The Risks of Relying on Risk Metrics (Part 2) – Calculating the Odds with Value at Risk Modelling

by IMCZ Treasurer John Henry Smith

All investors are acutely aware of the risks inherent in stocks. Every day we are confronted with the undulations of price volatility making it nigh on impossible to accurately predict a stock's future price the further out in time we go. Of course we do track the news and our stocks as best we can, and we prudently diversify our portfolios to reduce the potential threats of loss. But the truth still remains that we don't know what tomorrow will bring and because we don't know we take a risk!

Notwithstanding the measures we take to protect ourselves, it must be said that we live in a kind of 'bounded reality' with our expectations more geared to regular events than to remote ones. We can see this when we examine the results of all combinations of two dice in the way they produce a bell-like curve. The further away from the central average the less likelihood there is of getting a double six or double one; in fact there is only a 1 in 18 chance that you will be that lucky. On the other hand there is a 2 in 3 chance of numbers occurring between 5 and 8 and it is here that we focus our attention! Human as we are we intuitively come to believe that the peripheral probabilities are so far removed from reality that they are highly improbable! And indeed you would be right when you really mean improbable, and not impossible!

The Normal Distribution of 2 Dice Combinations

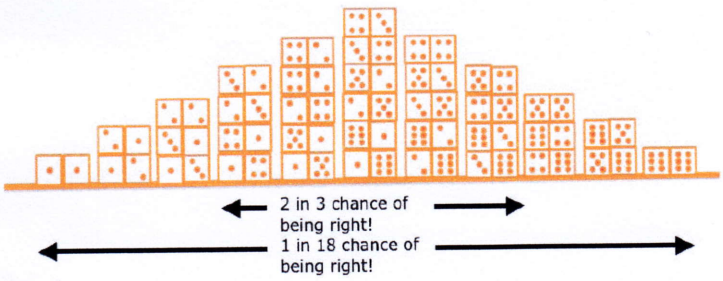


Figure 1

These piled-up dice represent a so-called 'Normal Distribution' curve and is used in Value at Risk (VaR) modelling to simulate the frequency of random numbers as a means of quantifying market risk based on the average of the range and its standard deviation[1].

If we have never won $1 million we never plan to make such a win. If we have a portfolio of stocks worth $100,000 it never enters our heads that we will lose it all. The chances are so remote as to be off the map. By the same token, we never thought that Lehmann Brothers would disappear, nor Bear Stearns and Washington Mutual would go to the wall, nor that Fanny Mae and her boy-friend, Freddy Mac, would suffer near-death experiences, nor that the AIG giant was 'too big to fail' and would have to be resuscitated after being infected by the same virus that that spread like a pandemic throughout the global financial system; but it happened, all of it and much more; improbable though it all seemed in the summer of 2007.

The burning facts unfolded bizarrely for us all to see, and the burning question was if we are so clever that we have models to quantify risk to what extent could they be relied upon to predict the impending events of 2008? Might not the Value at Risk model have been able to forecast such a calamity? To see whether the model might have done so, let's assume you wished to buy into a fund based on the SP500 index. You are a bit of a statistics freak and so you calculated the average value of the SP500 for 2007 to be 1,476.95 and its standard deviation to be 44.89. You then run your VAR program with 500 iterations, which generated the following results (Figure 2):

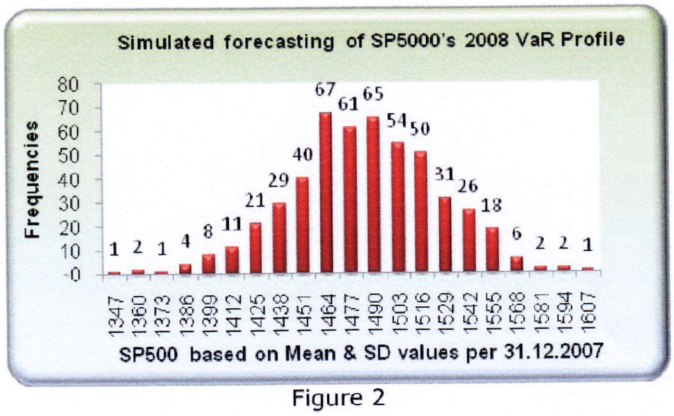
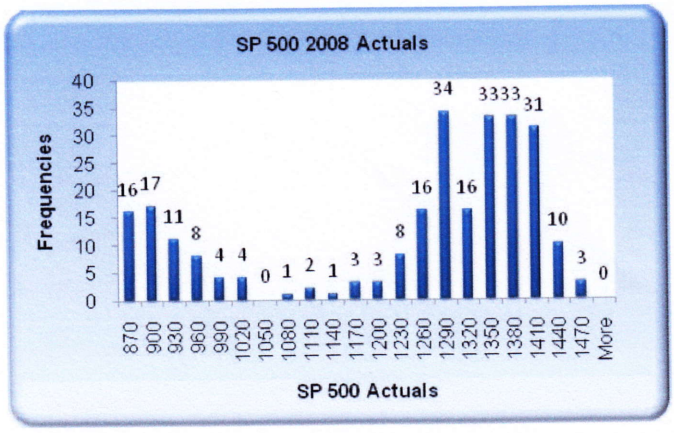


Figure 2

St Dev	-3.00	-2.00	-1.00	0.00	1.00	2.00	3.00
Probability	-49.9%	-47.7%	-34.1%		34.1%	47.7%	49.9%
SP500	**740.47**	**772.08**	**972.80**	1476.95	**1,981.10**	**2,181.82**	**2,213.43**
Profit/Loss	(736.48)	(704.87)	(504.15)		504.15	704.87	736.48

Great! There is a 34.1% probability that the SP500 will lose 504.15 points or one standard deviation, just like you saw in the two dice example and the same odds of making a 34.1% profit. You know from your own experience that the SP500 hardly ever falls so far, so it's a fair risk, you think. Dropping 2 standard deviations or 47.7% is just too remote to be realistic, let alone 3 standard deviations. And so on 31 December 2007 fortified with your forecast you invest $100,000 in an index fund having been bright enough to quantify the risks.

Like so many investors you are a buy-and-hold person, fully equipped to face the buffeting of the stock market volatility you observed in 2007. And so in 2008 you hold and hold and hold throughout the whole (or is it 'hole') of 2008 only to watch the SP500 fall 38.5%; for you a loss of $38,500 not counting management fees. Incredulously, you ask yourself how it could happen. You checked and re-checked your VaR calculations and found nothing wrong with them. Finally, to resolve what really happened you decide to do another VaR calculation this time with the real, not simulated, data. To your utter dismay, your calculations produce the following results:



Horrified, you see an entirely difference picture; a picture that no book on statistics could ever have prepared you for. The histogram of actual values in Figure 3 has moved strongly over to the left side of the simulated values of the graph in Figure 2. Almost, so to speak, off the map of expectations! And the highest values are not clustered around the average of 1,221.04 at all, which only shows a frequency of 3. Instead, the highest frequencies are to the right, where they shouldn't be, ranging between 1,290 and 1,410. How could this happen? Your only comfort is that you and your index fund are not alone. In fact all such funds, including a very

high percentage of hedge funds (over 96%), sank into deep water, being clustered closely together as one might statistically expect. So did they all fall foul to their own risk models that couldn't cope with outliers of extreme impact? Who knows!

When all is said and done, it seems that Nassim Nicholas Taleb was right, really right, when he wrote:

"Almost everything in social life is produced by rare but consequential shocks and jumps; all the while almost everything studied about social life focuses on the 'normal', particularly with 'bell curve' methods of inference that tell you close to nothing. Why? Because the bell curve ignores large deviations, cannot handle them, yet makes us confident that we have tamed uncertainty."[2]

I believe, just like Mr. Taleb, that we become too bounded in our thinking when we are confronted with elegant-looking models that seem to encompass all future probabilities. In Figure 2 these probabilities simulated 2007 data to produce the 2008 forecast. However Figure 3 captured a different dataset, namely the actuals of 2008. In the end, the simulation had its own 'bounded reality', since it could not capture a completely new set of circumstances, namely the ignorance and abuse that produced the distortions of the sub-prime crisis and its aftermath. In his article in the Financial Times dated March 17, 2008 entitled, "We will never have a perfect model of risk", Alan Greenspan, ex-Chairman of the U.S. Federal Reserve Board and author of *The Age of Turbulence: Adventures in a New World* wrote:

> *"If we could adequately model each phase of the cycle separately and divine the signals that tell us when the shift in regimes is about to occur, risk management systems would be improved significantly. One difficult problem is that much of the dubious financial-market behaviour that chronically emerges during the expansion phase is the result not of ignorance of badly under-priced risk, but of the concern that unless firms participate in a current euphoria, they will irretrievably lose market share."*

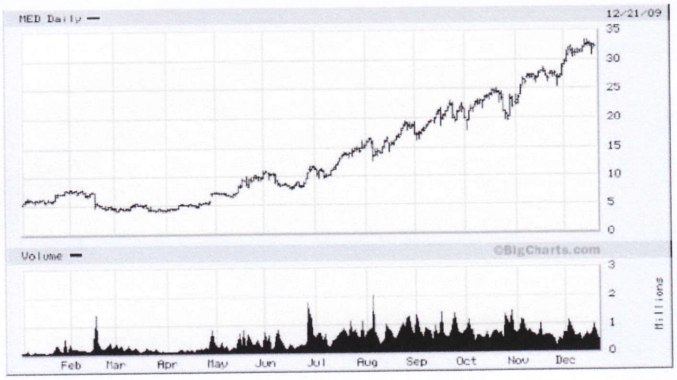
Of course, we know that the 2 dice example theoretically has exactly 36 combinations and no more, but we should have known it is just about impossible for you to roll the dice to get the same results in just 36 throws! Yes, I really do mean impossible, and not improbable – of that I am certain, just like Nassim Nicholas Taleb says!

1 *Standard deviation measures the dispersion of data about the mean value.*
2 *"The Black Swan", Prologue, Page xxiv*

Investment Corner

by IMCZ Treasurer John Henry Smith

As there are several categories of investment styles, each Grail stock will be analyzed in accordance with a stated style or strategy, i.e. Momentum Investor, Value Investor, etc.



COMPANY DESCRIPTION

Medifast, Inc. (Medifast) is engaged in the production, distribution, and sale of weight management and disease management products and other consumable health and diet products. The Company's product lines include weight and disease management, meal replacement, and vitamins primarily manufactured in its modern, the United States Food and Drug Administration (FDA) approved facility in Owings Mills, Maryland. The Company's operations are primarily conducted through five of its wholly owned subsidiaries, Jason Pharmaceuticals, Inc. (Jason), Take Shape for Life, Inc. (TSF), Jason Enterprises, Inc., Jason Properties, LLC and Seven Crondall, LLC. The Company offers a variety of weight and disease management products under the Medifast brand and for select private label customers. Its distribution channels include Medifast Direct, Take Shape for Life, Medifast Weight Control Centers and Medifast Physicians.

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Assessments and Analysis based on Dec 22, 2009 close price: $34.81		
Analysis of:	Medifast Inc. (MED)	
Industry:	Speciality Retail, Other	
Strategy:	Momentum Investor	
YTD Performance:	530.6%	
SP 500 YTD Performance:	23.8%	
Capitalization:	$1.72 billion	Small Cap

CATEGORY	CRITERIA OF A MOMENTUM INVESTOR	SCORE	REPORT CARD
Current quarter vs. same quarter last year:	Current EPS growth 18% better than the same quarter last year	+109%	PASS
Annual earnings growth:	Annual earnings growth above 18%	11.5% over the past 5 years	FAIL
Earnings consistency:	Year on year earnings growth should be higher that the previous one, allowing for one dip.	Over the last 5 years annual EPS were 0.14, 0.16, 0.38, 0.28 0.38	PASS
Current price level:	Should be within 15% of its 52-week high	MED's current stock price ($34.81) is within 15% of a 52 week high ($35.58)	PASS
4 month S&P relative strength line:	A general upward trend in the stock's weekly relative strength compared to the SP500.	MED's relative strength trend has increased over the last 4 months	PASS
Price performance compared to all other stocks:	A stock's price performance, or weighted relative strength, compared to the SP500 over the past year should be no less than 80.	MED's relative strength is 97	PASS
Confirm at least one other leading stock in the industry:	Confirm the industry's attractiveness by citing at least one stock that has a relative strength of at least 80.	In MED's industry sector (Medical Equipment & Supplies) there are 57 companies that have a relative strength at or above 80	PASS
Look for leading industries:	The number of companies in the industry with a weighted relative strength above 80, or look for industries with the most stocks making new 52-week highs.	MED's industry sector is currently one of the top performing industries	PASS
Decreasing long-term debt/equity	A debt/equity ratio less than 2, or the company has consistently cut debt over the last 3 years.	MED has a debt/equity ratio of 0.12	PASS
Return on equity:	A Return on Equity of at least 17%.	MED's ROE is 23.1%	PASS
Shares outstanding:	Shares outstanding less than 30 million.	MED has currently 15 million shares outstanding	PASS
Insider ownership:	Insider ownership of 15% or more	Insiders own 12.9% of MED's stock	FAIL
ownership:	Some institutional ownership is preferred.	Institutions own 44.9% of MED's stock	PASS