



The Flaws of Finance

James Montier

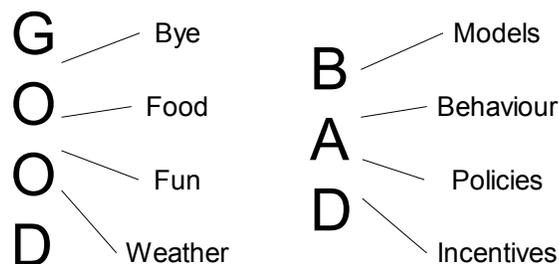


This paper is based on a speech delivered at the 65th Annual CFA Institute Conference in Chicago on May 6, 2012.

As a child, watching my parents write postcards whilst we were all on holiday was an instructive experience. My mother would meticulously write out the card, scattering a few interesting holiday tidbits within the text. My father, whose sum total of postcards sent was invariably just one (to his office), opted for a considerably more efficient approach. His method is shown at the left in Exhibit 1.

I think we can construct a similar diagram to explain the Global Financial Crisis (GFC), represented at the right in Exhibit 1. In essence, the GFC seems to have sprung from the interaction of the following four “bads”: bad models, bad behaviour, bad policies (which is really just bad behaviour on the part of central banks and regulators), and bad incentives.

Exhibit 1
Efficient Postcard
Writing and the GFC



Source: GMO

In an effort to rethink finance, I want to examine each of these factors in turn, beginning with bad models.

Bad Models, or, Why We Need a Hippocratic Oath in Finance

The National Rifle Association is well-known for its slogan “Guns don’t kill people; people kill people.” This sentiment has a long history and echoes the words of Seneca the Younger that “A sword never kills anybody; it is a tool in the killer’s hand.” I have often heard fans of financial modelling use a similar line of defence.

However, one of my favourite comedians, Eddie Izzard, has a rebuttal that I find most compelling. He points out that “Guns don’t kill people; people kill people, but so do monkeys if you give them guns.” This is akin to my view of financial models. Give a monkey a value at risk (VaR) model or the capital asset pricing model (CAPM) and you’ve got a potential financial disaster on your hands.

The intelligent supporters of models are always quick to point out that financial models are, of course, an abstraction from reality. Just as physicists can study worlds without frictions, financial modelers should not be attacked for trying to reduce the complexity of the “real world” into tractable forms.

Finance is often said to suffer from Physics Envy. This is generally held to mean that we in finance would love to write out complex equations and models as do those working in the field of Physics. There are certainly a large number of market participants who would love this outcome.

I believe, though, that there is much we could learn from Physics. For instance, **you don’t find physicists betting that a feather and a brick will hit the ground at the same time in the real world.** In other words, they are acutely

aware of the limitations imposed by their assumptions. In contrast, all too often people seem ready to bet the ranch on the flimsiest of financial models.

Someone intelligent (if only I could remember who!) once opined that rather than breaking the sciences into the usual categories of “Hard” and “Soft,” they should be split into “Easy” and “Difficult.” The “Hard” sciences are generally “Easy” thanks to the ability to perform repeated controlled experiments. In contrast, the “Soft” sciences are “Difficult” because they involve trying to understand human behaviour.

Put another way, the atoms of the feather and brick don’t try to outsmart and exploit the laws of physics. Yet financial models often fail for exactly this reason. **All financial model underpinnings and assumptions should be rigorously reviewed to find their weakest links or the elements they deliberately ignore, as these are the most likely source of a model’s failure.**

Let’s take the CAPM as an example of the way in which behaviour is assumed to be exogenous in finance, and how this creates problems. The CAPM can be constructed from four assumptions:

1. Transaction costs and other illiquidities can be ignored.
2. All investors hold mean-variance-efficient portfolios.
3. All investors hold the same correct beliefs about mean variance and covariances of securities.
4. Every investor can lend all she or he has, or can borrow all she or he wants at the risk-free rate.

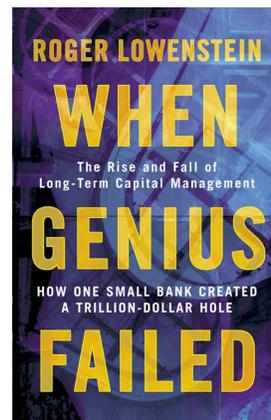
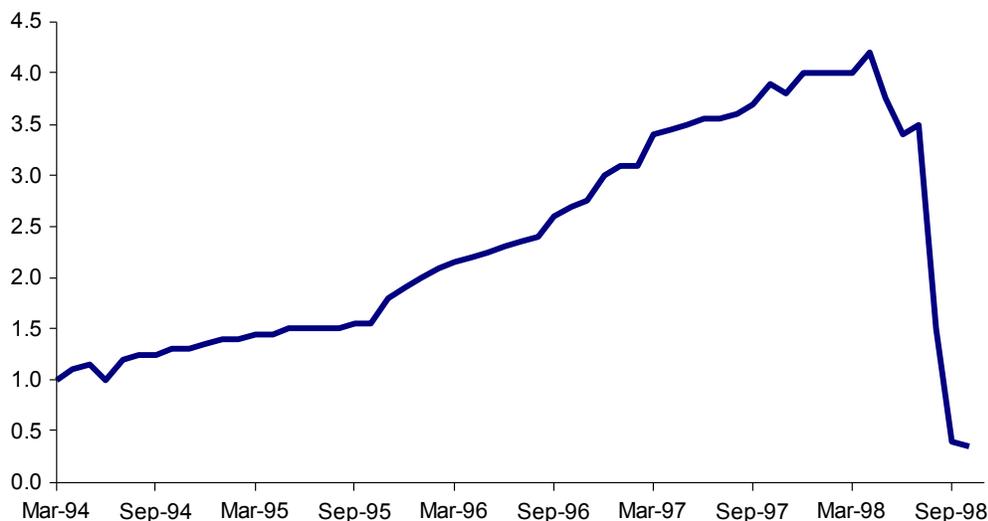
In case you object to the idea of a risk-free rate in assumption 4, this can be replaced by the following:

- 4a. It is possible to take a long or short position of any size in any risky asset.

Essentially this model says that the only “risk” is volatility (assumption 3), that illiquidity can be ignored (assumption 1), and that leverage is freely available and can be deployed without any consequences (assumption 4 or 4a). Those following this model will seek to leverage up illiquid assets. We have seen this movie before! Anyone remember the saga of Long-Term Capital Management?

Their business model (largely informed by more complex versions of the CAPM) involved trades such as buying off-the-run government bonds (e.g., 9½-year bond), and shorting the on-the-run equivalent bonds (e.g., 10-year benchmark bond), and then leveraging up. Basically, they were applying leverage to an illiquid asset. The dénouement for the LTCM movie is displayed in Exhibit 2.

Exhibit 2
\$1 Invested in LTCM



Source: Lowenstein

The atoms (market participants) of financial models are not inert. They either ignore the weaknesses of the model or actively seek out and exploit the model's weak links.

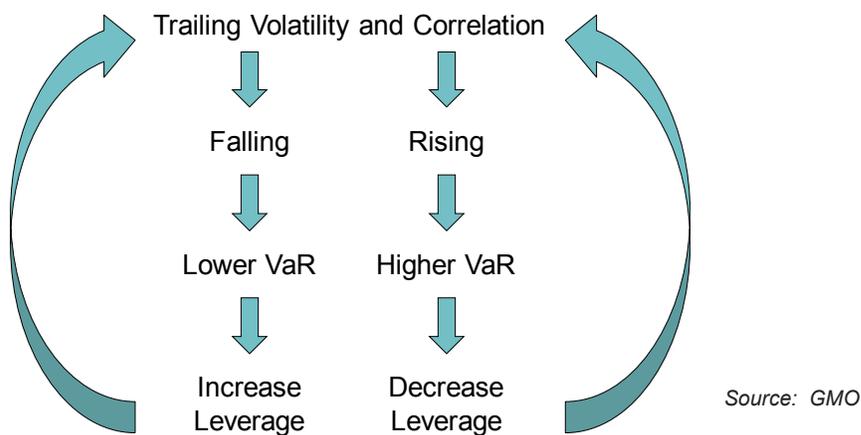
In the GFC it wasn't CAPM, but rather models such as Value-at-Risk (VaR) that created problems. It is noteworthy that VaR has been a villain in financial crises before – it was, for example, LTCM's chosen form of risk management. Its problems have been known for a long time. Indeed all of the "bads" identified in this note had been discussed by many, including me, ahead of the crisis, so this is far from an exercise in hindsight bias.

Using VaR is like buying a car with an airbag that is guaranteed to fail just when you need it, or relying upon body armour that you know keeps out 95% of bullets! VaR cuts off the very part of the distribution of returns that we should be worried about: the tails.

Exhibit 3 shows the feedback loops embedded within a typical VaR approach. Most VaR calculations use trailing volatility and correlation inputs. When these decrease, the calculated VaR falls, allowing the users to increase their leverage as they now have "less risk." Of course, the reverse is also true. When volatilities and correlations rise, VaR will also increase, and the users will be forced to deleverage. If everyone is using VaR, the potential for system wide problems is clear, as the model itself acts as a transmission mechanism between institutions (a classic example of Minsky's adage that stability begets instability).

Exhibit 3 VaR Is Doomed

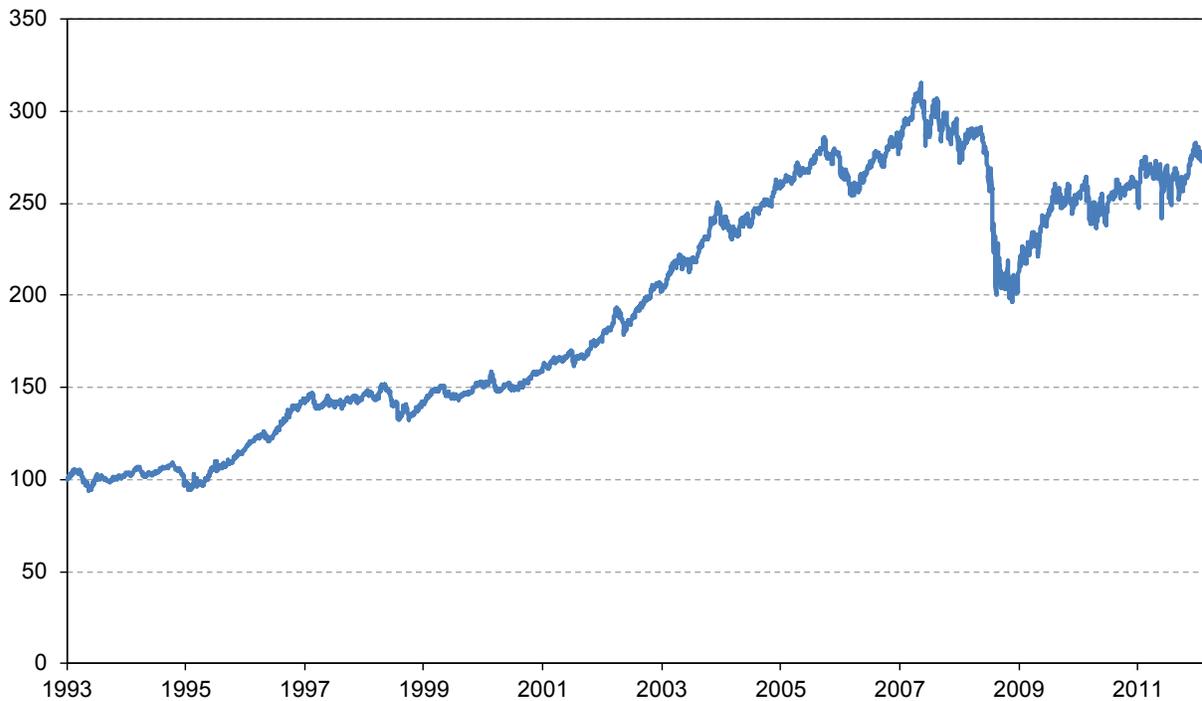
VaR – a car with an airbag that is guaranteed to fail when you need it, or body armour that is 95% bullet-proof



The problems inherent in VaR are further amplified by the use of short runs of data to estimate the inputs. This creates an even more pro-cyclical element, adding to the problems of VaR. If the immediate past is a period of tranquillity, then the future is held to be the same. If a risky asset, let's say a CDO, happens to have been less volatile than U.S. treasuries over the last couple of years, the model says (with a straight face) that the CDO is less risky than treasuries!

VaR is extremely vulnerable to peso problems. Peso problems are really just situations where the proverbial poop [Ed: No, James did not use this phrase.] has yet to hit the fan. For instance, if you are running a currency carry trade and buying currencies with high interest rates and shorting those with low interest rates, your returns may look great as long as no devaluations occur. However, the high interest rates may simply be compensation for an expected devaluation. When this occurs your returns are often annihilated (see Exhibit 4). Yet in the run-up to the devaluation, a VaR approach will say you have essentially no risk!

Exhibit 4 Carry Trade for G10 Currency Futures



Source: Bloomberg, Deutsche Bank

Blinded by “Science”

All of this begs the question as to why on earth people keep using VaR (and other clearly busted financial models). Partially, it is a function of the fact that regulators adopted it (more on this below), and in part it is because VaR has a veneer of mathematical and expert support.

These two play to our human weaknesses. Neuroscientists have discovered an alarming aspect of our interaction with “experts.” Using MRI technology, they busily recorded brain activity while study participants made simulated financial decisions.¹ During each round, the participants had to choose between receiving a risk-free payment and trying their chances in a lottery. In some rounds they were presented with advice from an “expert economist” (surely an oxymoron if ever one existed) as to which alternative was preferable.

The results of this experiment are worrying. Expert advice attenuated activity in areas of the brain that correlate with valuation and probability weighting. In other words, the expert’s advice made the brain switch off some processes required for financial decision making. The players’ behaviour simply echoed the expert’s advice. Unfortunately, the expert advice given in the experiment was suboptimal, meaning that participants could have done better had they weighed the options themselves. An example of “bad advice driving out good.”

Other behavioural biases conspire to blind us to the flaws of bad models. For instance, a behaviour known as anchoring can make even irrelevant numbers powerful inputs into our decision making. To demonstrate this, consider the exercise I have given to over 600 professional fund managers:

Before you answer the next question, please write down the last four digits of your telephone number.
Now, estimate the number of physicians that work in London.

¹ J. Engelmann, C.M. Capra, C. Noussair, and G. Berns, “Expert Financial Advice Neurobiologically ‘Offloads’ Financial Decision-Making under Risk,” PLoS One, 2009.

Oddly, those with a telephone number of 7000 or higher think there are around 8,000 doctors working in London. Those with telephone numbers of 3000 or lower think there are around 4,000 doctors working in London. I don't have a clue as to how many doctors there are in London, but I'm sure that my guess should be unrelated to my telephone number.

Others have shown that judges were influenced by irrelevant anchors when setting jail sentences, even when they were fully aware of the irrelevance of the input.² In one study, judges were asked to roll dice to determine the sentencing requests from the prosecution. The pair of dice they used was loaded to give either a low number (1,2) or a high number (3,6). Having rolled the dice, the judges were told to sum the scores with the result representing the prosecution's request for jail time. Having rolled the dice themselves, the judges could clearly see that the input was totally irrelevant. However, the group who received the total score of 3 issued an average sentence of 5.3 months; those who received a total score of 9 issued an average sentence of 7.8 months! A 50% increase in jail time based purely on the roll of dice. Simply giving people irrelevant inputs starts to bias behaviour. Think about this in the context of VaR output!

Indeed, relying on the output of a computer has been found to create problems in general. Skitka et al.³ were the first to document the problem (although it has been confirmed in a wide range of contexts). They asked participants to follow a set of tasks designed to simulate the types of monitoring and tracking tasks required in flying commercial aircraft. This involved a computer simulation of "flying" a plane, complete with dials and computers. During the course of the simulation, some problems were highlighted by the central computer, others by the dials alone. The participants were much more likely to respond to the central computer warning, and they often missed the warnings from the dials if the central computer didn't flash as well. This was despite the fact that the participants were told the dials and gauges were 100% accurate and the computer was only "highly but not perfectly reliable." We humans love to defer to authority even when that authority is a computer!

Outside of the research lab, UBS, in their mea culpa to shareholders, confessed that the overly narrow focus on VaR had contributed to their problems:

The historical time series used to drive VaR...[were] based on five years of data...sourced from a period of relatively positive growth...hindsight suggests...did not attribute adequate weight to the significant growth in the U.S. housing market...and Subprime... no attempt to capture more meaningful attributes... such as defaults, loan to value ratios, or other similar attributes...Market Risk Committee relied on VaR...even though delinquency rates were increasing and origination standards were falling in the U.S. mortgage market.⁴

In general, anything requiring advanced mathematics should be treated with extreme suspicion when it comes to financial applications. As is so often the case, Ben Graham⁵ got there way ahead of the rest of us:

Mathematics is ordinarily considered as producing precise and dependable results; but in the stock market the more elaborate and abstruse the mathematics the more uncertain and speculative are the conclusions we draw therefrom...whenever calculus is brought in, or higher algebra, you could take it as a warning signal that the operator was trying to substitute theory for experience, and usually also to give speculation the deceptive guise of investment.

As I was going to press with this paper, one of my colleagues sent me a priceless article written in 1970 by John Siegfried.⁶ The point the paper makes is as powerful today as when it was originally composed: complexity to impress is all too common.

² B. English, T. Mussweiler, and F. Strack, "Playing dice with criminal sentences: the influence of irrelevant anchors on experts' judicial decision making," *Personality and Social Psychology Bulletin*, 2006.

³ L. Skitka, K. Mosier, and M. Burdick, "Does automation bias decision-making?" *International Journal of Human-Computer Studies*, 2009.

⁴ UBS Shareholder Report on UBS's Write-Downs, April 18, 2008.

⁵ B. Graham, *The Intelligent Investor*, 1958.

⁶ J. Siegfried, "A first lesson in econometrics," *Journal of Political Economy*, 1970.

For instance, this is how finance sees the world:

$$\ln\left\{\lim_{\delta \rightarrow \infty} \left\{[(X')^{-1} - (X^{-1})'] + \frac{1}{\delta}\right\}\right\} + (\sin^2 q + \cos^2 q) \\ = \sum_{n=0}^{\infty} \frac{\cosh p \sqrt{1 - \tanh^2 p}}{2^n}$$

This is how my 3-year old daughter would see the same equation:

$$1 + 1 = 2$$

I have long argued that what we need in finance is a version of the Hippocratic Oath. It warmed the cockles of my heart when I read the Modeler's Oath, written by Emanuel Derman and Paul Wilmott.

The Modeler's Hippocratic Oath

I will remember that I didn't make the world, and it doesn't satisfy my equations.

Though I will use models to boldly estimate value, I will not be overly impressed by mathematics.

I will never sacrifice reality for elegance without explaining why I have done so.

Nor will I give the people who use my model false comfort about its accuracy. Instead I will make explicit its assumption and oversights.

I understand that my work may have enormous effects on society and the economy, many of them beyond my comprehension.

Now if only it could be included in the CFA code of ethics.

Bad Policies and Bad Incentives

As if bad models alone weren't enough, those self-same bad models were then adopted by regulators and became the basis for bad policy. This is perhaps the world's best example of what economists call regulatory capture (although I've not seen anyone explore it as such). Just ask yourself who invented VaR. It was the investment banks. And who promoted the use of VaR as a means of determining capital adequacy? The investment banks.

Now imagine that you asked a classroom full of children to mark their own homework. Would you be surprised if they gave themselves higher marks than an objective assessor? If so, you are touchingly naïve about human nature. Surely, trust but verify, to borrow Reagan's expression, is a better approach.⁷

The regulators decided to ignore any such concern, but instead they blessed the use of VaR as a benchmark for behaviour. As David Einhorn⁸ has pointed out, this has created some perverse (bad) incentives.

By ignoring the tails, Value-at-Risk creates an incentive to take excessive but remote risks. Consider an investment in a coin-flip. If you bet \$100 on tails at even money, your Value-at-Risk to a 99% threshold is \$100, as you will lose that amount 50% of the time, which obviously is within the threshold. In this case the VaR will equal the maximum loss.

Compare that to a bet where you offer 127 to 1 odds on \$100 that heads won't come up seven times in a row. You will win more than 99.2% of the time, which exceeds the 99% threshold. As a result, your 99% Value-at-Risk is zero even though you are exposed to a possible \$12,700 loss. In other words, an investment bank wouldn't have to put up any capital to make this bet.

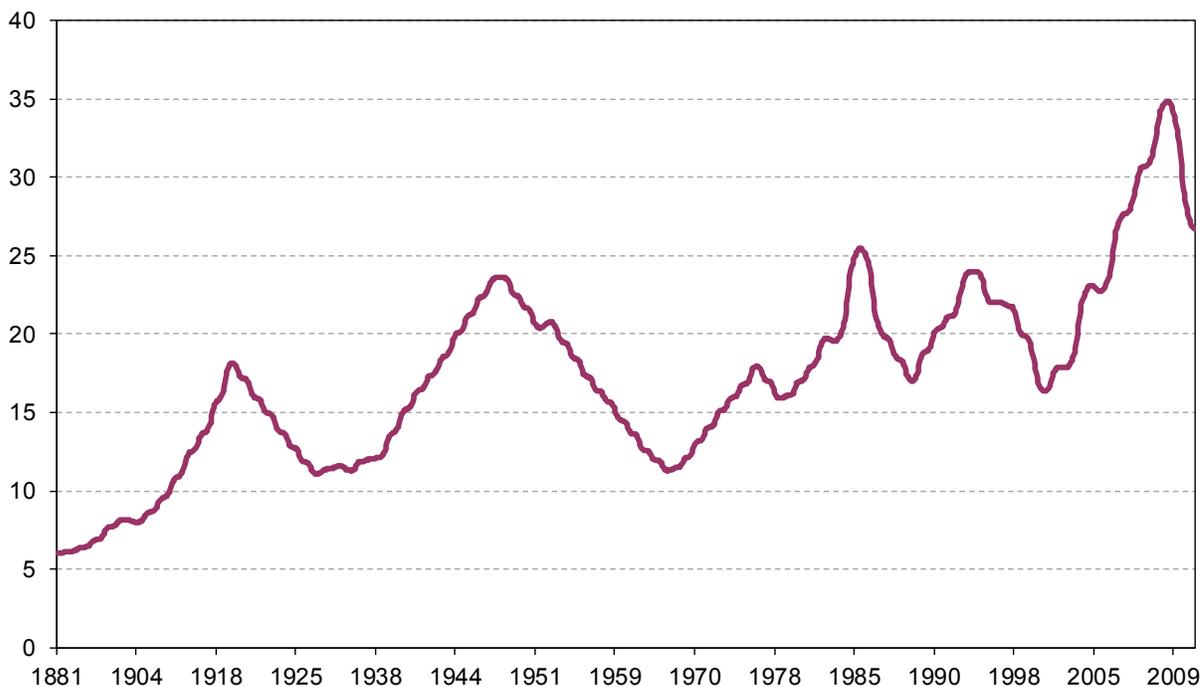
⁷ N. Mazar, O. Amir, and D. Ariely, "The dishonesty of honest people: a theory of self-concept maintenance," 2005. The authors show that, given the chance, people will indeed cheat.

⁸ D. Einhorn, "Private Profits and Socialized Risk," GARP Risk Review, June/July 2008.

This regulatory capture produced the latest in a long series of relaxations of the limits of leverage that a bank could deploy. In the first half of the 19th century, British bank shareholders had unlimited liability, and equity capital accounted for approximately half of the balance sheet and leverage was around 2x.

In 1855, the joint stock company was authorized, and leverage started its inextricable climb upwards as shown in Exhibit 5. However, until the end of the 1930s some banks still used an extended liability structure, such that shareholders were liable for an additional fixed level of capital reserve in the event of stress or bankruptcy. However, in the post war era this was abandoned and limited liability was exploited to the maximum. It can hardly be coincidence that the rules allowing banks to use their own models (VaR) for risk capital assessment (implemented in 2004) drove yet another surge in leverage to its all-time peak of 35x!

**Exhibit 5
The Long-Term Leverage of UK Banks**



Source: Miles, Marcheggiano, and Yang (2011)

There was a completely misplaced faith by regulators that markets were efficient, and hence this leverage wasn't a problem. As Alan Greenspan admitted in his testimony before Congress in October 2008, "Those of us who have looked to the self-interest of lending institutions to protect shareholder's equity, myself especially, are in a state of shocked disbelief."

Central banks also need to shoulder their fair share of the blame in other regards as well. Not only were they often the direct regulator, they also had a helping hand in creating a bad environment. For instance, ever since Alan Greenspan arrived at the Fed in late 1987, any potential problem in the markets seems to have been greeted by interest rate cuts, creating an environment of extreme moral hazard, known colloquially as the Greenspan put (and carried into the Bernanke put).

This policy of cutting rates in the face of financial stress created wave after wave of financial bubble blowing, with each bursting bubble engendering yet another round of rate cuts, until ending up at today's zero interest rate policy and quantitative easing. This environment creates investors keen to commit one of the cardinal sins of investing: reaching

for yield. Sadly, this habit follows Keynes's Law that demand creates its own supply. When investors are happy to reach for yield, the supply of products available to indulge in this reckless pursuit will seem endless.

Bad Behaviour and Bad Incentives

This is an apposite point at which to provide an example of bad behaviour and bad incentives combining in the context of investors reaching for yield. For this, we need to turn the spotlight on the rating agencies.

The rating agencies seem to have believed in what can only be described as modern-day mortgage alchemy. They seemed to believe that it was possible to take a pound of minced beef and by the magic of diversification turn it into a pound of prime steak. Of course, one always has to check the incentives that people have. In this case, who paid for the rating agencies to undertake their work? It was the suppliers of the bonds themselves. This is a dreadful system, and a prime breeding ground for self-serving bias.

As Warren Buffett warns, "Never ask a barber if you need a haircut," or, as Upton Sinclair noted, "It is difficult to get a man to understand something, when his salary depends upon his not understanding it!"

Auditors provide a good example of this bias at work. One hundred and thirty-nine professional auditors were given five different auditing cases to examine.⁹ The cases concerned a variety of controversial aspects of accounting. For instance, one covered revenue recognition while another concerned capitalization versus expensing of expenditures. The auditors were told the cases were independent of each other.

The auditors were randomly assigned to either work for the company or work for an outside investor who was considering investing in the company in question. The auditors who were "working" for the company were 31% more likely to accept the various dubious accounting moves than those who were "working" for an outside investor (and this study was conducted in the post Enron era). No wonder the ratings agencies were falling over themselves to award the highest ratings to these rearranged piles of minced beef.

A recent paper on the behaviour of loan officers¹⁰ provides another timely and highly relevant example of self-serving bias. Agarwal and Ben-David present direct evidence showing that a change in the incentive structure of loan officers – from fixed salary to commission-based compensation – causes the officers to approve more loans and at higher amounts, leading to a significant decline in the credit quality of loans.

They found that loans are about 7% more likely to be accepted by loan officers who were commission-based than by loan officers on fixed salaries (an increase of 19.4% in relative terms). Approved loan amounts by commission-based loan officers were larger by about 23%. Interestingly, Agarwal and Ben-David found that average external credit quality (measured by an outside credit scoring firm) remained unchanged, whereas the average internal credit score (calculated by the loan officers) actually increased! However, despite the increase in the perceived quality of loans, loan performance actually deteriorated. The 12-month default probability increased by 1.2% percentage points for loans booked by commission-based loan officers (an increase of 27.9% in default in relative terms).

The asymmetry of incentives can't be ignored either. Any contract that gives you all of the upside without the matching downside is going to create problems. It is well-known that traders at investment banks have exceptionally skewed incentives. They play with the bank's capital, take a large share of the upside, and if everything goes horribly wrong they can walk away, claiming it was the market that was wrong.

Finally, on the topic of incentives: beware of the danger of becoming incentive-obsessed. As Ariely et al.¹¹ have shown, in circumstances where the stakes get very large, attention tends to get diverted from the underlying task to the reward itself, resulting in a poorer performance than would otherwise have been the case.

⁹ D. Moore, G. Loewenstein, L. Tanlu, and M. Bazerman, "Auditor independence, conflict of interest, and unconscious intrusion of bias," 2004.

¹⁰ S. Agarwal and I. Ben-David, "Do loan officers' incentives lead to lax lending standards?" (2011).

¹¹ D. Ariely, U. Gneezy, G. Loewenstein, and N. Mazar, "Large stakes and big mistakes," *Review of Economic Studies*, 76, 451-69, 2009; and Montier, *Behaviour Investing*, Chapter 52, 2007.

Bad Behaviour

It would be wrong to blame the agencies alone. After all, there is plenty of blame to go around. As the table below shows, the fundamental default rate of asset-backed securities (ABS) was very different from the equivalent rating on corporate bonds. In fact, ABS were, on average, nine times more likely to default than a corporate bond with the same rating. Why didn't investors pay any attention to the possibility that mortgage alchemy might go awry?

Table 1
Not All Ratings Are Equal!

5-year rolling default rates

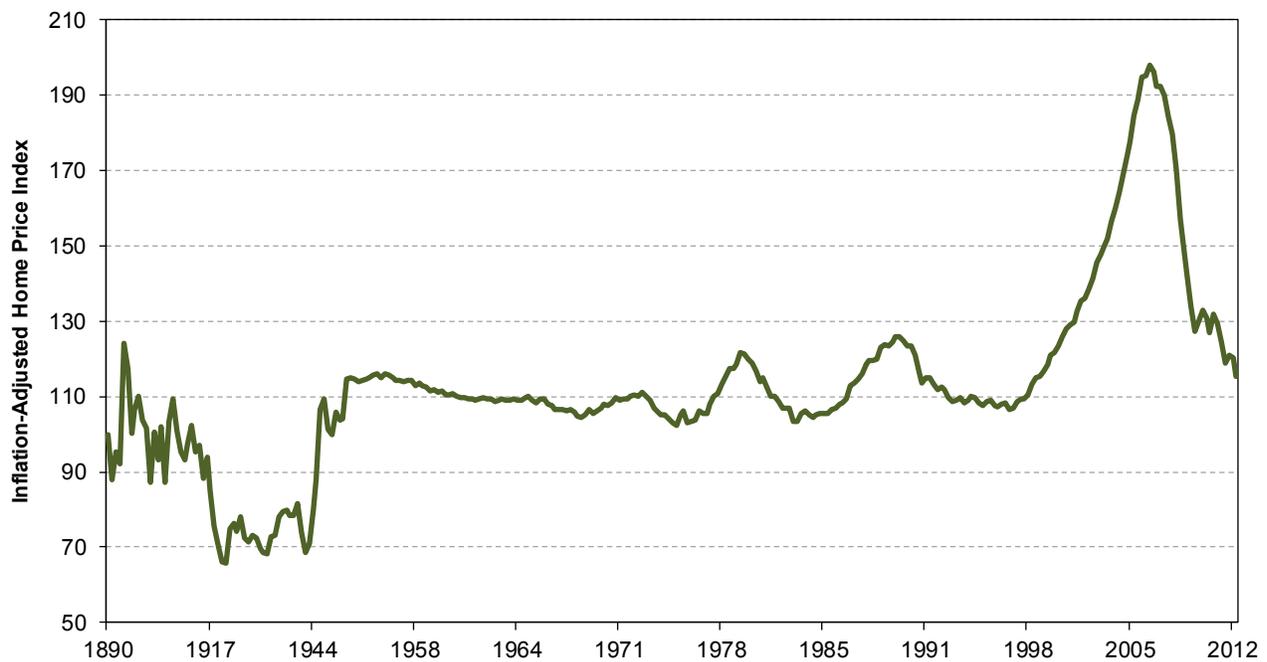
Rating	Corporate Bond (82-06) Default Rate	ABS (93-06) Default Rate	Ratio of Default Rates
AAA	0.1	0.9	9
AA	0.2	6	30
A	0.5	5	10
Baa	2.1	20.8	10
Ba	11.3	48	4
B	27.7	58	2
Caa	50.9	82.8	2

Source: Moody's, SG Global Strategy

This is prima facie evidence of investors neglecting risk. Indeed, this neglect of risk was widespread. For instance, in 2005 Ben Bernanke observed that the price of housing largely reflected strong fundamentals, and that there had never been a nationwide decline in house prices. Of course, this ignored the vicarious experiences of other markets, such as Japan and the UK, which had clearly demonstrated the ability of house prices to decline nationwide. It also ignored the fact that real home prices had never seen such a boom before (Exhibit 6).

Exhibit 6

U.S. Real Home Price Index



Source: Shiller (2012)

This raises the question as to why so many people (investors and central bankers alike) neglected risk. In part, neglected risk stems from an overly narrow definition of risk (as volatility). As I have shown before, volatility is a poor measure of true risk.¹² This is as true at the economic level as it is at the market level. So while Bernanke and his ilk were proclaiming the “Great Moderation,” – a taming of the economic cycle – they were ignoring the dangerous build-up in leverage and debt stocks.

It also stems from a gamut of potential behavioural biases. As we saw with the UBS *mea culpa* quoted earlier, there is a tendency to want to justify events like the GFC by identifying them as black swans. According to Taleb, black swan events are characterised by three traits: (i) they are inherently unpredictable; (ii) they have a massive impact; and (iii) we all tend to make up *ex post* rationalizations to explain away the scariness of the black swan problem.

To view the GFC as a black swan, to me at least, is an abdication of responsibility. It should be remembered that black swans of the kind often encountered in finance are really a matter of perspective. For instance, think about turkeys in the run-up to Thanksgiving. Every day a kindly human turns up to give them water, feed them, and tuck them into bed. Then one day this same kindly human commits turkey genocide! From the turkey’s point of view this is clearly a black swan. From the farmer’s point of view it is anything but.

In fact, the GFC is something much closer to what Max Bazerman calls a “predictable surprise.” These events also have three characteristics: (i) at least some people are aware of the problem; (ii) the problem gets worse over time; and (iii) eventually it explodes into a crisis.

So what stops us from seeing “predictable surprises?” At least five behavioural hurdles help prevent us from thinking properly about predictable surprises. First on the list is the most common of all behavioural flaws: over-optimism. The entire human species appears to live in Lake Wobegon, where all the children are above average. At the end of Monty Python’s “Life of Brian,” one guy on a crucifix starts singing “Always Look on the Bright Side of Life.” We just aren’t good at looking for the bad news. Incidentally, the one group of people who see the world the way it really is are the clinically depressed (hence their depression).

We also suffer from the illusion of control. This refers to people’s belief that they have influence over the outcome of uncontrollable events. We think that even if something does go wrong, we will be able to sort it out.

The third barrier to spotting predictable surprises is self-serving bias (as detailed above). It is rarely in anyone’s interest to ring a bell at the top. Just imagine you were a risk manager in 2007: if you had objected to CDOs, you would simply have been fired and replaced with someone happy to sign off on them.

Myopia plays a role as well. This can be summed up as “Eat, drink, and be merry, for tomorrow we may die.” Of course, this ignores the fact that on any given day we are roughly 26,000 times more likely to be alive than dead. If you prefer, myopia can be neatly expressed by reference to St. Augustine’s plea, “Lord make me chaste, but not yet.” In a world where short-term profits are valued so highly, it is exceptionally hard to focus on the long-term picture.

Inattentive blindness, or the invisible gorilla¹³ problem, is the fifth hurdle to spotting black swans. In the classic demonstration of this, participants are shown a short video clip of two teams, one dressed in white, the other dressed in black, passing a basketball between themselves. The task is to count the number of times the people dressed in white pass the ball. Halfway through the video clip, a man in a gorilla suit walks into the game, stops, beats his chest, and then walks off. At the end of the video, participants are asked how many passes there were, and whether they spotted anything unusual. On average, some 50-60% fail to spot the gorilla. We just aren’t good at seeing things we aren’t looking for.

¹²J. Montier, “I want to break free, or, strategic asset allocation is not static allocation,” May 2010. A GMO white paper available to registered users at www.gmo.com.

¹³D. Simons and C. Chabris, “Gorillas in our midst: sustained inattentive blindness for dynamic events,” *Perception*, 28, 1059-1074, 1999.

Rethinking Finance: A Manifesto for Change

Hopefully the preceding has convinced you that finance is in need of some repair. So, let me now turn briefly to what we should seek to learn from the above.

Theory of Finance

Those involved in the theory of finance should heed the Modeler's Oath presented earlier, and stop sacrificing reality on the altar of elegance. Much headway around liquidity, leverage, bad behaviour, bad incentives, and delegated management has been made over the last few years by those willing to incorporate many of the elements discussed above. Ultimately, academics should interact more with practitioners in order to ensure their models aren't missing the most important elements of the problem at hand. A little more common sense and a little less complex mathematics would go a long way toward making the theory of finance more sensible. Sadly, as Howard Marks has observed, common sense is not so common.

Practice of Finance

All practitioners should be required to take a financial version of the Hippocratic Oath, with an emphasis on doing no harm. They should also avoid becoming "slaves to some defunct economist" to borrow Keynes's phraseology. Far too frequently, ideas flow out of academia and are seized upon by those in pursuit of profit because they serve their own ends, rather than the ends of the client.

Practitioners should abandon their obsession with optimality. One of financial theory's lasting contributions to the world of financial practice is the concept of optimality. I don't believe that the optimal can exist in an ex ante sense without the aid of a crystal ball. Of course, ex post, it is trivial to construct an optimal portfolio. However, since I've yet to encounter an investor armed with a fully functioning crystal ball, I would suggest that we need to abandon the pursuit of the optimal, and **instead aim for robustness.** Ex ante optimality is inherently fragile: it is only optimal for your best guess of the future.

Let us forsake the false deity of volatility as a measure of risk. Risk isn't a number. It is a far more complex and multi-faceted concept. **Risk is the permanent impairment of capital.** As I have written many times before, there are three routes to the permanent impairment of capital: (i) valuation risk (buying an overvalued asset); (ii) fundamental risk (real business risk); and (iii) financing risk (including leverage, overcrowding, etc.). Thinking about risk across these different dimensions should help protect against some of the most common ways of damaging capital.

We should all treat financial innovation with scepticism. As J.K. Galbraith noted, "The world of finance hails the invention of the wheel over and over again, often in a slightly more unstable version." All too often, financial innovation is just thinly veiled leverage.

When engaged in the use of models, know the limits of those models, and don't try to game them. I fear that this may prove to be impossible, illustrated by the scorpion, who, having found a turtle willing to transport him across a river, stings the turtle halfway across, saying "It is just my nature."

We must focus on the long term, and not get caught up in the short term. Of course, as Keynes argued, "It is the long-term investor, he who most promotes the public interest, who will in practice come in for the most criticism... For it is the essence of his behaviour that he should appear eccentric, unconventional and rash in the eyes of average opinion."

We should avoid getting bogged down in the details. The risk of missing the wood for the trees seems to be a perennial problem for most investors. Einstein once said "If you can't explain something to a 6-year old, you don't understand it yourself." To me, all finance concepts should be able to pass this criterion. Time and again, complicated jargon and dense mathematics are used to baffle and bamboozle.

All investors should be required to study the history of financial euphoria. It never ceases to amaze me how little we learn from one crisis to another. Galbraith noted "the extreme brevity of financial memory." The details of each bubble may change but the underlying patterns (usually involving some nasty combination of illiquidity and leverage) don't.

We had seen instruments like CDOs before. During the junk bond boom of the late 1980s, they were collateralised bond obligations (CBOs).

We should all learn to engage in what is pompously described as event horizon scanning. In plainer English this translates to looking out for predictable surprises, or becoming a black swan hunter. Of course, the timing element of predictable surprises makes them hard to deal with. Not only do you need the skills necessary to engage in this activity, you also require the patience to stand aside when the world is going mad (but making lots of short-term profit in the process).

Regulation/Policy and Finance

When it comes to policy, central bankers and regulators have much to learn. First and foremost, **central banks should “lean against the wind,”** rather than be cheerleaders for manias. Bursting bubbles in their early stages is likely to be far less damaging in the long term than allowing them to go full term and then trying to mop up after the burst.

Central bankers and regulators must also learn that markets aren't efficient. **They shouldn't expect the market to do the “right thing.”** Hence, they should be wary of inferring too much from market prices, including risk measures. Mark-to-market based accounting suffers from similar problems.

Capital adequacy should be contra-cyclical not pro-cyclical. Surely this is a “no-brainer”: ensure that reserves are built up in good times to provide for the bad. A simple indicator such as credit growth as the basis of capital adequacy shouldn't be beyond the ken of regulators.

It really shouldn't need to be said. But as with all regulators, financial regulators should **guard against regulatory capture and industrial self-serving bias.** Letting banks use their own models to assess risk and capital requirements was always going to end in tears. Yet once again, Basel III seems to have been, at least partially, formulated by the banks!

Finally, **regulators should try to learn the correct lesson from the GFC.** It seems as if the lesson learnt has been that investors had too much equity in their portfolios in the run-up to the GFC. Of course, this isn't the correct lesson to take away. It wasn't that funds had too much equity (and equity-like risk) in their portfolios, it was that they had too much **expensive** equity. Ironically, the regulators are now encouraging funds to own too much **expensive** fixed income, sowing the seeds for a future crisis no doubt!

*Mr. Montier is a member of GMO's asset allocation team. Prior to joining GMO in 2009, he was co-head of Global Strategy at Société Générale. Mr. Montier is the author of several books including *Behavioural Investing: A Practitioner's Guide to Applying Behavioural Finance*; *Value Investing: Tools and Techniques for Intelligent Investment*; and *The Little Book of Behavioural Investing*. Mr. Montier is a visiting fellow at the University of Durham and a fellow of the Royal Society of Arts. He holds a B.A. in Economics from Portsmouth University and an M.Sc. in Economics from Warwick University.*

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