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Stock market performance and manufacturing capability of the fifth long-cycle industries

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Abstract

Nearly 80 years ago Russian economist, Kondratieff, introduced the theory of economic long-cycles. Since from the start, this theory has faced controversial acceptance; for example, in the future studies researchers have used it to develop further specific applications, but in economics some leading scientists reject the entire idea still. Although, this theory is well developed, there does not exist research from the examination of relation between stock market performance, and leading innovation cycle industries manufacturing capacity addition and utilization. Based on the system dynamics model, called world dynamics, capacity addition and utilization have earlier been identified as the leading indicators of long-cycles.

Our research results in this paper indicate that capacity utilization of computer manufacturing in US, and in some cases of US semiconductors, has influence on the stock market indexes of Nasdaq, S&P500 and Dow. However, it should be noted that capacity investment changes of these three examined industries (semiconductors, computers and telecommunications) are involved in the proposed regression models too. Further analysis reveals, that we are able to build regression models for all three stock indexes, containing only two variables. Notably, these two variables are capacity addition change in semiconductors and computers. This observation further increases discussion, whether we should be interested only about capacity addition changes of innovation wave industries, and possibly give secondary importance for the utilization.

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1. Introduction

We are currently living from the fruits of the fifth innovation wave, which gave the needed technological base for the fifth economic long-cycle; as logic was originally proposed by Russian economist Kondratieff. Despite of the significant amount of criticism towards Kondratieff's work in his home country at the time as being reported by Garvy [1], and especially some technical flaws (e.g. wage index deflated by wholesale prices makes the entire long-cycle to disappear), this theory has received considerable attention in the scientific research. For example, *Futures* journal devoted whole issue in the early 1980s for this issue alone.

Research has faced difficulties to identify the fifth innovation wave "leading industries", and especially its starting year (or the end of fourth cycle). Explanation for this lack of direction could be explained by the foundation of Kondratieff's [2] long cycle theory. In his seminal article, the most important data series to verify this new theoretical construction was price development of France, UK and US, starting from the time of industrial revolution. Kondratieff further argued that long-cycles are only a by-product of industrial capitalistic system. However, Goldstein [3, pp. 195–210] has shown that long wave type of behavior has been around since the early days of price index recording; his data starting from 16th and 17th century strongly supports K-wave theory. However, if the situation is compared to the development occurred after the birth of the fourth long wave, we could identify that in all of the developed countries price indexes have increased considerably. For example, in year 1945 consumer price index of US was approx. 50, and at the moment the very same index has reached level of 580. Therefore, cycles seem to have diminished; Ayres [4] shares the same opinion that in recent decades the effects of long-cycles have severely weakened.

However, economists have found that the use of price changes is now repeating the well-founded long-cycle pattern [5,6]. So, in one sense long-cycles are history (as compared to ordinary life), but in other way around, they are pretty useful in economic research and model building purposes.

In the first appeared article Kondratieff [7] argued that economics is more like a dynamic model, changing with respect of time, and cycle theories follow pattern *prosperity—crisis—depression*. One year after Kondratieff [2] introduced long wave theory in more detailed manner, and identified *prosperity* part takes approx. 24–25 years, while decline showed more variation, and it was impossible for him to give exact number for the wave length, since the first long wave lasted for 60 years, and the second one for 47 years. Ayres [5,6] presented comprehensive analysis concerning this length issue, but still the same uncertainty exist. However, it could be generalized that long-cycles have 25 years up-swing, and similar length of downward movement. Devezas and Corredine [8] represent impressive analysis of biological systems (e.g. development of human from newborn, ancient civilizations, economics, solar system), and argue that long-cycle length to be around 54 years. Earlier Marchetti [9] has shown that even infrastructures follow the same cycle length. Other contemporary research works in the field has not found any opposite directions to cycle duration (e.g. [10,11]).

As uncertainties exist in both of these cycle phases, total length shows higher variation. Thus, on possible solution and explanation for long wave length was provided in Dator's [12] research; "Historical Societal Generation" has been estimated to have duration of 39.2 years ($\pm$4.2 years). Researchers in social science have strong belief that this is the driving force of evolution, including also economics (Table 1).