

2.8. On a new class of cyclic historical processes

The earlier chapters of this monograph referred to a historical process in a general sense, which means variability fixing in specific factors for specific positions. The position of civilizational identity of a nation. The position of economy. The position of demographic development. Position of social development and so on. These quite material potentials or positions reveal cyclic time dependence, also of harmonic nature. Frequency spectrums were obtained for various historical processes, development cycles were shown to have various periods (frequencies) in the range between the longest (thousands years up) to the shortest with duration of decades or even several years. Some periods were compared to mechanisms resulting in cyclicity itself. For example, civilization value identity depends on generation interaction, first of all within a family while taking over knowledge, traditions, customs, which explains frequency spectrum with peaks related to generation age (grandparents, parents, children).

Oscillatory or cyclic nature of development (meaning variation of welfare factors) was practically proved to be connected with *interrelation* of competing principles. These principles are likely to act as various types of social energy (traditionalism and modernism, for example) in other *motivators* of social energy. The issue of possible motivators, or moreover interrelation agents, types of their relation leaves much for research.

Thereupon hypothetic possibility for cyclicity of competing agents' interrelation result as well as cyclic variability of relation or interrelation process itself is of high interest. It's rather obvious that cyclicity of agents' relation may result in cyclicity of the abovementioned positions. Revealing cyclicity of the relation may provide a way to understand the nature of historical cyclicity of development.

The study¹ analyzed the size of cause-and-effect relation of various factors for Russian demographic development and demographic result. The period under

¹ Vladimir I. Yakunin, Stepan S. Sulakshin, Vardan E. Bagdasaryan, State policy for Russian demographic turnaround. Moscow, Nauchniy Expert, 2007.

analysis covered the XX century. The factors analyzed included ideological and spiritual position of the Russian society, civilization value of Russian identity, quality of state policy in relation to demography and level of Russian people welfare. Figure 2.8.1. shows ratio for so-called Russian vitality index (Figure B. 10) to the foregoing factors. There stands out the fact that material factor with a time lag (factor influence delay) does not declare oscillating nature, and the relations of the remainder three factors with demographic result declare this nature. The physical meaning of almost sinusoidal dependence is in cycling change of the strength in factor-result relation in the course of time. It has to do with interfamily relationship in a three-generation family.

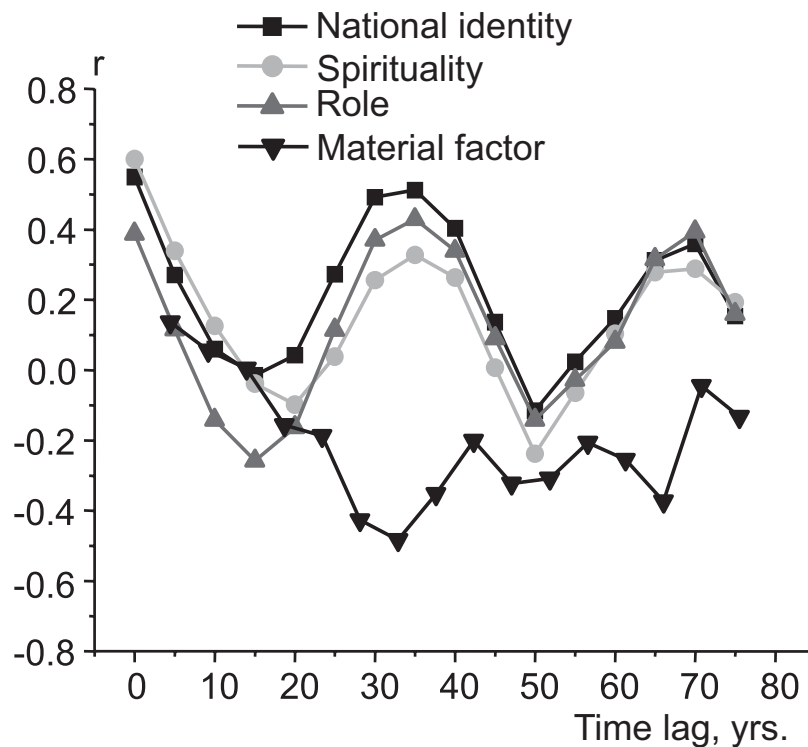


Figure 2.8.1. Ratio for Russian vitality index (Figure B. 10) to demographic development factors (specified).

The other example of two principles conflict, which generates cyclicality, is a procedure for government control over natural monopolists services (Figures 2.8.2–2.8.4). Competing principles here are a monopolist’s wish to raise prices and the contrary wish of a state to control the raise by forced tariffs regulation.

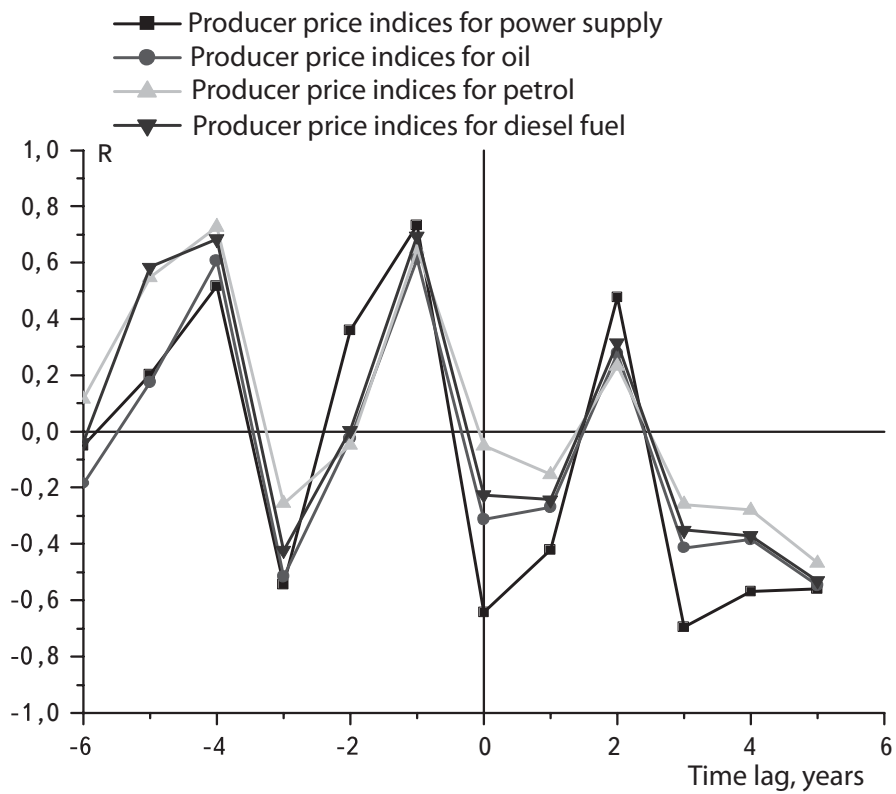


Figure 2.8.2. Index of correlation between price indices for power supply, oil, petrol, diesel fuel and inflation index.

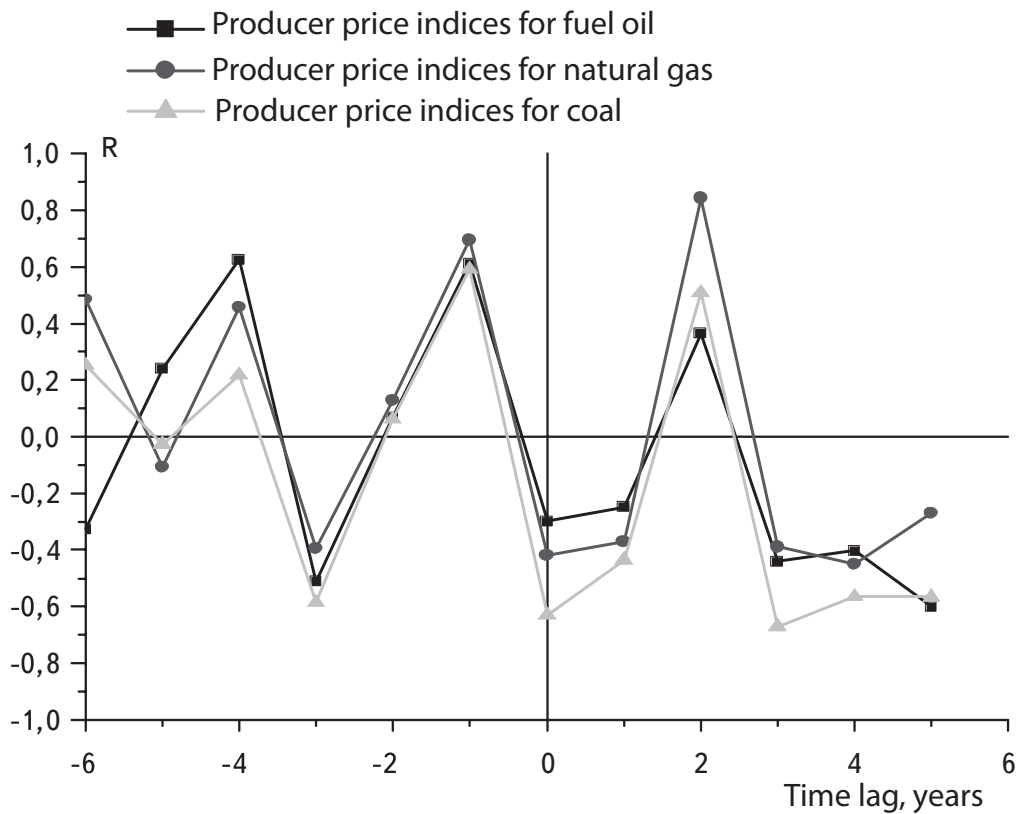


Figure 2.8.3. Index of correlation between price indices for fuel oil, gas, coal and inflation index

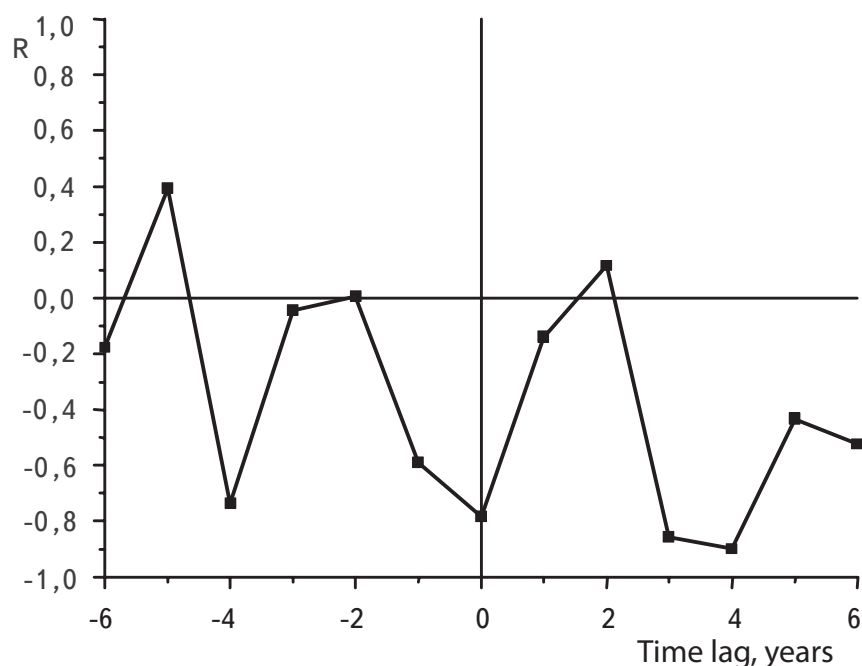


Figure 2.8.4. Index of correlation between tariff indices for freight service by min transport and inflation index

Three-year cyclicity of cause-and-effect relation is evident. In theory a mechanism causing cyclic variability of factor relation can be determined.

Tariff regulation in natural monopolies by the method of marginal pricing is about adjusting tariffs for a following year using a multiplier having regards to forecast value of inflation index, which in turn is strictly connected with apparent inflation for a preceding year^{2, 3}.

This relation can be generally described as follows

$$Y_{n+1} = Y_n \times X_n;$$

where X and Y are time functions for inflation and adjustable tariff accordingly.

² Regulations on government control over tariffs for accessible to the public telecommunications and postal services. Approved by RF governmental regulation № 637 dated October 24, 2005.

³ Formulas for adjusting prices (tariffs) for electric power supply applied in electric power purchase and sale agreements, application procedure and procedure for specifying target and actual indices used in formulas. Order № 348-э/12 by the Federal Tariff Service dated December 5, 2006.

In this case the following relation can be built:

$$Y_{n+k} = Y_n \prod_{i=1}^k X_{n+k-1}$$

Then the required correlation index with time lag (which in discrete case is described with k index) shall have the following form:

$$R(k) = \frac{\sum_{n=1}^N x_n y_{n+k} - \frac{\sum_{n=1}^N x_n \sum_{n=1}^N y_{n+k}}{N}}{\sqrt{\sum_{n=1}^N x_n^2 - \frac{\left(\sum_{n=1}^N x_n\right)^2}{N}} \cdot \sqrt{\sum_{n=1}^N y_{n+k}^2 - \frac{\left(\sum_{n=1}^N y_{n+k}\right)^2}{N}}}$$

where n and i — current indices, N — number of years.

With annual smoothing of time dependence between inflation index and tariff curve they represent steadily and weakly changing curves. For the purpose of this analysis they can be described as linearly dependent on time.

$$Y_n = A \times n$$

$$X_n = B \times n$$

These model calculations result in the following quasiharmonic dependence (Figure 2.8.5.).

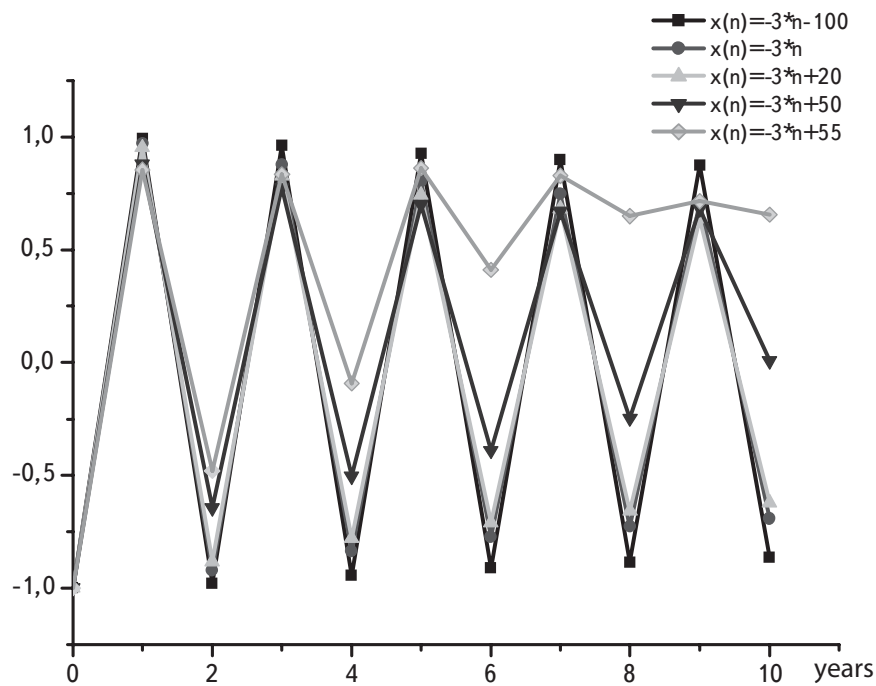


Figure 2.8.5. Model calculation of correlation index for inflation index adjustable tariffs of natural monopolies and inflation index, ($y(n)=2*n$)

The built theoretical model actually shows a harmonic nature of the factor relationship value in the course of time. It should be noted that in this case a factor (determined by an act of government control over tariffs for natural monopoly services) in correlation with inflation index produces the same harmonic effect, though with a less amplitude than in the situation of tariff index (the first derivation) correlation with inflation index. It's only a period that differs. In practice in the situation with tariff index (its first derivative) harmonic period equals to about three years. The «tariff — inflation index» correlation produces a two-year period, which is precisely the model described in Figure 2.8.5.

Mathematically the relation of a tariff with inflation index at its determination likewise determines relation of a tariff index (the first derivative) with inflation index, therefore harmonic shall occur in both cases, which can be observed in practice.

This implies the following resume. First, the method for factor analysis applied by the authors is sensible to subtle relations, which are not identifiable at a superficial glance in the complicated socio-economic system. Second, it enables

revealing a new class of historical variability of a harmonic nature. This is a cyclic variability of binding force for various factors characteristic of human community position and its types and performance. Factor relation cyclicity makes it possible to specify mechanisms, which cause cyclicity of historic development itself in its various aspects.