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Quantitative investing

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Quantitative investing, a rapidly growing strategy that uses complex computer models to make trading decisions, has taken a blow to its reputation with the current markets troubles.

Quants traders use tools and algorithms to analyse past asset price movements in order to make successful, automated trades. Satyajit Das, a consultant to hedge funds and investment banks, argues that in reality, quants models "potentially exacerbate market risks, sometimes seriously."

Can quantitative investing work consistently? Is it an identifiable basis for success in trading? How will a market dominated by risk aversion and liquidity affect quants strategies?

Mr Das answered reader's questions in a live online debate on Wednesday August 22.

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What are some other techniques employed by quant traders besides market-neutral pairs trading?
Darko Bodnaruk, Ljubljana, Slovenia

Satyajit Das: Pairs trading is a big area though I would never call it market neutral as you are taking correlation risk. There are different classes of models:

a) short term, high frequency data model - these look at liquid traded markets and are look at short term price fluctuations and try to detect anomalies in price action and do quick in and out trades to take advantage of order driven dislocations e.g. those caused by algorithmic execution.

b) statistical arbitrage type models - these use a fundamental price relationship or pattern to trade things like volatility skews, volatility term structure, swap or credit spreads or merger arbitrage.

My favourite these days is "double agent" models. You try to find out who is using which model to price or trade and then try to take advantage of what their model is going to do and try to exploit this. Am not sure it is sensible or even works.

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I am a private investor who runs a mechanical long short fund but with longer hold periods, eg 3 or more months. In the recent turmoil my shorts (picked using several factors including RS) performed uncharacteristically poorly. Maybe I was short the same stocks as the quants who were forced to close their positions. My question is: how do the quants pick the stocks to go short on (so I can avoid the same stocks!)
Anonymous

Satyajit Das: RS indicators are very unreliable in the type of market that prevails today as they don't handle choppy trading condition very well. It is impossible to say why your model underperformed. I don't typically find it easy to do ex post attribution of model performance as you

need to have a fairly complete information set which you will rarely have. It is useful to the words of Isaac Newton, one of the founding figures of modern science, when he faced his own moment of certainty. He lost £20,000 (a very large sum today) in the stock market as a result of the South Sea share bubble. Chastened, Newton said: ”I can calculate the motion of heavenly bodies but not the madness of people.”

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The algorithmic trading with the application of randomized algorithms used for the control of uncertain systems creates an innovative IT platform, which will change the way of smart trading to be performed at stock exchanges globally. Do you see the factors of time and space as the most critical elements in the global spatio-temporal redistribution of wealth through the novel approaches to the valuation of asset classes, use of computer modelling in decision making process, liberalization of trade, presence of an open access for wide categories of traders in the exchange process during the algorithmic trading in the credit derivatives, equity derivatives, commodities and currencies markets worldwide?
Viktor O. Ledenyov, Ukraine

Satyajit Das:Maybe. But I think you should take Paul Valery, the French poet, advice: ”The future is like everything else, it is not what it was”.

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Having read Traders, Guns and Money, it’s hard to imagine why banks continue to make use of models, especially when they’ve proven to be imperfect time and time again. Or is it more a case of everyone else is doing it so I should do it too?
Jasdev Sekhon

Satyajit Das: I am always amazed at how little things change in financial markets at all. We all seem to have exceedingly short and imperfect memory. Martin Baker’s advice in ”A Fool and His Money” about the nature of financial activity says it best: ”Take a speculative cocktail shaker. Add four parts public ignorance and 33 parts greed. Toss in a little perceived genius. If you don’t have any freshly ground perceived genius to hand, a little dried genius status will do. Season generously with mystique. Add apparent publicity shyness to taste. Serve in opaque tumbler of awes, ill informed media coverage”.

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It seems to me that widespread condemnation of quantitative methods is an over-reaction. As for the modellers, they may have forgotten the principles of simplicity and robustness in constructing quantitative models. And, of course, the investment edge comes from being a little bit more original and creative than other modellers. Most of the recent problems faced by quant strategies are the result of the replication of well-known methods in a crowded field, assuming benign circumstances. Do you think lessons have been learnt?
Iran Pouyandeh, Bermuda

Satyajit Das: I think people tend to be wildly and irrationally optimistic at some stages and wildly and irrationally negative just a little later. I think the point you make about crowding is very relevant. There is too much money chasing too few opportunities. Louis Bacon (of Moore Capital) when returning capital to investors commented: ”Size matters. It is the bane of the successful money manager”. Clever people can make money if there are a few clever people and lots of opportunities. This is the problem of ”scalability” – what works on a small scale cannot work on a larger scale. In 2004, Hilary Till argued that the maximum size of the hedge fund industry was 6% of institutional (and high net worth) assets. There are other constraints. Some hedge fund strategies need liquid markets and a complete set of instruments. There are few such markets.

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How will career opportunities in the quant investing business develop in the next 5 years? What are the required qualifications?
Rudolph Fosilio, Zurich

Satyajit Das: I think we will continue to worship at the shrine of quantitative finance for a while yet.

The best qualification I think is success which admittedly is a little difficult to establish in advance. If this fails a degree in maths or a quantitative discipline can't hurt.

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I think the problem is skewed payoffs for quant strategies. They seem to work well for several dozen months, and they get levered up as the historical performance is viewed as confirmation of their success. Then idiosyncratic risk rears its head (like the current credit squeeze) and they do horribly during that time period. This would also explain why hot traders at prop desks can easily start their own quant funds, but people warning of black swan events like Nassem Taleb aren't able to raise hedge fund money. What are your thoughts?
Shawn McFarlane, St. Paul, Minnesota, USA

Satyajit Das: I would tend to agree with your point on leverage. A model which has reasonable predictive power may not function well when you leverage it significantly as the need to liquidate on drawdown may well not allow the strategy to operate. Similarly when you leverage it naturally means that you are changing the sizing of the position which means you start to hit trading liquidity constraints - what may be a great strategy for $100 m may not be a great one for a $1,000 million traded.

You also make the point about incentive structures. That is a major but different issue more generally in financial markets - moral hazards and asymmetric returns. Assume a $100 million fund where the manager's fees are 1% and 20% of performance. Assume also the manager has a $5 million (5%) interest in the fund. If the hedge fund losses $20 million (20%) then, the manager losses $1 million (20% of $ 5 million). The loss is offset by the management fee received (1% of $100 million equalling $1 million). If the hedge fund makes $20 million (20%), then the manager earns $ 4 million (20% of $20 million) plus the management fee ($1 million) - a 100% return. In the words of Mark Twain: "I am opposed to millionaires, but it would be dangerous to offer me the position."

As to why black swan funds are more common, I am not sure. Maybe the timing was wrong. In recent time, you would have done well to follow Galbraith's advise: "a rising market and a long position is a sure sign of investment genius". Maybe the tide will turn after recent events.

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Given the failure of quant strategies to work in the subprime generated turmoil would you reckon the use of more Artifical Intelligence and neural network based approach where past historic training of the systems would be in a better position to help detect and avert failures of purely computer based strategies or would you suggest a shift away from computer based algorithmic trading altogether?
Sandeep Manhas, London

Satyajit Das:I am not sure that more complicated modeling is necessarily the way forward. I think we need to understand that the data we work with is poor. Also we have limited understanding of cause and effect in financial markets e.g. our understanding of asset price processes or price evolution is limited. Financial crises now are less the result of economic downturns, geopolitical events or natural disasters and more the result of the structure and activity in financial markets. Complexity and inter-connections within the financial markets have increased. Risk is now driven by the increasingly tight coupling of markets and the resulting complexity and interdependence. I am not we will be able to model them successfully. This doesn't mean that models are not useful but need to be used with great care and understanding of their limitations as well as their predictive powers.

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How do we explain the fact that the models being used had 25-standard deviation events, several days in a row?
Antony Paul Kozhipatt

Satyajit Das:I don't think a 25 standard deviation event means anything. The assumption is that the distribution is normal or a known form. Also the assumption is that the volatility calculated using

the immediate past is relevant as a benchmark in the analysis. Both assumptions are risky. Writing in 1995, Robert Merton foreshadowed the events that were to unfold 3 years later at LTCM: ”any virtue can become a vice if taken to extreme”.

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How do you square your criticism of quant with your involvement in derivatives? At the end of this, who can ignore Buffett: what else is there other than value investing?
ORC Cox, Tokyo

Satyajit Das:I am not uncritical of derivatives or quant trading. Like all tools both are useful if utlised sensibly and with an understanding of the intrinsic limitations of the models. I see quant models as just one tool amongst others just as I see derivatives as potentially useful ways to transfer or create risk. Most forms of analysis are some form of data mining exercise. I think Warren Buffet once observed that ”If past history was all there was to the game, the richest people would be librarians”.

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It seems that ’quant’ strategies can encompass a large range of trading styles, from the extremely short-time period statistical arbitrage through intra-day positioning and also including much longer-term quant-model driven macro strategies. Which of these types of strategy has been affected most by the recent market volatility?
Adam Wall, New York

Satyajit Das: You are quite correct. ’Quant’ strategies cover a wide area of widely disparate activities. For example, is price earning ratios a quant strategy? I think short period high frequency data based strategies are vulnerable to poor performance when market are under stress. This is because the market becomes liquidity driven and choppy. I think quick fill, mean reverting types of price relationship over a very short time horizon are difficult to implement in this environment. Long term macro strategies are not going to be affected to the same degree. The more interesting question for longer term strategies which are frequently based on cause-effect value relationships is does the volatility signal a major regime shift. If it does then clearly you have problems.

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What other options are as good as quants for making investment decisions?
Praveen Tyagi, London

Satyajit Das: In the end all trading is about using information in various ways to predict likely future price movements . Quant models are one of them. They are just heuristic aids to decision making. Anything that helps make the correct decision helps as does anything that helps your understanding of what is happening. I think we need to be clear that any decision-making tool is a reduced form model which approximates reality. Most traders in reality trade ”outside the model”. They use the model predictions and adjust for other things. A major issue is that all our models assume rational markets and behaviours. As John Maynard Keynes observed that ”the market can remain irrational longer than you can remain solvent”. So all option are good or bad - just depends on whether they make money.

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Do you observe the capital convergence or divergence trends in credit markets in conditions of increasing volatility and decreasing liquidity of capital flows globally? How can you explain these dependencies using economics theory, and correlate the theoretical propositions with the practical outcomes at stock exchanges worldwide? Viktor O. Ledenyov, Ukraine

Satyajit Das: A very interesting question. In the short run, you see liquidity driven > convergence but it is liquidity driven. If I am a hedge fund and want to de-leverage or am forced to de-leverage by margins calls then I am forced to sell firstly what is liquid and secondly what might have profits (to avoid realising losses). This makes certain assets highly correlated at least in the short run. As time goes by, I think market adjust and you get de-coupling. For instance, in the current credit crisis, in the medium term, we might get significant changes in capital flows. A McKinsey & Co

study showed that the United States absorbed around 85% of total global capital flows, or over $500 billion each year. Asia and Europe were the world's largest net suppliers of capital, followed by Russia and the Middle East. 75% of cross-border capital flows were loans and debt securities. Conservative Asian and European investors prefer debt. Older investors in developed countries wanted income to finance retirement spending. Cross border debt flows funded the US financed government debt (up $400 billion) and a rapid expansion in US private debt (up $1.3 trillion). A key growth area was asset-backed securities ("ABS"), including mortgage-backed securities ("MBS"), reflecting the strong US housing market and high levels of home-equity lending which was being securitized. This is causing a lot of the current problems in terms of the global spreading of credit issues. In time, foreign investors may decide that such cross border investing entails "unknown unknowns" and seek other investments. For example, local capital markets may be encouraged to develop more quickly. Thsi would cause divergence.

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What effect or consideration is given for the credit rating of companies given that some of these appear to be over rated?
Joseph Kelly, Park Row

Satyajit Das: Ratings are an expression of opinion of the likelihood of default of a particular security based on mathematical models, history and snake oil. Investors, woefully ignorant about how a rating is determined, ascribed magical properties to the alphabet soup of letters assigned to a security. Investors and bankers made assumptions about the stability of the rating. They also chose to link rating to pricing and set the amount of borrowing supported by a particular security. Protected by expansive exclusion clauses, the agencies did not discourage these uses of ratings, instead promoting their use as widely as possible.

I also think the nature of structured ratings is more complex than normal corporate ratings. They are based on the subordination (i.e. the amount of securities available to absorb the initial losses). Unfortunately, this may make them vulnerable to rapid downgrading when losses rise rapidly.

CDO ratings in particular show some anomalies. The number of defaults in the BBB class of CDO securities is not materially different from that on BB CDO securities. BBB is classified as investment grade while BB is not. Many investors only purchase investment grade securities but in a CDO it seems the risks are the same. CDO security ratings also seem to be less stable than comparable rated corporate bonds. The likely reasons include model failure, input problems and a certain naivete in the application of these models to new markets. Bill Gross, from PIMCO, colorfully observed that in rating CDOs the agencies had been seduced by "hookers in six-inch stilettos".

I have worries about different issues. There are uncomfortable similarities in the relationship between investment banks and rating agencies and that between auditors and the companies they audit. Investment banks pay the rating agencies to rate the CDO securities. Investment banks and rating agencies work closely in structuring the transactions. Rating agency staff cross over to the "dark side" to work for investment banks. CDO ratings also pay more than rating conventional bonds. The knives are already out as politicians in the USA and the European Union have started to focus on the role of rating agencies.

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In your highly entertaining, yet educational book 'Traders, Guns & Money' you mentioned that LTCM endured such heavy losses because banks had copied LTCMs strategy. Could we argue the same is the case with the quantitative funds today, such that - by and large - they employ the same strategies, hence resulting in an aggregate effect in the market? If so, do we need to pull the plug of the quantitative funds during times of distress?
Ali Dicleli, Istanbul

Satyajit Das: I think a fundamental problem in markets is convergence. Everybody has the substantially the same education (Chicago free market logic), similar information or dis-information (whichever you prefer), similar price data and increasingly similar models (though quants would protest on this point as they still like have a tendency to 'model envy' - my model is better than your model!). This means we tend to all put on similar trades exaggerating the effect on the market. This also strain liquidity. In a breakdown as liquidity evaporates, as we have seen recently, then people cannot exit and enter positions as quickly as they or the models need to leading to problems. In

distress, I think the models actually become pro-cyclical and exaggerate the problems.

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Background

Liquidity needs throw spanner in quant models

Lex: Quant fund troubles

Limitations of computer models

Satyajit Das works in the area of financial derivatives and risk management. He is the author of a number of key reference works on derivatives and risk management including *Swaps/ Financial Derivatives Library* and *Credit Derivatives, CDOs and Structured Credit Products*. He is the author of *Traders, Guns & Money: Knowns and Unknowns in the Dazzling World of Derivatives.*