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FORECASTS ON SOME FINANCIAL INDICATORS:
A CASE STUDY FOR S.C.D.A SIMNIC

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Abstract:
In this paper, several financial indicators at S.C.D.A. Simnic are investigated from a statistical point of view. Using the method of least squares, the mathematical functions that model the trend are found and with the help of which financial forecasts are made, also using the growth rates with a chain basis and a fixed basis for the time series corresponding to the period 2008-2022. Finally, an analysis is made of the correlations between these indicators, such as income, expenses, profit, assets, liabilities, stocks, receivables, capital and the results found are interpreted. Thus, the forecasts on the financial indicators and the correlations between them can be of great help in the management of a company, being able to contribute to the efficiency of the activity through adequate budget planning, performance evaluation, investment decision-making or human resources planning. They can help managers identify opportunities and risks, optimize the use of resources, and achieve better financial results for the firm.

Keywords: financial indicators, forecasts, time series, correlations.

1. Introduction

At the agricultural research and development station Șimnic - Craiova, the research theme focused on culture technologies for the main agricultural plants in the pedo-climatic conditions specific to the area, plant protection, fodder production and bull breeding, as well as the mechanization of agricultural production processes. S.C.D.A. Simnic is an agricultural resort that produces and sells cereals and dairy products of the best quality. In this work we will make analyses and forecasts on the main financial indicators from S.C.D.A. Siminic.

Forecasting financial indicators of a company has multiple purposes and benefits. Among the main uses of financial indicator forecasts we mention:

- allows the company to plan and create budgets for future periods. This includes estimating revenue, expenses, profit, cash flow and other relevant financial indicators. Forecasts help set financial goals and align resources accordingly.

- provides a benchmark to assess the firm's current performance against established goals and expectations. By comparing actual results with forecasts, deviations can be identified and corrective actions can be taken to improve financial performance.

- provides essential information for making strategic decisions regarding investments, business expansion, management of financial resources and other key aspects. They can provide insight into the potential impact of decisions on the firm's financial situation and help identify opportunities and risks.

- can be used to attract financing from banks, investors or other external sources. They demonstrate the solvency and financial sustainability of the firm and provide confidence in its ability to repay loans or provide an attractive return to investors.

- are useful in communicating with stakeholders such as shareholders, business partners, customers or employees. They provide insight into the company's financial direction and convey information relevant to understanding its situation and performance.

Forecasts of financial indicators must be based on relevant data and information, sound analysis and appropriate estimation methods. It is important to recognize that forecasts are estimates and that actual results may vary depending on internal and external factors that may affect the business. The analysis and evaluation of a company is aimed at establishing the real value of the business at a given moment, estimating the real wealth of the shareholders and the company's potential to increase their wealth. Thus, the evaluation of an entity does not only consist in establishing the value of a property or an asset, but also involves determining its ability to generate flows in the future (profit, cash flows), from which the owner should benefit, these being able to be predicted by statistical-mathematical methods.

There are several methods of forecasting a company's financial data, but in the paper we will use financial modelling. This method involves the use of statistical-mathematical models to project the company's financial data into the future. These models may include simulation models, regression models, economic models or time series models (see for example Mackinnon, J.G. (2004), Georgescu V. (2005), Iacob S.V. (2019)). They can be customized according to the specifics of the business and the available data. We will use the method of least squares in determining the trend function for forecasting financial data, using the growth rates with a chain basis and with a fixed basis in the analysis of the corresponding time series.

The work is structured as follows. The introductory part presents the advantages of the forecasts of some financial indicators and their usefulness. The second part corresponds to the study of the specialized literature, in which the results obtained in other scientific works and the connection with the present work are presented. In the third part, the research methodology is presented, in which descriptive statistics, time series analysis and the method of least squares are used to determine the trend function. The fourth part contains the new elements of the work, being statistically analysed several financial indicators from S.C.D.A. Simnic. Growth rates with a chain basis and a fixed basis are used in the analysis of the time series corresponding to the period 2008-2022 and forecasts are made on the values of the financial indicators from the year 2023 with the help of the trend functions. Also, an analysis of the correlations between these indicators is made, using the correlation matrix and the results are interpreted. The work ends with the part of conclusions and further developments.

2. Literature Review

There is a lot of specialized literature in the field of economic-financial analysis from a statistical point of view. In this work we will present only a part of these works, namely those that use similar research methods. Thus, Anghelache C. and Capanu I. (2000), Gheorghiu Al. (2012) described the economic indicators used in micro and macro-economic analysis.

Spătaru L. (2011) presented the economic-financial analysis as a tool of enterprise management, and Lazăr M., Lazăr C. (2012) made a statistical-economic analysis of the indicators.

Anghelache C., Anghel M.G., Iacob S.V. (2020) highlighted the important aspects regarding statistical indicators, as well as their role in econometric analyses. For economic indicators, a series of variation and correlation coefficients are calculated that highlight the way in which the factors with influence on the economic evolution are interrelated and lead to concrete results over time.

Davidson R. and Mackinnon J.G. (2004), Georgescu V. (2005), Iacob S.V. (2019) describe statistical-econometric methods for quantitative analyses in economics. Anghelache C. and Anghel M.G. (2014) presents economic modelling concepts and case studies.

In their work, Anghelache C., Anghel M.G. (2022) analysed a series of data to make a forecast regarding the yield of investments on the capital market. The authors used data from the international literature and used the method of comparison and other statistical methods of capital market evolution. Also, Anghelache C., Radu I. Stoica R. (2020) analysed through the dynamic series of flows, the way in which a commercial company evolves economically. The calculations were made on the basis of chronological indicators, which are expressed and calculated as indicators with a fixed base or indicators with a chain base.

Boshnakov G.N. and Iqelan B.M. (2009) proposed a method for generating periodically correlated and multivariate ARIMA models having the dynamic characteristics partially or fully specified in the form of eigenvalues, respectively eigenvectors of the associated model matrices. This method uses the spectral decomposition of the multi-companion matrices and their factorization into products of the corresponding matrices. The generated models are needed in simulation, but can also be used in estimation, for example to set sensible initial parameter values for nonlinear optimization.

In their work, Anghelache C., Anghel M.G., Samson T., Stoica R. (2017) present the essential theoretical elements on which economic forecasting must be based. The authors give a wide space to the methodological framework of the economic forecast of the structure of the forecasts and pay attention to the logical flow of the forecasting works, by going through the essential stages of diagnosis, forecasting and planning.

In the book by Bardsen G. et al. (2007), wage and price modelling take a central role as the authors interpret and evaluate the last forty years of international research experience. It also covers inflation modelling, inflation targeting, monetary policy rules and forecasting in one book. It is also emphasized that inflation is a complex phenomenon, not one that can be explained by one or two explanatory variables.

Pesavento E., Rossi B. (2006) found that existing methods for constructing confidence intervals for multivariate impulse response functions can have poor

coverage at long times when the variables are highly persistent. The aim of this paper is to propose a simpler method, which is not punctual and which is efficient in the presence of very persistent processes, using approximations based on the local-to-unit asymptotic theory. This method is shown to have better coverage properties at long horizons than existing methods and can provide different economic conclusions in empirical applications.

Reis R. (2009) pursued two approaches to modelling consumption dynamics, one statistical and one economic. The first statistical approach estimates consumption properties and calculates costs so that consumption fluctuates around its average growth. The second economic approach uses a calibrated model of optimal consumption and measures the costs of eliminating income shocks.

3. Research Methodology

Descriptive statistics (Table 16) can be used in analysing a company's financial indicators over a certain period of time to provide a summary and interpretable picture of the data. It involves using statistical methods to describe and synthesize the main characteristics of financial data, such as trends, distribution, variability, and relationships between variables.

Thus, descriptive statistics can be used in the analysis of a company's financial indicators using:

- measures of central tendency, such as mean, median and mode to identify the central or typical value of a financial indicator over a period of time. These measures can provide insight into the average or representative level of the indicator.

- measures of variation, such as dispersion, standard deviation and coefficient of variation, to assess the variability and dispersion of financial data over a period of time. These measures can indicate the degree of fluctuation or stability of the financial indicator. Also, the coefficient of variation is not always the best measure of relative variability, for example when the mean is zero or negative, and it may be useful to use other statistical measures to assess the variation in a data series.

- correlation analysis, by using the correlation coefficient to evaluate the relationships between the company's financial indicators over a period of time. This can help identify dependencies or relationships between different financial aspects of the firm.

By applying these methods and techniques of descriptive statistics, we can gain a deeper understanding of financial data and extract relevant information for decision making. However, it is important to consider other contextual aspects and to use statistical methods appropriate to the nature and distribution of the financial data being analysed.

The method of least squares is a common method used in determining the trend function in financial data analysis. This method involves fitting mathematical functions to the historical data so that the sum of the squares of the differences between the observed values and the estimated values is minimal.

It is important to note that the least squares method provides an estimate of the trend function based on the available data, but cannot anticipate unpredictable changes or external influences. Therefore, it is recommended to use also more methods and to take into account the specific context of the business in the interpretation and use of the obtained results.

4. Results and discussion
4.1 Statistical analysis and forecast of financial indicators

In what follows, we will do a statistical analysis and forecast on the main financial indicators from S.C.D.A. Simnic.

A firm's total financial income refers to the sum of all income earned by that firm in a given time period, usually a year. To calculate the total revenues of a company, all the revenues generated by it during the reference period are added up. It includes income from the firm's main activities, such as sales of products or services, but also income from secondary or non-operating activities, such as dividends, interest or rental income.

It is found that the average total financial income in the period 2008-2022 at S.C.D.A. Simnic was 11.336.834 with a standard deviation of 2.368.573, with a maximum value of 15.346.011 obtained in 2015, due to the access to European funds and a minimum of 7.584.149 in 2010. The coefficient of variation has a value of 20,8% suggesting a relatively low variability of the data, the series being homogeneous and the mean representative. In general, there is an increasing trend, visible in recent years (Table 1, Figure 1), but inflation also increased during this period. We make the forecast with a polynomial function of the second degree, by the method of least squares and we get

$$f(x) = 10521x^2 + 233461x + 9000000$$

For the year 2023, we calculate the value of the forecast by $f(16) = 15.428.752$.

Table 1. Growth rates for total financial income

Year	Total income	Growth rate with chain base	Growth rate with fixed base
2008	10951587		
2009	7722384	-29,48%	-29,48%
2010	7584149	-1,79%	-30,74%
2011	9658066	27,34%	-11,81%
2012	9647979	-0,10%	-11,90%
2013	10431235	8,11%	-4,75%
2014	10594708	1,56%	-3,25%
2015	15346011	44,84%	40,12%
2016	10569369	-31,12%	-3,49%
2017	10401397	-1,58%	-5,02%
2018	12097945	16,31%	10,46%
2019	13876620	14,70%	26,70%
2020	12619088	-9,06%	15,22%
2021	13677425	8,38%	24,88%
2022	14874548	8,75%	35,82%
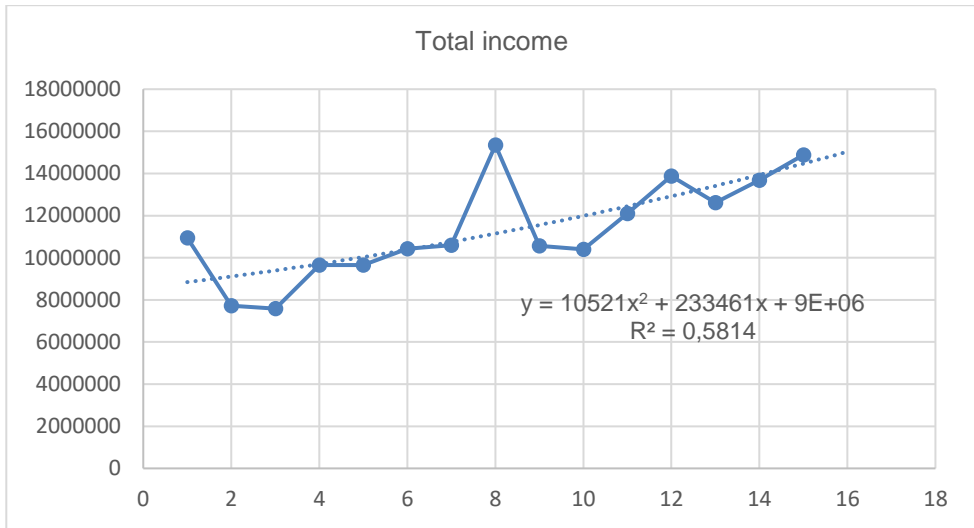
Figure 1. Total income at S.C.D.A Simnic

Turnover refers to the total value of sales of products or services made by a company in a given period of time, usually a year. This includes the sum of the values of all sales transactions completed by the company. Turnover measures the volume of the firm's sales activity and reflects its level of performance in generating revenue from its core operations. Thus, the difference between turnover and total revenues lies in the fact that turnover refers strictly to the revenues generated from the main sales activity of the firm, while total revenues include all revenues obtained by the firm, regardless of their source. Turnover is an important indicator for evaluating the performance and size of a business. An increase in turnover can indicate expansion and success in the market, while a decrease can signal difficulties or problems with the company's sales and overall performance.

In the analysed period, an average of 8.595.885 was recorded with a standard deviation of 2.280.353 lei. The maximum value of 12.561.548 was obtained in 2022, and the minimum of 4.797.954 in 2010. The coefficient of variation is 26,5%, resulting in moderate relative variability. This suggests that the data has some variation from the mean, but that variation is still relatively small. There is an increasing trend in the last 6 years (Table 2, Figure 2). We make the forecast using a polynomial function of the second degree, resulting in the expression:

$$f(x) = 56292x^2 - 508377x + 8000000$$

For the year 2023, a value of $f(16) = 14,276,720$ is expected.

Table 2. Growth rates for turnover

Year	Turnover	Growth rate with chain base	Growth rate with fixed base
2008	9542877		
2009	6367257	-33,27%	-33,27%
2010	4797954	-24,64%	-49,72%
2011	5796490	20,81%	-39,25%
2012	8222398	41,85%	-13,83%

2013	7016426	-14,66%	-26,47%
2014	8796428	25,36%	-7,82%
2015	6711821	-23,69%	-29,66%
2016	8382542	24,89%	-12,15%
2017	8055757	-3,89%	-15,58%
2018	9033860	12,14%	-5,33%
2019	10472220	15,92%	9,73%
2020	10981331	4,86%	15,07%
2021	12199368	11,09%	27,83%
2022	12561548	2,96%	31,63%
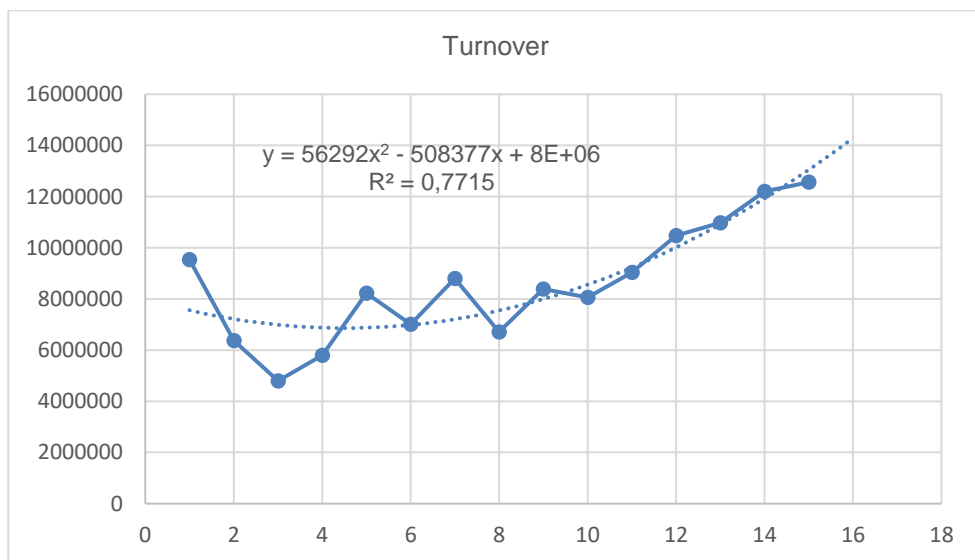
Figure 2. Turnover at S.C.D.A Simnic

Total expenses in a company represent the sum of all costs and expenses incurred in carrying out its activity in a certain period of time. These expenses include all resources and monetary value consumed in the process of production, sale or provision of services. Total expenses are important for evaluating a firm's financial performance because they reflect the costs incurred in relation to the revenues generated. Effective expense management can help increase profitability and improve overall business performance.

Regarding the period 2008-2022 at S.C.D.A. Simnic, an average of 10.585.419 was calculated, with a standard deviation of 2.166.878, with a maximum value of 14.021.626 in 2022, also due to inflation, and a minimum value of 7.223.260 from the year 2009. The coefficient of variation with the value of 20,4% indicates a sufficiently homogeneous series with the representative average. There is an increasing trend throughout the period (Table 3, Figure 3) with some small fluctuations. The prediction function is chosen linear, given by

$$f(x) = 447009x + 7000000$$

with the predicted value for the year 2023 given by $f(16) = 14.152.144$.

Table 3. Growth rates for total expenses

Year	Total expenses	Growth rate with chain base	Growth rate with fixed base
2008	9165594		
2009	7223260	-21,19%	-21,19%
2010	7401331	2,46%	-19,24%
2011	8692016	17,43%	-5,16%
2012	8668933	-0,26%	-5,41%
2013	9450079	9,01%	3,10%
2014	9709249	2,74%	5,93%
2015	12032304	23,92%	31,27%
2016	10949014	-9,00%	19,45%
2017	11265472	2,89%	22,91%
2018	11261739	-0,03%	22,86%
2019	13316949	18,24%	45,29%
2020	13374724	0,43%	45,92%
2021	12249009	-8,41%	33,64%
2022	14021626	14,47%	52,98%
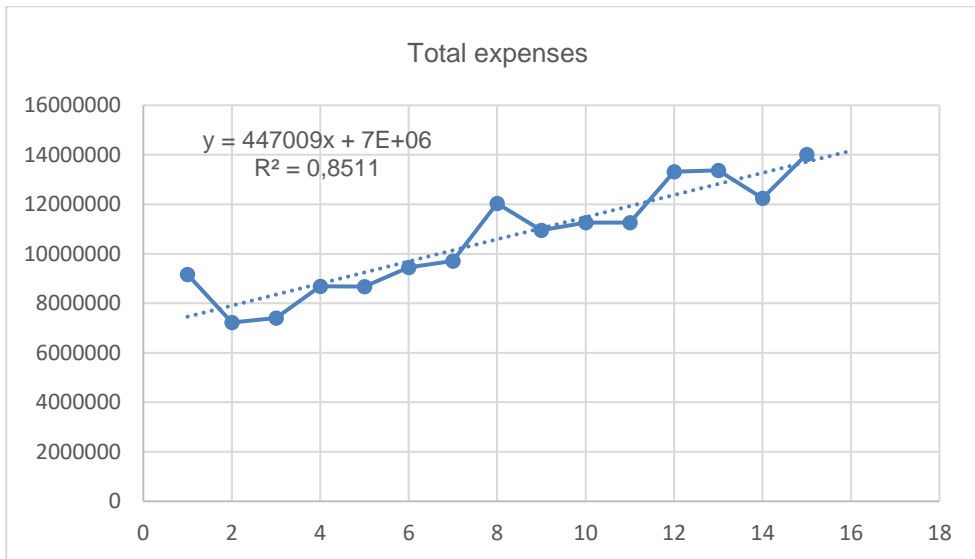
Figure 3. Total expenses at S.C.D.A.Simnic

A firm's profit is the difference between its total income and its total costs over a given period of time, usually a year. It is a measure of the financial performance of a business and indicates how efficient the company is in generating net income. Profit is an important indicator of a company's financial health and reflects its ability to generate a surplus of income over expenses. A positive profit indicates that the company generated more income than the costs incurred and can be a sign of the success and sustainability of the business. On the other hand, a negative profit or loss indicates that total expenses exceeded total income and the company was unable to generate enough income to cover costs. In these cases, a careful

assessment of business activity and strategy is required to identify and correct financial problems.

The analysis of the net profit at SCDA Simnic results in an average value of 673.347 and a standard deviation of 1.025.004 in the analysed period, with a maximum value of 3.155.975, obtained in 2015, also due to the access to non-refundable funds, but also a minimum value negative -1.028.248 in 2017. It should be noted that the profit was reinvested and a significant part of the income was used to repay the loans, for this reason resulting in large annual fluctuations (Table 4, Figure 4). Large variations are observed from one year to another, a fact confirmed by the coefficient of variation which has a value of 152%, the data series being heterogeneous and the mean insignificant. It is difficult to make a realistic forecast in these conditions, in which no trend can be distinguished, but we can cautiously try a decreasing linear function, taking into account the unfavourable international situation and the reduced price of grain due to imports from Ukraine, resulting

$$f(x) = -45530x + 1000000$$

and for the year 2023, the forecast is $f(16) = 271.520$.

Table 4. Profit growth rates

Year	Profit	Growth rate with chain base	Growth rate with fixed base
2008	1674449		
2009	522239	-68,81%	-68,81%
2010	155150	-70,29%	-90,73%
2011	919758	492,81%	-45,07%
2012	895820	-2,60%	-46,50%
2013	931161	3,94%	-44,39%
2014	761228	-18,24%	-54,53%
2015	3155975	314,58%	88,47%
2016	-530805	-116,81%	-131,70%
2017	-1028248	-93,71%	-161,40%
2018	714486	169,48%	-57,33%
2019	442593	-38,05%	-73,56%
2020	-774245	-274,93%	-146,23%
2021	1407747	281,82%	-15,92%
2022	852902	-39,41%	-49,06%
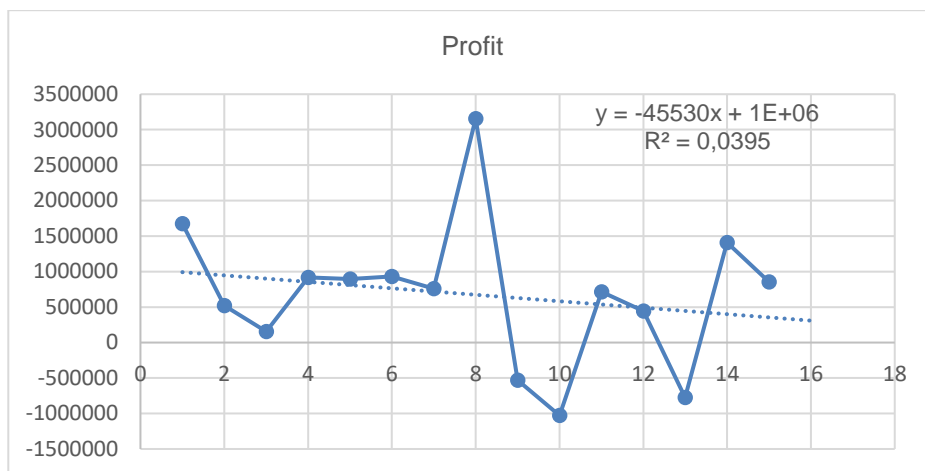
Figure 4. Net profit at S.C.D.A Simnic

A firm's total assets represent the total value of all resources owned by the company during a given period of time. Assets include all assets, rights and resources controlled by the firm that have the potential to generate future economic benefits. Total assets are calculated by summing up the values of all the patrimonial elements of the company. Total assets provide a picture of the total value of the resources held by the firm and are used to assess its size and solvency. It is important to note that total assets must be analysed in the context of other financial indicators and accounting reports to obtain a comprehensive picture of a firm's financial position and performance.

At S.C.D.A. Simnic, an average of 50.168.121 is found in the period 2008-2022, with a maximum value of 70.373.168 in 2020 and a minimum value of 11.107.205 in 2008. The coefficient of variation is 41,6 % meaning that the relative variability is high. This suggests that the data have significant variation from the mean, but are not very extreme, with the mean still being significant. There is a significant jump of 338% in 2011 of the total assets (Table 5), due to the retrocession of some lands to the company and the revaluation of the assets. For this reason, for the forecast we will use the period 2011-2022 (12 years, Figure 5) and consider a polynomial function of degree 3, resulting in the expression:

$$f(x) = 13828x^3 - 319546x^2 + 4000000x + 50000000$$

The forecast value for 2023 is obtained by calculating $f(13) = 78.376.842$.

Table 5. Growth rates for total assets

Year	Total assets	Growth rate with chain base	Growth rate with fixed base
2008	11107205		
2009	11764521	5,91%	5,91%
2010	11538250	-1,92%	3,88%
2011	50595629	338,50%	355,52%
2012	51706716	2,19%	365,52%
2013	52980121	2,46%	376,98%
2014	54744932	3,33%	392,87%

2015	59295536	8,31%	433,84%
2016	62946173	6,15%	466,71%
2017	63430407	0,76%	471,07%
2018	62327564	-1,73%	471,07%
2019	54951800	-11,83%	394,74%
2020	70373168	28,06%	533,58%
2021	66509290	-5,49%	498,79%
2022	68250513	2,61%	514,47%
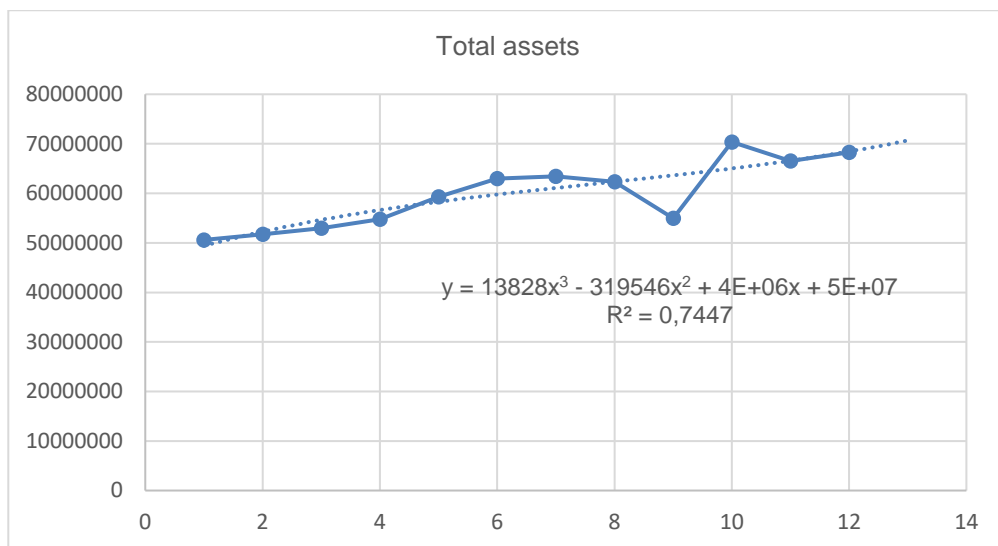
Figure 5. Total assets at S.C.D.A Simnic

Fixed assets represent those long-term assets of a company that are used repeatedly and continuously in the performance of its production or service activity, over a period longer than one year. These assets are often critical to the operation of the business and are not intended for immediate sale.

From the descriptive statistics at S.C.D.A. Simnic, an average of 40.500.088 was calculated for fixed assets, with a standard deviation of 19.732.345, having the maximum value of 60.207.160 reached in 2020, and a minimum value in 2009 of 3.739.055. The coefficient of variation has a value of 48.7%, resulting in a high variability, that is, the data have a significant variation compared to the mean, but they are still not very extreme, the mean being somewhat significant. There is a significant increase in the year 2011 of fixed assets (Table 6), due to the retrocession of lands made within the company and consequently for the forecast we will use the period 2011-2022 (12 years, Figure 6), also considering a polynomial function of the third degree, resulting in the expression:

$$f(x) = -29887x^3 + 477459x^2 - 413946x + 40000000$$

Consequently, the forecast for the year 2023 is obtained from $f(13) = 49,647,534$

Table 6. Growth rates for fixed assets

Year	Fixed assets	Growth rate with chain base	Growth rate with fixed base
2008	3865914		
2009	3739055	-3,28%	-3,28%
2010	3875188	3,64%	0,23%
2011	42414526	994,51%	997,14%
2012	42536688	0,28%	1000,30%
2013	42749866	0,50%	1005,81%
2014	44130076	3,22%	1041,51%
2015	46691913	5,80%	1107,78%
2016	54059277	15,77%	1298,35%
2017	53952206	-0,19%	1295,58%
2018	54005497	0,09%	1295,58%
2019	46865725	-13,22%	1112,28%
2020	60207160	28,46%	1457,38%
2021	54527361	-9,43%	1310,46%
2022	53880880	-1,18%	1293,74%
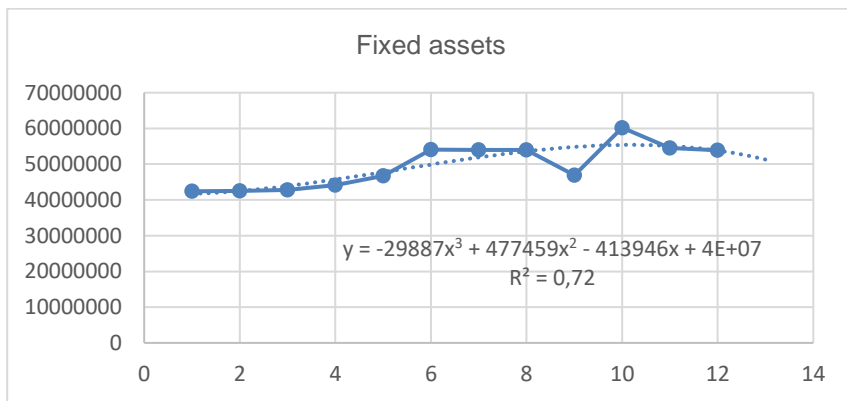
Figure 6. Fixed assets at S.C.D.A Simnic

$$y = -29887x^3 + 477459x^2 - 413946x + 4E+07$$
$$R^2 = 0,72$$

Current assets are those assets of a firm that are expected to be converted into cash or consumed within a normal business cycle, i.e. within a time frame of approximately one year. These assets are liquid and can be easily converted into cash within a short span of time. Current assets are essential for running a company's day-to-day business and help support the liquidity and day-to-day running of the business. They are valued at the lower of realizable value or estimated market value.

In the analysed period, there was an average of 9.468.032, with a standard deviation of 1.858.383, with a maximum value in 2022 of 14.369.633, but also a minimum value of 7.241.291 recorded in 2008. The coefficient of variation has a value of 19,6% suggesting that the data have a certain variation from the average, but this variation is still relatively small and the average is representative. There is an increasing trend in the last four years (Table 7, Figure 7). For forecasting we also use a polynomial function of the third degree and the expression results:

$$f(x) = 15780x^3 - 326913x^2 + 2000000x + 4000000$$

with the value $f(16) = 16.945.152$ forecasted for the year 2023.

Table 7. Growth rates for current assets

Year	Current assets	Growth rate with chain base	Growth rate with fixed base
2008	7241291		
2009	8025466	10,82%	10,82%
2010	7663062	-4,51%	5,82%
2011	8181103	6,76%	12,97%
2012	9170028	12,08%	26,63%
2013	10230255	11,56%	41,27%
2014	10614856	3,75%	46,58%
2015	9603623	-9,52%	32,62%
2016	8886896	-7,46%	22,72%
2017	9478201	6,65%	30,89%
2018	8322067	-12,19%	14,92%
2019	8086075	-2,83%	11,66%
2020	10166008	25,72%	40,38%
2021	11981929	17,86%	65,46%
2022	14369633	19,92%	98,440%
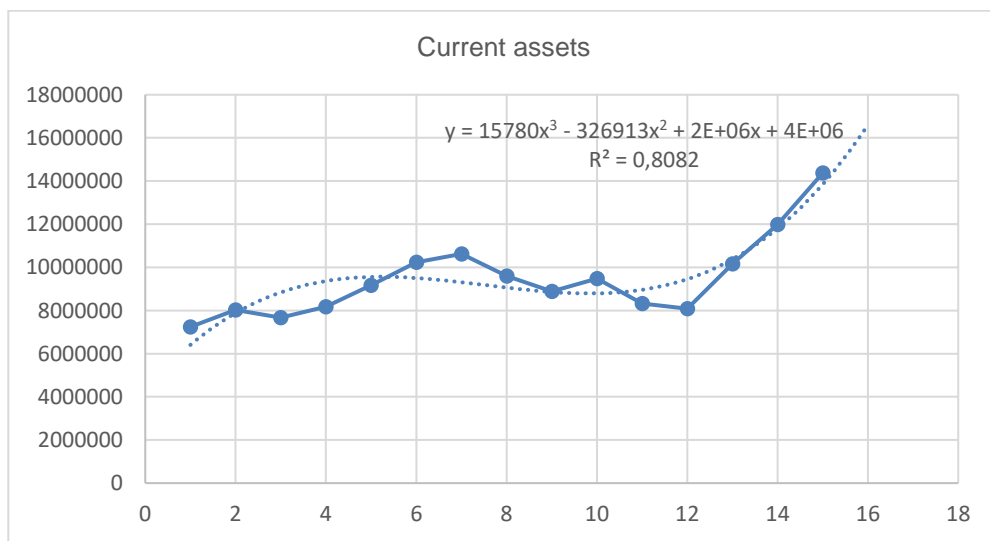
Figure 7. Current assets at S.C.D.A Simnic

Current liabilities in a company are short-term financial obligations of the company that must be paid within a time frame of about one year. These liabilities are usually associated with purchases of goods or services, operational financing or other current financial obligations of the firm. Current liabilities reflect the level of the firm's financial obligations to third parties and represent an important part of the