# MACRO-PRUDENTIAL REGULATION: WHERE ARE WE AND WHERE DO WE NEED TO GO?

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## INTRODUCTION

Financial crashes appear so complicated, and have so many proximate causes, that instead of being events of great learning as well as woe, they end up giving everyone a license to say *I told you so*. Left-of-centre Europeans explain the crash is proof that unfettered markets are doomed. Right-of-centre Americans believe that the elaborate but incomplete system of Government regulation created risky behaviour. Those in the east consider the crisis was one of overconsumption by a spending-addicted west, while those in the west counter that the fault lay in the excessive saving and mercantilism of the east. But rather like the old story of the blind men and the elephant, these politically-charged perspectives miss the picture as a whole[1].

Anyone familiar with the large and complex rule books of banking supervisors could hardly call banks unregulated. Equally, it is also clear that poor supervision and uneven rules created incentives for banks to shop around for accommodating jurisdictions. But quite simply we had ill-conceived regulation in the west - that many in the east had resolved to follow. It was bad and complex. Complexity has many drivers, one of the most important being that it is an avenue of industry's capture of its regulators[2]. Regulators were destined for poor and complex rule-making because they did not start with a framework of what we were trying to achieve and in the case of limiting systemic risk, of a framework for what drives and influences it. They worked instead with the flawed notion that we should find existing good practices in the banking sector and then require all financial institutions to follow this best practice[3]. With every reset regulatory rules grew bottom-up by slow accretion. Bankers forever found loop-holes that regulators later chased to close, or in some cases, loopholes politicians had created and held open to protect popular interests[4]. It is hardly surprising then, that banking regulation emerged looking piecemeal, punctuated by exemptions and special cases, highly resistant to easy comprehension by anyone trying to analyse the systemic effects and increasingly the preserve of compliance lawyers[6].

In trying to make sense of it all, many have blamed regulatory arbitrage between regulated banks and less regulated "shadow banks" and so concluded that we needed to simply make the same

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[1] The story of the blind men and an elephant originated in India from where it is widely diffused. In various versions of the tale, a group of blind men touch an elephant to learn what it is like. Each one feels a different part, but only one part, such as the side or the tusk. They then compare notes and learn that they are in complete disagreement (from Wikipedia).

[2] See "Banks put themselves at risk in Basle", A. D. Persaud, October 2002, The Financial Times.

[3] See, "A History of Banking Regulation", C. A. E. Goodhart, forthcoming, for a background as to the intellectual influences on early regulation. Extending "best practice" was a flawed approach to regulation because the whole reason for banking regulation - the social externality we are trying to internalize - is that even the best banks will under-invest in systemic stability.

[4] Political pressures led the risk weights for housing lending and all Eurozone government bonds to be fixed at artificially low levels.

[6] No offense to lawyers is meant here (some of my best friends are lawyers…) what is meant is that lawyers are focused on the adherence to the law, not on the softer issues of systemic risk management. When I wrote "Sending the herd off the cliff edge" in 2000 (IIF, Washington), on how the risk-sensitive approach to banking regulation was leading to systemic fragility, very few macro-economists were writing about the macro implications of banking regulation.

regulation more comprehensive across sectors and countries: Banking is global and regulation should follow suit; if it looks like a bank, and quacks like a bank, then it is a bank and should be regulated as one. All this sounds sensible enough, but it is a shade polemic given that the shadow banks do not take or make deposits and are, just like a shadow, inextricably linked to their alter ego, dependent on banks for funding which can be a useful conduit for regulation. There is an important balance to get right. Where regulatory arbitrage contributes to systemically dangerous behaviour, steps should be taken to avoid it, but the notion that there is a single rule-book, appropriate for all countries at all times, thereby eliminating regulatory arbitrage is overly ambitious[7]. And taking bad regulation and spreading it more generally, locally and abroad, is to be avoided too. Moreover, we can never win this boundary game and should consider whether we even want to. Regulating risks in one area and as a result driving it another, and then regulating risks in that new area only to see it slip away again, has as its logical extension, that we will merely chase risks to where we can no longer see them[8]. This is not the goal of good regulation. At a minimum we want to know where risks have moved.

It is preferable to take a comprehensive approach to where it is best for risks to be from a systemic risk-management perspective, and where they should not be. This kind of regulation that would incentivise risks flowing in sympathy to where there is a capacity for risks to be, or if we are to be less dirigiste, does not get in the way of this flow in the name of consumer protection or some other ancillary objective. But this requires a framework of systemic risk control and management, one that takes into account the nature of financial risks and how they are hedged, absorbed, concentrated and interact with each other. This framework is absent from most regulatory discussions.

While there appears to be a common vocabulary around systemic risks, macro-prudential regulation and financial system resilience, there is little underlying theory of what generates systemic risk nor how systemic risks can be hedged or absorbed. Consequently, after a general nodding around the FSB table of the importance of systemic risks, most discussions end up focusing on a structure for understanding with firm-level risks. Ideas like improved banking competition, contingent capital, ring-fencing retail from wholesale banking are all intrinsically micro-prudential ideas that look good from a static perspective, but do not consider the macro-dynamic. They do not relate to what makes financial systems vulnerable to systemic risk or what propagates systemic risk. Below are some ideas on the nature of financial risk and a framework for reducing systemic risks in the financial sector that these ideas imply.

## WHY REGULATE?

In establishing a framework for regulation it is worth starting off by considering why we cannot simply let markets get on with it. This question will seem banal to many commentators outside of the United States, but over the last decade, financial regulation has been a victim of mission creep and like some overly diversified conglomerate it is no longer clear what its core activity is. Following the World Trade Centre horror on September 11, 2001, regulators were increasingly given the role of financial policemen, keeping tabs on potential terrorist-financing as well as money laundering. While these are important endeavours, putting them within the remit of the financial regulator as opposed to, say, a financial crime watchdog, promoted the development of

[7] See, "The Locus of financial regulation", A. D. Persaud, International Affairs, Volume 86, Number 3, May 2010.
[8] See "Redesigning Regulation of Pensions and Other Financial Products, J. Nugge and A. D. Persaud, Oxford Review of Economic Policy, Vol. 22, No. 1, Spring 2006.

the financial regulator as a compliance body that checked up on and enforced narrow rules[9] as opposed to a national risk-management body that thought broadly about what risks banks were taking and how were they managing them. Under the weight of too many objectives and masters, regulators lost focus and the crucial work of keeping the financial system safe was pushed to the back burner.

This is illustrated by the fact that after the crisis, politicians and supervisors often countered criticism by saying that they could not possibly know what banks were up to because the banks used a complex network of off-shore and off-balance sheet vehicles to conduct their business[10]. But no one can begin to adequately supervise a bank unless they know exactly how it makes its profit - be it through off-balance sheet or off-shore vehicles - and critically what risks they are taking to make its profits. This is a fundamental of banking supervision and supervisors had all the power they needed to find that information, to forecast bank profitability and to enquire when those forecasts under-predicted revenues or risks. They chose not to do this. Partly because they had so many important things to check, the process of supervision effectively becoming a long list of boxes to be ticked, rather than about understanding the risks that were being taken and how they were being diversified or hedged. Partly too, the zeitgeist of the time suggested that markets were always right and governments needed to get out of the way. Regulators in London openly boasted of "light touch regulation" and participated in attempts to export the UK-model to other unsuspecting jurisdictions[11]. In the end the environment disarmed obdurate or inquisitive supervisors. Under this compliance model of regulation, the prevailing view was that it was not their business to understand a bank's business model and its profitability, merely to see whether what they were doing was compliant.

To consider what the focus of regulation ought to be it is useful to go back to first principles and consider why we regulate banks over and above the way we regulate other corporations. Many manufacturers produce harmful products and in many cases we regulate the sale and safety of these products[12] but generally we do not regulate the holding companies as much as we regulate bank holding companies. We don't ask gun manufacturers, tobacco, drink or drug companies to have a minimum amount of capital or to be publicly listed. We ask this of banks because of two separate features of finance. First, markets self-regulate well when consumers are engaged in a great many purchases, can quickly find out the quality of the product, can easily switch providers and can easily remedy a poor purchase. The experience of retail consumers of financial products is almost the exact opposite of this ideal. They tend to make a small number of large, infrequent, purchases – like a mortgage or a pension; they cannot easily see whether these are the right product choices until several years after the original decision when the salesmen may have long departed; and often a mistake can lead to life changing losses. Consequently, retail consumers who need a greater degree of consumer protection than professionals trading daily in the wholesale markets or consumers of other products[13].

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[9] Prior to the financial crisis there was an slightly phony philosophical debate between the US "rules-based" approach to regulation and the UK's "principles-based" approach. While this sounds intellectually interesting, the reality is that operationally the two approaches were more similar than the protagonists would care to let on. In the UK there was a fat "rule book" to help people adhere to the principles and in the US, there were a series of principles to help the enforcers consider whether a rule had been followed or not.

[10] Lehman's had over 600 off-shore entities

[11] It is a good thing that they were not too successful in this regard, outside the Middle-East and the British dependencies.

[12] A number of commentators argue that we should have a "FDA" that should approve financial products before they can be sold to consumers. We discuss the problems with this approach later on.

[13] The rest of this article is focused on systemic risks rather than consumer protection risks, suffice to say that I fully accept this argument and regulators already regulate quite strictly what the non-professional financial consumer can buy and how these products are sold.

Secondly, when one shoe shop fails the others in the high street prosper from the removal of the competition. Not so for banks. The failure of one bank can trigger the failure of many others. This is partly because banks create credit: the overdraft of one customer is the cash deposit of another, which is the collateral being pledged to yet another for an investment. These interrelationships are both deep and broad. Even with separate funding, common investments in the same sector mean that if one bank fails and becomes a forced seller of assets in that sector, it could bring down others. Moreover, given this shuffling around of bank-created credit, at any given time some banks will be long of liquidity and some short, so they regularly lend to each other. The tight knitting together of banks means that confidence in the system plays a critical role in the liquidity and solvency of individual firms and vice versa.

All of this confirms that banking in a credit economy is highly systemic. It is a classic externality story. Given the wider social costs of a run on banks is so much greater than the private costs of a single bank failure, bankers will, from a social perspective, under-invest in avoiding bank failure. Were governments not to intervene to better internalize these social externalities and provide the public goods of confidence and trust, markets would be narrow and repressed, providing a substantial drag on economic activity and growth. In this regard it is important to see good regulation not as a constraint or hindrance to markets but as a compliment to their development[14].

We regulate therefore for two distinct purposes: to protect vulnerable consumers and to mitigate systemic risks. It is worth considering how these two issues relate to each other. Commentators neglect the possibility of there being trade-offs between these two objectives. We may want to find ways of limiting the losses incurred by vulnerable consumers and to do so we limit their ability to make losses by limiting their ability to operate in certain markets and instruments. But at some level financial market "liquidity" needs "losers". When a market is falling, we do not want Great Aunt Agatha's pension fund to be the one betting the shop that there will be an early rebound. But we do want someone to do so otherwise markets will keep falling thereby wiping out the returns of Aunt Agatha's portfolio anyway. Liquidity needs a type of investor prepared to buy when everyone is selling and prepared to accept short-term losses for the potential of larger, longer term gains. Trying to limit the losses of all through micro-prudential rules could create expensive macro disasters[15].

Similarly, the decline in trading costs should benefit consumers, but it may also incentivise a socially useless build up of exposures that, when a crisis hits and confidence plummets, become systemically dangerous[16]. Transaction taxes undermine consumer returns modestly during quiet times and reduce systemic fragility during the noisy times. These potential trade-offs hint at the fallacy of composition that exists for financial risks. It is quite possible that what is safe for individual consumers and institutions, is not safe when this behaviour is multiplied and aggregated across the system. Regulating finance is not like regulating the gas industry where imposing common standards reduces risk. It is why micro-prudential rules are not enough and could even undermine macro-conditions. It is why we need genuinely macro-prudential regulation.

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[14] This idea is well developed in "One Economics Many Recipes", D. Rodrik, 2011.

[15] In the 2007-2009 crisis, after a few attempts by Sovereign Wealth Funds went awry, the only one prepared to be a buyer was Governments or their agents, central banks. The Lender of Last Resort became the Buyer of Last Resort – a phrase I first heard from Willem Buiter.

[16] UK, FSA Chairman Adair Turner had some interesting remarks on this subject in his September 2008 "Prospect Magazine" interview: "The idea that more complete markets and more liquid markets are definitionally good and the more of them we have the more stable the system will be, that was asserted with great confidence up to three years ago. But what precisely we do as a result of the collapse of that approach is unclear."

In managing consumer risk and systemic risk it would be easy to simply reduce risk-taking. However, economic growth and activity depend on the taking of risks. No risk, no growth. Bank assets as a proportion of GDP are considerably lower in emerging economies and it is arguable that their most pressing problem is insufficient risk-taking not an excess. A wider objective must be to regulate the system in such a way that we minimize the amount of systemic risk generated by a given aggregate level of risk-taking.

One method is to improve resolution mechanisms so that when a crisis hits it is resolved in a manner that limits systemic risks as much as is possible. This approach has received most attention generating a number of clever ideas that seem to limit the exposure of tax-payers and government. However this approach may prove the least successful. In a credit economy one of the principal avenues of contagion is confidence and there are a limited number of ways in which you can save tax-payers and maintain confidence[17]. The notion that restructuring the financial sector into a larger number of smaller banks is an attractive thought, but if all of those smaller institutions behave in the same way we end up with the same systemic problem as before and an additional layer of complexity in dealing with it. Small banks can be a major source of risk, indeed, the triggers of the last crisis were the smaller institutions: Bear Sterns, IKB and Northern Rock[18].

Arguably, government should play a critical role in the resolution of systemic crises given that in a liquidity crisis period it is the asset in greatest demand and shortest supply and Government, being immortal, has more of it than anyone else. Perhaps the question is how should Government correctly price the lending on its balance sheet before and afterwards[19]. Additionally, while good resolution can make a positive difference at the margin, fundamentally, it cannot create small crashes from large booms.

Another approach is to attempt to minimize the booms[20]. Financial crashes are not random events driven by random frauds as some think. Almost all financial crashes are preceded by similarly sized booms. There are a number of macro-prudential tools that could help to tame booms such as counter cyclical loan-to-value limits, capital adequacy requirements and simple leverage ratios. Market participants find booms hard to identify when they are in them because they are incentivized to see only those indications that the boom will last. But central bankers and regulators should be less incentivized to do so and if in doubt[21] could use simple rules to

[17] See, A Dissent, Recommendations of the Independent Commission on Banking, C. A.E. Goodhart and A. D. Persaud, Vox.EU, May 2011.
[18] The UK's "small banking crisis" of 1974 arguably had a greater impact on UK markets and economy than the current crisis.
[19] One idea I have proposed is that instead of capital adequacy requirements with their necessary combination of crudeness and complexity, banks are required to privately insure the first 10% of the loss to creditors and, using this market price, pay into a Government sinking fund the equivalent premium for insuring the other 90% with payment options in a difficult year. Risky banks would therefore by chastened by high insurance premia and would be incentivized to lower it in a number of ways, including capital buffers, the spread of their business and other forms of insurance and self-insurance and Governments would be paid for the fact that in a systemic crisis there are few alternatives to a Government rescue. Insurers could not provide all the insurance as that would merely mean that the next banking crisis brought down the insurers as well.
[20] See "Fundamental Principles of Financial Regulation", M. Brunnermeier, A. Crockett, C. Goodhart, A Persaud and H. Shin, Geneva Report on the World Economy, No. 11, ICMB/CEPR/NBER
[21] Governments, presumably, would like a boom to last until after the next election and central bankers often look good during the beginning of a boom where growth is strong and inflation not yet emerging, making some unwilling to act swiftly against it.

determine whether they should be pressing harder on different braking mechanisms e.g. each year lending growth is significantly above average[22]. Smaller booms yield smaller crashes giving Governments greater maneuverability.

A good test for any financial stability initiative is whether it will make the booms bigger, smaller or unchanged. Indeed, the concern here with over contingence capital and bail-in instruments is that they will not only trigger an earlier collapse of confidence in the credit markets in the crisis but actually give a false sense of security beforehand, helping markets to over-reach themselves.

Many of the more traditional macro-prudential instruments - like time-varying capital adequacy requirements and loan-to-value limits in mortgage lending have been considered in the wake of the current crisis. The revised Basle II even includes a facility for raising capital adequacy requirements by a couple percentage points to take into account the economic cycle. Supervisors have the discretion to do more although there is fading momentum in this area. Regulators appear to be suggesting that managing the cycle is the job of central banks and not bank supervisors. This makes sense until it is recognized that a boom in one area of the economy cannot be easily contained through interest rates that apply to the whole economy. Regulatory action can be better targeted to the life cycle of a boom in a particular sector by focusing on easy access to financing. If market participants are convinced, for example, that house prices will rise by 20% per year in an economy where other sectors are growing at a respectable 3.0% the level of interest rates required to limit lending to the housing sector would crucify the rest of the economy.

Booms are not driven by market participants doing something they think is risky, but investing in things they think are safe, so safe, as to justify doubling up and increasing leverage. There is a mis-pricing of risk, which is often the result of the arrival of a new technology that will change the world and encourage many to argue why this time, it is different. The stories are not always as far-fetched as that of the South Sea or Mississippi Companies, and the technologies often do change the world (rail roads, motor cars, electricity) they just do so without making quite as many people as rich as they imagined.

Free-market fundamentalists are easily persuaded that the mis-pricing is a result of mis-information or absent information, and many attempts have been made following crashes to improve transparency in financial markets[23]. However, during booms market participants actively ignore the information that would have challenged their optimism. Maybe an inclination to optimism was a successful survival technique hard-wired into us during evolution. Whatever the underlying causes of humanity's weakness for "gold rushes", it would be reasonable to conclude from the evidence of the last eight hundred years of financial folly that mis-pricings will continue and limiting their consequences through counter-cyclical or other measures should be a central task of regulation[24].

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[22] See, "How to avoid the next crash" Charles Goodhart and Avinash Persaud, May 1, 2008, The Financial Times. Other proponents of counter-cyclical regulatory action include Claudio Borio, John Eatwell, Stephany Griffth-Jones and Jose Antonio Ocampo.

[23] After the Asian financial crisis (1997-1999), one strand of thinking was that it was caused by the absence of good information on the scale of short-term external debt and much effort was made to improve data quality and dissemination standards and codes. While more information is generally better than less, the prevailing thinking behind a boom tends to explain why standard data analysis no longer applies and there is a new metric of valuation that sustains the boom (recall the obsession with "eyeballs" to the expense of profits during the dotcom boom of 1998-1999) and so more and better information is unlikely to help to avoid the cycle, but maybe it can help steer the longer-term trends.

[24] See "Eight Hundred Years of Financial Folly", Reinhart and Rogoff, 2010.

Another way to moderate the mis-pricing of risk that drives the credit cycle would be macro-prudential regulation that channeled different risks to places in the financial system where, were they to explode, they would be absorbed with least spillovers to the rest of the economy.

## THE NATURE OF RISK

During the halcyon days of the last boom when liquidity was plentiful, risk became commoditized: different risks could be extracted from instruments, traded separately and their price volatility measured. Risks were sliced, diced, traded and modeled. Investment was boiled down to a mean-variance optimization problem. There was a nexus of risk-return points and investors merely had to decide what their risk appetite was or their returns requirement. This elegant picture was reinforced by academia. Its proponents won Nobel Prizes and there was an increasing sense of intellectual snobbery in finance. If you didn't buy into the nexus, the implication was that it was because you weren't bright enough to understand it. Many regulators and central bankers, perhaps fearful of not being considered sufficiently cerebral, bought into these ideas in their entirety. In Financial Stability Reviews they championed the notion that the new financial technology was making the world a safer place by spreading risk out of concentrated balance sheets and distributing it across many investors[25].

There are fundamental problems with this approach to risk. However compelling a picture, risk is not a stable particle to be found in different amounts in different instruments and readily measured by the volatility of its price. Risk is a chameleon. The riskiness of an instrument changes with who is holding it. Equity markets are risky for someone who may need to raise cash at a moment's notice and cannot afford to suffer a loss. These markets are less risky to the player with the luxury of choosing when to buy and sell. Government bond markets are safer for someone needing immediate liquidity and risky for someone saving for a defined pension benefit in twenty years time.

In addition, the "risk-as-measured-by-past-volatility" approach is too static. It was not a wholly unreasonable approximation to the 1950s when Harry Markovitz was developing mean-variance optimization at the Rand Corporation at a time of few computers and datasets. Risk is dynamic. It is driven by strategic behaviour. Regulators approved of mean-variance optimization of portfolios and underpinned the framework in the market directive of 1995 and the approved credit risk models of Basle II[26]. Consequently, the observation, for example, that an asset boasted higher than average returns and lower than average volatility of returns in the past, would have triggered all mean-variance optimising market participants to buy it over time, changing it into an overvalued asset, with a herd of investors exposed to it, and therefore particularly vulnerable to a change in sentiment[27].

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[25] I do not wish to embarrass any authors but a cursory glance of the contents pages of the Financial Stability Reviews of central banks in the years up to 2007 should be illustrative of this point.

[26] I have written about the folly of these regulatory-approved models and how, instead of being a source of risk-management, they actually create risk in a series of articles including "The Folly of VaR: Gresham Lecture, October 2002", A. D. Persaud,

[27] As I have argued before, there are similarities here with Heisenberg's Uncertainty Principle in that the observation of risk, creates risk and the observation of safety creates risk, see "Sending the herd off the cliff edge, the disturbing interaction between market-sensitive risk-management and herding of investors, A. D. Persaud, Jacques de Larosiere Award in Global Finance, IIF, September 2000. Illustration of this idea comes from the starkly different market response to defaults in Asia in 1997 – where cross-over investors were heavily exposed given past, favourable, risk-return characteristics of Asian markets - and the Argentine default in 2000, which was the largest default in history, but had far more limited spill-over effects because by then cross-over investors (international investors who were not

One of the abiding lessons of the role of behaviour is that financial market liquidity is not about the size of market capitalisation or turnover as is often thought, it is about diversity. A market may be large but if everyone is trying to sell at the same time, perhaps in response to a piece of information or a signal to sell from their common risk management systems, then the market will fall vertically, empting of all liquidity. To retain liquidity, a market must have participants that have different valuations of the same assets, different strategies based on the same valuations perhaps because of different investment horizons or funding. Liquidity requires heterogeneity. However, in a number of ways, and ironically enough, in the name of safety and stability and as an extension of the data standards and codes approach, regulators have reduced the market's natural heterogeneity and been encouraging homogeneity which has reduced liquidity and made markets more fragile. An example is the use of mark-to-market valuation models, credit ratings in bank risk models or the use of standard value-at-risk, risk management models by bankers and investors, all of which generate common buy or sell signals[29].

The third flaw in the approach to risk embedded in bank regulation prior to the crisis was the notion that there was one thing called risk that could be measured in one way and capital could be put up as a hedge against that level of risk. There are different risks which we know are different, not because they are called by different names but by the fact that they are hedged in very different ways. Credit risk is an example. It is best hedged by diversifying across a range of different credits that are uncorrelated. (All assets end up being correlated in a liquidity crisis where everything is measured in terms of the ability to be turned into cash.) Uncorrelated risks are likely to go in the opposite direction during normal times – for example, a holding of alternative energy assets and a holding of equity investments in companies that are heavy users of fossil fuels. A sharp rise of fossil fuel prices should send the former portfolio up and the latter down.

The way to hedge liquidity risks however, is not to diversify across a wide range of equally illiquid assets. It is to have long-term funding so that you are not forced to sell an illiquid asset quickly, or put another way, it is to diversify across time. Market risks are best hedged through a combination of asset diversification and time diversification.

## SYSTEMIC RISK MANAGEMENT

The nature of risk points to three essential elements in a framework of systemic risk management. A diversity of risks and market participants is a source of systemic resilience that must be supported. It should not be undermined through, for example, the imposition of common rules for the sake of commonality without reference to underlying risks and risk capacity. Mark-to-market accounting rules, or market-sensitive risk-management tools make perfect sense for asset holders with short-term funding for whom today's price is *the* price they face and makes no sense for asset holders with long-term funding who face the price at some date. When prices fall because of short-term factors, in a resilient financial system we should expect to see short-term funded holders selling to long-term funded holders while in a fragile system we would see short-term and long-term holders competing to sell first with few buyers in sight.

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emerging market specialists but held other assets they would have to sell in a search for liquidity) had fled emerging markets chased away by the then very poor risk-return characteristics. Safety created risk and risk created safety.

[29] In, "Liquidity Black Holes", UNU Discussion Papers, 2001, and "Liquidity Black Holes, How to Observe, Measure and Manage them", Risk Books, 2005, I develop a theory of how "Liquidity Black Holes" are triggered by common risk rules and how the increased tendency of markets to fall into these liquidity holes can be measured.

We need to replace the idea of risk-sensitivity with risk capacity. What should matter to regulators is not the market's pro-cyclical measure of risks – which will tend to understate risks in a boom and overstate them in a crash, compounding the credit cycle – but that different risks are being encouraged to go where there is capacity to absorb them were they to erupt. Across the financial system we need financial institutions to put aside capital where they hold credit risks that are not diversified by uncorrelated credits, liquidity risks that are not matched by long-term funding and market risks that are neither diversified by uncorrelated markets or matched by long-term funding. The result will be that financial institutions will take the risks they have the greatest capacity to absorb and transfer the risks they do not to those that do. Banks are generally better positioned to diversify and therefore hold credit risks and they should do so. Most pension funds and insurance companies are better placed to hold illiquid risks and they should do so - with transfers between the two sectors moving in sympathy with these capacities.

Appropriate transfers between financial sectors - from places without a capacity to hold a specific risk towards places that can - is therefore an important source of financial system stability. To generate this flow we need to incentivise the matching of specific risks. If we do not do that it is possible for transfers to be inappropriate from a systemic risk perspective. Indeed, the focus of the past approach on current prices and past returns conjured up the exact opposite of what we would want to see from a systemic risk perspective. Banks, with their short-term funding, ended up holding illiquid risks such as investments or lending to private equity funds and portfolios of complex credit derivatives, which over periods of high liquidity appeared to offer superior returns. Pension funds and insurance companies without an ability to source credit, ended up selling illiquid assets to banks and buying concentrated credit risks as a way of outperforming risk-free benchmarks. This compounded the financial system's fragility[30].

Imagine a AAA-rated package of credits paying a semi-annual interest payment, that is performing, but the rating has come into doubt as a result of problems in a similarly rated instrument. Liquidity in the package will disappear. Were it to be sold immediately its price would be significantly below where it was a days ago. Because the credit is performing we would consider this to be liquidity risk. If a (short-term-funded) bank held this asset and was known to do so and perhaps as a result came under funding pressure it may be forced to raise liquidity by selling the asset, which would put the price of the asset under further downward pressure. If a pension fund (with long-term liabilities) held this asset, they could just continue to do so, pocketing the interest payments. From an economic perspective they should be under no compulsion to respond to short-term changes in price. What should matter to them is the probability that the asset can continue to perform in the long-run. Indeed, the pension fund trustees may even consider buying more of the asset as relative to the cash flows it generates it has now become cheap. They could buy more from distressed banks, limiting the downward pressure on the asset and the distress of the banking system. If however, they are required to consider their future solvency by marking their assets to market price on a daily basis, or have adopted a bank-style daily earnings at risk system, they may be forced to compete with the bank to sell the asset before the price falls too far. Yet they would be doing so for reasons that are distant from whether the asset will perform when the pensioners need it to perform in the distant future.

In this example the pension fund has a capacity to hold liquidity risk. By holding liquidity risk it will earn a liquidity premia, which, given its capacity, is the closest thing there is to a free lunch. By holding on to assets when their liquidity falls and by buying assets that have become illiquid

[30] See "Credit Derivatives, Insurance Companies and Liquidity Black Holes", A. D. Persaud, The Geneva Papers on Risk and Insurance, Vol 29, No. 2, April 2004.

the pension fund's behaviour not only benefits its members, it adds to systemic resilience. By forcing the pension fund to behave as if it were a bank with short-term funding and no capacity for liquidity risk, through daily valuation and short-term solvency and risk estimates, pension funds will end up have a similar appetite for assets as banks. They will not be able to earn the liquidity premia, pushing them into trying to earn the smaller credit risk premia, which they have a weaker capacity to hold than banks as they have less access to the full range of credits to hedge their credit portfolios. Common standards across the diversity of the financial sector can lead to an artificial homogeneity in financial behaviour. By selling assets when their price and liquidity falls, the pension fund's behaviour not only undermines the long-term returns of their members, but it contributes to systemic fragility.

In the arguments above differences in liabilities and/or funding have been crucial to notions of risk capacity. Long-term funded institutions can hold liquidity risk, short-term funded institutions cannot. Financial systems naturally have market participants with different liabilities. Pension funds and insurance companies having long-term liabilities and funding. Hedge funds with lock-ups have medium-term liabilities and banks generally have short-term liabilities and funding. Valuation and risk management should reflect these different liabilities. Forcing everyone to behave as if they are operating in the short-term through an insistence of market-to-market accounting, or market-sensitive risk management systems across banks and non-banks in the name of "completeness", a removal of arbitrage or "consistency" will destroy stability-generating heterogeneity and create systemic fragility as the main market participants try to buy and sell the same assets at the same time[31].

Measuring the maturity of liabilities is easier than measuring the liquidity of assets that often appear highly liquid in booms and far less so in crashes. The determination of the liquidity of an asset would relate to how "cash-like" it is, so that long-term Government bonds would be considered liquid and very-short-dated corporate credits could also be considered liquid. Progress is being made in this area as a result of the development of the concept of a Long-term Funding Ratio. A critical point however, is that we must apply these ideas between the banking and insurance sectors and not just within them so as to allow natural differences in funding and liabilities to be a source of risk transfers and systemic resilience.

Separately from the allocation of risks across the financial system, special attention must still be placed to the allocation of risks across time. At the heart of almost all financial crashes is the excessive leverage during the preceding boom. Tempering the likely underestimation of credit and liquidity risks by market participants and regulators alike will also be important, perhaps through simple limits to leverage and time varying capital adequacy for the credit and liquidity "mis-matches"

## CONCLUSION - VIVE LA DIFFERENCE

[31] In value accounting I have previously proposed "mark-to-funding" accounting where valuations are a weighted average of mark-to-market funding and a discounted-cash-flow valuation or some other long-term measure, with the weights being determined by the maturity of the funding of the institution holding the assets. Under mark-to-funding, banks would essentially use market-to-market accounting and could not hide behind "hold-to-maturity" rules where they did not have the funding in a stressful environment to hold an asset to maturity, but a long-term pension fund with liabilities that on average came due in 20 years time and held long-term assets could value these assets using a long-term measure like discounted cash flows and not be forced to respond to daily price changes. See "Regulation, Valuation and Systemic Liquidity" A. D. Persaud, Banque de France, Financial Stability Review, 2010.

The fallacy of composition is strong in finance. It is possible for individual firms to act in a manner that is safe for them, while making the system unsafe. It is also possible for individual firms to act in risky idiosyncratic ways, but in aggregate create systemic resilience. The system is greater than its component parts. The pursuit of systemic stability has the greatest social externalities. Limiting or internalising these social externalities should be where the fault lines of regulation lie.

Consequently, organizing risks in the financial system in such a way as to limit systemic risk should be a critical focus of financial regulation. At the heart of such organization is an appreciation of two notions. There are many different forms of risk each with different ways of being hedged and there is a diversity of market participants with different capacities for hedging and absorbing different risks. Working with these diversities is pivotal to creating a safer system for a given level of individual risks. Diversity exists naturally. Individuals, insurers, pension funds, private equity funds, hedge funds and banks have different liabilities, different maturities in their funding, and varying abilities to hedge their risks internally.

Destroying differences in the name of standardization, consistency and reducing regulatory arbitrage may be the right thing to do when regulating the gas industry, but it is a highly dangerous thing to do in finance. Homogeneity is a source of financial fragility. When market participants are artificially required to sell at the same time, and are induced to buy at the same time, markets are prone to instabilities. Liquidity demands diversity. A system is safer if when short-term funded institutions want to sell, long-term funded institutions want to buy.

There are natural forces for homogeneity such as the universal collapse of information costs and abundance of data and data-processing power, so artificially adding to that homogeneity through our accounting and regulatory rules is to be avoided if we are to ensure a resilient system. The way to support heterogeneity and the resilience of the system is to organize different risks so that they flow to those sectors with the capacity for absorbing those risks were they to explode. Across the financial system, institutions, whatever their name, should have to set aside capital for the mismatch or concentration of their credit risks and separately for the mismatch or concentration of their liquidity risks, and separately for their mismatch of market risks and separately for their mismatch of any other risks. In this way, institutions will attract the risks they can best offset and absorb, making the system as a whole safer for a given level of individual risks and capital. Simply setting aside more capital will not make the system safer if risks are held in places unable to absorb them.

The purpose of this organization of risks is to make the financial system least vulnerable to a mis-pricing of individual risks. There will always be mis-pricings and there tends to be a collective under-estimation of risk in the booms and over-appreciation of it during crashes. An important bulwark against financial crisis will not just be a better allocation for risks across the financial system but also a batter allocation across time. It will continue to be imperative that any assessment of risk, mismatches and concentration are tilted against the grain of the economic cycle with, for example, capital being higher for a given mismatch in a boom than in a crash.

The old framework of risk-sensitivity, relying on market perceptions of risks could never work. In the booms when we would want institutions to be putting aside more capital and de-leveraging in anticipation of the coming adjustment, market perceptions of risk are low and falling and perceptions of value, capital and liquidity are overinflated, thereby permitting even more leverage, pumping up the boom just before the burst. This article has set out a new framework for thinking about financial risk and safety that has the potential for success because it is rooted in a risk

management approach, a systemic approach and a recognition of the nature of different financial risks and risk capacities.

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