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Multivariable Modeling in the Analysis of Current Assets in the Format of the Hybrid Model t/v-models

Tsatsulin Alexander Nickolaevich
North-West Institute of Management, Branch of RANEPA (Saint-Petersburg, Russian Federation)
Professor of the Chair of Financial Management
Doctor of Sciences (Economy), Professor
Honorary Worker of Higher Education of the Russian Federation
Full member of National Academy of Tourism of Russia
Member of the European Academy of Natural Sciences (Hannover, Germany)
vash_64@mail.ru

ABSTRACT
This article discusses the principles and methods of constructing hybrid model multivariate index analysis treatment of tangible assets on the example of retail trade enterprises. Analysis of the time and speed of the current assets held in respect of the current inventory storage for uniform positions of the group range shoe department of the economic entity. Separately were built time model and the turnover rate. And the final stage, the crossing using the index procedure was constructed by $\nu|t$-model, which comprises five separate signs factors. For each of rounds signs factors hides its standard statistical measure, which is traditionally carried out by an economic analysis based on defined goals and objectives, both in enterprises and for special applied research. These indicators serve as indicators of the financial condition of any economic subject, are comparative characteristics in assessing the competitiveness of the subject in the commodity markets and can be used to assess the market value of the business. The resulting model is verified, it held on reliable calculations. The model opens up new horizons of financial and economic analysis of movement of material assets of the enterprise, and allows you to put together a comprehensive study the parameters of speed and time of commodity circulation. The latter is complicated, and it is sometimes even impossible, in multivariate econometric models in connection with the phenomenon of multicollinearity of signs factors. This circumstance makes it promising for the first time built a similar hybrid model for solving the problems of short-term forecasting, and for the purpose of operational planning of material circulating assets.

KEYWORDS
simple index, analytical index, index crossing, mixed-index analysis, hybrid model of factor analysis, primary and secondary feature, working capital, current assets, index model

Многофакторное моделирование при анализе оборотных активов в формате гибридной модели t/v-модели

Цацулин Александр Николаевич
Северо-Западный институт управления — филиал РАНХиГС (Санкт-Петербург)
Профессор кафедры финансового менеджмента
Доктор экономических наук, профессор
Почетный работник высшего профессионального образования РФ
Действительный член Национальной академии туризма России
Член Европейской академии естественных наук (Ганновер, Германия)
vash_64@mail.ru

РЕФЕРАТ
В статье рассматриваются принципы и методы построения гибридной модели многофакторного индексного анализа обращения материальных активов на примере розничного торгового предприятия. Анализ времени и скорости движения оборотных средств проведен в отношении товарных запасов текущего хранения по однородным позициям группового ассортимента обувного отдела экономического субъекта. Отдельно были построены модель времени и модель скорости оборачиваемости изучаемых активов. А на за-

ключительном этапе, применяя процедуру индексного кроссинга, была сконструирована v|t-модель, которая содержит пять самостоятельных признаков-факторов. За каждым из учтенных признаков-факторов скрывается свой стандартный статистический показатель, по которому традиционно осуществляется экономический анализ в зависимости от сформулированных целей и задач, как на предприятиях, так и для специальных прикладных исследований. Эти же показатели служат индикаторами финансового состояния любого экономического субъекта, работают как сравнительные характеристики при оценке конкурентоспособности субъекта на товарных рынках и могут быть использованы при оценках рыночной стоимости бизнеса. Полученная модель верифицирована, по ней проведены достоверные расчеты. Модель открывает новые горизонты проведения финансово-экономического анализа движения материальных активов предприятия, позволяет воедино и комплексно изучать параметры скорости и времени товарного обращения. Последнее осложнено, а подчас бывает и вовсе невозможно, в эконометрических многофакторных моделях в связи с явлением мультиколлинеарности признаков-факторов. Отмеченное обстоятельство делает перспективной построенную впервые подобную гибридную модель в решении задач краткосрочного прогнозирования и оперативного планирования.

КЛЮЧЕВЫЕ СЛОВА
простой индекс, аналитический индекс, индексный кроссинг, индексный микст-анализ, гибридная модель факторного анализа, первичный и вторичный признак, оборотный капитал, оборотные активы, индексная модель

> "Well, in our country," said Alice, still panting a little, "you'd generally get to somewhere else — if you run very fast for a long time, as we've been doing."
>
> "A slow sort of country!" said the Queen. "Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"
>
> *Carroll, Lewis:*
> *Through the Looking-Glass*
> *and What Alice Found ttThere,*
> *Chapter 2*

Introduction

Research in the field of industrial production, as well as in wholesale and retail trade links issues of turnover of tangible assets is a separate and important area of analysis of the financial condition of any economic subject. The effectiveness of such asset management is reflected immediately in terms of solvency and stability of the enterprise. There is considerattble domestic and foreign bibliography dedicated to the study of time and the speed of certain types of tangible assets. This article is related to the construction of a fundamentally new hybrid v|*t*-model multivariate analysis on the example of the dynamics of asset inventory of a particular trader.

Among the most important economic characteristics and generalizing Stick efficiency of movement in the market space and the commodity circulation mass in the form of raw materials and fuel finished product inventories and etc. within the production cycles are *indicators — The time of the working capital* and *the velocity of the working capital*. These indicators generally serve a special economic concept as turnover of goods.

The economic analysis of these characteristics is particularly important in setting conditions of the market mechanism of management of industrial enterprises of the real sector, sales, trading and purchasing of specialized applications and systems, improvement of commercial calculation and the increasing importance of financial leverage in the market of diverse relationship partners [13; 14].

Formulation of the problem

Analysis of the time and the velocity of inventory included in the scheme of analysis of working capital, but it should be carried out taking into account the results directly analyzing the volume and structure of sales production and trade. Let us consider the measure currents security indicator turnover of inventory, i. e. during the treatment of a fixed mass of commodities, in order to build a multifactor index model analysis of treatment of tangible assets of the economic entity [3].

The indicator in the corresponding provision of i-th period is measured in days of turnover, i. e. the time of treatment j-th asset on the following relationship:

$$t_i^{(j)} = \overline{З_i^{(j)}} / W(1)_i^{(j)}; \quad i = \overline{1, n}; \quad j = \overline{1, m}, \tag{1}$$

where $t_i^{(j)}$ — the spending time average stock, for example, normal sales process of goods in the days or time of circulation of goods; $З_i^{(j)}$ — the average size of inventory in value during the reporting period, which is calculated as the average dynamic range of the torque on the observations of the state of inventory; $W(1)_i^{(j)}$ — the cost of one-day turnover of the j-th asset on the integrated heading, in the relevant currency units in the i-th period.

Index of turnover margin of security, or a measure of time circulation of goods, gives an idea of how many days the uniform sale will be enough the actual size of the inventory, recorded and evaluated at the end of the reporting period, i. e. at a particular time or date. If you interpret the value of this indicator in terms of the treatment time goods, it characterizes the length of stay of the goods assortment of varieties in the form of a corresponding commodity stock.

We calculate the value $t_i^{(j)}$ from Table 1 on the example of the company "Trading House" for the III quarter of 2015, which will continue to be regarded as a period. Anticipating all subsequent analytical calculations, should estimate the size of the average of inventory for the III quarter of the reporting period — $\overline{З_1^{(ij)}}$:

$$\overline{З_1^{(ij)}} = \frac{0.5 \times 15\,600 + 12\,000 + 9\,600 + 0.5 \times 15\,900}{3} = 12\,450 \text{ ths rub.} \tag{2}$$

Given that the turnover of one day in the III quarter of 2015, i. e. the reporting period was 200 thousand rubles, the actual provision of turnover inventory was found to be in days

$$t_1^{(ij)} = \frac{12\,450}{200} = 62.25 \text{ days.}$$

In this case, a known certainty we can say that its enterprise standard of inventory are not filled, because the time of his treatment of inventory amounted to only 62.25 days with easily defined regulatory largest circulation time:

$$t_{n_0}^{(ij)} = \frac{\overline{З_{n_0}^{(ij)}}}{W(1)_1^{(ij)}} = \frac{15\,000}{200} = 75.00 \text{ days.} \tag{3}$$

Most often in practice, the calculation of this parameter in the denominator taken one-day turnover of the reporting period — month or quarter, and in the chamber celebrates the numerator — the actual inventory at the end of the reporting period, that will ensure the future of the trade, the forthcoming period.

So, for example, the provision of inventory turnover in days for these the conditions of the sales process in August for (i = 2) was found to be

Table 1

Calculation of deviations from the norm of inventory storage current j-th type retailer Limited Liability Company "Trading House" for the III quarter of 2015*

Order №	At the beginning of the month reporting year	Credited (planned) turnover for the quarter, ths. rub.		The actual inventory of the current storage		Deviation from the norm		The actual turnover per month, ths. rub.
		Total	day turnover ИПЗ/n pl**	cost of, ths. rub.	turnover in days	cost of, ths. rub.	turnover in days	
$i=\overline{1,k}$	i	$W_{pl}^{(ij)}$	$W(1)_{pl}^{(ij)}$	$З_1^{(ij)}$	$v_1^{(ij)}=\overline{З_1^{(ij)}}/W(1)_{pl}^{(ij)}$	$\Delta З_{1/n_0}^{(ij)}$	$\Delta t_1^{(ij)}/n_o$	$W(1)_1^{(ij)}$
1	2	3	4	5	6	7	8	9
1	01.07.2015	×	×	15 600	78.00	600.00	3.00	5 850.00
2	01.08.2015	×	×	12 000	60.00	–3 000.00	–15.00	5 200.00
3	01.09.2015	×	×	9600	48.00	–5 400.00	–27.00	6 900.00
4	The specification for the III quarter	18 000	200.00	15 000	75.00	×	×	17 950.00
5	01.10.2015	18 900	210.00	15 900	–	–	–	–

* Data source: the official state reporting data operational and technical and managerial accounting;

** Note: n_{pl} = 90 days.

$$t_1^{(2j)} = \frac{З_1^{(2j)}}{W(1)_1^{(2j)}} = \frac{12\,000}{200} = 60.00 \text{ days.} \quad (4)$$

As seen from the expression (4), the calculation of this parameter as the denominator is taken one-day turnover of the reporting period (month or quarter), as well as the numerator — the actual inventory at the end of the month in the reporting period, which will directly provide trade next month. Naturally, it is thin and commercial point that at the time of calculating the index of the next analyzed one day trade $W(1)^{(i)}$ is not yet known. Therefore, in commercial practice often takes the actual turnover of preplanning period $W(1)_1^{(ij)}$. Index of turnover of inventory availability, in days, is determined by the individual products, product groups and as a whole.

Unequal turnover of tangible assets for selected groups of food and non-food items is primarily due to: the quality of goods, determine the nature of customer demand — daily, periodic, excessive; the complexity of the product portfolio; conditions for storage of inventory determined by the physicochemical properties of the goods; so a variety of food products require special storage conditions, which can be provided only in large enterprises, for example, or urban refrigeration chambers, vaults with special gas fillings, effective in the conditions of refrigerants and the use of modern innovative technologies [10].

Inventories turnover in days for a complex range of products, such as significant depth and breadth/width range, and durable, are generally much higher than for a simple range of goods and *FMCG* (Fast Moving Consumer Goods). Thus, food products of the so-called "Basic basket" consumption (bread, milk, eggs, cheese, etc.), without which the trading network can't work (required, tie-in), have a transient turnover, in contrast to the products of the premium segment and the goods with a period of prolonged turnover (alcohol, confectionery and tobacco products and so on).

The magnitude of commodity circulation time is influenced by various factors that can be taken into account and importantly as in the direction of acceleration and deceleration in the direction of this circulation, and thus for the size of inventory, the use of inventory management system. The main, quite objective factors that reduce treatment time and thus improve the trade efficiency should include such factors flax-supermarket goods movement process benefits as general economic, industrial, trade and marketing.

The factors of general economic order should include political, social, legal and economic stability of the state, development of market structures, having a healthy competition among producers, suppliers and vendors, and as a consequence of the marked points — an increase market supply of goods in accordance with the positive dynamics of solvent demand of the population as a whole and the individual consumer groups, in particular [8].

For production factors, such as the manufacture of printing book products include the degree of conformity to customer demand print runs of books in the publication. In the book market, this factor ultimately emerges as the changing ratio of the size of consumer demand for a specific product offering literature and adjusted the number of so-called "factories", i. e. publication issues within the general circulation.

Research methods

Analysis of the inventory of the current storage for example, by the trade organization, can be illustrated by the example shown in the table 1 (columns 7–8). After analyzing the current inventory storage overall economic entity by techniques is analyzed by comparing individual headings range. Research Methodology, used here by the author, based on the technique of index analysis with the assistance of the First and Second Index systems, the development of which directly involved the works of authors [1; 2; 4–6].

The range of instruments used in the study includes the construction of simple and multivariate analytical indexes, with the release of a result on the construction of the

five-factor model, a hybrid of retail turnover. Author's model contains the analysis of the time factors, material assets turnover rate, size, inventory and analysis of two structural components with respect to the value of one-day sales and stock SKUs current storage company.

We consider the applied methodology. For each j-th commodity group it is determined by the size of the actual stock of the current storage at the beginning of the quarter, and in days of turnover. The value of index turnover in days of turnover is obtained by dividing the total stock on a one-day planning, credited the come quarter turnover for a particular product group:

$$t_1^{(ij)} = \frac{\overline{З}_1^{(ij)}}{W(1)_1^{(ij)}}. \quad (5)$$

For July 2015, i. e. for the number $i = 1$ period of time, the stock will be equal treatment

$$t_1^{(1j)} = 15\,600/200 = 78.00 \text{ days}.$$

Then, the value of $t_1^{(1j)}$ is compared with the value of $t_{n_0}^{(ij)}$, i. e. to the agreed norm or reference turnover.

In the event of significant changes in the actual structure of the turnover compared to a planned recalculation of sums standards for product groups, based on the actual size of turnover:

$$\Delta t_{1/n_0}^{(ij)} = t_1^{(ij)} - t_{n_0}^{(ij)}; \quad (6)$$

Let's say, for the points in time — July 2015 ($i = 1$)

$$\Delta t_{1/n_0}^{(1j)} = 78.00 - 75.00 = +3.00 \text{ days}. \quad (7)$$

Thus, the excess of inventory for the month turned out to be three days, and on the cost of the commodity mass excess was the same:

$$\Delta \overline{З_{1/n_0}^{(1j)}} = \Delta t_{1/n_0}^{(1j)} \times W(1)_1^{(ij)} = 3.00 \times 200.00 = 600.00 \text{ ths rub}. \quad (8)$$

These estimates characterizing the excess of the normal level of monthly stocks already in this form can serve as valuable indicators of the inventory, even with very superficial conduct rapid analysis.

The analysis of speed of turnover of material current assets in trade (*v*-model). Analysis of the current inventory storage, one of whose tasks is to identify deviations of the actual stock on a specific date from the commodity standard of this period can't be complete without examining the rate of turnover of tangible assets, which has independent significance.

It is recalled that already considered above the indicator for the asset or the time-reversal of inventory — is the term or period of time during which marketed the average inventory. The faster committed commercialized products, the less working capital in the form of tangible assets required for uninterrupted treatment process in trading systems, and the lower, hence, distribution costs are developing in trade and value chains.

Acceleration asset turnover, in turn, leads to a reduction the duration of the process of handling the material benefits in the form of a complete production and supply cycle, and, accordingly, to increase profitability, strengthen the financial condition of the company and etc. On an indicator of security turnover inventory is closely related indicator

of the *speed of circulation of commodities*, or the turnover of tangible assets having independent analytical value.

The rate of circulation of commodities, or *inventory turnover*, or even *the turnover speed* characterizes the number of revolutions of the mass of commodities, taken in the amount of the average commodity stock, which is calculated every time specifically for the analyzed period. The practical content of this characteristic can be interpreted as follows with the options a comment: how many times renewed commodity stock during the analyzed period, or a sales occurs during the reporting period in the amount of the average commodity stock.

The rate of turnover in the reporting period $v_1^{(ij)}$ is defined as a relative value by dividing the volume of trade on the average size of inventory for a particular i-th period and, preferably, on the integrated j-th commodity items with the following well-known relation:

$$v_1^{(ij)} = W_1^{(ij)} / \overline{З_1^{(ij)}}, \tag{9}$$

where $W_1^{(ij)}$ — the value of the actual turnover for the period (quarter); $\overline{З_1^{(ij)}}$ — the average inventory for the same period (quarter).

We perform speed calculation according to the same table 1 for the period with the final counting of the column 9, in which the actual trade shows in the amount of 17 950.0 thousand rubles. The velocity of the turnover for the quarter was, according to the expression (9):

$$\upsilon_1^{(ij)} = 17\ 950.00/12\ 450.00 = 1.44\ \text{turnover}. \tag{10}$$

Thus, the mass of commodities, which is equal to the average commodity stocks, addressed during the period of about one and a half times. Knowing the speed of commodity treatment $\upsilon_1^{(ij)}$, can be determined already known during treatment $t_1^{(ij)}$. For it will carry out a series of necessary identity transformations taking into account the meaning of the expression of the formula (6):

$$v_1^{(ij)} = \frac{W_1^{(ij)}}{\overline{З_1^{(ij)}}} = \frac{W(1)_1^{(ij)} \times n_1}{\overline{З_1^{(ij)}}} = \frac{n_1}{t_1^{(ij)}}, \tag{11}$$

where n_1 — the number of days of operation of the enterprise in this quarter.

Location is determined by the time the average stock turnover rate through its characteristic

$$t_1^{(ij)} = n_1 / v_1^{(ij)} = 90.00 / 1.44 = 62.25\ \text{days}. \tag{12}$$

Consequently, the weight of tangible assets, equal to the average value of inventory, addressed in the quarter of about 62.25 days — i. e. slightly more than the length of two full consecutive months.

In analyzing the dynamics of the rate of circulation of commodities and commodity-supply treatment time is traditionally used index method is simple, it is a clear, reliable and generally efficient comparison tool in conducting analytical calculations factor in the following areas: analysis of growth in turnover through faster turnover of goods; calculation of volume released (mobilized) or overly involved (immobilized) current assets as a result of the rate of change and the time the time of turnover of goods [11].

In order to illustrate these aspects of the example analysis of said range of footwear companies, which is listed in Table 2, should be to build the index dynamics of the average rate of turnover for the three k-th commodity items $(k \quad 1, s)$, that are reflected in the table for the reporting and the base period. This measure of the average

The analysis of turnaround time of (t-model) and of turnover speed (v-model) of Limited Liability Company "Trading

Order №	Name of product group footwear	Quarterly volume of turnover by period, ths. rub.		Individual quarterly turnover index
		basic	reported	
$k=\overline{1,s}$	k	$w_0^{(k)}$	$w_1^{(k)}$	$i_{W_{1/0}}^{(k)}=\frac{W_1^{(k)}}{W_0^{(k)}}$
1	2	3	4	5
1	Leather	24 260.00	29 820.00	1.2214
2	Combined	21 350.00	30 640.00	1.4346
3	Sports	12 080.00	12 110.00	1.0150
–	In total:	57 690.00	72 570.00	1.2579

Individual index of commodity circulation speed	The volume of trade turnover for the one-day period, ths rub.		Individual commodity mass index of a one-day turnover
	basic	reported	
$i_{v_{1/0}}^{(k)}=\frac{v_1^{(k)}}{v_0^{(k)}}$	$W(1)_0^{(k)}$	$W(1)_1^{(k)}$	$i_{W(1)_{1/0}}^{(k)}=\frac{W(1)_1^{(k)}}{W(1)_0^{(k)}}$
13	14	15	16
1.4006	271.00	331.00	1.2214
1.1754	237.00	340.00	1.4346
1.0068	133.00	135.00	1.0150
1.1935	641.00	806.00	1.2574

speed will be the index of variable composition — characteristic of a productive attribute the so-called First index system (I *IS*):

$$\mathfrak{I}_{\bar{v}(\bar{\mathfrak{Z}},v)_{1/0}}=\bar{\mathfrak{Z}}_1\overline{v_1^{(k)}}:\bar{\mathfrak{Z}}_0\overline{v_0^{(k)}}=\frac{\sum_{k=1}^{s}v_1^{(k)}\overline{\mathfrak{Z}}_1^{(k)}}{\sum_{k=1}^{s}\overline{\mathfrak{Z}}_1^{(k)}}:\frac{\sum_{k=1}^{s}v_0^{(k)}\overline{\mathfrak{Z}}_0^{(k)}}{\sum_{k=1}^{s}\overline{\mathfrak{Z}}_0^{(k)}}, \quad (13)$$

$V^{(k)}{}_0 \Rightarrow v_1^{(k)}$
$\mathfrak{Z}^{(k)}{}_0 \Rightarrow \mathfrak{Z}_1^{(k)}$

Table 2

material current assets in trade for the shoe department House" for the III quarter of 2014–2015

Average inventory on current storage periods, ths. rub.		Individual index of inventories	Structure of average inventory for the period, %		The speed of turnover by period, time	
basic	reported		basic	reported	basic	reported
$З_0^{(k)}$	$З_1^{(k)}$	$i_{З_{1/0}}^{(k)} = \frac{З_1^{(k)}}{З_0^{(k)}}$	$d_{З_0}^{(k)} = \frac{З_0^{(k)}}{\sum_{k=1}^{s} З_0^{(k)}}$	$d_{З_1}^{(k)} = \frac{З_1^{(k)}}{\sum_{k=1}^{s} З_1^{(k)}}$	$v_0^{(k)}$	$v_1^{(k)}$
6	7	8	9	10	11	12
6 990.00	6 130.00	0.8770	27.67	23.03	3.47	4.86
10 100.00	12 340.00	1.2218	39.99	46.36	2.11	2.48
8 170.00	8 150.00	0.9976	32.34	30.61	1.48	1.49
25 260.00	26 620.00	1.0538	100.00	100.00	2.284	2.726

Continuation of Table 2

The structure of the one-day turnover by period, %		Treatment in time periods, days		Individual index time reversal commodity weight
basic	reported	basic	reported	
$d_{W(1)_0}^{(k)} = \frac{W(1)_0^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}}$	$d_{W(1)_1}^{(k)} = \frac{W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(k)}}$	$t_0^{(k)}$	$t_1^{(k)}$	$i_{t_{1/0}}^{(k)} = \frac{t_1^{(k)}}{t_0^{(k)}}$
17	18	19	20	21
42.28	41.07	25.79	18.52	0.7181
36.97	42.18	42.62	36.29	0.8515
20.75	16.75	61.43	60.37	0.9827
100.00	100.00	39.407	33.027	0.8381

where $\overline{{}_{З_1} v_1^{(k)}}$ — the average speed of the mass of commodities turnover in the reporting period specified in the Table 2 commodity groups shoe range, which can be estimated from the ratio of the final counting (FC) of columns 4 and 6 as FC_4/FC_6:

$$\overline{{}_{З_1} v_1^{(k)}} = \frac{\sum_{k=1}^{s} v_1^{(k)} \overline{З}_1^{(k)}}{\sum_{k=1}^{s} \overline{З}_1^{(k)}} = \frac{72\,570.00}{26\,620.00} = 2.726; \quad (14)$$

value $\overline{\upsilon_0^{(k)}}_{\bar{3}_1}$ — the average rate of the mass of commodities turnover in the corresponding reference period on the specified table in the same commodity groups shoe range, which can be estimated from the FC_3/FC_5 calculation:

$$\overline{\upsilon_0^{(k)}}_{\bar{3}_0} = \frac{\sum_{k=1}^{s} \upsilon_0^{(k)} \overline{З_0^{(k)}}}{\sum_{k=1}^{s} \overline{З_0^{(k)}}} = \frac{57\,690.00}{25\,260.00} = 2.284. \qquad (15)$$

Finally, the very dynamics of the index of the average turnover rate, according to the expression (13), was found to be

$$\Im_{\bar{\upsilon}(\bar{З},\upsilon)_{1/0}} = \overline{\upsilon_1^{(k)}}_{З_1} : \overline{\upsilon_0^{(k)}}_{З_0} = 2.726 : 2.284 = 1.1935 \sim 119.35\% \cdot \qquad (16)$$

$$\begin{array}{|c|}\hline \upsilon_0^{(j)} \Rightarrow \upsilon_1^{(j)} \\ \hline З_0^{(j)} \Rightarrow З_1^{(j)} \\ \hline \end{array}$$

Thus, the relative growth rate of turnover in the reporting period compared with baseline was 19.35%. This increase occurred both through the growth of the actual speed rate (circulation of commodities) on all commodity positions range (see: Individual indices rate of commodity circulation in column 13 of Table 2), and due to changes in inventory structure for the same commodity items, that is, i. e. on the analyzed groups of shoes — leather, combined and sports (respectively, columns 9 and 10 of Table 2).

In other words, the very average increment rate in the dynamics of the expression (16) has taken place due to the simultaneous and combined effects of these two factors taken into account traits that should be resolved by the analyst on the individual components. Consequently, this increment should be laid out on the factors noted specifically that will take into account their impact on the isolated change in the average characteristics of the velocity under the First *IS*.

The index schema of factor analysis in this case can be in constructed by the expansion of variable composition of the index, which is in a particular situation has, in fact, constructed and calculated in the formula of the expression (13÷16). But for the purposes of further analysis, the simple index of variable composition present in its *modified form* entry through the structural component — the proportion of margin in the range of graphs 9 and 10 Table 2.

$$\Im_{\bar{\upsilon}(d_{\bar{З}},\ \upsilon)_{1/0}} = \frac{\sum_{k=1}^{s} d_{\bar{З}_1}^{(k)} \upsilon_1^{(k)}}{\sum_{k=1}^{s} d_{\bar{З}_0}^{(k)} \upsilon_0^{(k)}}. \qquad (17)$$

$$\begin{array}{|c|}\hline d_{\bar{З}_0} \Rightarrow d_{\bar{З}_1} \\ \upsilon_0 \Rightarrow \upsilon_1 \\ \hline \end{array}$$

The aggregate index (17), all the values of the factors taken into account (d_3 и υ) change their value during the transition from reporting period to the base period. For this reason, it should be recalled, the index is called the index of variable composition resultant variable. In order not to clutter the calculation formulas in the following text, the expression "hell" over the symbol of the sign as a characteristic of a statistical averaging of inventory on the corresponding headings of the analyzed sign-factor $\overline{З_0^{(k)}}$, $\overline{З_1^{(k)}}$ will have to be omitted.

To assess the impact of the turnover rate of individual headings to change the average velocity for the entire range of goods should be built within the IC I have analytical index of constant composition. Actually, the analytical index is constructed according to the rules of construction of factor analytic index with weights appropriate period taking into account the statistical nature of the indexed attribute [12]. In the case of constructing the index of constant composition — on the balance of the reporting quarter of 2015 in relation to the secondary feature — the velocity of the mass of commodities (v)

$$\mathfrak{I}_{\bar{v}(v)_{1/0}} = \overline{{}_{d_{3_1}} v_1^{(k)}} : \overline{{}_{d_{3_1}} v_0^{(k)}} = \frac{\sum_{k=1}^{s} v_1^{(k)} d_{3_1}^{(k)}}{\sum_{k=1}^{s} v_0^{(k)} d_{3_1}^{(k)}} = \frac{2.726}{2.230} = 1.2224 \sim 122.24\%. \qquad (18)$$

$d_{3_1} = \text{const}$
$v_0 = v_1$

Thus, according to the results of calculations in the expression (18) by increasing the velocity of the actual commodity weight for individual commodity groups the average speed of the mass of commodities turnover increased in the reporting period compared to the base period by 22.24%.

Next, you should find out how to affect change in the structure of inventory at an average speed of circulation of commodities. To this end, it is recommended to build the index has structural shifts or index structure

$$\mathfrak{I}_{\bar{v}(d_3)_{1/0}} = \overline{{}_{d_{3_1}} v_0^{(k)}} : \overline{{}_{d_{3_0}} v_0^{(k)}} = \frac{\sum_{k=1}^{s} v_0^{(k)} d_{3_1}^{(k)}}{\sum_{k=1}^{s} v_0^{(k)} d_{3_0}^{(k)}} = \frac{2.230}{2.284} = 0.9764 \sim 97.64\%. \qquad (19)$$

$d_{3_0} = d_{3_1}$
$v_0 = \text{const}$

Calculations show that the decrease in the average turnover rate of 2.36%, reflecting the structure of index changes in the expression (19), there by reducing the proportion of the fastest on the winding assets against the share of growth relatively "slow" the winding assets (compare the reduction in the share of leather shoes and footwear increased percentage combined in rows 1 and 2 in column 9). This brings to mind a quote from Carroll, quoted in an epigraph to the article, where there categories *Comparability*, *Relativity* are treating terminologically extremely informative and very modern.

Of course, all built in (13–19) indexes both simple and analytical algebrai-cally linked together in so-called First index system as follows

$$\mathfrak{I}_{\bar{v}(\bar{d_3},v)_{1/0}} = \mathfrak{I}_{\bar{v}(d_3)_{1/0}} \times \mathfrak{I}_{\bar{v}(v)_{1/0}} = 1.2224 \times 0.9764 = 1.1935 \sim 119.35\%. \qquad (20)$$

Verification of calculations, of course, gives a numerical link built analytical indexes in said system in a relative way.

Built system indices can also be determined in accordance with the above trend analysis of the absolute amount of growth in turnover due to the acceleration of the turnover of individual products. This value is defined as the difference form the index of

constant composition formula of the expression (18), presented in a familiar, for analytical indexes, aggregate form. Where the difference form of this index can be presented and is calculated as the

$$\Delta\sum_{k=1}^{s}W(v^{(k)})_{1/0}=\sum_{k=1}^{s}v_1^{(k)}d_{3_1}^{(k)}-\sum_{k=1}^{s}v_0^{(k)}d_{3_1}^{(k)}=72\,570.00\ -\ 59\,370.00\ =$$
$$=\ 13\,200.00\ \text{ths. rub.} \qquad (21)$$

The resulting valuation gain of 13.2 million rubles you can comment on the increase in turnover for the footwear product group achieved retailer in the reporting quarter compared with the base at the expense of increasing the turnover rate of tangible assets in the form of stock. In addition to I *IS* for the purposes of this analysis can be used Second index system (II *IS*), built on the lines of the statistical characteristics of the communications and presented as three indices [9].

The index of permanent staff from the expression (18) $\mathfrak{I}_{\bar{v}(v)_{1/0}}$ can also be found by a simple calculation in the framework of a direct statistical relationship characteristics following expression

$$\mathfrak{I}_{\bar{v}(v)_{1/0}}=\mathfrak{I}_{W(v,3)_{1/0}}:\mathfrak{I}_{W(3)_{1/0}}, \qquad (22)$$

but as an analytical index another index system — II *IS*.

The presented scheme of construction of I and II *IS*, followed by analytical calculations and comments reveal certain possibilities of deepening and detailed economic analysis of the characteristics of the retail turnover of the company investigated. Opening possibilities allow further discussion during case study material to build more complex multivariate index structure in the form of analytical models involving, in addition to the characteristics of the turnover rate of current tangible assets (v), and the characteristic time of their treatment (t).

The above is structurally loose material requires its logical conclusion in the form of a holistic copyright construct, based on the methodology adopted by the multivariate index analysis, which must be backed up by illustrative calculations on the raw data from Tables 1 and 2, which will be demonstrated in the continuation of the article.

For the construction of the aforesaid models were used index methods of analyzing the dynamics of inventory homogeneous range with the assistance of the First (I *IS*) and the Second index system (II *IS*). And if I *IS* allows factor analysis with elements of degradation of resultant variable with respect to changes in the structure and composition of the assets, the II *IS* directs the analyst on the study of direct communication characteristics of statistical factors and their components.

In support of the above in the article once again back to the first index system (I *IS*), more precisely, to its resultant variable $W^{(k)}$, and is applicable to a system known analytical technique *replacing the secondary diagonal elements*. That is, the above expression (13) are made known to convert, of course, does not change the essence of this equation

$$\mathfrak{I}_{\bar{v}(v,3)_{1/0}}=\frac{\sum_{k=1}^{s}v_1^{(k)}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s}\mathfrak{Z}_1^{(k)}}:\frac{\sum_{k=1}^{s}v_0^{(k)}\mathfrak{Z}_0^{(k)}}{\sum_{k=1}^{s}\mathfrak{Z}_0^{(k)}}=\frac{\sum_{k=1}^{s}v_1^{(k)}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s}v_0^{(k)}\mathfrak{Z}_0^{(k)}}:\frac{\sum_{k=1}^{s}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s}\mathfrak{Z}_0^{(k)}}=\mathfrak{I}_{W(v,3)_{1/0}}:\mathfrak{I}_{\mathfrak{Z}_{1/0}}. \qquad (23)$$

$v_0 \Rightarrow v_1$

$\mathfrak{Z}_0 \Rightarrow {}_{31}$

Index of variable composition from the First index system of the first index turned out to be mixed by, as shown in the expression (23), with respect to the two simple *indexes dynamics* of trade turnover and commodity stocks the current storage. But thus obtained ratio is useful for the further deepening of factor analysis purposes, and here it is permissible to use analytical technique that allows due to differences in the two index systems to carry out a kind of complement factor. Such a technique may well be called *a crossing index*, or *the index of mixed analysis*.

Thus, on one hand, according to the expression (20) of variable composition index $\mathfrak{I}_{\bar{v}\left(v^{(k)},\,\mathfrak{Z}^{(k)}\right)_{1/0}}$ equal to the product of the two factorial indices

$$\mathfrak{I}_{\bar{v}(d_{\bar{\mathfrak{Z}}},v)_{1/0}} = \mathfrak{I}_{\bar{v}(d_{\mathfrak{Z}})_{1/0}} \times \mathfrak{I}_{\bar{v}(v)_{1/0}}, \tag{24}$$

and, on the other hand, the same index $\mathfrak{I}_{\bar{v}(d_{\bar{\mathfrak{Z}}},v)_{1/0}}$, according to equation (23) coincides with the following expression

$$\mathfrak{I}_{\bar{v}(d_{\bar{\mathfrak{Z}}},v)_{1/0}} = \mathfrak{I}_{W(v,\mathfrak{Z})_{1/0}} : \mathfrak{I}_{\mathfrak{Z}_{1/0}}. \tag{25}$$

Considering the last two entries (24) and (25) as a system of two equations with the same left-hand sides, with respect to solve their $\mathfrak{I}W(v,\,\mathfrak{Z})_{1/0}$ of an unknown quantity indices posting the right side of the multiplier in a strictly meaningful sequence the purpose of the circular linking these indices in shown pattern of expression (26).

Thus, in the course of transformation was obtained 3-factor model of the volume index of turnover, depending on changes in the average of inventory, changing its structure and changes in the average speed (rate) of its commodity circulation. This model can be called *three-factor model* analysis of trade, depending on the state and dynamics of commodity stocks. In terms of content model must be "streamlined" as indicated in the scheme of logical and quantitative link located directly below the expression (27).

$$\mathfrak{I}_{W(v,\mathfrak{Z})_{1/0}} = \mathfrak{I}_{\bar{v}(v)_{1/0}} \times \mathfrak{I}_{\bar{v}(d_{\mathfrak{Z}})_{1/0}} \times \mathfrak{I}_{\mathfrak{Z}_{1/0}}, \tag{26}$$

1.2579 1.2224 0.9764 1.0538

$\mathfrak{I}_{\bar{v}\left(v^{(k)},\,\mathfrak{Z}^{(k)}\right)_{1/0}} = 1.1935$

$\mathfrak{I}_{W(v,\,\mathfrak{Z})_{1/0}} = 1.2579$

The analysis of turnaround time of material current assets in trade (t-model). Similarly, the above analysis the turnover rate can be analyzed during the treatment of inventory on the scheme I *IS* suitable for a homogeneous mix. However, here the pair Rounds and independent of each other factors ($t^{(k)}$, $W(1)^{(k)}$) of the multiplier determines the average size of the current storage stock ($\mathfrak{Z}^{(k)}$). Needless to say, the influence factor calculations similar to the calculations for the analysis of asset turnover rate.

In particular, the index of variable composition from I *IS* in its modified form is customary to visually browse and convenient for the purpose of factor analysis view time

$$\mathfrak{I}_{\bar{t}\left(t_1^{(k)},t_0^{(k)}\right)_{1/0}} = {}_{W(1)_1}\overline{t_1^{(k)}} : {}_{W(1)_0}\overline{t_0^{(k)}}, \tag{27}$$

where $_{W(1)_1}\overline{t_1^{(k)}}$ — the average handling time of inventory of current storage in the reporting period, which is calculated as the weighted arithmetic mean value of the slurry, and as feature-weight in this calculation is the value of a one-day turnover in the reporting period — $W(1)_1^{(k)}$:

$$_{W(1)_1}\overline{t_1^{(k)}} = \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(k)}} = \frac{26\,620.00}{806.00} = 33.027 \text{ дня;} \quad (28)$$

value $_{W(1)_0}\overline{t_0^{(k)}}$ — average handling time of inventory of current storage in the base period, and it is estimated that the prescribed manner, at the same time as weight-sign stands one-day turnover of the reference period — $W(1)_0^{(k)}$:

$$_{W(1)_0}\overline{t_0^{(k)}} = \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} = \frac{25\,260.00}{641.00} = 39.407 \text{ days.} \quad (29)$$

Finally, the very dynamics of the index of the average time of treatment of inventory in accordance with the expression (27), was found to be

$$\Im_{\bar{t}\left(t_1^{(k)},\, t_0^{(k)}\right)_{\%}} = {}_{W(1)_1}\overline{t_1^{(k)}} : {}_{W(1)_0}\overline{t_0^{(k)}} = 33.027 : 39.407 = 0.8381 \sim 83.81\%. \quad (30)$$

Thus, due to the simultaneous and joint action of the two factors taken into account the average time of treatment of inventory decreased by 16.19% in the reporting quarter compared to quarter basis. This means that in 2014 the average current storage of inventory enough without interruption in trade by 39.41 days, in 2015 — only 33.03 days, i.e. the differences observed in almost one week.

In other words, the average commodity stock in the last year turned into a realized turnover rate of approximately 6.4 days, or 153.6 hours, respectively, faster. This was the result of reducing the actual time reversal of inventory by individual commodity groups and items and changes in the structure of one-day sales of footwear in groups. Changes were noted in the reporting quarter compared to quarter basis in the respective years (see graphs 21 and 19–20 in Table 2).

The first circumstance (change time reversal) is reflected quantitatively in a specially constructed for this case the index of constant composition of the following form

$$\Im_{\bar{t}(t)_{\%}} = {}_{W(1)_1}\overline{t_1^{(k)}} : {}_{W(1)_1}\overline{t_0^{(k)}} = \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(k)}} : \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(j)}} =$$

$$\begin{array}{|l|}\hline t_0^{(k)} \rightarrow t_1^{(k)} \\ \hline W(1)^{(k)}{}_1 = \text{const} \\ \hline \end{array}$$

$$= 33.027 : \frac{25.79 \times 331.00 + 42.62 \times 340.00 + 61.43 \times 135.00}{806.00} = \quad (31)$$

$$= 33.027 : \frac{31\,320.34}{806.00} = 33.027 : 38.859 = 0.8499 \sim 84.99\%.$$

The second circumstance, namely, structural changes have taken place, in turn, can be quantified by constructing the index structure changes daily sales

$$\mathfrak{I}_{\bar{t}(W(1))_{1/0}} = {}_{W(1)_1}\overline{t_0^{(k)}} : {}_{W(1)_0}\overline{t_0^{(k)}} = \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(j)}} : \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} =$$

$t_0^{(k)} = \text{const}$
$W(1)_0^{(k)} \rightarrow W(1)1^{(k)}$

$$= 38.859 : 39.407 = 0.9861 \sim 98.61\%. \qquad (32)$$

The index indicates a decline in the average time of treatment of inventory by improving the day-sales structure: in particular, significantly decreased the proportion of third heading (from 20.65% to 16.75% — see graphs 16 and 17 in Table 2), in which observed the most significant treatment time (see graph 19 in the same Table 2).

Naturally, all built indexes in (30)÷(33) are linked to each other in the *First index system* through the multiplier analytical indexes

$$\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}} = \mathfrak{I}_{\bar{t}(t)_{1/0}} \times \mathfrak{I}_{\bar{t}(W(1))_{1/0}} =$$

$t_0^{(k)} \Rightarrow t_1^{(k)}$
$W(1)_0^{(k)} \Rightarrow W(1)_1^{(k)}$

$t_0^{(k)} \Rightarrow t_1^{(k)}$
$W(1)_1^{(k)} = \text{const}$

$t_0^{(k)} = \text{const}$
$W(1)_0^{(k)} \Rightarrow W(1)_1^{(k)}$

$$= 0.8499 \times 0.9861 = 0.8381 \sim 83.81\%. \qquad (33)$$

Verification in the expression (33), of course, and in this case it gives a numerical linking pre correctly calculated indexes in a closed factor index system.

Built system indices can also be defined in accordance with the absolute amount indicated above trend analysis of the use of current assets freed up working capital in a mode such as the immobilization of assets, by reducing the time of their treatment. This amount is estimated using the difference forms the analytical index of constant composition from the expression (32)

$$\Delta\overline{З(t)}_{1/0} = \sum_{k=1}^{s} \overline{З\left(t_1^{(k)}\right)}_1 - \sum_{k=1}^{s} \overline{З\left(t_0^{(k)}\right)}_1 = \sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)} - \sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)} =$$
$$= 26620.00 - 31320.34 = -4700.34 \text{ ths rub.} \qquad (34)$$

According to its economic content decreases in the expression (34) represents the average value of inventory used in the reporting period, the conversion of which in the daily retail sales actually took place with time spent on one turn stock in the corresponding quarter of the reporting year. Subtrahend is also some kind of a notional amount of working capital, indicating how much working capital would be needed in 2015 if the treatment time would be as large as the original, i. e. a year ago, as shown in the expression (34).

Received the same amount of "savings" (in its arithmetic sign "minus") in the amount of more than 4.7 million rubles indicates the notional value immobilized assets. In other words, the assessment carried out by the volume of released working capital by reducing the time of their circulation in the channels of goods movement study trading network.

Upon completion of the analysis of current assets can be cut to obtain another interesting derivative of the dependence of the analyzed indicators. To do this, repeat all the necessary transformations with algebraic expressions, used as the component of I *IS*. Namely, with the index of variable composition, the average time reversal of inventory depending on changes in the actual turnaround time and one-day volume of turnover.

It is appropriate to use the analytical technique is already familiar "replacement diagonal elements of the secondary" as the aggregate value of the ratio of the two weighted average values treatment time counted for dissimilar periods

$$\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}} = \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(k)}} : \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} = \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}} : \frac{\sum_{k=1}^{s} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} = \mathfrak{I}_{\bar{3}(t,W(1))_{1/0}} : \mathfrak{I}_{W(1)_{1/0}}. \quad (35)$$

$t_0^{(k)} \Rightarrow t_1^{(k)}$

$W(1)_0^{(k)} \Rightarrow W(1)_1^{(k)}$

Thus, the index of variable composition analysis of the average time of treatment of inventory of the current storage of the I *IS* in the expression (27) proved to be mixed by, as shown in the expression (35), with respect to the two simple indexes for average inventory of current storage and one-day turnover.

But the resulting ratio is definitely not the ultimate goal of the done reforms and is only an intermediate structure for the purpose of a more detailed study of the state and dynamics of current assets with the involvement of other optional examined similar analysis systems. It is also permissible already used technique *index cross connection*, which allows due to differences in the analyzed attributes index systems to implement a kind of factorial addition.

So, on the one hand, according to the expression (36), of variable composition index $\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}}$ is equal to the product of two factor indices treatment time and one-day turnover

$$\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}} = \mathfrak{I}_{\bar{t}(t)_{1/0}} \times \mathfrak{I}_{\bar{t}(W(1))_{1/0}}. \quad (36)$$

On the other hand, the same index $\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}}$ in accordance with equation (35) coincides with the expression

$$\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}} = \mathfrak{I}_{\bar{3}(t,W(1))_{1/0}} : \mathfrak{I}_{W(1)_{1/0}}. \quad (37)$$

Considering the last two entries in the expressions (36) and (37) as a system of two equations with the same left-hand sides, we solve the system of equations for the index $\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}}$, taken as an unknown variable. Then place all the existing (pre-built) codes on the right side of the multiplier factor in a strictly meaningful sequence to link the goals of these indices in the system.

In this way the updated causal mechanism of statistical relationships and productive factor, in this case, the primary feature of this time stands for average commodity index storage inventories current reporting period compared to the base period.

$$\mathfrak{I}_{\bar{3}(t,d_{W(1)},W(1))_{1/0}} = \mathfrak{I}_{\bar{t}(t)_{1/0}} \times \mathfrak{I}_{\bar{t}(d_{W(1)})_{1/0}} \times \mathfrak{I}_{W(1)_{1/0}}, \quad (38)$$

1.0538 0.8499 0.9861 1.2574

$\mathfrak{I}_{\bar{t}(t,W(1))_{1/0}} = 0.8381$

$\mathfrak{I}_{\bar{3}(t,d_{W(1)},W(1))_{1/0}} = 1.0538$

As a result of conversions received three-factor index model of average inventory-dependent changes in the mean time reversal of inventory ($\bar{t}$), a one-day change in the structure of trade turnover ($d_{W(1)}$) and the dynamics of one-day sales ($W(1)$).

This pattern of expression (38) can be called *three-factor t-model* analysis of average inventory, depending on changes in the average time of treatment of assets, changes in one-day sales structure and dynamics of the one-day turnover. In terms of content and organizational terms aforesaid medium model of inventory of current storage must also be "ordered" or "linked" in a way that has already been used up, and as it is shown in the diagram, located directly under the multiplier from the expression (38).

Such an ordering mechanism for causality of the phenomenon allows expert- analysts ably to perform, in addition to analysis of the influence of factors taken into account in the relative form, as an analysis of the impact of all the factors taken into account signs on the average size of inventory storage and the current in absolute terms, that is extremely important in the operational work of the specialists of the enterprise.

The data from this example Table 2 permit to conduct such analysis of the impact of factors taken into account in absolute terms by the example of the same shoe product groups. For this it is necessary to arrange signs factors in the circuit of expression (38), starting with *a primary feature*, which is one-day trade $W(1)$, and further, in order of the content of their linkage in the index multiplier middle of inventory ($\overline{З}$), as shown expression in the circuit (39).

Then skip to the absolute account level of symptoms-factors, taking already as calculated indices and make a difference by calculating the index of the form, using the method of *chain substitutions*.

$$\underset{1.0538}{\mathfrak{I}_{\overline{З}(W(1),d_{W(1)},t)_{1/0}}} = \underset{1.2574}{\mathfrak{I}_{W(1)_{1/0}}} \times \underset{0.9861}{\mathfrak{I}_{\bar{t}(d_{W(1)})_{1/0}}} \times \underset{0.8499}{\mathfrak{I}_{\bar{t}(t)_{1/0}}}, \qquad (39)$$

$$\mathfrak{I}_{\overline{З}(W(1),d_{W(1)})_{1/0}} = 1.2399$$

$$\mathfrak{I}_{\overline{З}(W(1),d_{W(1)},t)_{1/0}} = 1.0538$$

Because calculations on the scheme in the expression (39) that due to a change in the structure of one-day sales (–1.39%), the mean of inventory increased by 23.99%. But due to the reduction of the time reversal of this reserve at 15,01% increase in the average stock of goods necessary for the reporting period was limited to only the size of a 5.38% compared to baseline.

Let us estimate the change in absolute terms due to the influence of each of the three Rounds signs factors. The total deviation of inventory due to the cumulative effect of all the factors is:

$$\Delta\sum_{k=1}^{s}\overline{З}\left(W(1),d_{W(1)},\bar{t}\right)_{1/0} = \sum_{k=1}^{s}\overline{З}\left(W(1),d_{W(1)},\bar{t}\right)_{1} - \sum_{k=1}^{s}\overline{З}\left(W(1),d_{W(1)},\bar{t}\right)_{0} = \qquad (40)$$

$$= 26620.00 - 25260.00 = 1360.00 \text{ ths rub.}$$

The impact of one-day sales in the amount of inventories was equal

$$\Delta\sum_{k=1}^{s}\overline{З}\left(W(1)\right)_{1/0} = \sum_{k=1}^{s}\Delta W(1)_{1/0}^{(k)} \times d_{W(1)0}^{(k)} \times \bar{t}_{0}^{(k)} =$$

$$= \left(806.00 - 641.00\right) \times \left[0.4255 \times 25.79 + 0.3680 \times 42.62 + 0.2065 \times 61.43\right] = \qquad (41)$$

$$= 165.00 \times \left[10.97 + 15.678 + 12.69\right] =$$

$$= 165.00 \times 39.34 = 6491.01 \text{ ths rub.}$$

Summary description of the analysis of the dynamics of material circ

Order №	Factor name, which has been taken into account	Unit measurement	Contingent designations
$k=\overline{1,K}$	x_k	module	$\Delta W(x_k)_{1/0}$
1	2	3	4
1	The volume of one-day sales	Rub. per day	$\Delta W\left(W(1)\right)_{1/0}$
2	The structure daily sales average time of treatment of the current inventory storage	days	$\Delta W\left(\bar{t}(d_{W(1)})\right)_{1/0}$
3	The average stock turnover time	days	$\Delta W\left(\bar{t}(t)\right)_{1/0}$
4	Change in the average rate of inventory turnover due to a structural shift	speed for the period	$\Delta W\left(\bar{v}(d_{\bar{3}})\right)_{1/0}$
5	The average velocity of circulation of inventory	speed for the period	$\Delta W\left(\bar{v}(v)\right)_{1/0}$
–	In total:	Rub.	$\Delta W(x_1,x_2,x_3,x_4,x_5)_{1/0}$

Influence of the structure of one-day sales in the amount of inventories in absolute terms is estimated as follows:

$$\Delta\sum_{k=1}^{s}\bar{З}\left(d_{W(1)}\right)_{1/0}=\sum_{k=1}^{s}W(1)_1^{(k)}\times\Delta d_{W(1)1/0}^{(k)}\times\overline{t_0^{(k)}}= \tag{42}$$

$$=806.00\times\left[(0.4107-0.4255)\times25.79+(0.4218-0.3680)\times42.62+\right.$$

$$\left.+(0.1675-0.2065)\times61.43\right]=806.00\times\left[-0.3817+2.2930-2.3958\right]=$$

$$=806.00\times(-0.4845)=-390.51\ \text{ths rub.}$$

Effect of changes in commodity-supply treatment time by the amount of stock in absolute terms is estimated as follows:

$$\Delta\sum_{k=1}^{s}\bar{З}(\bar{t})_{1/0}=\sum_{k=1}^{s}W(1)_1^{(k)}\times d_{W(1)1}^{(k)}\times\Delta\,\overline{t^{(k)}}_{1/0}= \tag{43}$$

$$=806.00\left[0.4107\times(18.52-25.79)+0.4218(36.29-42.62)=\right.$$

$$\left.=+0.1675\times(60.37-61.43)\right]=$$

$$=806.00(-2.9858-2.6700-0.1776)=-4701.72\ \text{ths rub.}$$

Table 3

culating assets of retailer Limited Liability Company "Trading House"

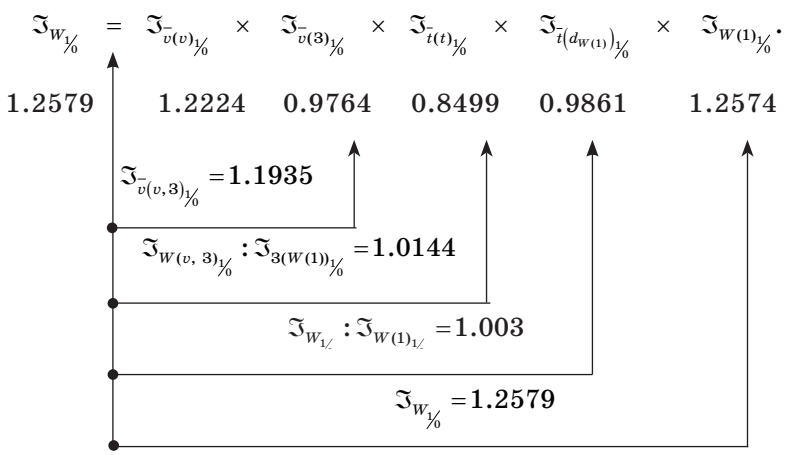
Impact in absolute terms, Rub.	Relative deviation, % to	
	the total change	the level of the base period
$\Delta W(x_m)_{1/0} = x_{11}x_{21}\ldots\Delta x_{m1/0}\ldots x_{k0}$	$\frac{\Delta\sum_{j=1}^{m} W\left(x_k^{(j)}\right)_{1/0}}{\Delta\sum_{j=1}^{m} W\left(x_1, x_2, x_3, x_4, x_5\right)_{1/0}}$	$\frac{\Delta\sum_{j=1}^{m} W\left(x_k^{(j)}\right)_{1/0}}{\sum_{j=1}^{m} W_0^{(j)}}$
5	6	7
15 043 700.13	101.10	26.08
−3 008 815.39	−20.22	−5.22
−6 073 615.21	−40.82	−10.53
−4 374 671.48	−29.39	−7.58
13 293 401.95	89.33	23.04
14 880 000.00	100.00	25.79

Control countable check the balance of the partial effects (increments) factors on the change in the size of inventory in the reporting period compared to the base period gives a total of the amount of the total increment of the expression (40) with the proviso of possible acceptable rounding error. All private, increment factors may be, if necessary, for the purpose of clarity, are summarized in a single standard analytical table of the Table 3 type.

The results of research

In this article the author presents the conceptual hybrid v|t-model multivariate analysis (velocity-time), allowing much more detailed and much more fully explore the phenomenon of turnover of tangible assets of the economic entity.

Using the index schema of the expressions (25) and (38) we can without difficulty obtain analytical relations that will link the complex into a single index variable composition scheme, both the index and three simple index of turnover dynamics, dynamics of average commodity stocks and the dynamics of one-day sales. The effectiveness of a sign, given the linear relationship (direct statistical relationship characteristics) of all indices in the form of a multiplier, will the index of retail trade turnover dynamics as dependent Rounds held in the analysis of the relative signs of factors, according to the regulations following *the five-factor model*

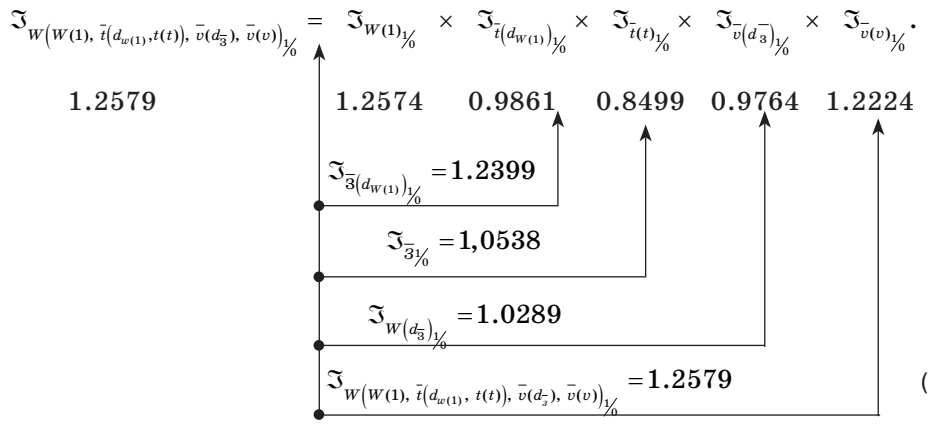


(44)

If *quantitative linkage* of all indices in direct communication performance does not cause technical difficulties, the meaningful economic docked each step with scoring indication (change of retail trade turnover) is not always obvious. Here, the expert-analyst should show patience in building a causal chain of interrelated signs, to find the necessary parts of the circuit with fixed them actual performance. And finally, it is necessary to carry out a detailed interpretation of the results consistently. This is extremely important and is associated primarily with the fact that the plug-in hybrid model factors are manageable, they can predict and plan in orientation mode, the final economic results.

Bearing in mind the analysis of the absolute influence of the factors taken into account on a productive feature (in this case — the amount of retail goods turnover), the starting index of the chain in the formula of the expression (44) should be the primary composite index only for its statistical nature trait-factor on the right side of the multiplier. He is a simple index of the dynamics of one-day sales — $\mathfrak{I}_{W(1)_{1/0}}$.

The next element of the chain linking "begs" to be an index that contains, at least in the numerator or the denominator of the aggregate characteristic of one-day sales volumes throughout the shoe assortment. That index is the index of one-day sales structure — $\mathfrak{I}_{\bar{t}(d_{W(1)})_{1/0}}$. Therefore, carefully calibrated and meaningful economic aspect of the method of chain substitutions, you can build the required analytical chain indices strictly specified sequence recorded chart below from the expression (45).



(45)

As a control test is necessary to carry out an algebraic coherent meaningful linkage of each of the index built into the hybrid v|t-model (velocity|time) of turnover of tangible assets represented by the formula of the expression (45) one by one, moving phases of this scheme in the direction *of the left — right*:

We carry out a second factor linking the analytical index of the expression (45) in the scheme of the index multiplier model. The second account is the index of the influence of the structure on the daily sales average time of treatment of the current inventory storage — $\mathfrak{I}_{\bar{t}(d_{W(1)})_{1/0}}$. The product of the first pair of indices gives the following interesting and understandable analytical dependence

$$\mathfrak{I}_{W(1)_{1/0}} \times \mathfrak{I}_{\bar{t}(d_{W(1)})_{1/0}} = \frac{\sum_{k=1}^{s} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} \times \left[\frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} W(1)_1^{(k)}} : \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}}{\sum_{k=1}^{s} W(1)_0^{(k)}} \right] = \quad (46)$$

$W(1)_0 \Rightarrow W(1)_1$; $d_{W(1)_0} \Rightarrow d_{W(1)_1}$; $t_0 = \text{const}$

$$= \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}} = \mathfrak{I}_{\bar{3}(d_{W(1)})_{1/0}} \cdot$$

$d_{W(1)_0} \Rightarrow d_{W(1)_1}$; $t_0 = \text{const}$

As a result, changes in the expression (46) obtained an analytical index of commodity stock, depending on changes in the structure of one-day sales $\mathfrak{I}_{\bar{3}(d_{W(1)})_{1/0}}$. The next (third in a row) factorial analytical index in the formula of the expression (45), which is to be linked to the multiplier circuit is the index of constant composition, the average time of inventory turnover — $\mathfrak{I}_{\bar{t}(t)_{1/0}}$ of course, affects the size of the average stocks of this storage. We show below the necessary conversion

$$\bullet \quad \mathfrak{I}_{\bar{3}(d_{W(1)})_{1/0}} \times \mathfrak{I}_{\bar{t}(t)_{1/0}} = \frac{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}} \times \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} t_0^{(k)} W(1)_1^{(k)}} = \frac{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}} = \quad (47)$$

$$= \mathfrak{I}_{\bar{3}(d_{W(1)},\, t)_{1/0}} = \mathfrak{I}_{\bar{3}_{1/0}} \cdot$$

Next, for each factor to implement the scheme linking multiplier the fourth at the row components — index changes in the average turnover rate of tangible assets due to a structural shift in the composition of inventories. Here the result of the previous link of the index $\mathfrak{I}_{\bar{3}_{1/0}}$, i. e. a simple index of the expression (47) should be multiplied by an analytical index $\mathfrak{I}_{\bar{v}(d_3)_{1/0}}$. Should whenever approached carefully, guided by the rules of construction of the index scheme, the economic content of the technical and economic indicators and thoroughly carrying out the necessary changes in the aggregate parts conjugate of factor analytic index to the circular linking procedure codes into the system. We realize these recommendations in relation to the following scheme:

$$\mathfrak{I}_{\bar{3}_{1/0}} \times \mathfrak{I}_{v(d_3)_{1/0}} = \frac{\cancel{\sum_{k=1}^{s} t_1^{(k)} W(1)_1^{(k)}}}{\cancel{\sum_{k=1}^{s} t_0^{(k)} W(1)_0^{(k)}}} \times \left[\frac{\sum_{k=1}^{s} v_0^{(k)} \mathfrak{Z}_1^{(k)}}{\cancel{\sum_{k=1}^{s} \mathfrak{Z}_1^{(k)}}} : \frac{\sum_{k=1}^{s} v_0^{(k)} \mathfrak{Z}_0^{(k)}}{\cancel{\sum_{k=1}^{s} \mathfrak{Z}_0^{(k)}}} \right] = \frac{\sum_{k=1}^{s} \bar{\mathfrak{Z}}_1^{(k)} v_0^{(k)}}{\sum_{k=1}^{s} \bar{\mathfrak{Z}}_0^{(k)} v_0^{(k)}} = \mathfrak{I}_{W(\bar{3})_{1/0}} \cdot \quad (48)$$

Resulting in the expression (48) analytical index of the dynamics of retail trade turnover has been dependent on changes in the structure of inventory by SKUs. And finally, the last, the fifth factor of influence on the size of inventory, which is also subject to the index linking scheme multiplier effect on the relative volume of retail turnover shoe group. It is an analytical index of constant composition of inventory velocity — $\mathfrak{I}_{v(v)\frac{1}{0}}$. It should "agree" with the previous result in the form of turnover index changes depending on changes in the value of inventory of current storage — $\mathfrak{I}_{\mathfrak{B}W(\ )\frac{1}{0}}$.

$$\mathfrak{I}_{\mathfrak{B}W(\bar{\ })\frac{1}{0}} \times \mathfrak{I}_{v\bar{v}(\ )\frac{1}{0}} = \frac{\sum_{k=1}^{s} v_0^{(k)}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s} v_0^{(k)}\mathfrak{Z}_0^{(k)}} \times \frac{\sum_{k=1}^{s} v_1^{(k)}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s} v_0^{(k)}\mathfrak{Z}_1^{(k)}} = \frac{\sum_{k=1}^{s} v_1^{(k)}\mathfrak{Z}_1^{(k)}}{\sum_{k=1}^{s} v_0^{(k)}\mathfrak{Z}_0^{(k)}} = \tag{49}$$

$$= \frac{\sum_{k=1}^{s} W_1^{(k)}}{\sum_{k=1}^{s} W_0^{(k)}} = \mathfrak{I}_{W(\bar{3},v)\frac{1}{0}}.$$

Noteworthy is the fact of "as if" automatic clarify the location of primary and secondary symptoms-factors $\left(W(1)^{(k)},\ d_W^{(k)},\ t^{(k)},\ d_3^{(k)},\ v^{(k)}\right)$ in the corresponding intermediate chain links of the hybrid v|t-model up to the resultant variable factor — W from the expression (49). However, this seemingly natural ease laid analyst in advance in the preliminary selection of the factors taken into account and building up in the meaningful chain of interrelated indicators.

Conclusions

In the end, a case study based hybrid index model analysis of cost volume of the quarterly turnover, depending on the value of inventory and the current storage volume of daily sales. It is enough for the reader a clear economic sense of the final result of the conversion from the expression (49), and allows managers to logistics and distribution business processes of production and trade, wholesale and retail trade and retailers to establish reasonable standards of current inventory storage.

This approach can also be timely to make these regulations required course corrections as taking into account the intensity of daily sales, and taking into account an accurate assessment of the seasonality factor purchases-sales. Thus, even when taken separately and piecemeal, but a row, analytical indexes pair give in linking cost-clear and transparent results in the assumption that the factorial scheme in a straight multiplier characteristics of the statistical relationship is sufficiently pre-calibrated.

Semantic analysis of the scheme by individual expressions (47) and (49), can be interesting to be interpreted as analytical indices built by a group of assessors "dual structural shift", which occurred in the first place, as a part of inventory, providing trade reporting period, due to changes in the structure of sales of daily trading enterprise of shoes. And this turned out to be an adverse structural shift was the cause of a different shift has happened as a result in the range of sales for the period under review. This is the second circumstance, as a result, led to a slight, barely noticeable, but the growth of retail trade turnover in the reporting period compared with the base only by 1.44% {compare with the previous indicator of growth +19.36% expression of formula (44)} in the calculations of the analytical chain.

In fact, the first structural shift in the assessment of significant symptoms are caused by (as the cause) of the second structural shift of another, no less significant feature for quite appropriate analogy with the movement of geologic plates or reservoirs under tectonic phenomena of nature. The proposed model allows the author simultaneously and jointly

explore and speed, and time of turnover of tangible assets with respect to typical primary reporting indicators and standard indicators of economic activity of the economic entity.

The hybrid model provides a reliable assessment of the effects of each factor on a productive sign and, accordingly, the carrying circular linking increments of each factor, not only in relative form, but also in absolute terms, i.e. at cost, using the method of the first differences as a special case of the method of chain substitutions with respect and dynamics, and targets, and the level of the plan. Table 3 shows the influence of the absolute size of each of the five signs of factors on the amount of the quarterly retail turnover, as well as the values of these increments in comparison with both the overall increase (column 6), and in comparison with the base level of a productive attribute (column 7).

Inference

Of course, the above scheme is proposed based on a factor analysis of the hybrid model of the index is not the only possible one. There are other, no less interesting patterns of economic analysis of the state and dynamics of current tangible assets with a different set of factors that characterize the level of inventory at different angles and in different aspects, and with not necessarily the index method, and correlation and regression methods analysis, and other analytical methods, complexity; at the expense of more serious mathematical apparatus, for example, with the use of matrix methods of research [7], and so forth.

The direction of future research

However, due to set out in a two-part article considerations, it seems very promising is the use of hybrid aggregated v|t-model systems integrated analysis of financial and economic state of the business entity as well as, say, a ratio analysis and multivariate models predicting the subject of bankruptcy. Of particular interest are the undoubted opportunities offered by the author of the model to be useful in order to adjust the state of the accounting (financial) statements of the enterprise in making its management informed management decisions in the organization, in assessing the market value of the business, as well as in the provision of engineering and operational long-term planning.

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