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Uncertainty, Modelling Monocultures and the Financial Crisis¹

Richard Bronk²

Intellectual failures and the crisis

There is no shortage of explanations of the economic and financial crisis that erupted in 2007. Indeed, at times there seem to be so many plausible explanations reinforcing one another that it is a wonder so few people saw the crisis coming. If ever there was an over-determined event, this appears to be it. The most popular culprit is the venality of some bankers; but, as John Cassidy points out, greed is a constant – “*what economists call a ‘primitive’ of the capitalist model*”.³ To explain the crisis, we need to focus on what new factors had come into play. Some blame clearly attaches to the incendiary combination of three factors: the perverse impact of short-term remuneration structures on incentives, revealed failures in risk management and light-touch regulation, and the excessive build-up of private credit and global economic imbalances encouraged by a long period of very low US interest rates. This paper argues, however, that we need to look deeper at two closely related intellectual factors that underlie these policy errors and help explain why the crisis happened when it did. These are, first, the failure by most economists, bankers and policy-makers to appreciate the central importance of radical uncertainty, its link to innovation, and the limits it places on the usefulness of risk models; and, secondly, a pervading tendency to underestimate how far an emerging monoculture of economics and risk models biased analysis and constructed a dangerous homogeneity of behaviour. Only by addressing these misunderstandings can we draw the right conclusions about how to improve business strategies and policy responses.

¹This paper is based partly on a lecture given at Gresham College in April 2010.

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³Cassidy, John, *How Markets Fail*, Allen Lane, 2009, p 11.

The world of finance and economic policy has become driven to an unusual degree by theory and models, and a number of commentators have pointed the finger at intellectual failures underlying the construction and use of the dominant models of economics and risk analysis in the run-up to the crisis. Cassidy, for example, draws attention to the extraordinary reach in financial, policy and some academic circles of a '*utopian economics*' that ignored the importance of market failures and fostered an illusion of stability and predictability.⁴ One manifestation of this was the Efficient Markets Hypothesis. This posits that market prices are reliable indicators of fundamental value – because market participants are forced by competitive pressures to make optimal use of available information, avoid systematic errors in their forecasting, and update their expectations rapidly in the face of new evidence. Any deviation of market valuations from underlying fundamentals should be essentially random and short-lived. This hypothesis had enormous implications: markets were self-adjusting and market prices were the best signals of emerging fundamentals and underlying value. Government and regulatory intervention might be needed to deal with information asymmetries and improve the transparency of information between market participants; but, beyond this, second-guessing the wisdom of markets was unlikely to be a good idea. Suffice it to say, this cheerful and optimistic creed – that the market knows best and efficiently prices available information and knowable risks – has taken a knock since 2007. Market expectations and pricing are revealed to have been close to delusional for a long time and driven by successive waves of exuberance and fear.

A related intellectual failure highlighted by Robert Skidelsky was the failure to learn John Maynard Keynes' central lesson about the importance of uncertainty – uncertainty, that is, that cannot be captured by probabilistic calculation.⁵ Frank Knight first articulated this crucial distinction between uncertainty and measurable risk in

⁴*Ibid*, pp 6-13 and *passim*.

⁵Skidelsky, Robert, **Keynes – The Return of the Master**, Allen Lane, 2009.

the 1920s;⁶ and for Keynes: “*The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be made. ... [Our] existing knowledge does not provide a sufficient basis for a calculated mathematical expectation*”.⁷ But, as Geoffrey Hodgson has shown, the Knight-Keynes concept of uncertainty almost disappeared from mainstream economics journal articles after the 1980s, as economists fell under the intellectual spell of the Rational Expectations Hypothesis and associated ‘model-based prediction’.⁸ Even more crucially for explaining the crisis, Knightian uncertainty was almost totally ignored by the burgeoning risk management industry.

From the mid-1990s onwards, financial markets, regulators and much of the rest of the corporate and public sectors fell under another spell – what Michael Power has called the “*grand narrative of risk management*”.⁹ A whole range of new Value at Risk (VaR) and other models promised to calculate the risk of future loss or default on the basis of extensive analysis of data on the past; while an associated institutional culture of control systems and risk officers sought to manage decisions taken in uncertainty in a rational and scientific manner. As Power argues, the result of this seemingly defensive narrative was a dangerous illusion of control. The related illusion was, to quote from Andrew Haldane, that we had entered a “*new era*” of “*simultaneously higher return and lower risk*”, resulting from “*a shift in the technological frontier of risk management*”.¹⁰ In fact, the narrative of risk management depended largely on a failure to appreciate the vital distinction made by Knight and Keynes between

⁶Knight, Frank H ***Risk, Uncertainty and Profit***, Houghton Mifflin, 1921.

⁷Keynes, John Maynard, ***The General Theory of Employment, Interest and Money***, Macmillan, 1936, pp. 149, 152.

⁸Hodgson, Geoffrey, ‘The Eclipse of the Uncertainty Concept in Mainstream Economics’, ***Journal of Economic Issues***, 2011, Volume 45(1), pp 159-175.

⁹Power, Michael, ***Organized Uncertainty – Designing a World of Risk Management***, Oxford University Press, 2007, p viii.

¹⁰Haldane, Andrew G., ‘Why Banks Failed the Stress Test’, Bank of England, February 2009, p 4.

measurable risk and true ‘unmeasurable’ uncertainty. Such uncertainty has for decades remained largely ignored and under-theorised.

Understanding uncertainty and its link to innovation

Knight used the word ‘risk’ to designate “*measurable uncertainty*”: here the possible outcomes are known; they can be classified in groups and assigned probabilities or projected distributions “*either through calculation a priori or from statistics of past experience.*” This is the realm of classic insurance markets – like fire insurance or life assurance – where the future can reasonably be assumed to be a shadow of the past. ‘Uncertainty’, by contrast, was the name Knight gave to cases where no probability can be computed because, for example, the case is unique; and, for Knight, such uncertainty was central to entrepreneurial activity and to a proper understanding of how economies and markets function.¹¹ Keynes agreed, noting that uncertainty is magnified by market speculation, “*animal spirits*” and “*waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for a reasonable calculation*”.¹²

To get a feel for how negotiable this boundary between Knightian risk and uncertainty might be – for how far the risk management industry and regulators have been justified in recent decades in implicitly or explicitly assuming they could successfully ignore uncertainty or turn it into measurable risk – it is essential to analyse more carefully the different kinds and sources of uncertainty in markets. And to do this it is helpful to expand on two distinctions made by Skidelsky.

The first distinction is between “*asymmetric information*” and “*symmetric ignorance*”.¹³ Information asymmetries, where one

¹¹Knight, Frank, *Risk, Uncertainty and Profit*, *op cit*, pp 233, 232, 199.

¹²Keynes, John Maynard, *The General Theory*, *op cit*, pp 161-3, 154.

¹³Skidelsky, Robert, *Keynes – The Return of the Master*, *op cit*, p 45.

party to a market transaction has an information advantage over another, can lead to opportunistic, even fraudulent, behaviour, to the mispricing of deals, or to thin markets characterised by such distrust between parties that trades dry up. The Efficient Market Hypothesis itself may have ignored such asymmetries, but they have nevertheless been extensively analysed in much of modern economic and regulatory theory. The solution to such problems is at least theoretically straightforward: more transparency and disclosure of information should help ensure that markets work more efficiently and that risks are priced correctly. The second sort of information problem is both more ignored and harder to solve, namely that of ‘symmetric’ ignorance – genuine uncertainty faced by all parties. One key question then is how many of the information problems in this crisis were asymmetric and how many were symmetrical cases of real uncertainty. This is, of course, partly an empirical question that is difficult to answer. But a theoretical analysis of the causes of symmetrical uncertainty can give us some clue.

Skidelsky’s second distinction is between “*epistemological*” uncertainty, where relevant probabilities are unknown, and “*ontological*” uncertainty, where they are logically unknowable.¹⁴ Epistemological uncertainty includes the inherent difficulty of grasping all the multifaceted aspects of what is going on and the sheer volume of information to be processed. It also relates to difficulties in understanding the non-linear dynamics of complex systems and the self-reinforcing emotional dynamics of market confidence and panic that make prediction fraught. Some progress has been made, and is possible, in shifting the boundary between such epistemological uncertainty and measurable risk, though non-linear and behavioural dynamics are not amenable to simple frequency distributions and precise definition of the likely spread of future returns. Ontological uncertainty, by contrast, implies the impossibility of knowing even the categories and possible nature of what has yet to be created or yet to evolve. As David Lane and Robert Maxfield note, this sort of uncertainty is

¹⁴ *Ibid*, p 88.

implied by radical innovation that revolutionises the parameters of markets and the range and nature of possible outcomes;¹⁵ and some non-linear dynamic systems may in time also allow for the emergence of genuine novelty. This kind of uncertainty can never be turned *ex ante* into measurable risk. The future opportunities and dangers we face are simply unknowable at the outset, and we must learn and adapt as we go along.

It was George Shackle who first emphasised the creative genesis of much of the uncertainty we face. He wrote of our “*own original, ungoverned novelties of imagination... injecting, in some respect ex nihilo, the unforeknowable arrangement of elements*”.¹⁶ The future is unknowable because it is still to be created by the original choices we (and others) will make and new possibilities we (and others) will imagine. In other words, there is an inevitable *ex ante* ontological uncertainty about the direct outcome of any innovation or novel choice we make, and this uncertainty is compounded by uncertainty about the second-order creative reactions of others. Shackle’s message is corrosive of the standard notion that forward-looking market valuations can be stable and efficiently priced – that there is a static reality ‘out there’ on which rational expectations will converge in response to competitive pressures. As Shackle put it, “*Valuation is expectation and expectation is imagination*”.¹⁷

In practice, of course, the future is not a complete ‘void’ as Shackle seemed to suppose. It is in part rationally predictable – and some of the risks can be forecast – given observed and socially constructed regularities in behaviour. But the important point remains that Shackle was much more right than most modern economists and risk modellers would acknowledge, at

¹⁵Lane, David and Maxfield Robert, ‘Ontological uncertainty and innovation’, *Journal of Evolutionary Economics*, 2004, Volume 15(1), pp 3-50.

¹⁶Shackle, G.L.S., *Imagination and the Nature of Choice*, Edinburgh University Press, 1979, p 52f.

¹⁷Shackle, G.L.S., *Epistemics and Economics*, Transaction Publishers, 1992, p 8. For further discussion, see Bronk, Richard, *The Romantic Economist – Imagination in Economics*, Cambridge University Press, 2009, chapter 8.

least in situations where novelty and innovation abound. They tend to ignore the fact that innovation and novelty create uncertainty and break predictable links between the past and the future. By disturbing previously stable regularities and changing key economic parameters, innovation undercuts the rationale for making probability forecasts on the basis of historical frequencies.

Uncertainty and the recent crisis

So how relevant are epistemological and ontological uncertainty to our understanding of the recent crisis? It is clear that in the last two decades epistemic uncertainty has increased, with devastating consequences for the assumption that market prices accurately reflect fundamentals. Financial markets and products have become much more complex; and the volume of relevant information has swamped the mental capacity of market participants to comprehend it, arguably outstripping even the growth in computer processing power. For example, Haldane has calculated that an investor in a typical CDO would need to read more than a billion pages of relevant prospectus information to understand its ingredients fully.¹⁸ In such circumstances, the comforting notion of market transparency becomes almost meaningless, while the standard idea that (at worst) one party to an exchange may be at an information disadvantage to another seems far less pertinent than the danger of symmetrical ignorance among all players. Moreover, it has proved fiendishly difficult for banks to calculate future risks when operating in a financial system of increasingly complex network interlinkages. When this complexity reached thresholds of computational intractability,¹⁹ and multiplied exponentially the number of pathways for emotional contagion, epistemological uncertainty began to threaten the

¹⁸Haldane, Andrew G 'Rethinking the Financial Network', Bank of England, April 2009, p17.

¹⁹See discussion in Mirowski, Philip, 'Inherent Vice: Minsky, Markomata, and the tendency of markets to undermine themselves', *Journal of Institutional Economics*, 2010, Volume 6(4), pp 415-443.

possibility of modelling market dynamics if anything went wrong, further contributing to instability.

As for the relevance of ontological uncertainty, we need look no further than the entirely novel dynamics in both primary and secondary markets since the mid-1990s caused by the continual invention of new subprime mortgage products and new derivative instruments for securitising these mortgages and bundling them up in ever more exotic ways. It is hard to see how historical data on the likelihood of mortgage default in the US housing market or on correlations between such defaults across regions (or indeed on volatility and correlations in associated secondary securitisation markets) could have been relevant after the scale of such innovation. The innovations ensured that it was simply impossible for the future to resemble the earlier financial environment captured by the historical data. And yet such historical data formed the bedrock of risk models assessing risks in the CDO and related markets.²⁰

In short, the risk models on which so much of the edifice of modern finance depended in the run-up to this crisis underestimated the epistemological uncertainty in modern markets and ignored the ontological uncertainty caused by rapid innovation. The complex non-linearities of financial networks and the multi-valence of social reality were rarely assessed and could not easily be codified in the dominant VaR models; while the ontological problem of innovation was assumed away in mostly Gaussian risk models that assumed that you could read the standard deviation ranges of future outcomes from the distribution of past returns. In one revealing sense, though, the problem of innovation was not totally ignored. It was often argued that it was preferable to base risk and capital requirement calculations on high frequency data from the recent past, because too much had changed for data from the more distant past to be relevant. But this argument was as inconsistent as it was dangerous. If only the recent past was considered relevant to the conditions of the day

²⁰See discussion in Peston, Robert, *Who Runs Britain?* Hodder, 2008, pp 163-8; and Tett, Gillian, *Fool's Gold*, Abacus, 2010, pp 75-80 & 112-115.

because of the parameter-altering nature of innovation, it should have been obvious that the recent past might not be relevant to the near future either. At the same time, the practice of collecting data only from the period now dubbed 'The Great Moderation' excluded readings from the market upheavals of the 1930s and 1970s that might at least have given a better idea of the scale of instability that can suddenly engulf dynamic and innovative markets operating in uncertainty.²¹

How to address uncertainty in financial markets

So how could policymakers and regulators go about controlling uncertainty in financial markets, if risk models extrapolating from the past cannot deliver? A radical solution would be to limit the amount of product innovation (as well the scope for complex network interlinkages) in the financial sector. This would help ensure that the future is predictable enough to rely more safely on VaR and other risk models based on past data. Such a move might be deemed appropriate if the banking sector is seen merely as a utility sector supporting other entrepreneurial sectors in the economy where innovation is more socially useful and the impact of any consequent uncertainty is generally lower. The moral dilemma is that you have to choose between innovation and predictability, and if you want the financial sector to be more predictable (and the risks within it more easily forecastable) then you need to limit innovation in that sector. This would, of course, hurt profits (as well as limiting losses and uncertainty). But then, as Knight argued, a competitive system will only allow profits to be made if there is genuine uncertainty: "*Profit arises out of the inherent, absolute unpredictability of things, out of the sheer brute fact that the results of human activity cannot be anticipated*".²² In a competitive market, predictable profits are

²¹See Turner, Adair, 'The financial crisis and the future of financial regulation', Financial Services Authority, January 2009, for discussion of the pro-cyclicality of basing capital requirements on VaR models using data only from the recent past.

²²Knight, Frank, *Risk, Uncertainty and Profit*, *op cit*, p 311.

quickly competed away (at least in the absence of monopoly rents or asymmetries of information). Regulators should perhaps have seen high profits in the banking sector as a sign of building uncertainty. The masters of the universe were making huge returns partly by playing with the radical uncertainty bred of innovation.

Taking the uncertainty caused by innovation seriously has implications for government action as well. Indeed, governments and regulators may be less nimble in sniffing out changes of trend than other market participants. Moreover, while government action (fiscal, monetary or regulatory) clearly has a crucial role in constructing certainty in markets, innovations in government policy and regulation are themselves sources of Knightian uncertainty. When a novel economic or regulatory regime is introduced, there are often unintended consequences, either because of the complexity of its interrelationship with existing policies and regulations, or because of the spate of innovations it inspires in firms looking to exploit new opportunities and loopholes. When the Federal Reserve experimented with exceptionally low interest rates to stave off the possibility of deflation after the collapse of the dotcom bubble, it presumably did not foresee the ramifications of its actions in stoking up a headlong search for new (riskier) high-yield products in the context of a newly deregulated market. And today, even on the implausible assumption that US and UK central banks have a robust model forecasting the likely direct effects of their innovative strategy of quantitative easing, it is inconceivable that their decision-function internalises all the indirect effects – such as the innovation of new retail savings products designed to beat inflation in a low interest rate era. The impact of such second-order innovative reactions to novel government policy is highly uncertain *ex ante*, not least because the exact form of the innovations cannot be known ahead of their invention.

Models: the distortion of focus

In order to understand why the failure of risk models to take account of Knightian uncertainty proved so catastrophic, it is

necessary to examine why using these risk models appears to have limited the capacity of bankers, regulators and rating agencies to spot what was going wrong before it was too late. So, too, while Dynamic Stochastic General Equilibrium models have been heavily criticised after the event for ignoring the role of the financial sector,²³ this does not in itself explain why the central banks using them were blind to the negative impact of their loose monetary policy on the dangerous build-up of credit. In other words, why did the use of misleading or incomplete models lead to myopia? And why did shortcomings in the models not become obvious much sooner?

To answer this question, it is helpful to remember the teaching of Romantic post-Kantian philosophers about the role played by metaphors (and by extension, models) in structuring our beliefs, actions and therefore social reality itself. The Romantics were clear that there is no single definitive and objective way of looking at the world; instead, the *world-as-it-appears-to-us* is partly the creation of our own minds. Our minds do not passively record and reflect facts 'out there'; nor do our beliefs merely imitate reality. Rather, in order to make sense of the chaos about us, we must supply an intellectual framework, a metaphorical colouring, a principle of selection. As Coleridge said, when arguing with a young scientist who thought he could analyse facts without first having a theory: "*You must have a lantern in your hand to give light, otherwise all the materials in the world are useless, for you cannot find them, and if you could, you could not arrange them*".²⁴ We cannot do without models and metaphors to help understand the world, any more than we can do without a lantern to see in the dark. But the problem with lanterns – and with theories and metaphors for that matter – is that the light they cast, the focus they bring, is inevitably limited. This means that if we use only one lantern – one theoretical framework – we are apt to

²³See, for example, Hendry, David and Mizon, Grayham, 'What needs rethinking in macroeconomics', *Global Policy*, 2011, Volume 2(2), p 179.

²⁴Coleridge, Samuel Taylor, 'Table Talk', 21 September 1830, reprinted in *Samuel Taylor Coleridge*, ed. H J Jackson, Oxford University Press, 1985, p 596.

stumble over aspects of reality outside the area illuminated by our theory.²⁵ To put it another way, the lens of metaphor or model can bias and distort our vision as well as focus it, and there is never only one right way of looking at an issue. Theoretical or modelling dogmatism makes us resemble a horse wearing blinkers, good at focusing straight ahead on one thing, but liable to miss what is coming at us from left field.

Monocultures and the financial crisis

Joseph Stiglitz has recently spelled out the relevance of this to the crisis. Noting that “*we often discount information that is contrary to our cognitive frame*”, he argues that economists’ standard models made them “*prone to equilibrium fictions*” and consequently blind to the bubbles that were building.²⁶ More broadly, it can be argued that the myopia induced by monovision – relying on one set of standard models – has been a major contributory factor in the crisis. Prior to 2007, many of the key players in both public and private sectors were so convinced that the Efficient Markets Hypothesis and neo-classical economic models were sufficient, and had so internalised this one perspective, that they were simply not predisposed to see problems that were emerging because their theoretical and conceptual framework had no place for them.²⁷ Similarly, bankers were so reliant on Gaussian distribution-derived VaR models that most of them genuinely believed that what has since happened was unlikely to occur even once in the lifespan of the universe. It is not surprising that banks were not ready for the financial tsunami that hit them if they were relying on risk models that told them that the daily market moves that subsequently materialised in August 2007 were as much as 25-standard deviation events.²⁸ Worse

²⁵For a fuller discussion of this point, see Bronk, Richard, ‘Models and Metaphors’, in *The Economic Crisis and the State of Economics*, ed R Skidelsky and C WesterlindWigstrom, Palgrave Macmillan, 2010, pp 101-110.

²⁶Stiglitz, Joseph E., ‘Rethinking Macroeconomics’, *Global Policy*, 2011, Volume 2(2), p 168.

²⁷See discussion in Bronk, Richard, ‘Models and Metaphors’, op cit p 105.

²⁸Haldane, Andrew G, ‘Why Banks Failed the Stress Test’, op cit p 2.

still, as Michael Power has pointed out, VaR models and related metrics of risk-adjusted return on capital became more than a 'best practice' frame for the views of management about the risks they were running; they also became part of an "*increasing conceptual convergence between regulatory management of economic capital and internal business models.*"²⁹ This elision between the previously distinct perspectives and cognitive frames of regulator and regulated under the Basel-II regime was to prove disastrous. As it turned out, partially blind bankers and traders were being regulated by those with exactly the same type of myopia.

Analytical monocultures of this sort not only led to blindness to the unexpected. They also helped construct a dangerous homogeneity of behaviour and high correlations in markets that became truly terrifying. One of the many factors left out of risk models in the run-up to this crisis was the destabilising rise in correlations caused by the rapid internalisation of the same return-on-equity strategies, the same accounting conventions and the same risk models across so many markets, all in the name of best practice and regulatory harmonisation. With everyone pursuing similar business and trading strategies, with similar trigger points for reducing exposures, the scene was set for a sudden reversal when something unexpected occurred. The implication is that economists, risk officers and regulators need to be aware of the extent to which dominant narratives, theories and norms construct behavioural regularities. They need to become sociologists and anthropologists as much as economists and quantitative modellers, since they have no choice but to interpret a pre-interpreted world. As Keynes pointed out, the key to successful investing, especially in the short-run, is to anticipate shifts in the interpretations and conventional frames of other market investors.³⁰

²⁹Power, Michael, **Organized Uncertainty**, op cit, p 74.

³⁰Keynes, John Maynard, **The General Theory**, op. cit, pp 154-157. See Frydman, Roman & Goldberg, Michael, **Beyond Mechanical Markets**,

How to overcome modelling monocultures

If the analysis above is correct then it becomes essential that economists, entrepreneurs and policy-makers learn how to avoid becoming locked into one cognitive frame. At the analytical level, this involves experimenting with new models, metaphors and perspectives as a method of switching cognitive spectacles. Such experimentation can enable improved diagnosis of features of multi-faceted markets that existing models fail to capture, and it can also help spot the emergence of novel patterns and trends. A good example of this in action is the growing use of modelling analogies from the field of epidemiology to analyse and manage the dynamics of default risk and market panic. Such models may be used to isolate and simulate the threshold effects and self-reinforcing dynamics in markets that can render them so unpredictable – dynamics rarely reflected in the historical correlations used in standard risk models and largely ignored in standard economic models. As Haldane notes, these epidemiology modelling analogies may also suggest new approaches to regulation – such as focusing on the risk to the system posed by the most interconnected institutions, which in times of financial contagion act like “*super-spreaders*” of disease.³¹

Modelling pluralism and experimentation with new metaphors and perspectives are surprisingly unpopular within academia and in the broader business and policy community, perhaps for different reasons. In the academic world there remains a fear that modelling eclecticism is less rigorous and productive than trying to improve standard models with bolt-on amendments. But eclecticism can be disciplined – with the choice of theory driven by the nature of the problem studied, and careful attention given to the boundaries of applicability of different models. Indeed, establishing clear boundaries of applicability can only enhance the effectiveness of both standard and less orthodox models. For

Princeton University Press, 2011, chapter 9, for discussion of ‘contingent regularities’ in these revisions of forecasting strategies.

³¹Haldane, Andrew G, ‘Rethinking the Financial Network’, *op cit*, pp 2f, 24-28.

example, however useful they are in other areas, it stands to reason that standard equilibrium models in economics – with their assumptions of rationally optimising individuals – and standard Gaussian risk models are much less successful when modelling innovative markets, network interdependence and Knightian uncertainty; in these conditions, there is simply no basis for fully rational expectations and no possibility of optimisation.³² In the broader community, many chief executives and senior civil servants reject modelling pluralism because they have got out of the mindset of needing to exercise judgement about which model to use when or which message to focus on if the application of different models suggests the advisability of different courses of action. It is often more comforting to fall back on the latest shared definition of ‘best practice’. But this is to forget that, in a world of Knightian uncertainty, it is impossible to know *ex ante* what best practice will be.

The monoculture discourse of universal ‘best practice’ is not the only shibboleth threatened by giving due weight to Knightian uncertainty. So, too, are the widespread normative discourses of ‘creating a level playing field’ and ‘global solutions to global problems’. For example, as Haldane argues, the attempt under the Basel II regime to ensure a level playing field for competition between financial centres ‘*resulted in everyone playing the same game at the same time, often with the same ball*’. The financial and regulatory world increasingly became a monoculture that (just like monocultures in agriculture) was highly susceptible to unforeseen diseases.³³ The result was only ruination and despair. Dani Rodrik suggests broader reasons to be wary of prioritising such global solutions to shared problems: quite apart from the danger of convergence on the wrong set of structures, there is plenty of evidence that solutions embedded in national governance structures are more effective and democratically

³²For a fuller discussion of disciplined eclecticism, see Bronk, Richard, *The Romantic Economist*, *op cit*, chapter 10.

³³Haldane, Andrew G, ‘Rethinking the Financial Network’, *op cit*, p 19.

accountable.³⁴ But, as this paper argues, the strongest reasons to avoid regulatory monocultures at the global level are epistemic: in a world of Knightian uncertainty, heterogeneity of approach allows more experiments in regulation and governance, and a higher chance that some experiments will be successful and any failures will prove less than catastrophic.

³⁴Rodrik, Dani, *The Globalization Paradox*, Oxford University Press, 2011; and 'Economic focus' column in *The Economist*, 12 March 2009.