Unregulatatiblity in Financial and Carbon Markets

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The controversy about how financial derivatives markets are to be regulated that has been opened up by the credit crunch in many ways parallels and overlaps the widening debate over regulation of carbon markets. Both markets involve hitherto untried attempts at commodification: in the case of the financial markets, commodification of an unprecedented range of uncertainties, and in the case of the carbon markets, commodification of climate benefits or the earth's carbon-cycling capacity. Policy responses to the crises facing both markets can be divided roughly into two streams. One, inspired by neoclassical economics and doctrines of "market failure", tends to assume that the production and exchange of the new proto-commodities can be successfully regulated or corrected by "internalizing externalities". Another, more pragmatically oriented, looks to partial or full decommodification as a way of tackling the problems engendered by the new markets. In the financial markets, a decommodification approach emphasizes measures such as removing certain instruments from trade, preventing the exchange of commercial bank deposits in some uncertainty markets, limiting securitisation, and so forth. In the carbon markets, a decommodification approach might, for example, prohibit offsets from being exchanged with emissions reductions, or challenge the supposed climatic equivalence, and thus the fungibility, among emissions reductions undertaken in different locations and technological contexts. Interestingly, both the calculative, "internalizing externalities" approach and the decommodification approach have supporters from wide ranges of the political spectrum, although an increasing number of policy analysts are adopting elements from the decommodification approach.

I. Introduction and Overview

Concurrent crises in finance and in climate are today concentrating official minds on fundamental issues of economics and regulation as seldom before. This article suggests that there may be advantages in considering the problems of regulation of carbon markets and of financial markets together, and proposes a way of classifying policies relating to both that may help decision-making in each.

The article is divided into seven parts and a conclusion. The second part links the financial crisis to the vastly expanded markets in uncertainty that have grown up over the past few decades, and describes the mechanisms by which those markets have grown. A third part locates the problems that have resulted largely in market architects' and participants' ambitious efforts to construct the calculable equivalents that help supply liquidity. A fourth part divides policy responses to the crisis into two: one which hopes that improved oversight of calculation and commodity creation can tame the markets, and one which places emphasis on prohibiting certain instruments, resegmenting markets, disconnecting derivatives from housing, and other decommodification measures. The fifth, sixth and seventh parts of the article then repeat this exposition for the carbon markets, pointing out parallels in commodity creation, resulting problems, and policy responses.

II. The Growth in Uncertainty Markets

The current financial crisis owes its distinctiveness to the immense widening in scope of the commodification of uncertainty over the last 35 years. What counts as risk, as insurance, as banking, as investment, as collateral, as capital requirements, have all changed radically in a short space of time. While no consensus exists about the extent to which uncertainty markets as currently constituted are regulatable, there is unanimity that they are not now being regulated effectively, as well as very powerful arguments that portions of them could never be effectively regulated.

It is important to emphasize the novelty of the problem. Before the 1970s, only certain types of uncertainties were commodified, and then only in highly constrained ways. Insurers, for example, strove, as far as was possible, to rely on actuarial tables to construct their products, avoiding insuring against large-scale disasters whose probabilities were hard to calculate. Insurers relied on investigators and police to ensure that the predictability of policyholder behaviour remained unaffected by the act of insurance itself. There were also limits on the abstraction and circulation of risks: 70-year-olds could not buy the life insurance policies of 20-year-olds for their own use. Casinos – another stronghold of commodified uncertainties – operated in an equally manicured landscape, emphasizing games whose odds could be precisely calculated, placing limits on stakes, deploying state-of-the-art surveillance and so forth. In addition, casinos were hemmed in by legal, geographical and moral restrictions designed to limit the damage done to society by addictive gambling. Commercial bankers, similarly, were willing to make only certain kinds of bets, their exposure, and that of their customers, conditioned by strict capital controls, requirements for collateral, personal assessments of client creditworthiness, knowledge of the specific products and markets involved, and so forth. Of course, uncertainties that lay outside this "safety zone" were always part and parcel of entrepreneurship and

investment, together with the 'animal spirits' required to brave them, but little pretence was made of quantifying and modelling abstract uncertainty and packaging it as a globally-tradable asset.

All that began to change with what economists John Eatwell and Lance Taylor call the "privatization of risk"[1] that followed the collapse of the Bretton Woods system in the 1970s and the growing importance to business of shielding itself from unfavourable exchange rate fluctuations. As new markets were created to tackle this and many other new uncertainties connected with growing globalisation, a vision opened up of the possibility of quantifying, pricing, exchanging, aggregating, circulating, hedging and offloading onto others a class of uncertainties far broader than that which had ever been commodified before. Just as ordinary units of length separate out an abstract notion of dimension from the characteristics of particular objects, or exchange-value abstracts from use-value, or abstract human labour becomes distinct from useful or concrete work, so the growing commodification of uncertainty abstracted from "concrete risks associated with particular assets":[2]

"The wealth of social, economic and political relations that engender specific risks appear as a singular, homogeneous object … the risk that social and political turbulence may precipitate a change of government in a post-colonial supplier, the risk that the economic politics of the central bank may motivate a rise in interest rates and a tightening of liquidity, the risk that a counterparty may use the bankruptcy laws to avoid payment, and more – all may be combined in a single derivative and priced as a package [that] … objectifies diverse and often unrelated circulations in a single instrument and then distributes the risk to a theoretically unlimited set of buyers. By combining forms of risk that need not be related or commensurable, derivatives engender an abstract form of risk."[3]

Varying labels including counterparty risk, currency risk, exchange rate risk, credit risk, model risk and so forth came to be treated as attaching to an underlying, calculable unity. Uncertainties became something to be mitigated less through direct action, as in the past, and more through hedging activities that were quantitative, globalized and divorced from traditional business relationships.

Partly because financial derivatives, unlike ordinary commodity derivatives, were based on abstract underliers such as the relation between currencies, there were few limits on commodity expansion. A complex web of mutually-reinforcing incentives and opportunities contributed to the construction of uncertainty markets whose notional volume came to top half a quadrillion dollars by 2007. The newly commodified uncertainties could be moved off balance sheet and used to expand credit in the name of efficiency. The "carrot of speculative profit" joined the "stick of financial risk" in motivating the abolition of capital controls and vastly increased volumes of international financial

transactions;[4] a derivative serving as a "use value for companies engaged in production" was also an "abstract exchange value for speculative capital".[5] Calculation of abstract uncertainties, which played a growing role in credit scoring as rating agencies relied increasingly on mathematical modelling, partly usurped the function of collateral, capital guarantees and various other means of constructing trust, enabling a huge expansion of leverage. Entranced by the prospect of high returns (at least in the short term), bank executives pushed for more lending, inflating bubbles in housing and other sectors that borrowers were encouraged to believe could expand indefinitely. The dearth of comparable short-term high-yield investment opportunities in more traditional enterprises encouraged the stampede into uncertainty commodities by a new class of institutional investors, ensuring that markets remained flooded with cheap debt and adding further to pressures for financial innovation. Throughout the process, financial institutions capitalized on the opportunities they had created to collect large fees from the multitude of new transactions. The dominance of financiers in US policymaking, together with the neoliberal fashions of the late 20th century, further stimulated the expansion of derivatives. In the 1990s, barriers between commercial and investment banking that had been in place since the Great Depression finally came down. None of this would have been possible without new computing and information technology, the unstinting advocacy of neoclassical economists, and the financial engineering skills of the "quants" (quantitative experts in mathematical finance), many of them from a scientific background, who designed and built the new uncertainty commodities.

The range of the uncertainties that were made abstract and put into exchange around the turn of the 21st century extended far beyond the well-behaved, clearly-contextualized, probabilistic risks already commodified by insurers and casinos into a veritable animal kingdom of unknowns of diverse description, contexts and origins if often overlapping natures. Examples included the fuzzy category of Knightian uncertainty,[6] in which the relevant factors to an outcome are known, but not the probabilities; uncertainties about deterministic events that are nevertheless not predictable; uncertainties about which the factors likely to be relevant are unknown and "tail risk" associated with highly improbable events of high impact. There were also indeterminacies due to what George Soros calls "reflexivity,"[7] which occurs when financial markets affect the so-called "fundamentals" that they are supposed to reflect, producing chronic disequilibrium. That, of course, included the uncertainties Keynes discussed under the rubric of the financial "beauty contest", in which prices "are driven by what market participants believe average opinion believes average opinion believes, and so on, ad infinitum".[8] In addition, there were uncertainties associated with attempts to predict the results of creativity or of path dependence; "primal risk" and so on. The economist Kenneth Arrow once imagined a security for every condition in the world, with every uncertainty becoming a commodity

that could be transferred to someone else;[9] the hedge fund practitioner Richard Bookstaber notes that according to the efficient market hypothesis, "nirvana is attained when a position can be taken against every possible state of nature."[10]

III. The Derivatives Crisis

The formal means of commensurating diverse uncertainties that quants were asked to develop were subject to severe blowbacks over the long term despite their mathematical sophistication, especially when they involved attempts to treat singular historical trajectories as if they were instances of repetitive, calculable sequences. Portfolio theory, which attempted to commensurate uncertainty and profit by abstracting from concrete hazards associated with particular assets and focusing on standard deviations in price swings, ended up assigning one-in-a-septillion odds to large price fluctuations whose actual probability was measurable in percentage points.[11] Price shifts that a normal distribution predicted would occur once every 300,000 years in fact occurred 48 times in the 20th century alone.[12] Similar shortcomings could be found in portfolio theory's descendants, such as value-at-risk, which magnified danger when fed unexpected bad news[13] and in the models that brought Long Term Capital Management down in 1998. Derivatives markets, by undermining their own "past conditions of production", made inaccuracies in pricing unknowable "until it [was] too late".[14] What with crises made inevitable through reflexivity, interactive complexity and tight coupling,[15] a liquidity that had come to depend on the wholesale commodification of uncertainties was prone to drying up all at once in a panic, with results that have become obvious. Tending to homogenize the objectives of investors, the liberalization of financial markets, by reducing heterogeneity and increasing cross-market correlations, wound up endangering the liquidity that was one of its objects.[16] Securitization, instead of reducing systemic risk, increased it.[17] These realities help explain why accusing the financial markets of fostering "casino capitalism", as critics so often do,[18] misses the nature of the changes that have resulted from the runaway commodification of uncertainty. The form of gambling with which traditional insurance and banking have now been commensurated is different in kind to, and far more dangerous than, that on offer in the familiar venues of Monaco, Las Vegas or Atlantic City.

A number of factors, however, militated against the systemic problem being given its proper weight, while simultaneously opening the door to various kinds of deception. High fees could be collected and large profits realized in a short time through trading uncertainty commodities, just as they can be through the cultivation of large-scale monocrops in the period preceding various blowups due to biotic depletion and other systemic disruptions. Few of those benefiting had strong incentives to investigate possible long-term consequences, many of which, in any case, had a tendency to vanish from view in the

skeletal abstraction of a credit rating, the principal vehicle for the construction of trust in contemporary money markets.[19] Moreover, the defects of the formulas that were the engine of commodification were routinely compensated for and concealed by traders' use of a "dark twin"[20] of older "heuristics and tricks" as well as a vernacular understanding of possible scenarios and narratives that they had acquired through long, everyday practice, none of which relied so heavily on spurious assumptions of normal or Gaussian distributions.[21] Of course, top managers and economists at a distance from the trading floor had learned to acknowledge that "a model is inherently wrong, because a model only looks backwards".[22] But because they believed that models were nevertheless useful approximations or heuristic devices, this obligatory admission did little more than inoculate them against a loss of confidence in the "inherently wrong" mechanisms that were continuing to play a key role in churning out uncertainty commodities. Quants were encouraged to make renewed efforts to "perfect" their formulas – a task which, because it could never be completed, tended to engender ever-increasing model complexity and opacity, which also helped hide the dangers involved. Nonstandard modelling efforts that better mimicked wild and discontinuous price oscillations or patterns of default correlation, such as multifractal curves, suggested greater caution,[23] but still left bankers and traders with the hope that a reified and disembedded "volatility" could be made into a commodity as robust as any other.

IV. Two Streams of Policy

Existing and proposed policy responses to the tendency toward crisis associated with the new uncertainty markets fall into two streams that tend to mingle in a somewhat confused way. One policy impulse is to address the problems associated with the commodification of uncertainties with attempts at further commodification and improved market calculation. The other is to undertake partial decommodification in a way that calls to mind the second phase of what Karl Polanyi called the "double movement", in which attempted sweeping commodification of "fictitious commodities" is followed by a reaction of societal self-defence against the systemic dangers that result.[24] The first impulse relies on the tacit assumption that all aspects of uncertainty markets will be regulatable without changing their fundamental structure, while the second acknowledges – sometimes also tacitly – the possibility that portions of them might not be regulatable as they stand and may need to be altered or deconstructed rather than extended.

The regulatory impulse toward more and better calculation and commodification is based on the same commensurability assumptions and practices of abstraction that the uncertainty markets are themselves founded upon. It starts from the judgement that the "benefits" of unlimited uncertainty commodification are not only indispensable, but, at least in theory, sustainable, and that "the task of

regulation is to 'internalise the externality,' that is to ensure that, as far as possible, individual decision makers take into account not only their risk but also the risk which society as a whole faces as the result of the contemplated action," thereby increasing efficiency and "acting as a surrogate for market discipline."[25] The assumption, in other words, is that the new systemic dangers created by unifying, quantifying and pricing an unprecedented range of uncertainties can themselves be quantified and priced. Such systemic hazards become "inefficiencies" on a level with all others, to be remediated through state regulation or, more plausibly, since uncertainty markets extend across national borders, global regulation through a multilateral treaty regime.[26] Regulators are urged to become re-calculators in order to act as a "surrogate for market discipline,"[27] correcting mispricings of uncertainties, assessing capital requirements and issuing new rules on the basis of their own information gathering, surveillance, risk assessment, dialogue with supervised firms, research into financial innovations and the shifting institutional structure of finance, and so forth. Thus, for example, the Basel Accord of 1996 used value-at-risk for calculating capital requirements and assessing when banks needed to add equity to cover asset valuation losses,[28] while Basel II ostensibly required external monitors as well as bank management to understand capital rating and risk evaluation systems and demanded that better reporting to be done on capital adequacy. Similarly, in 2004, the rating agencies Moody's and Standard & Poor's (and thus the regulators who relied on their findings) began to rate collateralised debt obligations according to a mathematical formula that assumes a standard bell curve distribution of default correlation.[29] As late as 2006, the US's Federal Deposit Insurance Corporation was confident that "more than 99 per cent of all insured institutions met or exceeded the requirements of the highest regulatory capital standards."[30] It is typically admitted that this approach is hobbled in that it is subject to regulatory capture, condemns regulators to "running several paces behind the market"[31] in matters in which to be effective, they would actually have to be at least abreast of it, and is unlikely to be able to find personnel able to do the sophisticated modelling work required on public-sector salaries.[32] Evidence suggests, moreover, that forms of regulation based on neoclassical orthodoxy provide opportunities for financial engineers to produce yet new varieties of problematic and destabilizing derivatives. More fundamentally, the assumption that the runaway processes of global commodification of uncertainty of the last few decades – with their associated tight coupling, interactive complexity and high liquidity and leverage – can be preserved if only they are more closely monitored and regulated has been called into deep question by the current financial crisis. As Alan Greenspan now concedes, "bank regulators cannot fully or accurately forecast whether, for example, sub-prime mortgages will turn toxic, or a particular tranche of a collateralised debt obligation will default, or even if the financial system will seize up."[33]

The second regulatory impulse, more pragmatically oriented, relies less on an ideological commitment to the efficient markets hypothesis, equilibrium theory or rational expectations theory, instead giving rise to a wealth of concrete policy measures many of which have already been shown to have practical application in mitigating systemic dangers. Modest examples of measures to institute controls on the commodification of uncertainty – proposed by policy thinkers from a wide range of political orientations – include, among others:

- Re-segmenting the market along the lines of the repealed Glass-Steagall Act of the US or the legal separation between mortgage and other investment markets that formerly obtained in the UK.[34]
- Preventing further liberalization of capital accounts, in order to curb volatility and contagion.
- Imposing other restrictions on capital movements.
- Instituting tighter exchange controls.
- Controlling leverage and thus reducing the size of the financial industry.[35]
- Controlling credit creation alongside the money supply.[36]
- Levying taxes on financial transactions.

More direct ways of restricting commodification of uncertainty include simply limiting the types of financial derivative on offer – a proposal that has been made, again, by figures across the political spectrum from Myron Scholes to Adair Turner, George Soros and *The Socialist Register*. The hedge fund practitioner Richard Bookstaber argues, for example, that "[r]ather than adding complexity and then trying to manage its consequences with regulation, we should rein in the sources of complexity at the outset."[37] Disconnecting basic housing from the uncertainty markets by limiting foreclosure powers and limiting certain types of bank lending while refinancing distressed mortgages is meanwhile being urged by a wide range of legislators, policy analysts and economists.[38]

Removing structural incentives for overambitious attempts to commodify uncertainty is generally seen as a necessary complement to such shorter-term measures. Positive proposals toward this end include banning bonuses and imposing a maximum wage on the financial sector, closing tax havens and reducing the role of the private sector in the provision of public services. A more fundamental (and long-mooted) measure would be to institute thoroughgoing public control over finance at all levels.[39]

V. The Growth of Carbon Markets

In many ways, carbon markets are parallel to financial derivatives markets. While no consensus exists about the extent to which they are regulatable, it is widely acknowledged that they are not now being

regulated effectively, and there are very powerful arguments that portions of them could never be effectively regulated.

While financial derivatives markets attempt to commodify an unprecedented range of uncertainties, carbon markets take an equally revolutionary step with regard to climate-benefiting actions, with the objective of making their distribution under a cap maximally cost-effective. The first step to commodification is to reconceptualize climate crisis mitigation as measurable, divisible greenhouse-gas "emissions reductions". This paves the way for construction of individuated, tradable pollution rights (or "thingified" climate benefit/disbenefits) whose status as asset, grant, or financial instrument is engineered to fit various accounting standards.[40] A second class of divisible, quantifiable climate-benefit units – "offsets" – is then developed, to be pooled with "reductions" in the service of generating further efficiencies. A final level of abstraction involves securitization, quality ratings and so forth.

As with financial markets, there exist both motives and opportunities to expand this process of commodity formation and trade to enormous size. Although currently not much above the US$100 billion mark, carbon has been heralded as prospectively "the world's biggest market overall,"[41] with "volumes comparable to credit derivatives inside of a decade."[42] Once attempts were in full swing to privatise global carbon-cycling capacity (as had earlier happened with risk), Northern governments in particular became keen to establish a thoroughly global market in the interests of fostering maximum liquidity. Incentives became intense for both buyers and sellers to see to the establishment of mass-production lines for CO_2 equivalents and cheap offsets: it will be to the advantage of emitters covered by the EU Emissions Trading Scheme, for example, to attempt to cover half of their targets during the 2013-2020 period by buying in offsets from abroad. For industries covered by the Effort Sharing Decision, the figure is 72 per cent.[43] Like financial derivatives, carbon swiftly proved a magnet for speculators keen to exploit the special characteristics of the new "asset class". Despite the recent economic downturn and low carbon prices, carbon market trading volumes have continued to rise as compliance buyers look to benefit from low permit prices, permit accumulators look to make money from rising prices, and hedge funds look to make money from permit price volatility. Some of the biggest buyers of CDM credits are financial sector powers such as Barclays, Goldman Sachs, Credit Suisse, Deutsche Bank, Rabobank, Morgan Stanley, BNP Paribas, Vitol and Merrill Lynch.[44] Corporate and state actors that enjoy or are able to gain legal control over large areas of land in countries such as Uganda, Brazil or New Zealand meanwhile stand to gain from markets for forestry offsets.[45]

From the start, the rush into carbon commodities created a heavy demand for technical mechanisms that could construct quantifiable "equivalences" among emissions reductions in different locations,

among different greenhouse gases, between land-based uptake of carbon dioxide and fossil-origin carbon emissions, and so forth. In order to provide the quantitative price framework needed for "cost-effectiveness" (and for the related polemical assertion that carbon markets could "depoliticize" climate action), carbon markets had to abstract from place, substance, technology and history. Emissions of carbon dioxide molecules from coal-fired power plants in Britain were commensurated not only with, say, emissions from gas-fired plants in Spain, but also with nitrous oxide emissions from adipic acid plants in South Korea and emissions which would have hypothetically occurred from oil-fired power plants if methane vented from coal mines or landfill sites had not been diverted to electricity generation or wind farms had not been constructed. Emissions-reduction technologies that were likely to result in unquantifiable but large "spillovers"[46] (economically uncompensated benefits that one actor's innovations provide to others) leading to radically-lessened long-term dependence on fossil fuels across many countries could be given equal weight to technologies lacking such effects, as long as both achieved the same numerical emissions reduction over the short term in a particular locality under a cap and trade scheme. That opened up theoretical possibilities of commensurating UK carbon dioxide emissions with, say, the chemical results of oceanic algal growth or the rearrangement of traffic signals in Bangkok that – like the ingenious new financial instruments developed for risk exchange – then had to be worked out in detail by a growing corps of specialized quants. As in the financial markets, checks and balances on this commensuration process, including regulation, was often left to actors (including some on the CDM Executive Board) who had a material or institutional interest in the creation of the commodities in question and were reliant on the same formulas as those used by the quants.

VI. Problems in the Carbon Markets

As with financial derivatives, carbon markets' ambitious programme of commodity formation has had a number of ramifications – many of them unanticipated by its architects – that affect how or whether its original object can be achieved. Foremost among these, as with the uncertainty markets, has been an increase in systemic hazard – most prominently, an increased threat to climatic stability. This stemmed partly from the way carbon markets, with their requirements for formulas and quantification, disembedded the climate problem from the need to "lock in"[47] revolutionary non-fossil energy and transport regimes within a few years[48] to take account of the phenomenon of path dependence[49] – highlighted, for example, by the very large, 40-year investments required in centralized generating plants. A mechanism for meeting short-term quantitative emissions targets cheaply was unlikely to select for the first steps of a process of long-term structural change away from fossil fuels. Capital-intensive industries, indeed, were given incentives for delaying structural change in the form of the alternative of buying (and, sometimes, banking)

pollution permits. To weigh different long-range social and technological trajectories or evaluate and "backcast" from distant goals would have been to threaten the imperative of cost-effectiveness.[50] Short-term price signals, as utility executives pointed out, simply could not be expected to influence long-term investment in the way required by the global warming problem – even absent the high price volatility exacerbated by the actions of lobby-prone governments in allowance creation and by the growing influence of speculative finance in the carbon trade. The opposition between the carbon markets and addressing fossil fuel dependence is sometimes even explicit in policy: the UK government, for example, conceded that because large-scale energy producers were covered by the EU Emissions Trading Scheme, there could be no separate provisions for setting large-scale energy production on a non-fossil technological path,[51] while Article 26 of the EU Emissions Trading Directive bans governments from legislating "inefficient" carbon dioxide emissions limits on energy generators covered by the EU ETS.[52] As trading expert David Driesen remarked, there is "a tradeoff between short-term cost effectiveness and investment in ... long-term economic and environmental progress."[53] Other experts agreed that carbon prices cannot "deliver the escape velocity required to get investment in technological innovation into orbit, in time"[54] and that "there is little evidence of price incentives inducing a fundamental transformation in the economy or society."[55] The project of finding a cost-effective way of addressing global warming through carbon markets, like that of finding an efficient way of addressing the problem of privatised global business risks, became incoherent insofar as creating the market framework necessary to make sense of the notion of cost-effectiveness entailed losing touch with what was supposedly being costed.

The commodification of climate benefit, like that of uncertainty, also ran up against intractable difficulties of specification and quantification. The answer to the question of how much "space" exists in the interlinked above-ground system of oceans, surface rock, soils, vegetation, and air in which carbon from underground fossil sources might be safely dumped depends both on what kind of world is considered tolerable and what the likely physical response will be of that above-ground system to the increasing load of fossil carbon with which it has to cope. No non-political answer can be found to the first question, and no simple probabilistic answer of the type customarily sought by politicians and other market architects can be found to the second due to the many nonlinearities, indeterminacies and unknowables (what many climatologists like to refer to as "monsters") of the climate system. Politics and climatology alike therefore militate against a climate commodity's being divisible into tradable elements or being commensurable with the economic gains and losses of taking climate action. The Harvard economist Martin Weitzman warns, in addition, that the market-oriented approach taken by Nicholas Stern, by "chopping off the really-bad tail and then ignoring it," leads to a dangerously degraded conception of the climate problem itself. In

words similar to those used by critics of the Black-Scholes option-pricing equation, Weitzman critiques the commensuration process inherent in multi-equation, computerized Integrated Assessment Models that aggregate economic growth with simple climate dynamics and highlights the systemic dangers that are heightened by "presenting a cost-benefit estimate for what is inherently a fat-tailed situation with potentially unlimited downside exposure as if it is accurate and objective."[56]

Carbon offset commodities present particularly apt parallels to the new uncertainty commodities involved in the ongoing financial crisis. Like many uncertainty commodities, offsets involve the attempted reduction both of Knightian uncertainty and of indeterminacy to probabilistic risk.[57] The blowbacks from such quantitative sleights of hand can then both obscured and spread through further processes of derivativization and securitization – an advanced level of commodification. In 2005, for example, the first carbon credit structured notes were released.[58] In 2008, Credit Suisse put together a US$200 million deal that bundled together offset projects in different stages of completion before tranching them for sale on the secondary markets.[59] Carbon credit special purpose vehicles have also been set up. Just as mortgage-backed securities, through a sophisticated technical process of simplification, concealed from distant buyers and sellers the economic realities bearing on lower-income neighbourhoods in Detroit or Los Angeles, so a carbon securitization package, with its perhaps even longer value chain, hides the heterogeneous climatic and social impacts and conditions scattered through an assemblage of, say, coal-mine methane, fossil fuel-switch and biomass projects in China and energy efficiency projects in Mexico. Throughout this process, both buyers and sellers of offset credits, in both the governmental and commercial sectors, have had incentives to ignore the abuses of science and mathematics involved. With the growing involvement of the City of London and Wall Street in carbon trading, what the late John Kenneth Galbraith called the "vested interest in error" which occurs when "[s]peculation buys up, in a very practical way, the intelligence of those involved"[60] is steadily adding to the problem. Yet as policy analyst Michelle Chan noted in recent testimony before the US Congress,[61] in a carbon bubble characterized by increasing pressures to commensurate and commodify, a collapse in value of "subprime carbon credits" (owing to failures to verify their equivalence to reductions, social unrest, cancellation, lack of confidence, and so on) could trigger severe effects on not only the climate but also the economic system.

VII. Two Strains of Policy Redux

Unsurprisingly, the problems of carbon markets have provoked the same two broad policy impulses that are now under discussion in connection with the financial markets. One impulse – still dominant – cleaves to the neoclassical doctrine of attempting to "improve"

practices oriented around formulas for abstracting from, commodifying, and taking positions against "every possible state of nature." Accepting the premises that offsets should be made fungible with emissions reductions, and that both can be taken as measurable tokens of climate benefit, this approach attempts to address the resulting blowbacks through more and better calculation. The second impulse – rapidly ascending to greater prominence – sees partial or full decommodification as a more realistic approach to the markets' developing difficulties and problematic impacts.

The first impulse is exemplified by the ever-ramifying efforts of governments, the CDM Executive Board, standard-setting boards and new carbon-credit rating agencies to tackle the riddle of "additionality" in offset markets (how to prove that a project goes beyond business as usual), to which, as carbon trader Mark C. Trexler and colleagues noted years ago, "there is no technically 'correct' answer."[62] The controversies engulfing this question are too well-rehearsed to require exposition here,[63] but it is worth noting that one ironic effect of this impulse has been to reinforce the supply-side dominance in the offset markets of large polluting corporations in the global South, who are better able than others to devote resources to navigating the regulatory mazes that the additionality debate has made ever more intricate. With corporations such as Sasol, Mondi, Rhodia, Tata, Birla, Jindal and so forth gaining additional revenues for activities that show no sign of addressing the fossil fuel problem in countries such as South Africa, Korea or India,[64] and whose effects therefore must logically enter into calculations of carbon saved and lost, this approach, in line with Keynesian or Sorosian observations about "reflexivity", ultimately puts additional impossible demands on offset accounting. The neoclassical regulatory approach is also challenged by the exacting and sweeping demands for quantification and monitoring thrown up by cap and trade systems, which far exceed those of conventional pollution regulation systems.[65]

The second, more pragmatic policy impulse, aimed at obviating chains of complexity, reaction and cascading systemic dangers, is represented by – to take one recent example – the Clean Environment and Stable Energy Market Act of 2009 put before the US Congress by Representative Jim McDermott.[66] The McDermott bill would prohibit offsets and eliminate trading in the primary and secondary markets and thus avoid many risks associated with subprime carbon and the development of opaque carbon securities. Going still further are policy analysts associated with international networks such as the Durban Group for Climate Justice, who oppose the commodification of carbon-cycling capacity outright, including that of cap and trade schemes, on the grounds that it is unworkable and counterproductive, constitutes a new movement toward enclosure of the atmosphere as well as of land and knowledge in the global South, and reinforces pollution "hot spots" in industrialized societies while draining resources away from provision of green jobs.[67]

Despite their diverse pedigrees, such decommodification approaches chime with Martin Weitzman's injunction to his fellow orthodox economists to acknowledge more openly the "incredible magnitude of the deep structural uncertainties that are involved in climate-change analysis,"[68] as well as with that of the hedge fund trader Richard Bookstaber to seek "coarse" approaches to problems characterized by combinations of deep uncertainty or indeterminacy and potential for extreme consequences.[69] As in the debate over the financial crisis, proposed policy responses to the commodification of climate benefit cannot be neatly categorized along conventional political lines.

VIII. Conclusion

Through an analysis of commodification, this article has offered a short comparative survey of the complex terrains that stretch before governments and other bodies seeking to regulate both the financial and the carbon markets in a time of crisis. It has argued that it will be fruitful to consider both markets together in the effort to formulate coherent policy responses that are properly sensitive to the origins, structure, limitations and effects of each. It has, finally, attempted to suggest the advantages of laying economic orthodoxies aside when trying to determine what is and is not possible for regulators to achieve in each market at this critical moment.

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