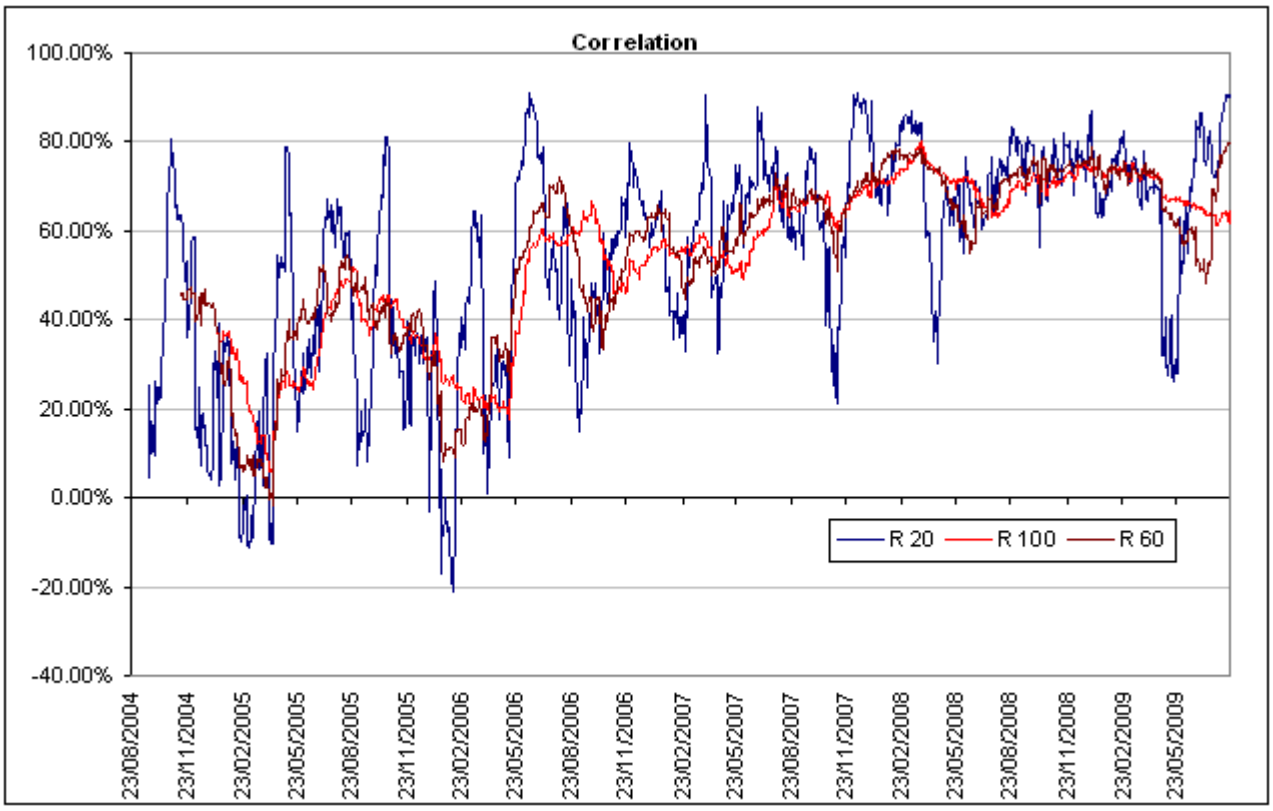
Quant Risk Management and Other Fallacies

Quant Risk Management

Statistical or mathematical techniques have been used in investment management and finance to better understand risk but there are limitations, sometimes severe limitations.

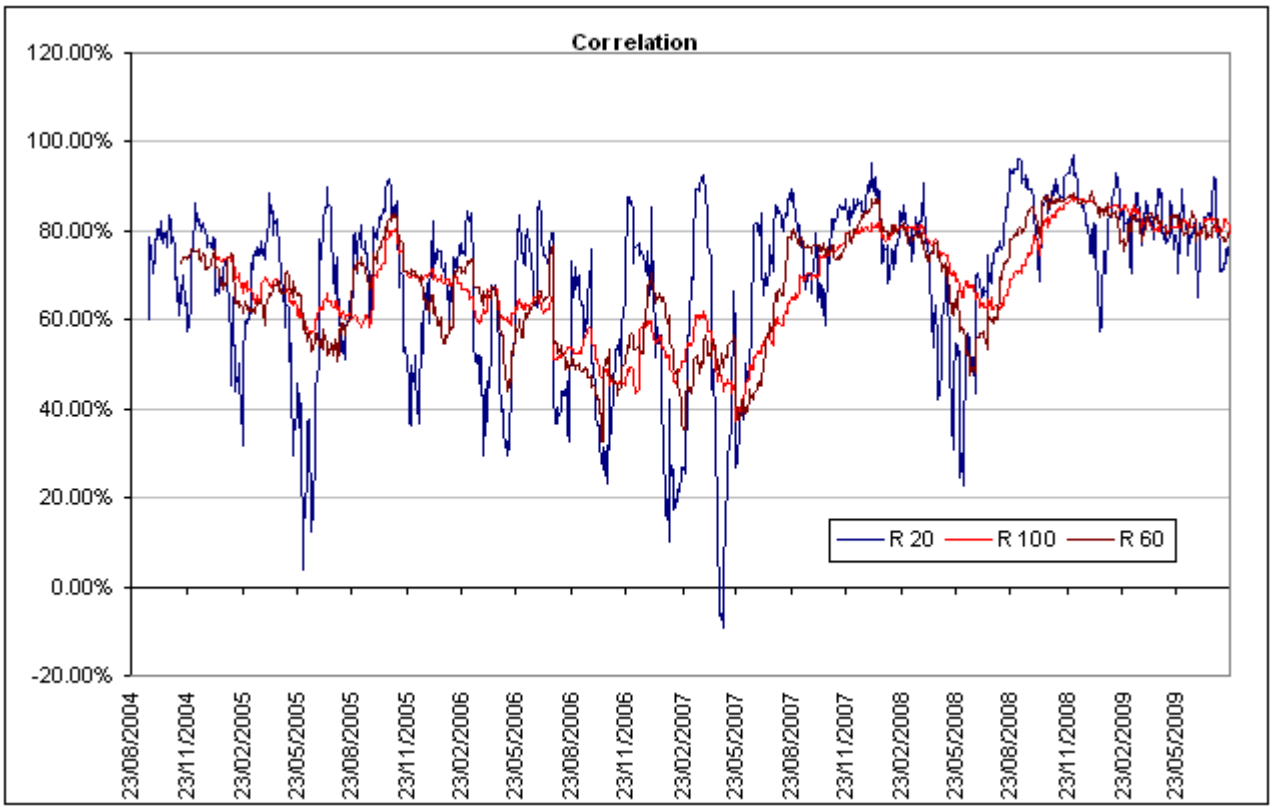
At the end of the day, there is no substitute for common sense and an understanding of the sometimes complex underlying drivers of price relationships that often become oversimplified in a mathematical or statistical context. We can talk about Value at Risk and its various augmentations to handle non-Gaussian distributions, we can look at conditional Gaussian multi-variate distributions. Or we can take a look at a simple example. Lets look at the relationships between 3 auto stocks in Europe, Fiat, Renault and Peugeot.

Fiat versus Renault



- 20 day correlation ranges from -20% to +90%.
- 60 day correlation ranges from -2% to +70%.
- 100 day correlation ranges from +6% to +60%.
- Clearly the average correlation is fairly constant across all frequencies at 36% and standard deviations of the means start at 25% for 20 day reducing (non linearly) as one would expect with increasing sample size.
- There appears to be a trend in correlations higher from 2004 to 2009.
- There is no clear cycle or periodicity to the fluctuations in correlation.

Renault versus Peugeot



- 20 day correlation ranges from +4% to +90%
- 60 day correlation ranges from +44% to +84%
- 100 day correlation ranges from +50% to +80%.
- Average correlation is fairly constant across all frequencies at 65% and standard deviations of the means start at 26% for 20 day reducing (non linearly) as one would expect with increasing sample size.
- There appears to be no trend in correlations.
- There is no clear cycle or periodicity to the fluctuations in correlation.

So, in any portfolio measurement system, which correlation does one use, 20, 50 or 100 day correlations? Or how about tick by tick data, or how about weekly data, or monthly data? They all suffer from the same problems. Statistical estimation techniques will assume that variances and correlations are time static, they will often use the whole sample thus ignoring the fluctuations of correlations and volatilities over the different frequencies. They assume

that data is homoskedastic (variance is constant over time) as opposed to heteroskedastic (variable variances). Even where they deal with heteroskedasticity, a simple functional relationship is assumed for the evolution of variances.

Let’s ditch our statistical model for a moment and look at Renault and Peugeot (Includes Citroen).

- Both are French.
- Both make affordable cars.
- Both make vans.
- Both embrace diesels.
- Both compete in pretty much the same geographies, product segments and price points.

You would expect price correlation or lack thereof to stem from differential quality of management. Quality of management is a fairly stationary quantity and does not fluctuate nearly as much as the fluctuations in correlations.

There are some dissimilarities. Renault owns a significant portion of Nissan providing it with more exposure to the highly competitive US market.

Now let’s look at Fiat. It’s European, it makes affordable cars, it makes vans, it makes diesels, and it competes in the same geographies. But wait, it owns Maserati, hardly in the same price point as Renault. It also owns Ferrari. But more than all this, it has a tractor and agri machinery and construction business (Case New Holland), it has a truck and commercial vehicles business (Iveco for all of you who have ever driven an army 3 tonner), it has a components business diversified from cars to trucks to industrial automation and it has a publishing business. One would naturally expect the price action of Fiat to be quite different from Renault. Yet even the100 day correlation has been in the 60% to 80%

range.

The Usefulness of a Quant Portfolio Risk Management System:

There is no substitute for an in depth understanding of each asset in a portfolio, what are the risk factors responsible for its price variability, the current and historical relative strength of those risk factors in explaining price variability, the fundamentals underlying price variability, the dynamics of all the other participants in the market for that particular asset. This is a very tall order since it has to hold for each and every asset in a portfolio. The average human brain simply cannot cope with the number of moving parts in this problem.

A quantitative statistical risk management system can manage large amounts of data and present it in more manageable form. Detail is lost, but range is gained. Still, how much can one trust such systems? It seems that so much detail is lost, or not captured. Does it provide a trader with the necessary courage to execute what his gut instinct already tells him? Does it give the trader a false sense of control?

An investment manager can use a system to manage data, provided they have a good understanding of the limitations of the system and are not over-reliant on the output of the system. The more complex the strategy, the more complex the portfolio, the more diverse the portfolio, the less able is the human mind capable of managing all the diverse pieces of the puzzle. Delegating to a system when the underlying complexity is high also means that more detail is lost.

Unfortunately, investment management is not a very scalable business. It needs attention to detail, judicious use of systems and mathematics, a constantly probing and skeptical mind, and an utterly relentless search for underlying causality.

Three quants went hunting. One of them sighted a grouse

taking flight and indicated it to the other two. The first took aim, fired but missed, aiming too high. The second took aim, fired but missed, aiming too low. The third whooped with joy: We hit it!.