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Economic and Financial Analysis Based on Time Series Method

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Abstract *The purpose of this article is to highlight the possibility of using time series in economic and financial analysis for. In this context, we considered as the main indicator of economic analysis and financial turnover, which is significantly correlated variation and dynamics of the time series. To highlight the practical aspects related to the use of time series analysis and dynamic turnover we have achieved a practical study, in which we studied the evolution of this indicator made in a company in Romania, Transgaz S.A., in the period 2004-2014. The data used in the analysis are recorded in company balance sheets, slides taken 11 years to investigate. The objectives of this analysis are analyzing the evolution of turnover in the period 2004-2014, analysis of dynamic component possibilities turnover and forecasting its future.*

Key words Economic analysis, financial analysis, time series method, turnover, dynamics indices, growth rate

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1. Introduction

Time series analysis is a complex topic. A time series is defined as a collection of well-defined data point or some quantity that that have been measured at regular intervals of time. Time series analysis is about what has happened to a series of data points in the past and attempting to predict what will happen to it the future.

Depending on the type of measurements that are being taken, time series can be classified as being either a stock or a flow series. Stock series are measures, or counts, taken at a point in time and flow series are measures of activity over a given period of time. The main difference between a stock and a flow series is that a flow series can be affected by trading day effects. Both stock and flow series are treated in much the same way in the time series analysis process.

Dynamic Series/timeline consists of two parallel rows of data, the first row shows the variation characteristic time and the second row, variation researched phenomenon or feature from one unit to another time. Dynamic series/chronological are also called time series.

The analysis of dynamic series can be detached and therefore tend to approach absolute value recorded increases from year to year, or around trend growth rates based chain.

Statistical analysis of the series should be based on a system of indicators that characterize many quantitative relationships within the series and the period to which they relate.

We distinguish three categories of indicators: absolute indicators, relative indicators and indicators mean. In this article my porpoise is to carry out the calculation of these indicators in Transgaz S.A. on the turnover in the period 2004-2014.

2. Methodology of research

The methodology for calculating the indicators used to characterize a series is drawn on the example of the series of intervals, which ensures continuity and change of time may be interpreted as an analytic function of time:

$$Y_i = f(t_i), \quad (1)$$

Where:
Y_i = studied variable values;
T_i = while variable numerical values.

As the interval is a time series of indicators expressed in absolute size, we can move to processing of the series by calculating the absolute indicators, relative and mean.

A first absolute indicator, volume series can be calculated only for the series of intervals, the terms are cumulative:

$$\sum_{i=1}^{n} \frac{\Delta i}{i} - 1 = \Delta n/0 \quad (2)$$

$(y_1 - y_0) + (y_2 - y_1) + ...(y_n - y_{n-1}) = y_n - y_0.$

Relative indicators are widely used in macroeconomic analysis in relation to the determination of proportions and correlations between different activities and sectors of national economy.

$$I_{i/0} = \frac{yi}{y0} \cdot 100$$
$$I_{i/i} = \frac{yi}{yi-1} \cdot 100 \quad (3)$$

By calculating the absolute and relative indicators characterized the relations that exist between individual terms of a series, taking pairs. It follows the variability in terms of a series, due to influence exercised by all the causes and conditions that determine the evolution of the phenomenon.

The average growth rate reflects how increased relative sizes phenomenon in the period under review, the average interval from one unit to another. The average growth rate can be calculated as the difference between the average index dynamics, expressed as a percentage and 100% (which is based reporting).

3. Results

3.1. Data

To achieve analysis of the evolution and dynamics of turnover we used data from the balance sheets for a period of 11 years, from 2004 to 2014 the company Transgaz S.A. The results will be presented in Table 2 in order to highlight the link between absolute and relative indicators and presenting the calculation method.

Table 1. The turnover at TRANSGAZ S.A. during 2004-2014

Year	Turnover (thousand lei)
2004	772.277.441
2005	770.115.066
2006	909.017.487
2007	1.038.866.794
2008	1.119.389.990
2009	1.187.350.293
2010	1.308.103.000
2011	1.336.979.000
2012	1.327.987.000
2013	1.484.710.000
2014	1.618.090.000

Source: www.transgaz.ro

A first absolute indicator, is the volume of the series and can be calculated only for the series of intervals, for which the terms are cumulative.

$$\sum_{i=o}^{n} yI = 12.872.886.071$$

Fixed-base allowance (second column, table 2) noted with Δi/0 is obtained as the difference between the level of each period y_i and the level of the period of reference y_0.

$\Delta i/0 = y_i - y_0$.

In analyzing the dynamics of turnover at Transgaz SA this relationship applies to fixed-base allowance as follows:

$\Delta 1/0 = y_1 - y_0$ = 770.115.066 - 772.277.441 = -2.162.375 mii lei,
$\Delta 2/0 = y_2 - y_0$ = 909.017.487 - 772.277.441 = 136.740.046 mii lei,
……
$\Delta 11/0 = y_{11} - y_0$ = 1.618.090.000 - 772.277.441 = 845.812.559 mii lei.

The results are full represented in table 2 for the period 2004-2014.

Base increased by chain (column 3, table 2.) noted with Δi/i-1 is the difference between the level of each year (y_i) and the level of the year before (y_{i-1}), according to the relationship:

$\Delta i/i-1 = y_i - y_{i-1}$.

In our analysis, this relationship applies as follows:

$\Delta 1/0 = y_1 - y_0$ = 770.115.066 - 772.277.441 = -2.162.375 mii lei
$\Delta 2/0 = y_2 - y_1$ = 909.017.487 - 770.115.066 = 138.902.421 mii lei
$\Delta 3/0 = y_3 - y_2$ = 1.038.866.794 - 909.017.487 = 129.849.307 mii lei
……
$\Delta 11/0 = y_{11} - y_{10}$ = 1.618.090.000 - 1.484.710.000 = 133.380.000 mii lei

The results are full represented in table 2 for the period 2004-2014.

Table 2. The dynamic of turnover at TRANSGAZ S.A. during 2004-2014

		Absolute changes		Dynamic indices %		Growth rate %	
Year	Turnover	Fixed-base	Chain-base	Fixed-base	Chain-base	Fixed-base	Chain-base
	y	Δi/e	Δi/i-1	Ii/e	Ii/i-1	Ri/e	Ri/i-1
A	1	2	3	4	5	6	7
2004	772.277.441	-	-	100%	-	-	-
2005	770.115.066	-2.162.375	-2.162.375	99,72%	99,72%	-0,28%	-0,28%
2006	909.017.487	136.740.046	138.902.421	117,70%	118,03%	17,70%	18,03%
2007	1.038.866.794	266.589.353	129.849.307	134,51%	114,28%	34,51%	14,28%
2008	1.119.389.990	347.112.549	80.523.196	144,94%	107,75%	44,94%	7,19%
2009	1.187.350.293	415.072.852	67.960.303	153,74%	106,07%	53,74%	6,07%
2010	1.308.103.000	535.825.559	120.752.707	169,38%	110,16%	69,38%	10,16%
2011	1.336.979.000	564.701.559	28.876.000	173,12%	102,20%	73,12%	2,20%
2012	1.327.987.000	555.709.559	-8.992.000	171,95%	99,32%	71,95%	-0,67%
2013	1.484.710.000	712.432.559	156.723.000	192,25%	111,80%	92,25%	11,80%
2014	1.618.090.000	845.812.559	133.380.000	209,52%	108,98%	109,52%	8,98%
Total	12.872.886.071	-	845.812.559	-	-	-	-

The relative indicators have a very important place in the concrete analysis of the dynamics of social and economic phenomena. Indicators are used extensively in macroeconomic analysis in relation to the determination of proportions and correlations between different activities and sectors of the national economy.

The relative size, which shows how many times has changed as a phenomenon, is called dynamic index can be calculated with fixed-base and chain based.

The dynamic indices with fixed base is noted with $I_{i/0}$ (column 4, table 2) and is calculated as the ratio between the level of each year and the level of the year chosen as the base, is expressed as a percentage:

$$I_{i/0} = \frac{yi}{y0} \cdot 100$$

Applying this relationship in the economic analysis investigated, we get the following results when dynamic index:

$$I_{1/0} = \frac{y1}{y0} \cdot 100 = \frac{770.115.066}{772.277.441} \cdot 100 = 99.72\%$$

$$I_{2/0} = \frac{y2}{y0} \cdot 100 = \frac{909.017.487}{772.277.441} \cdot 100 = 117.70\%$$

……..

$$I_{11/0} = \frac{y11}{y0} \cdot 100 = \frac{1.618.090.000}{772.277.441} \cdot 100 = 209.52\%$$

The results are full represented in table 2 for the period 2004-2014.

Growth index-based chain ($I_{i/i-1}$) is calculated as the ratio between the level of each year and the previous year (column 5, Table 2.). This index is expressed as the percentage relationship:

$$I_{i/i} = \frac{yi}{yi-1} \cdot 100$$

We apply this relationship of based growth index chain at the turnover of the company investigated during 2004-2014.

$$I_{1/0} = \frac{y1}{y0} \cdot 100 = \frac{770.115.066}{772.277.441} \cdot 100 = 99.72\%$$

$$I_{2/0} = \frac{y2}{y0} \cdot 100 = \frac{909.017.487}{770.115.066} \cdot 100 = 118.03\%$$

……..

$$I_{11/0} = \frac{y11}{y0} \cdot 100 = \frac{1.618.090.000}{1.484.710.000} \cdot 100 = 108.98\%$$

The results are full represented in table 2 for the period 2004-2014.

Fixed-base growth rate is a ratio between the fixed base increase of each period and the year chosen as the base. This indicator is noted by $R_i/0$, is shown in column 6 of Table 2 and it is usually expressed as a percentage:

$$R_{i/0} = \frac{yi-y0}{y0} \cdot 100$$

In case of the turnover of TRANSGAZ S.A. this relationship contributed at the following percentages:

$$R_{1/0} = \frac{y1-y0}{y0} \cdot 100 = \frac{-2.162.375}{772.277.441} \cdot 100 = -0.28\%$$

$$R_{2/0} = \frac{y2-y0}{y0} \cdot 100 = \frac{136.740.046}{772.277.441} \cdot 100 = 17.70\%$$

……..

$$R_{11/0} = \frac{y11-y0}{y0} \cdot 100 = \frac{845.812.559}{772.277.441} \cdot 100 = 109.52\%$$

The results are full represented in table 2 for the period 2004-2014.

The growth rate base chain (Ri/i-1) is calculated as ratio between chain-based growth of each year and the previous year and was expressed as a percentage, according to the following equation:

$$R_{i/i} = \frac{yi-yi-1}{yi-1} \cdot 100$$

Applying this relation to the progression of turnover we get the next growth rate following chain base for the period 2004-2014:

$$R_{1/0} = \frac{y1-y0}{y0} \cdot 100 = \frac{-2.162.375}{772.277.441} \cdot 100 = -0.28\%$$

$$R_{2/1} = \frac{y2-y1}{y1} \cdot 100 = \frac{138.902.421}{770.115.066} \cdot 100 = 18.03\%$$

……

$$R_{11/10} = \frac{y11-y10}{y10} \cdot 100 = \frac{133.380.000}{1.484.710.000} \cdot 100 = 8.98\%$$

The results are full represented in table 2 for the period 2004-2014.

The transition from the base rate increased by fixed base in the chain can be made only by transforming them into dynamic indices:

$I_{i/0} = (R_{i/0} + 1) \cdot 100$

$I_{i/i-1} = (R_{i/i-1} + 1) \cdot 100$

Because there is no equality between the indices of the rate increase based in chain and the rate indices fixed over the period, we used the relationship:

$$\prod_{i=1}^{n} Ri/i - 1 \neq Rn/0$$

4. Conclusions and recommendations

A time series indicators can be organized into a system in which each allow you to highlight one aspect of how the development of the phenomena studied. The veracity indicators are determined by the manner in which a series of signification period chosen for the evolution of the phenomenon studied empirical data used homogeneity and length series.

The purpose of this article was to carry out the calculation of three indicators: absolute, relative and mean on the turnover of Transgaz S.A. in the period 2004-2014. For each year of the analysis we have calculated Fixed-base, Chain-base of the dynamic indices, Fixed-base and Chain-base of the growth rate.

The values recorded by the indices investigate shows values on the rise in the case of indices with fixed base while in the case of indices based in chain the values are relatively similar.

We have encountered a similar situation and in relation to the rate of growth of turnover in the period 2004-2014. Index values are similar, and in the case with fixed base indices and in the case of those based in chain.

To gain an overview of indices analyzed in the evolution of the turnover in the period 2004 to 2014, the values recorded by them are summarized in full in table 2.

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