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Chaos Theory in Finance

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Abstract

The theory of chaos is well suited for the understanding of the financial perspectives, because the behavior of the financial market is predetermined whole number of circumstances that are relative to the market can be caused by both internal and external reasons. The theory of chaos for decades was one of the most acute topics in science, but so far it has not been sufficiently used in financial theory and practice. In the course of growing instability and increasing the role of randomness in financial markets, attention to this theory is growing. In this connection, it is important to determine the possibilities and limits of its application in finance, as well as its relation to traditional economic theories. The article attempts to clarify some points related to the possibility of using chaos theory in finance. In particular mechanism of its application to the macro and micro processes, as well as the use of certain methods and instruments such fractal and stochastic processes, prediction.

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1. Introduction

In recent years, financial institutions were pushed into an unknown territory after unprecedented global trends, such as extremely low and negative interest rates, low commodity prices, and especially hydrocarbons, new technologies and the growing number of cyber-attacks. The traditional banking business model, built on correspondent relations,

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undergoes modernization, while the bank-to-client relationship is passed in an environment where nothing is "ordinary" and a lot of surprises. In general, there have been important disruptions in the payment industry, regulation, macroeconomic risk, capital accumulation and investment, and financial intermediation. As a result, financial markets have changed significantly and most importantly their uncertainty has increased markedly. First of all, innovations growth has led to the constant anticipations of the unexpected. Secondly, there is a transformation of financial markets: on the one hand, numerous nonfinancial services and entities are introduced into the financial sphere, on the other hand, financial activity began to merge with the information, trade and other economic and cultural activities. Thirdly, finance is faced with the problem of big data. As a result, further development of finance is associated with their digitization and further introduction of mathematical techniques and models into the industry. Especially high expectations exist for the application of the theory of chaos in the study of financial markets and the organization of work on them. But this requires a long process of escape from habitual modes of thought, models and expressions.

The theory of chaos for decades has been one of the hot topics in science, but so far has had almost nothing to do with finance. At the present time, timid attempts are made to elucidate the possibilities and outline the limits of its application in finance [10], as well as to conduct a watershed between traditional economic theories and chaos theory [1]. In the article attempts are made to clarify some points connected with the possibility of using the theory of chaos in financial theory and practice.

2. Macroeconomics and microeconomics approaches to the financial chaos

The theory of chaos can be represented in the form of an appropriate section of knowledge suitable for searching order in disorder. Initially, this theory was used to develop tools for trading stocks[7], but now the scope of its application in finance has expanded[5]. The main arguments are: (1) chaos theory is competitive and may well become a "convenient" theory of the financial market, (2) traditional finance does not take into account dynamics, while chaos theory is built on the dynamics of the system, which allows the theory to be brought closer to reality, and (3) Instability is associated not only with the crisis, to which the theory of chaos in the financial market is applied, but also from the hypothesis of Minsk's financial instability, which assumes instability of the financial market as such and in many respects links it to its innovativeness. Overall, these arguments are based on the positive experience of applying the theory of chaos to the analysis of the financial market.

If complexity consists of simpler and smaller systems, a chaotic/complex system can be analyzed through that ones. There are some cases that prove that there is a base system/sequence outside chaos or chaos consists of some simple ordered systems. For example, during the financial crisis of 2008-2009, the overwhelming majority of banks were in order - they were able to organize their activities on a market basis or with the help of the state, but in general the financial markets were in a state of chaos.

An analysis of the reasons for low interest rates can make an interesting and rather simple conclusion: the relative excess of free capital and the relatively prosperous period of the economy (even in view of recent critical surges) affected the interest rate cut. In these conditions, the state has nothing left to do to maintain and push forward this peculiarity of the market. Mathematically, it is quite easy to prove the relationship between the fall in the interest rate and the growth of the free money supply, which seeks active use and growth. And this conclusion follows from both the theory of an effective market and the theory of chaos. So, the market is determined by supply and demand, as the supply of capital grows much faster than the growth of the economy, then the conclusion is quite unambiguous in favor of low interest rates. Nevertheless, this conclusion is not typical for traditionalists.

Financial chaos is often perceived as a mess that often causes prostration and reckless actions. As a result, it increases the helplessness that prevents correct decisions. At the same time, financial chaos is composed of a complex system in which there are various somehow-ordered subsystems that are in some way structured and there are interactions between them of some sort. In general, in financial chaos, the order-to-disorder ratio is quite problematic and largely depends on the specific situation on the market. The fact is that the extreme points of the cycle – crisis and boom – can not be characterized as a market disorder, but also they do not fit the definition of order. Rather, it is characterized by the notion of "financial chaos." In this case, they must be analyzed from the standpoint of the theory of financial chaos. At the same time in the financial science efficient market theory is more commonly used for analysis of the financial market as a whole, according to which any deviation from the balance of the market are considered to be market anomalies. In this regard, it is very important to clarify the place and role of both theories in

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