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THE BUTTERFLY EFFECT AND POSSIBILITY OF FORECASTS IN ECONOMY

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Aim and task. The aim of this article is forecasting the development of economic events and the impact of tiny changes on the state of the entire system as a whole. To achieve the aim the history of the origin of the butterfly effect is studied and the possibility of applying this effect to the markets is analyzed.

Object and subject of the research. The object is the forecasting of economic processes in international markets. The subject of the research is the concept of the butterfly effect and globalization.

Research methods. During the research the following methods were used: analysis, synthesis and generalization.

Scientific novelty and practical value of the obtained results concern the importance of the concept of the butterfly effect for financial world as globalization continues to increase. Volatility in one small area of the international markets can grow rapidly and bleed into other markets, and a hiccup in one corner of the international markets can have global consequences. Improvements in technology and wider access to the Internet has increased the degree to which international markets influence each other. This has led to more episodes of extreme market volatility.

Research results. The butterfly effect is the idea that small things can have non-linear impacts on a complex system. The concept is imagined with a butterfly flapping its wings and causing a typhoon. Of course, a single act like the butterfly flapping its wings cannot cause a typhoon. Small events can, however, serve as catalysts that act on starting conditions. In Chaos theory scientists talk about what is popularly called the butterfly effect, the idea that a butterfly's wings might create tiny changes in the atmosphere that could alter the path of a tornado. It is the idea that small differences in one area, can lead to widely diverging outcomes elsewhere. And in the financial world what has been happening in Europe has been having just such an effect.

The butterfly effect has become well-known in popular culture, and the concept has clear applications to finance. It and chaos theory may provide a partial explanation for the unpredictability of capital markets.

The phrase "the butterfly effect" was first coined during a scientific meeting in 1972. Scientist Edward Lorenz gave a talk on his work regarding weather prediction models. The phrase suggests that the flap of a butterfly's wings in Japan could create a small change in the atmosphere that might eventually lead to a tornado in Texas. Lorenz studied how small differences in initial values led to large differences in weather models at the Massachusetts Institute of Technology. As a low-profile assistant professor in MIT's department of meteorology in 1961, Lorenz created an early computer program to simulate weather. One day he had entered an initial condition in a weather model as 0.506, rather than the precise number of 0.506127, which resulted in a completely different and unexpected weather pattern. That tiny alteration utterly transformed his long-term forecast, a point Lorenz amplified in his 1972 paper, "Predictability: Does the Flap of a Butterfly's Wings in Brazil Set Off a Tornado in Texas?"

In 1963, he wrote a paper on this concept, titled "Deterministic Nonperiodic Flow." The butterfly effect concept shows how difficult it is to predict dynamic systems, such as weather and financial markets. Study of the butterfly effect has led to advances in chaos theory.

Capital markets go through alternating periods of calm and storminess. However, they are not always chaotic, and the shift between calm and chaos is often sudden and unpredictable. Some believe that these concepts of chaos theory can be used to understand how financial markets



operate. Markets tend to grow bubbles that eventually pop with drastic consequences. Financial bubbles often grow because of positive feedback. When investors make money during a rise in the financial markets, other observers think the investors must have made a smart decision, which leads the observers to invest their own money in the markets. The result is more buying and stock prices going higher. The positive feedback loop leads to prices beyond any logical or justifiable level. The loop eventually ends, and the last investors in are left hanging with the worst positions.

Although technology has increased the impact of the butterfly effect in global markets, there is a long history of financial bubbles going back to the tulip market bubble in Holland during the 17th century. Tulips were a status symbol among the elite. They were traded on exchanges in Dutch towns and cities. People sold their belongings to begin speculating on tulips. However, prices began to drop and panic selling ensued. There are more recent examples of bubbles. On October 1987, known as Black Monday, the Dow Jones Industrial Average (DJIA) lost around 22% in one trading day, the largest percentage drop ever for that market. Therefore, we can say that over time the markets will be increasingly interconnected as the technology continues to improve, and the butterfly effect will remain a driving force in global markets.

Marketplaces are, in essence, chaotic systems that are influenced by tiny changes. This makes it difficult to predict the future, as the successes and failures of businesses can appear random. Periods of economic growth and decline sprout from nowhere. This is the result of the exponential impact of subtle stimuli – the economic equivalent of the butterfly effect. Breuer explains: “We live in an interconnected, or rather a hyper-connected society. Organizations and markets ‘behave’ like networks. This triggers chaotic (complex) rather than linear behavior”. Preparing for the future and seeing logic in the chaos of consumer behavior is not easy. Once-powerful giants collapse as they fall behind the times. Tiny start-ups rise from the ashes and take over industries. Small alterations in existing technology transform how people live their lives. Fads capture everyone’s imagination, and then disappear.

In this situation businesses have two options: build a timeless product or service, or race to keep up with change. Many businesses opt for a combination of the two. For example, Doc Martens continues selling the classic 1460 boot, while bringing out new designs each season. This approach requires extreme vigilance and attention to consumer desires, in an attempt to both remain relevant and appear timeless. Businesses leverage the compounding impact of small tweaks that aim to generate interest in all they have to offer.

We like to think we can predict the future and exercise a degree of control over powerful systems such as the weather and the economy. Yet the butterfly effect shows that we cannot.

Conclusions. We investigated the history of the origin of the butterfly effect studied and the possibility of applying this effect to the markets. We tend consider the butterfly effect to be an interesting experiment for us, but the most forecasts made for the short term and related to macroeconomic indicators, both for individual countries and for entire regions, were not justified. The second conclusion of the theory of chaos is that the reliability of forecasts decreases with time. From the butterfly effect it follows that long-term forecasting is doomed to failure.

Keywords: *butterfly effect, globalization, capital markets, financial bubbles.*

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