

ECONOPHYSICS AS A PANACEA TO INSECURITY AND ECONOMIC CHALLENGES IN NIGERIA

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Abstract

This paper aimed at reviewing the role of Econophysics in solving insecurity and economic challenges in Nigeria. Econophysics is a field in science designed to study the dynamic behavior of financial and economic markets. It is an interdisciplinary research field, where the tools of Physics are applied to understand the problem of economics. It is reviewed that “Insecurity is the state of fear or anxiety stemming from a concrete or alleged lack of protection.” It refers to lack or inadequate freedom from danger. This implies that insecurity is an absence of peace, order and security. Economic challenges include economic slow-down featuring low output, liquidity and unemployment. This has resulted to numerous bankruptcies, reduced amounts of trade and commerce as well as highly volatile relative currency value of fluctuations, mostly devaluations, financial crises and bank failure which results into high level of insecurity. The application of Econophysics education will help in proper organization, coordination and marketing of business which can enhance self-employment and consequently combat insecurity. Hence, recommendation was made that Econophysics education should be taught in our tertiary institutions for equipping and preparing students for Econophysical challenges with a bid to tackling the menace of global economic recession.

Keywords: Econophysics, Physics, Economic, Insecurity.

Introduction

Econophysics is known as the *Physics of finance*. It is the study of dynamical behavior of financial and economic markets. Econophysics is a new area developed recently by the cooperation between Economists, Mathematicians and Physicists. The origins of the word, which combines the names of the two disciplines Economics and Physics, are the result of Physicists starting to apply statistical Physics to finance: (high-frequency finance, financial risk and (correlations, and complexity in finance) (Olatunbosun, Fajiwe, & Olajide, 2012). Econophysics education can be termed to be a construct in science education which is

designed to study the dynamic behaviour of financial and economic markets. In a broader sense, it can be referred to as a field in science education which improve understanding of mathematical models from physics to explain economic and financial behaviour on the basis of information, instructions and objective advice that enhanced the development of skills and confidence of learners in strengthening information about financial and economic markets on the basis of good information. (Olatunbosun, Fajiwe, & Olajide, 2012).

Insecurity refers to the state of fear, anxiety, restlessness and uncertainty, stemming from lackadaisical attitude of our

disgruntled and greedy politicians, militants. The implication is that Nigeria symbolizes unsafe place of abode and has also been included among one of the terrorist countries of the world. Therefore, investors, foreigners, expatriate and even indigenes of Nigeria are scared about investing and committing their hard-earned resources in lucrative businesses in Nigeria. (Adeleke, 2013). As such this is to find out the role of Econophysics in combating insecurity in Nigeria.

Conceptual Clarifications

Meaning of Physics

According to Norwegian University of Science and Technology (NTNU, 2016), Physics is a natural science based on experiments, measurements and mathematical analysis with the purpose of finding quantitative physical laws for everything from the Nano world of the micro cosmos to the planets, solar systems and galaxies that occupy the macro cosmos. The laws of nature can be used to predict the behavior of the world and all kinds of machinery. Many of the everyday technological inventions that we now take for granted resulted from discoveries in physics. The basic laws in physics are universal, but physics in our time is such a vast field that many subfields are almost regarded as separate sciences. The early Greeks established the first quantitative physical laws, such as Archimedes' descriptions of the principle of levers and the buoyancy of bodies in water. But they did not actually conduct experiments, and physics as science stagnated for many centuries. By the 17th century, however, Galileo Galilei and later Isaac Newton helped pioneer the use of mathematics as a fundamental tool in physics, which led to advances in describing the motion of heavenly bodies, the laws of gravity and the three laws of motion. The laws of electricity, magnetism and electromechanical waves were developed in the 1800s by Faraday and Maxwell, in particular, while many others contributed to our understanding

of optics and thermodynamics. Modern physics can be said to have started around the turn of the 20th century, with the discovery of X-rays (Röntgen, 1895), radioactivity (Becquerel, 1896), the quantum hypothesis (Planck, 1900), relativity (Einstein, 1905) and atomic theory (Bohr, 1913). Quantum mechanics (Heisenberg and Schrödinger), beginning in 1926, also gave scientists a better understanding of chemistry and solid state physics, which in turn has led to new materials and better electronic and optical components. Nuclear and elementary particle physics have become important fields, and particle physics is now the basis for astrophysics and cosmology (Usman & Abubakar, 2019).

Meaning of Economics.

The word 'Economics' originates from the Greek work '*Oikonomikos*' which can be divided into two parts: '*Oikos*', which means 'Home', and '*Nomos*', which means 'Management'. Thus, Economics means 'Home Management'. The head of a family faces the problem of managing the unlimited wants of the family members within the limited income of the family. In fact, the same is true for a society also. If we consider the whole society as a 'family', then the society also faces the problem of tackling unlimited wants of the members of the society with the limited resources available in that society. Thus, Economics means the study of the way in which mankind organises itself to tackle the basic problems of scarcity. All societies have more wants than resources. Hence, a system must be devised to allocate these resources between competing ends

BrainKart (2016) lamented that, Alfred Marshall define: "*Economics as the study of man in the ordinary business of life. It enquires how he gets his income and how he uses it. Thus, it is on the one side, the study of wealth and on the other and more important side, a part of the study of man*". Marshall, therefore, stressed the supreme importance of man in the economic system. Marshall's

definition is considered to be material-welfare centred definition of Economics.

Ronald and Robert (2015) define economics as, giving two interpretations, the first, *"Economics examines how to make choices well."* They also say, *"Economics studies the allocation of limited resources in response to unlimited wants."* To say economics examines how to make choices well can be questioned due to the nature of society, what is making a choice well, does rationality come into it, what is a rational decision, are humans rational.

Meaning of Econophysics:

The Econophysics is regarded as an interdisciplinary research field where the tools of physics are applied to understand the problem of economics. The term Econophysics was introduced in 1995 at the second Statphys-Kolkata conference in Kolkata (formerly Calcutta), India by the Physicist H. Eugene Stanley, who was also the first to use it in print (Olatunbosun, Fajiwe, & Olajide, 2012). 'Econophysics' perspective: applies to economic phenomena various models and concepts associated with the physics of complex systems e.g. statistical mechanics, condensed matter theory, self-organized criticality, microsimulation, (Collier & Hooker 2015).

Modern econophysics was initiated by physicists, who perceived the possibility of solving economic problems using methods applied in natural sciences. From the very beginning, the development of this science was based on international cooperation and using Kuhn's language scientific communities formed by physicists, including Polish physicists. Attempts by a Polish researcher, Rawita Gawronski, who tried in 1958 to arouse the interest of the scientific community of Polish economists in the application of methods of physics in research on markets and economies, were entirely ignored. Nobody remembers his work today and he is not referred to. Thus, econophysics found its place immediately in the centre of

the mainstream economics.

Generally, there are no differences between the paradigm of the world econophysics and the paradigm of the Polish econophysics. There is also a paradigmatic correspondence between econophysics and the mainstream economics, but only in a local sense, i.e. as regards specimens.

There is no paradigmatic correspondence between econophysics and the mainstream economics in the global sense. Spontaneously developing econophysics has forced a change of a disciplinary matrix into a trans-disciplinary matrix, but it seems that the process occurs in a slightly different way in the world and in Poland (Collier & Hooker 2015).

Concept of Insecurity:

The word "insecurity" has myriads of connotations. It signifies danger; hazard; uncertainty; lack of protection, and lack of safety (Achumba, Ighomereho, and Akpor-Oboro, 2013). Insecurity is defined as the state of fear or anxiety stemming from a concrete or alleged lack of protection." It refers to lack or inadequate freedom from danger. This implies that insecurity is an absence of peace, order and security. They further explained insecurity from two perspectives. Firstly, insecurity is the state of being open or subject to danger or threat of danger, where danger is the condition of being susceptible to harm or injury. Secondly, insecurity is the state of being exposed to risk or anxiety, where anxiety is a vague unpleasant emotion that is experienced in anticipation of some misfortune. These definitions of insecurity underscore a major point that those affected by insecurity are not only uncertain or unaware of what would happen but they are also vulnerable to the threats and dangers when they occur. People engaged in business activity, either directly or indirectly, to satisfy unlimited human wants. Therefore, business has become part and parcel of human existence in particular and global world in general. United Nations

Development Programme (1994) defines Security as protection from hidden and hurtful disruptions in the daily activities, at homes, offices or communities etc. (Akonbede & Udama2013).

Security Challenges in Nigeria.

Adagba (2012) defined security “as a reasonable level of predictability at different levels of the social system, from local communities to the global level” The understanding here is that at the global level. There is a presence of an order which is predicated upon the predictability of the behavior of other members within the system. At local level, security thus includes the ability of the state to predict the likely implication of any particular condition on its citizens. The recognition lies squarely not on the state's ability to enforce law and order, though that may be important, but in creating the necessary socio-economic conditions that guarantee fair amount of predictability on the behavior of its citizens. Aliyu (2012) conceived and present security as a state of reduced or contained threats and tension in which the stability of a state is not in an imminent danger of disruption from within and without. Stability is here viewed as the order, regularity and pattern, which characterized the state's condition over an extended period.

Aliyu (2012) critically outline three important variables that define the nexus of the causes and problems militating against National security issues in Nigeria which he cited as poverty, inequality and mass unemployment. The idea, it is worth mentioning here, is to show that these indicators are actually the fundamental security threats which have engendered insecurity in the country today.

Unlike, in advanced societies where economic power offers political leverage, in Nigeria the reverse obtains, with one dominant social class determining, to use the words of Harold Lasswell, who gets what, when and how. Therefore, economic

problems including poverty, unemployment and inequality, structural politics of exclusion, and a discriminating social system in which an individual will never realize his potentials without a “godfather” provide the cannon fodder of radicalization, social tension, conflict, violence, and the ultimate break down of law and order as we are presently witnessing in Nigeria today (Aliyu, 2012 cited in Oyeshola, 2005).

Alozieuwa, (2012) on his own view showcase terrorism, armed robbery, kidnapping and other criminalities as a quick survey of the security challenges in Nigeria. He argued that Militants in the southeastern parts of the country also contribute, in no small measure, to the security challenges facing the country.

Impacts of Econophysics on Insecurity and Economic challenges in Nigeria.

The operations of various insecurity monsters affect the economic activities of both the crisis region and non-crises region. About 20 years ago, a few Econophysicists got interested in applying some ideas and concepts from physics to solve problems in finance and economics as follows

(1) More than anything, econophysicists have helped to establish empirical facts about financial markets; for example, that the probability of large market movements (up or down) decreases in accordance with an inverse cubic power law in many diverse markets (stocks, bonds, currencies, derivatives, and in many nations). This is a very simple mathematical pattern and captures in precise form the so-called “fat tails” of market fluctuations the natural occurrence of large market upheavals much more frequently than expected This is important for proper risk management, among other things. Also, if you want to make theories to explain how markets work, you first need to determine precisely how they do work with data, to establish clearly what needs to be explained (Trincado & Vindel, 2015).

(2) Econophysics have also identified instructive links between markets and other natural phenomena. For example, in the period following a large market crash, markets show lingering activity which follows the famous Omori law for earthquake aftershocks (events become less likely in simple inverse proportion to the time after the main shock). Such connections indicate that the explanation of such market dynamics may well not depend on facts specific to finance and economics; that more general dynamical principles may be involved (Ayers, and Collinge, 2005).

(3) Econophysics also helped develop more realistic models of markets, here often in collaboration with economists. It demonstrated how fat-tailed dynamics could arise naturally in models representing a market as an ecology of interacting adaptive agents. Models of this kind have since become widespread and used to perform some of the most sophisticated tests of policy proposals -- for the idea of a financial transactions tax, for example, as currently planned by the European Commission (Zafirovski, 2003).

(4) Work in econophysics through the study of minimal models such as the minority game - has also revealed surprising qualitative features of markets; for example, that a key determinant of market dynamics is the diversity of participants' strategic behaviour. Markets work and fairly smoothly if participants act using many diverse strategies, but break down if many traders chase few opportunities and use similar strategies to do so. Strategic crowding of this kind can cause an abrupt phase transition from smooth behaviour into a regime prone to sharp, virtually discontinuous price movements (Ayers & Collinge, 2005).

(5) Yale economist John Gean Akoplos has argued for two decades that a key variable driving major economic booms and busts is the amount of leverage used by financial institutions. It goes up in good times, down in bad. Since the financial crisis, controlling

leverage has become a major new focus of financial regulators, and their work may well benefit from physics-inspired models of the dynamics of markets in which firms compete with one another through the use of leverage. A notable study by Gean Akoplos and two physicists found that such a market will naturally become unstable as leverage increases beyond a threshold. This boundary of instability is not at all obvious to market participants or made evident by standard economic theories. Such models may well help improve macroeconomic policy and financial regulation (Adeleke, 2013).

(6) Econophysics also helps clarify other fundamental sources of market instability. For example, standard thinking in economics holds that the sharing of risks between financial institutions through derivatives and other instruments - should both make individual firms safer and the entire banking system more stable. However, a collaboration of economists and physicists recently showed that too much risk sharing in a network of institutions can decrease stability. An over-connected network makes it too easy for trouble originating in one place to spread elsewhere (Zafirovski, 2003).

(7) Econophysicists have examined the relationship between market efficiency and stability. In economic theory, markets become more efficient, more able to pool collective wisdom and price assets accurately -- as they become more "complete," i.e. equipped with such a broad range of financial instruments that essentially any trade can be undertaken. The econophysics work has shown, however, that completeness brings with it inherent market instability, a possibility never raised by standard economic analyses (Trincado & Vindel, 2015).

(8) The complexity of today's markets makes it essentially impossible for financial institutions to judge the risks they face, as the health of any decent-sized financial institution depends on a vast web of links to other institutions about which little may be known. To improve risk judgement,

econophysicists have recently developed a network measure called Debt Rank which aims to cut through network complexity and reveal the true riskiness of any particular institution. This idea may also provide a natural means for making markets more stable, for if regulators made Debt Rank results public, then anyone would, at a glance, gain a much more accurate view of the true risks associated with any bank. If banks seeking to borrow funds were forced to do so from the least risky banks, systemic instability would be improved. This is, for now, a highly speculative idea, but one that clearly has promise (Trincado & Vindel, 2015).

Conclusion

Nigeria has been hit by insecurity and economic challenges. Since econophysics has been dealing with financial markets from the moment of its emergence, it has also been involved with the most critical issues in

economics. Financial markets rule all other markets, exerting a global effect on them. For this reason, all economic events occurring in those markets are recorded. Without this, it would be not possible to conduct any economic policy. The task of econophysics is to gain an impact on economic processes, which cannot be achieved without convincing economists that econophysics models have better predictive abilities and demonstrate better understanding of reality than previous economic models.

Recommendation

It is recommended that: Econophysics should be taught in our tertiary education for equipping and preparing learners for econophysical challenges, such as inflation, reduced consumer's confidence, price instability and rising cost and unemployment. Seminars and workshops should be organized by Government at all levels on econophysics.

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