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Under the 'Volcker Rule' in the United States, it is Proposed that Banks Will No Longer Be Allowed to Own, Invest in, or Sponsor Hedge Funds, Private Equity Funds, or Proprietary Trading Operations for Their Own Profit, Unrelated to Serving Their Customers: Can this Be an Effective Regulatory Response to Risk Issues Exposed During the Financial Crisis that Commenced in the Autumn of 2008?

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Abstract: The financial crisis revealed the extent of the global financial system’s interconnectedness. Regulators are challenged to find new means of identifying and tackling sources of risk. A regulatory focus on micro, rather than macro prudential (i.e. network-based), models may explain recent failures.

Some authors (Krahn and Wilde), analysing risk management, conclude that it is governments’ duty to provide insurance against a system-wide crash. In contrast, Battiston and others focus on increasing connectivity and risk. Representative agent models are applied to the financial system. But Colander and Haldane have suggested that regulation must be extended from individual institutions to a systemic perspective. Network analysis theorists, such as Barabasi, contend that the implications of interactions between economic agents must be probed. They argue that a sufficiently developed appreciation of connections between firms, households and a dispersed banking sector is needed to understand risk. This will be contrasted with the response of traditional regulatory theorists (including Goodhart), calling for greater capital requirements and more stringent regulation.

Regulators must devise effective means of tracking systemic linkages. Network analysis theories, focusing on interconnections between financial institutions, can provide valuable tools to assess risk in the modern financial system.

The challenges posed by interconnectedness are most likely to endure. Hence the need to assess whether a proposal, such as that contained in the “Volcker Rule”, is an adequate response.

Key words: Financial risk, New approach based on network analysis

JEL classification: K 23

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Ted Harding*

I. INTRODUCTION

The financial crisis that engulfed the international economy in late 2008 demonstrated how a major shock to a financial market can have widespread negative consequences. One of the main challenges facing regulators is the task of devising effective means of tracking systemic linkages in the international financial services market. The scale of the financial devastation entails that reform of the regulatory system is essential.

In the United States, under the Volcker financial reform proposals, supported by the Obama administration, no bank or financial institution that contains a bank will own, invest in or sponsor a hedge fund or a private equity fund, or proprietary trading operations unrelated to serving customers for its own profit¹.

An ancillary proposal would place broader restrictions on the excessive growth of the market share of liabilities at the largest financial institutions. This would be intended to supplement existing limits on the share of deposits².

At the core of this paper is the conviction that effective, credible regulatory reform requires a new assessment of the international financial system. The goal of this approach would be the devising of remedial measures specific to the challenges presented by an ever-evolving and sophisticated market, rather than ones that simply react to issues as they present themselves. Essentially, it advocates an holistic approach, based on an appraisal of the

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¹ President Barack Obama. Remarks by the President on Financial Reform, January 21st, 2010. <http://www.whitehouse.gov/the-press-office/remarks-president-financial-reform> Downloaded 22/03/2010

² *ibid*

modern financial system. By focusing on micro, rather than macro prudential (i.e. network-based) models, the recent failures of regulators may have been inevitable. Traditional regulatory models have tended to concentrate on individual institutions in the financial system, rather than on the system itself. While an institution may appear financially sound, based on its published accounts, it may, in fact, be very vulnerable to failure, due to its relationship with other institutions in the system. Network analysis offers potential remedies to this problem.

A network is a set of items, referred to as nodes, with connections between them. Systems taking the form of networks are common. Examples include the World Wide Web, social networks of acquaintances, or other connections between individuals, organisational networks and networks of business relations between companies and many others³. This paper takes the principles used in the analysis of networks and applies them to the international financial services market.

The “Volcker Rule” is assessed in terms of whether it can be an effective regulatory response to issues of risk exposed during the financial crisis that commenced in the autumn of 2008.

II. THE SCALE OF THE CHALLENGE FACING REGULATORS

First it is necessary to assess the scale and nature of the problem confronting governments and regulators. At the heart of the measures advanced to remediate the failings of the international financial system is the need to tackle the problem of “moral hazard” that manifested itself in such menacing form during the financial crisis. There has been a long-established “safety net” underpinning the operations of commercial banks. Generally this takes the form of deposit insurance and lender of last resort facilities. However, as Volcker has noted⁴, the concept of institutions being “too big to fail” remains highly problematic and in need of effective policy responses. The idea that “...very large, complex and highly interconnected financial institutions can count on public support at critical times”⁵ provokes public anger at such unfairness. The provision of a public “back-stop” for irresponsible risks taken by banks and other financial institutions leads to what might be called the “socialisation of losses”.

³ A graphic illustration of a simple network appears in the Appendix to the paper.

⁴ “How to Reform our Financial System”, By Paul Volcker, New York Times, January 31st, 2010.
<http://www.nytimes.com/2010/01/31/opinion/31volcker.html?pagewanted=print> Downloaded 09/03/2010

⁵ Volcker, op. cit. p 1

III. “TRADITIONAL” REGULATORY RESPONSES AND REACTIONS TO FINANCIAL FAILURES

In response to the crisis, many of the policy prescriptions urged on governments and regulators have taken a traditional, conventional approach towards financial institutions. Given the severe depletion of banks’ capital reserves, a focus upon strengthening bank capital requirements was predictable. Policymakers were encouraged not just to concentrate on making capital adequacy obligations contra-cyclical, but to correlate them with the movements in bank lending and asset prices in specific sectors. Prior to the markets turmoil, Goodhart and Persaud⁶ were among those who advocated reforms to banks’ capital adequacy levels. According to them, it would be possible to introduce “...these contra-cyclical measures to the new framework of banking regulation, under the umbrella of pillar 2 of Basel II (dealing with the supervisory review process).”⁷

More recently, commenting on the proposed Volcker reforms, Sinn⁸ argued that a return of the Glass-Steagall Act, as urged by some US policymakers to minimise risk in financial markets, would be an ineffective response. Sinn argued that, unlike the US, Europe has a “universal banking system” and a separation of commercial and investment banking would destroy the European banking world. Hence, he advocated concentration upon the strengthening of banks’ capital reserves. The approach of central banks around the world was typified by that of Mervyn King, the Governor of the Bank of England, who has been prominent among those calling for reform that would result in state support being limited to retail, or utility banking⁹.

Following the crisis, there have been attempts by various prominent financial services sector executives to thwart sweeping regulatory reform of the financial system. In April 2009, Lloyd Blankfein, chairman and chief executive of Goldman Sachs, argued against measures he considered threatening to the future of financial innovation and urged governments to “...resist a response that is solely designed to protect us against the 100-year storm”¹⁰.

There are compelling grounds, however, for challenging the characterisation of the recent markets turmoil as a once-in-a-century event. Economic and markets crises are not rarities

⁶ “How to avoid the next crash”, By Charles Goodhart and Avinash Persaud, Financial Times, January 20th, 2008. Reproduced in Goodhart, CAE., *The Regulatory Response to the Financial Crisis*, Edward Elgar Publishing: 2009, p 95

⁷ Goodhart, C., and Persaud, A., *ibid*

⁸ Sinn, H-W, “A New Glass-Steagall Act?” <http://voxeu.org/index.php?q=node/4710> Downloaded 05/03/2010

⁹ Speech by Mervyn King, Governor of the Bank of England, to Scottish Business Organisations, Edinburgh, 20th October, 2009

¹⁰ Remarks by Lloyd C. Blankfein, Chairman and Chief Executive Officer, Goldman Sachs, Council of Institutional Investors Spring Meeting, April 7, 2009

and analysis of previous upheavals is not in short supply. The work of Bagehot¹¹ and Kindleberger¹², to name but two, provides prominent examples. In the nineteenth and twentieth century, the United States suffered a number of panics and depressions that devastated personal wealth and led to high unemployment. A sub-prime financial system, rather than sub-prime mortgage lending, is perhaps the real source of the latest turmoil. Roubini is among those who identify warped compensation structures and corrupt ratings agencies as sources of the malaise whereby the global financial system "...rotted from the inside out"¹³.

IV. NOT A UNIQUE CRISIS?

Reinhart and Rogoff¹⁴ contend, however, that the current financial crisis differs little from a series of similar past crises. Yet, as Colander et al¹⁵ note, "... the received body of models in macro finance...provides no room whatsoever for such recurrent boom and bust cycles."¹⁶ The failure to identify the threats to the international financial system before the events of late 2008 is striking. In their analysis of the risk management implications of CDOs, Krahnen and Wilde¹⁷ identified what they considered to be a possible increase of 'systemic risk'. However, their reaction to this prospect is telling. The authors conclude that the threat from increased risk ought not to be the preoccupation of the institutions engaged in the CDO market, but the obligation should be on governments to provide costless insurance against a crash that could devastate the entire system.

¹¹ Bagehot, W., *Lombard Street: A Description of the Money Market*. Henry S. King and Co.: London 1873

¹² Kindleberger, C.P., *Manias, Panics, and Crashes: A History of Financial Crises*. MacMillan: London 1989

¹³ Extracted from *Crisis Economics: A Crash Course in the Future of Finance*. Roubini, N., with Mihm, S., Allen Lane: New York 2010. Extracts published in *The Sunday Telegraph*, B5, May 2nd, 2010

¹⁴ Reinhart, C and Rogoff, K, *This Time is Different: A Panoramic View of Eight Centuries of Financial Crises*. Manuscript, Harvard University and NBER.

¹⁵ Colander David and Ors.: *The Financial Crisis and the Systemic Failure of Academic Economics*, (http://www.ifw-members.ifw-kiel.de/publications/the-financial-crisis-and-the-systemic-failure-of-academic-economics/KWP_1489_ColanderetalFinancial%20Crisis.pdf)

¹⁶ Op. cit. p 2

¹⁷ Krahnen, J-P and Wilde, C: *Risk Transfer with CDOs and Systematic Risk in Banking*, Centre for Financial Studies, WP 2006-04. Frankfurt

V. “BLACK SWANS” AND INTERCONNECTIONS IN THE MODERN FINANCIAL SYSTEM

The suggested policy responses referenced above seem to derive from an economic approach that appears not to take full account of the extent to which international financial markets are interconnected and the potential problems arising in one part of the world to have massive repercussions elsewhere. Evidence from the markets for Credit Default Swaps (CDSs) and Collateralized Debt Obligations (CDOs) shows how the default of one counterparty can place huge strain on the entire system. This is an example of a high-impact event that is difficult to predict, but to which the financial system is very vulnerable. Such “Black Swan” events, as identified by Taleb¹⁸, can pose a major threat to financial stability. On examining the relationship between flawed models of the economy and regulatory failure, regulators are challenged to find new means of identifying and tackling sources of risk.

It may be questioned whether the policy choices recommended by those who do not appear to have challenged their pre-crisis view of the economic system ought to be adopted without thorough-going scrutiny, let alone with alacrity. In order to obtain new assessments of financial fragility, Colander et al recommend that the supervisory authorities develop a “...perspective on the network aspects of the financial system, collect appropriate data, define measures of connectivity and perform macro stress testing at system level”¹⁹. The logical progression of such an argument is that the threat posed by systemic risk entails that regulatory responses must move from a micro approach to a system-wide regime of regulation. It is a feature of financial institutions’ activities that they engage in “regulatory arbitrage”, by relocating their operations from tightly-regulated markets to less well-regulated ones. Rather than simply seeking to tackle problems that have manifested themselves, there is an overwhelming case for first probing the system that produced such disastrous events and, following analysis, prescribing reform measures. Indeed for those who regard Volcker’s reform measures as a credible response, it should be noted he has conceded that proprietary trading by banks was not central to the financial crisis – the very argument used by some critics of his proposed ban on such activity²⁰.

VI. THE NEED FOR A NEW APPROACH TO LINKAGES AND THE ASSESSMENT OF RISK

The central theme of this paper is that a different approach is required if policy prescriptions (be they the proposed Volcker reforms, or others) are to be devised that are capable of aiding authorities seeking to regulate the operations of a highly sophisticated, global and interconnected market for financial services. Linkages between institutions and the

¹⁸ Taleb, Nassim Nicholas: *The Black Swan, The Impact of the Highly Improbable*, Penguin: New York, 2008

¹⁹ Colander et al, op. cit. p 12

²⁰ “Volcker Ends Up Agreeing With Critics of His ‘Rule’”, Moneynews, <http://moneynews.com/PrintTemplate?nodeid=81369>. Downloaded 02/05/2010

entwining of markets give the international financial system characteristics of a living organism or ecosystem. Technological change and the easing of regulatory controls in the 1990s facilitated the evolution of new and diverse financial products. This created an enduring challenge for regulators, as they seek to apply rules to products that were not even conceived of when the current governance regimes were put in place. The nature of the contemporary financial market, therefore, calls for an approach to regulation that is holistic and multi-disciplinary.

A regulatory focus on micro, rather than macro prudential (i.e. network-based), models may explain recent regulatory failures. The work of Erdos and Renyi²¹ on the random graph was one of the earliest theoretical models of a network. Subsequently this has been applied to various scenarios in economics and the social sciences in a multi-disciplinary approach. Newman²² has studied how shocks may be transmitted through networks. A case in point is the manner in which contagious diseases may be transmitted through a network of nodes, originating in a limited group of infected nodes.

V. NETWORK THEORY AND ITS RELEVANCE TO COMPLEX SYSTEMS

At the core of work by network theorists, of which Barabasi is perhaps the most prominent, is the belief that there must be some organising principles governing the complex webs around us²³. Essential to his work has been the study of power laws – a pattern of distribution in which large is rare and small is common. Barabasi employs power laws to describe how wealth is distributed in society (large wealth is rare, small wealth is common), hence the not uncommon observation that 20 per cent of people hold 80 per cent of the wealth²⁴. Discovering power laws in networks made them essential to understanding complex systems. Barabasi found that the presence of power-law distributions in networks required hubs with a disproportionate abundance of links, the formation of which could not have been random. He dubbed such new types of networks “scale free”, as there was no typical number of links and, therefore, no scale²⁵. Barabasi’s work suggests that scale-free networks are not vulnerable to failure. In collaboration with Albert and Jeong, he²⁶

²¹ Erdos, P. and Renyi, A., “On random graphs”, Publicationes Mathematicae, Vol. 6, pp290-297, 1959

²² Newman, MEJ, “Random graphs as models of networks”, Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, NM 87501, USA, 2003

²³ Barabasi, A-L: Linked – How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life, Plume, 2003

²⁴ Barabasi, A-L: Linked, op. cit. p65ff

²⁵ Barabasi, A-L and Albert, R, “Emergence of Scaling in Random Networks”, Science, Vol. 286, October 1999, p 509

²⁶ Albert, R, Jeong, H and Barabasi, A-L, “Error and attack tolerance of complex networks”, Nature, Vol. 406: p 378-382

demonstrated that error and attack tolerance is displayed only by certain groups of networks, including the World Wide Web, social networks and cells. The ability of the nodes to communicate is found to be unaffected even by high failure rates.

The price of the great resilience comes, however, in the form of fragility under attack. A hierarchy of many small nodes is held together by a few large hubs. The nodes are defined by financial institutions and the links are the interconnections between the institutions, as Soramaki has noted²⁷. Attack and remove the most connected nodes in any network and it disintegrates. As Haldane has observed, interconnected networks exhibit a knife-edge, or tipping-point, property. Up to a point, the connections act as a shock-absorber. But beyond a certain range, the interconnections may act as “shock-amplifiers, not dampeners, as losses cascade”²⁸. Rather than acting as a mutual insurance mechanism, the system may lead to mutual destruction. Therefore, ironically, scale-free networks couple robustness against failures with vulnerability to attack. The test for regulators is to identify when the system is approaching the tipping point. This is as relevant to a regulator based in New York or Singapore, as it is to one in Dublin.

According to Barabasi, the natural consequence of connectedness and interdependency in the modern financial system is exposure to “...cascading financial failure”²⁹. The interdependency of the international financial community is such that no institution may work alone. Extrapolating from Barabasi’s work and applying it to the financial services market, it may be possible to foresee and limit future crises, if the macroeconomic interdependencies of networks are understood. Even though the hubs of international finance are based in particular jurisdictions, the activities carried on within them have huge impacts outside the countries in which the hubs are located. Hence, in the recent financial crisis, individual states were forced to introduce radical measures to rescue financial institutions resident within their borders. Yet the transnational nature of such institutions’ operations makes a compelling case for the establishment of new, more powerful international regulators. Just as publicly-quoted banks are obliged to comply with the rules of stock exchanges in countries other than their own residence, but in which they wish to have a listing, there is no convincing reason why institutions with international operations should not be amenable to the requirements of international regulators.

VI. GLOBALISATION AND INTERCONNECTEDNESS – THE THREAT

With the rapid pace of globalisation and financial integration the risk posed by interconnectedness looms large. This is perhaps the most significant and troubling adverse consequence associated with externalities present in the modern financial system.

²⁷ Soramaki, K.: *“Is network theory the best hope for regulating systemic risk?”*. ECB workshop on: “Recent advances in modelling system risk using network analysis”, European Central Bank, October 5th, 2009.

²⁸ Haldane, A., *“Rethinking the financial network”*, Speech delivered at the Financial Student Association, Amsterdam, April 2009, p 10

²⁹ Barabasi, A-L., *Linked*, op. cit. p 211

Awareness of the Too-Connected-to-Fail (TCTF) problem leads, logically, to the question of how to regulate TCTF banks and other institutions, ensuring that they are amenable to modes of regulation that are internationally-recognised and, crucially, enforceable in a transnational context.

The malign potential of a “failure cascade” is derived from the idea that the failure of one institution could prompt a cycle of failures befalling other entities in the same system. Such a dark scenario is predicated upon inter-institution exposure due to direct and indirect connections between institutions. Linkages of this sort derive from balance sheet claims that expose one institution to the default of other institutions. As Battiston et al have observed, if a firm is “...pushed into bankruptcy, this can trigger a cascade process in which bankruptcies generate more bankruptcies”³⁰. The authors conclude that systemic risk can be the “...the result of two factors: the size of the different possible cascades, and the frequency by which the system visits the distribution of robustness that leads to such cascades”³¹.

A cascade of failure could also result from a shared reliance on lines of credit that may be cancelled swiftly and with a minimum of notice. This type of occurrence was very evident during the recent “credit crunch”. The source of indirect linkages could be via the means of derivatives contracts and securities, where the market values are linked to the collapse of an institution which, at first glance, would appear to have little or no connection to those it affects. Effective regulation and proper monitoring of risk in the system call for the development of methods for the assessment of TCTF risk.

Chan-Lau³² employed balance sheet network analysis to measure interconnectedness risk from direct exposures across various banking systems, using data from advanced and emerging market economies. His analysis suggests that the main sources of risk in the global banking system are “...shocks that impair the solvency of banks based in the United States and the United Kingdom”³³. In the context of a need to find new means of assessing risk in a highly interconnected system, Chan-Lau’s work illustrates how the use of simple methodology - balance sheet –based network analysis - may capture interconnectedness and TCTF risk in domestic and international banking systems using only data that is available on the public record.

³⁰ Battiston, S., Stiglitz, J., and Others: *Liaisons Dangereuses: Increasing connectivity, risk sharing and systemic risk*. http://www0.gsb.columbia.edu/ipd/pub/aer_simplified1_4.pdf. p14

³¹ Battiston, S., et al, op. cit. p17

³² Chan-Lau, J., *Balance sheet Network Analysis of Too-Connected-to-Fail in Global and Domestic Banking Systems*, IMF Working Paper, April 2010

³³ Chan-Lau, op. cit. p3

VII. COMPLEX INTERDEPENDENCE REDUX

In many respects, the complex interdependence of states identified by Keohane and Nye³⁴ resonates with the reality of contemporary financial markets. Keohane and Nye argued that the decline of military force as a policy tool of choice and the increase in economic and other forms of interdependence ought to increase the probability of cooperation among states. The potency of certain modern financial instruments (characterised as “weapons of mass destruction” by financier Warren Buffett³⁵) ought to create a similar impetus towards cooperation. The notion of an institution being too-big-to-regulate ought not to be given the opportunity to become part of public consciousness. The bailout of financial institutions in the past two years has demonstrated the vital role of the state, notwithstanding the roll-back of regulatory measures in the 1990s. Nevertheless, the scale and range of activities engaged in by financial institutions leaves one in no doubt as to the limitations on the capacity of even the largest states to provide effective regulation.

Following the bailing-out of large financial institutions, such as AIG, the position of major players in the CDS networks of insurance and reinsurance for the mitigation of credit risk has bolstered belief in the idea that some institutions are, indeed, “too big to fail”. But as Markose et al have observed³⁶, perpetuating the fiction of non-failure of such a financial institution avoids an essential key credit event that may trigger a chain of obligations with itself as the focal point and also as guarantor of major bank balance sheet items. The loss of such items results in the banks being undercapitalised and menaced by potential insolvency. The failure to maintain proper monitoring and regulation of the CDS market resulted not only in the failure to contain the financial crisis within the constraints of the financial system, but the cost of remedying the situation has cost (and will continue to cost) taxpayers huge sums of money in bailouts.

VIII. EXTERNALITIES AND INFORMATION ASYMMETRIES

The assessment of risk in the modern financial services market appears, in many ways, evokes Coase’s work³⁷ regarding the economic efficiency of an economic allocation or outcome in the presence of externalities. However, Pigou³⁸ and Hardin³⁹ argued that

³⁴ Keohane, R.O., and Nye, JS, *Power and Interdependence*, (3rd ed.), Longman, New York, 2001

³⁵ Quoted in: “Buffett warns on investment ‘time bomb’”, <http://newesvote.bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/2/hi/2817995.stm> Downloaded 03/03/2010

³⁶ Markose et al, *Too Interconnected To Fail: Financial Contagion and Systemic Risk Model of CDS and Other Credit Enhancement Obligations of US Banks*, University of Essex, Discussion Paper Series, ISSN 1755-5361, February 2010

³⁷ Coase, R., *The Problem of Social Cost*, (1960) 3 *Journal of Law & Economics*

³⁸ Pigou, AC, (1946), *The Economics of Welfare*, 8th ed., London Macmillan

marginal cost pricing at the level of an individual unit is ineffective for modelling economic activities that have negative externalities. It may be the influence of such work that prompts Markose et al to comment that a practical modelling tool, useful for delivering quantitative analysis of systemic risks in the financial sector, remain elusive⁴⁰.

As Haldane notes⁴¹, the assessment of risk in the financial markets entails not only knowing one's counterparty, but knowing one's counterparty's counterparty too. This phenomenon gives rise to network externalities. A graphic illustration of such externalities, or contagions, was the case of Lehman Brothers, whose failure had such seismic effects.

The speed at which information is transmitted in international commerce and the huge profits to be gained from having access vital information before it becomes available to business rivals highlights the importance of information asymmetries. Just as Hayek⁴² emphasised the value of knowledge in society, the importance of information as a commodity has seldom been greater. A similar theme is apparent in the work of Markose et al, where they observe that an "information gap" on gross inter-institutional exposures, cross-market, cross-currency and cross-country linkages creates the potential for future turmoil. They urge that all credit extensions should be electronically tagged, so that their progress through the international financial system may be traced and the resulting information made publicly-available.

IX. REGULATION THAT IS NETWORK-AWARE AND NETWORK-BASED

Having a central clearing house for CDS contracts offers one potential solution to the risk that such instruments pose. Any clearing house would require sufficient capital or liquidity to counteract systemic risk. Concerns of this nature have led Markose et al (borrowing terminology relating to the vaccination of disease carriers) to propose the creation of a "...super-spreader fund"⁴³ which reflects the systemic risk posed by the network impacts of key financial players in it.

Financier George Soros has also noted that while ordinary securities must be registered with the Securities and Exchange Commission in the US before they may be traded, "synthetic" securities (such as CDOs and CDSs) ought to be similarly registered⁴⁴. Fundamental to Soros's argument is the contention that it is the task of regulators to understand derivatives

³⁹ Hardin, G., *The Tragedy of the Commons*, (1968) 162 Science, pp 1243-1248

⁴⁰ Markose et al, op. cit. p 12

⁴¹ Haldane, op. cit. p 15

⁴² Hayek, FA., *The Use of Knowledge in Society*, (1945) 35:4 American Economic Review, pp 519-530

⁴³ Markose, S., et al, op. cit. p 50

⁴⁴ Soros, G., *"America must face up to the danger of derivatives"*, Financial Times, 23/04/2010, p 13

and synthetic securities. They ought not to allow their creation if it is not possible to fully evaluate the resulting systemic risks. Were derivatives traded on exchanges registered as a class, it follows that specifically-created derivatives would have to be registered individually, with regulators being obliged to understand the risks involved. The very existence of such a registration process would be time-consuming, thus discouraging the use of over-the-counter derivatives.

X. CONTAGIONS AND THE “ROBUST-YET-FRAGILE” SYSTEM

According to Haldane, the scale and interconnectivity of the international financial services network has increased significantly over the past two decades.⁴⁵ However the author notes that the network has evolved into a “robust-yet-fragile” system, vulnerable to losses of confidence in key financial hubs at crucial moments and with rapid transmission of disturbance. Barabasi and Haldane⁴⁶ cite the experience in tackling the spread of HIV/AIDS as being relevant to the confronting threats in the international financial markets. In the case of randomly-distributed networks, targeted treatment is of limited utility. But in the case of networks having “long tails”, (including finance), targeted vaccination programmes seem to offer a more effective response to contagions and epidemics.

Gai and Kapadia have focused on the means by which losses may potentially spread via the complex network of counterparty exposures following the default of a party⁴⁷. The authors follow the logic of the market’s operation by examining how the knock-on effects on asset prices at some institutions of such a default can force the writing-down of asset values. “Contagion due to the direct interlinkages of interbank claims and obligations may thus be reinforced by direct contagion on the asset side of the balance sheet,”⁴⁸ they note. A criticism of the framework posited is that it may assume financial connections between intermediaries are formed on a random basis and are static. This may result in modelling the contagion process in a rather mechanical manner, as balance sheets and the size and structure of interbank linkages remain constant as default spreads throughout the system. It may be argued that, under conditions of “normality”, financial institutions are strong and minor variations in their probability of default do not affect lending decisions on the interbank market. However, the dramatic failures of Bear Stearns and Lehman Brothers demonstrate that contagion may spread rapidly; giving banks little time to protect

⁴⁵ Haldane, A., op. cit. p12

⁴⁶ Barabasi, A-L: *Linked*, op. cit. p123ff and Haldane, A., op. cit. p24. Given Haldane’s position as executive director at the Financial Stability Group at the Bank of England, his remarks appear to display serious intent to make the study of financial networks an essential element in financial stability oversight.

⁴⁷ Gai, P and Kapadia, S.; *Contagion in financial networks*, Bank of England Working Paper No. 383, p10

⁴⁸ Gai, P and Kapadia, S, op. cit. p3

themselves before being impacted. An appreciation of the significant role played by linkages is also evident in recent statements by the European Central Bank⁴⁹.

The model developed by the authors addresses the issue of contagion in arbitrary financial networks and seeks to address concerns about the widespread transmission of shocks in the context of rapid financial globalisation and in the aftermath of a large-scale, systemic financial crisis. One of the ironies emerging from such research is that while a high level of connectivity can diminish the likelihood of contagion, it may also accelerate the speed of its transmission across the system when problems arise. The aggregation of shocks and the presence of liquidity risk also increase the likelihood of contagion.

In common with the findings of other analysts, Gai and Kapadia's work shows that the financial systems may display tendencies towards being robust-yet-fragile. But, crucially, the research demonstrates how apparently indistinguishable shocks may have vastly different consequences. This may go some way to explain why the seeming resilience of the system to significant shocks prior to the recent financial crisis was not a good indicator of future robustness. For this reason (among others), those who suggest "solutions" to the problems exposed during the financial crisis, without displaying that they have reconsidered the manner in which they assess the system itself, must have their proposals subjected to the most thorough, reaching and critical assessment.

XI. LINKAGES: THE GREAT UNKNOWN

The assessment of risk when the extent of the linkages between institutions is not known presents one of the most important challenges to regulators. It would be of particular interest to conduct analysis based upon the consequences flowing from the failure of a particular financial institution, which would affect large and / or highly connected borrowers in the interbank system. Such an exercise could be married with the approach adopted by Chan-Lau, whereby the actual balance sheets for the targeted banks could be used. It is suggested that this approach could aid the development and maturing of a model of contagion risk.

Conducting analysis on the basis of factors that characterise the modern banking system may also yield a clearer picture of the risk confronting institutions. Nier et al have carried out research using criteria such as net worth, the size of the interbank market, the degree of connectivity and the concentration of the system⁵⁰. However, it emerges that the number of connections to the central node is hugely significant. The authors conclude that "...banking systems that show a high degree of tiering, i.e. where there is a first tier of money-centre

⁴⁹ Tumpel-Gugerell, Gertrude: *Recent advances in modelling systemic risk using network analysis*, European Central Bank Workshop, 5 October 2009, http://www.ecb.int/press/key/date/2009/html/sp091005_1.en.html

⁵⁰ Nier, E, Yang, J, Yorulmazer, T and Alentorn, A (2007), *Network models and financial stability*, Journal of Economic Dynamics and Control, Vol. 31, pp 2,033-60

banks and a second tier of smaller banks that depend on the first-tier banks – are not necessarily more fragile than more homogenous banking systems”⁵¹.

XII. “SHADOW-BANKING”: IT HAS NOT GONE AWAY

For those who are yet to be convinced that a radically new approach is necessary in order to assess the risks posed by the modern financial system and, therefore, to regulate it, the impact of the “shadow banking” network provides further evidence of the need for change. In order to evade the requirements of the Basel II regulations, prior to the crisis, the leverage of financial institutions rose to levels that were unprecedented. The favoured means by which the Basel II rules were circumvented was by the use of special investment vehicles (SIVs). Typically SIVs were used to purchase loans and sell bonds that were sliced and diced from them. Over time, as Tett has noted, financiers created a “...vast ‘shadow banking’ system that was out of the sight of almost everybody outside the specialist credit world”⁵². Indeed, as Krugman has written, the crisis “...for the most part, hasn’t involved problems with deregulated institutions that took new risks. Instead, it has involved risks taken by institutions that were never regulated in the first place”⁵³. The consequences of financial devastation wrought by institutions operating beyond the reach of regulators and dealing in products the regulators neither knew of nor understood have profound implications. The hedge fund market remains largely unregulated. Furthermore, the interaction between leverage, connectivity and system risk provides an overwhelming case for its investigation.

XIII. EMBEDDEDNESS AND THE NEED FOR “NEW” REGULATION

As Colander et al observe, it is very likely that “...extreme leverage levels of interconnected institutions will be found to impose unacceptable social risk on the public”⁵⁴. This seems evocative of Polanyi’s work⁵⁵ on the concept of embeddedness, in challenging the idea of the economy as an interlocking system of markets, automatically adjusting supply and demand through the price mechanism. If taxpaying citizens are left with no alternative other than to fund vast bank bailouts, fundamental issues of democratic accountability arise. Reviewing Polanyi’s work from the vantage point of 2001, Stiglitz noted that the “...freedom to move capital in and out of a country at will is a freedom that some exercise, at enormous cost to others. Unfortunately, the self-regulating economy ... does not

⁵¹ Nier, E et al, op. cit. p2,060

⁵² Tett, Gillian., *Fool’s Gold, How Unrestrained Greed Corrupted a Dream, Shattered Global Markets and Unleashed a Catastrophe*, Little, Brown (London) 2009, p116

⁵³ Krugman, Paul: *The Return of Depression Economics and the Crisis of 2008*, Norton: New York and London, 2009, p163

⁵⁴ Colander et al, op. cit. p13

⁵⁵ Polanyi, K., *The Great Transformation*, Beacon Press: Boston, 1957

represent a balancing of ... freedoms..."⁵⁶ As O'Brien has written: "Embedding restraint has become a policy priority for the entire regulatory community... in every major securities market"⁵⁷.

XIV. THE FUTURE: SOME FORECASTS

At a time of such great flux, it is difficult to predict how the regulation of the financial markets may evolve over the next five years in response to the financial crisis. However, it may be argued with some force that economics and the economics profession have failed to provide society with proper insight into the workings of the modern financial system and adequate warnings about the instruments it had created. The inability of conventional economic theory even to envisage the current problems of the global financial system requires that there must be a new approach to analysing the interconnectedness of economic actors and the risks that this produces. This has profound implications for regulatory "solutions" proffered by those who seem to focus upon the malign outcomes of a sub-prime system, rather than upon the composition and functioning of the system.

Network theory would appear to offer a preferable alternative to such analysis – and could aid the effective implementation of reforms such as those proposed by Volcker – as it offers the prospect of enabling regulators to determine what really is systemically important. The international, interconnected nature of the market makes the network metaphor all the more apposite. As Barabasi wrote a decade after the publication of his seminal work on network analysis, "...many fads have come and gone ... one thing is increasingly clear: Interconnectivity is so fundamental to the behaviour of complex systems that networks are here to stay"⁵⁸. The "easy" option is to enact new regulations intended to address the outcomes of system dysfunction. In reality, the ability of the financial services industry to devise new products means legislative measures resulting from the Volcker proposals may be circumvented. The real and more challenging task is to devise regulatory responses based on an understanding of how an evolving and multi-faceted, interconnected system actually functions.

⁵⁶ Stiglitz, J., Forward, in: K. Polanyi, *The Great Transformation* (2001, 2nd ed. 1944), p xvi

⁵⁷ O'Brien, Justin., *Engineering a Financial Bloodbath*, Imperial College Press (London) 2009, p 158

⁵⁸ Barabasi, A-L., *Scale-Free Networks: A Decade and Beyond*, *Science*, Vol. 325, July 24th, 2009, p 413

APPENDIX:

A directed, weighted financial network in which there are five banks, with darker lines corresponding to higher value links. This is an example of a simple, weighted, directed network with five nodes.

From: Gai, P and Kapadia, S, Contagion in financial networks, Bank of England Working Paper No. 383, p 11

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