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Through the Looking Glass

"A fast-growing mutual fund has told investors that it will not charge them to redeem what is left of their money, after losing more than 80 per cent of its value in the wake of this week's turbulence.

"The collapse in value of the options trading fund, called the LJM Preservation and Growth Fund, is the biggest one-week drop for a mutual fund recorded in 20 years by the research group Morningstar, which sharply criticised LJM over its risk management claims."

- By Joe Rennison for The Financial Times, 8 February 2018.

The following extract is from *Investing Through The Looking Glass* (Harriman House, 2016).

After the precepts of Keynesianism, perhaps the most notorious example of specious science in economics is modern portfolio theory, born under highly questionable circumstances in 1952.

Harry Markowitz published his article – 'Portfolio Selection', *Journal of Finance* 7 (1) – in March of that year, an article which would go on to achieve cult status within financial circles.

Markowitz at the time was a young mathematician with no experience of investment. This would not prevent him from advocating the bold investment argument at the heart of his portfolio theory: that a diversified portfolio is always preferable to an undiversified one. This was in turn based on the presumption that 'variance of return [volatility] is an undesirable thing' – and a mathematical proof that variance of return may be reduced within a portfolio of stocks and shares by holding a number of different shares.

But even by holding a large number of shares, it is not possible to eliminate variance of returns altogether. Nor is it possible for any one portfolio to exhibit both the maximum return and the minimum variance. Once an investor has achieved effective diversification, then

> There is a rate at which the investor can gain expected return by taking on variance [reducing the number of shares he owns], or reduce variance by giving up expected return [by diversifying his portfolio again].

Markowitz did not explicitly state that risk and volatility (variance) are the same thing. But as a result of his article, the financial industry would go on to treat volatility and risk as synonymous, and the financial regulators would then join them in that erroneous belief.

Once again, the Austrians were on the preferred track. Another substantive insight from the Austrian school is that risk – whatever risk might even be and however we might define it – is entirely subjective. It is subject to context. Your risk and my risk are not the same.

But Markowitz assumed that they were. As did the legions of financial professionals who followed in his wake.

Risk is not, realistically, volatility – the extent to which a price wobbles around an average level. Risk is, for example, the risk that you incur a permanent capital loss. You saved for your retirement and lost everything ? Tough.

Complete ruin ? Now ***that*** is risk.

Older economists than Markowitz never even dared to define risk. Although there was keen discussion among economists, before World War One, as to what risk might be, and whether it was the same thing as uncertainty, there was complete agreement that whatever risk was, it was probably too complex a thing ever to be fully understood and, crucially, ***that it was incapable of mathematical calculation***.

But Markowitz essentially put a figure on risk. Risk, post-Markowitz, equated to the annualised standard deviation of a portfolio's return – in other words, how much its net asset value wobbled. Not the likelihood of complete financial failure for the portfolio's owner, but merely the extent to which its net asset value oscillated around a mean.

There is a quotation attributed to the great physicist Albert Einstein:

> Not everything that can be counted counts, and not everything that counts can be counted.

Volatility (the standard deviation of an investment, or an investment portfolio's return), per Markowitz, can be counted. Risk, which truly counts, cannot be counted.

Peter L Bernstein, in his biography of risk, *Against the Gods*, suggests that the sea change in attitude towards risk came about because of widespread revulsion at the horrific slaughter of the Second World War. The awful toll on human life bred an attitude that international cooperation could and should be organised so as to prevent any recurrence of that tragedy, and to try and improve the human condition in general. This attitude gave rise to new international organisations like the United Nations, the World Health Organisation, and the World Bank.

If science could give us the atom bomb, the thinking went, it could also define risk.

It just couldn't identify it properly. Or deploy it within a model that might actually be of use to investors.

Markowitz's lack of underlying market knowledge is something of a scandal. In Bernstein's words:

> Markowitz had no interest in equity investment when he first turned his attention to the ideas [in his research note]. He knew nothing about the stock market. A self-styled 'nerd' as a student, he was working in what was then the relatively young field of linear programming..
>
> One day, while waiting to see his professor to discuss a topic for his doctoral dissertation, Markowitz struck up a conversation with a stock broker sharing the waiting room who urged him to apply linear programming to the problems investors face in the stock market. Markowitz's professor seconded the broker's suggestion enthusiastically, though he himself knew so little about the stock market that he could not advise Markowitz on how or where to begin his project.

To a man with a hammer, everything looks like a nail. To a mathematician with no market experience, why not assume that equations can solve everything ?

Aldous Huxley, who came from a family of distinguished scientists, once wrote that science simply ignores anything which it cannot measure.

> Not everything that counts can be counted..

Finance World cheerfully adopted the volatility of historic returns as an appropriate proxy for risk. Based upon this idea, the Capital Asset Pricing Model (CAPM) was developed. CAPM would beget the Efficient Market Hypothesis. EMH would beget a statistical measured widely used by portfolio managers called value-at-risk..

The CAPM model is still alive and well and being taught to brand new generations of fund managers, and CFA candidates, despite the fact that it is pure nonsense.

The CAPM model can be defined by the following equation:

$r = Rf + Beta \times (RM - Rf)$

where

r is the expected return on a security;

Rf is the "risk-free" rate (i.e. cash);

Beta is the overall market risk;

RM is the return from the appropriate asset class.

We can put to one side the fact that there is no longer any "risk-free" rate, if indeed there ever was one. The policies of QE and NIRP (Negative Interest Rate Policy) have essentially killed off the risk-free rate. (Both cash and Treasury bills now yield nothing, or less than nothing, in much of the developed world.) We can also ask whether beta is an appropriate,

accurate or measurable proxy for market risk. And whether it's remotely sensible to boil down risk *per se* to an easily calculable figure.

We can also consider some of the additional assumptions that CAPM requires in order to "work":

- Investors are all identical
- Investors are all equally risk-averse, profit-maximising individuals (a lifeform known as *homo economicus* that has never been glimpsed in the real world)
- All investors have access to all available information about the market simultaneously
- Market returns obey a model of normal distribution
- Asset markets are frictionless, information is costless, trading is costless, and the borrowing and lending rates are identical
- There are no such things as taxes, regulations or restrictions on short selling.

Stephen Hawking makes the following observation in 'A Brief History of Time':

> [a scientific theory] is always provisional in the sense that it is only a hypothesis: you can never prove it. No matter how many times the results of experiments agree with some theory you can never be sure that the next time the results will support the theory. On the other hand you can disprove a theory by finding even a single observation that disagrees with the predictions of the theory.

Science is science. Finance is not. In Finance World, simplistic models are used in crude simulations of the market, and the only way their creators can even attempt to keep a straight face is by bolting on ever more elaborate fixtures to the models to account for their all-too-obvious flaws.

Building on the work of Harry Markowitz, the CAPM was the creation of Jack Treynor, William Sharpe, John Lintner and Jan Mossin. Sharpe, Markowitz and Merton Miller would go on to receive the 1990 Nobel Memorial Prize in Economics – always a dangerous sign – for their "contribution" to financial economics. Fischer Black and Myron Scholes would go on to develop the so-called Black-Scholes model for derivative pricing in 1973.

Bad economics. Overly crude modelling. Widespread adoption within the financial services industry. What could possibly go wrong ?

Prior to the financial crisis of 2007/8, the finest example of academic vanity leading to disaster came in the form of Long Term Capital Management, the hedge fund demolished by its own Nobel laureates.

LTCM was the dress rehearsal for the financial crisis in two respects. First, because it showed how much money you could lose with enough Nobel laureate economists on your side.

Second, because it effectively enforced the principle of "the Greenspan put" – the idea that, in extremis, the Fed, or any other central bank, would a) slash interest rates to help out Wall Street and b) do whatever else it took to bail out Wall Street. Taxpayers would become collateral damage in this process.

The failure of LTCM in 1998 can be traced back to Markowitz and, for that matter, to Walras himself.

The market volatility experienced in stock, bond and currency markets in August 1998 should, according to Finance World's standard risk models, never have occurred.

On August 4 of that year, the Dow Jones Industrial Average fell by 3.5%.

Three weeks later, as the news out of Russia got worse, stocks fell by 4.4%.

On August 31, they fell by 6.8%.

Other asset classes fared worse – notably bonds. Bank bonds fell by a third in value relative to Treasuries. LTCM was on the wrong side of both trades (it was long credit and short government debt, in all markets, using leverage of 200:1).

Standard risk modelling theory had estimated the odds of that final, August 31 collapse at one in 20 million – something that, if you traded daily for almost 100,000 years, you would not expect to encounter once.

The odds of experiencing three such declines in the same month were even more minute – roughly one in 500 billion.

In the parlance of risk modelling and the normal distribution curve of standard deviation (the bell curve), August 1998 was a succession of "fat tails".

Or was it ?

A year beforehand, the Dow had fallen by 7.7% in a single day. Probability: one in 50 billion.

In July 2002, the Dow recorded three separate, steep falls within seven trading sessions. Probability: one in four trillion.

On October 19, 1987, the Dow fell by over 20%. Based on the standard financial theory, the probability of the October 1987 crash was less than one in 10^{50} – odds so small that they have no meaning whatsoever in reality.

The bell curve shows variation in probability distributions.

Consider the adult male population in the USA. The average height of an American male adult is roughly 70 inches. The standard deviation from average height is two inches.

So 68% of all American men are between 68 and 72 inches tall (that is, they stand within one standard deviation either side of the mean).

95% of all American men are between 66 and 74 inches tall (within two standard deviations either side of the mean).

And so on.

The standard bell curve doesn't "disprove" the existence of giants or dwarves – rather, it simply suggests that their populations are going to be very small. Which, in real life, is precisely the case.

But in the financial markets, the standard bell curve does not exist.

The bell curve is not a good map for those navigating financial market reality.

Between 1916 and 2003, for example, the daily index price movements of the Dow do not fit neatly on the bell curve. The tails are too fat.

Theory suggests that over that time period, there should have been 58 days when the Dow moved more than 3.4%. In fact, there were over 1,000 of those events.

Theory predicts six days of index swings beyond 4.5%. In fact there were 366 of them.

Index price swings of more than 7% should, according to theory, come once every 300,000 years. In reality, the twentieth century saw 48 separate occasions of them.

Could standard financial theory be wrong ?

Markowitz didn't deserve his Nobel Memorial Prize in Economic Sciences. That award should have gone instead to the Polish-born scientist and mathematician Benoit Mandelbrot. But Mandelbrot died in 2010, so will sadly never get his chance.

Mandelbrot, father of the Mandelbrot set, of never-ending fractals, is co-author, with Richard Hudson, of a book entitled 'The (mis)behaviour of markets'. Mandelbrot's book is, to the best-selling author and financial theorist Nassim Nicholas Taleb,

> The deepest and most realistic finance book ever published.

If you happen to look at price records, as Mandelbrot did, especially in relation to the market in cotton, you find a different kind of distribution to that of the bell curve.

The tails in the market price curve do not flatten out into irrelevance. Rather, they follow a "power law" that happens to be quite common in nature.

In a "power law" relationship, a relative change in one quantity triggers a proportional relative change in another. If you double the length of a square, for example, its total area is multiplied not by two times, but by four.

The same type of "power law" holds for income distributions (the so-called Pareto principle, "the 80-20 rule", shows that roughly 20% of the population accounts for 80% of its wealth).

And it also holds, somewhat ominously for those who believe in stable or easily controllable markets, for earthquakes, volcanic eruptions, landslides, and forest fires.

Unlike Markowitz, who conjured up a square theory in blissful intellectual isolation and then hammered it into the round hole of the market, with little bits of relevance flying off the theory each time, Mandelbrot developed his own theories having already spent a good deal of time assessing historical prices.

Here are some of his conclusions.

Rule 1: ***Markets are riskier than we think***. And certainly riskier than conventional financial theory thinks.

Price movements do not happily track the bell curve.

Extreme price swings are not the exception. ***They are the norm***.

Rule 2: ***Trouble runs in streaks***.

Or as Shakespeare put it,

"When sorrows come, they come not single spies / But in battalions !"

Market turbulence does not arise out of a clear blue sky and then disappear. It tends to cluster. A wild market open may well be followed by an equally desperate complete trading session. A chaotic Monday may well be followed by an even more chaotic Tuesday.

Rule 3: **Markets have their own personality**.

Benjamin Graham famously created the manic depressive character 'Mr Market' to account for the stock market's constant oscillations between greed and fear.

But when individual investors, institutional fund managers, hedge funds, day traders and sovereign wealth funds come together in a real marketplace, a new kind of market personality emerges – both greater than, and different from, the sum of its constituent parts.

Mandelbrot suggests that market prices are determined by endogenous effects specific to the inner workings of those markets, rather than by exogenous, external events. For example, his analysis of cotton prices during the last century showed the same broad pattern of price variability when prices were unregulated as they did in the 1930s when cotton prices were regulated as part of Roosevelt's New Deal.

Rule 4: ***Markets mislead***.

In Mandelbrot's words,

"Patterns are the fool's gold of financial markets."

The workings of random chance create patterns, and human beings are pattern recognition experts. We see patterns even where none exist.

This does not necessarily invalidate technical analysis – if enough market technicians believe that a certain price level equates to support, or resistance, that presumed support or resistance line will become a self-fulfilling prophecy. But Mandelbrot clearly advocates caution: financial markets are especially prone to statistical mirages. And bubbles and crashes are inherent to financial markets. "They are the inevitable consequence of the human need to find patterns in the patternless."

Rule 5: ***Market time is relative***.

Just as the market has its own personality, so it has its own time signature. Professional traders often speak of a "fast" market or a "slow" one, depending on their assessment of volatility at the time in question. And financial markets scale. Even the financial media scales: companies and media corporations issue annual reviews, quarterly results, monthly updates, daily newspapers and ad hoc electronic bulletins.

In a "fast" market, things like market-, stop- or limit orders have limited utility. Prices don't necessarily glide. Sometimes they gap down or leap up, effortlessly vaulting beyond price limits presumed to protect portfolios from ruin..

The following extract is taken from the conclusion of the book.

These are not auspicious times for savers or investors. The financial system has yet to be properly restructured after its near-death experience in 2008. Currency wars continue to rage. Central bank monetary activity has distorted asset prices globally. Economists and central bankers continue to flaunt their ignorance of, and overconfidence in, the practical limits of their false sciences.

It is difficult, though happily not impossible, to identify compelling value opportunities from around the world, Notwithstanding the distortions and mispricings of so many types of assets, it is still possible to construct diversified portfolios of prudent and sensible investments. While the uncertainty of our times is uncomfortable, craving certainty about the future is unrealistic. We must play the hand we're dealt. In the words of the author Vivian Greene,

> Life isn't about waiting for the storm to pass. It's about learning to dance in the rain.

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