

# Regulatory arbitrage and model sophistication in the financial crisis

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*The aim of this paper is to investigate the main financial strategies set up by financial institutions over the last few years and which are at the origin of the financial breakdown we have gone through. Whether we are talking about Conduit, Negative Basis Trade, Credit Default Swap / Financial Guarantee deals, Credit Derivative Product Company, Proprietary Trading strategies, these strategies all shared some common features. First, they were all considered (before 2007) as arbitrage opportunities, e.g. non-risky and profitable strategies (which they were actually for quite a long time). Secondly in all these strategies, regulation loopholes and model sophistication were deeply involved and even necessary for their being so profitable. Thirdly markets proved to be unable to assume their traditional role of driving away and eventually destroying these seemingly arbitrage opportunities, at least before the imbalance they generated had become so heavy that they crashed down under their own weight.*

*This paper advocates the fact that any reform of the regulation of financial institutions will open the field of a new wave of financial innovations whose primary goal will just consist in circumventing any new regulation. Regulators and Board members of financial institutions should keep that in mind and beside ambitious global reforms (like macro-prudential policy, risk-based remuneration design, cyclicity-adjusted capital requirements etc.), one has to look carefully at more microeconomic considerations. In this respect, auditing performance and return on (regulatory) capital of main desks and business lines / products within a financial institution could be an easy and cheap way to track extraordinary profitability relative to the regulatory capital they require. Outstanding and abnormal return-on-equity on a specific desk, product or strategy is probably the most accurate guide to know where the next accident will take place.*



## Introduction

The “No arbitrage” or “No free lunch” assumption is the stone on which the derivatives business and more generally the whole finance industry have been founded. Starting from Black and Scholes or Merton frameworks for modelling equity derivatives and credit derivatives to Heath, Jarrow and Morton models for interest rate and exchange rate derivatives, all these models and frameworks share the very same assumption that “one cannot make a positive profit for sure from a zero-cost strategy”. In other words, if you think of you have found such a strategy, then under the assumption of No Arbitrage, your strategy is actually risky and you seem to have missed that point (and great pain may afflict you soon...).

This assumption has a straight corollary which states that “if such an arbitrage opportunity / free lunch ever appears somewhere and someday, then there always exist investors who swiftly book an immediate profit out of it so as no arbitrage opportunity can ever last for long”. In other words, the No Arbitrage assumption can also be stated in quite a milder form, which says “one can not make a sure and sustainable profit from a zero-cost strategy”.

The aim of this paper is to discuss this assumption at the light of the strategies which have exploded in banks’, monolines’, and insurers’ balance sheets and which are at the centre of the financial wreckage we have been living in for the past couple of years. Indeed, Negative Basis Trades, Conduit or Credit Derivative Product Company (CDPC) - based strategies, Credit Default Swap / Financial Guaranty deals, etc. were once considered and sold as profitable, non-risky and incredibly cheap strategies. Any risk manager of any bank has heard at least once the fairy tale which Front Offices vendors used to tell, that “a Conduit-based strategy produces a sure profit for zero-equity and, as such, has an infinite Return-On-Equity”.

It comes as no surprise that these strategies seen

once as (quasi-) arbitrage opportunities have eventually gone bust. It is exactly what the No Arbitrage assumption says, that is, that arbitrage opportunities do not actually exist (or do emerge transitory) and if ever one market participant thinks they have found one, it is likely because he or she fails to recognize that his or her strategy is actually risky and therefore bears significant hidden risks.

In some sense, the financial crisis does not contradict the No Arbitrage assumption. It is more in line with the following version of the No Arbitrage assumption which is quite different from the one stated above, and it is precisely this difference which is at the core of this paper. Indeed, the financial crisis teaches us that: “one can make a sure and durable profit from a zero-cost strategy... but not for ever!”

Indeed, it is all about time and horizon. In the conventional statement of the No Arbitrage assumption, an arbitrage opportunity cannot last more than (say) a few days. On the contrary, in the “contemporary” No Arbitrage assumption as exemplified by the current crisis, an arbitrage opportunity can last much longer than a few days, say a few months or even years, and can actually last so long that it may create a huge market imbalance which eventually crashes down in a free fall.

This is the interesting point and understanding the reasons why seemingly arbitrage opportunities lasted for so long is crucial for paving the way towards a safer road for the future of the financial world.

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<sup>(2)</sup>Cat Bonds can also be an alternative to traditional reinsurance and open larger capacity or additional leverage to negotiate traditional cover.

<sup>(3)</sup>Regulatory rules state that up to 50% of future profits can be eligible to cover solvency margin requirement. The eligibility of future profits is subject to a waiver by the regulator and can not exceed 25% of solvency margin requirement.



## No arbitrage opportunity in financial modeling

The No Arbitrage assumption has the convenient feature of being economically sound and mathematically powerful. As an economic assumption, it simply states that whatever economic agents' preferences, aversion toward risk, or subjective discount rates are, economic agents all share some minimal rationality. That is if ever someone is presented with the possibility of a positive profit, without having to take risk and at zero cost, he or she will rush out to take advantage of it thereby eventually removing the advantage it, as soon as markets adjust accordingly and begin to function properly. Therefore, such an arbitrage opportunity should either not exist in the first place or should disappear straightaway, should one ever appear.

Any pricing and hedging modelling used in any trading floor for the last 30 years has been constrained to satisfy this assumption. In other words, nobody would accept to trade derivative products on the basis of a model which would not satisfy this assumption<sup>(1)</sup>. As a matter of fact, the No Arbitrage assumption is not only an economically appealing hypothesis, it is also a highly powerful mathematical tool. All quants have been once illuminated by the pricing formulas which could be derived from this assumption and how these could be expressed in such an elegant form that seemed too elegant to be misleading<sup>(2)</sup>.

As such, the No Arbitrage pricing framework is at the heart of what IFRS rules consider as Fair Value and you may also find some explicit reference to this theory in the Basel II framework<sup>(3)</sup>.

Unfortunately, this pricing framework is sometimes used as a kind of magic while it goes without saying that the theory applies only if some other assumptions are satisfied as well. In

particular, the theory states that the No Arbitrage prices can not be uncovered univocally when markets do not exist or have dried up. In short, the IFRS level 2 and level 3 types of assets - for which marked-to-market are not readily available - are exactly the situation where No Arbitrage mark-to-model prices should be used with great caution.

Discussing all the pitfalls which result from using the No Arbitrage framework in an appropriate way are beyond the scope of this paper. One should keep in mind that detecting arbitrage opportunities and taking benefit of them are at the core of what traders and quants were asked to do over the past two or three decades.

The story becomes highly interesting when one realizes that regulatory rules, accounting rules and discrepancies between the models used by market participants generate seemingly arbitrage opportunities. Moreover, these arbitrage opportunities are of the long-lasting sort as no available market mechanisms ensure that these opportunities are doomed to disappear rapidly. Since they last too long, they lead to ever growing market imbalance until final explosion as the one we have been going through for the past couple of years.

## Regulatory and model arbitrage in practice


In some sense, most fees earned by the banking industry over the past years have been derived from building and exploiting arbitrage opportunities created by regulations and model loopholes. It does not come as an exaggeration to state that banks' corporate and investment branches were mostly dedicated in this "arbitrage business" and the most part of bonus and compensation packages paid to traders and quants people were justified by the (appa-

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<sup>(1)</sup>Incidentally, many competing models, for example models based on non-conventional price dynamics such as fractal or chaotic or "fat tail" distribution, have been always rejected by quants and traders because of the difficulty to plug the No arbitrage assumption into these frameworks. Even though many eminent academics have repeatedly demonstrated that market price dynamics were evolving more like fractal or chaotic or long-memory distributions, allowing Black Swan to happen, than more conventional Gaussian-based models.

<sup>(2)</sup>In short, the No Arbitrage assumption implies that prices can be expressed as the discounted value of the future expected cash flows generated by the asset, where the expectation is calculated with the so-called risk neutral (or forward neutral) probability distribution which in some sense sums up all agents' preferences and risk aversion.

<sup>(3)</sup>For example, when Basel II describes how Loss Given Default parameters should be computed when future recoveries are uncertain and bear systematic risks



rent) positive profit & loss generated by these activities.

These arbitrage opportunities fall into different categories and lead to a different sort of terminal explosion.

Let us start with banking regulation-based arbitrage, e.g. simple arbitrage strategies made possible within banking regulation. They consist of purchasing (say) some mortgage-based securities and booking them into a trading portfolio instead of a banking book. These securities had a very significant component of credit risk and could be viewed either as mortgage-like assets (thus consistent with a banking book classification) or as a trading product since apparently they seemed to be easily tradable on a day-to-day basis. As we know now, these markets were not so liquid and even at the time when they were purchased and sold, it was really dubious to consider these securities as trading products. Nonetheless they were booked as trading products because trading products fall under the market risk regulation and as such were weighted lightly in comparison with the capital they would have been charged had they been booked as banking products. As a result, this strategy could show a persistent abnormally high return-on-equity. This may explain why so many proprietary trading desks in banks around the world, even in regional or retail banks whose core business is definitely not supposed to make money from proprietary trading, have purchased huge loads of asset-based securities as a recipe for boosting returns-on-equity.


Moreover, as this strategy was booked in as a trading portfolio, the internal funding rate was based on the short term interest rate even though in retrospect these assets turned out to be highly illiquid and comfortably installed in banks' balance sheets for the next few decades or so... (except if a government-sponsored defeasance structure is set up). Had they been booked in as a banking portfolio, the internal funding unit would have (maybe) charged a much higher long-term interest rate, which together with the higher capital charge would have considerably reduced the incentive to enter these strategies

in the first place. The game played by banks between their trading and banking books is now well documented and is explicitly cited by Basel Committee architects as a primary cause for concern in reforming market risk regulations.

In some ways, these arbitrages can also be interpreted as some kind of internal arbitrage taking place within the bank, between trading floors for one part and the internal funding unit and the capital management unit for the other part e.g. those units responsible for funding business lines and allocating capital. In this respect, the publicly released "Shareholder Report on UBS's Write-Downs" (2008) is enlightening, highlighting the way internal mispricing for funding and inappropriate regulatory capital charge can drive business lines into very dangerous water.

The financial crisis has also shown other lasting arbitrage opportunities involving two different pieces of regulation, for example the banking and insurance regulations. Though these two regulations focus by definition on different kinds of risks, they nevertheless share some of them. Typically, credit / counterparty risks are in the scope of the two regulations but are not weighted identically in terms of capital charge whether you are a bank or an insurer. The Negative Basis Trades are typical examples of these multi-regulation arbitrage opportunities. These strategies consisted of purchasing credit-linked securities, say some tranches of Collateralized Debt Obligation (CDO), and simultaneously purchasing protection, namely a Credit Default Swap (CDS), written by an insurer, typically one of the so-called monoline insurance companies.

This trading strategy had a very low contribution to market risks as any change in value of the CDO was supposed to be offset by the opposite change in the value of the protection contract. Moreover, as monolines were rated AAA, the net exposure (i.e. CDO plus its CDS based protection) was almost zero and was reduced to a AAA exposure which then did not deserve a significant capital charge regarding counterparty risk. Though this strategy was supposed to bear almost no risk, in the sense of the regulatory capital requirement necessary to cover it, it had however a positive



spread, meaning that there was a mispricing somewhere. The fact that this arbitrage lasted for so long before financial explosion, i.e. before monolines and AIG Financial Products-like companies (almost) defaulted all together, proves that usual market mechanisms did not function properly in their mission of driving out arbitrage opportunities and mispricing.

Negative Basis Trades are of particular interest as they illustrate how multiple regulations and different credit-risk models have combined together for the worst. Firstly, one may blame the gap between the models used by corporate and investment banking branches for pricing and evaluating potential credit losses of CDO and CDS and, on the other hand, the models (or more exactly the absence of models) used by monolines in their symmetrical assessment of the risks embedded in the protection they sold. Therefore, Negative Basis Trades may also be understood as an arbitrage of models built by banks at the expense of monolines as models used in banks were definitely more sophisticated and accurate than those used in monolines. Banks were definitely aware of this fact<sup>(4)</sup>.

Secondly, arbitrage of models also took place between banks and rating agencies' models. The rating models used by rating agencies were either flawed or so widely publicized that they could be easily reverse-engineered, again at the expense of monolines which used to take agencies-based ratings for granted. Quants people in banks had been used to structuring CDOs with the explicit goal to obtain a predefined target for its rating, and they were enabling to do so precisely because all market participants knew rating agencies' models. Nothing illegal or immoral there but, as no model is perfect (and least of all rating agencies' ones), a large gap between stated rating and actual riskiness of the product appears, in which Structured Credit desks in banks have entered massively.

Thirdly, banking and insurance regulations are not similar, meaning that insurance-regulated monolines did not consider CDS the same way as the banking regulation did. In the most sophisticated deals, a so-called "transformer" vehicle

was set up for transforming financial CDS into (insurance-regulated) Financial Guarantees, which permitted to capture "the best of the two worlds".

At last, internal rate funding was not adequately priced for the same very reason as outlined at the beginning of this section: a short-term internal funding rate was charged to the desk whereas Negative Basis Trades were definitely not so easy to unwind at short notice.


Arbitrage of models, arbitrage between different regulations and arbitrage within banks' internal funding system have combined to let Negative Basis Trade deals last for too long and make them look like arbitrage opportunities.

As a last example, the Conduit-based industry is another example of arbitrage between multiple regulations and here accountancy rules were deeply involved. A conduit was a Special Investment Vehicle (SIV) where risks related to credit-linked products such as CDOs (again) were transferred to. On the other hand, the vehicle was refinanced by issuing short-term Commercial Papers sold to investors. The banks which transferred their credit risks bore a part of the SIV's equity and extended a back-up liquidity line to the SIV (preferably a less-than-one-year liquidity line).

Avoiding unnecessary sordid details, one may sum up the deal in the following way: instead of having these risks in their balance sheets, banks used to transfer them into the conduit; one significant share of profit generated by the conduit came back to them while Commercial Papers' investors earned an interest income. The trick was then to convince accountants and auditors that risks had been genuinely transferred and therefore should not be consolidated in the balance sheet. This was done under the umbrella of the accounting rule which states that consolidation can be avoided provided that you can prove that you do not bear the majority of risks and benefits coming from the SIV. When accountants and auditors were not "spontaneously" convinced by the demonstration provided by Front Offices, a "friendly"

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<sup>(4)</sup>In short, there is a sort of "Jungle Law" by which those who enter sophisticated markets with poor, not state-of-the-art models and tools are promptly arbitrated by all other market participants. .



and warm pressure was generally sufficient to convince them that consolidation would be really a bad idea.

At the end of the day, banks earned a positive profit out of a conduit whose regulatory capital requirement was actually zero, the latter coming from the fact that the backup liquidity line was contractually fixed for less than one year (which implied zero capital charge). However the return of this strategy stayed positive for a long time, partly because of the large scale maturity transformation between underlying assets (CDOs) which were actually long-dated assets and liabilities which were made of short-dated Commercial Papers. The liquidity premium was the core of the profit while there was no capital charge in the face of the subsequent liquidity risk. As a result, Front Offices have repeatedly explained for years that this strategy had an infinite return-on-equity, in other words that it was an arbitrage opportunity. Similarly, in the words of the Lord Turner Review (2009), it comes as: “SIVs [Conduits] were a clear case of regulatory arbitrage”.


Which conclusion can be drawn from all these strategies which have involved hundreds of billions USD of nominal amounts of CDO-like credit structured products? First, as thoroughly detailed in the Lord Turner Review (2009), regulatory arbitrage or model-based strategies were not, in the long run, true arbitrage opportunities because at the very end they all collapsed and incurred such huge losses that the banking industry itself has been on the verge of a total meltdown. Secondly, we must however accept the fact that these strategies were considered as risk-free profitable strategies (i.e. arbitrage opportunities) for quite a long time, closer to several years than just a few days or weeks. Consequently, it teaches us that these spurious arbitrage opportunities have not been driven out of financial markets in the “usual” way: where and when conventional arbitrage opportunities emerge, market participants exploit them rapidly and market prices adjust soon to make these opportunities unprofitable. In “non-conventional” arbitrage opportunities, i.e. those where regulations and/or models and/or “internal regulations” are involved, these strategies can last longer with

the appearance of a genuine profitable arbitrage opportunity. Above all, precisely thanks to regulation distortion, modelling or internal regulation loopholes, these non-conventional arbitrage opportunities are not solved (and driven away) through usual market adjustments but through the final collapse of the global imbalance (i.e. a financial crisis) they generated and contributed to accumulate.

### What's next?

Regulators are now working on new regulations aimed to avoid these dangerous strategies and make them unprofitable in the first place. Below are examples of present proposals which will become formal regulation in the coming months:

- Preventing internal arbitrage, in particular between trading and banking books. As an example, the last Basel II consultation papers on market risk and Incremental Risk Charge (IRC) propose stricter rules and heavier capital charge for credit-linked expositions in trading books, which at the very least might remove all economic incentives in the trading vs. banking book game within banks.
- Killing Conduit-based, unconsolidated vehicles. The Lord Turner Review emphasizes the need for an “economic substance over form” appreciation of risks, which is a diplomatic call for more stringent rules when deconsolidating risks out of the balance-sheet.
- Focusing more on models pertinence. Though the Lord Turner Review offers a deep investigation of models flaws, inconsistent underlying assumptions, misplaced reliance on sophisticated mathematics etc., it does not propose at this stage any significant regulatory change, which comes as no surprise considering the difficulty of enacting laws and rules regarding mathematic models used by quants people over the world.
- Improving pertinence of Fair Value figures, etc.



There is abundant literature these days issued by academics, regulators, supervisors and central bankers which will soon be translated into formal rules. Banks should prepare themselves to meet much higher regulatory standards in future and those banks which fail to do so on time will not stay intact.

However it is worth keeping in mind that, as usual, new regulations are designed to prevent the accidents of the past and do not say a lot about future crisis. In particular, if the underlying idea behind our discussion of previous sections of this paper is valid, i.e. that a large part of banks' business is dedicated to exploit arbitrage opportunities and loopholes made available by regulations (both external and internal) and models sophistication, then one can expect that a new industry is about to emerge within market participants (banks, funds, insurers or whoever) whose aim will be to play on the large new field opened by regulatory innovations. In this respect, it is in contradiction with intuitive thinking that over-regulation discourages innovation. In the financial industry, the opposite is true: regulation encourages (maybe perverse) financial innovation<sup>(5)</sup>.

The good news is that it may bring fat fees to repair banks' financial accounts (and incidentally large bonus to repair bankers' personal accounts) but it is a little scary to think of what the next crisis may look like when considering that future regulation is designed to be even more complex than the one we have been living with so far.

One does not need a crystal ball to predict that financial innovation on which the next future generation of quants people will work hard on will be oriented towards:

- Circumventing new market risk and credit risk regulation.
- Exploiting differences between Basel II and Solvency II regulations. The fact that Solvency II allows for internal economic capital models whereas Basel II did not go that far is a great opportunity to give birth to chimerical, partly insurer partly banker animal whose raison

d'être will be to take advantage from the "best" of both worlds.

- Playing with differences between renovated IFRS rules and again banking / insurance regulations. The fact that present Basel II consultative papers on market risk and IRC are evocating some new concept of "prudent valuation framework" which might not fall in line with IFRS Fair Value definition opens a large playing field for having good fun with home-cooked financial accounts and prudential statements.
- Playing with hybrid capital, bond-like equity or equity-like bond for an "efficient" monitoring of solvency ratios and Tiers, etc.


### What to do?

Past financial crisis tell us quite a pessimistic story of what could happen next: a new set of regulations gives birth to a new wave of financial innovations of a much higher complexity than before, then the financial industry becomes populated with newly-created shadow banking / insurance bodies whose sole goal is to take on risks (and hopefully make profit from it, at least for a while) in the most unregulated way, then the whole industry eventually collapses under its own weight and the imbalance it has contributed to create.

It does not mean that regulation is counterproductive or dangerous; it only means that we must have this in mind when designing sophisticated new regulations. However, some hope does actually exist. As a matter of fact, one can imagine that banks' risk management division will be reinforced by what happened over the last couple of years. Most of the time, risk managers have not failed to perceive in advance what may go wrong but they were simply not listened to or lacked enough support from their CEO to deter Front Offices from taking excessive risks. Conflicting relations between business people and controllers is a classic story, as old as the financial industry itself but hopefully most bank managers have now understood that banking is

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<sup>(5)</sup> For example the de Larosiere Group (2009) states that "(...) Over-regulation, of course, should be avoided because it slows down financial innovation and thereby undermines economic growth in the wider economy". Theoretically, the argument is obviously true but in the day-to-day life of financial markets, it is far from clear.



just about managing risks and that risk management should be at the core of any business model which aims at generating sustainable profit. In this respect, one may hope that supervisors and governance bodies will do their best to help those inside banks whose role is to ensure that risk management is in the DNA of any risk-taking business.

Turning to fundamental economics, we should recognize that regulation and specifically capital adequacy rules are a tentative way to set a “price of risk” not from a market-driven mechanism (e.g. where offer and demand confront to one another to eventually reach an equilibrium price) but from a top-down process by which regulators define authoritatively the amount of capital required for covering risk. In this respect, future regulation will be directed to increasing this discretionary price of risk. At the end of the day, taking risk will supposedly be more expensive and therefore financial institutions should be willing to take less risk in the first place or will have to pay a higher price for it (e.g. set aside more capital on the face of it) so the story goes.

However, fundamental economics and history warn us about the dangers of interfering in the price-discovery mechanism at the core of any market economy, whether these markets are dedicated to goods, services or financial instruments, the latter corresponding exactly to the “goods” invented by economic agents for exchanging risk. Dangers linked to interference are typically those termed in the economic literature as “inefficient allocation” of the underlying good, or “inefficient allocation of risk” in this context. In other words, as the price of risk is not derived from a market-driven discovery mechanism, one may end in the situation where price is either understated or overstated, which can mean three things:

- that mispricing of risk implies that some economic agents take on too much risk while others take on too little
- that the capital adequacy ratio, which is sup-

posed to match capital requirement with the risks actually taken, loses its pertinence and lacks adequacy. Not surprisingly, any report issued after a financial accident never fails to stress the fact that current regulation “underestimates some important risks and over-estimates banks’ ability to handle them” (following the lines of the de Larosière Group (2009) for example)<sup>(6)</sup>.

- imbalance, e.g. disequilibrium between offer and demand for risk, emerges almost instantly and thrives as soon as risks are mispriced, which at the very end means bubbles and exuberant behavior of financial instrument markets.


Thinking of financial instruments as a way to exchange risk and equating financial markets to “risk markets” (e.g. markets where risks are sold and purchased) are more than simplistic analogy. If this analogy bears some truth, it implies again that regulation though highly necessary may turn out to create a nightmarish and unwanted outcome.

There is no straightforward solution to address the issue since a no-regulation free-banking world is certainly not an option. At the macroeconomic level, regulation should promote market-driven mechanisms and symmetrically discourage over-the-counter transactions. This is exactly what regulators are doing right now when putting pressure on market participants to build a regulated clearing house for trading Credit Default Swaps. As any market-driven solution, it allows for greater transparency and standardization and increases the chance for a price-discovery mechanism to work properly, which should eventually set a price for risk closer to an efficient market-price than the authoritative price fixed by regulators through adequacy rules.

Secondly, at the microeconomic level, supervisors (and before them, banks’ top executives and Boards’ members) should pay great attention to returns and performance measures of all banking activities, and probably at the finest level of granularity. Outstanding returns are the most accurate indicators of dysfunctional mar-

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<sup>(6)</sup> That regulation is never perceived as in adequation with actual risks is due to the fact that adequation is a constantly moving target and therefore will never be reached once for ever. Top-down price setting (and regulatory capital requirements are a tentative way to set a price of risk) always generates inadequation between demand and supply, e.g. between the “regulatory price” and the market price which would ensure equilibrium.



kets and therefore the best predictors of future accidents. Whether you look at proprietary trading or conduit-based or Negative Basis Trade business before 2007, you cannot fail to see the astonishing (sometimes infinite!) returns-on-equity of these strategies. In practice, supervisors and top management should focus on desks or product lines which show extraordinary returns relative to their capital requirement and should demand appropriate explanation from business managers, the latter having to explain whether their outstanding performance comes from plain high value-added innovation or from internal arbitrage, external regulatory arbitrage or model sophistication.

In short, top executives should ask their budget control managers to list the top (say) 10 best performers (in terms of return on capital and provided that all costs and benefits are properly taken into account). These top 10 business managers / heads of desk then need to explain the rationale behind their performance, and pass on these justifications for validation and audit to independent experts coming from risk, finance, internal audit divisions or even to external experts and auditors to feed Board discussions. Though setting a performance auditing process implies some work to build sound measures of return-on-equity, the efforts are worth to be made. In particular, performance measurement requires comprehensive measure of capital requirement (e.g. while capital requirement may be an aggregation of requirements coming from market risk, credit risk and operational risk regulations), cost of risk, cost of internal funding, managing costs etc. and, last but not least, these elements have to match exactly with what feeds into accounting reports and, of course, contributes to remuneration calculation.

Finally, from supervisors' point of view, one may guess that if some strategy shows incredible returns-on-equity and is performing equally well among all market participants, then it may ring as a warning bell that some regulatory arbitrage or model wrong doings are being taking place and that corrective actions are likely needed.

Obviously these modest microeconomic recommendations may seem lacking ambition and are certainly less flamboyant (but much cheaper to implement) than those proposed these days like macro-prudential policy, risk-based remuneration design, cyclicity-adjusted capital requirements etc. However, they would surely promote safer risk-taking business at quite a low cost and would provide banks' or insurers' executives, Boards members and supervisors with early warning signs about when and where the next accident will take place.

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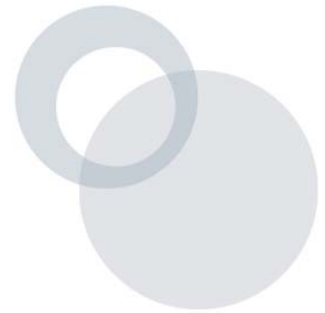
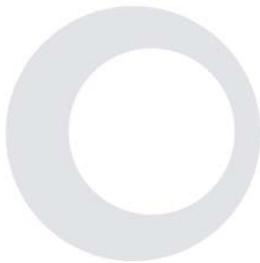
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- Analyse et cartographie des risques pour mesurer l'exposition, les facteurs de risque, les pertes attendues et inattendues sur des portefeuilles bancaires (risque et exposition à la conjoncture immobilière, au marché de l'automobile, etc.) ou des portefeuilles d'assurance (catastrophes naturelles, risques pandémiques, variable annuités).
- Mise en conformité avec les exigences réglementaires Bâle 2, Solvabilité 2 mais aussi avec les exigences liées aux calculs de Fair Value et d'Impairment Test en normes IFRS, dans un souci de pragmatisme, d'auditabilité et de fiabilité.
- Audit et validation de dispositif de risque de marché (VaR, pricers de produits dérivés), de dispositif Bâle 2 ou Solvabilité 2, de dispositif ALM (convention d'écoulement liquidité / taux) etc.
- Capital management avec l'objectif :
  - de mesurer l'impact des activités/produits/clients/stratégies de développement sur les emplois pondérés et la consommation de capital ;
  - de mettre en œuvre une quantification et une allocation efficace du capital réglementaire et/ou économique ;
  - de développer des outils de tarification adaptés ;
  - de répondre aux exigences réglementaires en matière de reporting et de gestion du capital réglementaire et/ou économique.
- Ingénierie financière et assurantielle grâce à la position unique du Groupe Aon comme leader mondial de la gestion de captives d'assurance et de réassurance, et l'expertise financière de notre équipe.
- Risk Analytics (Banques) afin de modéliser, quantifier, stress-tester les risques de crédit, les risques financiers, les risques ALM, les risques opérationnels, les risques d'intermédiation etc. dans une logique de développement d'outils rigoureux, auditables, opérationnels et répondant aux attentes des régulateurs, des superviseurs, des agences de rating ou encore des Commissaires aux comptes.
- Risk Analytics (Assurances) et Actuariat pour accompagner nos clients dans la migration vers Solvabilité 2 (pilier 1, pilier 2, ORSA) tant sur le plan technique que stratégique (impact des nouvelles normes réglementaires sur l'exploitation des sociétés, l'environnement concurrentiel et la création / maintien d'avantages compétitifs).

### Aon France

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