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# Bonuses, Credit Rating Agencies and the Credit Crunch

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## ABSTRACT

The payment of bonuses can bring big benefits. But harm, too, can result. In the financial sector, this is especially true, above all when they are related to noisy indicators of performance over brief periods. This paper starts by exploring these ideas, then proceeds to examine credit rating agencies and their role in the 2007 credit crunch. It emphasizes the paucity of long term high frequency financial data to quantify tail event risks, the failure to apply analysis of fundamentals in financial and housing markets, and rewards structures to individual players that reinforced myopia as three key components of the crisis.

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## ***INTRODUCTION***

Bonuses account for a large proportion of the pay bills of financial firms. In UBS, for example, no less than 49% of pay in 2007 took the form of variable compensation or bonuses<sup>5</sup>. The credit crunch that began in August 2007 has led to a hunt for culprits. Bonus payment systems and credit rating agency errors, singly or together, look like prime candidates at the point of writing this, one year later. The main aim of this chapter is to explore and assess the thinking behind such allegations.

## ***BONUSES: SOME GENERAL ISSUES***

The payment of bonuses can do good. This is especially true when performance-related pay is compared with fixed remuneration. Here are some of the main potential benefits:

- a. a bonus typically provides greater incentive for effort on the part of the employee;
- b. the employer may perceive that it reduces the marginal cost of employing labour, which will be especially welcome if rates of unemployment or marginal taxation are high;
- c. in a partnership, payment of bonuses to staff below partner level may improve morale;

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<sup>5</sup> According to its published accounts: Financial Times (2008).

- d. compressing bonuses in bad times may be preferable, from all parties' standpoints, to short time working or dismissals;
- e. a bonus could promote greater loyalty among staff, and strengthen workers' incentives to keep each other up to scratch.

The first of these arguments stems directly from agency theory<sup>6</sup>. Suppose individuals' levels of assiduity cannot be observed directly, but that more effort from any of them tends to improve some observable indicator of performance. Fixed pay for a worker will elicit less effort than remuneration based positively, at least in part, on this measure of achievement. Fixed pay creates the temptation to shirk, assuming (plausibly, surely) that employees prefer less effort to more. And the case for bonuses becomes even stronger if the employee is less averse to risk.

Benefit b rests on the idea that the employer will seek to maximize profits. If the share of profits accruing to workers is fixed, maximizing the residue must imply maximizing total profits, too. If the number of employees is determined by profit maximization, anything that cuts the marginal cost of hiring workers must strengthen the demand for labour. And a shift from an unconditional fixed wage of  $x$ , to a part-profit linked, part-fixed system of remuneration with a fixed value of less than  $x$ , and an average expected value of  $x$ , must mean that the employer will want to offer more jobs, or longer time at work. In a simple case, at least, we can reason thus. If unemployment levels are too high, or employment is discouraged by taxing wage payments at the margin, an efficiency gain would ensue. In addition, there is at least a chance that both the firms' owner(s) and the workers will gain as a result. The key argument behind b – and also d – was first advanced by Weitzman (1984, 1985, 1986).

The argument for c looks more nebulous. One way of putting it is that sharing bonuses beyond the top echelon of an institution is like an exchange of gifts: be nice

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<sup>6</sup> A good review of agency theory is provided by Prendergast (1999). One of its key inventors was James Mirrlees, whose seminal work in the area is celebrated by Dixit and Besley (1997).

to the staff, and they will be nicer to you in return. A more rigorous basis can be found when one thinks of informal contracts stretching beyond the present, into the future. Your generosity to fellow players now may be rewarded by greater generosity towards you later on. Cooperation is so often better than conflict, but cooperation often calls for the prospect of deferred rewards, that are not discounted too highly. Conflict can be all too tempting, and especially so for those with short sight. The gift exchange idea was first expounded by Akerlof (1982). That is a story of carrots. A related stick version is the shirking-containment model of premium pay and unemployment, due to Shapiro and Stiglitz (1984). They argue that firms may pay workers more than they are worth, more than they might earn elsewhere, to make the dismissal (which might follow from detected shirking) all the more painful.

The idea behind d is that the bonus acts as a shock absorber. In good times, when the employer is busy and his products sell well, he pays the staff more. In bad times, instead of releasing them, he keeps them on, but pays them less. We are apt to think of big swings in aggregate employment as highly damaging, and hence anything that keeps jobs reasonably steady in the face of shocks has some definite merit in it. A variant of the argument is that it is unfair for different age cohorts to have such a large – and possibly enduring – impact on their careers determined by the accident of when they were born, or leave education. Those trying to get work in bad times may suffer a big loss of earnings, not just in the short term when jobs are hard to find, but later on too, because they have failed to gain from the experience that goes hand in hand with work.

Benefit e stresses the possible advantages of a bonus scheme within the workforce. It is especially powerful when bonuses are related to the observable production outcomes from a relatively small group. Then the group is likelier to stop its members from slacking, because slacking by anyone is a public bad, from which all of them will suffer, despite its possible attraction to the individual concerned. The bigger the group, the weaker this effect becomes. From this standpoint, the ideal group size is just one, but the joint production implicit in teamwork may render this

infeasible. By contrast, a fixed wage contract in a large company essentially divorces the individual's return from her input completely.

There are counterarguments, however. One is that most workers are averse to risk. Bonuses make income uncertain. Uncertain income streams are liable to imply uncertain consumption streams. This is especially true when capital markets are imperfect. If so, consumption smoothing in the face of income shocks is harder, and, in the limit, impossible. The firm, on the other hand, may be in a far stronger position to absorb risk. Moreover, if the employer is neutral to income risk when the employee dislikes it, it is best if the employer offers the worker full insurance. This may well be true merely if the employer is less risk-averse than the worker. Problems arise, of course, because the provision of such insurance is liable to bring adverse incentive effects. This is bound to happen if the worker likes extra leisure and acts privately, in ways unobservable (except perhaps at considerable cost) to any monitor the employer engages. If the worker does not wish for any more leisure at the margin, on the other hand, or if his inputs can be observed ex post, that will not occur. But the iron law of leisure says that you really value it highly when it is scarce; and random events and the actions of others make inferences about an individual staff member's effort or quality of work hard to draw.

Another counterargument is that whether a bonus system beats a system of fixed pay may well not be the acid test. There are other possible arrangements. One is a system of what one may call "fixed payoff". That would involve a set of all combinations of pay and work time, let us say, between which the employee felt indifferent. Full time work remunerated at  $X$  might be thought of as equivalent, in utility terms, to "gardening leave" at an income of two thirds of  $X$ , for example; and both might deliver the same utility as a sixty hour week remunerated at  $1.7X$ . An employer faced by random shifts in the demand for labour, due to uncertainty about technology or the selling price of his product, could offer a contract that included all three of these options – and many more – as possibilities, with the employer, once the source of the uncertainty was revealed for a particular period, choosing the package

that would suit him best. Very often, it transpires<sup>7</sup>, this fixed payoff system will prove better than either of the other two alternatives.

There are some further worries, too. The bonus system is typically asymmetrical. These extra rewards, which are granted over and above the standard pay contract, usually have a minimum value of zero. At the top end, there may be no limit. So bonuses are essentially *non-negative*. This asymmetry is tempered, however, by the possibility of subsequent contract non-renewal, or even dismissal. And for some top management, there is the threat of possible early severance, with compensation levels that are sometimes negotiated *ex post*, and sometimes written into the contract *ex ante*. These qualifications aside, the “heads I win, tails someone else loses” feature of a reward system with just carrots and no sticks creates an incentive to take risk, which may well be damaging in aggregate to the parties affected. This is an especially serious concern for rewards in the financial sector. It comes on top of limited liability provisions, and deposit insurance, which replicate the same one-sidedness at the level of the firm. The manager or employee concerned is in the position of enjoying an option. He or she has opportunities for plenty of upside, while being shielded from sufficiently bad downside outcomes. A risk neutral individual is encouraged to act as a risk lover. Worse still, perhaps, projects with a negative skew, that spreads far out below the zero bound, will look particularly enticing.

There is also a different concern, which arises if the individual potential bonus recipient is averse to risk. Suppose the bonus is linked to the profits of the firm that employs him. So he becomes a kind of equity holder in that firm, and quite possibly a formal one, too. Why should he compound the risks by linking his wealth to the fortunes of his employer? His job is on the line if the company fails; so would he not do better to diversify his portfolio by placing any wealth he has in the other assets?

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<sup>7</sup> Sinclair (1987) provides various examples of this.

## ***BONUSES IN THE FINANCIAL SECTOR***

Resolving the issue about what part bonuses should play in pay in the *financial* sector, and what form they should take, is now an urgent matter. There is a widespread view that bonus concerns may well have contributed alarmingly to the gravity of the 2007-2008 financial crisis in a number of different ways.

Paying bonuses based on sales commissions can be especially hazardous in insurance firms. Income from policies written accrues now; but whether those policies turn out profitable will only be known later. Many members of several Lloyds of London insurance syndicates were brought to bankruptcy in the 1990s by asbestos claims emanating from contracts with US clients written by the syndicates' agents who were paid on commission at what turned out later to be excessively unfavourable premia. Had the agents been rewarded according to the subsequently revealed *profitability* of the business they wrote, and not to its immediately apparent *volume*, Lloyds would not have been brought to its knees. Had the purveyors of sub-prime mortgages received bonuses based on the long-run net returns from the mortgages they sold, and not on the volume of mortgages they sold, the 2007 credit crunch might well have been much less serious. Bonuses related to the wrong variable and defined over a short period are a recipe for serious trouble – especially when they apply to the financial sector.

There are some interesting analytical issues here, too. It seems likely that the truncation of bad-outcome returns implicit in the asymmetry of bonuses could have encouraged bank personnel to gamble excessively on the continuation of the house price boom in the US, the UK, Ireland, Spain and other countries where the post-2003 bubble was especially apparent.

Then there was the linking of remuneration to relative performance, measured over a short interval. This must surely have made top staff wary of taking a longer term

view, and more inclined to join the “search for yield” that led to the carry trade borrowing in Japanese Yen and lending the proceeds to higher risk mortgagors. Nominal interest rates have been wafer thin in Yen for much of the period from the early 1990s, reflecting expectations of low (indeed often negative) rates of inflation, and very sluggish aggregate output in Japan.

The principle of *uncovered interest parity* implies that the differential in short-term default-free rates between Japan in Yen, and the US in US dollars, should reflect expectations of the rate of change in the nominal exchange rate between these currencies over the specified interval. Lower yen rates than dollar rates on three month treasury bills (an annualized 1% gap for example) should imply an expectation that the dollar will slide by about 25 basis points over the period. Depreciating currencies should offer higher interest rates, to compensate for the expected decline in capital value. The evidence is that uncovered interest parity (UIP) works far better in the long run (over a decade or so, for example) than the short run (over a few months, let us say)<sup>8</sup>. Part of the reason for the short term failure may be ascribed to the fact that short term interest rates tend to move in several little steps in the same direction – and more so, or for longer, than the market participants presumably predict. This, coupled with the fact that an unexpected interest rate reduction (rise) in a country usually triggers a sudden jump downwards (upwards) in the external value of the currency, may generate the strange observation that we may see staggered appreciation coinciding temporarily with previous interest rate increases, against the grain of UIP.

Other financial markets sometimes display similar phenomena. Fundamentals ultimately tend to govern asset prices. But these prices may drift away from the fundamentals for protracted periods, for many months, for example. Sometimes they continue drifting away from them, in the wrong direction, for years on end. Foreign exchange markets exhibit this tendency, with deviations from fundamental long term

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<sup>8</sup> See Mahadeva and Sinclair (2005), chapter 3, for multi-country econometric results confirming this, and Meredith’s chapter in Mahadeva and Sinclair (2002) for some interesting discussion of the theory.



equilibrium showing half lives of three years or so<sup>9</sup>. Equity and real estate markets can also fall prey to these weird gravity-defying movements. Such perverse movements are called bubbles. Eventually bubbles burst. Anomalies collapse. Reality re-establishes itself. But large short run profits can often be made by betting against logic and following temporary trends. The knowledge of this prompts people to think that it is safe to continue betting on such changes persisting for a while. Ultimately such bets end up with spectacular losses. But not at once. And if financial institutions remunerate traders with bonuses based on performance measured over brief intervals, that can only serve to inflate the bubbles further.

When bonuses are linked to relative performance over these short periods, the picture can get even worse. This is because traders are encouraged, if this is so, to copy each other very rapidly, and dissuaded from taking the contrarian long view that the market so badly needs for asset valuation to come into line with fundamentals. Contrarians make great profits, and stabilize markets, but unfortunately they may well lose substantial amounts on a week to week or month to month basis. Elongating the performance review period, from the standpoint of evaluating appropriate bonus payments, would therefore support the lonely ill-paid contrarians who rely on longer term thinking and penalize the antisocial copycats.

Relative performance evaluation has other consequences. One major plus is the fact that it can throw a sharper light on the subject's achievements. It strips away the effects of aggregate shocks that affect all players equally. It focuses on the individual. It needs to be remembered, though, that there are shocks at the individual level too, so relative performance still gives a distorted signal in the short run. There is also one big minus. This is the fact that bonuses are not the only thing that relative evaluation may lead to. There is also the possibility of non-renewal. An exceptionally bad performance may well trigger that. And if contract review occurs at a known date, and data accrue continuously in the meantime, someone who has clocked up a weak record in the interim is encouraged to take big bets. If the bets go sour, dismissal

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<sup>9</sup> See Driver and Westaway in Driver, Sinclair and Thoenissen (2005), for example.

ensues just the same. But if they come off, the poor record is suddenly effaced. The contract is renewed. So the discontinuities in the structure of rewards inherent in the threat of impending non-renewal can cause the agent to do things the principal may well lose from. This problem can arise when evaluation is absolute as well as relative, but may well become more acute in the latter case.

Looking back on the errors made by staff at banks and other financial institutions in the past few years, we can see that it is not just a silly decision to disregard the eventually inexorable logic behind UIP that led to the carry trade errors. Just as bad was the failure to apply the analysis of fundamentals to the housing market in the United States, and also to the mortgages that were supplied to back transactions in it. Theory tells us that real long run house prices in a country should move with its aggregate real income (positively, roughly one-for-one), real building costs (roughly half-for-one) and negatively with long run real interest rates.

There is also a positive link between the *level* of the real price of housing and its anticipated *rate of change*. This feature of housing markets applies to all assets. If gains are expected in the future, that can only enhance the attractiveness of an asset now. A depreciating asset is unloved and necessarily cheap. The level-rate of change link inevitably serves to make asset markets mercurial. But at least when participants share reasonably good information, it really is a crucial piece of the jigsaw, pinning down price dynamics, and determining how asset prices evolve after an unexpected shock. Short term movements in credit conditions and the like should really have next to no *permanent* impact on the prices or the stocks of housing. If they propel house prices for a time away from these long run fundamentals, as they so often do, a sharp correction later on is almost bound to follow. That is when the bubble bursts. Bonuses to staff engaged in asset markets that are based on quarterly or annual performance will encourage myopia and breed bubbles. When they reflect performance over a decent run of years, however, asset market participants will be rewarded for taking the longer view. Those asset markets should function better, reacting sharply to news but otherwise displaying less excessive – and socially harmful – volatility. Furthermore, Adrian and Shin (2007, 2008) provide compelling

evidence that the degree of leverage of financial firms changes over the cycle, increasing in booms when interest rates start low, and falling in downturns when interest rates start high. This will interact with, and exacerbate, the cumulative effects of bubble movements and instabilities emanating from the housing and foreign exchange markets. And this interaction, extended by the newly adopted practice of marking to market, may also serve to explain why a relatively limited set of initial losses (estimated by Greenlaw et al (2008) at some \$400 billion) should, when combined with the consequences of jumps in oil and other commodity prices, should have fanned out into such a large fall, relative to trend, in world GDP. Under perfectly functioning capital markets, a one off loss of \$400 billion should be treated as a non-recurrent hit to wealth that might be expected to cut annual consumption by perhaps \$20 billion, tapering eventually to nothing. But the macroeconomic cost of the 2007 credit crunch, with its various knock on effects, appears thus far to be much, much larger than that.

### ***CREDIT RATING AGENCIES***

Agency theory was developed to try to devise appropriate contracts between an individual who cannot do everything for herself, and a specialist hired to do it instead. Typically the specialist has much greater expertise. But he may have his own agenda; he could well be averse to risk; and the quality of his work will often be bedevilled by extraneous factors that make his own contribution almost impossible to assess. This is true of nannies and medics, and plumbers and lawyers. It is also especially true of specialists working in finance, and in particular, those engaged in valuing individual assets.

Banks collect the deposits of everyman, pool them, and lend most of the garnered funds out to borrowers they deem dependable. Banks appraise potential borrowers, and the assets such loans would finance. Asset evaluation is also a key aspect of the jobs, *inter alios*, of unit and investment trust managers, underwriters, stockbrokers, life insurers, fund managers, financial advisers, pension fund trustees and real estate

agents. And when banks, private sector companies or state organizations seek to borrow by issuing debt, it is the role of rating agencies to tell the world how such debts should really be assessed. Given that the loans generally prespecify much or all the stream of interest to be paid, the raters have to have a special focus on risk. How safe is this loan, the rating agencies ask themselves; and their answer to that question is essentially the rating that they publish.

One side effect of the credit crunch that began in 2007 is the ungainly process of identifying possible culprits in which the media, the academics, the regulators and the politicians are now engaged. High on this list come the credit rating agencies. Numerous questions began to arise about the agencies. Here is a list of some of them.

How could the raters get it all so wrong? How could so many financial instruments to which they had given reasonably high or even, in many cases, top marks, end up in 2007 and 2008 being unsaleable, and effectively worthless? Were the credit rating agencies' judgements on particular bonds coloured by the fact that they (or some other part of their companies) were earning large "advice" fees from those issuing, underwriting or holding them? Did the key problems begin with the "structured" products (linked to U.S. mortgages, often to borrowers with weak credit histories) with their opaque character, and their split between origination and distribution? Were the rating agencies in fact adequately regulated? Or sufficiently competitive? Was anyone really rating them? And had those making the 2004 revisions to the Basel arrangements for regulating minimum capital ratios for financial institutions been mistaken in giving the rating agencies much too large a role? Have the agencies rated debt consistently – in particular, have private sector issuers been accorded unduly favourable ratings in comparison with public sector borrowers?

To throw light on these questions, some descriptive details are called for. There are three large, long established credit rating agencies, all of which are based in the US, with tentacles stretching across the world. These three giants together account for about five sixths of the world market in rating services. They are Standard and Poors

(owned by McGraw Hill), Moody's, and Fitch (owned by Fimalac). The fourth largest, Dominion Bond Rating Service, began in 1976. It operates from Toronto, Canada, but enjoys a global, though more modest, coverage.

Two smaller Japanese raters, Japan Credit Rating Agency Ltd., and Ratings and Investment Information Inc., have joined these four as members with formal US "Nationally Recognized Statistical Rating Organization" status, together with four other US companies, the insurance rater A.M.Best, LACE Financial (based in Maryland), Egan-Jones (Philadelphia) and Realpoint LLC (Horsham, Pennsylvania). Realpoint was the last to be granted this status, in June 2008. It is unique in generating its income from investor subscriptions, not fees charged to bond issuers<sup>10</sup>. Outside the US, there are various other rating companies in Asia, including India's ICRA, Indonesia's PEFINDO, and Shanghai Brilliance in China, which has recently entered a technical service agreement with Standard and Poors.

One feature that the main raters share is a debt-quality grading system in buckets. There are four key categories, prefaced by A (the best), B, C, and D (the worst). The top three grades are subdivided: A embraces AAA, then AA, then plain A, and the B and C buckets similarly. Moody's suffixes its highest marks in each category with "aa", then "a". The top grades are defined as the safest – those bonds likeliest to pay interest, and repay principal, in full on due dates. Some of those subdivisions can be broken down further, with plus or minus suffixes.

Buckets are crude objects. Most of the various factors that contribute to the risks to the interest stream and the principal promised by a bond imply that those risks are in fact rather better treated as continuous, as opposed to discontinuous variables. And although state preference theory is certainly richer and more focused than mean

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<sup>10</sup> Mainelli (2003) states that his private conversations with the big three raters revealed that none of them could have survived with a business model based on investor subscriptions. This might in part be due to a free rider problem (groups of potential bond buyers might club together, with just one of them paying for the information). But whatever its cause, reliance on bond issuer fees may create a serious conflict of interest for the rater that will perceive an undue return from flattery.

variance theory in abstract terms, and points to the benefits of a discrete approach in state space in simple one-horizon examples, the number of relevant possible states is effectively infinite. Risk management models, such as Value at Risk, are certainly based on handling chance in a continuous fashion. Besides this, a powerful objection to buckets is that they encourage a rater and a rated issuer to ask the question “How much rubbish can we get away with concealing behind better assets in this instrument and still qualify for a particular, respectable grade?” With unique-asset issues – and *a fortiori* for complex ones - buckets encourage clustering at the bottom end of the range. The smaller the number of buckets, or the more crowded the top bucket, the more acute this problem becomes. And when, as we shall see actually occurred, almost all the securities related to sub-prime housing market loans ended up with the top rating, it was almost as if the effective number of buckets had shrunk to just one.

So it would seem better, perhaps, to adopt a continuous scale. This might range from zero to 100%. If so, it could provide an answer to the following question. If a risk neutral informed investor had to focus on just two events, payment repayment in full (A) and loss of principal and all interest (B), what would be the probability of event A that made her indifferent between that hypothetical bond and the actual bond under scrutiny? If the answer was 0.9 (90%), let us say, the bond in question should ideally sell, on current information, at a 10% discount relative to an absolutely safe bond with similar maturity characteristics. This would apply in the case of risk-neutral investors at least – or, more generally, to those who were able to diversify all risks. Refinements could be made to allow for various wrinkles, such as risk aversion and the ex ante covariances between the risky bond in question and other instruments, to capture the tastes and beliefs of the “representative” investor that dominates standard portfolio theory. A further change that might be undertaken is the substitution of a range for a single number on the scale. This would reflect a measure of the uncertainties attaching to the estimates of likely servicing flows and repayment of principal on the bond in question. The range might be interpreted as a confidence interval, at 99% perhaps, despite the fact that this might suggest rather an implausible degree of precision for such very murky speculations.

An alternative to the continuous scale, with or without the confidence intervals, would be a simple ranking of rated objects. We might call this the “Wrangler” list<sup>11</sup>. The agency would then attempt to judge the safety of a newly issued bond by comparing it with other instruments with broadly similar maturity, and placing it in order of perceived riskiness. That order would be liable to change as new information came along. And the ranking would contain other information, such as the issue size and date. The Wrangler list would avoid the difficulties inherent in trying to quantify risks, and (because it was relative) guard against any tendency to unwarranted grade inflation. In 2005, Moody’s data suggest that *80.8% of subprime mortgages were converted into pools rated AAA*, and almost as many (80.1%) in 2006<sup>12</sup>. A more sober calculation would have been to grade all such derivatives with a B prefix or lower, but Greenlaw *et al* (2008) show that less than 5% got translated into those buckets in 2005 and 2006. In hindsight this was a really grievous error. So how could it be that almost all sub-prime mortgage backed securities ended up with the top grade for safety? We shall return to this issue in a moment.

All but one new, small rating agency, we saw, relies on fees charged to bond issuers rather than levied on investor subscriptions. And the issuer fees have been amplified in recent years by fees for advice on how complex instruments can be structured so as to achieve a flattering grade. The conflict of interest issues raised here have been of considerable concern to observers for some while: Heffernan (2005), for example, talks at length about them, and the perils they posed.

In its summary report on the three large credit rating agencies, The Securities and Exchange Commission (2008) recommends a number of changes to rules governing structured products and issuer-rater relations. These include a ban on a firm rating one when relevant data that would permit others to check the grade are unavailable; a ban on a firm rating a product on which anyone in that firm has given advice; a

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<sup>11</sup> Wranglers are Cambridge Mathematics graduates, who, uniquely in the UK, are not *classed* (placed in buckets) but rather, ranked in order of merit.

<sup>12</sup> Source: Exhibit 3.3 in Greenlaw *et al* (2008), P. 17

requirement to publish all ratings and reratings; a ban on staff concerned with rating a product negotiating the issuer fee; and an insistence on a firm's providing full explanations of the differences in its methods of assessing credit-worthiness and risks between traditional and structured products. All these recommendations are prudent. Although the definition of "data", "unavailable" and "methods" leave room for ambiguity in practice, and although there are already signs that the agencies will try hard to resist some of the changes proposed, these new rules should help to achieve something urgent and very important: the rebuilding of trust, not just in the agencies themselves, but also in the markets for financial instruments more generally, so many of which have ceased to function properly – if at all - since August 2007.

The SEC proposals reflect analysis of the three firms scrutinized. Residential mortgage backed securities (RMBSs) and collateralized debt obligations (CDOs), the two key types of structured product the agencies were asked to rate, saw a torrent of new business in and after 2003, up to mid-2007. Subprime mortgage originations had been just \$97 billion in 1996; ten years later, they had ballooned to some \$600 billion<sup>13</sup>. The number of CDO rated deals by two firms rose eightfold between 2002 and 2006. The character of the products also became increasingly opaque, as issuers attempted to reduce perceived risks, in the mysterious belief that "risk could be effectively eliminated by trading", by ever-greater dicing and splicing of the original loans; and because the setting of fees and the determination of the rating sometimes involved overlapping staff, some issuers may have come to think that they could somehow pay their way towards more favourable ratings.

Rating agency staff found it very hard to keep up; some rating criteria were not disclosed; resort was had to "out of model adjustments", the reasons for which sometimes went unrecorded; internal audit arrangements in two of the three agencies appeared, the SEC judged, to be less than adequate. In a wide sample, four fifths of the RMBS and CDO deals were found to have been underwritten by barely a dozen firms, raising concerns about paucity of competition among the "arrangers" who act

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<sup>13</sup> Ashcroft and Schuermann (2008).



as midwives for the bond issues and revenue source for the agencies. Statistical models that agencies employed for evaluating bond risks (which depend on borrowers' credit worthiness, default risks and losses in the event of default) varied widely across the agencies, and some appeared on technical grounds to be more trustworthy than others.

Probably the gravest problem for the rating agencies, as well as for other participants in the housing and financial markets, was in fact the paucity of data they had from which to assess risks. Imagine a farmer on the slopes of Mount Vesuvius in 78 AD, reporting that he had farmed there continuously for 20 years and never observed the slightest sign of an eruption. "I look at the mountain every few minutes, and I can tell you with complete confidence that my thousands of observations suggest that there is absolutely nothing whatever to worry about". Statistical inference requires a large number of observations, it is true. But it also calls for a long span of history from which these data are drawn. This is because there can be low frequency disturbances, like the eruption of a volcano, which can also be large. It is just no good assuming that the probability distribution from which random events are drawn is stationary and adequately represented by a large number of observations in a brief period of time.

The explosion of computing power and of easily accessed high frequency data on, say, financial asset prices is a recent phenomenon. It is a product of the last decade or two, no more. Relationships seemingly firm and unshakable over this interval can break down without warning, and suddenly change. It was changes like this in the correlograms and covariance matrices of bond prices that brought Long Term Capital Management to its knees in 1998. The 2007 credit crunch saw history repeat itself<sup>14</sup>. The US macroeconomic environment in the later 1990s and the early years of the 21<sup>st</sup> century was exceptionally benign, with unemployment and inflation both low and steady, few business or bank failures, and a steady crescendo towards the end in house prices, accompanied by very low interest rates, that made mortgage lending collateralized on dwellings look – on a short term basis - a very safe and attractive

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<sup>14</sup> A recent paper by Reinhart and Rogoff (2008) emphasize some of the similarities (and the differences) between the 2007 credit crunch and previous episodes of grave financial instability.

bet. But had the data sets employed in the agencies' models been able to incorporate comparably rich figures for the earlier years of great turbulence, like the 1970s or the decades between the wars, a very different picture of risks would have been obtained. And similar conclusions could have been reached, based on theoretical and empirical economic models of fundamentals in the housing and asset markets.

The "Vesuvius problem" is really the key component of what we can now see was a perilously erroneous underpricing of risk in the three or four years before August 2007. Some errors were certainly made by the rating agencies. Very low policy rates were set, and held down, by the Federal Reserve FOMC, from 2001 to 2005. For much of that time, they were as much as 300 basis points below neutral, providing very strong support to private sector expenditures. They were a key ingredient in generating the euphoria and explosion of borrowing. But all major financial intermediaries must share some responsibility for the abnormal, wafer thin risk premia that persisted in wholesale money and corporate bond markets until mid 2007. These generated misleading signals for the rating agencies and for final investors, lower down the chain. And the standard risk management models<sup>15</sup> employed by all these institutions were narrowly backward looking. They were based, like the Vesuvius farmer's predictions, on the belief that all relevant financial markets would continue to be open and reasonably complete, and to function as they had in the happy, richly documented, golden decade or two up to 2007.

What about bonuses? Mortgage issuers often appear to have been paid on commission. But importantly, the SEC reports no evidence that individual analysts' bonuses or pay were linked to revenue from issuers whose bonds they had rated, or contrary to the agencies' stated policies. So this was not, it appears, a case of commissions distorting staff behaviour in the credit rating agencies themselves – however much this may have happened elsewhere in the chain of firms involved in the RMBS and CDO markets. But bonuses will have reflected the firm's profit over the year. That is surely much too short a period for chickens to come home to roost.

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<sup>15</sup> Among others, Milne (2008) argues this point persuasively.

Ideally one would want to reward raters and their analysts according to the accuracy of their rating judgements and revisions, as history unfolds over the longer term. Unfortunately this has not happened. One of the SEC report's most telling passages in this connection is a footnote on page 12, which quotes an email dated 15 December 2006 from an analytical manager to a senior analytical manager in an unnamed rating agency about the CDO market. "Let's hope that we are all wealthy and dead by the time this house of cards falters", the author wrote. So as far as the credit rating agencies were concerned, the crisis that began in August 2007 certainly did not come as a complete surprise. But the "house of cards" may well have tumbled much sooner than this author actually expected.

In some ways we still know too little about the rating agencies performance, other than that their ratings imply that they (and others) read the housing, mortgage and credit markets badly wrong. It is perhaps a little unfair to judge them too harshly. Shocks do happen, and no-one can foretell financial markets perfectly. Where they were more at fault was in their blindness to economic fundamentals, which would have sounded alarm bells in the mortgage markets long before August 2007, and to which *risk* ratings should have responded. It would be interesting to learn, too, whether all agencies are equally timely in the judgements they accord to instruments they rate in common, or whether one of them tends to lead the others in setting or adjusting grades. There may have been unthinking copycatting. Or even some cynical reasoning to the effect that an agency that gave stiffer grades would attract less business, given that all but one small one are funded by fees charged to the issuer. In the case of corporates with equity quotations, it would be valuable to learn whether rating revisions on their bonds tend to lead or lag big changes in corresponding equity prices. We know of no detailed research on Granger tests of causation here; any serious attempt to determine the social benefit from credit rating agencies would rely greatly on the answers such tests threw up. Competition among raters is clearly very important, and the SEC proposals will be helpful in that respect. And there is a danger that raters, and other financial market players, will find themselves ensnared by unwise new regulations, established in the wake of the 2007 crisis, which could prove to stymie competition and innovation in the future. But one point is clear: the Vesuvius problem with data made for excessively sanguine judgements.

## **CONCLUSION**

Bonuses are not inherently bad. When they are properly set and constructed, variable remuneration mechanisms can improve economic efficiency in numerous ways, when compared with many – if not all - alternatives. This is true of financial as well as non-financial firms. But when the individual's rewards have floors, and reflect short period outturns which are far more influenced by luck and the inputs of others than by what the individual has actually done, they can be perilous. And when misapplied in the financial sector, where risk-taking at the shareholder's, the taxpayer's and the depositor's expense can be especially pronounced, and the ripple of potential misery can spread out so far and to so many others, these dangers can be really alarming.

The brevity of the observation period has other sinister effects. It encourages over-reliance on a well documented recent past – what we have called the Vesuvius problem. The generally benign financial environment that ruled in North America and much of Europe for the six or so years both before and after the turn of the century led to risk being gravely mispriced. Rating agencies fell victims to this; and so did banks and other financial intermediaries. When coupled with the short horizons of players in the financial markets, where most of the bonus systems in operation clearly made matters worse, attention was diverted from fundamentals and agents were encouraged to copy each other, and bet against the laws of economic gravity (that what rises will probably fall later on).

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