements in Finance. CFM, forthcoming.

[2] Two Centuries of Trend Following. Y. Lempérière, C. Deremble, P. Seager, M. Potters, J.P. Bouchaud. 2014, Journal of Investment Strategies

[3] Tail Risk Premiums versus Pure Alpha. Y. Lempérière, C. Deremble, T. T. Nguyen, P. Seager, M. Potters, J.P. Bouchaud. 2015, Risk Magazine.

[4] Deconstructing the Low-Vol Anomaly. S. Ciliberti, Y. Lempérière, A. Beveratos, G. Simon, L. Laloux, M. Potters, J. P. Bouchaud. 2015.

Important Disclosures

CFM has pioneered and applied an academic and scientific approach to financial markets, creating award winning strategies and a market leading investment management firm.

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