Institution: London School of Economics and Political Science

Unit of Assessment: 19: Business and Management Studies

Title of case study: Smarter regulation of financial markets

1. Summary of the impact (indicative maximum 100 words)

LSE research on endogenous risk has had impact at both the macro and micro level. At the macro level, it provided input for the design of the counter-cyclical measures and systemic risk surcharges in the Basel III regulations in financial markets. It also provided a significant input to the G20 agenda on financial stability. At the micro level, the research has had a significant role in shaping the thinking and recommendations of the UK Foresight Report on "The Future of Computer Trading in Financial Markets". Through this, the work had a direct impact on Markets in Financial Instruments Directive (MiFID) II, the EU legislation that governs how EU financial service markets operate. The original EC proposal for trading halts in volatile markets - Minimum Resting Times (MRT) - to regulate high frequency trading was dropped and the Foresight proposal of time stamps based on synchronised atomic clocks across trading venues was adopted.

2. Underpinning research (indicative maximum 500 words)

Research Insights and Outputs: Based on their concerns about Basel II, as originally outlined in [1], Danielsson, Shin (now at Princeton) and Zigrand ([3], [5] and [7]), together with Goodhart [4], developed an approach to modelling financial risk and regulation that has since become known as "Endogenous Risk" [ER]. A survey of the main ideas can be found in [6].

ER models show how small shocks can snowball into extreme outcomes, purely because of reinforcing feedback loops originating within the system, without the need for extreme exogenous shocks. The macro outcome for risk can therefore be fundamentally different from that resulting from agents' risk management decisions. Specifically, the amplifying pro-cyclical feedback loops comprise of loss and margin spirals, in which fire sales destroy capital and increase risk (pecuniary externalities), which in turn forces further sales, closing the loop. These loops will in turn be directly affected by the nature of the regulatory policy environment. The intuitively appealing properties of ER, and its rigorous modelling in dynamic nonlinear rational expectations models (and in adaptive expectations models), have led to their practical application in many regulatory situations. The discussion here concentrates in particular on counter-cyclical capital regulations and on capital market infrastructure regulations.

In research financed by an EPSRC grant (GR/S83975/01), published in [3], the ER concepts were modelled to analyse Basel II with adaptive expectations. This was further developed in a rational expectations framework in both discrete time [6] and continuous time [5]. The essence of ER is seen to be robust to variations in the type of expectations, which is a reassuring finding. This work formed the basis for the ESRC funding of the new Systemic Risk Research Centre (SRC) at LSE and an ESRC grant on High Frequency Trading [8]. This research is also at the core of Goodhart's influential Geneva Report [4] outlining the general principles of financial regulation.

ER has many practical applications in policy analysis and design. The first policy application relates to computer-based and high-frequency trading. This can be found in [9], which describes a panoply of possible algorithmic feedback loops in high-frequency trading data, and offers policy suggestions about how to limit the potential instability inherent in such markets.

The second application arose from the initial paper [1], which was written in response to the Basel Committee's invitation for comments on its Basel II proposals. The paper highlighted the pro-cyclicality of the Basel II proposals and their risk amplification properties. This was the genesis of FMG's subsequent work in the macro-level endogenous risk area. ER modelling, with its focus on systemic risk, aids the design of counter-cyclical macro-prudential policy measures.

In contrast to micro-prudential regulation focused on individual financial institutions, macro-

prudential regulation concerns itself with the stability of the financial system as a whole. Research focused on macro-prudential risk and its regulation should therefore take into account the systemic importance of individual institutions such as size, leverage and their interconnectedness with the rest of the system. Hence, we need to complement micro-prudential regulation with macro-prudential regulation, which acts as a countervailing force to the natural decline in measured risks in a boom and the subsequent rise in measured risks in the following collapse. Goodhart's influential Geneva Report [4] outlines the general principles of such financial regulation based on LSE's research.

Key Researchers: Jon Danielsson has been at LSE from 1998, Charles Goodhart from 1985, and JP Zigrand from 1998.

3 References to the research (indicative maximum of six references)

[1] Danielsson, J., Embrechts, P., Goodhart, C., Muennich, F., Keating, C., Renault, O., and Shin, H. (2001). "An academic response to Basel II." *Financial Markets Group Special Paper* 130. http://eprints.lse.ac.uk/51497

[2] Danielsson, J. and Shin, H. (2003). *Endogenous risk. In Modern Risk Management: A History*. Risk Books. http://eprints.lse.ac.uk/10208

[3] Danielsson, J., Shin, H., and Zigrand, J.-P. (2004). "The impact of risk regulation on price dynamics. *Journal of Banking and Finance*, 28:1069–1087. DOI: 10.1016/S0378-4266(03)00113-4. http://eprints.lse.ac.uk/16628

[4] Goodhart, C. et al. (2009), *Geneva Reports on the World Economy.* In the series, "The Fundamental Principles of Financial Regulation". http://www.cepr.org/pubs/books/P197.asp

[5] Danielsson, J., Shin, H., and Zigrand, J.-P. (2010). "Balance sheet capacity and endogenous risk." *Mimeo*, FMG/WC DP 665. http://www.lse.ac.uk/fmg/workingPapers/discussionPapers/DP665_2011_BalanceSheetCapacity.pdf

[6] Danielsson, J. and Zigrand, J.-P. (2008). "Equilibrium asset pricing with systemic risk." *Economic Theory*, 35: 293–319. DOI: 10.1007/s00199-007-0238-3. http://eprints.lse.ac.uk/24823

[7] Danielsson, J. and Shin, H. and Zigrand, J.-P. (2012) "Endogenous Extreme Events and the Dual Role of Prices." *Annual Review of Economics*, 4: 111-129. DOI: 10.1146/annureveconomics-080511-110930 http://eprints.lse.ac.uk/43140

[8] ESRC Systemic Risk Research Centre at the LSE (ES/K002309/1) and an ESRC grant on High Frequency Trading (New Finance - High-frequency Trading Risk Simulation, project ID 866)

[9] Linton, O., O'Hara, M. and Zigrand J.-P. (2012). "Economic impact assessments on MiFID II policy measures related to computer trading in financial markets." *Foresight Working Paper*, Government Office for Science. http://www.futuresindustry.org/epta/downloads/Economic-Impact-assessments-on-MiFID-2-policy-measures_083012.pdf

Evidence of quality: ESRC Systemic Risk Centre, PIs Dr Jon Danielsson and Dr Jean Pierre Zigrand. Grant amount £3,757,474.70; publications in top peer-reviewed journals and major reports.

4. Details of the impact (indicative maximum 750 words)

LSE work on Endogenous Risk [ER] has impacted upon both the regulation of high-frequency trading as well as the design of macro-prudential regulation, highlighting the importance of the work at both the micro and macro levels. We first discuss the policy impacts and public debates related to high-frequency trading. This is followed by a discussion of macro-prudential regulation.

A. Impacts on regulation of high-frequency trading

Zigrand acted as lead expert to the Foresight project on "The Future of Computer Trading in Financial Markets" (2010-13) sponsored by Secretaries to the Treasury Hoban and then Clark [11]. Danielsson and Goodhart were also commissioned to produce inputs into this process. The final Foresight Report [10] illustrates the power of the ER principles outlined in papers [3], [5] and [6]. In particular, the Report casts doubt on a number of widely-held views on how high-frequency trading works and formed the basis for rethinking the nature of policy interventions. The Report showed that the MiFID II proposal of Minimum Resting Times (MRT) was flawed. The EU Parliament voted on the issue, with account taken of the Foresight findings, after discussions with Zigrand and colleagues [11]. Between the intervention and the vote, the MRT proposal was dropped. Moreover, the Foresight recommendation for time stamps based on synchronised atomic clocks across trading venues was subsequently added to MiFID II. Supranational and national regulators are now preparing their interpretations and guidance for MiFID II. On the basis of this impact, Zigrand and colleagues have been asked to advise on the adoption of best practice derived from Foresight by the Task Force on Micro-structural Issues of ESMA (6.12.12) as well as BAFIN (Germany), the Autorité des Marchés Financiers (France) and the AFM (Netherlands).

There was also impact through policy debates. In its discussions of MiFID II in relation to the City of London, the House of Lords [12] explicitly referred to [7]. Zigrand was invited to No 10 Downing Street (11.11.11) to inform the Prime Minister's advisors on the Foresight findings and also to No 11 Downing Street (19.04.12). On 26.11.12, the "Parliamentary Commission on Banking Standards" invited and cross-examined Zigrand on the effects of computer-based trading on financial markets [13]. Zigrand emphasised the endogenous risk feedback loops operating in robotic markets based on the academic papers [3], [5] and [6]. Zigrand was also invited to present at the high level EU Joint Research Centre meeting, where EU Commissioner Michel Barnier stated that "we should follow the lead example and model of the UK Foresight project on computer trading" (8.11.12) [14]. Similarly, Zigrand spoke on the recommendations of Foresight to the US Senate Banking Committee and to the US House Committee on Financial Services and to the US Commodities Futures Trading Commission (CFTC), including commissioner O'Malia as well as to Senator Coons. The work has also been discussed in numerous newspaper articles [15].

B. Impacts on macro-prudential regulation

The research has fed significantly into the macro-prudential policy debate (see, for example [19], [20] and [21]). The ER research outputs and ideas have fed into the G20 regulation agenda to reduce systemic risk in banking through Goodhart's influence in the development of the agenda and through Shin as adviser to the President of the Republic of Korea (2010) at the time of the crucial G20 meeting in Seoul. In the UK, the research has impacted policy, where the macro-prudential emphasis can be traced back to Goodhart and Shin's advice to the Bank of England. These ideas have been pushed further by Danielsson who gave evidence to the Treasury Select Committee of the UK parliament [16] and the Economic Affairs Committee, House of Lords [17], and to Danielsson and Zigrand's meetings with the Treasury to discuss endogenous risk (these meetings were not minuted, though Mark Hoban [18] references the work).

The macro-prudential counter-cyclical measures as suggested by LSE research on ER have become embedded in capital regulations emanating from the Basel Committee at the Bank of International Settlements (BIS), as well as in the latest push for macro-prudential regulations more generally. The emphasis on the role of systemic oversight, as opposed to supervisory oversight of individual institutions, is the crucial message. The ER approach leads to a natural focus on the need for and effective design of counter-cyclical measures in Basel III, such as counter-cyclical capital buffers. The most significant effect of which is a systemic risk surcharge on large interconnected banks as an absorption buffer.

Going beyond the two principal impacts detailed above, LSE research at the micro level also has influenced the debate on European hedge-fund regulation (Danielsson in 2008 at the European Parliament) and has had input into derivatives regulation and the role of counterparties (Zigrand at the European Commission 2009). Danielsson and Zigrand also consulted the Treasury on the

endogenous risks of financial transactions taxes, stamp duties and the UK bank levy. At the macro level, the research has ongoing input to central banks' policy discussions, including the Bank of England, Banque de France, NY Fed and the ECB, as well as the Icelandic and Luxembourgish Central Banks where Danielsson and Zigrand are advisers to the respective Governors. Influential books refer to this work ([4] and [20]).

Why does the impact matter? Both the impacts described above – on the regulation of high-frequency trading and on macro-prudential regulation – strengthen the stability of financial markets. This outcome is desirable for its own sake, but also because instability in financial markets can spill over into the wider economy, as the financial crisis of 2008 and the subsequent economic crisis in its aftermath have shown. The scale of the current economic crisis, where there has not yet been a return to pre-2008 trend paths in most economic indicators, demonstrates the significance of the impact.

5. Sources to corroborate the impact (indicative maximum of 10 references)
All Sources listed below can also be seen at: https://apps.lse.ac.uk/impact/case_study/view/24

[10] Beddington, J. et al (2012). "The future of computer trading in financial markets". Foresight, Government Office for Science. Foresight sent it to 242 Members of the EU Parliament, the EU Council, EU commission officials and the President of the EU, as well as to US senate and house committees and to regulators worldwide. The chapters on "Financial Stability and Computer Based Trading" and on "Economic Impact Assessments on Policy Measures" were written by Zigrand). https://apps.lse.ac.uk/impact/download/file/1440
[11] Supporting letter by the Chief Scientific Advisor to HM Government to Calhoun outlining the work and impact of Zigrand. This source is confidential.
[12] HOUSE OF LORDS, European Union Committee, 2nd Report of Session 2012–13. MiFID II: Getting it Right for the City and EU Financial Services Industry. https://apps.lse.ac.uk/impact/download/file/1453
[13] "Parliamentary Commission on Banking Standards Sub Committee G-Panel on the Operation of Wholesale Markets, Computer-Based trading, HC 784-I". https://apps.lse.ac.uk/impact/download/file/1454
[14] Michel Barnier, "Mettre la science au service de la stabilité financière et de la croissance en Europe". https://apps.lse.ac.uk/impact/download/file/1463
[15] Financial Times, New York Times, Washington Post, Evening Standard, Insurance Daily, Reuters, Huffington Post, Automated Trader, BBC Radio 4, CNBC, City AM, Bloomberg, Bureau of Investigative Journalism, The Trade News, Financial News and others. https://apps.lse.ac.uk/impact/download/file/1455
[16] House of Commons Treasury Committee. Banking Crisis: International Dimensions, Eleventh Report of Session 2008-09 (14 July 2009); https://apps.lse.ac.uk/impact/download/file/1456 [B.3] House of Commons Treasury Committee. The Committee's Opinion on proposals for European financial supervision, Sixteenth Report of Session 2008-09 (11 November 2009). https://apps.lse.ac.uk/impact/download/file/1457
[17] HOUSE OF LORDS Select Committee on Economic Affairs (2 June 2009). 2nd Report of Session 2008-09: Banking Supervision and Regulation. Volume I: Report; [B.2] https://apps.lse.ac.uk/impact/download/file/1458
[18] Hoban, M. (16 April 2012). Speech by the Financial Secretary to the Treasury, Mark Hoban MP; IOMA, https://apps.lse.ac.uk/impact/download/file/1459
[19] Landau, J. P. (2008), "Extreme events in finance: some reflexions," Banque de France. https://apps.lse.ac.uk/impact/download/file/1460
[20] French, K. R. et al. (2010). *The Squam Lake Report: Fixing the Financial System* (Princeton University Press). https://apps.lse.ac.uk/impact/download/file/1461
[21] Majnoni, G. and Powell, A. (2011*). On Endogenous Risk, the Amplification Effects of Financial Systems and Macro Prudential Policies.* Inter-American Development Bank. https://apps.lse.ac.uk/impact/download/file/1462