



No. 37
**Evolution Through
Resilient Networks?
The Practice and
Politics of Financial
Systems**

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Please cite this working paper as:

Brassett, James and Holmes, Chris, 'Evolution through Resilient Networks? The Practice and Politics of Financial Systems' *GR:EEEN Working Paper, No.37*

www.greenfp7.eu/papers/workingpapers

This research acknowledges the support of the FP7 large-scale integrated research project **GR:EEEN - Global Re-ordering: Evolution through European Networks** European Commission Project Number: 266809

Abstract: Regulatory responses to the financial crisis have positioned themselves apart from the prevailing image of errant bankers, irresponsible borrowing/lending, and ‘moral panic’. Instead, a range of innovative policy agendas have sought to foster a new ethos of *resilience*: financial networks are rephrased as (one among several) complex, inter-dependent systems that must adapt to a range of global uncertainties. Once recognised, regulators (and network agents alike) can begin to model the likelihood of system wide ‘events’, such as sovereign defaults, capital flight/crunch, even terrorist attacks, in a manner that (supposedly) enhances both their predictability and the efficacy of contingency planning. In broad terms, the goal of such regulation is to foster evolution through resilient networks, embracing the reality of risk, while building adaptable relationships throughout the system. In this working paper, we map one instantiation of financial resilience embodied in the Bank of England’s recent turn to complexity modelling and its correlative, somewhat metaphorical, ethos of ‘clear thinking’ in ‘complex times’. In our view, there is much scope for innovation within such moves; in particular, we highlight the potential return of ‘local agency’ in the discourse of financial resilience – through ideas about local banking, reciprocity, and inclusion. However, by engaging the more critical literature on resilience, we argue that important dilemmas are likely to remain for policy makers who try to marry complexity with clarity in a financial system that remains politically contested *and contestable*. We conclude by outlining a pragmatic agenda for further experimentation.

Keywords: resilience; networks; financial regulation; emancipation.

Resilience is fast becoming a policy mantra across governance domains. Conceptually, resilience spans several traditions of thought, from engineering, to psychology, through to work on adaptive ecologies and complexity theory. ‘Resilience agendas’ have been deployed to manage ‘threats’ as diverse as flood risk, terrorist attacks, and the Olympics. This working paper extends to look at the recent mobilisation of resilience to address questions of financial governance in the wake of on-going global crises. As Jeremy Walker and Melinda Cooper (2012: 144) note “[a]bstract and malleable enough to encompass the worlds of high finance, defence and urban infrastructure within a single analytic, the concept of resilience is becoming a pervasive idiom of global governance.” Resilience is thus a discourse of governance that seeks to shape the practice and content of networks in a manner analogous to earlier tropes of ‘globalisation’ (Brassett, Croft and Vaughan-Williams, 2013).

Interest in the rise of resilience has spanned academic specialism. While certain disciplines – such as engineering, ecology or development – engage with resilience agendas in terms of ‘try to make things more resilient’, authors within political science have been more circumspect, asking questions about the social effects of this increasingly pervasive discourse. For more critical authors resilience is perhaps better understood as a new rationality of neo-liberal governance, with its core themes of uncertainty and individualism (See inter alia Lentzos and Rose, 2009; O’Malley, 2010; Walker and Cooper, 2012). On this view, resilience is part of a more generalised trend that seeks to *responsibilise* individuals, while legitimating existing relations of power through tropes of freedom, transparency and accountability (Dean, 2012; Zebrowski, 2009). Indeed, Cooper and Walker underline: resilience is “a governmental philosophy of nature and society so all-encompassing and resilient to critique that the effects of political interventions (and non-interventions) made in its name, even when catastrophic, seem as inescapable as the weather.” (2011: 145).

In what follows, we seek to open up and engage with this question of politics and the political relation to resilience. Broadly speaking, while we share the concerns of more critical scholarship on resilience, we argue that the apparent ‘victory’ for neo-liberalism is not as straightforward *or as stable* as might appear. Rather, we encourage reflection upon the contingency and instability of various ‘practices’ made in the name of resilience, in order that new sites of intervention might be thought.

Addressing *financial resilience*, more specifically, we would agree that there is *manifestly* the potential for the agenda to be captured, or colonised, by particular social units – classes, governing bodies, perhaps even individuals – or governmental logics such as neoliberalism. This seems particularly apparent, for instance, in the continuing focus on ‘systematically important banks’ within the ‘crisis management’ agendas of bodies like the G-20 and the Financial Stability Board (FSB).¹ However, we think there is also a potential space for thinking more critical modes of resilience beyond straightforward binaries of risk/resilience, empowerment/vulnerability, adaptable/static, etc. Indeed, we think an emphasis on ‘systems’ - instead of values or subjects – may allow for resilience to be articulated in novel ways that promote individual or community autonomy, for instance. While such ideas might appear ‘quaint’ or ‘naive’ to the well-seasoned critic of ideology, our sense is that such paradoxes or ‘misfires’ in the performance of resilient finance might elicit important

¹ http://www.financialstabilityboard.org/publications/r_111104bb.pdf

alternatives to the dominant forms of financial knowledge, i.e. risk, liquidity and speed (See Butler 2010).

On our view, perhaps the most troublesome aspect of resilience is not the notion itself, but the particular way(s) in which it has been pitched? In the arena of (post-)crisis financial regulation, resilience has typically been presented as a paradigmatic 'policy solution' by financial and regulatory elites. In this sense, it is unsurprising that particular structures of financial governance are emphasised at the expense of others. However, we can also observe examples of resilience which operate upon the same sphere of life – in this case the financial – but which emerge from entirely different quarters, e.g. resistance movements, or local banking agendas. These 'bottom up' instances of finance are interesting insofar as they respond to the same problems of 'large finance', while shying away from the dominant narratives of crisis management. Such examples of 'small finance' are also precisely locations where a politics of resilience is embraced. By politics, we mean the contested and contestable nature of discourse is fore-grounded, the possibility of 'not knowing' is embraced (Zizek, 2012), and reciprocity, anti-finance or romance are contemplated.

Our argument is developed over several sections that interrogate emerging discourses of financial resilience in the UK. After first noting the consolidation of financial resilience in the post-credit crunch period, especially in relation to the context of the 'disaster management' rhetoric that abounded, the broad policy implications are introduced. Financial resilience has been invoked to underline a paradigmatic shift to understand financial *systems* as adaptive and non-linear: in short, it is not a case of 'too much market', or finding the 'right balance' between states and markets, but rather, one of internalising and/or transcending the state-market binary in pursuit a better model of the *financial system*, per se. This shift is both practical and – on Andrew Haldane's argument - potentially emancipatory, especially when set against the long tradition of elitism and exclusion in UK finance. We further embellish this move with a discussion of the complexity science that underpins UK finance's new relationship to uncertainty. However, a number of questions of de-politicisation, accountability and autonomy can be asked and we develop this line of questioning with reference to the more critical literature on resilience.

Despite the apparent claim to nature, or common sense, new gaps between the idea(l) of resilient markets and everyday political economy are established by

discourses of financial resilience, meaning that new spaces of resistance become think-able. We therefore conclude with a conceptual and political discussion of certain avenues for *democratising* financial resilience. On a conceptual level, we try to unpick the re-phrasing of state-market binaries in financial resilience. In Polanyian, it can be argued that resilience ‘embeds’ financialised markets via the metaphor of ‘systems’; but this effort both fails – as the state market binary is always-already fictional; a constitutive binary – and is exceeded by its own logic, i.e. that we can all ‘adapt’ as we like, and therefore, *logically*, the capacity to model any such system is thrown in question. On a strategic level, we seek to highlight and positively describe some of these adaptations with a view to proffering a more experimentalist attitude.

1. Crisis (and the emergence of) management (speak)

Britain is a poster child for financial crisis management. The UK has excelled in crisis management over the five years of the global downturn, but more dramatic intervention will be needed from central banks according to analysts. (*The Telegraph*, Headline, 15-02-13)

In the wake of the sub-prime crisis and global credit crunch much of the noise in ‘crisis response’ was made by sovereign leaders. Gordon Brown (2008) called for a global “early warning system”, and a new Bretton Woods with an IMF that offers “by its surveillance of every economy, an early warning system and a crisis prevention mechanism for the whole world.” However, such international grandstanding could not distract from the fact that the primary mechanism of response was a traditional cash injection. That is to say, the concrete response to the crisis was for states to bail out the banks.

As such much of the critical discussion around the financial crisis, even as it has travelled and morphed into (next) a sovereign debt crisis and (next again) a second banking crisis, has been located on the traditional questions of IPE: states and markets. *Should banks be bailed out using public funds? What is the distribution of responsibilities and duties between the public and private sector? Should markets work for the public good?* As Paul Langley, among others, has noted, there are numerous issues with this rendering of finance. In a paper on the Trouble Assets Relief Programme (TARP) he argues:

Whether voiced by academics across a range of disciplines or by media commentators or politicians of various hues, debates about the TARP and public interventions in the crisis more broadly are usually figured through the binary of state and market, where the former is seen as exercising sovereign and centralised agency in coming to the rescue of the latter. The diverse forms taken by public interventions in the crisis, their contingencies, uncertainties and

distinct implications, thus tend not to be deemed to be particularly significant. All that would seem to matter is that, in the terms of *The Guardian* newspaper's Economics Editor Larry Elliott (2009), 'It's only "big government" that got us out of the crisis'. (Langley, 2010: 3)

For a number of people working in IPE this states vs markets rendering of global finance is problematic and from a number of perspectives. Historically, it ignores the deep imbrications between the sovereign capacity to raise credit and raising armies. Socially, it overlooks (some might say silences) the class associations between individuals working in states and markets. Politically, the range of policy options is markedly reduced to spending more or spending marginally less more on governing the economy.

In conceptual terms Langley argues that such a binary limitation should be addressed by retaining sensitivity to how discourses of finance and financial governance are both contingent and reliant upon a more widely distributed form of agency. While we would very much agree that this is an important route of enquiry, our concern here is less with the analytical weakness of the state-market dichotomy than with the performative effects of its various invocations. On a slightly different tack then, we question how evolving forms (that work under the heading) of 'governmental intervention' sought to manage the crisis via particular iterations of the state-market binary. For example, in a speech entitled 'The Crisis Management Menu', Paul Tucker (2010: 15) concluded by asking whether,

...our community can find ways of distributing the costs of official sector support operations back to the system and its uninsured creditors rather than to the general taxpayer. If we can achieve that, market discipline would be enhanced. We need to hang on to 'market discipline' as a watchword in these debates. The goal of re-regulation – of redrawing the rules of the game for the financial system – should not be to reintroduce the wisdom of the state into micro decisions about how to run businesses. But rather to put market discipline at the heart of a market economy.²

For us, the crucial point in this passage is not whether or not the Bank is analytically wrong, but rather, to ask what are the effects of using such an analysis in terms legitimating particular forms of thought/action. A state-market opposition is invoked to regulate action (and inaction) in ways that seem politically salient. We are therefore concerned to think through how the international grandstanding of (crisis) management speak has translated into new rationalities of financial governance. In particular, we suggest that a particular narrative of crisis and response was overlaid upon the state-market dilemma to suggest that the dichotomy can be folded into a question about the resilience of the financial system. Perhaps over-simplifying, then, where Langley sees distributed agency, resilience theorists have seen systems.

² <http://www.bankofengland.co.uk/publications/Documents/speeches/2009/speech410.pdf>

2. Resilience

Resilience has multiple genealogies. Discourses of resilience can be read into the policy discourses of the IMF and the World Bank of the early 90s (Cooper and Walker, Op Cit.). Equally, a focus on domestic capacities and threats in the 'War on Terror', meant resilience became embodied in the institutions of Homeland Security and, in the UK Civil Contingencies Act. Indeed, it is in the area of security that resilience seems most elaborated in a UK context. For example, the UK Civil Contingencies agenda has marked a move away from exclusively state-centered conceptions of security governance, to a more complex and integrated system, including both public *and* private organizations working at multiple levels. It aims to generate a more risk-sensitive, prepared and adaptable system of resilience that can understand, react to, and proactively plan for extreme events (Brassett, Croft and Vaughan Williams, 2013).³

While neat definitions of resilience are elusive, they all seek to incorporate a notion of risk management that is complex, adaptable and focused on/facilitative of ongoing relationships between multiple actors from across sectors. Much of the policy oriented literature on resilience has proceeded in quasi-scientific terms by thinking about resilience as a *natural* trait of individuals or communities. This trait, it is suggested, is normally inherent at some level, but it can also be 'learned' and (importantly) improved (Comfort et al 2010; de Bruijne et al, 2010). This understanding has proved influential as a reflexive orientation to policy making in an 'uncertain world'.

An important precursor to this understanding of resilience-as-adaptation comes from early work on 'ecologies' and the emergence of general systems theories in the 1960s (Laszlo and Krippner, 1998). Broadly speaking the concept of ecology refers to a system of alliances between entities in a radically interconnected milieu of interaction. In its initial phase, the aim was to think in evolutionary terms about how ecological systems adapt and change.⁴ On this view, resilience is produced as one possible response to a disturbance or extreme event such as flooding, fires, as well as human activities such as deforestation. C S Holling introduced a key distinction between engineering resilience, which refers to the time it takes for a system to return to its previous state after an external disturbance on the one hand, and ecological

³ This section draws liberally on Brassett, Croft and Vaughan Williams, 2013

⁴ As C. S. Holling argued, "...individuals die, populations disappear, and species become extinct. That is one view of the world. But another view of the world concentrates not so much on presence or absence as upon the numbers of organisms and the degree of constancy of their numbers." (Holling, 1973: 1).

resilience relating to a more open and complex ability of a system to sustain productivity under pressure, while not necessarily 'returning' to any primordial state on the other.

Holling argued that resilience should be associated with qualities within a system rather than any end point or goal and thus 'if we are dealing with a system profoundly affected by changes external to it, and continually confronted by the unexpected, the constancy of its behavior becomes less important than the persistence of the relationships' (Holling, 1973: 1). By turning to a focus on relationships, Holling's view of ecological resilience becomes extendable to social systems as well. Indeed, as Jeremy Walker and Melinda Cooper argue 'under the sign of resilience, this is an approach to risk management which foregrounds the limits to predictive knowledge and insists on the prevalence of the unexpected', seeking to 'absorb and accommodate future events in whatever unexpected form they may take' (Walker and Cooper, 2011: 6). Common across these approaches then is the notion of society *as a set of relationships*. The system is not founded upon any subject – be it the individual or a particular set of values - but on the *characteristics* of the system as a whole.

Financial resilience

Given the focus on uncertainty, crisis and adaptability, it is perhaps unsurprising that such a concept might be deemed appropriate for thinking about the complex and uncertain worlds of finance and financial governance. However, for all that resilience can appear as a straightforward – almost common sense - objective of financial agents, we should not ignore the feat of discursive work that has been required to legitimate this transition in thinking.

It is not simply that finance has been 'securitised', or that systems theory has been 'imported' to the Bank of England. Rather, specific people have succeeded in pushing their reasoning in an environment of crisis management that is conducive to both. So, for instance, Andrew Haldane at the Bank of England has been an important voice. In a number of speeches and articles Haldane has made the case for resilience in strident terms, pitching it as both intellectually and politically attractive.

Haldane often draws analogies and inferences between seemingly unrelated phenomena. This has the effect of folding finance within a systems logic that spans more widely than states and markets. In a highly cited speech, he draws a line between finance and nearly all forms of crisis management by addressing the SARS crisis:

Both events [the failure of Lehman Brothers and the unfolding of the SARS epidemic] were manifestations of the behavior under stress of a complex, adaptive network. Complex because these networks were a cat's-cradle of interconnections, financial and non-financial. Adaptive because behavior in these networks was driven by interactions between optimizing, but confused, agents. Seizures in the electricity grid, degradation of ecosystems, the spread of epidemics and the disintegration of the financial system each is essentially a different branch of the same network family tree. (Haldane 2009, p. 3)

Encapsulated in this bundle of images is a sense of financial resilience as a complex adaptive system, itself an element within a wider set of systems. Finance is held to be both interconnected with other systems and, itself, roughly congruous with them. A number of interesting ideas about financial resilience are entailed within this sweep.

Firstly, it is interesting to note how Haldane's point of reference for thinking about resilient systems is to emphasise their behaviour 'after the event', whatever event. This (existential) foregrounding of the event in the imagination of finance holds implications for how we might conceivably think about time, space and political community (Brassett and Clarke, 2012). It is at once a securitising move, enlisting us (all) to a range of scenarios and planning that somewhat modifies traditional lines of intervention, and a mechanism for transcending the state-market binary. The *deus ex machina* of 'the future event' is what binds the system/community.

Secondly, accepting the logic of extreme events, the focus of resilience is upon optimising the possibilities for agents in conditions of uncertainty; it is their adaptive behaviour over time that is considered to be the crucial element. Resilience is therefore a particular quality, revealed through behaviours over time. Such a gesture is important and also somewhat curious: if agents are optimising but unknowing, then responsibility for actions is reduced at the same time as we seek to facilitate their future adaptability.

And thirdly, somewhat transcending the state-market binary, Haldane's imaginary is of a system of systems, where all are interconnected and dependent. It is not that the state is faced with the question of intervening or not intervening, as the system is *de facto* established. Thus, in somewhat progressive terms, there is space within financial resilience to think creatively, imaginatively almost, about how finance functions and might function differently.

All this has led financial resilience down two, somewhat divergent paths of governance reform: 'radical critique' and 'financial stability'. In different ways these paths have produced a novel set of transgressions of the state-market dichotomy that we will seek to tease out in this and subsequent sections.

'more of the same _ and better'...That has been the response to every financial crisis of the past fifty years... As a thought experiment, imagine...we were designing a regulatory framework from scratch. Finance is a complex, adaptive

system. What properties would a complex, adaptive system such as finance ideally exhibit to best ensure against future crises? Simplicity is one. There is a key lesson, here, from the literature on complex systems. Faced with complexity, the temptation is to seek complex control devices. In fact, complex systems typically call for simple control rules. To do otherwise simply compounds system complexity with control complexity. Uncertainty would not then divide, it would multiply.

Robustness would be second. This has a particular meaning in the context of complex systems: resilience given ignorance. More often, this is called Knightian uncertainty or simple model error. The dynamics of complex systems, such as large banks or interconnected financial webs, are not well understood. That means uncertainty needs to be taken seriously if financial regulatory frameworks are to be robust.

Timeliness would be a third criterion. Complex systems often exhibit a knife-edge property, with discontinuities and tipping points a naturally-occurring feature. Those same features have punctuated the present financial crisis...That underscores the importance of timely, pre-emptive regulatory intervention if financial disaster is to be averted. (Haldane 2011, pp. 2_3, original emphasis)

Simplicity, robustness and timeliness may sound like the traditionally conservative tropes of a financial regulator, but they underscore how complexity is being used to justify 'pre-emptive intervention'. The radical nature of Haldane's position is clearly rhetorical – i.e. the grandstanding of an upwardly mobile policy maker – but there is also substance. Haldane has tilted at financial privilege arguing that the current (full) costs to society of running finance outweigh the benefits. While this might seem an easy gambit in the current period of scorn for bankers and their bonuses, in the context of a highly respected Bank economist, there is reason to take note. Where the political intervention stops, the financial (re)imagination begins. In the past few years the Bank has turned to a form of financial modelling that draws on complexity theory in order to dispense with (in theory) the old privilege of the public bailout.

3. Complexity

Complexity science is not a unified field of thought, but rather a collection of insights and approaches developed in a wide variety of academic disciplines and intellectual traditions. Heylighen *et al.* note how representations – or rhetorics - of complexity, have often fallen into two different categories: 'either very specialised, technical formalisms, such as network clustering algorithms, computer simulations and nonlinear differential equations, or rather vaguely defined metaphors, such as "emergence" and "the edge of chaos"' (Heylighen *et al.* 2007: 117).

Underpinning this cleavage is an epistemological divergence. For those in the metaphorical camp, complexity suggests limits to our predictive knowledge of the world. By this account, non-linearity in cause and effect, feedback mechanisms and 'near chaotic' dynamics make the world, at least to some degree, indeterminate and ambiguous, making prediction difficult, if not impossible, in sufficiently complex

systems (cf. Little 2012: 6). Yet for those in the techno-formalistic camp, the notion of complexity provides the opportunity for *greater* predictive knowledge of the world as it provides the basis for enhanced mathematical modelling techniques (Cooper 2011: 379).

At the Bank of England, both rhetorics of complexity are in evidence. Haldane certainly appeals to **complexity as a metaphor** for the nature of contemporary financial relations. He implies limiting the role of large-scale regulatory authorities, such as the BOE, on the basis that the predictive knowledge required to implement regulation at such scale is subject to too much uncertainty. Indeed, the theme of 'simple regulation for complex finance' was developed in a speech given by Haldane in the summer of 2012, where he argues through the 'metaphor' of a dog's ability to catch a Frisbee:

So what is the secret of the dog's success? The answer, as in many other areas of complex decision-making, is simple. Or rather, it is to keep it simple. For studies have shown that the frisbee-catching dog follows the simplest of rules of thumb: run at a speed so that the angle of gaze to the frisbee remains roughly constant. Humans follow an identical rule of thumb. **Catching a crisis, like catching a frisbee, is difficult.** Doing so requires the regulator to weigh a complex array of financial and psychological factors, among them innovation and risk appetite... Yet despite this complexity, efforts to catch the crisis frisbee have continued to escalate. Casual empiricism reveals an ever-growing number of regulators, some with a Doctorate in physics. Ever-larger litters have not, however, obviously improved watchdogs' frisbee-catching abilities.... So what is the secret of the watchdogs' failure? The answer is simple. Or rather, it is complexity....the type of complex regulation developed over recent decades might not just be costly and cumbersome but sub-optimal for crisis control. In financial regulation, less may be more (Haldane 2012: 1).

Haldane's perspective is akin to the classic Austrian view of economic regulation: markets, as big price-generating information machines, are so complex that attempts by well-meaning officials to regulate them are doomed either to be ineffective or, more probably, to make matters worse.

There is a sense in which this perspective is profoundly individualising, in that it suggests that order can successfully emerge only from individual decision-making (Cooper 2011: 375). Yet the irony is that this perspective is marked by a distinct lack of agency, where agency refers to the capacity of people to actively transform their surroundings. As Brett Christophers has argued, regulatory appeals to excessive complexity in financial markets can function as a way of absolving responsibility: 'The inclination [is] to blame complexity for crisis - to invoke 'complexity' as a causal and sufficient explanation of crisis in and of itself' (2009: 808).

But, in the last instance, as Langley argues, finance is, and financial crises are, constituted by *agency*, that is, ethically reflexive *people* interacting with one another. For instance, standard financial portfolio theories and the variants of the

efficient markets hypothesis that shaped regulatory thought prior to the crisis were flawed partly due to the fact that they systematically ignored the agency of financiers, in particular the ability of financiers to subvert and manipulate price mechanisms and the markets within which they sit (Holmes 2009).

In other words, complexity, in both market structure – the continual emergence of new quotable markets, investable indices *etc.* along with the financialisation of non-financial markets – and in product structure – tranching, securitisation, CDOs, CDSs *etc.* – was *actively pursued* by agents on the basis that they offer opportunities for higher profit (cf. Schwarcz 2010: 17). Therefore, although Haldane sells the complexity-resilience couplet as opposed to misguided pre-2008 equilibrium economic thinking (2012: 3), in the sense that the actual behaviour of individuals and associated questions of financial power relations is absent from his discussion, he retains the empty structuralism that was so problematic. In that sense, it fits in with a long tradition of seeking to remove agents from models of the economy (Kagan 2009: 507).

At the ‘nuts and bolts’ level of policy analysis and economic knowledge production, the **techno-formalistic rhetoric of complexity** is more important, where the emphasis is on augmented, rather than diminished, powers of prediction. Indeed, the emergence of the research field of ‘econophysics’, which seeks to apply knowledge from physics to markets, especially financial markets provided a plot from which some of these ideas could grow, including well-developed monographs organised around the aim to provide ‘more realistic’ descriptions of financial market behaviour using insights from complexity thinking (e.g Mantegna and Stanley 1999; Johnson *et al.* 2003), as well as academic work commissioned by large investment banks (Marschinski and Matassini 2001: 4) and numerous research centres devoted to the topic.

In the immediate wake of the sub-prime crisis, the European Commission began funding the Forecasting Financial Crises (FOC) project, which drew together natural scientists, computer scientists economists and policy makers under the 7th Framework programme. This project has since sought to produce research that *forecasts* financial crises and to engage in various forms of scenario planning. One of the most significant pieces of research to emerge from FOC has been the DebtRank model (Battiston *et al.* 2012), which was debuted in an article in *Scientific Reports*, an open-access subsidiary of *Nature*. DebtRank was partly inspired by Google’s system of ranking webpages, PageRank, and it attempts to provide a metric by which the connectedness of a financial institution, via debt, to other financial institutions, can be

measured. This is achieved by a series of equations into which is fed data on the US financial economy sourced from the Federal Reserve.

The central conclusion that the scholars derive from running the algorithm – that financial institutions which are more interconnected present a greater systemic risk – is whilst no doubt valid, *rather unsurprising*. Interconnectedness is obviously a prerequisite for the contagion that marked the sub-prime crisis, but the research has caught the imagination of a wide constituency. One financial commentator hastily joining the dots envisioned: ‘How google can avert the next financial crisis’ (Buchanan 2012) and *New Scientist* journalists described DebtRank’s architects as ‘the financial meltdown forecasters’ (Coghlan and Marshall 2012). At the Bank of England, these messages will likely fall on welcome ears. In a 2011 article, also in *New Scientist*, Haldane argued that, in order ‘to navigate economic storms, we need better forecasting’ (2011). In this piece, the focus is entirely on gathering more knowledge, developing better modelling and, ultimately, enhancing regulatory power:

Regulators are talking seriously about introducing common metrics for financial transactions. Alongside that, data warehouses are being constructed to store these raw materials. There are even moves afoot to put these raw materials to work. The US aims to create an Office of Financial Research to collect data from firms and weave the information into a web suitable for mapping and simulating risk. Now imagine the light this financial map might shine. It would allow regulators to issue the equivalent of weather-warnings - storms brewing over Lehman Brothers, credit default swaps and Greece. It would enable advice to be issued - keep a safe distance from Bear Stearns, sub-prime mortgages and Icelandic banks. (2011)

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The philosophical skepticism of the other metaphorical rhetoric of complexity is replaced by a rhetoric of action. Still, as with DebtRank, it is faintly disappointing that the high rhetoric is used only to justify relatively small changes to the way in which regulation is undertaken, and very little institutional change at all. For example, Haldane characterises the existence of crises as the result of a ‘risk management gap’, which ‘can most obviously be filled by some systemic oversight agency’ (2012: 18) before citing new bodies that, in his view, fulfil this role: the Financial System Oversight Council (FSOC) in the US, the European Systemic Risk Board (ESRB) in Europe and the Financial Policy Committee (FPC) (*ibid*). The FSOC is housed in the US Treasury department, the ESRB was formed under the auspices of the European Commission and the FPC is housed at the Bank of England.

The extent to which the radical potential of complexity/resilience can be, by Haldane’s account, assimilated into the existing institutional layout of capitalism, is mirrored by the way in which he plugs his far-reaching insights into existing mechanisms of regulation. Indeed it is notable that Haldane castigates the discipline

of economics for focusing on calculable risk, rather than incalculable, 'perhaps unknown' uncertainty, yet later on in the same speech, argues for the construction of new regulatory rules and systemic risk models that *do* take account of uncertainty (2012: 19) so as to avoid systemic crisis.

This tension captures the epistemological cleavage at the centre of complexity policy-thinking and should be the subject of further debate, but to return to the point, when it comes to actual policy recommendations, complexity thinking is remarkably tame: the one example Haldane mentions here and in another speech is the replacement of bank capital ratios by bank leverage ratios (2012: 19). Sure, this would involve change, but rather little change (see also Haldane 2012a [dog and Frisbee]).

4. The performativity of financial resilience

In a working paper written by a Bank economist, a mathematical zoologist and a theoretical ecologist, the same combination of rhetoric is employed (Arinaminpathy *et al.* 2012). The authors apply the complexity frame by drawing parallels between financial crises and the spread of infectious diseases, but ultimately, the conclusions are again tame: tougher capital requirements for bigger banks than for smaller ones. It could be argued, for example, that, whatever capital requirements are in place, banks will find ways to subvert them in the same way that banks and other institutions have increasingly moved their activities 'off balance sheet', indeed in the same way that companies move their operations 'offshore', so as to avoid regulation and taxation altogether. For example, if we see credit crises as profitability crises rooted in declining returns, then tweaking regulation is missing the point. However, for our purposes, it is enough to emphasise how the radical implications of complexity/resilience have been assimilated and made intelligible/workable, within existing regulation regimes.

What is interesting though is how the re-phrasing of regulation in terms of complexity/resilience has allowed for the performance of new subjects. For instance, while it might be argued that despite all the talk of complex adaptive systems the role of financial governance is pretty much unchanged, this would ignore the shifts in discursive imagination as the Bank updates its mandate. The Financial Stability Committee has been joined by a 'financial resilience division'. A series of financial resilience benchmarking exercises have been undertaken that focus on leveraging

and debt ratios. In addition, a whole chapter of the financial stability report was devoted to financial resilience.⁵

A significant innovation speaks to the power of resilience agendas to cross-fertilise. Echoing concerns with Critical Infrastructure Protection in the Civil Contingencies Act, the financial stability report of the Bank of England now refers to something termed ‘Critical Market Infrastructure’ and/or ‘Financial Infrastructure’. Critical Market Infrastructure is used to denote a range of contract settlement systems such as Continuous Linked Settlement Systems in FOREX trading and derivatives as well as the increased use of ‘central counterparty clearing’ in over the counter trading. These are market led devices that aid the speed and volume of liquid financial transactions that are now denoted as ‘critical’, in the sense of being securitised as national ontology (See also Aradau, 2010: 501). This is an interesting trajectory to say the least, and one which does not necessarily do justice to the transnational dimensions of many financial networks performed as ‘critical to the nation’.

Having outlined the broad turn to address questions of resilience in policy circles, we must now move from ‘tracing the discourse’ to consider the deeper politics of financial resilience. For us, the key place to start is with those governmental and bio-political diagnoses of resilience that seek to show resilience provides a further layer of neo-liberal rationality. One important route into the ‘politics of resilience’ is provided by those scholars concerned with neo-liberal governmentality. For them, the turn to resilience provides a set of useful normative rationalities, about how to tie individuals with the responsibility for dealing with uncertain markets. As such financial resilience becomes a normative legitimation of business as usual.

Resilience as governmental⁶

Distinguishing between risk and uncertainty, Lentzos and Rose argue: “...attention to uncertainty poses problems for rationalities of risk management, nonetheless these uncertain futures must be *rendered thinkable, prepared for and pre-empted or mitigated*. [...] ...this does not entail a resort to ‘non-rational’ ways to bring the future into the present, but rather requires the use of different modes of rationalization.” (Lentzos and Rose, 2009: 236. Emphasis added.). Indeed, they point to the rise of scenario planning, whereby practitioners seek to imagine different forms of

⁵ As it reports: “Leverage ratios have edged down further and the aggregate capital position of the major UK banks has improved a little. Banks have been able to issue substantial amounts of term debt and have shrunk their balance sheets, although a substantial funding challenge remains. This has improved their resilience to shocks, including further funding strains.”

⁶ Aspects of this section draw from Brassett and Vaughan-Williams (2013).

catastrophe. In the UK, this future preparedness is encapsulated in the discourse of resilience which, they argue, “has become something that can be engineered into systems, organizations, perhaps nations and persons.” (Ibid. 243). And thus, a governmental approach places a critical spin on resilience by portraying it as an *engendered logic* rather than a straight problem-solving exercise:

A logic of resilience, then, is not merely an attitude of preparedness; to be resilient is not quite to be under protection nor merely to have systems in place to deal with contingencies. Resilience implies a systematic, widespread, organizational, structural and personal strengthening of subjective and material arrangements [...] *Perhaps the opposite of a Big Brother state, a logic of resilience would aspire to create a subjective and systematic state to enable each and all to live freely and with confidence in a world of potential risks.* (Ibid. 243 Emphasis added.)

On this view, the issue of uncertainty is essentially folded into the governmental logics of liberal society via discourses of resilience. It is not a disciplinary logic in the sense of ‘orders’ or ‘sanctions’, instead the production of subjects capable of living with (a particular rationality of) uncertainty is promoted as a new framework of security.

This argument is given further embellishment by Pat O’Malley, who suggests that resilience planning is not simply a logic of ‘large scale’ or ‘state’ security governance, but actually entails building diverse logics and techniques of the self. In particular, he emphasizes how the self is increasingly encouraged to nurture or train resilient traits understood as anything from self-help books that teach individuals to ‘survive through chaos’, to the widespread prevalence of cognitive behavioral techniques in western society. Indeed, he suggests that this ‘resiliency manoeuvre’ “takes much of its impetus from compatibility with advanced liberal approaches to government in what are constituted as particularly uncertain times.” (O’Malley, 2010: 490). By which he means:

Advanced liberalism promotes the need to become an entrepreneur of one’s self, to manage one’s own risks, to be innovative, adaptive and responsible. The new resilient self is also to be achieved rather than taken as natural.” (Ibid. 505).

On this view, the uncertainty to which resilience (apparently) responds is also a condition of survival in advanced liberal societies. Thus, at the same time as resilience governs individuals through ‘empowering them’ to respond to and cope with extreme events, it also perpetuates a set of individuals capable of succeeding with neo-liberal systems, *thus allowing neo-liberal systems to succeed* (Dean, 2012).

This argument bears particular relevance to the idea of financial resilience which manifests (in the UK context especially) as a form of business as usual. Indeed, Walker and Cooper almost seem to present resilience as a straight victory for neoliberalism that sees the 'ecologised' neo-liberal views of Hayek now firmly embedded in the central institutions of state. In a word, the state-market dichotomy has been resolved through its own transcendence, resilience as an organising logic of distributed neo-liberal agency.

But what is missing from the discourse of resilience at the Bank of England is precisely what is so important in the governmental accounts identified: the idea of subject discipline, subject awareness. In short while the BOE is content to run financial models and build scenarios of economic 'catastrophe', there is a disconnect with the subjective experience of finance, which is handled, if at all, by the piecemeal rolling out of financial literacy agendas and the social discipline of the News Media. There is, to be sure, much to consider in the production of financial market subjects complicit with a resiliency agenda, either through fostering entrepreneurial homeowners/mortgagers, or, the proliferation of financial management software in phone apps and online 'educational' or 'motivational' websites. However, our concern here is to focus on ambivalence, and the capacity of resilience agendas to breakdown, be resisted, or emerge in unexpected ways.

Breakdowns and misfires

“...breakdown is constitutive of performativity (performativity never fully achieves its effect, and so in this sense 'fails' all the time; its failure is what necessitates its reiterative temporality, and we cannot think iterability without failure). Its moments of breakdown are also important for another version of 'critique'. Under what conditions do the theories of finance produce impossible scenarios that are bound to backfire and fail? (Butler, 2010: 153)

There is a dilemma at the heart of critical enquiry: to what extent does an appreciation of the logic and craft of a particular rationality tranquilise the capacity for alternatives? In their otherwise inspiring intervention, for instance, Walker and Cooper argue that: 'In its tendency to metabolize all countervailing forces and inoculate itself against critique, "resilience thinking" can-not be challenged from within the terms of complex systems theory but must be contested, if at all, on completely different terms, by a movement of thought that is truly counter-systemic (2011: 157). While the will for large scale, countervailing alternatives may be appealing in a radical (or romantic) sense, this may run the risk of figuring finance as far more

coherent and self-reliant than might be the case. Taking Butler's notion of breakdown, wonder whether financial resilience, and the background assumptions of complexity that partly constitute it, *are themselves* iterations: uncertain and incomplete?

For all the techno-formalistic renderings of complexity science-as-modelling, the implied scepticism towards prediction and control of future events remains an essential part of the notion of complexity. And this scepticism provides ample room for radical democratic readings of complexity on the basis that it implies that the knowledge necessary for prediction and control of social affairs by 'those at the top' (Rihani 2007: 140), may simply not be accessible. The emergent complexity thinking at the Bank of England is a good example of the epistemological politics of complexity in action. Haldane, and other researchers are caught between the radical implications of complex understandings of the economy and the desire to turn those insights into knowledge required to exert governance.

For sure, resilience strategy has the potential to be captured and assimilated within existing political orders. Walker and Cooper are right to argue that resilience can fit with a certain set of neoliberal assumptions about individualism and uncertainty that disempower. Similarly, regulatory institutions such as the Bank of England are not elected, so there are straightforward democratic concerns to be aired. However, there is manifest potential to reclaim the notion of resilience in a way that resists, rather than affirms existing state-market relations and to do this we must search around the edges of resilience for examples of resistance.⁷ Returning to Butler,

...the question for theorists of performativity is not merely, how are economic matters made? Or how are certain effects instituted? But also, how do we think about the political value of certain economic effects? Even if political questions are already raised within the terms of economic analysis and practice, those questions do not exhaust what we mean by politics. After all, if certain operations of performativity fail, then it is useful to know when and why they do, and whether they ought to. And if new forms of organizing the economic world become available, it will be only on the basis of increased reflection not only on what works and what does not, but also, what is the best way for economics to work? Such a question assumes that there is an outside to economics, even

⁷ As a strategy of governance against a background of complexity, the notion of resilience also retains this essential contestability. In the literature on resilience to environmental change, the question of the place of agency in systems thinking is beginning to be raised. Katrina Brown and Elizabeth Westaway chart some of this emergence within resilience scholarship whilst also noting how debates over the place of agency easily spill over from development studies into studies of resilience in general (Brown and Westaway 2011).

though it is clear that there can be no workable answer without entering into the inside of its current modes of agency. (Butler, 2010: 154)

On this view, and drawing together much of the preceding argument, resilience encompasses (incomplete) associations of complexity modelling, systems thinking and metaphors of simplicity. While it would be easy to assume that politics is most likely to reside outside such a system, there are also opportunities for agency within its terms: adaptable, flexible networks that mediate uncertainty through reciprocity and 'hope'. Whether financial resilience succeeds, breaks down, or fails is, in part, a function of what network agents 'do'.

5. Alternative Finance: Bank of Dave

In a recent two part series aired by British television broadcaster Channel 4, one such network agent was presented doing finance differently. The documentary, *Bank of Dave*, charts the attempt of David Fishwick, a businessman from Burnley, UK, to set up a bank which rejects the orthodox approach to banking evinced by major retail banks in favour of a localised, community-based approach. The following quotes are drawn from their webpage:

Burnley Savings and Loans Ltd officially opened its doors in September 2011. The company was created and is managed by David Fishwick, a local entrepreneur, business man, and the largest supplier of Minibuses in the U.K....Feeling that High Street Banks treat people as credit scores and not as individuals, David decided to return to basics. As such, Burnley Savings and Loans Ltd DO NOT credit score, choosing a more personal approach to underwriting, dealing with customers on a case by case basis...we also offer the opportunity for people to be a part of something that could not only benefit Burnley and the North West of England but EVERY community in the country! ...So by offering affordable loans to people who have struggled to obtain finance from the high street banks, through no fault of their own, as well as offering 5% AER on your savings David has proved that the financial industry can also be socially responsible....Any profits received, after the overheads are paid WILL BE DONATED TO CHARITY! At Burnley Savings and Loans we do not do big bonuses.

The resilience-thinking inspired research discussed earlier in this article might suggest that Fishwick's crusade makes good macro-economic sense. If excessive connectedness in banking is a bad thing – the broad thrust of the research – then, rather than charting and regulating that connectedness, another strategy might be to foster local banking that is not so heavily interconnected in the first place. Another broad insight emanating from that research is the idea that more regulatory attention should be cast upon those large, interconnected financial institutions, involving for

example higher liquidity requirements for more heavily connected institutions (Gai *et al.* 2011).

Yet, despite the documentary featuring a rather anodyne endorsement from British Business Secretary, Vince Cable, the most striking thing that it revealed was quite how difficult it was for Fishwick to set the institution up at all. Regulations and norms about what banks ought to be, worked to stifle his attempts at every turn, with much appearing to hinge on the legitimate use of the word “bank”. In a high point of semiotic comedy, Fishwick, despite his best efforts to name the institution Bank of Dave, eventually settles for “Bank on Dave!”, where the dual meaning of the term ‘bank’ along with the use of an exclamation mark and quotation marks is enough to allow the institution to avoid banking regulation altogether.

In part, this is a *Brazil*-esque story of a person’s battle with bureaucracy but, unlike Gilliam’s film, Dave appears to win the fight by establishing a savings and loan company which effectively performs most of the functions of a retail bank. Yet, at another level, the case can be read as a conflict on the plane of financial resilience. While its economic impact may be tiny, “Bank on Dave!” opens up the possibility of alternative bases for the construction of financial resilience and renders it political by illustrating the resistance that such a move might engender amongst regulators with a completely different vision in mind. Against the prevailing uncertainties of the financial system – and particularly, the big finance of capital mobility, and highly leveraged financial models – Dave seeks to build networks of reciprocal lending. Instead of credit scoring he personally meets the borrowers and establishes a relationship. By all means, there is a degree of romance and charm in the persona of the entrepreneur (though this hardly exclusive to small finance), yet there is still an alternative form of resilient finance in the offing: less risky, more adaptable network relations.

A pragmatic call for experimentation

In conclusion, this working paper has attempted to reflect a growing awareness among financial regulators that uncertainty and inter-connectivity are important issues for finance. Finance, along with many other policy domains, is beginning to explore the potential for resilience thinking to help to both generate complexity models that aid predictability of extreme events and to build adaptable financial networks that might thrive through crisis. We have sought to refuse either the scientific assumption that this move to financial resilience is something that simply works (and can be perpetually improved), on the one hand, and the critical – yet

somewhat totalising – governmentality perspective that resilience is simply a new stage of liberal government (that carries new rationalities, and normativities), on the other. Instead, we have sought to explore and engage the contingencies and fragilities of resilience in order to capitalise on what Butler refers to as ‘performative agency’. By this we mean to suggest that it is in the very breakdowns and misfires of the discourse of financial resilience that political possibilities can be imagined.

Going forward on these terms is essentially a pragmatic call to engage with new experiments in financial resilience, in terms of supporting the study of alternative financial networks like Bank of Dave, but also co-operative banking, Bitcoin, religious banking and so forth. More critically, it is a suggestion to policy makers that financial resilience should not simply serve as a new layer of governmental rhetoric to justify old forms of elite level decision making, large capital models of financial agents, and other forms of ‘London-centrism’. Rather the task may be to think about financial regulation in experimentalist terms? Following Sabel and Zeitlen, an experimentalist governance architecture exists when

- (1) framework goals and metrics for assessing their achievement are provisionally established by some combination of “central” and “local” units, together with relevant outside stakeholders;
- (2) local units are given broad discretion to pursue these ends in their own way;
- (3) but as a condition of this autonomy, these local units must report regularly on their performance and participate in a peer review in which their results are compared with those employing alternative means to the same general ends;
- and (4) the goals, metrics, and decision-making procedures themselves are periodically revised in response to the results of the review process. (2011: 1)

At present, we would suggest the financial system of resilience discourse is being imagined in a highly top down, elitist manner that is neither reflective of the reality of alternative financial networks and agents, nor is it facilitative of inclusion and dialogue with such agents. An experimentalist attitude might engage the breakdowns and fissures that exist in a more democratic and creative manner.

Bibliography

Arinaminpathy, Nimalan; Kapadia, Sujit; May, Robert (2012) “Size and complexity in model financial systems”, Bank of England working paper no. 465

Aradau C (2010) ‘Security That Matters: Critical Infrastructure and Objects of Protection’.
Security Dialogue 41: 491-514.

Battison, Stefano *et al.* (2012) “DebtRank: Too central to fail? Financial networks, the FED and systemic risk”, *Scientific Reports* 2:541 pp.1-6

Brassett, J. and Clarke, C. (2012) Performing the Sub-Prime Crisis: Trauma and the Financial Event' in *International Political Sociology*, 2012, 6(1): 4-20.

Brassett, J., Croft, S. and Vaughan-Williams, N. (2013) 'An Agenda for Resilience Research in Politics and International Relations, in *Politics*, forthcoming.

Brassett J. and Vaughan-Williams, N. (2013) 'Security Politics and Performative Ecologies of Resilience', unpublished mimeo, available upon request.

Brown, Gordon (2008) 'Speech to the Lord Mayor's Banquet', 10/11/08 Transcript: <http://webarchive.nationalarchives.gov.uk/+/number10.gov.uk/news/speechesand-transcripts/2008/11/speech-to-the-lord-mayors-banquet-17419> [accessed 31/05/10] (Brown and Westaway 2011).

Brown, Katrina and Westaway, Elizabeth (2011) "Agency, Capacity, and Resilience to Environmental Change: Lessons From Human Development, Well-Being, and Disasters", *Annual Review of Environment and Resources* 36:1, pp.321-342

Bruijne, M, Boin, A, and van Eeten (2010) Resilience: Exploring the concept and its meanings. In Comfort, L, Boin, A and Demchak, C (eds) *Designing Resilience: Preparing for Extreme Events*. Pittsburgh: University of Pittsburgh Press, 13-32.

Buchanan, Mark (2013) *Forecast: what physics, meteorology, and the natural sciences can teach us about economics* (London: Bloomsbury Publishing)

Butler, J. (2010) ' Performative Agency', in *Journal of Cultural Economy*, 3(2): 147-161.

Christophers, Brett. (2009) "Complexity, Finance, and Progress in Human Geography", *Progress in Human Geography* 33:6 pp.807-824

Coghlan, Andy and Marshall, Michael (2012) "The financial meltdown forecasters", *New Scientist* Issue 2877, 23/08/2012.

Comfort, L, Boin, A and Demchak, C (eds) (2010) *Designing Resilience: Preparing for Extreme Events*. Pittsburgh: University of Pittsburgh Press.

Dean, M. (2012) 'Rethinking Neo-Liberalism' in *Journal of Sociology*, published online before print.

Gai, Prasanna; Haldane, Andrew and Kapadia, Sujit (2011) "Complexity, concentration and contagion", *Journal of Monetary Economics* 58:5, pp.453-470.

Haldane, Andrew (2009) 'Rethinking the financial network' Speech by Mr Andrew G Haldane, Executive Director, Financial Stability, Bank of England, at the Financial Student Association, Amsterdam, 28 April 2009. Available at <http://www.bis.org/review/r090505e.pdf>

Haldane, Andrew (2011) "To navigate economic storms we need better forecasting", *New Scientist* Issue 2842, 13/12/2011

Haldane, Andrew (2012) "Tails of the unexpected", speech given at "The Credit Crisis Five Years On: Unpacking the Crisis", conference held at the University of Edinburgh Business School, 08/06/2012

Haldane, Andrew (2012a) "The dog and the frisbee", speech given at the Federal Reserve Bank of Kansas City's 36th economic policy symposium, *The Changing Policy Landscape*, Jackson Hole, Wyoming 31/08/201

Heylighen, Francis; Cilliers, Paul and Gershenson, Carlos (2007) "Philosophy and Complexity" in Bogg, Jan and Geyer, Robert eds. *Complexity Science and Society* (Oxford: Radcliffe) pp. 117-135.

Holling, C (1973) Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics*, 4: 1-23.

Holmes, Christopher (2009) 'Seeking Alpha or Creating Beta? Charting the Rise of Hedge Fund-Based Financial Ecosystems', *New Political Economy*, 14: 4, 431-450

Holmes, Christopher (2013) Ignorance, denial, internalisation and transcendence: A post-structural perspective on Polanyi's double movement. *Review of International Studies*, 39, (2) 273-290.

Johnson, Neil F.; Jefferies, Paul and Ming Hui, Pak (2003) *Financial Market Complexity* (Oxford: Oxford University Press)

Kagan, Jerome (2009) *The three cultures: Natural sciences, social sciences and the humanities in the 21st century* (Cambridge: Cambridge University Press)

Langley, Paul (2010) 'Liquidity Lost: The Security Apparatus for Toxic Assets', paper presented at Stockholm SGIR conference, available at: <http://stockholm.sgir.eu/uploads/Liquidity%20Lost%20SGIR%20Version%20Langley.pdf>

Alexander Laszlo and Stanley Krippner (1998) 'Systems Theories: Their Origins, Foundations, and Development. In Jordan, J S (ed.) *Systems Theories and A Priori Aspects of Perception*. Amsterdam: Elsevier Science, 47-74.

Lenzto, F and Rose, N (2009) Governing Insecurity: Contingency planning, protection, Resistance. *Economy and Society* 38: 230-54.

Little, Adrian (2012) "Political action, error and failure: the epistemological limits of complexity", *Political Studies* 60:1 pp3-19.

Mantegna, Rosario N. and Stanley, H. Eugene (1999) *An Introduction to Econophysics: Correlations and Complexity in Finance* (Cambridge: Cambridge University Press)

Marshinski, Robert and Matassini, Lorenzo (2001) "Financial Markets as a complex system", Deutsche Bank Research Paper, November 2009.

O'Malley, P. (2010) 'Resilient Subjects: Uncertainty, Warfare and Liberalism', in *Economy and Society*, 39(4): 488-509.

Schwarz, Steven L. (2010) "Regulating complexity in financial markets", paper presented at the University of Oxford Leverhulme Lecture Series, 10/11/2010

Rihani, Samir (2007) "Difficult shift to complexity in political economic analysis" in Bogg, Jan and Geyer, Robert eds. *Complexity Science and Society* (Oxford: Radcliffe) pp. 136-141.

Sabel, C. and Zeitlin, J. (2011) Experimentalism in Transnational Governance: Emergent Pathways and Diffusion Mechanisms Paper presented at the panel on "Global Governance in Transition", annual conference of the International Studies Association, Montreal, March 16-19, 2011.

Tucker, Paul (2010) 'The Crisis Management Menu' Speech by Mr Paul Tucker, Deputy Governor for Financial Stability at the Bank of England, at the SUERF, CEPS and Belgian Financial Forum Conference: "Crisis Management at the Cross-Roads", Brussels, 16 November 2009. <http://www.bis.org/review/r091118d.pdf>

Walker, J and Cooper, M (2011) Genealogies of resilience: From systems ecology to the political economy of crisis adaptation. *Security Dialogue*

Zebrowski, C (2009) Governing the network society: a biopolitical critique of resilience. *Political Perspectives* 3(1):1-38.

Zizek, S. (2012) 'The Wests crisis is one of democracy as much as finance', in *The Guardian*, 16th January
<http://www.theguardian.com/commentisfree/2013/jan/16/west-crisis-democracy-finance-spirit-dictators> (accessed 24/08/13)