

Financial Markets, Climate Change and STS

Giuseppina Pellegrino, Tonino Perna, and Iacopo Salemmi

Abstract Departing from a fascinating analogy between financial and climate fluctuations proposed by Tonino Perna under the category of “extreme events”, this conversation addresses crucial issues in contemporary society, such as the relationship between financial capitalism and real economies, the controversies around alternative development models, and the role of the media in fabricating emergencies and crises. Whereas Perna interrogates macro-economic historical trends, Pellegrino and Salemmi put forward an STS approach into the topic, in order to frame the role of information infrastructures, controversies and the media (Pellegrino) and questioning the primacy of Economics as objective science through the hypothesis of economical medicalization of our society (Salemmi).

Keywords: extreme events; financial markets; climate change; information infrastructures; economic medicalization.

Money and CO₂: Convergences and Divergences between Financial Market and Climate Fluctuations

Tonino Perna

The hurricane Sandy which stroke the US East Coast at the end of October 2012 put once again the issue of climate change at the centre of the stage. According to the majority of climatologists, this change depends on the increasing impact of CO₂ we release in the atmosphere. At the same time, the financial crisis which since 2007 impacted strongly on the real world economy is far from ending. No feasible exit from the public debt which puts at risk the whole system of Western economies has been identified until now.

Both the financial and the climate shocks manifest themselves as turbulences, “giant oscillations” which witness the breakdown of the equilibria of our devel-

opment model as well as of the ecosystem. “Extreme events” have always happened but in this historical stage they became more and more intense and frequent.

This article departs from stating an “analogy” (see Marzo 2012; Melandri 2004) between the markets and the climate behaviour over the last thirty years. The aim is to find out a common matrix to the two phenomena, which are at first analyzed as independent. Then possible relationships between them are explored notwithstanding their apparent diversity, in order to propose urgent measures to face with such unprecedented changes and transformations.

I. The great fluctuations

“The Misbehavior of Markets” by Mandelbrot and Hudson (2004) has recently enhanced my interest and understanding of financial market and climate fluctuations. Using his fractal tools, Mandelbrot describes the volatile, unforeseeable and dangerous properties that few financial experts account. For Mandelbrot, markets have turbulences as rivers have whirlpools. On the basis of the Gaussian curve, we learn that fluctuations are always possible even if there is little probability of oscillations. Despite the fact that Mandelbrot’s statement does not explain why today’s financial crisis is one of the worst since the time of the Great Depression of 1929-32, it is still an important contribution to our understanding of the high risks associated with financial markets. If we consider the data provided by Andriani (2006) within the period 1987-2002, we learn that we have gone through at least seven financial crises. They include the 1987 Wall Street crash; the 1989 Japan financial crisis; the Europe monetary crisis of 1992; the 1994 Mexican economic crisis or “peso crisis” associated to the so called “Tequila effect”; the 1997 Asian crisis; the 1998-99 financial crisis of Brazil and Russia that caused the drastic devaluation of the ruble; the crash of the dot-com bubble in 2000-2001 linked to the “growth over profits” mentality and the aura of “new economy”. In practice, we could say that financial crises have become, in a short period of time, a regular occurrence around the world as never before (see fig. 1 & 2). In fact, looking at the evolution of the Dow Jones index during the last century, it appears clearly that it has repeatedly registered great fluctuations during the last two decades. More in general, the oscillatory evolution of stock prices is showing that the bear market¹ has entered a new acute phase. And this might not be the last one.

¹ In the Stock Trading jargon, a market in which prices are falling.



Fig. 1 – Dow Jones Index 1916-2002 (Mandelbrot and Hudson 2004)

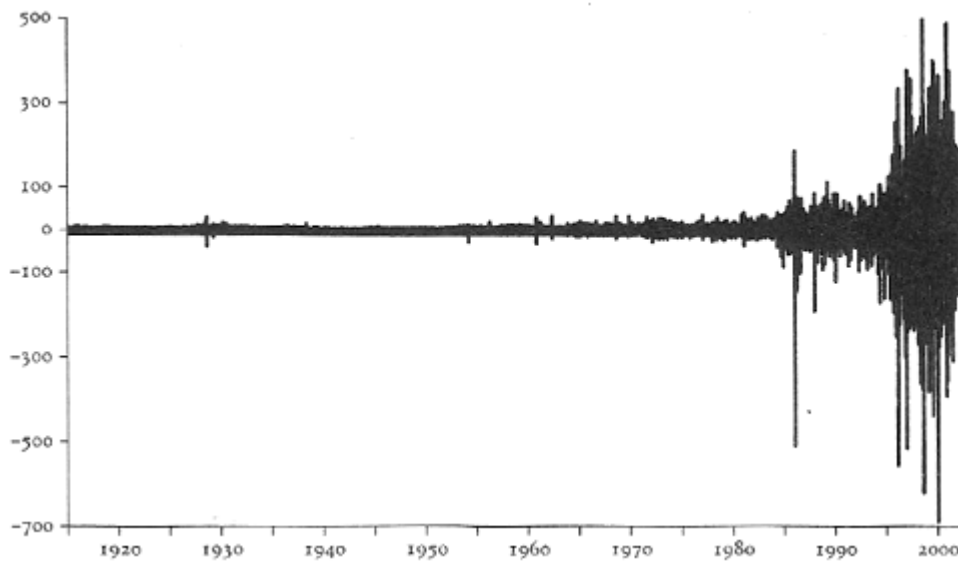


Fig. 2 – Dow Jones daily variations (Mandelbrot & Hudson 2004)

To better understand those anomalous fluctuations, determining contribution comes to us from Nobel Prize Prigogine in his work on “far-from-equilibrium dissipative systems”. His thesis is that areas of turbulence (Prigogine and Stengers 1979) are registered over a certain velocity which generates fluctuations that can influence the whole system. The system itself loses equilibrium to a point

where its properties become completely different than those of hydrodynamic-type systems. Fluid dynamics studies those variations.

Unlike Prigogine, I believe that non-equilibrium reactions or “giant oscillations” within a system are related rather with acceleration than velocity. Prigogine speaks of “a certain velocity” that brings the system to a critical point where areas of turbulence are observed. In other words, under the pressure of unbalanced driving forces, there is a critical point from where the system becomes instantaneously off balance. My understanding is that acceleration within the system determines its far-from-equilibrium properties.

When it comes to financial markets, the stock exchange is one of those primary entities from where to observe money motion and market prices fluctuations. For instance, if we consider the stock market exchanges of the last two decades, we see that GDP (Gross Domestic Product) and DJIA (Dow Jones Industrial Average) show great fluctuations and a clear disconnection between financial and real economy.

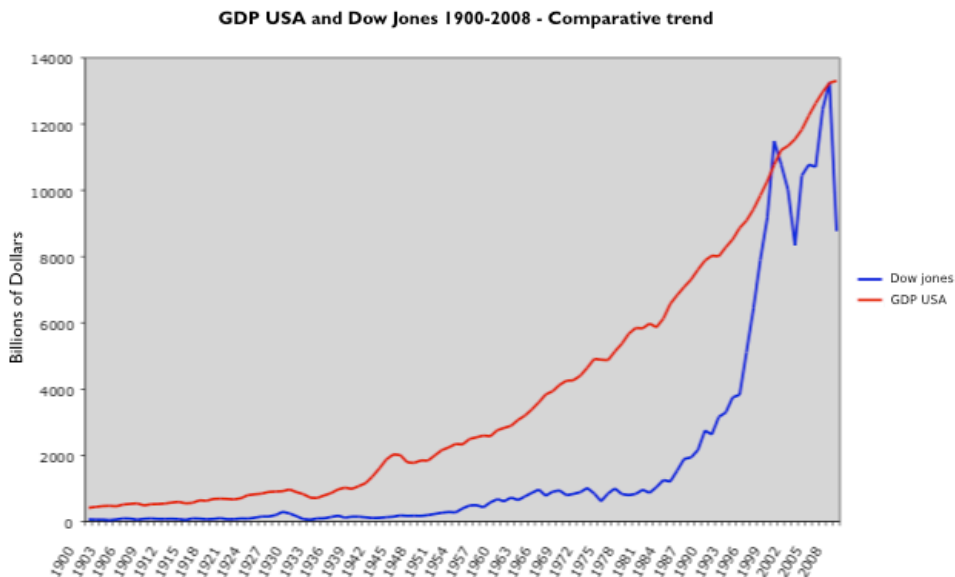


Fig. 3 - GDP USA and Dow Jones 1900-2008 - Comparative trend.

In figure 1, we see that DJIA endures a pulled up curve since the middle of the '90s. We also see that while the index of correlation between GDP and DJIA turns out positive till 1995 (and is equal, in average, to 0,8), from 1998 to 2008, there is no correlation anymore. In fact, the index is equal to 0,2. This means that for the first time in one century there is a clear gap between GDP and DJIA in the US, which signs a period of great discontinuity and instability – something that was not seen since the Great Depression. In the '20s, during the period that precedes the Wall Street crash, the correlation between the two indexes was still quite high (0,8).

Then one question comes to our mind: what does cause the gap between financial and real economy which seems to have become one of the main features of today's capitalism?

If we look at the main macroeconomic parameters, we do not find any significant fluctuation compared to the past. The only singular event is the long period of growth that has signed the Western economy after World War II. Of course, there have been times of recession during that period, but these were minor and short-term events. There was no sign of absolute inversion.

Applying the outline of "Kondratieff", a systemic crisis was predicted at the clash between the '70s and the '80s.. Kondratieff's cycles have an average duration of fifty years and depend on cyclical trends of big technological innovations which create new production and consumption sectors.

The cause of such instability could be found in the continuous emission of money, coupled with its "acceleration". This phenomenon is represented by the succeeding financial crises during a short period of time (1987, 1989, 1991-92, 1994, 1997, 2001-02, 2007-09). An overwhelming monetary mass has been created at global level with estimates that speak of 1 million billions of dollars. In contrast, GDP is only 60,000 billions of dollars (Fig. 4).

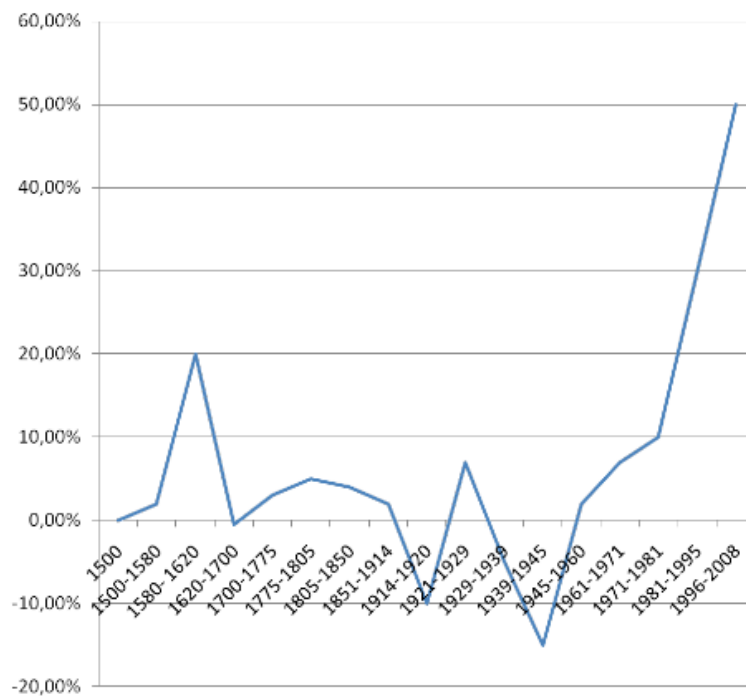


Fig. 4 – Average monetary growth per year (1500-1850 measured in gold and silver; 1850-2008 measured in currency and bonds). Author's elaboration from various historical sources.

The fluctuations of market prices registered during the recent economic crisis of 2008 have followed a similar trend.

It is quite interesting to note that, as Keynes has pointed out (Keynes 1931), market prices remained stable for almost one century – between 1826 and 1914 – with oscillations that never exceeded 30%. One reason might be that this was a period where the emission of bank notes was limited by the adoption of “gold standard”. In fact, since the removal of the last vestige of such standard by Richard Nixon in the beginning of the ‘70s, the world has been awash with paper money. Another reason is that the products of the so-called “creative finance” did not exist at that time.

A similar reflection could be made about CO2 emissions. The continuous increase of CO2 emissions in the atmosphere during the last fifty years has produced reactions of permanent non-equilibrium as witnessed by extreme weather events. Such events are not caused by the accumulation of CO2 emissions but by the acceleration of the accumulation process. In other words, if CO2 emissions had been accumulated during a larger period of time, the self-regulation of the biosphere would be more efficient (Fig. 5 and Fig. 6).

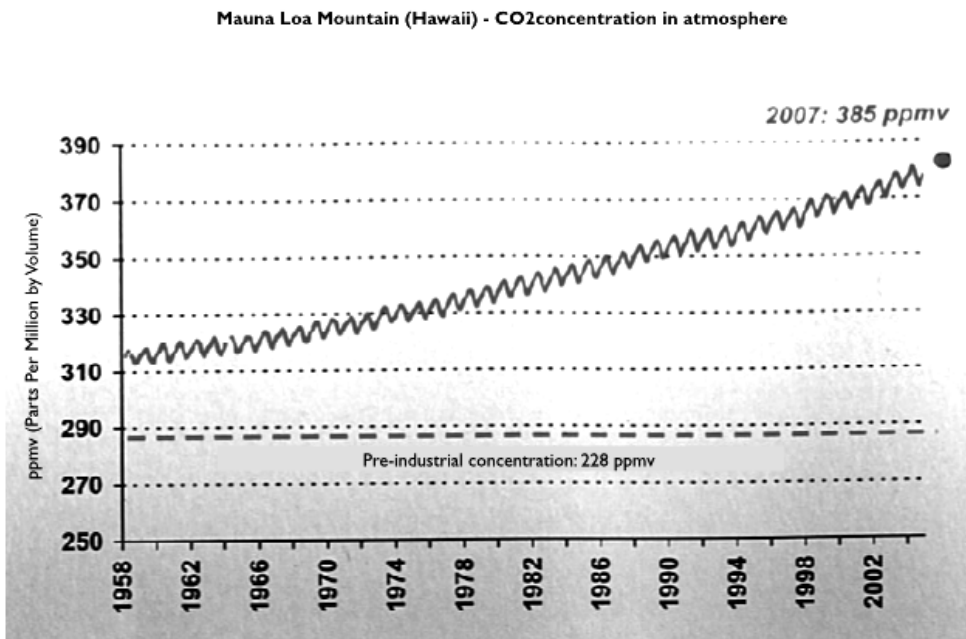


Fig. 5 – CO2 concentration in atmosphere (Mercalli 2008, 48).

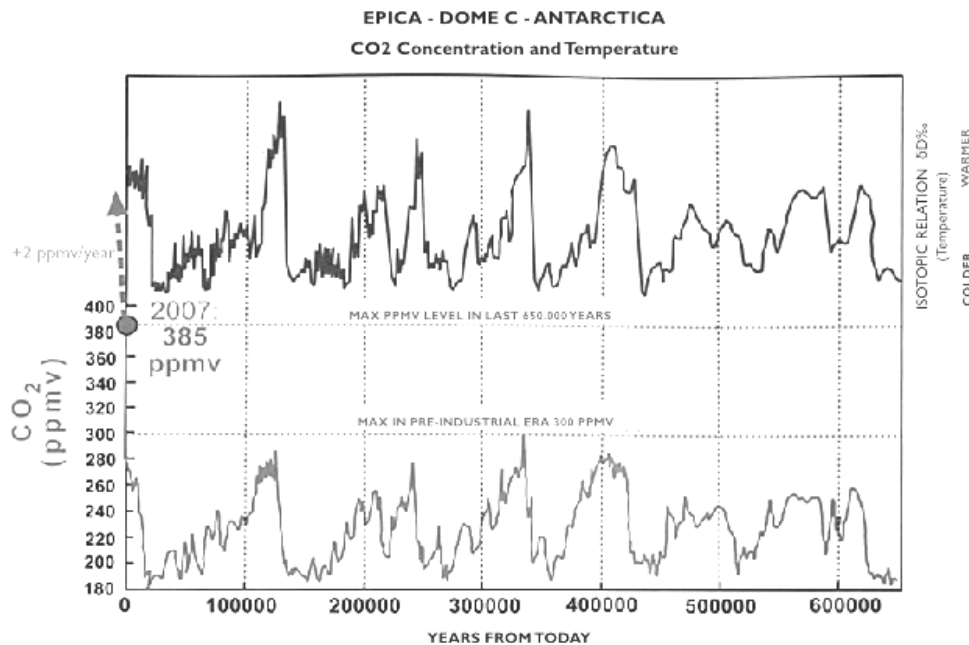


Fig. 6 – CO2 concentration and temperature (Mercalli 2008, 48).

We do know that large temperature variations in the troposphere might cause traumatic and dramatic damages to the bio-systems on which life depends. Nicholas Stern (Stern 2007) who collected data from the best studies on the matter has offered various scenarios on economic risks associated with global warming and climate change. His conclusions have been widely reported in the press and received particular attention. They helped to build awareness on the issue, but at the same time generated some confusion. Not all the scenarios seem to fit reality. Sea level rise for instance might cause damages to small islands and coastal populations. However, being a slow process, it gives time to find appropriate answers.

Stern hypothesized different scenarios by 2050 according to the degree of Earth average temperature increase, calculating the consequent economic losses, environmental refugees, agricultural waste and so on.

While such studies give us important inputs to better understand the economic dimension of climate change, they unfortunately lack information about ecological and human costs. For instance, sea level rise is a fact and should mobilize our attention. But we should not underestimate the “giants oscillations” that are associated with such phenomenon and are already in motion. The growing impact of human activities on the environment will continue to produce extreme events and natural hazards like tornadoes, floods, droughts, cyclonic storms.

Natural Catastrophes Trend in XX Century

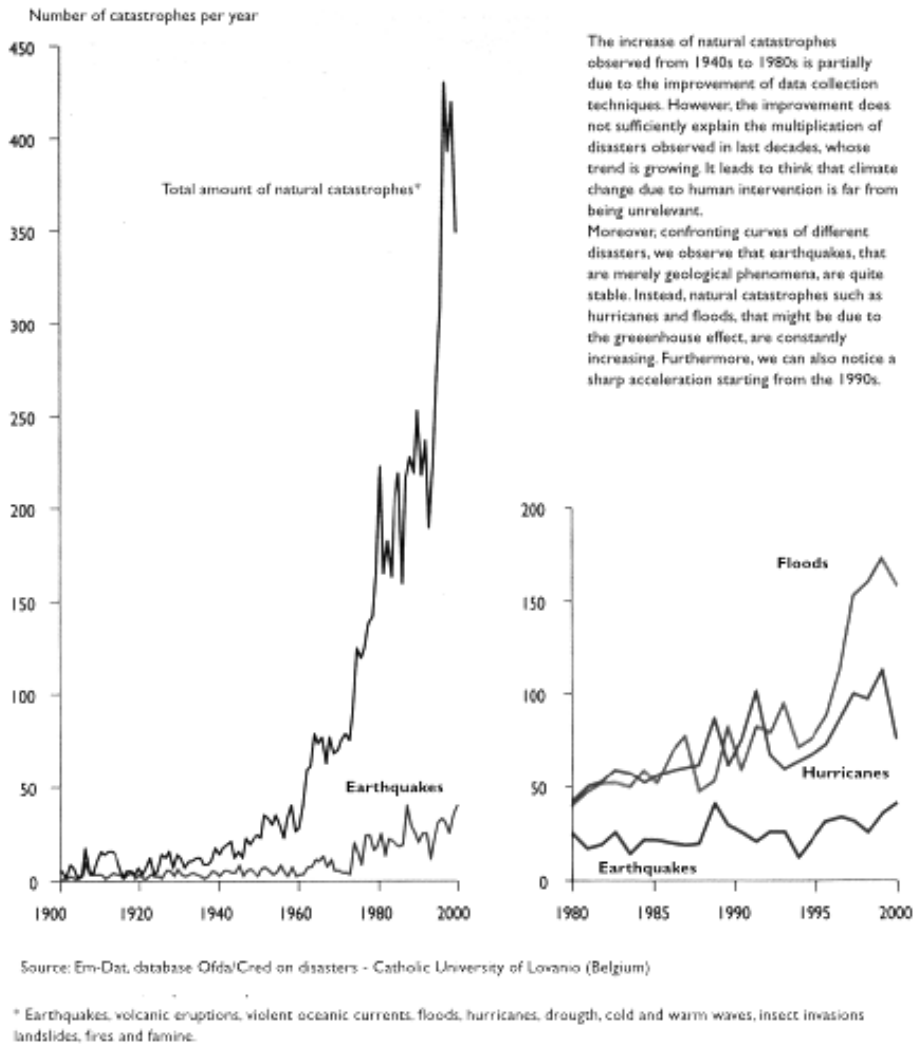


Fig. 7 – Natural catastrophes trend in the 20th century.

Meteorologists are on the front line to observe weather and temperature variations. In Chicago, in March 2007, temperatures varied from 20 C° to minus 15C° within only two days, and in 2009 they went down by 23C° within only twelve hours. In Italy, the ground station of Pizzoli in Abruzzo (Italy) registered a variation of 30° C from one day to another on December 22, 2009. Various examples

of this kind can be given. Larger surface temperature variations will most probably be registered in a near future and those new extreme occurrences of weather phenomena will be added to the list of historical weather records.

In an article published in the international weekly journal of science *Nature* (August 2009), two American universities supported the thesis that stronger and more frequent hurricanes, typhoons and tropical storms are hitting the Caribbean. Processing data over a period of thirty years from now, they came to the conclusion that those weather events rose by 31% and that their origin can be found in the overheating of ocean waters – that are producing a greater energy quantum. While the period of observation is too short to make a trend, it is still a sign of change. Extreme weather events have been registered all over the world. Exceptional snowfalls swept the Guangdong province, Southern China, in March 2008, while the Perito Moreno glacier in Argentina was melting at unprecedented rate. In August 2007, exceptional snowfalls were registered in Buenos Aires and Johannesburg. In Australia and India, high temperatures reaching 55°C were recorded in January 2008.

Antonio Navarra, director of the Euro-mediterranean centre for climate changes, asserts the following:

“We are registering important temperature variations from one year to another. Core-drilling projects through the ice cap in Greenland have demonstrated a similarity with what happened thousands of years ago.”

2. Regulation of financial flows and terrestrial temperatures

For almost two hundred years, since trading of stocks began on a stock exchange, financial flows were regulated by monetary and political authorities. Today, all financial analysts agree that the explosion of speculative bubbles is the result of a lack of regulations and vigilance.

The self-regulatory system of the Earth's temperature is a bit more difficult to understand. From data collected during core-drilling projects through the ice cap in Greenland and the Antarctic, it seems that, at both poles, periods of cold and heat alternate. In other words they do not happen in synchrony. Until now, we do not have any scientific explanation for this phenomenon.

If we compare the Earth to a living organism, the first question to be asked for is about the location of the Earth's thermo-regulatory center. The thermo-regulatory center of warm-blooded animals, including humans, has been found in the hypothalamus. In case of serious diseases, dysfunctions of the hypothalamus can cause death. Within a very short time, important body temperature variations ranging from 35° to 40° are usually registered. It is quite clear that the Earth does not look like a warm-blooded and homeothermic organism with arms, legs, claw and a brain. However, we think that the Earth should be considered as a living organism with two thermo-regulatory centers – one located at the North Pole and the other at the South Pole. Each of them works independently from the other

but their activity is coordinated and well balanced.

When it comes to periods of heat and cold, scientists have made the hypothesis that the diachrony between the two poles' activity is depending on ocean water streams. Unfortunately, until now, this hypothesis has not been proved scientifically. However, it is clear that the diachrony exists. And we believe it is not a casual event but the result of a self-regulatory mechanism aimed at reducing the risks of extreme temperature variations. A recent article based on satellite data from September 2012 (Stone 2012) shows which the Arctic ice mass keeps melting so hitting a negative peak. At the same time, the ice mass on the Antarctic side has been increasing.

By analogy, we could say that the two poles act as the cerebral hemispheres of our human brain. If one of them is under stress, and loses some of its functions, the other one can complement it in some way. Of course this is only an analogy, not the demonstration of a scientific truth. The alternate temperature variations between cold and heat at the two poles on a geological time scale could suggest that the Earth's average surface temperature is the result of the combined activity of these two "hemispheres".

The massive emission of CO₂ in the atmosphere could produce temperature variations inducing unforeseeable effects in the North and the South hemisphere, so bringing about increasing damages to ecosystems, especially to agriculture.

The financial speculation exploits the climate change like – in the real economy – governments exploit the "natural" disasters to strengthen their power. In the period 2008-2011, we registered very strong "oscillations" on the prices of principle foodstuffs, such as rice, wheat, corn, etc.. This phenomenon has produced a strong impact on traditional agriculture, which is the main defense of the ecosystem equilibrium – as Barroso, President of the UE Commission said – and as a consequence it increases the "greenhouse effect". Once again we have a further confirmation of the relationship between "extremes events" in the financial world and climate change. This means that the increasing frequency and intensity of "extreme events" (intense rainfalls, drought, hurricanes, and so on), put in crisis natural cycles of traditional agriculture. At the same time these events bring about financial speculations of basic products (rice, corn, grain) contributing to the economic collapse of small peasant farms, able to protect the biodiversity of the ecosystem, and having a low environmental impact. All this advantages big mono-cultural companies having a high environmental impact (CO₂ emissions). Such a process has a clear consequence, namely the increase of gases which foster "extreme events", in both the financial and the climatic field. Similarly, the "extreme events" caused by climate change produce increasing economic damages (about 250 billions dollars only in 2011) impacting on public expenditure and raising the fiscal crisis of the State, so fostering further financial speculation.

On the other hand, in debt countries are pushed to exploit even more intensively natural resources (forest cutting, unlimited drilling, shale gases) while cutting programs of CO₂ reductions and environmental protection. All this contributes to worsen the environmental disequilibrium, according to a perverse, self fostering mechanism.

We do know that such events will take place more and more frequently. Symptoms of non-equilibrium are clearly visible. Unfortunately, the availability of data is still insufficient to both predict where extreme weather events will take place and understand how these two thermo-regulatory centers work. How the Earth will regulate itself is still a mystery. Dis-equilibrium is evident and “extreme events” increase in their frequency and intensity. However, we cannot foresee when and how much a specific area will be affected and which areas will be saved from the impact of these events.

We personally think that global warming projections produced in recent years by Intergovernmental Panel on Climate Change (IPCC 2001; 2007) are not totally reliable, mainly because they do not take in consideration Gaia’s reactions (see the increase of Southern Pole glacier mass). Based on our hypothesis, one should not exclude the possibility of a compensating effect of one of the poles aimed at contrasting global warming. For sure, the number of extreme weather events will increase, both in intensity and frequency.

3. The impact of “giant oscillations”

How to make the world a safer place for the population in less technologically advanced countries, is one of the key political issues of the future – and not only from the point of view of food security. The poorest populations of Africa, Asia and Latin America have as limited capacity in front of extreme weather events as in case of harsh economic recession – when for instance they cannot afford the prices of first necessity goods like it happened in 2008. On the other hand, typhoons or tornadoes make more victims in Central America than in North America. In short, the poor are the first victims of “giant oscillations” – being them either economic and financial or climatic.

Jeremy Rifkin (see also Cianciullo 2008) states that there is a strong correlation between climate change and economic crises. He easily speaks of the growing risks for insurance companies represented by agricultural damages caused by global warming. We know that insurance companies' fortunes are directly tied to the accuracy of their environmental-risk projections. In The Stern report (Stern 2012), the framework of this analysis is much larger and considers the link between human activity and global warming, offering a plethora of data and examples too. The correlation between both phenomena exists.

The long-term economic effect of climate change should put in question our development model in the same measure that “extreme events” and “giant oscillations” recall our attention in case of financial crises. Human and environmental dimensions of such phenomena should not be ignored.

From our point of view, if the excess of money and CO₂ is provoking great damages at both the social and environmental level, the only remedy is to reduce their emission. It is neither a simple nor immediate operation, but there is no alternative.

A drastic reduction of CO₂ emissions will not have immediate effects. It will

take many decades to see positive changes in the biosphere equilibrium. Similarly, a drastic reduction of the global monetary mass might positively impact stock market giant fluctuations. The challenge will be how to curb speculation trends that affect land and oil prices, and weak currencies.

It is, therefore, necessary to think of a new global security policy that will put the highest priority on targeting the poor and bringing changes in the North-South relations. At the moment, the main priorities for industrialized countries seem to be the provision of appropriate technology to reduce greenhouse gas emissions in developing countries. This is only part of the solution. The risk is that such measure will only benefit the market of the green economy which is growing in the West. For the poor, climate change means higher prices for necessity goods, harvest loss, desertification and drought, floods and hurricanes.

To some extent climate changes have the same functioning of hyperinflation: their major impact affects the poorest who cannot transfer the increased prices to anybody else. The 25.000 dead for hotness in France (Summer 2007), in Russia (Summer 2010) or the 16 millions of environmental refugees in Pakistan (Autumn 2010) were mainly poor, elderly, disabled people, without any economic resource to escape from extreme events.

A policy able to tackle poverty in those areas of the world should include:

- the creation of effective disaster prevention and management systems of the risks associated with extreme weather events;
- the creation of mechanisms to ensure food security, including for instance the creation of food stocks to be co-managed at regional and sub-regional levels;
- the activation of measures that will keep the provision of goods and services of primary necessity (food, water, etc.) out of the market place.

To answer the challenges and risks associated with “giant oscillations”, giant political steps need to be taken. This means a drastic, radical revolution in development patterns as well as the elaboration of alternative conceptual frames able to handle with complex, interlinked and extreme events and their impact on our future.

Speculations, Catastrophes and (selective) Amplifiers: Handling “Extreme events” through STS

Giuseppina Pellegrino

Introduction

Saying that the world we live in is deeply interconnected seems to have become a taken for granted, not questionable statement. An assumption and an obviousness that rarely comes to proof and exemplification.

Perna’s account of “extreme events” (see Perna 2011) goes beyond this mere statement, pursuing the effort to show how very diverse phenomena (in surface) can be compared by analogy and, therefore, re-thought in the light of a common frame.

The aim of this contribution is to propose a more micro-level of analysis to account for financial and environmental crises, complementing the macroeconomic tools with specific STS insights, which immediately re-frame the phenomena in question and look at them from a different perspective.

First of all, both financial markets behaviour and environmental shocking events are far from being as “natural” as they appear at a superficial glance. At least listening to the mainstream media news covering both the issues as “first headlines”, we could infer that there is very scarce room to escape from the “index dictatorship” of financial Capitalism (at least so depicted by the media) as well as the unforeseeable (but more and more frequent) chain of hurricanes, tornados, flooding and the like at different latitudes and corners of the globe.

Indeed, at least from a conceptual viewpoint, this is only one small portion of the whole picture. This is what the media think relevant to amplify, as it will be argued later in this article. Behind and before, there is much more than this.

Speculations on financial markets and real economy crises, environmental catastrophes due to extreme events and their amplification by the media are altogether bits of a mosaic whose background is technoscience – and sociotechnical relations constituting it. In the light of a technoscientific approach, what ties together the “extremeness” of all these phenomena is their being just the emergent part of a broader, sunk world of relations. In other words, “extreme events’ are only the tip of the iceberg and what lies beneath (the classical STS “black box”) is a dense texture of relations based on the common ground of shared classifications, namely what STS approaches have defined as “information infrastructure” (Bowker and Star 1999; Star and Bowker 2006). Therefore, when adopting a phenomenological stance (Schütz 1945), extreme events are the emersion of what is otherwise taken for granted and not questioned anymore (in this case, well working financial markets, and ordinary weather forecast).

Crisis or interruption or breakdown – that means, little or big “holes” in the

texture of infrastructure – make visible the working (of) infrastructure itself, stressing the stability of its installed basis and putting into tension its inner components.

In what follows, it will be argued that financial markets can be interpreted, going back to STS approaches other than SSF (Social Studies of Finance, see Preda; Salemmi in this issue), as information infrastructures/bounded objects. This brings about interesting consequences in terms of how they work and what they require to their users.

On the other hand, “natural catastrophes” question about our categories of nature and culture, as they show how much uncertainty and controversy is at stake when handling only partially foreseeable events and hitting the limits of what would be called, in kuhnian terms, “normal science”. Stressed financial infrastructures (based on speculation) and climate change controversies, however, would not have the role they play nowadays if the selective amplifier of the media did not make them “the” issue to think, talk and decide about.

Such a “triadic” model (markets as infrastructures – environmental controversies – the media) is proposed as a way to handling with “extreme events” pointing to STS and the role technoscience plays in making ordinary everyday life of markets, climate and society an “extraordinary” chain of events.

If, as Perna points out, frequency and intensity of such “extraordinariness” makes it less and less exceptional, this means the established classifications (and forecasts) need to be urgently updated, and consequences taken up; not to “accept”, but at least to “domesticate” the “torqueing” which individual and collective biographies (Bowker and Star 1999) have to stand to survive to extreme events.

1. Financial markets as information infrastructures and bounded objects

Adopting an ecological-infrastructure approach to analyze financial markets means to take in consideration their general working prerequisites as information infrastructures and bounded objects (Star and Griesemer 1989; Bowker and Star 1999; Star and Bowker 2006). More than looking at the specificity of the financial markets mechanisms and dynamics as done by SSF scholars and literature (see Preda; Salemmi in this issue), such an approach emphasizes those characteristics which make financial markets well working infrastructures. It also identifies conditions of their breakdown and interruption.

Financial markets seem to share at least some crucial dimensions with information infrastructures, such as embeddedness, transparency, visibility upon breakdown (Star and Bowker 2006). Until market indices (which can be assimilated to the standards of finance world) increase their performance, there is a “virtual” invisibility of the markets. They are composed of “missing masses” (see Latour 1992) created by the big accelerations and giant oscillations which make the infrastructure tissue more complexly structured and opaque.

It is when performance does not reach or hit a positive value that visibility starts changing and the installed basis of market infrastructure (the mathematical models, algorithms and related information systems) becomes an issue for the media to select and “feed” public opinion. The word “spread” (belonging to the financial market jargon), this way, has been divulged, popularized and made a major pre-occupation across all social classes and groups in Western countries over the last year or so.

Beside being concurrently elicited by the media, speculation is based on the very possibility to manipulate classifications in order to orient future performance accordingly to expectations related to current and future behaviours. Not by chance the name of financial products which embed this manipulation is “Futures”.

In turn, financial market indices are bounded objects used themselves as standards to compare and evaluate other collective bodies’ performance (GDPs, public debt rate, unemployment rate and so on).

All of these data (indeed, numbers and figures) are then subject to the “definition power” of regulatory bodies such as international rating agencies, which seem to be the primary actor in the arena of financial capitalism, not being affected by the material and reputation “bankruptcy” of investment banks that led the current global crisis. Even worse, they have been profiting (and contributing) to the crisis through their evaluations, approvals and rejections (see Gallino 2011).

Proliferation of indices and standards, their instability and oscillation behaviour, all this signals that the very texture of the infrastructure is as much ecological as fragile (see Star and Bowker 2007).

However, it is when analyzing consequences of financial speculations and of the unbalanced relationships between real economy and financial markets that the interpretive adequacy of the ecological-infrastructure approach is even more evident. From individual savers and families who lost everything they had, to countries under constant scrutiny, financial markets infrastructure shows its “torqueing” power, the power to exert an unbearable pressure not only on lived biographies of individuals but also on the present and the future of entire populations and countries. The Greek case is the immediate example of what enforced compliance to the requirements imposed by financial markets can bring about.

Furthermore, following Perna’s argument, it can be asked if the speculative collapse of financial markets is an “internalized” behaviour, based on instability as a basis for the financial system to keep controlling (and taking over) the real economy system. If the breakdown is more and more frequent, then it can become a routinary approach, so reversing the relationship between visibility and invisibility, installed basis and breakdown, as well as the usual boundaries among social groups working around financial indices.

In the end, it is not irrelevant to recall that whereas classifications are in theory self-consistent and not contradictory, standards are such because they are shared across different social worlds/actors/groups, which using them can interact among each other. The breakdowns (in Perna’s terms, financial storms) signal an unsatisfactory working of these standards, testified by consequences (both in

quantity and quality) of exclusion for myriads of individual and collective bodies. If fitting the standard becomes more and more an undertaking, it could be an issue to re-discuss boundaries among social worlds and the very working of infrastructure. Current indices and evaluation mechanisms of financial markets (are) put in crisis, so that Ordinary maintenance is not enough. Sometimes, a new piece of infrastructure has to be implemented to start with different categorization mechanisms, able to re-include the “orphans” generated by continuous infrastructure breakdowns.

2. Climate change as controversy and fabrication

A tacit *fil rouge* between financial and environmental storms, beside Perna’s analogical argument, is the fact that weather forecast is another case of built-in information infrastructure, based itself on stochastic and statistical models, that means mathematical applications to foresee uncertainty and make it manageable. In this sense, financial markets and climate (in the shape of weather forecast) are two examples of “domesticating” (sometimes abusing) the laws of probability, “betting” on the short term future behaviour (of prices and of climate, respectively).

And also here, speculations or fabrication of more or less false catastrophes – “breaking news” in the old and new media - start emerging as a “structural” issue in weather forecast as a business and a show-biz (Livini 2012). To the extent that also in Italy private agencies of weather forecast seem to play a major role in delivering more or less “home-made” forecasts via web, marginalizing the scientific role and legitimacy of the institutional national agency in the public perception and opinion. It is enough to say that 300 million users were connected to weather.com on Sandy’s day (Livini 2012). Furthermore, environmental issues are handled through mechanisms of classification and regulatory bodies which are based on standards. The case of earthquake/tsunami risk classification is a classic one, whose limits and consequences are once again evident through counter cases, like the Emilia Romagna (Northern Italian region) earthquake in May 2012. An extreme and unexpected event, due to the very low risk attributed to the area by current mappings.

However, there is more than this. Climate and environmental “giant oscillations” are the controversial outcome of a controversial scientific issue, which can be labelled as “climate change” and sometimes declined as “global warming”. This is a typical example of what Social Studies of Science have identified as a controversy, that means a persistent, continuous and relevant disagreement on a scientific theory/phenomenon, which involves many social groups, first of all the scientific community and scientists, then the broader public, and the media, whose role has become increasingly and widely crucial in the dynamics and outcomes of technoscientific controversies (see Engelhardt and Caplan 1987), even more in light of the Internet centrality (see Lorenzet 2010).

“Major controversies, then, can be regarded as a microcosm in which the interactions between science and technology and the rest of society can be conveniently observed and studied” (Giere 1987, 126).

Technoscientific disputes can then reach a closure but this depends on how all of the actors in play (scientists, the public, the media and so on) will interact among each other, and how much the media contribute to foster uncertainty on the issue at stake.

In the case of climate change/global warming, an effective closure does not seem to be close in time, at least because of the major role played by the media and non-scientists. Such a role has been multi-faceted. On the one hand, as US popular press did for some years, uncertainty was fostered and built up to delegitimize lay knowledge and re-legitimize the primacy of scientific truth (Zehr, 2000). On the other hand, as made clear by the two docu-movies which have fostered the dispute and jeopardized the discussion arena (Gore 2006; Durkin 2007), political issues and politicization of the debate seem to be still very important in framing the thesis of the anthropogenic global warming and the role of CO₂ emissions in worsening life conditions and environmental equilibria. To the point that the “fabrication” thesis has been put forward, stating that science and scientists would have deliberately “built up” the global warming data.

Even if this was not a key issue in the recent Obama’s presidential campaign, the public perception that climate is radically changing with unforeseeable consequences has been increased and reinforced by the intensity and frequency of hurricanes, of which “Sandy” is the latest destructive example. Furthermore, the “Denial Propaganda” built up around climate change has been very recently addressed by another docufilm (Kehoe 2012) aimed at providing a critical perspective on the issue and supporting the urgency of climate change as a social global problem.

As Perna suggests, self regulatory mechanisms seems acting to contrast with the “giant oscillations”, but they are not effective enough, and the same happens in the case of financial markets. Still, it is in question how to face with these phenomena. Is it possible to think of a global contrastive action? The failure of political initiatives like Kyoto agreements and the contradictory role of IPCC do not encourage such a perspective. Others have seen in a micro-level of action and engagement the key to face with the problem, and here again, the role of the public perception, awareness and intervention would be crucial, as more participatory approaches to science (e.g. Public Understanding of Science – PUS) state.

The dispute continues, in the meanwhile human and non human costs increase and the World Weather Agency warns that in 2011 the CO₂ in the atmosphere hit the highest concentration recorded by now (Gualerzi 2011).

3. The Media as Selective Amplifiers

It is not trivial to go back to Orson Welles's "The war of the worlds" (30th October 1938) to talk about the media power in more depth than above. This radio-drama episode, beside securing the film maker and actor's fame, is still a powerful example of how simulation, deception and selective amplification can be carried out by the media (at that time, the radio).

Since then, Media Studies have become a field of study interacting with many others, making it clear that there is more than manipulation and propaganda to the media constitution and construction, often to the extent of proposing an integrated perspective to balance the apocalyptic approach (Eco 1964). To the scope of the argument of this contribution, one of the most interesting theories developed by (Mass) Media Studies seems to be the "Agenda Setting" one (Cohen 1963; McCombs and Shaw 1977). Its classical statement is that the mass media tell what topics to think about, more than simply saying "what" to think about. Part of this theory's merit has been the analysis of newsmaking mechanisms and dynamics (e.g., "news values" and "newsability" rules, which are another form of classification and evaluation system). Then, the agenda "metaphor" is salient to represent negotiations and conflicts between the media, the public and politics on the issues to be "thought about".

Such a theory seems still adequate to describe the role of selective amplification pursued by the media in technoscientific issues such as global warming/climate change, financial speculations, and other controversies, remembering that the current mediascape (Appadurai 1996) is even more complex and that the media have an ecological infrastructure in which the old and the new are always in play (Marvin 1994; Pellegrino 2008).

Media coverage (or its absence) makes a crucial difference in constructing the world as we know it, in telling us what to think/talk about, what worries and problems to address in everyday life and beyond. In the end, the informal golden rule of journalism for which "bad news is good news" is still working out extremely well.

In the case of technoscience, such a difference is even more important because of the discursive frames the media put in play to make sense of what is labelled as "new", "innovative" and sometimes "revolutionary" (Iacono and Kling 2001). This "rhetoric of the new" is particularly evident when new technoscientific phenomena are the issue at stake, especially new technologies on which horrors and hopes are constantly plotted (see Sturken et al. 2004).

Financial speculations and environmental catastrophes effects would not be the same without the media action. Extreme events are extreme not only because of their consequences and impact on the global economic and ecologic systems, as clearly shown by Perna. Their extremeness as a quality and an attribute is "fabricated", "constructed" and "amplified" selectively, according to changing interests, continuously negotiated by the media in front of other actors such as

scientists, opinion makers, citizens' associations, politicians, regulatory bodies.

To overlook such a construction and constructive process, which is constitutive of the arena of extreme events and of their consequences in terms of awareness and visibility, means to forget one of the driving mechanisms of this arena, as well as the potential to partly change the selective amplification through counter discourses elicited by the new media, namely the social web and its coordination power exploited by grassroots movements (e.g., “occupy wall street”).

Conclusions

To sum up, what can STS say about “extreme events” and their cogent role in contemporary society?

This contribution has been an attempt to complement the macro (economic-ecologic) perspective proposed by Perna with a different kind of focus on financial markets and climate change. Three key words have been analyzed as conceptual axes of an STS approach: (information) infrastructures, controversy and selective amplification. Indeed, the infrastructural dimension seems to be the most powerful line of continuity between financial markets, climate change and their media coverage. All of the phenomena rely on a complex sets of classification, standards, rules for heuristic evaluation which show their limits when speculations, catastrophes and collective panicking (or ignorance) break down the ordinary working of infrastructure. It is then that a new categorization and boundary work is needed. When any infrastructure excludes so many individuals and collective instances, stressing their lived existences because of a blind orientation towards self reproduction and maintenance, then it is time (and space) to think of alternative infrastructures. This means alternative classifications and standards, able at least to reduce the consequences of permanent uncertainty, routinary extremeness and dominion of exclusionary categories. This would be a minimum goal, still hard to reach but not secondary to other types of challenges technoscience deals with.

The Economical Medicalization: Objectivity, Measurements and the Primacy of Economics

Iacopo Salemmi

Introduction

The conclusions of Perna's article "Money and CO₂: convergences divergence between financial market and climate fluctuation", are extremely important.

The need for a new policy to prevent disaster effectively, in light of recent events, increases everyday; to focus on poverty issues and risk management is more urgent than we can image.

Our world is moving through "Giant Oscillations" and rather than accepting them as a given reality, we need to resist and react. Those extreme events such as the economic crisis, pollution disasters, and poverty's exponential growth need to be strictly implemented on the political agenda. The cases that Perna reviews show perfectly how brutal and unpredictable those shocking situations are.

Moreover, we need to examine those cases through "different lenses", to ensure good input material for new analysis and hopefully new solutions.

For this reason I would suggest also to examine these assumptions through an STS lens, in particular focusing on the idea of objectivity and performativity of the economic science. Before assuming upon risk oscillations, idealistic problematization and risk calculation, I would criticize the perspective and the imaginary that economics is suggesting to us.

My idea and concern regard not only the problematic aspect of those giant economic crises, that are draining our world and life styles, but also the prospects behind this drama, that could be portrayed as the economical medicalization of our society. By economical medicalization I mean the state in which we encounter, incorporate, and recreate an imaginary of ourselves based on constructed capacities, limitations, prospective and dreams as depicted by the scientific production of facts in economics.

The economical medicalization is an explicit intervention in our mind sets and in our national and economical imaginaries; indeed this process forges a feeling of acceptance towards changes and reforms justified by economical figures, even despite these changes worsen our everyday life. This economical medicalization is defining the rules of the game and our identity through constructed formulas, numbers, statistical analysis, and traded or negotiated objectivity.

Before going deeper into my thesis I will deconstruct the concept of financial markets rather than simply investigate their behaviours, regarding non-equilibrium reactions. By deconstruct, I mean to dismantle the concept of financial markets to its point of origin, going beyond the economics perspective and paying attention to the main actors involved: numbers and objectivity.

I. Deconstructing financial markets and economics as objective science

My deconstruction will go through four main steps. First, I will address the important issue of numbers, and especially measurements; secondly, I will illustrate the criticalities of economical objectivity. I will then reassemble the concept of Economics so to eventually configure more carefully the financial markets.

Measurements have become a figure of standardization and objectivity over the years. Porter (1995), in his book “Trust in Numbers”, argued that there is a crucial importance given to measures and numbers and how those measures create and shape continuously our imaginary. He underlined that while this makes things easier to laypeople who are unfamiliar to the economics jargon, on the other hand it is dangerously a convenient reduction of meanings to numbers. On the other side, this “convenient communication” through the usage of measurements is essentially a loss of information. Porter pointed out that in some cases this loss of information, as it happens with accounting and statistics, seems largely irrelevant but such an attitude presupposes that at the bottom of this process there is a clear determination through the activities of summarizing by measuring. Instead, as Porter (1995) suggested, measurement creates new things and transforms the meaning of old ones.

Measurements are a pillar of economics as a discipline. Neoclassical economics depended heavily on mathematical physics for the theoretical structure that the pioneers imposed on their disciplines; such imposition has been the basis to translate the practices and praxis into a scientific methodology. This assumption is perfectly logical and coincides with Lord Kelvin’s statement for which

“When you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot measure it in numbers, your knowledge is of a meager and unsatisfactory kind” (see Porter 1995, p. 72).

In fact, measurements and numbers are the most used tools in economics to sustain the argumentation of the discipline. However, this kind of measurements, in particular the economical political neutrality – as well as the simplification behind it (see Otway and Wynne 1989) – are strongly connected to practices of abbreviation and description which are eventually “simplified representations”. It follows that economics is not as neutral and objective as the Neoclassic perspective argued. Then adopting a constructionist viewpoint, Economics and financial markets are not immune to distortions and personal biases, so that they become a constructed environment and a place to be investigated through different lenses and perspectives, such as STS. The crucial consequence is that measurements and objectivity, as well as the primacy of economics, have deep political implications.

2. Financial markets, economics, and the world behind those identities

Following an STS approach to financial markets, Knorr Cetina and Preda (2005), MacKenzie et al. (2007), Sheila Jasanoff (1986; 1985), and Philip Mirowski (1994) have showed how fascinating and complicated is this unique constructed environment, which is more than ever becoming one of the most important issues of our everyday life.

As illustrated by Knorr Cetina and Alex Preda in their edited book “The Sociology of the Financial Markets” (2005, 6):

“The world economy was born with the dawn of international trade, and foreign exchange trading has played a role in this economy from this time onward [...]. Financial markets can only be assumed to exist when there are routinized, systematic forms of trading, relatively stable settings, a minimal degree of standardization of financial securities, and established cognitive procedures for their evaluation”.

Financial markets nowadays are characterized by the tendency of globalisation. In simple words, today we assist to the globalisation of every possible market through the localization of algorithms and calculations of the trade routines of Wall Street; that could be, “arguably considered as the global system of financial markets” (Knorr-Cetina and Preda 2005, 5).

Apparently, financial markets seem to be un-localized (e.g. bonds, shares etc.), however economy is typically a localized issue. In fact the dilemmas, issues, concerns and problems of the singular national financial market have consequences on the economies of other nation states and on their populations. This means that markets are localized and embedded physically and economically into the society of that specific nation. Despite this, they are simply unpredictable as showed by the different case studies of the economical crisis in the 20th century.

Crucial to the globalisation issue is the research on national bonds. While currency markets are inherently transnational markets, bonds are not. However, national bonds have become increasingly global in the most recent wave of globalization. Every country has its bonds, which reflect the value of cross-border transactions in bonds and equities as a percentage of GDP in the financial markets.

The important frame that we have to integrate in this context is also strongly related to the different criticism STS authors such as Callon (1998), Garcia *et al.* (2004), MacKenzie *et al.* (2007), and Hacking (1983) expressed towards economics assumptions and its performativity.

According to MacKenzie (Mackenzie *et al.* 2007) in economics the epistemological perspective is represented by knowing the world more or less accurately, whereas the ontological perspective is the production of the world, and the ability to reconfigure and transform it. The author points out that economics seems to be a tool for direct action or for strategy of intervention. MacKenzie also pro-

poses the performativity theory as an approach to economics and economies to analyse their messy materiality and complex networks. The performativity theory, as Merton and Wolfe (1995) suggested, is a self-fulfilling prophecy, namely a situation which is redescribed and redefined to make a false conception come true. Besides these assumptions MacKenzie (2007) strongly underlines that market efficiency is strictly connected to the available information that the market and other actors can reach.

This unopposed power of the economical performativity is shown perfectly by Callon (1998) and describes how economics is more than a mere observing tool, rather a machinery to shape and perform our society. This point is particularly important to contextualize the issue behind economics. Hacking (1983) as well posed this assumption by underlining how economics does not represent a certain environment but it does intervene on environment itself.

Also Garcia *et al.* (2004) followed the same path and ideas, showing how those economical numbers are constantly creating assumptions and decisions based on clamorous approximations; indeed the economical science is selling us an ideological perfect market, which instead should be more criticized.

These critical statements on economics will be the basis to analyse and perceive how the Spread is affecting our environment and not only describing it.

I also propose to connect MacKenzie's idea of Economics as a strategy of intervention more than a description to Foucault's governmentality (1973), according to which numbers have often been an agency to exercise power over individuals, since numbers turn people into objects to be manipulated. Indeed connecting those two theories we could understand and perceive how the power of economical numbers and decisions is exercising on us a constant intervention and manipulation of our behaviours, attitudes and mind-sets. At least this theoretical frame should shed light on the possibility that economics and its tools as percentages, measurements, numbers, and indicators are enacting the social by planning it.

Furthermore, as mentioned by Alexander Zinoviev (2000), we need to take into account that predictions are simply impossible; still what cannot be predicted through tools, could be planned. Therefore, the economics tools are not predicting our future; instead they are largely planning it every day.

To conclude, we need to introduce the issue of risk; Knorr Cetina and Preda (2005) showed the possibility to see and understand how much economics is constructed and how through this science emerges the issue of constructed risk, which nowadays is empowered constantly in our society. Knorr Cetina underlines how numbers for economic standards have been produced by standard setting organizations. The issue of economic risk is really important to understand because the risk *per se* is one of the strongest tools that can shape and recreate a certain imaginary.

3. The Economical medicalization

After this de-construction it is now possible to better understand my concern regarding the economical medicalization that is behind financial markets and also the current financial crisis. All the dilemmas of objectivity, politicization, neutrality, and risk communication are more than ever present in this field. The concept of economical medicalization could be also supported by Mirowski's (1994) "social induction process", which underlines how human ability to adapt to the most stressful environments is constantly making up our imaginary. Furthermore, in this way we cannot anymore perceive our "natural" environment, which becomes literally invisible to us.

To strengthen the economical medicalization assumption, I will show how the case of the objective self-fashioning, described by Joseph Dumit (2004), could reasonably relate to the case of the spread indicator in Italy, and how through this frame it could be interpreted as a pure medicalization.

The relation between experts, mediators, and laypersons is broadly studied and described through the STS literature. Dumit (2004) mentioned how this threefold relation could bring a sort of redefinition and production of the scientific facts, so recreating an objectivity that will be suitably accepted by the public. The objectivity depicted in Dumit's self-fashioning theory (2004) is an example of how our minds as well as our body capacities are constructed through what we read and listen to. The self-fashioning theory underlines how certain issues and behaviours are so much embedded in our society that they cannot be analysed outside of it. Dumit's analysis of the PET case shows how theories, machineries, and assumptions regarding the brain scans are transforming and recreating a complete new imaginary about our minds. Eventually we are strongly influenced by those medical assumptions, so that PET outcomes affect our behaviour and decisions.

A further example, Miller's syphilis case study. As stated by Miller (1975) the diagnosis/analysis approach in the case of syphilis, appears to fit particular problems, but those methods are constructed to fit in those problems, by creating results constructed and made up as objective. Those tools are clearly techniques of self-governing and intervention, which recreate an imaginary of technicality, purity, and objectivity.

After arguing about the problematic sides of economics, I would like to propose and analyze a relevant economic example that could be understood and analysed in the same way of Miller's syphilis or Dumit's PET.

4. The spread as economical medicalization

The example to illustrate the phenomenon of economical medicalization is the Spread, a well-known buzzword in Italy as in Spain, Greece, Portugal, and Ireland. Knowledge about the Spread has been growing over the past three years; the interest rate Spread is mainly used to subtract the Federal funds rate (the rate

that banks charge one another for overnight loans) from the yield on the 10 year of every nation Treasury bond. The interest rate named as Spread is a mathematical difference between a risk-free investment, such as a Treasury security, and a risky investment, such as a corporate bond. The Financial institutions define the interest rate “Spread” as the difference between the interest rates paid on deposits and the higher interest rates charged for various loan products.

In few words, the Spread is the interest rate that should foresee recession. In Europe the Spread is mostly used as the differential between Germany and the other European nations. And it is constructed from the difference between a given nation (Italy, Spain, France, Greece and so on) Treasury bonds and German Treasury bonds. The German bonds are indicated as the most valid and less risky Treasury bonds in Europe, and for this reason they are used as the term of comparison with all the other European nations.

My claim is that this indicator is a constructed tool that produces results and assumptions made to fit in our society and used to shape it. This is an explicit example of economical medicalization: no matter what policies or decisions will be taken, economics will make up them through its simplifications, representations, numbers, and measurements. Rather than representing the (constructed) objectivity of economics, the Spread could be seen and understood as an explicit example of technique of self-governing and intervention, aimed at recreating an imaginary of technicality, purity and objectivity.

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