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## Are derivatives dangerous?

Gunther Capelle-Blancard

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## Are Derivatives Dangerous? a Literature Survey

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Gunther Capelle-Blancard

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## ARE DERIVATIVES DANGEROUS? A LITERATURE SURVEY

### NON-TECHNICAL SUMMARY

There is a degree of consensus today that financial innovation has a positive impact on the financial system on the whole. However, whenever a financial crisis arises – rather often in recent years – the debate on financial innovation is once again on the table, frequently focusing on the benefits and dangers of derivatives. The financial crisis that began in 2007 is of course no exception to the rule.

Derivatives have undoubtedly seen the most important financial innovations in the last thirty years. To put it simply, derivatives are financial contracts between two parties, whose value is contingent on the future price of an asset such as a share, a currency, a commodity, or an index. There are many classes of derivatives, with the most notable being swaps, futures, and options. Overall, these instruments allow the price of buying or selling a certain amount of the underlying asset to be set in advance. They are primarily used for hedging purposes, but they can of course also serve to take speculative positions. In this regard, they prompt deep concern and are sometimes described as “weapons of mass destruction” (Warren Buffet, 2003).

Derivatives are the result of long evolution in commercial and financial practices, but derivatives markets definitively moved on to a new step when currency futures and stock options were introduced on organized exchanges in Chicago in the early 1970s. At the same time, Fisher Black, Myron Scholes and Robert Merton published their seminal articles on option pricing. Since then, derivatives markets have been experiencing a major boom: according to the Bank for International Settlements, the total size of the derivatives market in 2010 was about \$700 trillion, whereas it did not exceed \$1 trillion in the eighties.

In this paper, we survey the academic literature on the implications of derivatives for financial stability. There is plethora of papers on derivatives. Since the 1970s, a whole theory has been built and it is not exaggerated to say that academic research has significantly contributed to the growth of derivatives markets. However, the overwhelming majority of research is devoted to asset pricing, while very few papers deal with the destabilizing impact of derivatives. Yet, the exceptional growth of the market alone justifies some concerns, not to mention the opacity of OTC markets.

We aim to provide a global and updated view of the risk conveyed by derivatives. Overall, most economists recognize that derivatives have made a positive contribution to the economy, but since the global crisis of 2007-2010, critics have become much more frequent and virulent and the perception of derivatives has changed quite a lot. Although the usefulness of derivatives is not called into question on the whole, a number of voices have been clamoring about the risks that derivatives place on the stability of financial markets.

Theoretically, derivatives should allow optimum allocation of risks and promote market efficiency. But in practice, their development raises a number of problems. It was initially feared that derivatives fuelled the volatility of underlying markets, but empirical studies do not seem to bear this out. Nonetheless, several financial meltdowns (the Barings’ collapse, the LTCM bailout, the Société Générale trading loss, etc.) have been directly related to excessive use of the leverage effect, the complexity of products and the concentration of risks appear to be serious sources of instability, due to the frequency and magnitude of extreme risks, the increase in uncertainty and the growing possibility of systemic risks. Among the solutions that have been proposed to mitigate risk, beyond

strengthening internal control, putting clearinghouses into general use and limiting naked-transactions seem to be the most promising avenues.

#### **ABSTRACT**

Since the 1970s, the financial system has undergone deep structural changes. Innovation has been a key driver of these changes and most economists acknowledge that the impact has been positive overall. However, each time a financial crisis arises, the debate is on. Derivatives especially, which are among the major innovations of the past thirty years, cause deep concerns. In this paper, we propose a survey of the academic literature that has addressed the threats posed by derivatives. An initial issue is the impact of derivatives on the volatility of the underlying assets, but empirical findings do not suggest any significant effect. The recent literature on the dangers of derivatives is more concerned by systemic risks. Several studies suggest that the sophistication of the products and the concentration of risks are potential sources of instability because of the increasing uncertainty, the repeated occurrence of extreme losses, and finally the greater possibility of global crisis. Among the solutions that have been proposed to mitigate risk, beyond strengthening internal control, putting clearinghouses into general use and limiting naked-transactions seem to be the most promising avenues.

*Key Words:* A1, D8, G1.

*JEL Classification:* Derivatives, forwards, futures, options, financial innovation, speculation, OTC markets, financial instability

## LES MARCHES DERIVES SONT-ILS DANGEREUX ? UNE SYNTHÈSE DE LA LITTÉRATURE ACADÉMIQUE

### RÉSUMÉ NON TECHNIQUE

Depuis le début des années 1970, la sphère financière connaît un flot intense et continu d'innovations. Celles-ci sont à la fois la conséquence et la cause de trois changements structurels majeurs : la montée des risques, l'essor des nouvelles technologies de l'information et des communications et la libéralisation (ou déréglementation) de l'économie. Il existe aujourd'hui un certain consensus pour affirmer que l'innovation financière a globalement une incidence positive. Malgré tout, à chaque crise financière – et elles ont été nombreuses ces dernières années – le débat est relancé. Et celui-ci se focalise très souvent sur les produits dérivés. Bien sûr la crise financière globale n'échappe pas à la règle.

Les produits dérivés sont sans conteste les innovations financières les plus importantes des trente dernières années, pourtant riches dans ce domaine. Les produits dérivés sont des actifs financiers dont la valeur dépend du prix d'un actif sous-jacent : action, indice, taux d'intérêt, matière première... Ces instruments permettent aux agents de fixer à l'avance le prix auquel ils peuvent acheter ou vendre une certaine quantité d'actif sous-jacent. Il s'agit donc d'instruments de couverture ; mais ils peuvent aussi servir à prendre des positions spéculatives. A ce titre, ils suscitent de vives inquiétudes, d'où les qualificatifs de « bête sauvage » (Alfred Steinherr) ou d'« armes de destruction massive » (Warren Buffet) qui leur collent à la peau.

Les produits dérivés sont en fait le fruit d'une longue évolution des pratiques commerciales et financières, mais leur essor date essentiellement du début des années 1970. Et les craintes soulevées par les produits dérivés sont à la hauteur de leur croissance exceptionnelle. D'après la dernière enquête de la BRI, les montants notionnels s'élèvent en 2010 à environ 700 000 milliards de dollars, alors qu'ils n'excédaient pas 1 000 milliards de dollars dans les années 1980.

Les produits dérivés ont largement contribué aux progrès accomplis en matière de gestion des risques. Ces instruments facilitent, en effet, l'allocation des risques entre les agents, ce qui est l'une des principales fonctions du système financier. Et, une meilleure répartition des risques contribue à la croissance économique en permettant le financement de projets à haut rendement, qui sont également des projets risqués, et en permettant aux investisseurs de mieux gérer leur portefeuille d'actifs. En outre, les innovations financières contribuent, théoriquement, à l'efficacité des marchés. Cela passe par une diminution des coûts de transaction, une meilleure liquidité des marchés, des incitations à la collecte et à la diffusion d'informations. La plupart des économistes d'ailleurs reconnaissent la contribution positive des produits dérivés. Au point, que certains proposent d'en élargir le spectre de manière à permettre la couverture de nouvelles classes de risques macro-économiques (croissance du PIB, inflation, emploi, immobilier, *etc.*). Si l'utilité des produits dérivés n'est donc pas globalement remise en cause, de nombreuses voix s'élèvent pour souligner les risques que font peser ces produits sur la stabilité des marchés financiers.

La principale crainte concerne l'impact qu'auraient les produits dérivés sur la volatilité des marchés sous-jacents. En permettant de prendre des positions à fort effet de levier, l'inquiétude est que les marchés dérivés favorisent outrageusement la spéculation, au point de déstabiliser les marchés. Le débat rejoint alors celui – ancien – sur les vertus et les dangers de la spéculation. Pour les

économistes classiques, les spéculateurs ont un effet stabilisateur sur les marchés : en se portant acquéreurs de titres quand les prix de marché sont bas et vendeurs lorsqu'ils sont élevés, ils atténuent les variations extrêmes. Cette vision suppose toutefois que les agents adoptent des stratégies à moyen terme, voire à long terme, le temps que le prix des actifs reviennent à leur valeur fondamentale. Or, en pratique, les investisseurs ont tendance à orienter leurs décisions en se basant sur le comportement de leurs pairs plutôt que sur l'étude des fondamentaux. Cela suppose aussi qu'il n'y ait pas d'obstacles aux opérations d'arbitrage, ce qui est loin d'être vérifié.

D'un point de vue théorique, les conséquences des innovations financières sur la volatilité des marchés dépendent, en fait, des hypothèses concernant les imperfections financières. En général, l'effet induit par l'introduction de nouveaux produits financiers n'est favorable que si celle-ci favorise la participation des investisseurs informés. Ainsi, par exemple, l'augmentation de la spéculation via les marchés à terme a un effet déstabilisant lorsque certains agents ont une information imparfaite ; les autres agents sur-réagissent alors à ce qu'ils croient être des informations privées, ce qui a bien sûr un effet déstabilisant. En outre, même si l'ouverture d'un marché à terme a des vertus stabilisatrices (à l'équilibre, le prix est moins volatil), les effets d'apprentissage liés à la difficulté d'anticiper les comportements des autres acteurs rendent l'équilibre difficile, voir impossible à atteindre. Enfin, l'effet déstabilisant peut être lié au fait que les marchés dérivés encouragent les agents à choisir des stratégies plus risquées ce qui accroît le bien être social, mais conduit également à une augmentation de la volatilité.

Il ressort des nombreuses études empiriques qui se sont intéressées aux conséquences de l'introduction des produits dérivés sur les marchés sous-jacents que l'introduction des produits dérivés n'augmente pas la volatilité des marchés sous-jacents, qu'il s'agisse du marché des changes, du marché boursier ou des marchés de matières premières.

Pour autant, ceux-ci ne sont pas sans danger pour la stabilité financière, entendue au sens large. Depuis une quinzaine d'années, les faillites impliquant les produits dérivés ont été nombreuses et particulièrement médiatiques. Ces « incidents » n'ont d'ailleurs épargné ni les utilisateurs finals, ni les professionnels de la finance. Les pertes subies ont d'abord été mises sur le compte de l'inexpérience, la plupart des observateurs et des professionnels de la finance arguant, à juste titre, que pour toute innovation, une période d'apprentissage est nécessaire. Toutefois, certaines institutions financières parmi les plus prestigieuses, ont aussi essuyé de gros revers. On pense immédiatement à deux grandes banques – la Barings Bank en 1994 et la Société Générale en 2008 – et à deux *hedge funds* – Long Term Capital Management en 1998 et Amaranth Advisors en 2006. Mais il ne s'agit pas là de cas isolés : on peut en effet recenser ces vingt dernières années une trentaine de pertes de *trading* supérieures à 100 millions de dollars, et leur fréquence semble en augmentation depuis 2000 avec une moyenne de deux par an. Il convient, bien sûr, de distinguer entre les pertes dues à des fraudes ou à des malversations et celles dues à une mauvaise appréciation des risques. Les affaires Barings et Société Générale relèvent de la première catégorie, LTCM et Amaranth de la seconde. Mais dans tous les cas, l'effet de levier des produits dérivés a été utilisé massivement pour démultiplier les engagements, ce qui explique l'ampleur des pertes. Suite à la faillite de la Barings, les dispositifs de contrôle interne et de supervision ont pourtant été renforcés. Il semble d'ailleurs que dans le cas de la Société Générale ces dispositifs aient fonctionné correctement, sans toutefois que les alertes n'aient été prises suffisamment au sérieux. Cela pose donc le problème du statut particulier des *traders* au sein des établissements bancaires : ils jouissent en effet d'un prestige qui les place dans une position de supériorité manifeste vis-à-vis des personnes chargées de les contrôler. Une solution pour limiter les prises de risque excessives est de fonder les

bonus sur les résultats obtenus sur plusieurs années, en tenant compte des pertes éventuelles afin de limiter les asymétries dans le dispositif de rémunérations.

A la suite de la crise financière de 2007-2010, les critiques adressées aux produits dérivés ont surtout porté sur la mauvaise perception des risques. En fait, l'évaluation des produits dérivés ne peut se réduire à une discipline purement mathématique. D'ailleurs, dans les faits, les relations d'arbitrage les plus simples ne sont pas toujours vérifiées et l'évaluation des produits complexes est très subjective. En outre, les modèles, aussi sophistiqués soient-ils, intègrent mal, par nature, le risque opérationnel. Les modèles d'évaluation des produits dérivés permettent certes de mieux gérer les fluctuations du prix des actifs en transformant l'incertitude, sur laquelle personne n'a de prise, en situations risquées (*i.e.* mesurables et qui peuvent *a priori* être évitées). Cette traduction se fait bien sûr au prix d'une simplification de la réalité. Mais dans le même temps, ce processus fabrique de nouveaux risques, qualifiés de risque de second ordre, qui sont eux, par nature, imprévisibles. Il apparaît ainsi que des stratégies initialement conçues pour limiter les risques, se sont révélées particulièrement dangereuses pour la stabilité du système financier.

Une autre source d'inquiétude à propos des marchés dérivés concerne la concentration des acteurs susceptibles de provoquer des défaillances en chaîne. L'essentiel des transactions sont le fait de quelques acteurs. Or, rappelons-le, en théorie, le principal avantage des produits dérivés est de permettre une meilleure diffusion des risques... Ajoutons que la traçabilité des flux financiers complexes est impossible, ce qui en cas de crise est source de défiance : la crise financière en fournit une preuve éclatante. Pour éviter les effets en cascades qui résulteraient de la faillite d'un gros opérateur, une solution consisterait à encourager la migration des contrats OTC vers les marchés organisés. Les avantages et les inconvénients de chaque marché sont bien connus. Les marchés réglementés permettent de centraliser les ordres et de limiter le risque de défaut. A l'inverse sur les marchés de gré à gré, il n'y a généralement pas de chambre de compensation pour s'interposer entre les acheteurs et les vendeurs et supporter donc le risque de défaut ; en contrepartie les contrats peuvent être définis « sur-mesure ». Une migration des produits dérivés vers les marchés organisés, au moins pour ce qui est des produits les plus standard, permettrait donc de réduire les risques et d'améliorer la liquidité, surtout en période de stress, lorsqu'on en a le plus besoin mais où l'heure est à la défiance.

Enfin, pour limiter la spéculation, il est de plus en plus question de limiter – si ce n'est d'interdire – les stratégies à nu, en particulier dans le cas des CDS ou des dérivés sur les matières agricoles. Les produits dérivés offrent en effet la possibilité de se couvrir contre des risques que l'on ne supporte pas. De tels paris spéculatifs sont-ils socialement utiles ? Certains estiment que les positions à nu (tout comme les ventes à découvert) favorisent la liquidité des marchés, et contribuent donc à la stabilité financière. D'autres en revanche considèrent ces pratiques comme déstabilisantes car elles peuvent conduire à l'émergence de prophéties auto-réalisatrices. Prenons l'exemple des CDS : une hausse du prix des CDS peut être perçue comme synonyme d'une dégradation de la solvabilité de l'émetteur, ce qui fera grimper le coût de ses financements et donc sa probabilité de défaut. Dès lors, la solution envisagée est de limiter la participation à certains marchés dérivés. De toutes les propositions à l'étude aujourd'hui, c'est certainement la plus controversée.



**RÉSUMÉ COURT**

Depuis le début des années 1970-1980, la sphère financière connaît un flot intense d'innovations et il existe un certain consensus aujourd'hui pour affirmer qu'elles ont globalement une incidence positive. Malgré tout, à chaque crise financière le débat est relancé. En particulier, les produits dérivés, qui sont certainement les innovations financières les plus importantes des trente dernières années, suscitent de vives inquiétudes : les qualificatifs de « bête sauvage » ou d'« armes de destruction massive » leur collent à la peau. Cet article a pour objectif de synthétiser les résultats de la littérature académique sur les dangers que font peser les produits dérivés. On a d'abord craint que les produits dérivés favorisent la volatilité, mais les études empiriques ne semblent pas valider ces soupçons. Les études récentes portent davantage sur le risque systémique. La complexité des produits et la concentration des risques conduisent à une augmentation de l'incertitude, de la fréquence et de l'ampleur des risques extrêmes. Parmi les solutions envisagées pour limiter les risques, outre évidemment le renforcement du contrôle interne, la généralisation des chambres de compensation et la limitation des transactions à nu semble être les voies les plus prometteuses.

*Classification JEL* : A1, D8, G1.

*Mots-clefs* : Marchés dérivés, contrats à terme, options, innovation financière, spéculation déstabilisante, marchés de gré à gré, instabilité financière.

**ARE DERIVATIVES DANGEROUS? A LITERATURE SURVEY**

Gunther Capelle-Blancard\*

**1. INTRODUCTION**

Since the beginning of the 1970s, the financial sphere has seen an intense and continuous flow of innovations. They are both the consequence and the cause of three major structural changes: the increase in volatility, the boom in new information and communication technologies, and the liberalization (or deregulation) of the economy. There is a degree of consensus today that financial innovation has a positive impact on the financial system on the whole. However, whenever a financial crisis arises – rather often in recent years – the debate on financial innovation is once again on the table, frequently focusing on the benefits and dangers of derivatives. This was the case for the stock market crash of 1987 (Kleidon and Whaley, 1992) and for the Asian crisis (Dodd, 2002; Ghysels and Seon, 2005). The financial crisis that began in 2007 is of course no exception to the rule.

Derivatives are undoubtedly the most important financial innovations in the last thirty years, despite the abundance of innovations during this period. To put it simply, derivatives are financial contracts between two parties, whose value is contingent on the future price of an asset such as a share, a currency, a commodity, or an index. There are many classes of derivatives, with the most notable being swaps, futures, and options. Overall, these instruments allow the price of buying or selling a certain amount of the underlying asset to be set in advance. They are primarily used for hedging purposes, but they can of course also serve to take speculative positions. In this regard, they prompt deep concern and are sometimes described as “wild beasts” (Steinherr, 1998) or “weapons of mass destruction” (Buffet, 2003).

Actually, derivatives are the result of long evolution in commercial and financial practices and the fears are not new (Chance, 1995; Poitras, 2000; Swan, 2000). The very first transactions with delayed delivery – and thus similar to futures or options – go back to antiquity, then there is evidence of the use of derivatives in the 17<sup>th</sup> century in Holland and in Japan. Derivatives were already considered suspicious. Things did not get any better in the 19<sup>th</sup> century, despite the creation of organized markets in Chicago, which were kept from really developing by a constraining regulatory system. Derivatives markets were rather small and illiquid at that time, while most of the contracts involved commodities. Derivatives markets definitively moved on to a new step when currency futures and stock options were introduced on organized exchanges in Chicago in the early 1970s.<sup>1</sup> At the same time, Black and Scholes (1973) and Merton (1973) published their seminal articles on option pricing. Since then, derivatives markets have been experiencing a major boom.

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<sup>1</sup> The Chicago Mercantile Exchange was founded in 1897 and started trading currency futures in May 1972, while the Chicago Board Options Exchange where stock options were introduced was created in April 1973.

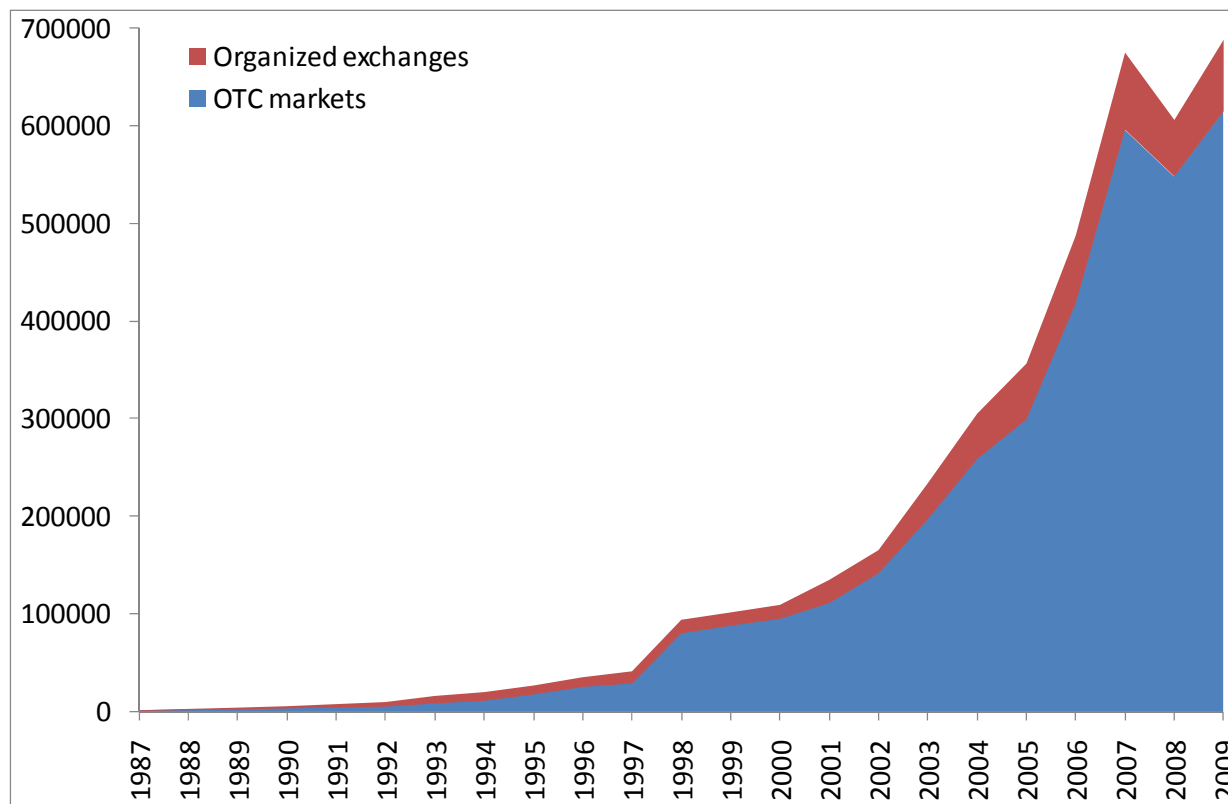
According to the Bank for International Settlements<sup>2</sup>, the total size of the derivatives market in 2010 is about \$700 trillion, whereas it did not exceed \$1 trillion in the 1980s (Figure 1). In the last twenty-five years (1986-2010) notional amounts have increased by 30% per year on the average, i.e. doubling every three years, with a speeding up since 2002. Many of the transactions are decentralized and unregulated so that data are rather approximate, but BIS surveys show that ninety percent of the total notional amounts are traded over-the-counter (OTC). Additionally, the percentage has tended to increase (the annual growth rate for OTC and organized derivatives markets is 35% and 23% respectively).<sup>3</sup>

The growth of the derivatives markets is not only exceptional, but it is not about to slow down significantly, even despite the global financial crisis of 2007-2010. Admittedly, the crisis temporarily cut the trend off, but as of March 2010 amounts outstanding are as high as before the market burst in 2007. One reason is that derivatives are very profitable for banks, since operations involve high added value and so this is where the greatest margins are. In 2009 for instance, U.S. commercial banks generated a record \$22.6 billion in derivatives trading revenues according to a survey of 1,030 federally insured banks by the Office of the Comptroller of the Currency. It is also very profitable for market undertakings: over one-third of the turnover of organized financial markets comes from the trading of derivatives.

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<sup>2</sup> BIS Quarterly Review (June 2010): Semiannual OTC derivatives statistics at end-December 2009 (Table 19) and Statistics on exchange traded derivatives (Table 23A).

<sup>3</sup> The BIS has conducted surveys of financial firms only since 1998. To go further into the past, we need data from the International Swaps and Derivatives Association (ISDA). The gap between the two surveys is around 25 percent, but the growth rates are similar.

**Figure 1. The boom in derivatives markets***Derivative financial instruments (notional amounts outstanding in billions of US dollars)*

Sources: ISDA Market Survey until 1997 and BIS Quarterly Review since (June 2010, Semiannual OTC derivatives statistics at end-December 2009; Table 19) for OTC markets; BIS Quarterly Review, June 2010 (Statistics on exchange traded derivatives; Table 23A) for organized exchanges.

As such, derivatives occupy a prime position on financial markets. To put things in perspective, stock market capitalization worldwide was \$48 trillion in January 2010. Admittedly, notional amounts outstanding are not necessarily representative of the amounts at stake. Still, if we consider gross market values, which represent the cost of replacing all open contracts, OTC derivatives amount to \$20 trillion.

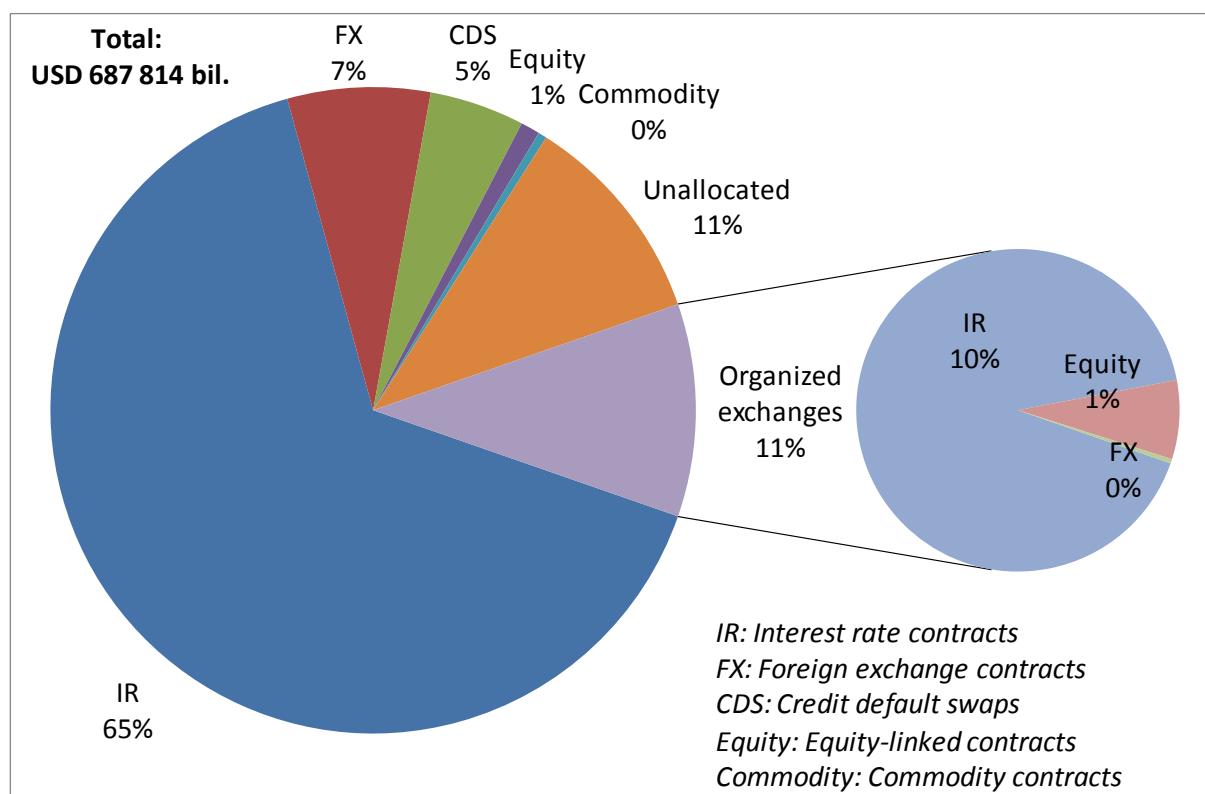
Financial derivatives have been thriving in recent years, not only from a quantitative viewpoint, but also from a qualitative one. Historically, the first contract involved commodities, but since the 1970s, standard financial assets, e.g. equities, interest rates, and currencies, are the main underlyings (Figure 2). Actually, a decisive step was taken at the beginning of the 1980s with the introduction of the first index-based derivative contracts (Millo, 2007). The original feature of these contracts resides in the lack of effective delivery of the underlying asset, if need be. The positions still open give rise to a cash payment depending on the difference between the spot index price and the clearing price in the case of futures and forwards, or between the spot index price and the strike price in the case of options. Accordingly, anything can serve as underlying, including the level of stock indexes, the volatility of the stock market, the number of defaults among a category of firms, or the

level of precipitation in Paris. Because derivatives can exist on any kind of asset, the scope is potentially endless: there is almost no limit to financial innovations.

In particular, credit derivatives – mainly credit default swaps (CDS) – have experienced a boom in the 2000s. Just before the crisis, between late 2004 and June 2007, amounts grew six-fold. They accounted for 8% of the business on OTC markets, which was almost as much as foreign exchange derivatives.

## Figure 2. The range of derivatives

Amounts outstanding of derivatives by risk category



Sources: BIS Quarterly Review, June 2010: Semiannual OTC derivatives statistics at end-December 2009 (Table 19); Statistics on exchange traded derivatives (Table 23A).

Likewise, there is no counting the number of products newly created every year on OTC markets that involve complex payment clauses. Already in the middle of the 1990s, Duffie and Rahi (1995) reported over a thousand. These new contracts with complex payoffs are called “exotic” – in contrast with “plain vanilla” standard contracts. They include Asian options (the payoff is determined by the average underlying price over some pre-set period of time), barrier options (which cease to exist if a

certain level is reached by the underlying), binary options (the payoff is either some fixed amount of some asset or nothing), etc.<sup>4</sup>

In this paper, we propose to survey the academic literature on the implications of derivatives for financial stability. There is plethora of papers on derivatives.<sup>5</sup> Since the decisive articles of Black and Scholes (1973) and Merton (1973), a whole theory has been built and it is not exaggerated to say that academic research has significantly contributed to the growth of derivatives markets. However, the overwhelming majority of research is devoted to asset pricing, while very few papers deal with the destabilizing impact of derivatives.<sup>6</sup> Yet, the exceptional growth of the market alone justifies some concerns, not to mention the opacity of OTC markets.

A number of official reports have come to feed the debate on the potential risks that derivatives entail.<sup>7</sup> These reports regularly warn against the misuse of new financial instruments and recommend caution and more transparency on the OTC market, but they usually fail to put the theoretical benefits and threats related to derivatives in perspective. In addition, we have listed only three academic papers that examine this issue: Mayhew (2001), Stulz (2004), and Hull (2008). Mayhew (2001) summarizes the theoretical and empirical research on how the introduction of derivative securities affects the underlying market. Mayhew's survey is very comprehensive, but it examines only one aspect of the concerns. Hull (2008) devotes the last chapter of his famous textbook on the main failures caused by improper use of derivatives. He describes the main losses experienced by financial institutions and non-financial corporations and proposes drawing lessons from these events. Once again, the scope is quite limited. Finally, Stulz (2004) provides a global view of the fears conveyed by derivatives. He studies both individual risk (at the firm level) and systemic risk (for the whole financial system), but the latter part is less developed and focuses mainly on the LTCM collapse in 1998.

In this paper, we aim to provide a global and updated view of the risk conveyed by derivatives. Overall, most economists recognize that derivatives have made a positive contribution to the economy, but since the global crisis of 2007-2010, critics are much more frequent and virulent and the perception of derivatives has changed quite a lot. Although the usefulness of derivatives is not

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<sup>4</sup> For a presentation of exotic options, see the international best-selling textbook by John Hull (2008).

<sup>5</sup> With the increasing number of articles on derivatives, no less than four dedicated academic journals have been launched: *The Journal of Futures Markets* (Wiley) in 1981, *The Journal of Derivatives* (Institutional Investor Inc.) in 1993, the *Journal of Derivatives & Hedge Funds* (formerly *Derivatives Use, Trading & Regulation*, Palgrave Macmillan) in 1994, and the *Review of Derivatives Research* (Springer) in 1996.

<sup>6</sup> The same is true for financial innovations (Frame and White, 2004). The papers mainly focus on the determinants and diffusion of financial innovations, and on the characteristics of the customers and users. Few papers examine welfare issues, and when they do so, they do not address issues related to financial instability.

<sup>7</sup> "Derivatives: Report of an Internal Working Group" (Bank of England, 1993), "Derivatives: Practices and Principles" (G-30, 1993), "OTC Derivatives Markets and their Regulation" (CFTC, 1993), "Financial Derivatives: Actions Needed to Protect the Financial System" (General Accounting Office, 1994), "Macroeconomic and Monetary Policy Issues Raised by the Growth of Derivatives Markets" (BIS, 1994), "Report on OTC Derivatives: Settlement Procedures and Counterparty Risk Management" (BIS, 1998), "Credit Risk Transfer" (BIS, 2003), "New Developments in Clearing and Settlement Arrangements for OTC Derivatives" (BIS, 2007), "Reform of the Over-the-Counter Derivative Market: Limiting Risk and Ensuring Fairness" (HFSC, 2009), "Task Force on Commodity Futures Markets" (IOSCO, 2009) "Derivatives: Financial Innovation and Stability", Banque de France, 2010) to name a few.

called into question on the whole, a number of voices have been clamoring about the risks that derivatives place on the stability of financial markets.

The paper is organized as follows. Theoretically, derivatives should allow optimum allocation of risks and promote market efficiency, as we recall in Section 2, but in practice, their development raises a number of problems. It was initially feared that derivatives fuelled the volatility of underlying markets, but empirical studies surveyed in Section 3 do not seem to bear this out. Nonetheless, several financial meltdowns have occurred that have been directly blamed on the excessive use of the leverage effect. The main failures – including the Barings' collapse, the LTCM bailout and the Société Générale trading loss – are described in Section 4. Lastly, the complexity of products and the concentration of risks appear to be serious sources of instability, due to the frequency and magnitude of extreme risks, the increase in uncertainty and the growing possibility of systemic risks. In Section 5 we review these concerns and present the main policy recommendations. Section 6 presents our conclusions.

## 2. MARKET COMPLETENESS, TRANSACTION COSTS AND OPTIMUM ALLOCATION OF RISKS

Derivatives have amply contributed to the progress achieved in risk management. They broaden the range of assets available and facilitate the allocation of risks, which is one of the main functions of the financial system. Additionally, better distribution of risks contributes to economic growth by allowing high-yield projects – which are also risky ones – to be financed and by permitting asset portfolios to be better managed by investors.

The primary interest of derivatives is to provide payoff that cannot be achieved with existing assets. In other words, derivatives can make the markets complete, so that risks are more easily shared. Kenneth Arrow was the first to suggest that the introduction of new contingent claims can achieve a better allocation of risk (Arrow, 1953). The same idea underlies the work of Ross (1976) on the consequences of the introduction of options. We can illustrate this by a simple example (Mayhew, 2001).

Suppose that agents can invest in a risky asset whose price today is 100 and that will be worth in the future 99, 100 or 101 according to the state of nature, or a riskless asset whose price is 100. The two assets cannot complete the market: many combinations are possible, but some payoffs will not be achieved. This is the case, for instance, for the distribution [1, 0, 0]. Let us now introduce a call option with a strike price equal to 100. This option allows the holder to purchase in the future the risky asset at a price of 100, whatever the state of nature that will prevail in the future. The payoff of this option is [0, 0, 1]. Now all the states are achievable. For example, to achieve the state [1, 0, 0], one should buy one unit of risk-free asset, short the risky asset (selling at 100 and buying-back at 99, 100 or 101) and buy one call option.

$$\begin{pmatrix} 100 \\ 100 \\ 100 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

Additionally, derivatives allow a decrease in transaction costs – especially short-sale constraints (Figlewski and Webb, 1993; Danielsen and Sorescu, 2001), which translates into higher liquidity

(Grossman, 1977; Biass and Hillion, 1994). Even if we consider that markets are complete, derivatives are useful because some investors face high transaction costs which prevent the replication of some payoffs. This is also relevant when considering stock index derivatives as it is much more expensive to trade a basket of stocks than it is to trade index derivatives (Subrahmanyam, 1991; Gorton and Pennacchi, 1993). Derivatives are also useful for investors who seek to diversify their portfolios. They enrich the range of instruments available to investors by giving access to classes of assets, such as commodities, that would otherwise require large transaction costs. Shiller (2004) and Gürkaynak and Wolfers (2006) even propose to broaden derivatives' spectrum so that new kinds of macroeconomic risks can be covered. These new contracts would involve macroeconomic variables such as GDP growth, inflation, the number of jobs created, and real estate prices (Shiller, 2008), etc., rather than financial assets. Actually, contracts on inflation, unemployment, stock market volatility, the temperature, the level of earthquakes on the Richter scale, etc. are already available. Their dissemination is limited for the time being, but these markets seem to be promising.

Moreover, the introduction of derivatives changes the wealth of information publicly available and therefore the price discovery process. Indeed, as suggested by Black (1975), given the leverage offered by derivatives, they are probably the best places to take advantage of expectations about the future value of financial assets<sup>8</sup>, though this effect may be offset by illiquidity and higher transaction costs. Easley, O'Hara and Srinivas (1998) and John, Koticha, Narayanan and Subrahmanyam (2000) with a sequential trade model with Bayesian inference, as well as Cao (1999) with a rational expectations model, examine this issue. They show that introducing derivatives improves the informational content of stock prices. In other words, since they enhance incentives to gather and disseminate information, derivatives theoretically make the markets more efficient.

### 3. MANIPULATION, SPECULATION AND VOLATILITY

The very first concerns about derivatives were about the possibility of manipulating prices. As early as in 1688, Joseph de la Vega described how to proceed: "... *enter as many put contracts as possible, until the receivers of premiums [assumed to be bulls] do not dare buy more stock [on their own initiative]. [Their hands will be largely tied] because they are already obliged to take the stock [covered by the put premiums, if requested to do so]. Therefore the speculation for the decline has free course and is an almost sure success.*" (cited by Mayhew, 2001). There is abundant literature on this topic which shows that profitable manipulation is possible, but only under some restrictive conditions (Kyle, 1984; Kumar and Seppi, 1992; Barnhart, Kahl and Barnhart, 1996; Pirrong, 2001). However, market depth is such today that this problem is less acute, except perhaps in the case of the least liquid markets or the most recent and sophisticated contracts.

At the end of the 1980s, the debate on financial derivatives mainly focused on portfolio insurance (Leland and Rubinstein, 1988). Portfolio insurance is a strategy of dynamic allocation that consists in taking advantage of the growth of a stock market index while limiting losses in the event of a slump.

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<sup>8</sup> In addition to the future price of the underlying asset, a second source of information conveyed by options is related to the future level of volatility. Accordingly, the interpretation of the informational content of trades by market makers on option markets is more complex than on spot markets, which can have a significant impact on informational efficiency (Cherian and Jarrow, 1998; Nandi, 1999; Capelle-Blancard, 2003).



To achieve this, the manager can use option contracts whose payoff is non-linear. The problem is that portfolio insurance entails buying the underlying asset when its price rises and selling it when its price falls. This strategy consequently contributes to market instability, especially when the readjustments are computerized and automatic. These practices were singled out after the crash of October 1987 in the Brady report in the US, but since then reforms have been implemented. In particular, stock markets have all been equipped with circuit-breakers to keep prices from getting out of control, proving that they are well-designed... This was clearly not the case in the US markets as shown by the “flash crash” of May 6, 2010. Additionally, it must be said that there are portfolio insurance techniques that do not resort to options, but that are just as procyclical. This is the case for example of stop-loss portfolio strategies.<sup>9</sup>

Undoubtedly, the main concern about derivatives is their potential impact on the volatility of spot markets. By allowing positions with strong leverage, derivatives might encourage speculation excessively, to the point that markets are destabilized. Here, the debate on financial innovations meets the (old) debate on the virtues and dangers of speculation. For classical economists, such as Adam Smith and John Stuart Mill, speculators have a stabilizing effect. Since they purchase securities when market prices are low and sell them when prices are high, they attenuate extreme variations. However, this view assumes that agents adopt medium-term strategies until asset prices come back to their fundamental value, although in practice investors base their decisions more on the behavior of their peers rather than on the study of fundamentals (see the pioneering articles by Cutler, Poterba and Summers, 1990, among others). This also assumes that there are no obstacles to arbitrage whereas this is far from being verified (Shleifer and Vishny, 1997; Gromb and Vayanos, 2010).

From a theoretical point of view, the consequences of financial innovations on market volatility depend on hypotheses about financial imperfections. Generally speaking, the effect produced by introducing new financial products is favorable only if it promotes the participation of informed investors. For example, Stein (1987) shows that increased speculation via futures markets has a destabilizing effect when certain agents have imperfect information. Other agents over-react to what they believe to be inside information and this of course has a destabilizing effect. In addition, Bowman and Faust (1997) use two examples to show that introducing options can lead to “artificial” equilibrium, or “sunspot equilibrium”. For Guesnerie and Rochet (1993), even if the opening of a futures market has stabilizing virtues – at equilibrium, prices are less volatile – the learning curve due to the difficulty of anticipating the behavior of the other players makes equilibrium hard, or even impossible, to attain. Besides, the learning period tends to get longer as our knowledge develops and financial products get more complex. For Newbery (1987), the destabilizing effect is related to the fact that derivatives encourage agents to choose riskier strategies, thereby increasing social well-being, but also leading to an increase in volatility.

A number of empirical studies have also dealt with the consequences of introducing derivatives on underlying markets: Mayhew (2001) has recorded over a score! The almost unanimous opinion is that introducing derivatives does not increase the volatility of underlying markets, whether they are the foreign exchange market, the stock markets or the commodity exchanges.<sup>10</sup> These same studies

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<sup>9</sup> The stop-loss strategy is to hold 100 percent of the portfolio in equity as long as its value exceeds a lower limit, and 100 percent in cash if not.

<sup>10</sup> According to Panetta *et al.* (2006), for instance, financial innovation (the authors do not explicitly refer to derivatives) has helped decrease the volatility of financial markets. Dynan, Elmendorf and Sichel (2006) or Jermann and Quadrini (2006) go even further, suggesting that financial innovation may be at least partly responsible for lessening the volatility of macroeconomic aggregates, a phenomenon known as the “Great Moderation”.

suggest on the contrary that derivatives promote increased activity on spot markets and facilitate the price discovery process (Chakravarty, Gulen and Mayhew, 2004; Cao and Wei, 2007), and this is obviously beneficial.

It should be noted that when the econometric studies mentioned above examined the impact of derivatives on the market instability, they considered only the effect on volatility, i.e. the standard deviation of price variations. Volatility is undoubtedly the easiest indicator to handle, but it is a rather rough measurement of instability for at least three reasons: *i*) it has been known, at least since Mandelbrot, that asset returns do not follow a normal distribution function and so the asymmetry of the distribution and extreme risks must be taken into account; *ii*) strictly speaking, volatility has a meaning only if we ignore uncertainty, as defined by Knight in opposition to risk; and *iii*) asset volatility does not measure the magnitude of systemic risk. As such, the rest of this article will discuss these three important dimensions of instability.

#### 4. A FEW RESOUNDING BANKRUPTCIES

In the past fifteen years or so, bankruptcies involving derivatives have been numerous and have triggered media feeding frenzies. These “incidents” have spared neither the end users nor the professionals of the world of finance.<sup>11</sup>

- *Does corporate use of derivatives destroy value?*

In the 1990s, a number of end users were the victims of their risky strategies. Among the most outstanding cases, let us mention Metallgesellschaft, one of the twenty largest German companies with losses of US\$ 1 340 million in 1994, due to using oil forwards (Culp and Miller, 1995; Verleger, 1999); Orange County in California with losses of US\$ 1 810 million in 1994, due to reverse repo operations (Miller, 1995, 1996; Miller and Ross, 1997); and Ashanti Goldfields with losses of US\$ 570 million in 1999 on exotic gold products (Gilbert, 2001).<sup>12</sup>

Certain cases even led to disputes opposing end users of derivatives and financial institutions. In particular, let us mention the case of Procter & Gamble, with losses of US\$ 157 million lost on the swaps market, versus Banker’s Trust (Loomis, 1995; Smith, 1997); Gibson Greetings, with US\$ 20 million lost on interest rate swaps, versus Banker’s Trust (Overdahl and Schachter, 1995; Cummings, Phillips and Smith, 1998); and Orange County versus Merrill Lynch (DiMartino, Ward, Stevens and Sargisson, 1996). The arguments developed by the companies were mainly centered around three points: *i*) inadequate information about risks; *ii*) doubts about valuing methods believed to be opaque and too complex; *iii*) sellers’ poor faith in neglecting to protect their clients’ interests – especially if the seller is none other than the principal bank – hard to reconcile with the fact that derivatives are always zero-sum operations. Financial institutions have a responsibility towards their clients. In the 1990s, bankers claimed that they had revised the conditions for commercializing derivatives in the sense of better transparency. But recently legal proceedings have come back in the

<sup>11</sup> See also Marthinsen (2004) for an analysis of the main cases.

<sup>12</sup> Inversely, let us mention that certain companies suffered heavy losses because they had not been properly hedged against financial risks. This is the case of Daimler Benz in particular, which was hit by record-breaking losses of 1.56 billion deutsche marks in 1995 and had to arrange an additional provision of 1.2 billion deutsche marks. In a public press release, the company attributed these losses mainly to the depreciation of the dollar. Since the financial department had only contradictory information on the developments in exchange rates, they preferred not to have any hedge at all!

news with the financial turmoil and this highlights the ambivalent behavior of investment banks, especially Goldman Sachs.

In any case, several studies (Allayannis and Weston, 2001; Bartram, Brown and Conrad, 2008) empirically show that the use of derivatives by non-financial companies has had the effect of reducing their total and their specific risk on the whole. These studies also show that derivatives create value for shareholders, rather than destroying it.

- *Financial institutions adrift*

Non-financial companies do not have a monopoly on derivatives losses; certain financial institutions among the most prestigious have suffered huge setbacks. The Barings Bank in 1994 is probably the first one that comes to mind, then the hedge fund Long Term Capital Management (LTCM) in 1998, Amaranth Advisors in 2006, and lastly the French bank Société Générale in 2008. These are in no way isolated cases; in the past twenty years some thirty trading losses of over US\$ 100 million each have been recorded, and the frequency has been on the upswing since 2000, with two a year on average!<sup>13</sup>

The similarities between these “affairs” are numerous. A distinction should naturally be made between losses due to malpractice and those due to faulty risk appraisal. The Barings and the Société Générale cases belong to the first category while LTCM and Amaranth come in the second. However, in every case, the leverage effect of derivatives was used massively to increase commitments and this is what explains the magnitude of the losses. For example, the notional amount of LTCM’s positions on interest rate derivatives was over US\$ 1,000 billion before its near-bankruptcy, whereas the fund’s equity amounted to only US\$ 4 billion and its assets totaled US\$ 125 billion. In the case of the Société Générale, the position taken by Jérôme Kerviel amounted to €50 billion before the bank sold it off, i.e. more than the bank’s market capitalization at the time.

In the case of the Barings and the Société Générale affairs, one single individual is responsible for colossal losses: US\$ 1.3 billion for Nick Leeson and €4.9 billion for Jérôme Kerviel.<sup>14</sup> Above all, in each instance there were repeated failures in internal control, with 75 alerts issued internally about Jérôme Kerviel! Another point they have in common is that whereas Leeson and Kerviel should have limited their action to arbitrage, they engaged in speculative operations that turned out to be a disaster. It seems that in many cases traders go far beyond the risk ceiling set by their hierarchy.

Following the Barings bankruptcy, internal control and supervision systems were however reinforced. In Singapore, Nick Leeson was in charge of both back office and front office activities in the Barings Bank. In other words, he was both controller and controlee. Since then, all the banks have taken measures to avoid this situation. It seems that this was not enough, since Jérôme Kerviel began his career in the back office and reportedly took advantage of his experience to circumvent control mechanisms once he became a trader. As a result, financial institutions have been thinking about building an authentic “Great Wall of China” between trading and control activities. The alert systems seem to have worked properly though, but without anyone taking them seriously enough.

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<sup>13</sup> See for example [http://en.wikipedia.org/wiki/List\\_of\\_trading\\_losses](http://en.wikipedia.org/wiki/List_of_trading_losses).

<sup>14</sup> More precisely, the loss of €4.9 billion was subsequent to the unwinding of Kerviel’s positions between January 21 and 23 – the loss over these three days is reportedly €6.4 billion. Before Friday the 18<sup>th</sup>, the trader’s position appears to have been positive.

This, in fact, poses the problem of the traders' special status in banking institutions, where they enjoy a degree of prestige that places them clearly in a position of superiority regarding the people in charge of controlling them. Not to mention the way bonuses are distributed between back and front offices and the possible linkages between the two professions, a relationship that does not make for quality of control.

Continuing with the fallout from the Barings affair, let us add that banks announced that they would rethink the traders' profit-sharing policy, the bonus system, in an attempt to limit its noxious effects. The problem essentially involves the asymmetrical nature of the incentives inherent in the mode of remuneration: traders<sup>15</sup> are affected by gains, but not by losses. Given the present situation, it is clear that the declarations have not been followed by facts: In recent years, bonuses have been booming incredibly, sometimes attaining several tens of millions of dollars for some star traders. In 2007, despite a catastrophic last quarter on Wall Street for the banking sector, end-of-year bonuses hit US\$ 65 billion. One solution to limit excessive risk-taking is for example to base bonuses on the results obtained over several years, taking losses into account (such proposals are considered in the pending legislation of most developed countries).

Lastly, let us note a final similarity between the Barings and Société Générale affairs: neither of the incriminated traders was trained in the most highly regarded schools. This last point is often used, at least implicitly, to defend the argument that derivatives are absolutely not to blame, because the bankruptcies were the result of the inexperience and incompetence alone of a few people. This argument does however have its limits. For example, the LTCM hedge fund was made up of two Nobel Prize winners, Robert C. Merton and Myron Scholes, a former vice president of the Fed, David Mullins, and a host of "rocket scientists". Coming back to the Société Générale, let us mention that the equity derivatives department where Jérôme Kerviel worked was recognized as one of the best in the world. It had been named number one in its category, equity derivatives house of the year, for 2007 in the issue of *Risk* magazine that came out in January of 2008.

## 5. COMPLEXITY OF PRODUCTS AND CONCENTRATION OF RISKS

For a few years now, and especially since the financial crisis that began in 2007, the criticism against derivatives has mainly pointed out the faulty perception of risks and the threat of systemic risk.

- *Illusion of control and underestimation of risks*

The basic idea of the pioneering research carried out by Merton (1973) and Black and Scholes (1973) on pricing derivatives consists in treating them as redundant assets. By assuming that markets are complete and perfect, only the no-arbitrage assumption is necessary to value these contracts. This approach has helped obtain essential mathematical results and cleared the way for a very productive body of research work. The attractiveness of the Merton-Black-Scholes demonstration is that it leads to a "fair" appraisal of derivatives prices which depends neither on agents' preference nor on their anticipation. In particular, there is no need to know the parameters of the investor's utility function to determine a price. This result is even more significant since modern financial theory emphasizes the unpredictability of stock market prices.

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<sup>15</sup> For Rajan (2005), it is not only the traders, but also the management itself of the banks, that are encouraged to take too many risks due to the present system of remuneration. More generally, this poses the problem of bank governance, a subject practically ignored until then (see Laeven and Levine, 2008).

Most of the hypotheses of the model have been outmoded to the benefit of ever more complex models. However, the idea that derivatives prices can be determined accurately and non-equivocally remains deeply rooted, exactly the same as the idea that the tools available allow perfect risk management (Capelle-Blancard, 2001). As a result, practitioners tend to underestimate risks, they often fall prey to excess confidence and “illusion of control”. In a survey conducted in 2004 by the International Swaps and Derivatives Association<sup>16</sup>, in which finance professors at the top 50 business schools worldwide were questioned, only 1% of them considered that derivatives have a negative impact on the global financial system. Moreover, 81% of respondents considered that the risks of using derivatives have been overstated. Besides, practitioners and academics very often simply consider that the problem is not with derivatives themselves, but only with some market participants without sufficient knowledge... This is nothing less than a simplistic view.

According to Merton: *“It is wrong to believe that you can eliminate risk just because you can measure it”*.<sup>17</sup> Likewise, for René Stulz (2000), former the editor of *The Journal of Finance*: *“(…) risk management is part of the social sciences. What makes social sciences different is that their object of study changes continuously, in this case partly as a result of financial innovation. Understanding these changes and how they influence risk is critical in times of great uncertainty. Risk management is not rocket science – it cannot be, since the past does not repeat itself on a sufficiently reliable basis. Future risks cannot be understood without examining the economic forces that shape them – a skill that is not taught in physics departments or engineering schools.”*

In other words, the pricing of derivatives cannot be reduced to a purely mathematical discipline. In addition, the simplest arbitrage relationships are in actual fact not always satisfied (Poteshman and Serbin, 2003), and the evaluation of complex products is highly subjective (Bernardo and Cornell, 1997). Moreover, no matter how sophisticated models may be, they do not integrate operational risks because of their very nature. What can be seen today therefore, is a change in orientation – albeit a timid one – which is not specific to the pricing of derivatives, but concerns finance, and even economics as a whole. After mathematics had made massive inroads into finance<sup>18</sup>, the trend today is more toward behavioral finance or toward neuro-economics.<sup>19</sup>

Research in sociology and psychology has also shed new light on the debate on financial instability. For example, for Millo and Holzer (2005), derivatives pricing models allow asset price fluctuation to be better managed by transforming uncertainty – something nobody can control – into risky situations which are measurable and can in principle be avoided. This transformation is operated of course at the expense of a simplification of reality. At the same time, the procedure generates new risks, qualified as second order risks, which are by nature unpredictable. The two authors base their reasoning on two examples: portfolio insurance and the LTCM bankruptcy. In both cases, strategies

<sup>16</sup> ISDA, A Survey of Finance Professors’ Views on Derivatives, March 2004:

<sup>17</sup> This warning is said to have been put forward a few months before the collapse of LTCM, which only goes to show that it is not enough to be aware of behavioral biases to be protected from them!

<sup>18</sup> The use of mathematics in finance was a genuine revolution in the years from 1960 to 1970. On this subject see the indispensable work by Peter Bernstein (1992).

<sup>19</sup> See Coates and Herbert (2008) for an example (they show that traders whose testosterone level is overly high – which physiologically boosts self-confidence – are likelier to take more risks).

initially designed to limit risks turned out to be particularly dangerous for the stability of the financial system.<sup>20</sup>

Research in social sciences other than economics has also provided original recommendations. For example, to counteract the problems stemming from an inadequate perception of risks, Fenton-O’Creevy, Nicholson, Soane and Willman (2004), have made a number of proposals. These include making the players involved more sensitive to the psychology of risk and decision-making, working to lessen the importance of the personality cult – for example by edifying teamwork, and lastly rethinking the remuneration schemes to limit individual reward.

- ***Concentration of risks and systemic concerns***

The last source of concern about derivatives involves the concentration of players who may set off chain reactions of default. When the financial system works properly, risks are allocated optimally among those who accept to bear the consequences. However, this does not say anything beforehand about their capacity to effectively bear these risks. Additionally, since agents feel they are covered, they sometimes feel encouraged to take on more risks (Franke and Krahen, 2006). Lastly and most importantly, this may lead to a reinforcement of contagion phenomena and to a concentration of risks that is dangerous for the stability of the financial system because it is likely to feed systemic risk (Stulz, 2004). The problem is expressed very clearly by Rajan (2005): “*While the system now exploits the risk-bearing capacity of the economy better by allocating risks more widely, it also takes on more risks than before. Moreover, the linkages between markets, and between markets and institutions, are now more pronounced. While this helps the system diversify across small shocks, it also exposes the system to large systemic shocks.*”

There are no comprehensive statistics about the degree of concentration on derivatives markets, but the OCC provides some data for the US. In late 2006, the five largest institutions in the United States were committed to over 98% of the notional amounts, i.e. US\$ 79.9 out of US\$ 81.3 billion. Recall that, theoretically, the main advantage of derivatives is to enable better diffusion of risks. Moreover, the traceability of complex financial flows is tricky, not to say impossible, which in the event of a crisis is a source of distrust – the recent financial crisis is a case-in-point.

In order to prevent a domino effect subsequent to the bankruptcy of a major operator, one solution might be to encourage the migration of OTC contracts toward organized markets. This position in favor of the use of central counterparty clearing (CCP) is expressed by numerous economists, among them Bliss and Papathanassiou (2006), Bliss and Steigerwald (2006), Cecchetti, Gynthelberg, and Hollanders (2009), Acharya, Engle, Figlewski, Lynch and Subrahmanyam (2009) and Duffie, Li and Lubke (2010).

The advantages and drawbacks of each market type are well known. Regulated markets allow orders to be centralized and default risks to be limited. On the contrary, on OTC markets there are hardly ever any clearinghouses that come between buyers and sellers, thereby bearing the risk of default, but contracts can be “custom-made” (Duffie, Garleanu and Pedersen, 2005). Risk allocation is therefore different on regulated markets and on OTC markets. In the first instance the market risk and the default risk are dissociated, with the players bearing only the market risk and the clearinghouse bearing the default risk, whereas in the second case, the risks are merged.

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<sup>20</sup> It should be noted that among the respondents of the ISDA survey (*op.cit.*), 45% considered that derivatives have created new types of risk.

Migration of derivatives toward organized markets, at least for the most standard products, would help reduce risks and improve liquidity. This is especially true in periods of stress, when reduced risks and improved liquidity are most needed, but when distrust seems to be the watchword. In the aftermath of the global financial crisis, it seems that there is a consensus on this issue.<sup>21</sup>

One question is how easy is it to clear OTC derivatives depending on their sophistication (Hull, 2010)? Surprisingly, OTC markets and regulated markets are not distinguished on the basis of the contracts' degree of standardization. The most typical case is that of foreign exchange derivatives. Although these contracts are absolutely standard, they are almost exclusively negotiated OTC. Why was the Philadelphia Stock Exchange or the Liffe (NYSE Euronext), for example, never imposed? One of the reasons must surely be that the foreign exchange market itself is OTC. Another reason is related to the self-feeding character of liquidity: liquidity brings more liquidity in its wake. So it is always very difficult, but not impossible – as proven by the Eurex boom – to compete with an already existing market. One option to encourage regulated markets could be to set higher capital requirements for unclear trades as proposed, for instance, by Duffie, Li and Lubke (2010).

- ***Derivatives and insurable interest***

Lastly, a controversial proposal is to ban naked strategies, especially naked CDS. Derivatives allow market participants to buy protection even if the buyer does not hold the underlying asset, the underlying debt in the case of CDS. In other words, it is possible to insure without an “insurable interest”, which is usually referred to as a naked strategy. Are such speculative bets socially useful?

On the one hand, some proponents consider that naked CDS (as well as short selling) increase markets liquidity, and are thus beneficial for financial stability (Duffie, 2010). On the other hand, there is room for destabilizing speculation when it is possible to insure without an “insurable interest”. Indeed, naked CDS might lead to the emergence of self-fulfilling prophecies: because CDS prices impact the perceived creditworthiness of the issuer, a rise in CDS prices will raise the cost of capital and so the likelihood of default (Portes, 2010).<sup>22</sup> In support of this idea, Coudert and Gex (2010) show that the CDS spreads lead bond spreads in the price discovery process. The usual interpretation is that the CDS market is the cheapest for informed traders who therefore preferably choose it to execute their orders. But, according to Portes (2010), there is another interpretation: “*leadership may be the result not of better information, but of the effect of CDS prices on the perceived creditworthiness of the issuer*”. This is a key issue, and further research is needed to disentangle those two interpretations.

In the aftermath of the subprime crisis and the debt crisis, the debate on insurable interest focuses on CDS. However, underlying assets other than bonds might be concerned, in particular commodities. Besides, since the beginning of the 2000s, there has been a process of financialization of commodity and energy markets (Tang and Xiong, 2010). Actually, no-one really envisages restricting the market to commodity producers or consumers, but there is a lack of academic research on the issue, with the debate mainly being engaged among law scholars. For instance, Stout (2009) proposes regulating the

<sup>21</sup> One notable exception is Pirrong (2006, 2010) who argues that the clearing mechanism is vulnerable to moral hazard and costly (especially when there are multiple clearinghouses). Therefore, he recommends the development of an auction-type mechanism to facilitate the replacement of defaulted OTC derivatives.

<sup>22</sup> Moreover, as noted by Matthews and Yelvington (2008), CDS encourage creditors to require the liquidation of a distressed company earlier in order to activate the CDS settlement, whereas before creditors were tempted to give the company a chance to avoid bankruptcy.

OTC derivatives market by refusing to enforce any contract unless one of the parties to the contract is truly using it for hedging rather than for speculation.

## 6. CONCLUSION

Empirical studies are almost unanimous: derivatives do not directly contribute to market volatility. Still, they are not without danger for financial stability in the widest sense. First, incentives within financial institutions spur traders to take excessive risks, and this hinders optimum allocation of risks. Second, derivatives introduce new forms of risk, e.g. operational risk, model risk, second order risk, which are all by their nature difficult to assess. In addition, derivatives expand multiple equilibriums. Lastly, the concentration of risks is likely to feed systemic risk. When all is said and done, do the dangers of derivatives outweigh their advantages? That is the 64,000 dollar question: how to quantify the dangers and advantages, and ultimately provide a clear answer to the question.

Although it is not advisable to prohibit derivatives or to constrain financial innovation – assuming it is possible – the above-mentioned defects can be remedied, at least in part. To achieve this, several roads need to be explored. The first issue is to encourage the migration of derivatives from OTC markets towards regulated markets in order that trades go through clearinghouses. The second is a need for public disclosure of derivatives positions at the individual level, both on the OTC markets and the regulated markets to bring transparency. The third and last issue – certainly the most debated – is about speculative trades: should we restrict them, and how? This issue is problematic and is part of a comprehensive reform of the financial system. One possibility is to restrict the access to some derivatives markets, in particular CDS and commodity derivatives, but further research is needed in this area.



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