GUINNESS
FUNDS
*un*common sense

Physics envy

Matthew Page, CFA
Co-manager, Guinness Global Equity Income Fund

Economists have long sought to identify a deterministic "natural law" of markets in the same way that physicists have discovered natural laws such as gravity and electromagnetism. This is sometimes referred to as "physics envy". If economists could identify a deterministic natural law of markets then we would be able to make useful and accurate predictions. Sadly no such law exists. Human actions are not governed by simple predictable laws.

The great American physicist Richard Feynman once joked, *"Imagine how much harder physics would be if electrons had feelings!"* Or as Newton put it: *"I can calculate the motions of the heavenly bodies, but not the madness of people."*

The next best thing to a natural law is a well-tested theory. Theories can be tested by building models based on the assumptions of the theory. No theory will be perfect, as it is a simplification of reality, but insight can often be drawn from it. However, what often happens when a model becomes popular is that practitioners forget the limitations of the assumptions of these models.

Indeed, the theory and models used by investment banks to create baskets of subprime bonds (that rating agencies were happy to rate as AAA) relied on the assumption that house prices would not fall.

The theory that is most prevalent in financial markets is the Efficient Market Hypothesis. It's a wonderful theory and model, but it is a long way from being a true, deterministic, scientific, physical law like Einstein's theory of relativity. One of the key assumptions behind efficient markets is that all agents/investors behave rationally. That seems like a poor assumption, as the work of Daniel Kahneman, Amos Tversky, Dan Ariely and Daniel Simons (to name a few) have shown. Humans are far from being rational. Human decisions are more emotional than rational. This causes us all to exhibit biases in our thinking that are very different from what a hypothetical, purely rational human would decide. Psychologists have identified over 150 of these biases, and investors, professional or otherwise, are not immune.

Ultimately the proof is in the pudding. If a theory can predict certain characteristics or outcomes then it can be said to be true.

Again Feynman wrote about theories:

"[The scientific method] is based on the principal that observation is the judge of whether something is so or not. All other aspects and characteristics of science can be understood directly when we understand that observation is the ultimate and final judge of the truth of an idea... If there is an exception to any rule, and if it [the exception] can be proved by observation, that rule is wrong."

The Efficient Market Hypothesis fails to predict the frequency of market crashes that have occurred through history, so by Feynman's standard the EMH is not robust and not true.

Despite the evidence, people continue to hang on to it. How many times did we hear that the financial crisis of 2007/8 was a one in 100 or 200 year event, even though we know we see crashes in markets much more frequently? Most of these nonsensical calculations are based on the assumption of the efficient market hypothesis, which leads to the convenient but lazy assumption that the returns of asset classes over time will fit a normal distribution or bell curve. It's convenient because normal distributions are defined purely by two measures: the mean and the standard deviation. No other inputs are required.

Normal distributions are also straightforward to manipulate mathematically, as opposed to less elegant distributions that exhibit the "fat tails" that would forecast the relevant frequency of market crashes through history.

Normal distributions form the basis of so much of modern finance theory. It is the basis of calculating Beta, which in turn allows you to calculate the cost of equity of a firm, which in turn can be used with numerous other potentially erroneous forecasts to calculate the "value" of a firm. It is the basis of Modern Portfolio Theory, the Efficient Frontier, Portfolio Optimisation. It is the fundamental basis for Value at Risk and the Black-Scholes option pricing model.

The insatiable human need for certainty, avoidance of ambiguity and prescience of the future has led to a widely held preference for using a model that is easy to manipulate, as opposed to one whose fundamental assumptions bear a resemblance to reality.

Under stable market conditions (temporary equilibria), these metrics and theories work fairly well. But as metrics like Value at Risk are used to manage risk, it is unfortunate that in the periods of highest risk, such as just before a market crash, they help you least. A risk tool that fails to protect you in a period of high risk is like an ejector seat that works well under normal conditions but fails to eject when you need it most.

The idea that "risk" behaves in a bell-shaped fashion and can be quantified, contained and managed just doesn't seem quite right. Ultimately we think it is more appropriate to think in terms of "uncertainty" than "risk", and get comfortable with the fact that risk cannot be fully captured in probability and statistics, or reduced to one number.

We think the market, rather than comprising purely rational investors, is made up of smart investors who are subject to behavioural biases and who have differing and evolving goals (different perspectives on what is rational) and different time horizons. This is sufficient to mean cycles can occur, crashes can occur and, most importantly, profitable opportunities will arise if you can avoid herd-like thinking. We think the appropriate framework to consider a financial market is that of a Complex System. Definitions of Complex Systems vary but it is generally accepted that a Complex System should include most or all of the following elements:

1. **The system has feedback loops.**

There are clearly strong feedback loops in financial markets. Momentum-oriented "investors" focus on companies whose share prices are following a trend. If a sufficient number of investors focus on momentum then the actions of momentum investors can lead to further momentum and positive feedback loops can arise. The same can happen with any theme or story if sufficient people become interested in it. Indeed government control of interest rates is meant to take advantage of feedback loops. Quantitative easing is an extreme example of this. Governments drive down real interest rates by buying huge quantities of bonds, which forces investors into riskier assets, which drives up the value of these assets, that improves levels of wealth and confidence, which in turn leads to further purchase of riskier assets. There are hundreds of feedback loops that evolve over time. Much of the time they compete and cancel each other out. Some are strong and some are weak, some are positive and some are negative. However, when enough of these feedback loops combine, asset bubbles and crashes can occur.

2. **The system is non-stationary.**

This means statistical or dynamic properties that might hold true over one time frame will not

necessarily hold true over another time frame. We know this is true. Take volatility as a good example: it tends to spike when there is fear in the market and fall when there is confidence.

3. Agents interact.

For "agents" you can read investors but technically it means anyone who participates in the markets – traders, market makers, mutual funds, hedge funds, ETFs etc. Essentially this means investors talk to each other, they share ideas, they debate, persuade, argue, agree, disagree. They watch the news, they read newspapers, magazines and journals, which are powerful funnels through which an initial point of view can cascade. This in itself can be another source of feedback loops. Believers in efficient markets would presumably argue that this would be pointless, as all investors are rational so by extension they will all agree on the price of an asset.

4. Agents can adapt their behaviour.

In reality investors try to adapt what they are doing to what is going on around them. They change their behaviour as their circumstances evolve and adapt to market circumstances, be it the level of fear in the market or their investment time horizon.

5. The population of agents evolves.

Market participants have changed significantly over the last 100 years. ETFs have taken significant market share from traditional mutual funds in recent years, while hedge funds grew rapidly through the 1990s. Product and market innovation will continue to have a dynamic impact on how markets function.

6. The system is a single realisation.

This is similar to point 2. The market is a constantly evolving system, so how the market behaved over a period in the past may not tell us much about the future.

7. The system is open.

This means that the market (the system) is strongly coupled to its environment and so can be affected by outside influence such as economic policy, changes in interest rates, quantitative easing, changes in legislation, changes in tax etc. Money can also flow in and out of the system through new companies listing and the repurchase of shares.

One of the key characteristics of a generalised Complex System is that unexpected phenomena emerge spontaneously at the macro level, through the micro-level interactions of many agents over time. In other words market crashes (an unforeseen phenomena) and their observed frequency are well within the expected outcomes of a complex system (unfortunately the spontaneous nature doesn't provide us with any clues as to when they may occur).

These unexpected phenomena are essentially periods of order that arise out of what most of the time looks more like a noisy, but stable, system. In a complex system it makes sense that markets crash, but on the same basis it makes sense that in less extreme circumstances the market may become more excited about a particular theme, story, trend, sector of the market etc. due to the feedback loops and interactions amongst investors. Valuations may well drift far from what might objectively appear justified (both to overvaluation and undervaluation).

The Complex System framework therefore starts by providing a more realistic set of assumptions of how market participants behave and interact, and helps to explain why opportunities for profit arise for patient investors. It also highlights what you can and cannot control, which unfortunately is less than we would all naturally want to believe. However, if we accept that risk cannot be boiled down into a single metric, that markets crash fairly frequently, and opportunities with a high reward and low uncertainty do arise then we can build a portfolio for this reality rather than a portfolio to fit a flawed theory.

Matthew Page, CFA
Co-manager, Guinness Global Equity Income Fund

March 2014

Important information and risk factors

Issued by Guinness Asset Management Limited, authorised and regulated by the Financial Conduct Authority.

This report is primarily designed to inform you about Guinness Global Equity Income Fund. It may provide information about the Fund's portfolio, including recent activity and performance. It contains facts relating to the energy market and our own interpretation. Any investment decision should take account of the subjectivity of the comments contained in the report.

This document is provided for information only and all the information contained in it is believed to be reliable but may be inaccurate or incomplete; any opinions stated are honestly held at the time of writing, but are not guaranteed. The contents of the document should not therefore be relied upon. It should not be taken as a recommendation to make an investment in the Fund or to buy or sell individual securities, nor does it constitute an offer for sale.

Risk
The Guinness Global Equity Income Fund is an equity fund. Investors should be willing and able to assume the risks of equity investing. The value of an investment and the income from it can fall as well as rise as a result of market and currency movement, and you may not get back the amount originally invested. Details on the risk factors are included in the Fund's documentation, available on our website. Shareholders should note that all or part of the fees and expenses will be charged to the capital of the Fund. This will have the effect of lowering the capital value of your investment.

Documentation
The documentation needed to make an investment, including the Prospectus, the Key Investor Information Document (KIID) and the Application Form, is available from the website www.guinnessfunds.com , or free of charge from:-

- the Manager: Capita Financial Managers (Ireland) Limited, 2 Grand Canal Square, Grand Canal Harbour, Dublin 2, Ireland; or,
- the Promoter and Investment Manager: Guinness Asset Management Ltd, 14 Queen Anne's Gate, London SW1H 9AA.

Residency
In countries where the Fund is not registered for sale or in any other circumstances where its distribution is not authorised or is unlawful, the Fund should not be distributed to resident Retail Clients.
NOTE: THIS INVESTMENT IS NOT FOR SALE TO U.S. PERSONS.

Structure & regulation
The Fund is a sub-fund of Guinness Asset Management Funds PLC (the "Company"), an open-ended umbrella-type investment company, incorporated in Ireland and authorised and supervised by the Central Bank of Ireland, which operates under EU legislation. The Fund has been approved by the Financial Conduct Authority for sale in the UK. If you are in any doubt about the suitability of investing in this Fund, please consult your investment or other professional adviser.

Switzerland
The prospectus and KIID for Switzerland, the articles of association, and the annual and semi-annual reports can be obtained free of charge from the representative in Switzerland, Carnegie Fund Services S.A., 11, rue du Général-Dufour, 1204 Geneva, Switzerland, Tel. +41 22 705 11 77, www.carnegie-fund-services.ch. The paying agent is Banque Cantonale de Genève, 17 Quai de l'Ile, 1204 Geneva, Switzerland.

Telephone calls may be recorded and monitored.