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# FEATURES OF FORECASTING RETAIL TURNOVER IN CONDITIONS OF INSTABILITY AND GLOBAL FLUCTUATIONS

## ABSTRACT

Real practice and challenges that are formed in the process of modern social transformations under the influence of instability encourage to conduct an active search for a theoretical and methodological platform, based on which retail can achieve in the practice of strategic management retail turnover of adequacy to challenges of stress factors. The article is aimed at carrying out a statistical test of the assumption about the random walk of the retail turnover volume of retail in Ukraine. Economic and statistical methods of analysis and forecasting, methods of logical generalization and mathematical abstraction were used to perform the scientific research. Results of a statistical test of the assumption about the random walk of the turnover volume of retail enterprises in Ukraine confirmed the hypothesis that the aggregate activity of retail enterprises in Ukraine is a random process that does not have regularities (trends). It is substantiated that in the conditions of an unstable external environment, the forecasting of retail turnover should be based on a powerful analysis of the formation of consumer demand for individual goods factors, based on the study of the patterns of change and forecasting of factor indicators, as well as be carried out according to the composition and structure of the turnover with a further summary of its total volume. The confirmation of the hypothesis about the random walk of the turnover volume of retail enterprises in conditions of instability and global fluctuations, which was the basis of the conducted research, made it possible to deny the traditional approach to forecasting, namely the deterministic forecast. For practical application, an approach to forecasting the turnover based on the assessment of the limits (minimum and maximum possible value) with a given reliability for the current perspective is proposed, which ensures the relevance of predictive calculations.

**Keywords:** retail, retail turnover, retail trade enterprises, forecasting, random walk, instability of the external environment

**JEL Classification:** M21, L81, D81

## INTRODUCTION

Determining the position of an individual retail enterprise in the market and, as a result, evaluating the economic efficiency of its operation is carried out by substantiating the possible volumes of turnover. The value of the retail turnover is extremely important and consists in the following: turnover is one of the important macroeconomic indicators of the socio-economic development of the country and a separate region; turnover characterizes the processes that take place in the field of commodity circulation, and is an indicator through the form of the value of consumer goods created in the production process changes; turnover affects the state of monetary circulation in the country, the stability of the national currency, determines the scale of foreign economic activity, budget revenues and other macroeconomic indicators; turnover determines trends in the formation and prospects for the development of supply and demand in the market; turnover characterizes the amount of attracting consumers' monetary income, the scale and level of satisfaction of consumer demand for goods; turnover is one of the important indicators of the standard of living, material and cultural well-being of the country's population; turnover allows to assess the nature of the distribution between the participants of the market process, the linkage and sequence of the stages of commodity

movement, the connections of the production sphere and trade intermediaries, the level and length of commodity movement channels.

In the sectoral economic mechanism, indicators of retail turnover (volume, macrostructure, rates of growth in relative prices, value per capita and per employee) are an integral part of state plans for socio-economic development and characterize important aspects of the Ukrainian citizens' living standard. From this, the main tasks in the field of forecasting the retail turnover at the macro level follow continuous growth of the volume and improvement of the retail turnover structure, the balance between the volume of turnover and the populations' monetary income, on the one hand, and commodity resources, on the other. The primary importance of forecasting turnover for determining the content of programs and plans for the development of the industry, for the formation of a system of plans and budgets at the level of an individual retail enterprise, requires an objective presentation of general conceptual approaches to forecasting and planning its volume and structure in market conditions, taking into account the uncertainty and variability of factors internal and external environment.

Retail turnover is one of the main effective indicators of the economic activity of retail and an important factor in ensuring sustainable economic growth of the country as a whole. Its volumes, structure and dynamics are not only one of the main characteristics of the domestic trade state and an indicator of the need for changes but also allow us to assess the effectiveness of the planned measures for the implementation of the strategic trade development program.

The COVID-19 pandemic and Russia's military invasion of Ukraine have had a significant impact on the lives of ordinary citizens and the functioning of business entities, and the retail sector is no exception. Retail trade companies in force majeure have been faced with the need to rethink previous forecasts and change approaches to the implementation of the prognostic-planning function, including the justification of the future volume of retail turnover. Therefore, the change in the attitude of domestic enterprises to the evaluation and forecasting of turnover gave priority to this issue in research and required verification and improvement of existing methodological approaches.

## LITERATURE REVIEW

With varying degrees of detail, the theoretical and practical aspects of retail turnover forecasting were considered in the works of such scientists as I. Blank, A. Mazaraki, N. Ushakova, L. Ligonenko, I. Smolin, V. Marcyn, Yu. Yakovlev, H. Tarasyuk, I. Vysochyn, David Jobber, Jeff Lancaster, Rozan L. Spiro, William J. Stanton, Gregory A. Rich, Peter Winkelmann, Arsawan I.W.E., and others. In particular, works [1-10] consider theoretical and practical approaches to sales management in the field of retail trade and emphasize the importance of making correct forecast calculations of turnover volumes.

Determining the position of an individual retail enterprise in the market and, as a result, evaluating the economic efficiency of its operation is carried out by substantiating the possible volumes of turnover. Koval et al. [9] put forward a thesis that is also found in the writings of a significant number of other sales management specialists: "Sales forecasting begins with a forecast for the whole industry since the conditions that have developed in it have a huge impact on the sales of any firm operating in this industry. Competition, customer preferences, and other external forces affect each firm's potential sales. Based on the expected sales for the whole industry, the forecaster usually derives the sales potential for a given firm... A forecast is then developed for specific products or markets...".

Since forecasting always precedes planning, it can be considered a sub-function of planning. Forecasting and subsequent planning from the point of view of management means a set of preparatory works for making management decisions related to future events. The forecast in the turnover management system is a preliminary development of multi-variant models of the development of the turnover of a retail enterprise. American specialists Spiro, Stanton & Rich in the field of sales management define sales forecasting as an estimate of the sales volume (in monetary units or physical indicators) that an individual enterprise expects to achieve in a certain period of time in a given market and with the proposed marketing plan [10]. As a rule, the forecast volume of turnover is less than its potential (maximum possible) volume due to capacity limitations, and resource base.

The initial successes of forecasting in the fields of economics and business were first softened and then cancelled after a reality check, first during the energy crisis of 1973/1974, then during the prolonged economic stagflation of the late 1970s and early 1980s, and again worsened further during the severe global financial crisis of 2007/2008. Initial, optimistic expectations that the social sciences (using powerful computers and sophisticated models) would be able to provide predictive accuracy in complex cases have repeatedly collapsed. There is a rather adamant position that the above-mentioned

fact has left various fields such as economics, management, political science and the humanities without objective evidence of successful, accurate predictions, which calls into question their usefulness and scientificity [11].

In our opinion, forecasting the turnover of a retail enterprise is a variable substantiation of the possible volume of turnover for a certain period of time based on the estimated information about the effect of the factors of the external and internal environment of the enterprise and historical data of past periods, which requires to be clarified in view of the needs of the enterprise in achieving the set target performance indicators [12].

The value of the turnover forecast is measured by its usefulness in the process of drawing up a turnover plan for a retail enterprise and making decisions in the field of sales, namely [12]:

- the forecast determines the limits of the turnover planning and ensures the determination of the initial indicators for the preparation of the turnover plan;
- realistically achievable rates of change in trade turnover are established in the forecast;
- the forecast takes into account all available options for the volume of turnover in the future period and the possibilities of achieving them.

In our opinion, forecasting is still an integral function of management and allows us to determine the target quantitative benchmarks of the enterprise's financial and economic activity for the future.

A widespread methodical approach to forecasting turnover is an approach based on the study of sales statistics, which is based on information from state statistical institutions regarding the volume and structure of turnover and research data on retail as a powerful direction in the field of marketing research. The practical use of this methodological approach requires the use of appropriate statistical apparatus.

In works [13-18] we find justification and use of the theory (hypothesis) of random walk (random walk theory) regarding the dynamics of financial instruments prices (primarily - stock market prices). It is believed that the theoretical basis of the hypothesis was laid at the beginning of the 20th century. With the development of this theory, scientists came to the opinion that price dynamics in the past do not carry any information about future price changes, that is, the market has no memory [18].

In [19-24], signs of random walk and approaches to its modelling are given. It was determined that:

- the movement is called a random walk if successive changes are independent of each other;
- distinguish between several varieties of random walk, among which simple random walk is usually used in financial modelling (more complex varieties of random walk models are used in polymer physics, ecology, population genetics, searching on the World Wide Web, image segmentation, brain research and moving nodes in wireless networks etc);
- in the case of a simple random walk, the indicators' power of growth (or what is the same, the natural logarithm of the growth rate) is the realization of a random variable with a normal distribution law.

Methods for checking that successive changes are independent of each other and justification for choosing the best method for a situation with a relatively small data sample (the number of observations in a dynamic series) are described in works [25-29].

Features of testing the statistical hypothesis about the normal law of the random value distribution of the retail turnovers' growth based on the Shapiro-Wilk criterion are described in [30-34].

Based on the level of training of relevant specialists and the availability of software for the implementation of individual calculation functions, any of the following forms of forecasting the volume of retail turnover can be chosen [12]:

1. *Point forecast* involves determining a specific number that characterizes the forecast volume of retail turnover (such a forecast can be called deterministic).
2. *Interval forecast* involves establishing the limits within which the forecasted value of the retail turnover volume will be located.
3. *Probability distribution forecast* is based on the understanding of the retail turnover volume as a random variable – the variable that, as a result of observation, takes one or another value, unknown in advance and dependent on random circumstances [35]. In this case, it is necessary to determine the probability of acquiring a certain value by the retail turnover within the groups of established localizing intervals in the forecast period.

The current state of forecasting calculations at real retail enterprises indicates the priority for the practical application of point forecasting, which allows obtaining a deterministic value of the forecast volume of retail turnover. However, the

instability of the external environment calls into question the relevance of this form of forecasting, which will be discussed below, and instead, it has increased the relevance of using alternative approaches to determine the retail turnover volume of retail trade enterprises for the future. It should be noted that in the conditions of instability and global fluctuations, the popularity of denying the expediency of any forecasting of the sales volume of goods, other than intuitive, is growing among practitioners, and appeals to scientists to provide justification for such a position are heard more and more often.

## AIMS AND OBJECTIVES

The purpose of the article aimed at carrying out a statistical test of the assumption about the random walk of the turnover volume of retail enterprises in Ukraine. A serious scientific argument in favour of the legality of denying the traditional methods of forecasting the retail turnover volume could be the acceptance of the hypothesis of random walk of this indicator under conditions of instability and global fluctuations, which is the basis of the research conducted by the authors of the article.

## METHODS

Statistical hypothesis testing has been carried out and it states that the growth force value of the turnover or "gross premiums written" indicator of retail is the realization of a random variable with a normal distribution law.

The article analyzes the retail turnover volume of retail trade enterprises (legal entities) in Ukraine for the period after overcoming hyperinflation and stabilizing the financial system (since 1996) according to the data of the State Statistics Service of Ukraine [36].

In order to refute the assumption about the random walk of the retail turnover volume of retail trade enterprises in Ukraine and, as a result, the lack of sufficient scientific grounds for its point and interval forecasting (similar to the situation with the forecasting of the market rate of financial instruments and exchange goods), a statistical hypothesis has been tested that the value of the growth force of this indicator is the realization of a random variable with a normal distribution law. For this:

- the growth force value for each year during the investigation period from 1996 to 2020 (the first in the range of dynamics is the value for 1997) has been calculated;
- the criterion for testing the statistical hypothesis has been chosen, taking into account the relatively small number of values in the dynamics range, and the procedure for its application has been implemented.

The indicator of the growth force, which is an analogue of the indicator of "force of interest", is considered the natural logarithm of the growth rate:

$$\delta = \ln \frac{y_i}{y_{i-1}}, \quad (1)$$

where  $\delta$  – the force of growth;  $y$  – the indicator, the dynamics of which are being studied, and the volume of retail turnover of retail trade enterprises (legal entities) in Ukraine in comparative prices.

The test criterion, which is adapted for a small sample of data and is used in this study, is the *Shapiro-Wilk test* [37], which involves the use of statistics (statistical indicator)  $W_H$ :

$$W_H = \frac{U^2}{(n-1)S_x^2}, \quad (2)$$

where  $U = \sum_{i=1}^n a_{n,i} [x_{(n+1-i)} - x_{(i)}]$  – statistical parameter;  $a_{n,i}$  – constant coefficients (constants), the values of which are given in special tables and are dependent on  $n$ ;  $n$  – the number of values in the sample (sample volume);  $x_{(i)}$  – the  $i$ -th element of the ordered sample of the random variable under study (in this study – growth forces);  $S_x^2$  – estimation of the variance of a random variable based on sample data (sample variance).

The calculated value of  $W_H$  according to formula (2) is compared with the critical value of  $W_H(\alpha)$  of  $\alpha$  order, which is usually taken as equal to 0.05 for economic research (i.e. 5%). These critical values of  $W_H(\alpha)$  are given in special statistical tables.

If  $W_H > W_H(a)$ , then we can conclude that the hypothesis of a normal distribution of a random variable does not contradict the actual data of observations.

The procedure for testing the hypothesis about the normality of the random variable distribution according to the Shapiro-Wilk criterion with its implementation using *MS Excel* is described in the source [38]. The same source gives statistical tables of constant coefficients  $a_{n,j}$  and critical values [38].

The verification of the statistical hypothesis that the value of the growth rate of the turnover or “gross premiums written” indicator of retail trade enterprises is the realization of a random variable with a normal distribution law has been also carried out using the Shapiro-Wilk test.

To test the statistical hypothesis about the homogeneity of samples of the growth strength indicators of retail turnover of retail trade enterprises in Ukraine in comparative prices before and after 2008, the Anderson homogeneity criterion has been used with a pairwise comparison of samples, which involves the calculation of a statistical indicator [38]:

$$a = \frac{1}{mn(m+n)} \left[ m \sum_{i=1}^m (s_i - i)^2 + n \sum_{j=1}^n (r_j - j)^2 \right] - \frac{4mn-1}{6(m+n)}, \quad (3)$$

where  $a$  – estimated sample value of Anderson's criterion statistical indicator (statistics);  $s_i$  and  $r_j$  – ordinal numbers of indicators  $x_i$  and  $y_j$  in the ascending pooled sample;  $x_i$  and  $y_j$  – indicators of the strength of growth in the retail turnover volume of retail trade enterprises in Ukraine in comparative prices before and after 2008, respectively;  $i$  and  $j$  – ordinal numbers (ranks) of indicators  $x_i$  and  $y_j$  in their own (separate) samples ordered by growth;  $m$  and  $n$  – sample size (number of observations) for periods before and after 2008, respectively ( $m = n = 12$ ).

Samples are recognized as non-homogeneous if the mathematical expectations of the empirical distribution functions of random variables found on these samples are not equivalent and the calculated statistical indicator according to formula (3) exceeds the critical value of Anderson's statistic for a significance level of 5%.

It should also be noted that given the relatively small volumes of both samples, the value of the calculated criterion statistical indicator according to formula (3) is subject to adjustment:

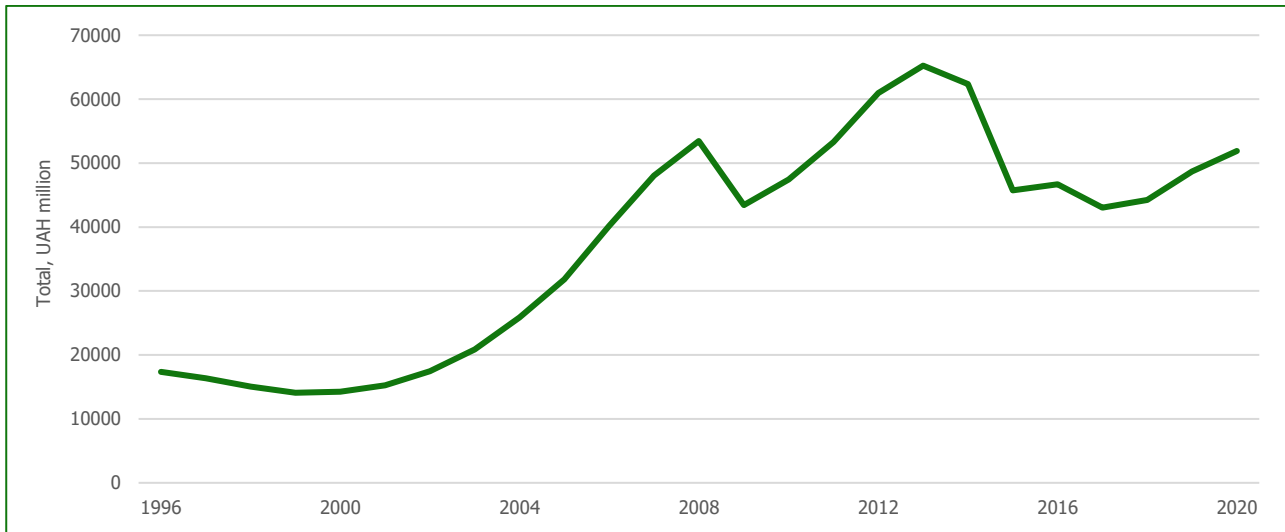
$$\tilde{a} = \frac{a - \frac{1}{16v} - \frac{3}{256v^2}}{1 + \frac{1}{m+n} - \frac{3}{8v} - \frac{9}{128v^2}}, \quad (4)$$

where  $\tilde{a}$  – modified estimated sample value of Anderson's criterion statistic (statistic) taking into account small samples;  $v = mn / (m + n)$ .

The adjusted value according to formula (4) is compared with the critical value of Anderson's statistic.

## RESULTS

Analyzing the dynamics of the volume of retail turnover of retail trade enterprises (legal entities) in Ukraine for the period after overcoming hyperinflation and stabilizing the financial system (since 1996) in comparative prices, one can notice the absence of any clear trends. In general, the dynamics of this indicator resemble a geometric Brownian motion (or so-called random walk), which is inherent in the stock market rate. The dynamics of the retail turnover volume of retail trade enterprises are illustrated in Figure 1.



**Figure 1. Retail turnover of retail trade enterprises (legal entities) in Ukraine in prices of 1996 for 1996-2020.** (Source: compiled by the authors based on [36])

As can be seen in Figure 1, in the period from 1999 to 2008 there was a local trend – the volume of retail turnover showed exponential growth. But the global financial crisis of 2008 put an end to this growth and marked the beginning of instability period that continues to this day.

A random walk implies the absence of any trends that could be detected and used in the process of strategic management. If it is available, forecasting is limited to estimating the limits (minimum and maximum possible value) with a given reliability only for the current perspective.

The results of the calculation of the growth force together with the initial data on the volume of retail turnover are shown in Table 1.

Despite the fact that the dynamic range of the growth rate indicator has 24 values, this amount of data can be considered a quite small amount for testing a statistical hypothesis, which is why the Shapiro-Wilk test has been chosen.

In the case of testing the hypothesis that the growth rate of retail turnover of trade enterprises in Ukraine (the dynamics of which are illustrated in Figure 2) is a random variable with a normal distribution law, the value of  $WH$  is 0.938. It exceeds the critical value  $WH(\alpha) = 0.916$ .

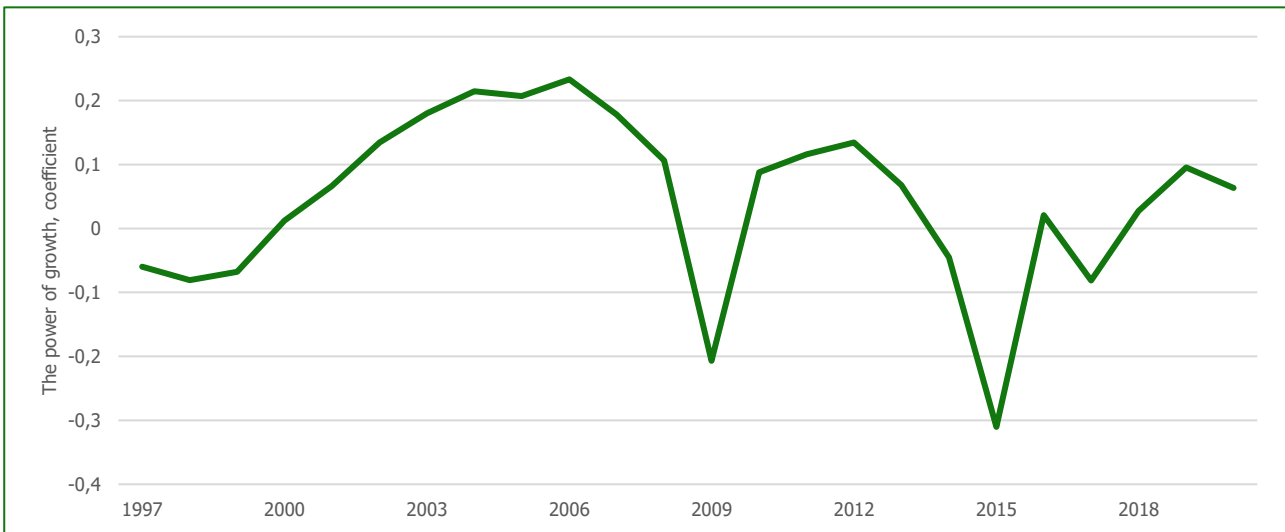
The obtained results show that, according to the Shapiro-Wilk criterion, the hypothesis of a normal distribution of the growth random variable of the retail turnover volume of trade enterprises in Ukraine does not contradict the actual observational data. Therefore, it is impossible to refute the statement about the random walk (geometric Brownian motion) of annual volumes of retail turnover.

But the proposed approach to the analysis of a range of dynamics of the trade enterprises' retail turnover annual volume in Ukraine can be generally denied, rejecting the above-mentioned results, if the heterogeneity of samples of dynamics indicators (such as growth rate and growth strength) for different periods is proved.

It is about the fact that the dynamic range of turnover, as can be seen in Figure 1, had two significantly different intervals – before 2008 and after 2008. It seems intuitively plausible to assume that after 2008, fundamental changes took place in the dynamics of the indicator due to the transformation of the national and global economic system in general (in addition, deepened by the internal events of 2013-2014), as a result of which comparison with the period before 2008 became impossible. The verification of this assumption involves the verification of the statistical hypothesis about the sample's homogeneity of the growth strength indicators of retail trade enterprise retail turnover in Ukraine in comparative prices before and after 2008 using the Anderson homogeneity criterion with a pairwise comparison of samples.

**Table 1. The growth rate of retail turnover of retail trade enterprises in comparative prices in Ukraine in 1996-2020.** (Source: compiled by the authors based on [36])

| Year | Retail turnover in actual prices, UAH billion | Consumer price index, based until 1996 | Retail turnover in 1996 prices, UAH billion | The power of growth |
|------|---|--|---|---------------------|
| 1996 | 17.3  | 1.000                                  | 17.3  | ×                   |
| 1997 | 18.9  | 1.159                                  | 16.3  | -0.060              |
| 1998 | 19.3  | 1.282                                  | 15.1  | -0.081              |
| 1999 | 22.2  | 1.573                                  | 14.1  | -0.068              |
| 2000 | 28.8  | 2.016                                  | 14.3  | 0.013               |
| 2001 | 34.4  | 2.258                                  | 15.2  | 0.066               |
| 2002 | 39.7  | 2.276                                  | 17.4  | 0.135               |
| 2003 | 50.0  | 2.395                                  | 20.9  | 0.180               |
| 2004 | 67.6  | 2.610                                  | 25.9  | 0.215               |
| 2005 | 94.3  | 2.963                                  | 31.8  | 0.207               |
| 2006 | 130.0   | 3.232                                  | 40.2  | 0.233               |
| 2007 | 175.1   | 3.646                                  | 48.0  | 0.178               |
| 2008 | 243.9   | 4.565                                  | 53.4  | 0.107               |
| 2009 | 229.9   | 5.291                                  | 43.4  | -0.207              |
| 2010 | 274.6   | 5.788                                  | 47.4  | 0.088               |
| 2011 | 333.1   | 6.251                                  | 53.3  | 0.116               |
| 2012 | 383.3   | 6.289                                  | 61.0  | 0.134               |
| 2013 | 409.1   | 6.270                                  | 65.2  | 0.068               |
| 2014 | 438.3   | 7.028                                  | 62.4  | -0.045              |
| 2015 | 478.0   | 10.451                                 | 45.7  | -0.310              |
| 2016 | 556.0   | 11.904                                 | 46.7  | 0.021               |
| 2017 | 586.3   | 13.618                                 | 43.1  | -0.081              |
| 2018 | 668.4   | 15.102                                 | 44.3  | 0.027               |
| 2019 | 793.5   | 16.295                                 | 48.7  | 0.096               |
| 2020 | 868.3   | 16.735                                 | 51.9  | 0.063               |



**Figure 2. Dynamics of growth in the volume of retail turnover of retail trade enterprises (legal entities) in Ukraine in comparative prices in 1996-2020.** (Source: compiled by the authors based on [36])

The final result of calculations according to formula (3) is the value  $a = 0.3819$ , and the modified calculated sample value of Anderson's statistic according to formula (4) is:

$$\tilde{a} = 0.3799.$$

This value is less than the critical value of the Anderson statistic for the 5% significance level:

$$w_n^2(\alpha=0,05) = 0.461.$$

It follows that the hypothesis about the homogeneity of the samples does not contradict the observational data. Therefore, the samples can be considered as belonging to the same general population. This is evidence that the indicators of growth strength before and after 2008 describe the same (single) process of dynamics of the retail turnover volume of retail trade enterprises in Ukraine.

## DISCUSSION

Thus, the available empirical data do not provide formal grounds for dividing the dynamic range of the retail turnover volume of retail trade enterprises in Ukraine in comparative prices into two incomparable periods before and after 2008. And this, in turn, means that the initial results of the study of random walk of the retail turnover annual volume remain unrefuted.

Forecasting retail turnover is an important starting point for planning the enterprise's activities because its volume will determine the need for all types of resources to ensure the activity of the trade enterprise, its financial results and financial stability. If, based on the results of the analysis, a categorical conclusion is reached regarding the random walk of this indicator, then this will automatically mean the recognition of the fact that the aggregate activity of retail trade enterprises in Ukraine is a stochastic process that has no regularities (trends) and cannot be the object of full-fledged strategic management and, accordingly, calls into question the expediency and relevance of strategic management in retail trade.

However, the very idea of strategic management has become a response to the complexity of activity planning based on the identified previous trends. In this context, the conclusion about the need to change approaches to forecasting retail turnover in conditions of high volatility of the external environment is more justified.

Such opinions have already been followed both in scientific research and in practical recommendations of specialized foresight companies. In particular, (Demand Forecasting for Retail and Consumer Goods: The Complete Guide) states that "Traditionally, retailers and consumer goods companies have created their baseline forecasts using time series modelling by looking at historical data to make predictions about future demand. These projections have often been adjusted based on causal modelling and manual input. However, modern companies have replaced these old approaches to demand forecasting with machine learning" [39]. Indeed, in the conditions of unstable markets and fast transformational social processes, machine learning, methods of neural networks, and artificial intelligence, which are able to explore large databases, and analyze a wide range of influencing factors, should become a new powerful tool for forecasting retail turnover.

If we talk about forecasting the turnover of a separate trade enterprise, it is worth paying attention to the portfolio approach. Thus, in [40] an analysis of the company's product portfolio and its planning based on the patterns of demand development, marginality, and individual product groups is proposed. This approach can also be used in the process of forecasting demand: the composition and structure of turnover should be brought to the fore, the study of change patterns in demand for individual commodity groups, forecasting of retail turnover by individual commodity groups, and only then the estimated amount of total retail turnover should be assessed.

Approaches to modelling forecast sales volumes are offered for companies in the B2B segment in the sources we have analyzed below. For example, the work [41] proposes a methodology for dynamic market simulation at the product level. The authors demonstrate quite convincing conclusions regarding the accuracy of the results of forecasting sales in the B2B segment using auto components as an example. The main conclusions are that modelling provides higher accuracy of forecasts. Thus, dynamic modelling of aggregate demand for B2B automotive components showed an average absolute percentage error (MAPE) of 8.5%, compared with an average MAPE of 30% achieved by 168 companies forecasting B2B products. The paper [42] proposes an approach to modelling sales in a retail company using fuzzy logic.

In work [43] describes an approach to modelling a product forecast based on survey data and proposes to use it in the process of planning sales in a test market.

The analyzed studies testify to the transition in the forecasting of retail turnover from simple statistical methods to complex modelling methods based on the processing of large data sets in combination with expert and other qualitative methods (panel surveys, etc.).

Perhaps it is quite debatable, but in our opinion, the idea of a parallel analysis of the dynamics of retail turnover and stock markets in the context of forecasting the main macro indicators can be interesting. Thus, in work [44] a structured analysis of the time series of commodity momentum portfolios based on a combination of the Markov switching scheme and indicators of arbitrage activity and investor sentiment is presented. The authors come to an important statement about the similarity of the behaviour of the impulse yield of financial instruments and assets in the commodity markets. The

results of our analysis also clearly show that the turning points in the dynamics of retail turnover coincide with the fall of the financial market (2008), political fluctuations and the beginning of the military confrontation with Russia (2013-2014). It is intuitively obvious to conclude that if the stock market was "functioning" in Ukraine, similar trends would be observed in its dynamics in 2013-2014. Also, analyzing the results we have obtained, it is worth considering that the period after 2014 is too unstable in Ukraine, on the one hand, and on the other hand, it does not take into account the retail turnover of the temporarily occupied territories, which also has an impact on its dynamics.

So, in the new economic situation, ensuring the survival of retail trade enterprises requires deep and comprehensive work related to the formation of forecast estimates of the retail turnover volume.

We hope that the conclusions and generalization made will encourage scientists and practitioners to engage in polemics, discussions, and contribute to the search and development of new, progressive, innovative approaches and tools for forecasting retail turnover necessary for the development of the trade economy.

## CONCLUSIONS

The results of the statistical verification of the assumption of random wandering of the Ukrainian enterprises' retail turnover volume, on the one hand, confirmed the hypothesis that the Ukrainian retail enterprises' aggregate activity is a random process that does not have regularities (trends). The above-mentioned actualizes the application of forecasting retail turnover of retail enterprises based on the assessment of limits (minimum and maximum possible value) with a given reliability for the current perspective.

At the same time, it should be taken into account that the dynamics of aggregate retail turnover reflect a complex set of socioeconomic processes occurring in society. These processes lead to changes not only in consumer attitudes but also in the structure of demand for goods. The total volume of turnover is the result of a large number of separate acts of purchase and sale of various consumer properties and purposes of goods, as a result of which the commodity structure of turnover is determined. In turn, the commodity structure of turnover is formed under the influence of such factors as the structure of needs (industrial, social and personal), the structure of production, the level and structure of money (purchasing funds and credit), the level and ratio of prices, as well as inflation. This allows us to draw a conclusion about the need to use more complex methods and models for forecasting retail turnover and the need to carry out this process in terms of individual product groups, taking into account the influence of individual factors on the formation of consumer demand for individual types of product groups. Further discussions in the scientific field should be aimed at this.

So, the conducted research made it possible to draw a general conclusion that in the conditions of an unstable external environment, the forecasting of retail turnover should be based on: 1) a powerful analysis of the factors of the formation of consumer demand for individual products, based on the study of the patterns of change and forecasting of factor indicators; 2) forecasting the composition and structure of the turnover and, only as a summary, its total volume; 3) application of complex automated methods of forecasting, such as machine learning in combination with expert methods and have an interval character with the determination of potential limits of the trade enterprise's activity.

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## ОСОБЛИВОСТІ ПРОГНОЗУВАННЯ РОЗДРІБНОГО ТОВАРОБОРОТУ В УМОВАХ НЕСТАБІЛЬНОСТІ ТА ГЛОБАЛЬНИХ ФЛУКТУАЦІЙ

Реальна практика й виклики, що формуються в процесі сучасних суспільних трансформацій під впливом нестабільності та глобальних флуктуацій, спонукають до активного пошуку теоретико-методичної платформи, спираючись на яку підприємства роздрібно́ї торгівлі можуть досягти в практиці стратегічного управління роздрібно́м товарооборотом адекватності викликам дії стрес-факторів. Метою дослідження є проведення статистичної перевірки припущення про випадкове блукання обсягу роздрібно́го товарообороту підприємств роздрібно́ї торгівлі в Україні. Для виконання наукового дослідження використані економіко-статистичні методи аналізу та прогнозування, методи логічного узагальнення та математичного абстрагування. Результати статистичної перевірки припущення про випадкове блукання обсягу роздрібно́го товарообороту українських підприємств підтвердили гіпотезу, що сукупна діяльність підприємств роздрібно́ї торгівлі в Україні є випадковим процесом, який не має закономірностей (тенденцій). Обґрунтовано, що в умовах нестабільного зовнішнього середовища прогнозування роздрібно́го товарообороту повинне спиратися на потужний аналіз факторів формування споживчого попиту на окремі товари, відштовхуючись від вивчення закономірностей зміни та прогнозування факторних показників, а також здійснюватися за складом та структурою товарообороту з подальшим підбиттям підсумку його загального обсягу. Підтвердження гіпотези про випадкове блукання показника товарообороту підприємств роздрібно́ї торгівлі в умовах нестабільності та глобальних флуктуацій, яка була покладена в основу проведеного дослідження, дало змогу заперечити традиційний підхід

до прогнозування, а саме детермінований прогноз. Для практичного застосування запропоновано підхід до прогнозування товарообороту на основі оцінки меж (мінімально та максимально можливого значення) із заданою достовірністю на поточну перспективу, що забезпечує релевантність прогностичних розрахунків.

**Ключові слова:** роздрібна торгівля, роздрібний товарооборот, підприємства роздрібної торгівлі, прогнозування, випадкове блукання, нестабільність зовнішнього середовища

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