



## The Absolute Return Letter October 2007

### Wagging the Fat Tail

*The Old Lady barks*

As far as intellectual honesty is concerned, statements do not come much bigger, in particular when aired by a senior member of staff of one of the world's leading central banks. To have the Old Lady of Threadneedle Street openly admitting that not everything that goes on in financial markets every day is entirely comprehensible takes some beating.

**We don't  
understand  
the markets,  
BoE admits**

*The Daily Telegraph, 24<sup>th</sup> September, 2007*

*The Mansion House speech*

Then again, if we take one step back and look more closely at BoE Governor Mervyn King's speech at the Mansion House dinner on the 20<sup>th</sup> June this year, perhaps we shouldn't be that surprised after all. I suggest you read the next few paragraphs very carefully.

*"Securitisation is transforming banking from the traditional model in which banks originate and retain credit risk on their balance sheets into a new model in which credit risk is distributed around a much wider range of investors. As a result, risks are no longer so concentrated in a small number of regulated institutions but are spread across the financial system. That is a positive development because it has reduced the market failure associated with traditional banking."*

*“But the historical model is only a partial description of banking today. New and ever more complex financial instruments create different risks. Exotic instruments are now issued for which the distribution of returns is considerably more complicated than that on the basic loans underlying them. A standard collateralised debt obligation divides the risk and return of a portfolio of bonds, or credit default swaps, into tranches. But what is known as a CDO-squared instrument invests in tranches of CDOs. It has a distribution of returns which is highly sensitive to small changes in the correlations of underlying returns which we do not understand with any great precision. The risk of the entire return being wiped out can be much greater than on simpler instruments. Higher returns come at the expense of higher risk.*

*“The development of complex financial instruments and the spate of loan arrangements without traditional covenants suggest another maxim: be cautious about how much you lend, especially when you know rather little about the activities of the borrower. It may say champagne – AAA – on the label of an increasing number of structured credit instruments. But by the time investors get to what’s left in the bottle, it could taste rather flat. Assessing the effective degree of leverage in an ever-changing financial system is far from straightforward, and the liquidity of the markets in complex instruments, especially in conditions when many players would be trying to reduce the leverage of their portfolios at the same time, is unpredictable. Excessive leverage is the common theme of many financial crises of the past. Are we really so much cleverer than the financiers of the past?”*

*Famous last words*

Remember the speech was delivered more than a month ahead of the summer meltdown in credit markets. In fact, Mervyn King warned us repeatedly of the dangers lurking in front of us. Most investors just chose to ignore him. Now fast forward a few weeks to the height of the credit crisis. Within days of each other Mervyn King and Federal Reserve Chairman Ben Bernanke made virtually identical statements.

King: *“Providing insurance for risk behaviour encourages excessive risk taking and sows the seeds of future financial crises.”*

Bernanke: *“It is not the responsibility of the Federal Reserve, nor would it be appropriate, to protect lenders and investors from the consequences of their financial decisions.”*

*The magic worked yet again*

Despite the obvious warnings that excessive risk takers should expect no help, days later, both banks were busy pumping billions into what had by then turned into a largely dysfunctional credit market. As icing on the cake, the Federal Reserve lowered the discount rate by half a percent which did the magic yet again. So, not for the first time, the central bankers came to the rescue when investors lost the plot. It has happened before and it will probably happen again, but that is not what this month’s letter is about.

*Modern Portfolio Theory*

Let’s instead go back in time, to 1952 to be precise, when the foundation of modern portfolio and risk management was established with the publication of Harry Markowitz’ now famous paper ‘Portfolio Selection’ in the Journal of Finance. Markowitz was the first to spell out the benefits of portfolio

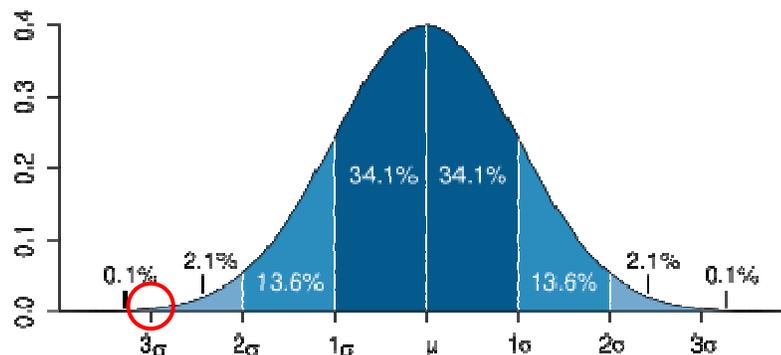
diversification and he developed the concept of modern portfolio theory by demonstrating that rational investors would always select a portfolio on the efficient frontier. Further work by James Tobin in the late 1950s, William Sharpe and Eugene Fama in the 1960s and Black and Scholes in the early 1970s built on the ideas of Markowitz; however, to this day Markowitz' work is used every day in every trading room and every research office throughout the securities industry.

*Is it time to call it a day?*

Here is the problem. Central to all the academic work referred to above is the assumption that returns are normally distributed. If they are not, you might as well bin everything to do with modern portfolio theory. Risk management tools such as volatility, covariance and value-at-risk, all so critical to how we deal with risk, become meaningless if the return pattern does not match the famous bell curve.

For returns to follow a normal distribution, you must have a set of independently distributed returns with no extremes. You find these mostly in static systems. For example, if you measure the height of all European men, you may find the average height to be 180 cm with a standard deviation of 10 cm (these numbers are made up).

**Chart 1: The Normal Distribution<sup>1</sup>**



As you can see from chart 1, one standard deviation (in the following just called SD) equals 68.2% of all outcomes, i.e. 68.2% of all European men are between 170 and 190 cm (+/- 1 SD). In other words, 31.8% are either below 170 cm or taller than 190 cm. In investment terms, it is the ones below 170 cm we have to pay attention to (i.e. the large negative returns). Approximately one in six will measure less than 170 cm which is why we talk about a "one in six year event" when we discuss a 1 SD event.

<sup>1</sup> The dark blue area represents less than one standard deviation from the mean. For the normal distribution, this accounts for 68.2% of all observations while two standard deviations from the mean (medium and dark blue) account for 95.4% and three standard deviations (light, medium, and dark blue) account for 99.7%. Source: en.wikipedia.org.

Focus on fat tail risk

Now, what investors really should worry about is what we call extreme risk – 3-6 SD events which can potentially wipe out years of profits. This is often referred to as *fat tail* risk. It is to be found to the extreme left of chart 1 (encircled in red). However, according to the text book, they do not occur very often. Take a closer look at the following table:

**Table 1: Translation of Risk as Measured by SD**

1 SD	1 every 6 years
2 SDs	1 every 44 years
3 SDs	1 every 740 years
4 SDs	1 every 31,575 years

Once every 3 billion years?

Statistically, assuming you are not an 'über human' vastly outliving the average person on this planet, you should experience only a couple of 2 SD events in a lifetime. The problem is that recent years have been littered with 6, 7 and 8 SD events. A 7 SD event equals 1 every 3 billion years or approximately the lifetime of our planet. Since the 1998 Russian debt crisis, financial markets around the world have experienced at least 10 extreme shocks none of which were supposed to occur more than once every few billion years.

Why doesn't the theory work?

Clearly, the theory doesn't work in practice and it may be time that we ditch modern portfolio theory altogether. Surprisingly few academic resources have been dedicated to this subject so far. Yet, our good friend and business partner John Mauldin offers a refreshingly simple explanation:

*"The rate of change is accelerating, so that more and more change is packed into smaller and smaller amounts of time. [...] The 20th century was equivalent to about 20 years of progress at today's rate of change. That pace will continue to increase the amount of innovation we pack into just a few years. That means in the next 20 years we will see double the technological change that we saw in the entire 20th century. At that pace, we will see almost four times the rate of change within 25 years.*

*"But that is just technology. There are also profound and rapid changes happening in the world of finance. Only a few decades ago, there was only a relatively small amount of derivatives in the world as compared to the totality of human commerce. Today we have a reported \$450 trillion in derivatives. For us to think that such a thing can come about and not add to the unpredictable nature of the world is not realistic."*

If you buy this theory, you would also have to accept that extreme events may become more, not less, frequent in the future. The problem facing the financial services industry is that pretty much everyone uses risk models which don't deal with extreme risk very well. For example, banks frequently use value-at-risk when providing loans for investment purposes. We happen to know of one (very famous) hedge fund which lost over 20% in August. The value-at-risk for this particular fund was between 4% and 5%. They lost 5 times

more than everyone thought was possible in one month! When your investment adviser tells you that your portfolio has an expected volatility of 8% and that you will probably never lose money over any 12-month period you might as well ask him if he also believes in Father Christmas.

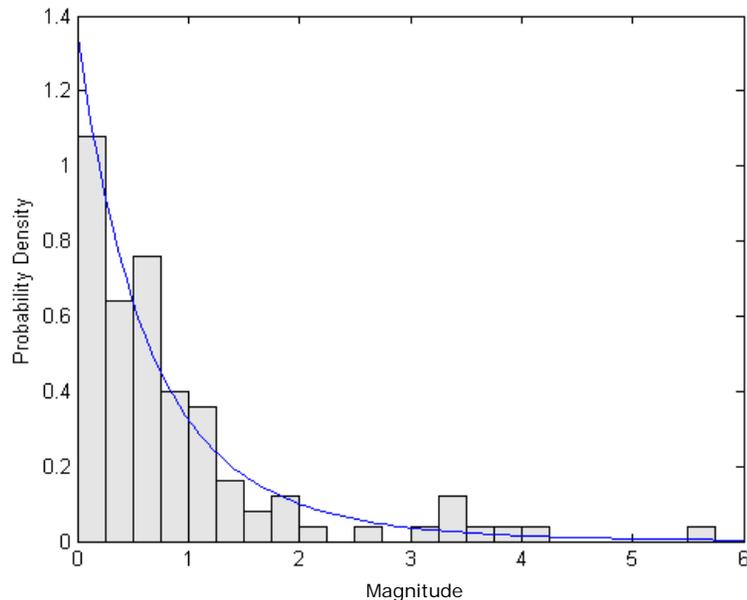
*Blame the risk models*

When the crisis unfolded in late July, the media indulged (as they always do) in the problems popping up across the hedge fund industry and many commentators openly blamed hedge funds for creating the problems. In reality, the problems arose because everyone (including hedge funds) used risk models which proved to be entirely inadequate to deal with problems of this nature. When Mervyn King gave his annual speech at Mansion House back in June he might as well have said: *"Returns are no longer normally distributed – change your risk models!"*

*Power law distributions*

About 4 weeks ago we had the pleasure of travelling with Professor Cuno Pümpin to Reykjavik where we hosted an investment seminar. Professor Pümpin gave a hugely inspiring lecture on this very subject<sup>2</sup> and he pointed out that returns in financial markets are much more akin to power law distributions than to normal distributions. Unlike normal distributions which occur mostly in static environments, power law distributions occur when three conditions are prevalent: Variety, inequality and dependency. Graphically, power law distributions look very different from normal distributions – see chart 2 below.

**Chart 2: The Power Law Distribution**



<sup>2</sup> Professor Pümpin lectured at St. Gallen University for a great number of years. Today he is the Chairman of Invision AG, a leading Swiss private equity group. His lecture in Reykjavik inspired us to write this letter.

Power law distributions are far more frequent than most people realise. Natural disasters, epidemics, war casualties, book sales, internet traffic, income distribution<sup>3</sup> as well as returns in financial markets are all examples of power law distributions (and there are many more). Some people also refer to power law distributions as the 80/20 rule.

*Average returns are meaningless*

Unlike normal distributions, power law distributions have no meaningful average that can be assumed to represent the typical feature of the distribution and no finite standard deviation upon which to base confidence intervals<sup>4</sup>. You may ask - does it really matter? It certainly does if your aim is to avoid the big knocks which can set you back for years. Using risk management tools which are based on the simple but deeply flawed assumption that returns are normally distributed may work 99% of the time but it will leave you totally exposed when you really need the protection.

*We have all been indoctrinated*

The financial services industry is loaded with at least two generations of people who have been indoctrinated through college, university and MBA schools to believe in the bell curve. That is obviously a problem for the industry but at the same time a huge opportunity for individuals who can overcome this misconception. Correctly implemented, it should be possible to turn something which is inherently unstable into an advantage – in particular as long as the crowd follows a different path. Perhaps we should start by recruiting an earthquake scientist. They certainly know how to deal with extreme risk.

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<sup>3</sup> *The Italian economist Vilfredo Pareto was the first to point out the existence of power law distributions.*

<sup>4</sup> *Source: The Power of Power Laws, John Hagel, March 2007.*

## Absolute Return Partners

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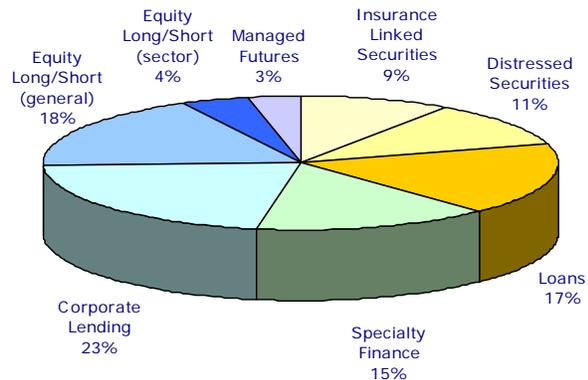
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The **Multi-Strategy Portfolio**  
as at 31<sup>st</sup> August, 2007:



The **Millennium Wave Portfolio**  
as at 31<sup>st</sup> August, 2007:

