

## ON THE VOLATILITY AS A DETERMINANT OF THE FINANCIAL CRISIS

### Authors

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**ABSTRACT:** *The international financial system has achieved a radical change in the last twenty years. From the so called Commodity Exchange, which is recognized as the origin of the financial system and even of the derivative one by the economic literature since 1500, to Black & Scholes (1973a) and Merton's (1973b) differential equations, finance abandoned real assumptions taking up those of economic statistical probability. In particular the assumption of securitization, sponsored by the school of El Karoui, subtracted the Keynesian concept of speculation of normal balance  $I=S$  from that of mere financial profit. However so extreme changes have been possible thanks to decisions which allowed a regulated system to deregulate itself following the theory of economic liberalism.*

*This work goes over the stages which have caused the international financial crisis by analysing it from a strictly technical point of view. In particular the establishment of the "securitized volatility" conditions of subprime mortgage had compelled the public opinion to move toward the need of going back to a regulation. This necessity led to modify the Basel protocols toward the so called Basel III which, instead, left the "market" free to create new and more dangerous short-term investment funds.*

**KEYWORDS:** *volatility; regulation; uncertainty; financial crisis;*

**JEL CLASSIFICATION:** K 20; K 22

### 1. INTRODUCTION

At the beginning of the 1980s, in the framework of an economic policy strategy aimed at releasing the market from the ties - the so called traps and snares - which had characterized, until then, the functioning of economic system, Margaret Thatcher, in the UK, and Ronald Regan, in the USA, started a process of deregulation which affected the

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financial market as well. The most incisive measure, in this direction, was adopted in 1999 with the "Gramm-Leach-Bliley Act" which eliminated the separation between commercial banks and merchant banks, transferring the task of checking the bank sector from the Fed to the Securities and Exchange Commission. At the same time, in 2000, derivatives, which at first were used as an instrument of protection against risks (of exchange rate, of interest rate, of fluctuations in raw material prices) and then for speculative purposes in a short time, were deregulated in the financial market. Banks themselves, even if not adequately capitalized, started to invest in these products, motivated by the wish to make profit from other returns that were allowed by the riskiness of the instrument and by the possibility to hide through them the losses in the financial statements. In a situation of *laissez faire*, the financial and banking system was no longer able to self-regulate and in a few years the international financial market began to be characterized by the presence of a large volume of very high-risk investments, which were guaranteed by an almost non-existent real basis and fostered by the possibility of increasing the leverage offered by the liberalization of capital restrictions imposed on investment banks in 2004. One of the characteristics of the current international financial crisis, as an effect of the deregulation, has been, precisely, that of forcing the use of derivatives, which have increased the volatility of the financial sector shifting the attention of financial operators from the operations of the real market, savings and investment, to those purely speculative.

In particular the current financial system is characterized by a system of SICAVs both institutional and retail which include new and more numerous Funds into daily lists of "Bloomberg". They are acquainted with clients through SIM which carry out a real form of intermediation between private individuals/banks and SICAVs. Observing the dictates of the creative financing, they invest in bonds which have nothing in common with the Keynesian ones. They are called "collateralized obligations", which don't give clients any coupons, but they work only on monthly or daily NAV values. Consequently both the macroeconomic nature of the inverse relationship between bond price/interest rate and that of the well-known speculative demand for money of the Keynesian approach fail. When the probabilistic NAV values do not guarantee a return such as to justify the commissions of the SICAV itself, these institutions pass through a short term PIC on international currencies. In this way the convergence in the long term demand and supply of money is avoided, as well as the levelling of currency prices. This "game" is guaranteed and amplified by the opening of many Credit Default Swaps, which insure SICAV against the so called exchange rate risk. However, the use of the CDS appears to be a "derivative" recurrence, recalling again the absence of a regulation of the international financial market. Nevertheless, the situation has not changed. It could be described as follows: the value of international exchanges has multiplied by fourteen. So in total it is nine times higher than the gross domestic product in the world. Quantified in this way, the total value of banking derivatives is very impressive, it figures up as much as 647 billion dollars, an estimate that was recorded in 2011 and could even increase. With such values the derivative instruments outstanding are excessive, especially when taking into account the fact that the regulation is inadequate and ineffective against their main risks. The confirmation has come recently with the case of JP Morgan, the famous American bank that had to reveal that more than 2 billion dollars were lost due to wrong bets. If we want to be more exact a historical account of the situation can make us better understand the

lack of change in finance. In August 2007, the world became aware that there are financial instruments so complex as to be frightening. It all started with the freezing of three funds by BNP Paribas. The transalpine bank could not calculate the value of Parvest Dynamic Abs, Euribor and BNP Paribas BNP Paribas Abs Eonia, three products in which it had invested in the U.S. domestic market. The collapse of the latter shook the entire financial universe, causing the change of patterns, paradigms and dogmas, which gave the impression to change even the rules. The result is that the derivatives market has been also subjected to such an intense downsizing that it is still in progress. The data from the Bank for International Settlements (Bank for International Settlements, or Bis) can explain a lot. In June 2006, there were contracts for OTC derivatives markets of 370.178 billion dollars in total, including credit default swaps (CDS) and financial instruments that acted as insurance against the risk of insolvency. The 370 thousand billion dollars refer to the gross national value, i.e. the sum of the opposite parties, sellers and buyers. It reached almost 600 thousand billion dollars within a year and a half. In December 2007, in fact, the gross notional value shot up to 596.004 billion dollars, but the net value has not changed much: from \$9.949 billion to \$14.522 billion. It is interesting to underline what were the most popular derivatives at that time. The BIS examines five categories of instruments: foreign exchange contracts, interest rate contracts, equity-linked contracts, commodity contracts and Cds. Between 2006 and 2007, derivatives surged and interest rates have increased from \$262,526,000,000 to \$393,138,000,000. But investors favoured CDS, which have raised from 20.352 billion to 57.894 billion dollars. The desire for protection increased gradually. According to the Bis, this situation derives from the fact that, between 2006 and 2007, investors were more and more afraid that something could have happen. They were right. In fact, in 2008 the most unpredictable things happened. By the continuous bailout of U.S. banks until the merger of the banks themselves, through the collapse of Lehman Brothers and the freezing of interbank markets, nothing has been immune to the worst of the subprime crisis. In June 2008, the gross national value of OTC derivatives reached and exceeded 600 trillion dollars, amounting to 683.726 billion. Over the next six months, as a result of the collapse of Lehman Brothers in December 2008, the total value of derivatives will be about 547,983,000,000 dollars.

Between 2009 and 2011 it started to change. After the initial shock, the investors had to make up the losses of which they had suffered, so the number of circulating derivatives has increased more and more. If it is true that in the two years following the disaster of Lehman Brothers the gross notional value remained stable between 580 trillion 603 trillion dollars, it is equally true that in 2001 something very special happened. In May of that year, it reached an altitude of 706.884 billion dollars and then it has slowly decreased up to today's value. It was not clear what the evolution would have been in the coming months. The regulation of post - Lehman has focused too much on the search for a scapegoat, and therefore has placed a burden on taxpayers to save the banking system, which has been the cause of the crisis. We can't easily understand what the derivatives market is now. It's not a coincidence if the operators are migrating more and more to over-the-counter markets. They are more flexible, they often allow the formation of a better price than the traditional ones and provide an unusual liquidity. The attempt of their regulation for political reasons, as it has been so far, has produced more harm than good. But it was the simplest and most immediate way to respond to citizens. Stanley Fischer, former governor of the Bank of Israel and one of the finest central bankers of all time,

once said about the detriment of the risks "derivatives are not evil, the men who use them are the problem.."

## **2. ABOUT VOLATILITY**

Volatility is a measure of the percentage change in prices over time. It is calculated by the standard deviation of the time series of prices of the portfolio, or by performing the square root of the variance, which is the average of the deviations of the price of a stock, the average of its prices at that time. It is a nice pun, the fact is that if volatility increases, the risk of the instrument is greater. As a reference, you have to consider that this is usually between 4% for bond indices and 20% for the equity indices. Volatility makes reference to the uncertainty and intuitively measures the value changes amplitude of a title. In other words, the higher the volatility, the higher the risk that the value of a stock changes. This means that the price of a stock can change both positively and negatively in a very short period of time. Investors assess these data as a risk measure of the securities and this often contributes to make assumptions of risk management, which then guide investment choices. Volatility is an important guide for the private investor. It is essential for the private investor's expectations of the securities performance and even for an analysis of its ability to see the value of his/her money to fluctuate a lot (high volatility) or just a little (low volatility) in time. Volatility also affects the time horizon: in fact stocks with higher volatility generally require a longer holding period. Due to volatility, performances in the short period are less predictable.

A title's volatility depends on many factors including: the intrinsic characteristics of the title (shares are legally riskier than bonds); the investor base, i.e. the type of investor that operates on those securities; the rules that determine the supply and demand, that is the function of these instruments in the financial market; the duration in case of bonds. There is a direct correlation between the expected level of performance and the instrument volatility. This is the true law of gravity of finance, the higher the risk the higher the expected return. So when you are offered the portfolio, you both have the estimation of the expected return and the potential loss. Bear in mind that finance is a zero-sum game, and although sometimes can appear quite illogical, there is no "free lunch" to the possibility of return – even if it is guaranteed –, because it always needs to be associated with a risk.

With reference to the concept of volatility as an indicator of financial markets, since 1993, the Chicago Board Options Exchange (CBOE) has introduced the VIX index to measure market expectations and short-term volatility in relation to the S & P 100 prices of the options. Since then, the VIX index (often called the fear index) has been considered an important barometer for assessing the confidence of investors and the volatility of U.S. markets. Ten years later, in 2003, in a joint effort between the CBOE and Goldman Sachs, the calculation of the VIX was updated in order to measure the expected 30-day volatility in a different way. Time was based on the S&P 500 (SPXSM) which is the benchmark for U.S. equities. The expected volatility was calculated using the weighted average of the S&P 500 options. This new methodology, which tracks a portfolio of exposure to the volatility of SPX options, has become a standard practice in trading on financial markets and the Forex Market. On 24 March 2004, the CBOE introduced the first futures contract based on the VIX index that can be traded on the market. Two years later, in February 2006, the CBOE launched options based on the VIX index. In less than five years, the

trading of options and futures – based VIX index has reached more than 100,000 contracts per day.

When the level of the VIX index is high, the stock markets are unstable, nervous and very volatile. The most important thing is not the level of the index, but its variation. Markets are pessimistic when the index rises and, vice versa, they are optimistic when it decreases, and this can be easily recognized from the graph below.



Source: our elaboration on Stata Corporation V.11

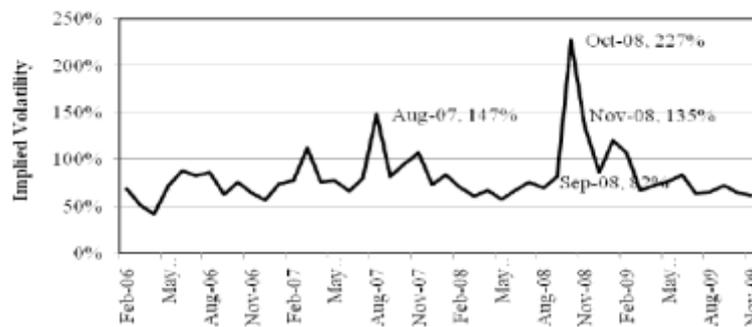
The concept of volatility is strictly linked to uncertainty. When uncertainty becomes so extreme, it coincides with fear in finance and therefore with losses in the portfolio. So, any analysis performed by experts and institutions cannot fail to consider volatility spikes. As it is shown in the graph above, crises show high volatility and vice versa. Whenever the value of the volatility index exceeds the threshold of 39, there's a tendency of stirring up situations of crisis or the VIX is a response to a critical situation which is ready to explode. Everyone would like to understand if and how the VIX increases and exceeds the threshold of 39, which is a clear indication of risk, a so severe risk that arises in a financial crisis. In fact, as you can see from the graph, on August 2007, the index recorded a 39 share, a clear message that no one was able to decode. No one was able or was willing to get the point.

The financial paradox for a new financial crises: a volatility on volatility index.

As previously stated, the VIX index is a volatility measure of the options on the S&P 500. However, only few know that the same VIX has its implied volatility, as well as, of course, the historical or statistical information which flows from past movements. Things

become almost funny: an index that measures the implied volatility of another index, has one itself, derived from the prices of options on their own Vix. We can call it volatility of volatility, meta volatility, or VIX 4, according to the USA theory. The graph below shows an outline of the average monthly volatilities implied, that were estimated using the At-The-Money VIX Call Options. Not surprisingly, the implied volatility of VIX Options was highest in October 2008, which was the month following the bankruptcy of Lehman Brothers.

The wave of the volatility during the financial crisis



Source: our elaboration on ProrealTime data

More, if we observe Data in the graph above, we notice that the implied volatility of VIX options has increased during the Crisis. Further, as the market rebounded from its losses of March 2009, the implied volatility of VIX Options dropped to levels lower than observed before the Crisis. Moreover, considering the table below, it is easy to see that, except for a few spikes, the average monthly volatilities implied were quite similar.

These values also show that the implied volatility of VIX Options is lower than the observed volatility of VIX for all periods. We can easily explain this difference considering the VIX Options Forwards, which are less volatile than VIX due to mean reversion.

<u>Period</u>	<u>VIX Options - Average Implied Volatility<sup>1</sup></u>	<u>Volatility of VIX % Daily Changes</u>	<u>Volatility of VIX Futures % Daily Changes</u>
Pre-Crisis	80%	119%	56%
Crisis	96%	128%	71%
Post-Crisis	69%	83%	48%
All Data	83%	116%	59%

Source: Bloomberg, dataset, 2009

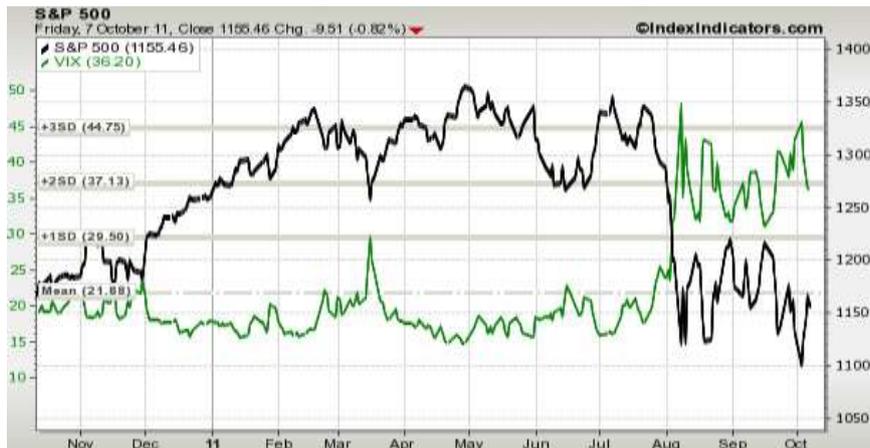
Now, in our analysis we noticed that over the past two weeks the volatility of volatility about VIX has incredibly increased. Since there exist different ways to calculate implied volatility, aggregating data on strikes and / or different maturities, it's no

surprising that different sources may provide different results. This is not the case, however, of options Xpress and iVolatility: for both financial sites, in fact, the VIX IV at 3 months has jumped from about 50 to over 115, then has more than doubled. According to data provided by ISE, however, the Vix (calculated to 30 days) on October 22 has reached a new high at 52 weeks, above at 230, then move to 170, more than double than the historical volatility of a similar period. Vix is doubtless increasing: this suggests that traders are pricing options on the Vix in a very high uncertainty about the levels that this index will reach in the coming weeks.

To be more precisely, we can expect an imminent spike VIX, which is usually associated with moments of negative trend of the S&P 500, or at least with strong fluctuations in the market. If it is not a certainty, certainly is a signal that can not be underestimated, because it may indicate the beginning of a new crisis.

### 3. CONCLUSIONS

The financial crisis has reached so critical and severe levels that a global response, even if limited, has been required. After the crisis, the Financial Stability Forum (now the Financial Stability Board) has analysed the causes straight forward and it immediately



suggested proposals for actions. As a consequence, the agenda of policy was shaped and approved by the G20 leaders.

Source: our elaboration on Powerdesk Fineco data

The crisis has revealed the presence of important regulatory gaps required for modern international finance. In particular, the regulatory environment seems to be based on Basel 3 model, which failed to identify the real reasons for the crisis. However, it is difficult to realize an international regulation, because, as Cooper states (1961), a system cannot be disciplined without cooperation. Therefore, there are more successful intra-or

inter regional initiatives such as those implemented by the European Community in accordance with Emir (European Market Infrastructure regulation). The EMIR has the objective of raising the level of transparency and stability in the deregulated markets, the establishment of the mechanism already used by clearing houses of the stock markets, as well as automatic guarantees to hedge the insolvency risk of one of the parties in an OTC future exchange.

The regulation, however, can not be the only way to discipline the financial markets. It is necessary that traders follow the basis of ethical finance, which goes beyond the mere speculative profit. In this context, the theory of behavioral finance should be expanded in its literature considering the "behavior" as the real basis of the financial economy.

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## TOOLS

Prereal Time data  
Powerdesk Fineco data  
Stata Corporation V.11