Extracts from "Meta-Risks", Jack Gray, *Journal of Portfolio Management*, Spring 2000.

RISKS OF INSUFFICIENT QUANT

Quant methods for assessing and managing risk, such as multi-factor models and VaR, and techniques such GARCH and neural networks, are now subtle, sophisticated, robust and effective. Their power has a three-fold source. First is their capacity to process large, complex and particularly high frequency data-sets of information more effectively and more quickly than humans. Second is the genuine discipline they impose by exorcising emotion from investment decision-making. Third is quant's underlying scientific/engineering methodology where data is 'objectively' classified and analysed, hypotheses are formulated tested and modified, and robust hypothesis-based portfolios constructed and managed.

The perceived complexity of quant tools and their methods exposes some to the meta-risk of failing to capitalise on its potential. Many refuse to see the power of quant. A recent instance is the rejection by Congress and the Supreme Court of the use of statistical sampling in the 2000 census partly on the grounds that it is 'less accurate', even though these quant techniques can lower costs and lower the risk of miscounting. This counter-intuitive result was highlighted by GMO's renewable resource specialist, who having counted trees in a forest found to his surprise that sampling was significantly more accurate. In the same spirit are those who unreasonably choose to not apply the discipline of quant or to over-ride it. Consider an investment committee that makes a global bet on commodities. The portfolio manager responsible for North America, who had previously been rolled on a similar decision, feels his views were not sufficiently considered and makes a stand, "not in my portfolio." Ever sensitive to deflated egos, the investment committee compromises and reduces the North American bet, but retains its overall size by squeezing more into less difficult 'ego-free' sectors. Does anyone record or measure the actual risks to which the portfolio is now exposed? In principle they can and should be assessed quantitatively but in practice, for human and organisational reasons they probably won't be. As Nick Leeson's performance reached stellar heights, his supervisors *expanded* his trading limits. None had the instincts, wisdom or courage to narrow them. Quant tools for controlling risk were available but were over-ridden by human and organisational behaviour patterns.

RISKS OF EXCESSIVE QUANT

Having run a masterly sustained marketing campaign that resonated with our ambient scientific culture, we quants convinced the world that the mathematical sciences are the most demanding of all human activities. However, our very success exposes us to the meta-risk of mis-using quant tools, of overquantifying, of measuring the intrinsically unmeasurable. That's the danger inherent in the oft-heard and often ill-considered comparison: 'it's not rocket science.' The secret is that quite a few aspects of rocket science are relatively straight-forward compared to investments. First, in rocketry human and organisational factors have significantly less influence on outcomes and the corresponding risks are far more quantifiable and controllable. This is highlighted by a vivid metaphor, reported by Michael Lewis,

created from a wisdom born of pain by an LTCM employee: *"The hurricane is not … more … likely to hit because more hurricane insurance has been written … (but) … the more people write financial insurance, the more likely it is that a disaster will happen, because the people who know you have sold the insurance can make it happen …"* Second, the underlying dynamics that drive rockets are understood and relatively predictable. But there may be no stable, general dynamical laws driving financial markets. What few specific laws there are remain ill-understood and through arbitrage-induced erosion, intrinsically unstable. …

Too great an emphasis on quant exposes us to the meta-risk of not managing that which is not modeled, which may explain how LTCM's *"… reliance on so many quantitative models blind(ed) them to liquidity concerns."*. That the critically important *liquidity risk* has no agreed quantified definition in spite of an agreed intuitive definition of liquidity as the ability to trade at the 'right' price, at the 'right' time, serves to underline its subtlety. Although volatility, beta and its variants are robust and effective proxies for risk, the multifarious, subtle and often idiosyncratic nature of risk can transcend these models. The partially quantifiable description of risk as 'exposure to the likelihood of disappointment' explicitly addresses behaviour and so encourages a dialogue on investors' expectations and how they are formed.

META-RISKS FOR QUANTS

Quants are exposed to their own peculiar brand of meta-risks, one of which is hinted at by Peter Bernstein's third explanation of what he sees as *"… the passion for risk management in today's world"*, namely that *".. complex strategies like VaR, and ornate stress tests …. (make) the game .. a lot more fun than it was in the day of the slide-rule.* ***Why not play****?" ….*

The most insidious quant meta-risk is *data mining*, a risk to which we are all exposed, particularly when under pressure to produce results. Although specific techniques such as out-of-sample testing and demanding robust theoretical underpinnings can hedge this risk, its dangers bear continual repeating. An almost too perfect example arose through a long-term analysis of US yield ratios. Over the bullish 20 years from 1977 to 1997, correlations between bond and equity yields were strong and *positive* (0.70 for earnings yields and 0.76 for dividend yields). The ready explanation is that rising equity prices make bonds relatively attractive, so bond yields fall together with equity yields. That the data has been mined to support the argument is revealed by the previous bullish 20 years from 1948 to 1968 where the respective correlations are equally strong but *negative* (–0.77 and –0.79), a phenomenon explained by rising inflation driving both up bond yields and future corporate profits. Over the entire period from 1871 to 1997 the correlations are essentially 0.

The widely recognised but poorly managed *model risk* is the meta-risk that the failure of often known mis-specifications, such as the assumption of continuous capital markets, has a far more damaging impact than expected. According to one study, 20% of the $24b in derivative losses incurred by banks over the past decade can be attributed to model risk. 1997 was especially graphic and was magnified in August last year when *"… the perfect storm blew in"* triggered by Russia defaulting on its debt. Alan Blinder Vice Chairman of the G7

Group, confessed to teaching his Princeton economics students that this event was impossible, that no nation *would* default on its sovereign currency denominated bonds because they could simply print more money. But it happened and models failed badly. Over a 12-month period correlations typically doubled, the likelihood and impact of which was substantially greater than expected. With even Emerging Market Debt and REITs moving in unison, portfolios designed to be diversified became highly concentrated. Models that worked well under 'normal' market conditions, failed in a world of more frequent extreme events, where limits to market reason and rationality were severely tested. Regulators who refused to allow for the risk-lowering effects of diversification in estimating capital adequacy requirements, may have been more prudent than was first thought if we are entering a 'fat tail' period of more frequent extreme events. …