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EU regulation of compensation practices in banks: It's the tail risk, stupid

A. Introduction

After the 2007/2008 financial crisis has given way to a sovereign debt crisis in the Eurozone, the financial industry still struggles with its heavier bridle. The wave of new regulation appeared as a well-deserved backlash against egregious practices that pushed the world economy to the brink of collapse. A political consensus emerged that deregulation of financial markets and institutions since the 1980s had gone too far and that, after many years of retreat, the government should more actively intervene in financial markets.[1]

It has often been observed that financial regulation occurs in waves triggered by catastrophe.[2] Only a crisis seems capable of rallying the political attention and will to impose more robust oversight on a free-wheeling industry with great lobbying prowess. Judging from the amount of regulation passed after the crisis, lawmakers have not allowed this opportunity to pass. The overall effect on financial stability and the public interest remains to be seen. The flip side of crisis-driven legislation is that it is inevitably designed in haste and with little thorough analysis of the issues and the most suitable regulatory approach. Now that the dust has settled after a massive post-crisis overhaul of financial regulation, it is time to reexamine some of the new rules and subject them to the critical scrutiny that, ideally, should have preceded their adoption. The following analysis does so for one piece of crisis regulation that, so far, has attracted relatively little attention from legal commentators: The detailed set

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1 On deregulation as a cause of the crisis see, e.g., *Financial Crisis Inquiry Commission*, The Financial Crisis Inquiry Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States, 2011, p. 52 –56. On public demand for regulating compensation practices see, e.g., *E. Ferran*, New Regulation of Remuneration in the Financial Sector in the EU, European Company and Financial Law Review (ECFR) 2012, p. 1, 2–3, 8–9.

2 See, e.g., *R. Romano*, Regulating in the Dark and a Postscript Assessment of the Iron Law of Financial Regulation, Hofstra Law Review 43 (2014), p. 25, 28 –30; *L. Enriques*, Regulators' Response to the Current Crisis and the Upcoming Reregulation of Financial Markets: One Reluctant Regulator's View, Pennsylvania Journal of International Law 30 (2009), p. 1147 et seq.

of rules governing the compensation of bank employees who, as "material risk takers", are responsible for major risk-related decisions.[3] In contrast to the broad and longstanding debate on executive compensation, these new rules apply exclusively to financial firms, yet within those firms extend beyond directors and officers, covering essentially all senior management, traders, and other key players within the bank.

The study focuses on EU regulation mostly because the EU's tack has been considerably more aggressive and comprehensive than that of the US and other jurisdictions. Two main results emerge from the analysis: Firstly, systemic crises result from the combined vulnerability of financial institutions across the economy, which creates a correlated risk of precipitous and surprisingly large losses. Crisis prevention should focus on reducing these "fat tails" in the probability distribution of banks' returns. It is only tail risks that matter. Secondly, the new pay regulation is a mixed bag. Most requirements contribute little or nothing to mitigating systemic risk. They at best reflect what banks would do anyway in the interest of their shareholders, adding only the cost of regulatory intervention. Some rules, particularly the "bonus cap" introduced by the European Parliament, will likely impair incentive alignment in banks. On the bright side, the requirements to defer the payout of significant parts of variable compensation and to force bankers to retain equity or debt instruments for several years hold some promise. Yet the deferral and retention rules should be targeted more precisely at tail risks. As they stand, they fall short of their full potential.

After a brief introduction to pay regulation and its development (section B.) the analysis proceeds in two steps: It starts out by dissecting the nature of systemic risk and the incentive problems it poses, so as to determine the goal at which regulators should aim (section C.). The second step considers the key elements of the new rules

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[3] But see *G. Ferrarini*, § ■ (in this volume); *G. Ferrarini*/*M.C. Ungureanu*, Economics, Politics, and the International Principles for Sound Compensation Practices: An Analysis of Executive Pay at European Banks, Vanderbilt Law Review 64 (2011), p. 431 et seq.; *A. Johnston*, Preventing the Next Financial Crisis? Regulating Bankers' Pay in Europe, Journal of Law and Society (J. L. & Soc.) 41 (2014), p. 6 et seq.; *Ferran*, ECFR 2012, p. 1 et seq. For the US, see among others *S. Bhagat/B. Bolton/R. Romano*, Getting Incentives Right: Is Deferred Bank Executive Compensation Sufficient?, Yale Journal on Regulation (Yale J. Reg.) 31 (2014), p. 523 et seq. See also the pointed critique of EU legislation by the economist *K.J. Murphy*, Regulating Banking Bonuses in the European Union: A Case Study in Unintended Consequences, European Financial Management (Eur. Fin. Mgmt.) 19 (2013), 631.

on banks' compensation practices. It seeks to assess whether the provisions that have been drawn up in great haste after the crisis will live up to the high expectations (section D.). Section E. concludes.

B. Regulation of bankers' pay after the crisis

As soon as governments turned to the causes of the financial crisis of 2008, compensation practices in banks took an awkward spot in the limelight. Official reports and statements on the crisis did not tire to blame "excessive" bonuses for reckless risk taking.[4] As part of a broader package of regulatory advances, leaders of the G-20 countries requested regulators and bank supervisors to propose new rules to mend compensation structures in the financial industry.[5] In 2009, the Financial Stability Forum (later to turn into the Financial Stability Board) presented "principles" and then "implementation standards" for "sound compensation practices".[6] The EU took special pride in advancing the global initiative and in leading its implementation.[7] For the Capital Requirements Directive III (CRD III)[8] enacted in November 2010, the EU Commission drafted a set of detailed provisions for banks that subsequently have been copied, with occasional modifications, to

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4 G20 Pittsburgh Summit Leaders' Statement, 2009, para. 13 ("Excessive compensation […] has both reflected and encouraged excessive risk taking."); *High-Level Group on Financial Supervision in the EU*, Report, 2009, para. 24, 117 et seq.; *Financial Crisis Inquiry Commission* (fn. 1), p. 61 et seq. (also emphasising the level of compensation); *Group of 30*, Financial Reform, A Framework for Financial Stability, 2009, p. 13 ("Highly aggressive and unbalanced compensation practices have strongly encouraged risk taking over prudence."). Even the global industry association found some reason for concern, *Institute of International Finance*, Final Report of the IIF Committee on Market Best Practices, 2008 ("incentives at times reflected the emphasis on short-term profitability in the market's response to financial reporting").

5 G20 Washington Summit Declaration, Action Plan to Implement Principles for Reform, 2008 (mandate to IMF/Financial Stability Forum).

6 *Financial Stability Forum*, FSF Principles for Sound Compensation Practices, 2009; *Financial Stability Board*, FSB Principles for Sound Compensation Practices, Implementation Standards, 2009. See also *Basel Committee on Banking Supervision*, Compensation Principles and Standards Assessment Methodology, 2010. For a timely critique see *Ferrarini/Ungureanu*, Vanderbilt Law Review 64 (2011), 431 and now *Ferrarini*■■**this volume, III.B.■■**.

7 See *Ferran*, ECFR 2012, 1, 12 et seq. (describing European influence on the international standards and US reluctance).

8 Amending Directive 2010/76/EU of 24 November 2010, OJ L 329 of 14/12/2010, p. 3 et seq. The preparation of the directive is described in *Johnston*, J. L. & Soc. 41 (2014), 6, 13 et seq.; for an overview of the main content, see *Ferran*, ECFR 2012, 1, 19 et seq.

legislation regarding alternative investment funds,[9] traditional investment funds[10] and then again to the recast of the Banking Directive[11]. Only the insurance industry escaped the one-size-fits-all approach and ended up with leaner and less intrusive rules.[12]

EU pay regulation for banks contains a range of requirements: A voluminous set of provisions makes substantive demands regarding the structure of compensation paid not only to all employees with a "material impact" in the bank's risk profile, ranging from directors and executives to major loan officers, traders, and senior risk managers.[13] Banks also have to establish a governance structure and processes to determine and control their pay practices. The more important of these rules will be analysed in section D. below. In addition, as part of the disclosure regime intended to foster market discipline (pillar 3 of the Basel II accord), banks have to publish information about their compensation policies as well as a broad range of quantitative data.[14] Member state authorities and the European Banking Authority (EBA) are required to collect and aggregate information and to make it available to the public.[15] EBA is also charged with drawing up guidelines for the implementation of pay regulation.[16] The current guidelines, dating from 2010, run 86 pages, the 2015 draft of new guidelines 120 pages.[17]

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9 Art. 13 and annex II Alternative Investment Fund Managers (AIFM) Directive 2011/61/EU of 8 June 2011, OJ L 174 of 1/7/2011, p. 1 et seq.

10 Art. 14a, 14b Undertakings for Collective Investments in Transferable Securities (UCITS) Directive 2009/65/EC, as amended by UCITS V Directive 2014/91/EU of 23 July 2014, OJ L 257 of 28/8/2014, p. 186 et seq.

11 Directive 2013/36/EU of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, OJ L 176 of 27/6/2013, p. 338 et seq.

12 Art. 275 Commission Regulation on Solvency II of 10 October 2014, OJ L 12 of 17/1/2015, p. 1 et seq.

13 The scope of the rules is explained and evaluated infra D.I.

14 Art. 450 Capital Requirements Regulation (EU) No 575/2013 of 26 June 2013, OJ L 176 of 27/6/2013, p. 1 et seq., following *Basel Committee on Banking Supervision*, Pillar 3 disclosure requirements for remuneration, 2011.

15 Art. 75(1), (3) Banking Directive.

16 Art. 74(3), 75(2) Banking Directive.

17 *Committee of European Banking Supervisors* (CEBS), Guidelines on Remuneration Policies and Practices, 2010; *European Banking Authority* (EBA), Consultation Paper, Draft Guidelines on sound remuneration practices, EBA/CP/2015/03, 2015 (including questions for public comments).

From a comparative perspective, the EU has shown greater zeal in regulating pay than other jurisdictions. Not only was the EU the first to adopt the Financial Stability Board's principles and standards and to implement it for most of the financial industry, but also did the European Parliament succeed in introducing an additional bonus cap for bankers not contained in the international standards.[18] The latter became the subject of fierce academic and political controversy, culminating in an annulment action by the United Kingdom against the respective provisions of the Banking Directive.[19] Contrast this with the hesitant approach in the US: Federal bank supervisors did promulgate "Guidance on Sound Incentive Compensation Policies" as early as 2010.[20] Although the guidance claims to conform to international principles and standards, it omits their more specific demands, such as that 40–60% of variable compensation be deferred and at least 50% be paid in equity instruments.[21] It explicitly chanmpions a supervisory approach imposing only broad principles and offering much leeway in complying with supervisory objectives.[22] While the Dodd-Frank Act of 2010 demanded that supervisors, within nine months, prescribe more robust "regulations or guidelines" to prohibit perilous compensation practices,[23] a rule proposal of 2011 stalled and appears to have been abandoned.[24] While executive pay continues to rank high on the agenda in the US, regulators seem loath to meddle with compensation systems for a broader class of significant employees within banks. Comprehensive pay regulation in banks remains a European preoccupation.

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18 See infra D.II.

19 The UK withdraw the action after advocate general Jääskinen had delivered an unfavourable opinion on 20/11/2014, case C-507/13, (*UK/Parliament and Council*), ECLI:EU:C:2014:2394.

20 *Office of the Comptroller of the Currency* et al., Guidance on Sound Incentive Compensation Policies, Federal Register 75 (2010), 36395.

21 On deferral and retention of variable pay, see infra D.IV.

22 See *Office of the Comptroller of the Currency* et al., Guidance on Sound Incentive Compensation Policies, Federal Register 75 (2010), 36395, 36399 ("principles-based framework").

23 Sec. 956(b) Dodd-Frank Act, 12 USC § 5641(b).

24 *Office of the Comptroller of the Currency* et al., Incentive-Based Compensation Arrangements, Proposed Rule, Federal Register 76 (2011), 21170 (containing inter alia a duty to defer at least 50% of variable compensation). See *Ferran*, ECFR 2012, 1, 26–7 (describing the proposal as US regulators following a European lead).

C. The justification for regulating pay: systemic risk and the financial crisis of 2008

The new regulation clearly is motivated by the financial crisis and a desire to prevent its recurrence. In justifying their intervention in banks' relations with key employees, lawmakers have been wise enough not to overstate the role of compensation in the financial crisis of 2007 and 2008. They have, however, claimed a "widespread consensus that inappropriate remuneration practices in the financial services industry also induced excessive risk-taking".[25]

I. Systemic risk

The most recent crisis has provided a painful lesson of how a systemic event in the financial system can cripple the economy; the consequences appear to be particularly severe in comparison to similar historical incidents.[26] To understand how a shock in the financial system affects real growth, one needs to consider the two essential services that banks and other financial intermediaries provide to the real economy: Firstly, they offer an opportunity to store and transfer value in the form of bank deposits or other money-like claims. It is essential that the claims used in these depositary and payment functions be perceived as "safe beyond doubt".[27] Because firms and individuals rely on the safety of these assets for their liquidity needs, the government ultimately cannot allow banks to collapse, at least if this means heavy losses to a large amount of (seemingly) safe assets. The second service provided by

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25 Commission Recommendation on remuneration policies in the financial services sector 2009/384/EC, OJ 2009 L 120/22, recital 2.

26 *C.D. Romer/D.H. Romer*, New Evidence on the Impact of Financial Crises in Advanced Countries, National Bureau of Economic Research (NBER) Working Paper Series 2015, No. 21021; *C.M. Reinhart/K.S. Rogoff*, Recovery from Financial Crises: Evidence from 100 Episodes, American Economic Review 104 (2014), p. 50, 53–5. For the effects of the recent crisis on the British economy see the *Independent Commission on Banking*, Final Report – Recommendations (Vickers report), 2011, p. 124–126.

27 For this notion, see *G.B. Gorton/G. Pennacchi*, Financial Intermediaries and Liquidity Creation, Journal of Finance (JF) 45 (1990), p. 49 (explaining financial intermediation with the need for liquid assets); *O. Hart/L. Zingales*, Banks Are Where the Liquidity Is, NBER Working Paper Series 2014, No. 20207 (explaining the need for safe assets); *R.C. Merton/R.T. Thakor*, Customers and Investors: A Framework for Understanding Financial Institutions, NBER Working Paper Series 2015, No. 21258 (describing customers of financial institutions as unwilling to bear credit risk); *G.B. Gorton/S. Lewellen/A. Metrick*, The Safe-Asset Share, American Economic Review 102 (2012), p. 101 et seq. (arguing that "safe" assets have remained at a stable share of one third of all assets in the US since 1952).

financial intermediaries is, of course, financing real investment.[28] Here, too, a systemic event can have severe consequences for economic activity. When banks and other intermediaries suffer losses, they often rush to reduce their default risk to preserve the safety of their debt. To do so, they need to deleverage and to decrease their credit risk exposure. For both reasons, financial institutions cut down their borrowing to firms and consumers. The precipitous credit contraction then disrupts investment and other activities in the real economy.[29]

The economic losses from the financial crisis are no doubt very substantial. How large they are in terms of expected value is difficult to tell because, as we will see later, the probability of systemic events can only be guessed. Nonetheless, it is highly advisable to consider additional precautions that contribute to mitigating systemic risk, such as regulating pay in the financial industry. Clearly, the political pressure to act is, and has been, immense. In designing a response that has at least some desired effect, it is essential to understand the nature of systemic events and hence of the risk that regulation seeks to minimise.

1. The crisis of 2008 as an illustration: how rather small losses pushed the world almost over the brink

The financial crisis of 2008 offers an illustration. As is well known, the crisis originated in the securitisation of subprime mortgages in the US. Early on, many commentators noticed that the losses that shattered financial stability were surprisingly small. As the former chairperson of the Federal Reserve, Ben Bernanke, put it: "[T]he stock market goes up and down every day more than the entire value of the subprime mortgages in the country."[30] A study covering almost 90% of the

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28 For the connection between the two functions – financing real, illiquid investment through liquid liabilities – see, seminally, *D.W. Diamond/P.H. Dybvig*, Bank Runs, Deposit Insurance, and Liquidity, Journal of Political Economy (JPE) 91 (1983), p. 401 et seq.

29 For evidence of a credit crunch from the recent financial crisis see *V. Ivashina/D. Scharfstein*, Bank lending during the financial crisis of 2008, Journal of Financial Economics (JFE) 97 (2010), p. 319 et seq.; *M. Campello/J.-R. Graham/C.R. Harvey*, The real effects of financial constraints: Evidence from a financial crisis, Journal of Financial Economics (JFE) 97 (2010), p. 470 et seq. Likewise for banks as liquidity providers through credit lines *V.V. Acharya/N. Mora*, A Crisis of Banks as Liquidity Providers, Journal of Finance (JF) 70 (2014), p. 1 et seq.

30 *Financial Crisis Inquiry Commission* (fn. 1), p. 227.

subprime mortgage-backed securities (MBS) issued between 2004 and 2007 found realised losses of only 5.29% of the issue amount or $69.3 billion on investment grade[31] MBS as of February 2011.[32] In a similar vein, the US Financial Crisis Inquiry Commission estimated that only 4% of subprime MBS issued 2005–2007 faced actual or imminent losses by the end of 2009.[33] A more recent estimate by Standard and Poor's is less cheerful, documenting default rates of around 16%, 41%, 59%, and 55% for all types of structured finance securities issued in each of the years 2004–2007 that were originally rated investment grade.[34] However, these percentages refer to all investment-grade ratings, not just triple-A, and they span the whole universe of structured finance and reflect the number of securities with defaults, not the amount of losses sustained. Be this as it may, the actual overvaluation of MBS was in the order of magnitude of at most "several hundred billion dollars", a rather small amount compared to banks' equity, let alone the ensuing loss in stock market valuation.[35] Measured by the size of the losses, it is rather puzzling how the burst of the real estate bubble in the US almost caused a financial meltdown.

What turned a bad bet on the housing market into a systemic event was the reliance of banks on markets for liquidity.[36] As mentioned above, one elementary service of financial intermediaries is to create safe and liquid assets as private money and

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31 "Investment grade" contains the top ten rating classes from AAA to BBB– (S&P and Fitch) or Aaa to Baa3 (Moody's).

32 *S.Y. Park*, The Size of the Subprime Shock, Working Paper, 2012. The paper also claims that triple-A rated MBS – accounting for about 83% of the issue amount of the sample – were almost unaffected with a loss percentage as low as 17%.

33 The respective percentage for "Alt-A" MBS was 10%, while CDOs were affected much worse, see *Financial Crisis Inquiry Commission* (fn. 1), p. 228–229; *E.P. Stringham*, It's not me, it's you: the functioning of Wall Street during the 2008 economic downturn, Public Choice 161 (2014), p. 269, 277 (reporting default rates of CDOs).

34 *Standard & Poor's*, Global Structured Finance Default Study (1978-2013): Credit Deterioration Slows, 2015, Table 9.

35 *M.K. Brunnermeier*, Deciphering the Liquidity and Credit Crunch 2007–2008, Journal of Economic Perspectives (J. Econ. Persp.) 23 (2009), p. 77 ($8 trillion stock market losses in the US 2007–2008). See also *R.J. Caballero/P. Kurlat*, The "Surprising" Origin and Nature of Financial Crises: A Macroeconomic Policy Proposal, Working Paper 2009, p. 11–12 (explaining that the decline in bank market valuation was much larger than the losses from mortgage assets).

36 See *H.S. Shin*, Risk and Liquidity, 2010, p. 233: "The global financial crisis […] has the distinction of being the first post-securitization crisis in which banking and capital market developments have been closely intertwined."

"parking space" for value.[37] Traditionally, such assets have been provided in the form of deposits that commercial banks use to finance their lending. The quintessential problem for this type of banking is the maturity mismatch between short-term liabilities (deposits) and long-term assets (loans). Traditional banks are inherently fragile because they would not be able to honour the short-term claims of all of their depositors at the same time. A bank run is always present as a possible equilibrium even if a bank's assets well exceed its liabilities.[38] Against this backdrop, it appears a straightforward innovation to let banks insure each other against liquidity shocks by enabling them to sell their long-term assets in a market. To this end, individual loans, mortgages or other assets have to be transformed into quickly tradable assets – they must become liquid. This is the purpose of securitisation: Assets are pooled to diversify risk; the resulting cash-flows from the portfolio are sliced into tranches. "Asset-backed securities" (ABS) issued from the highest tranches are meant to bear almost no risk of default, as testified by a high rating.[39] Because these senior ABS are supposed to be safe beyond doubt, they can be sold at no discount, making them highly liquid.[40]

The resulting structure has been aptly described as "securitised banking":[41] Banks and other intermediaries hold large amounts of ABS with long maturities, funding

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37 See *supra* fn. 27 and accompanying text. For the term "private money" see, e.g., *G.B. Gorton/G. Ordoñez*, Collateral Crises, American Economic Review (AER) 104 (2014), p. 343, 344; for "parking space" see *B. Holmström*, Understanding the Role of Debt in the Financial System, Bank for International Settlements (BIS) Working Paper, 2015, p. 20; and *G. di Iasio/Z. Pozsar*, A Model of Shadow Banking: Crises, Central Banks and Regulation, Working Paper, 2015, p. 3, 6–8 (pointing to the difficulty of storing large amounts of cash).

38 The standard reference, also with respect to the economic justification of deposit insurance, is *Diamond/Dybvig*, JPE 1983, p. 401.

39 For a detailed description specifically of subprime MBS and collateralised debt obligations (CDOs), see *G.B. Gorton*, Slapped by the Invisible Hand: The Panic of 2007, 2010, p. 82–104.

40 Assets are more liquid the less they are subject to an information asymmetry and to adverse selection, see *Holmström* (fn. 37), p. 5–6. For the notion that highly liquid assets ("private money") should be information insensitive so that the parties choose to remain ignorant ("no questions asked"), see *T.V. Dang/G.B. Gorton/B. Holmström*, Ignorance, Debt and Financial Crises, Working Paper 2012. Note that there are typically no public markets with observable prices for ABS, *G.B. Gorton*, Information, Liquidity, and the (Ongoing) Panic of 2007, American Economic Review: Papers & Proceedings 99 (2009), p. 567, 567–568. There is no use in producing information through public markets if an asset is information insensitive, see *Holmström*, (fn. 37), p. 4–7.

41 *G.B. Gorton/A. Metrick*, Securitized banking and the run on repo, Journal of Financial Economics (JFE) 104 (2012), p. 425.

them through short-term liabilities. The most prominent way of refinancing ABS portfolios are sale-and-repurchase (repo) transactions.[42] Under a repo agreement, the bank sells and later buys back a security at a specified price. The repo effectively amounts to a loan to the bank with the security as collateral, the analogue of a deposit in traditional banking.[43] If investors grow suspicious about the bank's solvency, they might decline to refinance the bank through repo transactions or require a higher "haircut" (safety margin on the collateral). But, importantly, the maturity mismatch between assets and liabilities no longer allows a self-fulfilling run on the bank. An embattled bank can quickly raise cash by selling their ABS to other market participants. By standing ready to buy ABS in the market, banks insure each other against liquidity risk. As a consequence, the withdrawal of short-term funding no longer threatens the bank's liquidity.

Liquidity insurance remains effective as long as ABS markets work smoothly. This implies that the fate of individual banks is tied to the markets on which they rely for liquidity. In addition, these markets become a public display of the value of banks' assets and hence their solvency. It is through these market channels that subprime losses eventually shattered the stability of the system. As said before, ABS are designed to be safe beyond doubt; with virtually no default risk, face value equals fundamental value. This relieves buyers of the need to value ABS and to require a markdown for a seller's potential informational advantage.[44] Yet when doubt over the valuation of subprime MBS and their high ratings mounted in 2007 and 2008,[45] buyers could no longer stay "blissfully ignorant".[46] As a possible response, they

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42 Another type of securitised banking was asset-backed commercial paper, see, e.g., *D. Covitz/N. Liang/G.A. Suarez*, The Evolution of a Financial Crisis: Collapse of the Asset-Backed Commercial Paper Market, The Journal of Finance (JF) 68 (2013), p. 815.

43 Except that depositors receive no collateral. For a description of repo markets, see *Gorton/Metrick*, JFE 2012, p. 431–433; *A. Copeland/A. Martin/M. Walker*, Repo Runs: Evidence from the Tri-Party Repo Market, Journal of Finance (JF) 69 (2014), p. 2343, 2347–2352.

44 *Supra* fn. 40.

45 *Gorton*, AER 2009, p. 567 –568 suggests that the introduction of publicly traded credit default swaps (CDS) on indices of RMS may have triggered the crisis by creating a visible market estimate of RMS default risk.

46 The expression is borrowed from *Gorton/Ordoñez,* AER 2014, p. 343, 345; *Holmström* (fn. 37), p. 6. *Gorton/Ordoñez,* AER 2014, p. 343, describe formally how the failure to produce information about the value of safe assets engenders a credit boom with more and more risky lending; the boom ends when a shock jump-starts information production.

could have attempted to understand the ABS and evaluate them to prevent adverse selection. However, the relevant ABS were notoriously complex and opaque, effectively forbidding a reliable value assessment.[47] The likely consequence were hefty discounts to compensate for the potential default risk and to account for adverse selection. Having to accept large markdowns means that ABS abruptly lost their liquidity. In addition, there is a second reason why liquidity in ABS markets suddenly "dried up". While markets offer insurance against a run on a single bank, there is a risk of a larger run on the corresponding market itself: If investors lose confidence not just in a single bank but – after observing a decline in market values of ABS – in several banks with ABS holdings, the withdrawal of funding forces all of them to sell simultaneously while eliminating the same banks as potential buyers. The resulting pressure on prices further exacerbates the flight of investors, creating an even stronger need to raise cash. While the price decline should, in principle, attract other market participants with sufficient funding, these other players will not buy into a falling market as long as more selling is under way and they can expect to buy later at even more depressed prices. A correlated run on banks thus can lead to a run on the markets that were supposed to ensure the liquidity of banks.[48]

The empirical evidence supports the view that the relatively modest losses from the credit boom in US real estate triggered a liquidity breakdown, and only this sudden loss of liquidity turned the burst of the real estate bubble into a severe financial crisis. Figure 1 depicts the prices of credit default swaps (CDS) for four index

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47 *Gorton/Ordoñez*, AER 2014, p. 346, and *Holmström* (fn. 37), p. 5–6, 12–15, suggest that in good times the opacity of ABS fostered their use as highly liquid, money-like asset about which "no questions were asked".

48 A formal model regarding specifically the connection between bank liquidity and the liquidity of markets for bank assets can be found in *A. Martin/D. Skeie/E. L. von Thadden*, The fragility of short-term secured funding markets, Journal of Economic Theory (J. Econ. Th.) 149 (2014), p. 15. For the interaction of market participants' funding and market liquidity, see generally *A.E. Bernardo/I. Welch*, Liquidity and Financial Market Runs, Quarterly Journal of Economics (QJE) 119 (2004), p.135 et seq. (explaining runs with financially constrained market makers); *M.K. Brunnermeier/L.H. Pedersen*, Market Liquidity and Funding Liquidity, Review of Financial Studies (Rev. Fin. Stud.) 22 (2009), p. 2201 et seq.; *V.V. Acharya/S. Viswanathan*, Leverage, Moral Hazard, and Liquidity, Journal of Finance (JF) 66 (2011), p. 99 et seq.; *M. Oehmke*, Liquidating Illiquid Collateral, Journal of Economic Theory (JET) 149 (2014), p. 183 et seq. (explaining price overshooting in collateral markets with risk bearing limitations of lenders); *F. Malherbe*, Self-fulfilling Liquidity Dry-ups, Journal of Finance (JF) 69 (2014), p. 947 (pointing to liquidity hoarding as a cause of future adverse selection and providing a useful overview of the literature).

portfolios of twenty triple-A rated MBS. To buy insurance for a nominal amount of $100 invested in one of the portfolios, one had to pay a premium of $100 minus the value indicated by the corresponding line in Figure 1; thus, the insurance premium in January 2006 was close to zero.[49] Comparing the prices during 2008 and 2009 in Figure 1 with the realised losses and defaults in MBS reported above indicates that the market valuation of CDS by far overstated the default risk.[50] It has been demonstrated that CDS prices not only overshot relative to realised losses but also were inconsistent with any *ex ante* reasonable set of valuation assumptions[51] and even concurrent MBS pricing.[52] Supplemental analyses suggest that CDS prices became more dispersed, reflecting increased sensitivity to information,[53] and were related to the financial condition of banks rather than to information about the quality of the underlying MBS.[54]

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49 For a more detailed description, see *R. Stanton/N. Wallace*, The Bear's Lair: Index Credit Default Swaps and the Subprime Mortgage Crisis, Review of Financial Studies (Rev. Fin. Stud.) 24 (2011), p. 3250, 3253–3254. For a description of the ABX.HE indices, see *I. Fender/M. Scheicher*, The Pricing of Subprime Mortgage Risk in Good Times and Bad: Evidence from the ABX.HE Indices, Applied Financial Economics (Appl. Fin. Econ.) 19 (2009), p. 1925, 1927–1932.

50 For triple-A subprime MBS, *Park* (fn. 32), reports realised losses of 17% as of February 2011. Similarly, *Stanton/Wallace*, Rev. Fin. Stud. 2011, p. 3260–3262, document that not a single triple-A tranche in the four ABX.HE portfolios in Figure 1 had suffered any loss by July 2010. Even with a default rate of 59% as reported by *Standard & Poor's* (fn. 34), for investment grade (not just triple-A) rated structured finance securities, the actual losses would be far lower because there are significant recoveries conditional on default, cf. *Stanton/Wallace*, Rev. Fin. Stud. 2011, p. 3260–3262.

51 *Stanton/Wallace*, Rev. Fin. Stud. 2011, p. 3265–3270 (suggesting *inter alia* that with a historically low recovery rate of around one third, a 100% default rate would have been needed to support the market price).

52 *Gorton*, AER 2009, p. 568–571 (arguing that the arbitrage link to MBS markets broke during the crisis).

53 *Holmström* (fn. 37), p. 16.

54 *Stanton/Wallace*, Rev. Fin. Stud. 2011, p. 3270–3275; see also *Fender/*Scheicher, AFE 2009, p. 1925 (providing evidence that liquidity concerns contributed to the fall in subprime MBS prices).

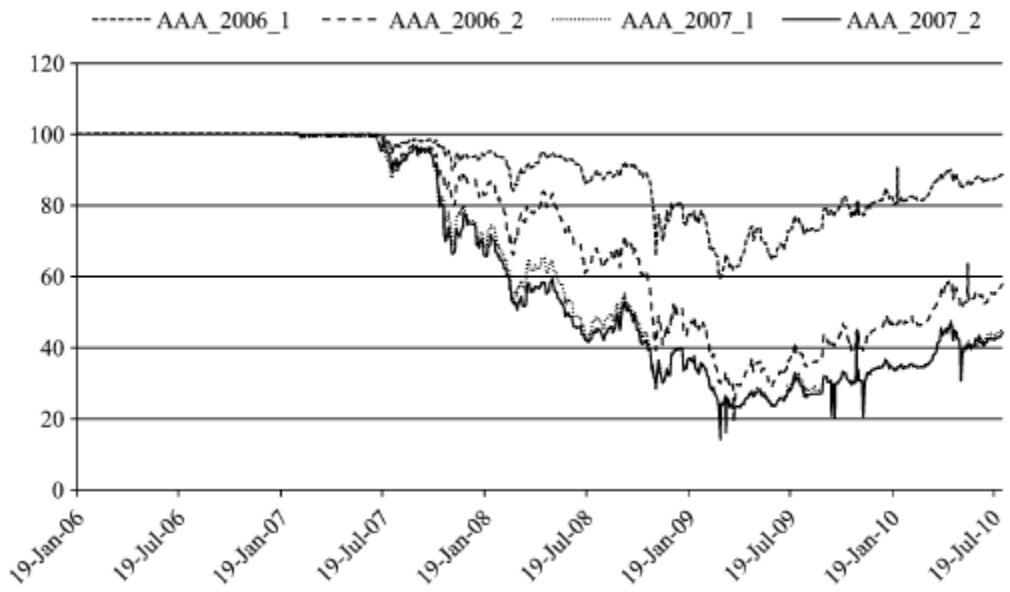

Figure 1: Prices of credit default swaps (CDS) for index portfolios of twenty triple-A MBS. The "ABX.HE" index portfolios were formed in January and July of 2006 and 2007, respectively. The figure is reproduced from Stanton and Wallace (supra fn. 49).

The drop in market valuations of MBS and related CDS corresponds with a hasty withdrawal of funding from investment banks. The total pre-crisis volume in repos has been estimated at $10 trillion for the US and $6–7 trillion for Europe.[55] For a sample of ABS and other securities in the US, it has been found that the average haircut rose from almost zero before the crisis to 45% in late 2008.[56] As a consequence, investment banks faced the choice either to finance the haircut from other sources or to sell their holdings into a falling market. Investors likewise pulled out of the asset-backed commercial paper market, another major short-term financing channel for ABS portfolios.[57] Disruptions in ABS markets other than MBS appeared

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55 For these and other estimates, see *Gorton/Metrick*, JFE 2012, p. 432–433.

56 *Gorton/Metrick*, JFE 2012, p. 428–429. In the tri-party repo market, a different segment, margins remained relatively stable but the total volume of lending declined, especially in relation to distressed investment banks, *Copeland/Martin/Walker*, JF 2014, p. 2345–2346, 2356–2366; with respect to the tri-party market see also *A. Krishnamurthy/S. Nagel/D. Orlov*, Sizing Up Repo, Journal of Finance (JF) 69 (2014), p. 2381, 2396–2399.

57 *Covitz/Liang/Suarez*, JF 2013, p. 815 ; *M. Kacperczyk/P. Schnabl*, When Safe Proved Risky: Commercial Paper during the Financial Crisis of 2007–2009, Journal of Economic Perspectives (J. Econ. Persp.) 24 (2010), p. 29, 37–41; see also *E. Schroth/G.A. Suarez/L.-A. Taylor*, Dynamic debt runs and financial fragility: Evidence from the 2007 ABCP crisis, Journal of Financial Economics (JFE) 112 (2014), p. 164 (estimating a structural model to show that leverage and

to be driven by the market-perceived creditworthiness of banks,[58] supporting the view that prices reflected forced selling due to liquidity needs of banks rather than only the deteriorated quality of ABS. Finally, a study covering the major US investment banks from the 1990s until 2008 shows that these market participants manage their individual risk by increasing leverage in good times and deleveraging in bad times; the resulting funding capacity was predictive of risk premia and asset prices.[59]

2. The nature of systemic risk

The recent financial crisis is not going to repeat itself. Nonetheless, analysing this particular episode reveals defining features of systemic risk that the post-crisis wave of financial regulation seeks to address. A striking characteristic is that systemic risk is, indeed, "systemic" not only in its effect but also in its root cause. The recurrent theme in the above account of the crisis is the liquidity of markets. The extent to which assets can be sold readily and at no discount depends on the behaviour of "the market". It is beyond the control of any single player whether market participants view a particular asset class as "information insensitive" and trade it at face value "without questions asked"[60] – or when and why doubts about the valuation suddenly make these assets information sensitive and less liquid.[61] Likewise, market liquidity evaporates when other market participants hit their internal funding constraints.[62] The probability of a simultaneous funding shortfall, therefore, depends on the level and distribution of leverage in the market. Systemic risk is a "macro" phenomenon; it depends on the state of the market, not the single institution.[63] Of course, it remains

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asset liquidity strongly predict which ABCP issuers suffer a run). It has been claimed that asset-backed commercial paper was even more important than repo as an ABS funding source from outside the (investment) banking sector, *Krishnamurthy/Nagel/Orlov*, JF 2014, p.2396–2399.

58 *Gorton/Metrick*, JFE 2012, p. 441–447.

59 *T. Adrian/H.S. Shin*, Liquidity and leverage, Journal of Financial Intermediation (J. Fin. Intermed.) 19 (2010), p. 418.

60 On information insensitivity, *supra* fn. 40.

61 See *supra* text accompanying fn. 44 *et seq*.

62 See the references in fn. 48, 59.

63 For the move towards "macroprudential" regulation see, e.g., *S.G. Hanson/A.K. Kashyap/J.C. Stein*, A Macroprudential Aproach to Financial Regulation, Journal of Economic Perspectives (J. Econ. Persp.) 25 (2011), p. 3, 5 (providing a short-hand definition as controlling "the social costs

true that systemic risk results from decisions made by individual players, such as the amount of leverage taken, the exposure to certain asset classes and the degree of reliance on market liquidity. Controlling systemic risk ultimately requires adjustments by individual firms. And yet a key challenge is that the appropriate adjustments depend on information about the aggregate state of the market.

A second characteristic of systemic risk is that it materialises in rare events with large, disastrous losses. Both the rarity and the hefty impact of systemic events can be traced back, ironically, to the relative success of risk management techniques at limiting the probability of large losses for investors and financial institutions. The most important risk minimization tool is diversification: If different risky investments – say, loans or other assets – are less than fully correlated, pooling them in a portfolio reduces the overall risk (variance) per Euro invested. In addition, the central limit theorem of probability theory implies that the return from a portfolio of independently distributed risks approximates a normal distribution ("bell curve") even if the component assets have a less benign return distribution. For instance, a typical loan pays the face value of principal plus interest with high probability or, with a small but non-trivial probability, a much lower amount if the borrower defaults; the probability distribution of returns has a left or negative "fat tail".[64] But if many loans are pooled, the probability of extreme outcomes for the portfolio becomes exceedingly small. By moving towards a normal distribution, risk pooling helps to calculate a maximum loss amount with a high degree of confidence, the well-known "value at risk".[65] The estimated value at risk can be used to determine a minimum safety margin, such as a capital buffer, or it can be the relevant measure for limiting the amount of risk-taking.

Risk management techniques like value at risk strive to rule out the possibility of a disastrous loss. When this purpose is defeated, it is usually because risks are correlated so that diversification fails to reduce variance and the return distribution of

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associated with excessive balance sheet shrinkage on the part of multiple financial institutions hit with a common shock").

64 Technically, the distribution has negative skew and excess kurtosis.

65 On value at risk see, *G.A, Holton*, Value-at-Risk: Theory and Practice, 2014, available at http://value-at-risk.net; *P. Jorion*, Value at Risk, 3rd ed., 2007.

the full portfolio still exhibits a fat tail. Such a strong correlation occurs in a liquidity freeze: When asset classes become information sensitive and suffer markdowns for adverse selection and when, subsequently, firesales drive prices further down and affect other market segments, very diverse assets move together even if those assets have little in common based on fundamentals and under ordinary conditions. Because market prices determine the ability of market participants to raise cash and to meet their obligations, these surprising correlations, though temporary, can bankrupt financial institutions and inflict lasting harm on the market and the economy. To the single market player, systemic risk figures as small probability, large loss tail risk.

Finally, the rarity of systemic events leads to a third characteristic of systemic risk, the lack of quantitative data. Because it is the overall market that breeds disaster and is struck by it, there are only few observations. In addition, markets and their environment change over time, not least from attempts to prevent the recurrence of past crises. All of this makes it difficult to derive lasting lessons from history. Attempts at conceiving quantitative models to predict financial crises bear witness to the intricacy: While certain factors, including most prominently the growth of credit in the economy, indicate a higher likelihood of a crisis, these signals contain much noise. The existing models often fail to detect an impending crisis or trigger false alarms.[66] Instead of predicting the occurrence of a systemic event, another approach seeks to gauge the vulnerability of institutions in the event of a crisis. An established method in this regard is "stress testing", where banks simulate the impact of more or less extreme, adverse scenarios on their viability.[67] In a similar vein, quantitative measures have been proposed to capture the correlation between the distress of an individual institution and that of other institutions or the financial system as a whole.[68] Testing these measures against data from the financial crisis confirms that

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66 *Caballero/Kurlat* (fn. 35), p. 6–8; additional references cited in *Gorton/Ordoñez*, AER 2014, p. 344.

67 Stress tests have become part of the regulatory toolbox: for banks' own risk management, see art. 86(9), 87(2) Banking Directive; for the supervisory review, see, e.g., art. 100 Banking Directive. On stress testing, see generally *M. Quagliariello* (ed.), Stress-testing the Banking System, 2009.

68 *T. Adrian/M.K. Brunnermeier*, CoVaR, NBER Working Paper Series 2011,No. 17454 (proposing "forward ΔCoVaR", the difference between the value at risk of the financial sector

they would have had predictive power.[69] While this is a considerable accomplishment, the historical data on adverse events remains scarce and allows only rough estimates.[70]

To describe the lack of a reliable measure for systemic risk, some apply the terminology of Frank Knight who famously distinguished (measurable) "risk" from (unquantifiable) "uncertainty".[71] In this parlance, systemic risk constitutes "uncertainty" rather than "risk". Alternatively, one can conceive of probability as a subjective assessment and still speak of systemic "risk", while acknowledging that the available data sustains a wide divergence of rational, subjective probability estimates.[72] Whatever the theoretical reference, it is an important insight that systemic risk largely eludes methodological attempts at quantifying it. If there is human foresight of financial disaster, it is more art than science.[73]

Summing up the analysis, the taking of "excessive risk" appears not to describe well the cause of the recent crisis or of systemic events in general. Rather than deliberate wagering, systemic risk arises from limited knowledge of the aggregate state of the

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conditional on the particular institution's distress minus conditional on the institution's normal condition, as predicted by characterics of the institution such as leverage, maturity mismatch etc.); *V.V. Acharya/L.H. Pedersen/T. Philippon/M.P. Richardson*, Measuring Systemic Risk, CEPR Discussion Papers 2012, No. DP8824 (putting forward "systemic expected shortfall", a bank's undercapitalization conditional on the financial system being undercapitalised).

69 *Acharya/Pedersen/Philippon/Richardson* (fn. 68), p. 17–28.

70 See, e.g., *M. Billio/M. Getmansky/A.W. Lo/L. Pelizzon*, Econometric measures of connectedness and systemic risk in the finance and insurance sectors, Journal of Financial Economics (JFE) 104 (2012), p. 535, 537–538 (motivating their own analysis of correlations outside distress states with the relative dearth of crisis data and the need to identify new and emerging connections).

71 *F.H. Knight*, Risk, Uncertainty and Profit, 1964, p. 233–235 (explaining uncertainty with the difficulty "to form a group of instances, because the situation dealt with is in a high degree unique"); *J.M. Keynes*, The General Theory of Employment, Quarterly Journal of Economics 51 (1937), p. 209, 212–214. Applying the distinction to financial crises: *R.J. Caballero/A. Simsek*, Fire Sales in a Model of Complexity, Journal of Finance (JF) 2013, p. 2549, 2556–2557 (in the context of a formal model); *A. Pacces*, Consequences of uncertainty for regulation: Law and economics of the financial crisis, European Company and Financial Law Review (ECFR) 2010, p. 479, 483–484; *K. Pistor*, A legal theory of finance, Journal of Comparative Economics (J. Comp. Econ.) 41 (2013), p. 315, 316.

72 See *G.A. Holton*, Defining Risk, Financial Analysts Journal 60 (2004), p. 19–21 (relating the Knightian distinction to the frequentist interpretation of probability). For subjective probability theory, see seminally *L.J. Savage*, The Foundations of Statistics, 1954, p. 27 et seq.; for a more recent textbook presentation, see *E.T. Jaynes* (G.L. Bretthorst, ed.), Probability Theory, 2003.

73 *Caballero/Kurlat* (fn. 35), p. 8, rightly point to the tautological nature of this statement. If crises were predictable, they could be averted.

market and of the economy. A systemic event occurs if individual precautions are overwhelmed by the very fact that the precautions of other market participants are also proving deficient. “Treacherous safety” appears to be a more fitting short-hand description of the problem.

II. Systemic risk as an incentive problem

The characteristics of systemic risk should enter into a regulatory strategy to prevent the recurrence of a crisis or, more realistically, to mitigate its probability and impact. As has been shown, systemic risk arises from mutually reinforcing vulnerability to certain volatile changes, such as the sudden loss of liquidity in markets. It follows that in order to limit systemic risk, regulation should strive to reduce the exposure of individual institutions to shocks that have the potential of growing into a systemic event. If a bank is less exposed to and hence less affected by an initial disruption, it reacts less mechanically to it. This can break a self-fulfilling dynamic that otherwise might turn an unexpected change into a systemic crisis. Thus, the task at hand is to detect and to reduce vulnerabilities that the individual bank shares with other institutions and that, for this reason, could set off a death spiral. From the point of view of the decision-maker and her institution, this is largely equivalent to avoiding low-probability risks involving extreme losses. When looking at compensation practices, the regulatory objective thus is to incentivise the identification and mitigation of tail risks. In pursuit of this goal, one first needs to understand why the natural self-interest of banks and their employees does not provide sufficient assurance against a tail risk that can threaten the bank’s existence (subsection 1.). A second aspect is the peculiar intricacy of targeting risks that occur only at very low frequencies (subsection 2.).

1. Incentives to incur systemic tail risk

The financial crisis of 2008 was a calamity not only for the world economy but also for many decision-makers in the financial industry. Bearing responsibility for the downfall of reputable and proud organisations like Bear Stearns, Lehman Brothers, AIG, Royal Bank of Scotland and UBS – or, on a smaller scale, Northern Rock, Anglo Irish Bank, WestLB, IKB, and many others – doubtlessly counts among the more excruciating and humiliating experiences that a career in the financial industry

has to offer. It stands to reason that top executives, traders, risk managers and other employees have their own self-interested reasons to avoid the bank's insolvency. In this view, the accumulation of systemic tail risk in the years before the crisis likely was an "honest mistake". Such an account would also conform to the theory that safe-beyond-doubt assets play an important and useful role in the economy. The flip side is that systemic risk sometimes builds without being detected by market participants.[74]

Even if occasional financial crises may be inevitable, it remains a valid question whether the amount of information produced about systemic risk is optimal. One reason to suspect that banks devote insufficient effort to gauging and managing tail risk is the externality that failing banks impose on depositors, other creditors, and the taxpayer. Dire as the consequences of financial disaster may be for bank insiders, they are only a fraction of the total loss to society. In addition to this externality, the market-wide nature of systemic risk creates a collective action problem in gathering and processing information. Single banks and individual managers or traders can be tempted to free-ride on the effort of others to mitigate their vulnerability and hence the level of systemic risk. Conversely, if a single market participant detects the build-up of systemic risk, she may not be able to insulate herself from the fallout of the impending crisis.

Worse still, the mistakes before the financial crisis arguably not only reflect a collective lack of precaution but also an opportunistic advantage from incurring systemic risk. The reason is that *systemic* risk, by its very nature, also constitutes *systematic* risk. The slightly different term refers to a key concept in asset valuation. A "systematic" risk is the opposite of an idiosyncratic (or unsystematic) risk. The idiosyncratic risk inherent in an asset is uncorrelated to the variability of other assets. It follows that idiosyncratic risks can be eliminated through diversification, by forming a suitable portfolio of different assets, in which losses in one asset tend to be cancelled out by gains from another one. Conversely, systematic risk is the

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74 See *supra* fn. 40 for the notion of safe, information-insensitive assets. For information insensitivity as the source of unjustified credit expansions that result in busts, see *Gorton/Ordoñez*, AER 2014, p. 343 et seq. See also *N. Gennaioli/A. Shleifer/R. Vishny*, A Model of Shadow Banking, Journal of Finance (JF) 68 (2013), p. 1331 (build-up of systemic risk because investors irrationally underestimate tail risk).

component of an asset's variability that cannot be diversified away because it is correlated across assets. A fundamental prediction of asset valuation theory is that (only) systematic risk is priced in the market and carries a risk premium. Put differently, an asset's expected return rises the more it systematic risk it contains, for instance the more it comoves with the overall market.[75] By definition, a severe "systemic" event affects other financial institutions and, in consequence, asset returns across the economy. Because the impact of a systemic shock is felt everywhere, it cannot be diversified away. Thus, systemic risk is a source of systematic risk.

This has a worrying implication for the incentives of banks and their employees. If systematic risk is priced, one way to raise expected returns is to increase the exposure to systematic/systemic risk. In fact, there is growing evidence that a tail risk factor predicts equity returns.[76] It has also been documented that hedge funds with greater exposure to economy-wide tail risk produce higher returns after adjustment for other known risk factors.[77] To the extent that investment returns reflect an insurance premium for bearing risk, they should not be credited to the diligence and prowess of the respective trader or manager. But without a reliable measure of

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75 This is the common ground of the well-known Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). For the CAPM, see *J. Lintner*, The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets, Review of Economics and Statistics 47 (1965), p. 13; *W.F. Sharpe*, Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, Journal of Finance (JF) 19 (1965), p.425. For the APT, see *S.A. Ross*, The Arbitrage Theory of Capital Asset Pricing, Journal of Economic Theory (J. Econ. Th.) 13 (1976), p. 341. For an accessible exposition, see *A.F. Perold*, The Capital Asset Pricing Model, Journal of Economic Perspectives 18 (2001), p. 3.

76 *B. Kelly/H. Jiang*, Tail Risk and Asset Prices, Review of Financial Studies (Rev. Fin. Stud.) 27 (2014), p. 2841 et seq. (time-varying tail risk factor as predictor of equity returns); *T. Bollerslev/V. Todorov*, Tails, Fears, and Risk Premia, Journal of Finance (JF) 66 (2011), p. 2165 et seq.; *P. Santa-Clara/S. Yan*, Crashes, Volatility, and the Equity Premium: Lessons from S&P 500 Options, Review of Economics and Statistics (Rev. Econ. & Stat.) 92 (2010), p. 435 et seq. See also *R.J. Barro*, Rare Disasters and Asset Markets in the Twentieth Century, Quarterly Journal of Economics (QJE) 121 (2006), p. 823 et seq. (explaining the "equity premium puzzle" with the risk of large economic downturns).

77 *A. Buraschi/R. Kosowski/F. Trojani*, When There Is No Place to Hide: Correlation Risk and the Cross-Section of Hedge Fund Returns, Review of Financial Studies (Rev. Fin. Stud.) 27 (2013), p. 581 et seq. (risk of changes in correlations between assets as a predictor of hedge fund returns); *T. Adrian/M.K. Brunnermeier/H.-L.Q. Nguyen*, Hedge Fund Tail Risk, in: J.G. Haubrich/A.W. Lo (eds.), Quantifying Systemic Risk, 2013, p. 155, 161–170 (seven observable risk factors as predictors of both negative fat tails in hedge fund return distributions and of hedge fund returns after adjustment for other known risk factors).

systematic tail risk, there is no way of telling a strategy of "manufacturing tail risk"[78] to earn risk premia from truly value-creating investment accumen or trading skill. From this angle, the accumulation of disaster risk in banks could be less a mistake of bank managers and traders than a more or less conscious strategy to fabricate performance and be rewarded for it.

2. Difficulty of deterring tail risk taking

Selling insurance to the market and claiming the resulting risk premia as investment performance only works because risk is not easily observable. Ideally, one would want to purge risk premia earned for bearing systematic risk from investment returns. Yet all that can be readily seen are the realised returns, not their riskiness and its systematic (undiversifiable) part. The challenge of evaluating investment performance, then, is to find a reliable measure of systematic risk. Identifying systematic risk is at the heart of performance-based compensation, as will be discussed in more detail below. The point here is to demonstrate why tail risk, in this regard, poses a special difficulty. Because the probability of tail events is small, excessive tail risk can go undetected for a long time. Suppose, for instance, that a sudden liquidity freeze occurs with probability 5% within a given year. The cumulative probability that a breakdown happens within five years is 33%; for ten years, the probability rises to only 40%.[79] Bank managers and traders have a good chance of getting away with substantial tail risk for extended periods of time while claiming credit for an appearance of superior performance.[80]

Systematic (undiversifiable) risk other than tail risk can be measured based on higher-frequency observations. An example are risk factors inherent in stock returns, such as the market "beta" that captures the comovement of a share price with a

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78 The expression is borrowed from the title of *V.V. Acharya et al.*, Manufacturing Tail Risk: A Perspective on the Financial Crisis of 2007–2009, Foundations and Trends in Finance 4 (2009), p. 247.

79 For a different, more elaborate example see *Bhagat/Bolton/Romano*, Yale J. Reg. 2014, p. 523, 528–30.

80 The link between tail risk and the time horizon of the relevant incentive scheme is explored further below D.IV.2.

market portfolio.[81] Factor models of predicted returns can be used to adjust actual performance for the part that is attributable to systematic risk. It is even more straightforward to calculate a measure of total (idiosyncratic and systematic) risk associated with an investment as long as it is normally distributed; the most prominent example being value at risk.[82] The available data thus provides a measure "normal" risk independently of the particular investment's outcome. By contrast, indicators of the current level of systemic risk in the economy are only weakly predictive.[83] Whether and to which extent an investment exposes the bank to systemic/systematic tail risk is largely a matter of subjective judgment. This makes it a daunting endeavour to control the taking of tail risk. The task amounts to requiring someone to exercise and follow her own subjective best judgment even where this conflicts with her own self-interest.

D. Is EU pay regulation effective in controlling systemic risk?

The EU boldly took the lead in regulating pay in the financial industry. The sheer volume of output in the form of legislation and regulatory guidance is impressive. How effective it will be in addressing systemic risk is another matter. This section considers key elements of EU pay regulation and seeks to assess their contribution to the regulatory objective.

I. Scope: material risk takers

The long-standing and continuing debate on compensation practices in the corporate governance literature focuses exclusively on the corporation's top executives and, to some minor degree, on independent directors at the board. One striking feature of the new compensation rules directed at banks is that their ambit is much broader. Specifically, pay regulation applies to "categories of staff including senior management, risk takers, staff engaged in control functions and any employee

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81 For the theoretical underpinnings of beta in the CAPM, see fn. 75. For a well-known empirical factor model see only *E.F. Fama/K.R. French*, Common risk factors in the returns on stocks and bonds, Journal of Financial Economics 33 (1993), 3.

82 *Supra* fn. 65.

83 *Supra* fn. 66 et seq. and accompanying text.

receiving total remuneration that takes them into the same remuneration bracket as senior management and risk takers, *whose professional activities have a material impact on [the institution's] risk profile*".[84] The Commission has exercised its power under the Bank Directive and adopted a technical standard to define bank employees that qualify as "identified staff" or "material risk-takers" (MRT).[85] Besides executives and other board members, employees covered include senior management below the director and officer level; the heads or responsible managers of the risk management, compliance and internal audit functions as well as of significant branch offices, subsidiaries, or other separate business units; the heads of legal affairs, finances, human resources, information technology, and other key functions; responsible risk managers and committee members deciding on major risk categories; persons involved in the decision-making of major credit and trading decisions as well as on new products; and, by way of a refutable presumption, employees having earned, in the previous year, more than €500,000 or more than the lowest compensation earned by a member of senior management, or who has fallen in the top 0.3% earnings bracket.[86]

The broad scope of EU pay regulation is reflected in data compiled by EBA under a mandate of the Banking Directive. For 2013, EBA reported a total of 34,060 MRTs in bank groups supervised in the EU.[87] This corresponds to a fraction of 1.17% of all employees of said groups.[88] More importantly, only 15.5% of identified staff serve as directors on corporate boards in a management or supervisory function. All other MRTs are employed at lower levels of the corporate hierarchy.[89]

The EBA data collection also provides a first hint why EU pay regulation in the financial industry extends beyond the board of directors. In the sample, directors

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84 Art. 92(2) Banking Directive, emphasis added.

85 Commission Delegated Regulation (EU) No. 604/2014 of 4/3/2014, OJ L 167/30 of 6/6/2014.

86 Art. 3, 4 Commission Delegated Regulation (EU) No. 604/2014.

87 *EBA*, Benchmarking of Remuneration Practices at Union Level and Data on High Earners, 2015, p. 24, Figure 21. The EBA notes that the data may not be comprehensive and also that the definition of identified staff had not been fully harmonised in 2013.

88 *EBA* (fn. 87), para. 46.

89 Calculated based on *EBA* (fn. 87), p. 25, Figure 23. Managing directors account for 6.0% of MRTs, directors with a supervisory function for 9.5%.

with management functions received a mean total (fixed and variable) compensation of €651,473; directors in a supervisory capacity earned only €30,196. The surprise, compared to other industries, is that one class of employees seemed to receive a larger paycheck than their superiors: MRTs in investment banking received a mean total compensation of €790,177.[90] Presumably, the discrepancy results in large part from averaging compensation across the entire industry. Bank groups with extensive investment banking activities may well pay their executives more than other institutions in retail and commercial banking. However, a glimpse at the most recent compensation report of Deutsche Bank for 2014 shows that seven employees received a higher compensation than even the two co-chairmen of the management board; 49 lower-level employees were in the same or a higher compensation bracket than the other members of the management board.[91] Although Deutsche Bank paid its executives far more than the EBA industry average, some of its lower ranks did even better. It appears that banks themselves consider the contribution of certain key employees to be as critical to their success as the performance of their corporate leaders. They find it profitable to compete vigorously for the most talented traders and to reward them generously. This suggests that decisions made by rank-and-file employees indeed have "a material impact" on the bank's bottom line. It also suggests that one cannot easily substitute these employees or control their decision-making. To a significant degree, the nature and the amount of risk taken on behalf of the bank is determined at lower levels and in a decentralised fashion.

The importance of traders and other key employees for bank risk taking combines with the nature of systemic risk as an aggregate state of the market or the economy. Reducing the exposure of financial institutions to a potential systemic event mitigates its impact and hence overall systemic risk. But individual banks can only respond to an emerging threat if they identify it as such. As highlighted above, detecting systemic risk amounts to a judgment call, on which even experts often disagree and which often depends on relevant information from different corners of the bank. By sharpening the incentives of a broader class of decision-makers towards systemic

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90 *EBA* (fn. 87), p. 33, Figure 34. Investment banking also boasted a greater share of 21.8% of MRTs compared to 6.0% managing directors, calculated based on *EBA* (fn. 87), p. 25, Figure 23.

91 *Deutsche Bank*, Financial Report 2014, 2015, p. 275 (listing pay brackets of high earners), p. 283 (stating the total compensation of managing directors).

risk, regulation can enhance the exchange and aggregation of relevant information within the bank and also across financial institutions. Overall, extending pay regulation beyond executives and the board appears a very plausible policy choice.

II. Limits on variable pay

While the scope of the new rules is widely agreed, the most controversial issue concerns the amount of variable, performance-related compensation. In the course of rulemaking at the global and European level, the idea of limiting the total amount of bankers' pay never gained traction.[92] Instead, restrictions on the relative size of the variable pay component took hold.[93] The CRD III insofar contented itself with a general standard, requiring an "appropriate balance" of fixed and variable components.[94] For the re-enactment of the Banking Directive to implement Basel III, the European Parliament insisted on a more stringent cap on variable pay.[95] The eventual compromise follows the Parliament's proposal in limiting the variable compensation of each MRT to the amount of her fixed compensation. An exception is provided for member states to either lower the cap further or to permit the bank's shareholders, by a qualified majority, to raise the cap to at most twice the amount of fixed compensation.[96]

The bonus cap is the most controversial part of the EU compensation regulation for the banking industry. Outside the European Parliament and the general public, it has won little support. Most academic commentators have dismissed it, sometimes in rather harsh terms.[97] It appears that the limitation is being felt by the large banks,

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92 But see *Ferran*, ECFR 2012, p. 9, 11–12 (initiatives of France and Germany thwarted by opposition from the US and the UK).

93 In this regard, the Financial Stability Board only called for limitations in order to preserve and rebuild the bank's capital base, see *Financial Stability Board* (fn. 6), standard no. 3.

94 See annex I(1) no. 23(l) CRD III: fixed compensation is required to be high enough to allow the bank to pay a low or no variable compensation in response to bad inferior performance.

95 Report of the Committee on Economic and Monetary Affairs of 5/30/2012, A7-0170/2012, art. 90(1)(f). On attempts to include the cap already in the earlier CRD III directive of 2010, see *Murphy*, Eur. Fin. Mgmt. 2013, p. 631, 643.

96 Art. 94(1)(g) Banking Directive.

97 *Bhagat/Bolton/Romano*, Yale J. Reg. 2014, p. 523, 547 ("proposal could not be more wrong-headed"); *Murphy*, Eur. Fin. Mgmt. 2013, p. 645 ("variety of unintended and unproductive side effects"); *Ferrarini* ■**this volume sub V.(B)**■. But see *Johnston*, J. Law & Soc. 2014, p. 25

especially those with extensive investment banking activitites, as witnessed by the UK's annulment action that targeted mainly the bonus cap.[98]

1. Variable compensation as incentive to take risk

At first blush, the logic of binding the maximum variable pay to the amount of fixed compensation seems straightforward. It is assumed that, by limiting the potential rewards, MRTs will find it less attractive to incur large risks in pursuit of higher returns. As explained above, greater systematic risk translates into higher expected returns. If variable pay is tied to realised returns with incomplete adjustment for risk, MRTs can increase the expected value of their compensation by taking on more systematic risk. To the extent that a bonus cap dampens the performance incentive, it also mitigates the inclination to expose the bank to priced risk.[99]

Leaving aside the effect of systematic risk on returns, the debate usually focuses on convex reward schemes as the main cause of a perverse risk incentive.[100] With a convex, option-like incentive scheme, an agent earns relatively more from a greater gain than she foregoes from a more severe loss. Figure 2 depicts such an arrangement under which the agent receives a flat wage for "losses" and an increasing bonus for "gains". The basic structure of MRT compensation in banks resembles Figure 2 in that there is usually a threshold performance before any bonus is paid on top of the fixed salary. Since risk is defined as variability, greater risk implies a larger probability of both large success and large failure. Under the convex scheme, the

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(contending that the cap "will eliminate the current practice of […] giving […] incentives to increase risk indiscriminately in pursuit of ever higher returns on equity" while not impairing incentive provision "to increase profitability").

98 *Supra* fn. 19 and accompanying text.

99 As will be shown *infra* D.II.2., the bonus cap likely fails specifically to address tail risk.

100 The first to point this out for managerial compensation appear to be *C.W. Smith/R.M. Stulz*, The Determinants of Firm's Hedging Policies, Journal of Financial and Quantitative Analysis (J. Fin. & Quant. Anal.) 20 (1985), p. 391, 399–402. The general insight in the context of shareholders' convex incentive structure goes back to *M.C. Jensen/W.H. Meckling*, Theory of the Form: Managerial Behavior, Agency Costs and Ownership Structure, Journal of Financial Economics (JFE) 3 (1976), p. 305, 334–337; *D. Galai/R.W. Masulis*, The Option Pricing Model and the Risk Factor of Stock, Journal of Financial Economics (JFE) 3 (1976), p. 70 et seq. For a differentiated view, see *S.A. Ross*, Compensation, Incentives, and the Duality of Risk Aversion and Riskiness, Journal of Finance (JF) 59 (2004), p. 207 (describing and criticising the claim that convexity induces risk taking as "common folklore"). See also *T. John/K. John*, Top Management Compensation and Capital Structure, Journal of Finance (JF) 48 (1993), p. 949, 960-966 (deriving an optimal, non-convex scheme for managers of firms with debtholders).

chance of success looms larger for the agent than the possibility of loss. In consequence, the agent may have an incentive to choose an investment strategy with greater risk even if this meant a lower expected value of returns.

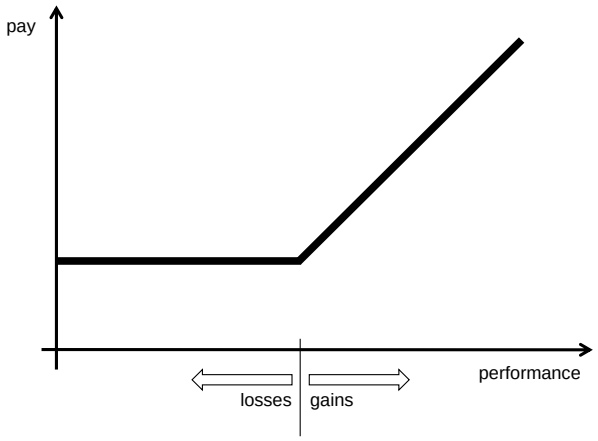

Figure 2: A convex compensation scheme under which pay rises linearly with performance once a minimum threshold is met.

In light of the foregoing, one might expect pay regulation to restrict convexity in compensation schemes. Surprisingly though, the limitation on variable compensation and particularly the bonus cap have the opposite effect. They mandate a significant level of fixed pay and a real possibility that MRTs do not earn variable component.[101] Put differently, the rules prescribe a scheme of the type shown in Figure 2. It is not without irony that the law requires the very convexity that can cause an incentive to take unjustified risk.

It is an interesting question to ask whether regulators should strive for less convex and more linear compensation schemes. One potential reason for convexity is that banks deliberately produce a perverse risk incentive for MRTs to advance the interests of shareholders, whose participation in the bank's total value likewise has a

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[101] Art. 94(1)(f) Banking Directive (requiring fixed pay to be high enough "to allow the operation of a fully flexible policy on variable remuneration components, including the possibility to pay no variable remuneration component"); see also art. 92(2)(g) Banking Directive (mandating a "clear distinction" between fixed and variable pay).

convex shape.[102] However, this explanation does not sit well with the observation that executive compensation is linked in a convex fashion to the returns of shareholders, not to total firm value.[103] Shareholders hardly benefit from inducing a harmful risk incentive relative to their own financial success. There must be other reasons for the popularity of convex incentive schemes. Figure 3 illustrates an additional rationale by contrasting a convex scheme with two linear alternatives. It is assumed that the agent's compensation cannot turn negative because of her risk aversion or limited wealth.[104] In replacing the bold-lined convex scheme, one can seek to hold the expectation value of compensation fixed. For instance, if the agent's optimal effort yields expected performance somewhat above the bonus threshold of the convex scheme, linear pay according to the dashed line in Figure 3 would offer the same expected wage to such agent. But at the relevant performance level, the dashed line is flatter than the convex scheme, indicating that the linear wage has less incentive power; this would induce the agent to lower effort and, as a result, expected performance.[105] To achieve the same incentive power, a linear compensation contract would have to be as steep as the convex scheme in the gains territory to the right of the threshold. As the dotted line in Figure 3 reveals, this would dramatically increase the agent's expected compensation for exercising best effort.[106] This suggests that convex incentive schemes serve to reduce the expected payout of banks to MRTs. In the jargon of agency theory, they reduce the "information rent" the principal has to pay to induce a given level of effort.

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102 For the resulting risk incentive of shareholders see, generally, the classic references in fn. 100. Empirical evidence suggests that more shareholder-minded corporate governance is associated with greater risk taking by banks, see *A. Beltratti/R.M. Stulz*, The credit crisis around the globe: Why did some banks perform better?, Journal of Financial Economics (JFE) 105 (2012), p. 1, 14–16; *R. Fahlenbrach/R.M. Stulz*, Bank CEO incentives and the credit crisis, Journal of Financial Economics (JFE) 99 (2011), p. 11; *L. Laeven/R. Levine*, Bank governance, regulation and risk taking, Journal of Financial Economics (JFE) 93 (2009), p. 259, 265–269.

103 Both stock options and many bonus types tied to accounting performance introduce a convexity. For the composition of executive compensation, see *N. Fernandes/M.A. Ferreira/P. Matos/K.J. Murphy*, Are U.S. CEOs Paid More?, New International Evidence, Review of Financial Studies (Rev. Fin. Stud.) 26 (2013), p. 323, 337.

104 Limited liability is a standard assumption in many agency models.

105 The argument made here is very imprecise. In fact, the incentive effect depends on how effort impacts the probability distribution of performance. For a rigorous analysis of the optimality of convex schemes, see *R.D. Innes*, Limited Liability and Incentive Contracting with Ex-ante Action Choices, Journal of Economic Theory (J. Econ. Th.) 52 (1990), p. 45.

106 Again, the analysis is very loose, see the previous footnote.

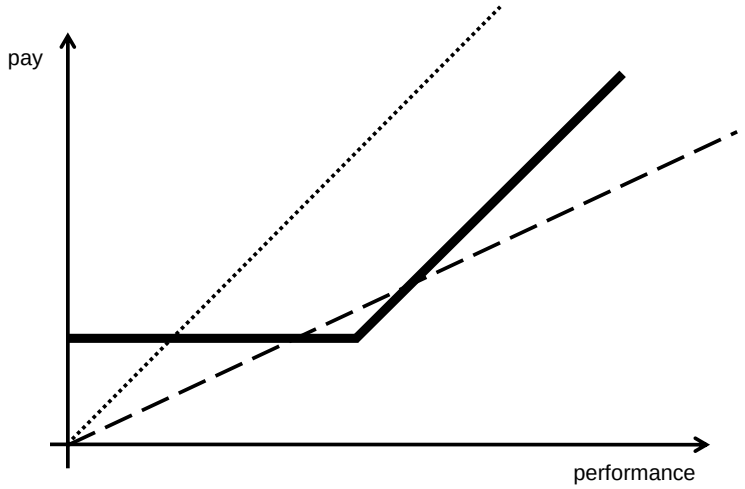

Figure 3: A convex compensation scheme (bold line) compared to a linear scheme with low and high incentive power (dashed and dotted line, respectively).

The argument for convexity presupposes that the agent's expected performance falls in the range of variable compensation (is "in the money") so that the positive slope has an incentive effect. By contrast, a convex scheme could also entice the agent to minimise effort and to settle for the guaranteed fixed compensation. Certainly, this is not the image that a casual observation of the investment banking industry evokes. Permitting laxity is not in the interest of either shareholders or executives, even if inducing reckless risk taking were. The likely reason for not slacking off is that the explicit structure of compensation is not the only incentive at work. Another one relates to career prospects and, financially speaking, to the stream of future remuneration. Deciding on promotion, relegation, termination, or changes in the level of fixed pay are additional ways of providing incentives to the agent.[107] There

[107] *Cf. B. Holmström*, Managerial Incentive Problems: A Dynamic Perspective, Review of Economic Studies (Rev. Econ. Stud.) 66 (1999), p. 169 (effort incentive resulting from a desire to increase the perceived value of one's talent/human capital). The recent debate on executive compensation emphasises the complementarity between corporate governance and compensation incentives. The thrust there is to substitute more efficient governance mechanisms for expensive compensation, see *P. Cebon/ B.E. Hermalin*, When Less Is More: The Benefits of Limits on Executive Pay, Review of Financial Studies (Rev. Fin. Stud.) 28 (2015), p. 1667; *D.L. Dicks*, Executive Compensation and the Role for Corporate Governance Regulation, Review of Financial Studies (Rev. Fin. Stud.) 25 (2012), p. 1971; *V.V. Acharya/P.F. Volpin*, Corporate Governance Externalities, Review of Finance (Rev. Fin.) 14 (2010), p. 1.

can be a complementarity between explicit incentives from variable compensation and implicit ones in the flat range of the compensation scheme.[108]

To sum up, compensation has to be analysed as part of a larger, possibly well-adapted incentive arrangement. The potential to create a harmful risk incentive is but one aspect of convex pay schedules; the overall effect may be very different. A steep variable compensation may be needed to encourage effort or to balance an excessive tendency to avoid risk induced by career concerns. The case against convex schemes is far from being conclusive.

2. Likely effects of the bonus cap

Whether or not convex compensation schemes induce more risk taking, the regulatory limits on variable pay have no bite against them. What other effects are to be expected of the bonus cap? The discussion of career-related incentives indicates that the explicit compensation structure is only the part of the iceberg that policymakers see. Career concerns may not only be complements but also (imperfect) substitutes to compensation incentives. Should the bonus cap, taken in isolation, make MRTs less eager to take risk than is in the interest of shareholders, management can stimulate more aggressive risk taking through the prospect of promotion or a permanent rise in the level of compensation ("carrot") as well as the threat of relegation or termination ("stick"). As banks adapt to the bonus cap, their risk appetite will inevitably and indiscernibly creep into decisions affecting the careers and long-term pay levels of MRTs.[109] Besides substituting implicit incentives

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108 One source of complementarity is the fact that the agent is more wealthy if one takes her expectancy of future income into account. This alleviates the limited liability constraint, *supra* fn. 104 and accompanying text. Also, promotion or termination decisions tend to rely more on discretion, allowing the decision-maker to use a broader range of information on the agent's effort and unmeasured aspects of performance. There could be a benefit from considering more subjective information to evaluate an agent if measured performance has been low.

109 A foretaste is the brazen attempt by London-based banks to label discretionary rewards as "role-based allowances" so as to have them counted as fixed pay for purposes of the bonus cap. See *D. Schafer/M. Arnold*, City bankers to evade EU bonus cap with 'role-based' allowances, FT.com, April 13, 2014; *A. Barker*, EU questions Bank of England regulators over UK bank bonus approvals, FT.com, February 5, 2014. In response, EBA explicitly ruled out any attempt at "circumventing" the rules, such as "where variable remuneration is considered as fixed remuneration in line with the wording of these guidelines, but not with its objectives", *EBA* (fn. 17), para. 162; on role-based allowances, see specifically *ibid.*, para. 122–125.

for explicit bonuses, banks can raise fixed compensation to be able to offer more variable rewards. The risk-dampening effect of the new rule is likely to remain small at best.

Even if it has an effect, the bonus cap arguably fails to influence the only type of risk that regulators should be concerned about. Variable compensation is typically awarded at yearly intervals.[110] By contrast, the catastrophic tail events that can threaten the bank's survival and the stability of the financial system occur with low probability and very rarely. MRTs are tempted to incur such risks to increase expected returns in ordinary times, when no tail event occurs. These higher regular returns may be very steady. As has been argued above, tail risks are associated more with a false sense of security than with aggressive brinkmanship. The financial crisis was caused by investments in fixed-income assets. Limiting variable compensation that accrues at short intervals does little to impede higher pay levels as a reward for cultivating long-term strategies with high and seemingly safe returns. The effect of the bonus cap specifically on tail risk likely is negligible or non-existent. What the cap could do is to destroy performance incentives before year end, after an MRT has reached the highest bonus level.[111] This hardly serves the goal of prudential regulation.

III. Comprehensive ex ante risk adjustment and compensation governance

The bulk of the new rules is concerned with the way banks assess performance to determine variable pay. Banks are required to consider "a combination of the assessment of the performance of the individual and of the business unit concerned and of the overall results of the institution", taking into account "financial and non-financial criteria"; performance measurement "includes an adjustment for all types of current and future risks and takes into account the cost of the capital and the liquidity required"; furthermore, the "allocation of the variable remuneration components

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110 But see *infra* D.IV. for long-term elements.

111 *Cf. KJ. Murphy/M.C. Jensen*, CEO Bonus Plans: And How to Fix Them, Harvard Business School NOM Unit Working Paper, No. 12-022, 2011, p. 3–5 (pointing to incentive effects of floors and caps in bonus plans); *K.J. Murphy*, Executive compensation: Where we are, and how we got there, in: G. Constantinides/M. Harris/R. Stulz (eds.), Handbook of the Economics of Finance, 2013, p. 211, 242–244.

within the institution shall also take into account all types of current and future risks".[112]

There is no doubt that these regulatory demands state the desirable. Few would object that an optimal performance assessment of traders or loan officers should adjust for "all types of current and future risks". The trouble with this wish list is not that it is controversial but that it lacks focus on the only issue that justifies why a prudential regulator meddles with the bank's internal incentive structure. Market discipline and regulatory capital requirements force shareholders to maintain sizable equity and thus to bear "normal" losses from irresponsible bets. For this reason, shareholders themselves and the board have an interest in avoiding rewards for gambling and risk premia instead of actual performance. If the regulatory requirement is to adjust for "all types of current and future risks", banks must apply a hodgepodge of risk measures and indicators. The most likely consequence is that tail risk – the only type of risk that should matter to a prudential regulator – will be one factor of many, and will carry little weight in view of the measurement problems. For the most part, regulators will enforce an imperfect variant of the policies that shareholders and management want to adopt anyway.

Considering tail risks, it would be more than welcome if banks adjusted variable pay to prevent MRTs from pretending performance by incurring systematic disaster risk. But there is no quantitative method, neither a simple nor a complicated one, to adjust performance for tail risk.[113] Existing quantitative approaches rely on historical covariances from episodes of distress or on hypothetical assumptions; they necessarily remain inaccurate and incomplete. In addition, they relate to institutions rather than to particular investments.[114] As highlighted above, the amount of systemic risk depends to large degree on the current state of financial markets and of other players, about which there is only scant information. The rarity of major crises together with the constant change in the relevant interdependencies offers little hope

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112 Art. 94(1)(a), (j), (k) Banking Directive.

113 But see *EBA*, Draft Guidelines (fn. 17), para. 196 (calling for the application of all methods used for internal risk measurement, including those relating to "stressed conditions").

114 See the measures referred to in fn. 68.

for a mechanical formula to detect and quantify tail risk. The only option is bonus reductions based on a largely discretionary assessment of tail risk.

For the ex ante risk adjustment, pay regulation relies on the methods of risk identification and measurement that banks use for other purposes, notably the internal capital adequacy assessment process.[115] Risk detection and assessment is the preeminent task of the bank's risk management function. Any tail risk that these procedures miss has no impact on variable compensation. Institutional constraints caution against optimism: Whoever is in charge of identifying and responding to tail risk will face fierce opposition from those MRTs whose investment strategies depend on taking such risk. Successful traders will be equally displeased when risk limits are imposed on their trading strategies as they will be disgruntled by seeing their stellar performance diminished because their investments would fare badly in a simulated stress scenario based on theoretical assumptions. Adjusting variable compensation to account for tail risk merely expands the battleground between risk managers and traders. It is an open question whether adding the issue of variable pay to the debate makes controlling tail risk more or less difficult for risk managers.

At any rate, devising and administering a risk adjustment for variable compensation necessitates the exercise of judgment. To permit and encourage independent judgment calls for a suitable governance structure. The Bank Directive seeks to provide such a structure: The bank's board of directors or other supervisory body has to take responsibility for setting "general principles" of compensation policy and for overseeing its implementation.[116] In significant[117] banks, the board must form a "remuneration committee" composed only of non-executive directors to prepare compensation-related decisions.[118] The bank has to review annually whether applicable regulation as well as the bank's own compensation policy and procedures have been complied with; if the review exposes shortcomings, the board has to

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115 *EBA* (fn. 17), para. 196–197 (referring to these various measurements).

116 Art. 92(2)(c) Banking Directive; *CEBS* (fn. 17), para. 42–5; *EBA* (fn. 17), para. 17–27.

117 According to *EBA* (fn. 17), para. 6, institutions are significant if they are "global" or "other" "systemically important institutions" under art. 131 Banking Directive or if the competent authority otherwise determines them to be significant.

118 Art. 95 Banking Directive; *CEBS* (fn. 17), para. 52–6; *EBA* (fn. 17), para. 42–9.

respond.[119] While these rules strive to hold the top supervisory level to account for the bank's compensation practices, they give little reassurance for the exercise of independent judgment in the individual case or, even less so, in relation to entire business units. There is little reason to be sanguine about managers' willingness to challenge palpable investment performance based on a largely subjective assessment of tail risk.

IV. Deferral and retention of variable pay

Up to this point, the review of European pay regulation for banks has been a sobering experience. While the new rules target the right group of decision-makers, they lack an effective remedy against incentives to create and incur systemic tail risks. Pay regulation seems scarcely more than a costly bureaucratic burden on banks with little or no effect on incentive alignment. Fortunately, a last set of rules may be more promising: It seeks to expand the time horizon over which performance is evaluated for the purpose of awarding variable compensation.

1. Deferral and retention rules in the Banking Directive

In this regard, the provisions in the Banking Directive are remarkably detailed and specific:[120] Banks set variable compensation for their MRTs at the end of each year based on risk-adjusted annual performance; this is referred to as the "accrual" period (see the illustration in Figure 4).[121] Yet the Banking Directive precludes the immediate payout of the total bonus. Instead, it requires banks to "defer" a minimum of 40% of accrued variable compensation (or 60% for "particularly high amounts") over a period of at least 3 to 5 years. The length of the deferral period is to reflect the "nature of the business, its risks and the activities" of the individual MRT.[122] Deferral means that the bank withholds payment of the accrued bonus so as to reduce

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119 Art. 92(2)(d) Banking Directive; *CEBS* (fn. 17), para. 49–51; *EBA* (fn. 17), para. 50–7.

120 The main requirements are already contained in the FSB's implementation standards, *supra* fn. 6.

121 *CEBS* (fn. 17), para. 88, encouraged "multi-year accrual periods" as "more prudent"; *EBA* (fn. 17), para. 235, does not contain a similar exhortation but calls for a proper balancing of the accrual and deferral periods.

122 Art. 94(1)(m) Banking Directive.

the bonus in light of later developments ("malus"). The bank can also pay out the bonus but reserve the right to reclaim it ("clawback").[123] As the two terms insinuate, the ex post adjustment always works against the MRT and never increases compensation.[124] The malus or clawback can affect up to the total amount of deferred compensation.[125] Deferred variable compensation is paid out or ceases to be subject to clawback at the end of the deferral period (as in Figure 4). Alternatively, it can "vest" in installments over the period, but at most *pro rata temporis*.[126] The bank has to stipulate criteria for the application of a malus or clawback. The Banking Directives mentions two relevant events, namely that the MRT "participated in or was responsible for conduct which resulted in significant losses" and that she violated "standards of fitness and propriety". The vesting of bonuses also is conditional on the financial sustainability of the bank.[127]

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123 According to guidelines by European supervisory authorities, a clawback is particularly apposite in serious cases of misconduct, such as fraud or severe negligence in causing significant losses, *CEBS* (fn. 17), para. 137; *EBA* (fn. 17), para. 269.

124 *CEBS* (fn. 17), para. 134 ("by way of a reduction"); *EBA* (fn. 17), para. 272.

125 Art. 94(1)(n) Banking Directive. Note that a malus can also attach to variable compensation for the current accrual period.

126 Art. 94(1)(m) Banking Directive. *EBA* (fn. 17), para. 269, 271, contemplate a malus or clawback even after the deferral period. By contrast, *CEBS* (fn. 17), para. 136, sees the malus as tied to the deferral period, which appears more reasonable.

127 Art. 94(1)(n) Banking Directive.

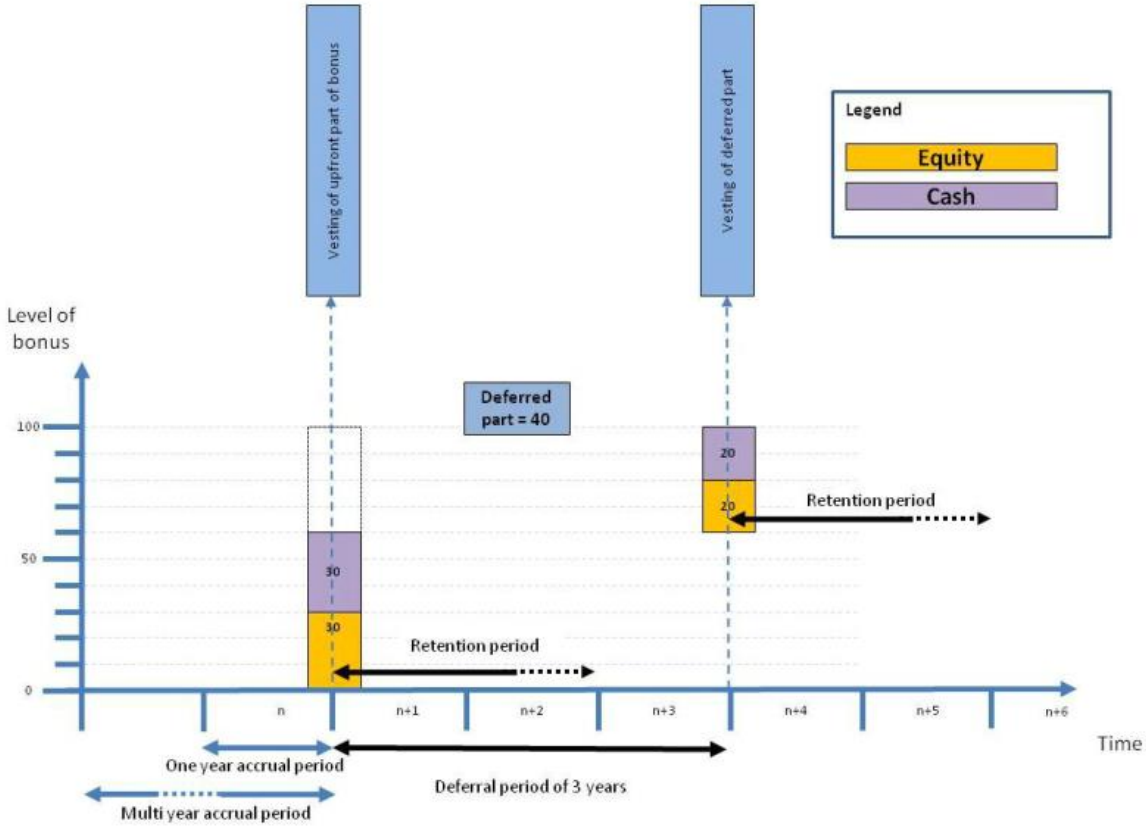

Figure 4: Graphical illustration of accrual, deferral and retention under the Banking Directive (Source: CEBS Guidelines on Sound Remuneration Policies and Practices, 2010, annex 3)

Besides deferral, the Directive provides yet another method of gearing variable compensation towards longer-term performance. It requires at least half of all variable compensation – both of the part that is paid out immediately and after deferral (see Figure 4) – to consist of an appropriate mixture of equity instruments and "where possible" instruments reflecting the risk of the bank's subordinated debt.[128] The MRT must hold the instrument during a "retention" period set with a view "to align[ing] incentives with the longer term interests" of the bank.[129]

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128 Art. 94(1)(l) Banking Directive. More specifically, the debt instruments should qualify as Additional Tier 1 Instruments (art. 52 Capital Requirements Regulation) or as Tier 2 Instruments (art. 63 Capital Requirements Regulation) or otherwise "reflect the credit quality" of the bank. *EBA* (fn. 17), para. 247, 251–252, encourages the use of bail-in debt.

129 Art. 94(1)(l) Banking Directive; see also *EBA* (fn. 17), para. 259–264 (requiring *inter alia* a minimum retention period of one year).

2. Incentive effects of short-term and long-term pay

The deferral and retention rules resonate with a widely held view that failure often results from an undue preoccupation with short-term performance and a neglect of potential long-term consequences. While emphasising long-term sustainability is a popular demand, it is less clear what one gains from linking compensation to outcomes in a more distant future. The answer must relate to the problem of designing incentives under conditions of asymmetric information and noisy observability of an agent's behaviour. From this perspective, the question to ask is whether later events provide useful information for evaluating and incentivising an agent's behaviour. MRTs are supposed to maximise ex ante expected, risk-adjusted returns. Ideally, one would want to reward MRTs directly for making optimal decisions ex ante rather than for observed performance ex post. Yet the previous subsection has highlighted the imperfections and, indeed, impossibility of a comprehensive measurement of ex ante risk; assessing the *expected* return from an investment is fraught with similar difficulty. In consequence, variable compensation is based mostly on *realised* performance. Actual outcomes serve as noisy indicator of ex ante behaviour.

Deferral and retention rules serve to tie compensation incentives to a longer observation period. Evaluating an investment strategy over an extended period can yield additional information on its expected returns and inherent risk. This is particularly relevant for tail risks with their low probability of extreme losses. If the probability of a tail event is present at any point in time, then extending the observation period increases the probability that a tail event will occur within the relevant timeframe.[130] In addition, deferring and retaining variable compensation for a long period of services forces MRTs to keep a large amount of money at stake. This can help to muster the incentive power needed to discourage tail risk strategies.

It is worth the while to analyse the these effects with slightly more rigour. Let us assume that in each of two periods, an MRT (or agent) can choose a good or bad strategy. For now, think of working diligently to increase expected returns from the

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130 Cf. *supra C.II.2.*

investments made on behalf of the bank. To keep things simple, the MRT's activity in each period leads either to "success" or "failure" performance. Following the good strategy produces a success with probability p (and a failure with probability $1-p$). The corresponding success probability under the bad strategy is q; of course, $p > q$. To introduce an incentive problem, we assume that choosing the good strategy causes a private cost C per round to the MRT whereas the bad strategy is costless. C reflects the effort of working hard and paying attention. The bank can incentivise the MRT based on short-term or long-term performance: It can either promise a bonus B_1 for success in each round or it can evaluate the MRT's performance over both rounds and reward two subsequent wins by paying B_2.[131] For now, we also presume the bank and the MRT to be risk neutral.

The question to ask is how much it costs the bank to induce the MRT to always follow the good strategy. To this end, the bank's variable compensation must make the agent better off in expected terms by at least $2C$ if she behaves well in both periods.[132] If the banks uses a short-term scheme, the difference in the expected bonus between the good and the bad strategy in each round must at least equal C, that is: $(p-q)B_1 \geq C$. The corresponding incentive compatibility condition for the long-term scheme is $(p^2-q^2)B_2 \geq 2C$.[133] Considering the minimum bonus amounts that satisfy these conditions, it is quite clear that the two-period bonus (that can be earned only once) must exceed the per-period bonus (that can be earned twice).[134] Less obvious is the fact that the long-term compensation is strictly cheaper for the bank than the short-term alternative: The minimum variable compensation to induce good behavior has a lower expected value with a two-period bonus compared with a per-period bonus.[135] The reason is that two successes are more informative of the agent

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131 Including the additional possibility of an intermediate bonus for a single success in a two-period evaluation would not change the gist of the argument.

132 In addition, her expected bonus must be higher by at least C compared to choosing the good strategy only in one round.

133 This condition also fulfills the per-period constraint of fn. 132.

134 Specifically, we determine the *minimum* bonuses B_1^* and B_2^* by treating the above inequalities as equations. This gives us $B_2^* = \frac{2(p-q)}{p^2-q^2} B_1^* = \frac{2}{p+q} B_1^*$. Because $1 \geq p > q$, it follows that $B_2^* > B_1^*$.

135 With the minimum incentive-compatible bonuses B_1^* and B_2^* (*supra* fn. 134), the agent chooses the good strategy in both rounds. This gives him a total expected bonus of $p^2 B_2^*$ under the long-term scheme and of $2pB_1^*$ under per-period compensation. The claim in the text is that $2pB_1^* >$

behaving well in both rounds than a single success. Short-term compensation uses a less reliable signal of agent behaviour. This increases the probability of rewarding bad conduct and, hence, the information rent obtained by the MRT at the expense of the bank.

$p^2 B_2^*$. Using the equality from n. 134 yields $2pB_1^* > \frac{2p^2}{p+q} B_1^*$, which simplifies to $1 > \frac{p}{p+q}$ and finally $q > 0$. Hence, as long as the bad strategy can produce "success" performance with positive probability, a short-term compensation plan is more expensive to the bank.

	Effort incentive problem		Tail-risk incentive problem	
	short-term, per-period bonus	long-term, two-period bonus	short-term, per-period bonus	long-term, two-period bonus
Probability of earning bonus with good strategy	70%	49%	99%	98%
Probability of earning bonus with bad strategy	20%	4%	90%	81%
Likelihood ratio good/bad	3.5	12.25	1.1	1.21
Minimum bonus amount to induce good strategy	€20.00	€44.44	€111.11	€117.58
Total expected bonus payments with good strategy	€28.00	€21.78	€220.00	€115.24
Total expected bonus payments with bad strategy	€8.00	€1.78	€200.00	€95.24
Probability of earning zero bonus with good strategy over both rounds	9%	51%	0%	2%

Table 1: Comparison of per-period versus two-period bonus schemes for a standard incentive problem (columns 2 and 3) and for preventing tail risks (columns 4 and 5). The table contains values based on the following illustrative assumptions: In both the standard and the tail-risk problem, following the good strategy entails a private cost of €10 for the agent relative to the bad strategy. In the standard problem, the good strategy has a probability of 70% of producing a success in each round; the respective probability for the bad strategy is 20%. The tail risk problem involves more extreme probabilities: The good strategy leads to a success (i.e., no disaster) in 99%, the bad strategy in 90% of cases.

Table 1 illustrates and extends these insights by way of a numerical example. The second and third columns compare a per-period with a two-period bonus scheme for what can be seen as a standard incentive problem: The success event here could be a high positive return whereas failure signifies a lower, perhaps mildly negative return. Without much effort from the MRT, the chance of a high return in a given period is

assumed to be 20%. If the agent works hard, she raises this probability to 70%. The "likelihood ratio" is a measure of how well an indicator discriminates between the agent choosing the good strategy (effort) or the bad strategy (no effort). A success in a single period makes it 3.5 times more likely that the agent follows the good strategy. By contrast, if the bank evaluates the MRT based on success in both rounds, the probability of a positive performance indication for a diligent agent is still 49% but the chance of a careless agent to be rewarded drops to just 4%. Overall, success in both rounds implies a 12.25 times higher likelihood that the agent has worked hard. The greater precision of the latter indicator allows the bank to minimise bonus payments to MRTs who follow the bad strategy. To illustrate this point, the table assumes private cost C of exerting effort during one period to be €10. Based on this number and on the corresponding minimum bonus amounts reported in the table, the expected compensation to a lazy agent can be kept to €1.78 with the more precise performance criterion of success in both periods as compared to €8.00 when a bonus is awarded for good performance in each of the two periods.

So far, the table only exemplifies the results of the earlier analysis. The greater precision of the two-period bonus raises the question why the bank would ever prefer a short-term compensation scheme. The last row of the second and third columns hint at an explanation. They show the probability that an agent who chooses the good strategy fails to receive any bonus at all, which can be understood as a measure of how risky the compensation scheme is for a diligent agent. In this respect, long-term compensation compares less favourably to the short-term alternative. In the numerical example, choosing the good strategy offers only a 50-50 chance of obtaining the two-period (large) bonus. Yet if a (smaller) bonus is paid for a success in each round, a faithful agent runs only a 9% risk of being left empty-handed. This indicates a tradeoff between the greater precision of multi-period evaluation and the diversification benefit of several subsequent opportunities to earn a bonus. The cost of exposing risk-averse MRTs to extreme variability in their total payoff appears to be the primary reason for "short termism" in variable compensation.[136]

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[136] That a more precise signal exposes the agent to greater risk seems at odds with the informativeness principle, according to which more informative signals reduce risk-bearing costs, see *B. Holmström*, Moral hazard and observability, Bell Journal of Economics (Bell J. Econ.) 10 (1979), p. 74 et seq.; *S. Shavell*, Risk sharing and incentives in the principal and agent

The fourth and fifth columns of Table 1 show a different tradeoff for providing incentives against tail risk taking. A success now refers to the absence of disastrous losses. As tail risks have a low probability, the good strategy is associated with a very high probability of 99% of success. The bad strategy consists of incurring an intolerable 10% probability of disaster, translating into a 90% success probability. Comparing the likelihood ratios again shows the two-period bonus scheme to be more discriminating than the per-period scheme. However, both the level and the difference of the likelihood ratios is far smaller than in the standard setting, underscoring the difficulty of restricting tail risk taking. The numerical example again assumes a private cost C of €10 for choosing the good strategy. The private cost may reflect the effort needed to detect and avoid deleterious risk, but it could also mean foregoing investments with seemingly high returns in exchange for priced tail risk. It is hard to tell whether the standard incentive problem of inducing effort or that of preventing large tail risks are equally severe, as implied by the assumption of €10 in private costs for both settings. Nonetheless, comparing the order of magnitude of minimum bonuses at least suggests a greater difficulty of preventing tail risk taking *vis-à-vis* inducing work effort. This provides a first reason to deploy a long-term scheme against tail risk taking: Accumulating variable compensation over several periods permits the bank to offer a larger reward (keeping one's bonuses for several periods) or, equivalently, threatening a larger penalty (losing all one's accrued bonuses).

In addition, the greater precision of two-period evaluation is particularly helpful in aligning incentives for success probabilities close to one and thus for the parameter range associated with tail risks (i.e., failure probabilities close to zero). Moving from per-period to two-period evaluation in the tail risk incentive setting cuts the required total expected bonus by almost one half, from €220 to around €115.[137] A long-term incentive scheme to restrain tail risk taking is significantly less expensive for the

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relationship, Bell Journal of Economics (Bell J. Econ.) 10 (1979), p. 55 et seq. The contradiction is only apparent though. Both per-period and two-period schemes use the same amount of information to determine the agent's total payout, namely the number of successes over the two periods. They only differ in how they relate payouts to the number of successes.

137 More generally, with p and q close to one, the minimum bonuses needed in the per-period and the two-period scheme become almost the same, see the equation in fn. 134. A careful agent can earn the per-period bonus twice (with probability p) whereas there is only one chance to receive the two-period bonus (with probability p^2).

bank than a short-term plan. Last not least, the very low probability of tail events for diligent agents implies that the probability of not being rewarded is low. As before, the one-period scheme provides more assurance but the probability of not earning the bonus is very low in the two-period scheme as well (2% versus close to 0% in Table 1).

Putting the pieces of the analysis together leads to a surprisingly clear policy prescription. In incentivising MRTs to pursue profitable investment opportunties, a long-term compensation scheme would be cheaper for banks if MRTs were risk neutral. Once risk-bearing costs are taken into account, the balance tips towards more short-term bonus schemes. For the second incentive problem, restricting tail risk, the tradeoff between precision in targeting the desired behaviour and agents' risk aversion results in a significantly longer evaluation period. Also, deterring tail risk requires a large reward (penalty) to be effective but exposes the MRT to only a small risk of missing the reward (suffering the penalty). The differences in optimal incentive provision for investment effort and for the avoidance of tail risk create a complementarity that a combined scheme can exploit: Conventional, "normal" investment performance is evaluated over a short horizon, such as a single year. The bonuses earned over several years feed into a pool of deferred and retained pay. The pool then operates to deter tail-risk taking by being subject to forfeiture in a tail event. This diminishes the value of bonuses as a short-term incentive, but only by relatively little given the very low probability of tail events, especially when MRTs strive to avoid tail risks. In the example of Table 1, the expected value of accrued bonuses declines by only 2% if they are exposed to a two-period tail-risk forfeiture scheme. Reusing short-term bonuses to deter tail risk taking, therefore, only moderately increases the level of pay required for ordinary effort incentives.

3. Assessment of deferral and retention rules

As is often the case, a closer investigation confirms the grain of truth in popular intuition, namely that short-term performance pay fails to incentivise bankers to avoid small-probability disaster risk. Embracing this intuition is arguably the only noticeable contribution that pay regulation makes to rein in systemic risk. In fact, the basic structure of deferral and retention rules strikingly mirror the policy recommendation derived from the analysis of the previous subsection: Variable pay

accrues over short horizons. Part of it is deferred and paid in instruments that are subject to retention. Deferred bonuses can later be slashed through malus or clawback in light of adverse outcomes, whereas retained instruments may suffer losses in value.

Besides supporting the general approach, the foregoing analysis also permits a critical appraisal of specific arrangements. A key insight is the difference between standard performance-based pay and the more intricate problem of inhibiting tail risk taking. While annual performance is a reasonably good indicator of an MRT's talent for and commitment to finding good investment opportunities, priced disaster risk can remain hidden for many years. Extending the timeframe of performance evaluation should be limited to discouraging this type of opportunistic risk taking. This seems what pay regulation contemplates when it cites "significant losses" as a trigger of an ex post reduction.[138] Also, where the bank pays variable compensation in the form of subordinated debt instruments,[139] the value of the MRT's holding is directly related to the absence of large risks that threaten the bank's viability.

However, the drafters of the new rules as well as financial regulators seem not to fully appreciate the complementarity between short-term effort incentives and long-term deterrence of tail risks. Instead of focusing exclusively on tail events, the Banking Directive generally calls for variable pay to be "considerably contracted where subdued or negative financial performance of the institution occurs", including through reductions "in payouts of amounts previously earned".[140] Unfortunately, the guidelines adopted or proposed by European supervisors show even less regard for the distinction between short-term bonus awards and their long-term use as a pledge against tail risk taking. They instead conceive of the malus or clawback as merely an extension and continuation of the ex ante risk adjustment:

> "The extent to which an ex-post risk adjustment is needed depends on the accuracy of the ex-ante risk adjustment and should be established by the institution based on back testing.

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138 *Supra* fn. 127 and accompanying text.

139 *Supra* fn. 128 and accompanying text.

140 Art. 94(1)(n) subpara. 2.

> […] Institutions should use at least the initially used performance and risk criteria to ensure a link between the initial performance measurement and its back testing."[141]

Although the guidelines go on to require that banks apply further "specific criteria" such as evidence of misconduct or "significant downturn[s] in financial performance",[142] their idea of the ex post adjustment is to repeat and perfect the original comprehensive risk assessment. This is exactly the opposite of a model that pursues different incentive alignment goals at the accrual and the ex post stage. A 2014 report by the German regulatory agency BaFin evinces the conceptual difference. Describing flaws in the compensation systems of 14 German banks, BaFin levels the following criticism against ex post adjustment policies:

> "The main problems in terms of payment restrictions were the lack of appropriate criteria for reducing the retained variable remuneration ('malus' triggers). For example, some institutions defined criteria or thresholds in such a way that an examination of whether a malus was applied would only take place in the event of extremely adverse developments or serious individual misconduct."[143]

What the German regulator decries as a shortcoming is, in fact, a design feature of the model advocated here: Ex post bonus cuts should be triggered specifically and exclusively by "extremely adverse developments" – tail losses – rather than by any random "subdued" performance. They should remain exceptional events. Regulators, by contrast, seem to adhere to a "more is better" view that is intent on maximising the precision of performance measurement in all dimensions. But regulation should not preoccupy itself with what can confidently be left to the bank's management and shareholders who bear the losses of all non-extreme performance shortfalls. It is only with regard to tail risks that the interests of shareholders diverge from the public good. What is more, the lack of focus critically weakens the effectiveness of pay regulation. To see this, consider again Table 1. If a malus can be imposed for any "subdued" performance in the second period and if the MRT has incomplete control

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141 *EBA* (fn. 17), para. 268, 270; similarly *CEBS* (fn. 17), para. 135, 138.

142 *EBA*, Draft Guidelines (fn. 109), para. 270; *CEBS* (fn. 17), para. 137.

143 *B. Botterweck/M. Jaeger/I. Steinbrecher*, Remuneration systems: audit campaign finds quality shortcomings at all institutions (2014), available at <http://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2014/fa_bj_1402_vergutungssysteme_en.html> (last accessed 11/29/2015).

over performance, then the sum of deferred bonuses will be worth considerably less to the MRT. The threat of an ex post deduction works as a discount on bonuses earned in the short run. This not only increases risk-bearing costs.[144] It also diminishes the penalty and hence the incentive power of deferred bonuses against tail risk. In terms of Table 1, the "minimum bonus amount" needed to deter tail-risk taking rises; conversely, a given bonus amount becomes less effective in preventing MRTs from assuming priced disaster risk. The main lesson is that a deferred Euro has only so much incentive power. Regulators should spend it on what matters – which is only controlling tail risk.

E. Conclusion

The enormous, often breath-taking bonuses paid in the financial industry made compensation practice a salient and plausible target for intervention after the financial crisis. The politics of financial regulation follow their own laws, one of them being that opportunities for new regulation are rare and pass quickly. Against this backdrop, it is no surprise that advances made after a crisis are a less-than-perfect fix for the problem at hand. The task of policy-related academic research is to point out the weaknesses in the hope of contributing to future improvements.

In this spirit, the evaluation of the far-reaching regulation of bankers' pay in the EU leads to a rather unfavourable conclusion. The central flaw of the new rules is their lack of focus. What warrants regulatory intervention is not a desire to improve bank management in general but, in the domain of prudential regulation, the concern for large-scale and correlated risks that cut through equity or liquidity buffers, imperil the viability of single banks and disrupt entire markets. As it stands, EU pay regulation creates massive amounts of red tape, including thousands of work hours spent in meetings, on documentation and box-checking exercises. The effect on minimising systemic risk is likely to be small. This is especially true for the controversial bonus cap that, in addition, has other unintended consequences. The regulatory demand for a comprehensive adjustment of variable compensation "for all

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144 Apart from tail risks the bank has an incentive to pick the right tradeoff between precision in performance evaluation and volatility borne by the agent (see text before *supra* fn. 136). Regulatory intervention then introduces a distortion away from the optimum.

types of current and future risks" achieves little more than what banks do anyway, safe for the additional documentation that regulation entails. The only promising measure is the requirement that significant parts of variable compensation be deferred and paid in retained instruments. But here too, the beneficial effect is diluted because regulation fails to focus on systemic tail risk. Trivially, understanding the disease is the key to inventing a cure.