
Impact of the auditor's use of Artificial neural networks on the study of enterprise continuity - Case Study at Saidal Society 2017-2023 -

Dr.Faiza Oumelkheir HACHI*

PRF. Elamine LEBBAZ

Laboratory: Quantitative Methods of Economics, Business Sciences and Applications for Sustainable Development, MAQEMADD, Ziane Achour University, (DJELFA), ALGERIA.

Laboratory : Economic and Human Development in Algeria University Blida. **PRF In** Ziane Achour University, (DJELFA), ALGERIA.

faiza.hachi@univ-djelfa.dz

e.lebbaz@univ-djelfa.dz

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Abstract:

Our current study aims to demonstrate the importance of using advanced analytical procedures by adopting AI approaches in the analysis of the financial position of the organization and to discover its ability to survive and grow in order to answer the problems of the study, the concepts of the study's variables were addressed in the theoretical section, Then apply the neural network method as an AI model to Saidal Foundation for the period 2017-2023 by forecasting its sales using this approach to reveal the ability of the institution in question to absorb more of its future sales revenue to verify its viability. Thus, the auditor avoids the risk of legal liability related to the fairness of his opinion on the financial position disclosed by the institution under scrutiny...

Keywords: Artificial intelligence; Synthetic neural networks; Auditing; Enterprise continuity; Forecasting.

Jel Classification Codes: M41, M42, G22.

*Corresponding author.

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1. Introduction:

The audit profession has witnessed a significant development in recent years in terms of the multiplicity and magnitude of economic institutions and the proliferation of multinational institutions, as well as the diversity and expansion of commercial exchanges and their interconnectedness, which impose on external auditors - and to achieve the principle of the necessary professional quality of care - the use of modern methods and methods of performance. which reflects the accuracy of the results reached, as well as the accurate and proper determination of the enterprise's status and financial position and the judgement of the sincerity and fairness of its financial lists, The most important methods of modern analytical procedures are the scrutiny of the use of AI models represented by synthetic neural networks.

Hence the underlying research problem and its importance in trying to present two frameworks, one theoretical and the other applied as an input to demonstrate the importance and impact of the use of AI models represented in synthetic neural network methods as analytical procedures in achieving the efficient use of the audit process and analytical examination and its impact in detecting and controlling external audit risks by verifying the sustainability of the enterprise In the light of the foregoing, we can study and discuss the problems of research by asking the following key question:

How capable is the use of synthetic neural networks to detect enterprise continuity?

To answer the main formats, the study requires us to develop the following sub-questions:

- What is the concept of analytical procedures in auditing and its most important methods?
- How can synthetic neural networking detect the sustainability of an enterprise?
- To what extent does the use of the synthetic neural network model reduce the risk of scrutiny by assessing the sustainability of the enterprise?

1.1. Study hypotheses:

To answer the main problem as well as sub-questions, we have drafted the hypotheses of this study for discussion and validation as follows:

- The audit analytical procedures are a process of examining and comparing the relationships between financial and non-financial statements in order to ascertain the continuity of the institution under scrutiny as well as verifying the validity and authenticity of the balance of the financial statements.
- Using the synthetic neural network curriculum as an analytical measure in the process of auditing the sustainability of the institution under consideration based on its potential to generate growing revenue from its future sales, thereby controlling potential undiscovery risks around the enterprise's activity.
- AI models - artificial neural networks - are used to understand the relationship between various audited

financial accounts by selecting some as independent variables and others' accounts (as a subordinate variable) which determines the degree of correlation and decline between these calculations and verifying their credibility and realism as well as predicting their future values in order to reveal the sustainability of the institution under examination.

1.2. The importance of the study:

Our study contributes to the analysis and discussion of many issues related to modern analytical procedures in the audit process of AI models. The importance of this study lies in the following points:

- The importance of the use of analytical procedures by the external auditor provided for under Algerian auditing standards, as well as the International Auditing Standard ISA N.o 520 issued by the International Standards Board to audit the enhancement of the quality of the external auditing process by detecting and responding to possible substantial deviations (by assessing the principle of institutional continuity) in order to reduce them in the future;
- The importance of using AI models in analytical auditing procedures to improve the qualitative characteristics of the data contained in the financial lists, thereby improving them in the service of internal and external parties relevant to and in the interest of the institution under scrutiny;
- Modern analytical procedures are represented in synthetic neural networks as one of the most important tools for collecting adequate and appropriate evidence on the sustainability of the institution under examination, as well as to draw the auditor's attention to extraordinary substantive misrepresentations that require additional audit procedures, thus avoiding and responding to various audit risks as much as possible.

1.3. Previous studies:

-**Amar Hani Mohammed Al-Naimi's study**, using synthetic neural networks to identify auditing risks, higher diploma research, 2019, Faculty of Management and Economics, Mosul University, Iraq.

The study was designed primarily to demonstrate the importance of using synthetic neurons to identify audit risks through the adoption of descriptive and analytical methodologies. Through its study, the researcher concluded that the process of identifying audit risks using artificial neural networks helps the auditor to properly perform audit tasks as well as expressing a neutral technical opinion on the fairness of financial strength.

-**Badr Nabih Arsanius' study**, Experimental Study of the Use of Neural Networks to Develop the Role of the Comptroller in the Report on Misleading Financial Statements, 2012.

The study aimed to close the gap of audit expectations using neural networks as one of the advanced methods of supporting decision, and concluded that the auditor's use of decision support tools in assessing management's risk of fraud using neural networks because of its proven predictive ability and the potential to absorb many variables and the sheer amount of data.

2. Theoretical part of the study:

The method of artificial neural networks is one of the most important methods and fields of artificial intelligence and modern technologies used in the process of analytical examination, especially those related to the identification of audit risks, which requires the external auditor to recognize them and their most important characteristics. Therefore, through this part of the study we will try to address the different concepts of artificial neural networks as an analytical measure.

2.1 Concept of analytical procedures:

It should be noted that the term "analytical procedure" was introduced by the United States of America in 1988 instead of the term "analytical review" in the sections of audit statement No. 54 ISA No. in 1970, where analytical procedures were considered to be one of the most basic tests the auditor is required to perform to obtain adequate and appropriate evidence.

- **The American Institute of Chartered**, through its International Auditing Standard N.56, has previously confirmed that evidence that can be obtained by an external auditor during his or her inspection mission is done only through his or her conduct of two types of proceedings:

❖ **Detailed audit of operations and balances;**

❖ **Analytical audit procedures for financial and accounting statements.**

IFAC's draft International Auditing Standard **No. ISA .No.520**, which replaced **IFAC International Auditing Guidance No. 12 of 1988**, also defined analytical procedures as (IFAC, 2019, p. 387): "an assessment of financial information by examining the expected relationships between financial and non-financial information, as well as enquiring about specific fluctuations and relationships that are inconsistent with the related financial information, or that deviate efficiently from the projected amounts".

We note that this definition was somewhat complementary with its counterpart, **SAS N ° 56**, issued by the American Institute of Chartered Accountants (**AICPA**) in **1988**, but this good focused on the purpose of the procedure while **ISA.NO.520** in addition to the objective of the analytical procedures, focused on possible methods of examination and analysis.

Many researchers in the field of accounting and auditing have also given different definitions of analytical procedures, including:

Both **BOYNTON AND RAYMOND** researchers define it as (Boynton, 2005, p. 324): "To study and compare the relationships between financial and non-financial statements with a view to ascertaining the correctness and correctness of the balance of the financial statements".

We note from the above definition that in their definition of analytical procedures, researchers have focused on analysis by linking the relationship between financial and non-financial data, but the most important aspect of the analysis should also examine the relationship between financial data and each other.

Where these procedures have been defined as: (Krait, 2009, p. 435) "A process of inspection and testing of information relating to an enterprise through its books and accounts and comparison of such information with what is known about the institution to determine its consistency."

From this definition, emphasis has been placed on analysing the internal data of the institution under scrutiny and comparing them with what is known about them (the surrounding external environment). This method of analysis is used to judge the reasonableness of the financial statements and accounts of the institution as well as its conformity with the nature and activity of the enterprise.

Based on the concepts of analytical procedures presented above, we can draw a comprehensive definition of them, and therefore analytical procedures are: "The process of testing and evaluating financial statements by examining and comparing financial information with each other and with non-financial information by using different methods and methods, such as inquiries and access to the internal and external documents of the institution under scrutiny, or quantitative through the use of financial analysis or mathematical and statistical methods to provide a reasonable level of assurance about the authenticity and legitimacy of financial lists as well as in order to achieve the objectives of the audit function. "

2.2 Concept of synthetic neural networks:

The style of synthetic neural networks dates back to 1943, so that the first model of an artificial neuron was built by scientists **MC Cllah & Pitt**, which was a dual-condition neuron and through which logical functions could be represented. In 1949, the scientist Hebb introduced the first neural network learning base called **Hebbian Learning Rule**, which was adopted as a foundation for the development of education algorithms (Kattan, 2014, p. 148).

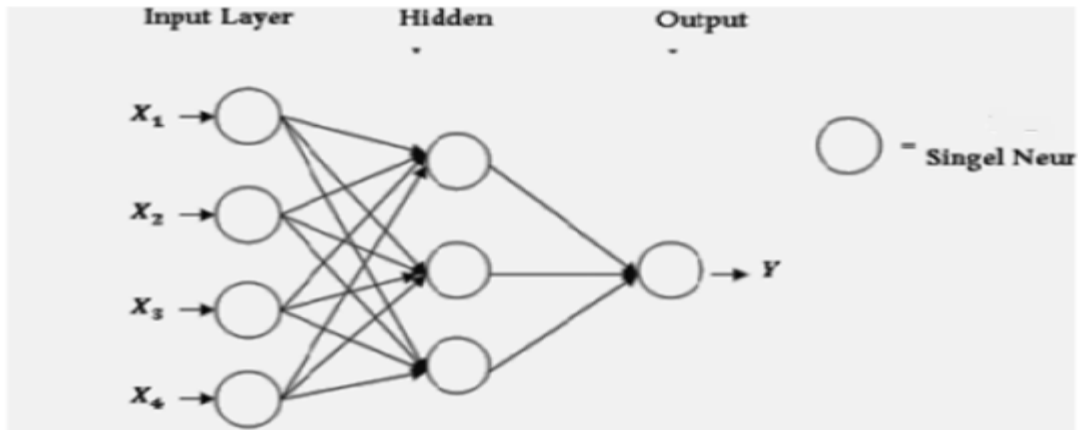
Singh & Chauhan has also defined neural networks as a mathematical or computational method or model that mimics the biological neural system, containing a range of neurons and interconnected informational processes, adaptable to external or internal information conducted during the network's learning and training phase (Chauhan., 2009, p. 37).

From previous definitions, artificial neural networks are one of the methods of artificial intelligence, and a mathematical model that mimics the biomass based on the information software used.

2.3 Artificial Neural NetWorks Structure:

ANN's synthetic neural network consists of 3 basic levels as represented by the following form:

Figure No. (1-1) :Synthetic neural network components



Source : Greck Tkacz and Sarah Hu, Forecasting GDP Growth Using Artificial Neural Networks, Working Paper 99-03, Bank of Canada, 1999, P 05

The above network levels are as follows (George F. Layer, 1989, pp. 670-675):

2.3.1 Input Level: It contains a set of nodes representing and equal the number of independent mutants.

2.3.2 Hidden Level: The network may have more than one hidden level and relate to input and output level, and there are networks with one hidden level called Single-Layer-Networks, and another with more than one hidden level called Multi-Layer-Network.

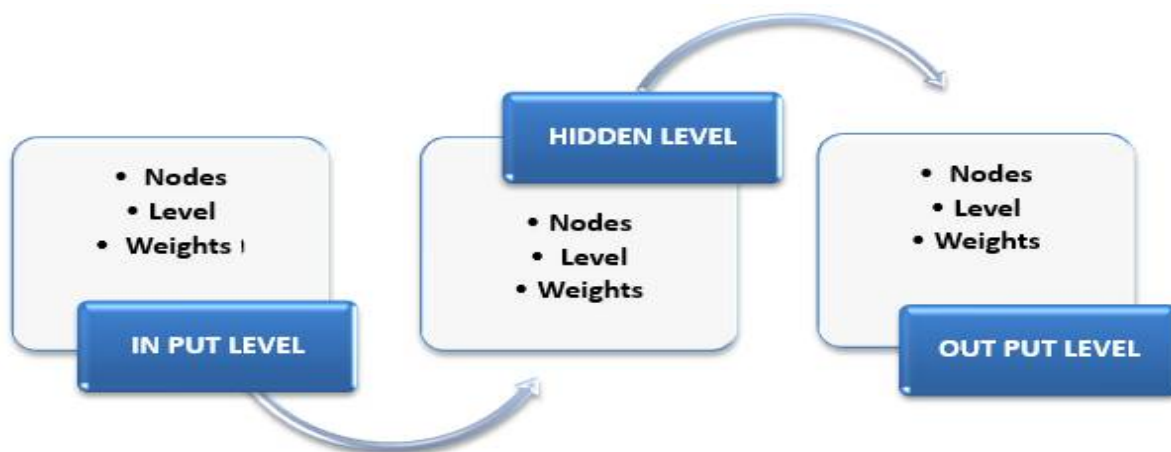
2.3.3 Output Level: It is a network output after training and processing process.

Each layer A and level above shall also include (Nazim, 2009, p. 206):

- ❖ **Nodes:** Nerve binding points between synthetic neural network levels.
- ❖ **Level:** a set of nodes that receive inputs and have a set of outputs.
- ❖ **Weights:** Weights show how strong the neural correlation is between the levels of the neural network, and each node has a weight attaching it to the previous level and a weight attaching it to the subsequent weight.

The levels and components of the synthetic neural network system can be detailed by the next form:

Figure No. (1-2): Levels and components of the synthetic neural network system

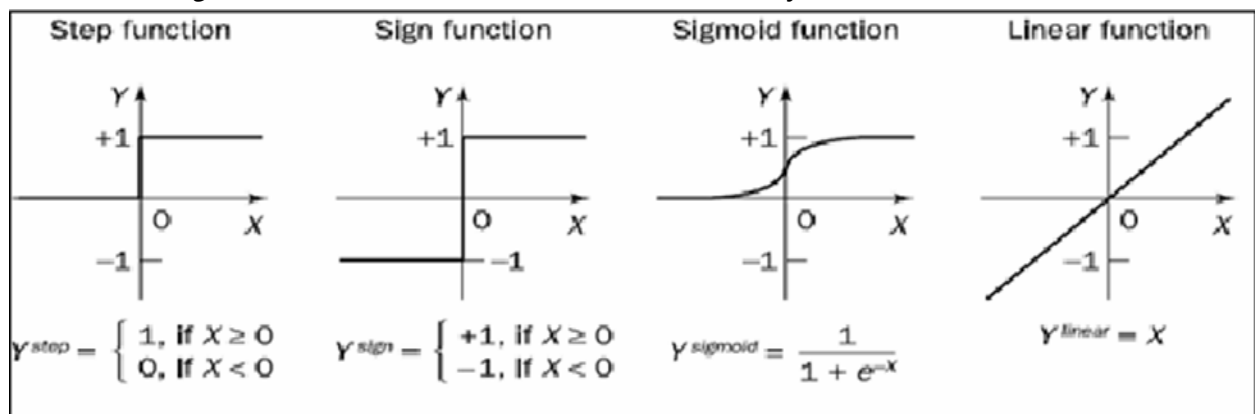


Source: Prepared by the researcher

The above shows that the synthetic neural network consists of 3 levels: Input, hidden layer and output, it should also be noted that when determining the neural network model its user must choose the number of neurons for the insertion process, which is a set of processing elements equal to the number of independent variables in the study model, To be processed by the number of hidden layers, the number of hidden neurons identified by experiment and finally the output neuron that most often equals the right one, as one synthetic neuron consists of the following:

- ❖ Input: Often symbolized by $X_1, X_2, X_3, \dots, X_n$.
- ❖ Weights: They are often symbolized by $W_{k1}, W_{k2}, W_{k3}, \dots, W_{kn}$.
- ❖ Processing element: which in turn is divided into two main sections:
 - **SUMMATION FUNCTION:** By which the relative weights of all inputs are calculated.
 - **TRANSFER FUNCTION:** This function determines the quality of operation outputs related to operating elements. This function includes several types of functions as illustrated in the following format:

Figure: (1-3) Activation function varieties used in synthetic neural networks



Source: Ben Nur Farid, Knight Marzouq Mohamed Al Arabi, Using AI Models to Predict Foreign Exchange Precautions in Algeria - ANN Industrial Neural Network Model, Journal of North African Economics, vol. 15, No. 20, 2019, p. 74.

Hence, we conclude that the activation functions used in synthetic neural networks are:

Exponential or sigmoid function **SIGMOID**;

- **LINEAR FUNCTION;**
- **SIGN FUNCTION;**
- **STEP FUNCTION.**

Synthetic networks have a range of characteristics, the most important of which are (Al-Saleh, 2009, p. 07):

- Its potential to derive meaning from complex or inaccurate data;
- Networking capability. Synthetic training by replicating the experience and establishing its own organization with the same data received during the learning and training process and the influence of its accounts and processes in a parallel manner.

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2.4. Types of synthetic neural networks:

Synthetic neural networks are generally classified according to several criteria that we outline through the following table:

Table (1-1) Synthetic neural network items.

Standard structure of synthetic neural network	
Single-Layer-Networks	They are networks consisting of an input layer that receives the signal from the outside world and another layer is the output layer so that the signals between the layers are streamlined towards the front of the Forward Direction
Multi-layered networks	They have more than one hidden layer, and containing the middle layers increases the network's ability to solve more complex issues.
Standard Type and Connection of Information	
Feed Forward Network	In this type of network, the spread of signals into the network is forward oriented, and the output of any layer affects only the next layer
Feedback Networks	This type of network has at least one feeding ring, so that the outputs of each artificial neuron are associated with other cell inputs in the same layer and adjacent layer, the most important of which is Hopfield Network:
Competitive Networks	These are networks through which training patterns are grouped into groups of similar patterns, resulting in the network's ability to detect relationships between these patterns. The most prominent types of such networks are the following:
	Self-regulated trait maps for Cohenin 1988.
	Diversity Discovery Network

Source: Prepared by the researcher, based on:Izzat Hazem Zaki, Use of Synthetic Neural Networks in Predicting Time Chains with Assyrian Behaviour, Iraqi Journal of Statistical Sciences, Mosul University, Iraq, No. 13, 2008, p. 167.

And so on until the last title of the article.

3. Using synthetic neural networks to predict the size of Saidal's 2023 sales:

3.1 Introduction to the Foundation for the Wisdom of Saidal:

SaidalSaidal's Foundation is a multinational Saidalceutical company. The group was founded in 1987 in Amman, Jordan, and has been active in the production and development of Saidalceutical products. This was the product of a licence for this activity in 1980, and is the group's headquarters in London. And this company is also the first Arabic company to enter the American and European markets, It has witnessed an expansion of its activity that has crossed its geographical boundaries through continuous growth and acquisition, expanding in many regions of the world, including Algeria.

SaidalSaidal Algiers is a limited liability company founded on 21/06/2000 under the brand name of SAIDAL SAIDAL ALGERIE, under the fiscal identification number:

NIF: 00001600122637900000 With **capital of: 9.977.812.000.00 DZD**, Activity Area 15-16 Stawali - Algiers, where the most important activities of this institution are:

- semi-Saidalceutical products industry;
- Saidalceutical Products Industry;
- food supplement industry;
- Exploitation of Saidalceutical registration decisions.

SaidalSaidal Algeria is mainly involved in the manufacture and sale of Saidalceutical products in the national market and in the manufacture and distribution of alternative Saidalceutical preparations. and is responsible for the manufacture of products on its own account and such routine manufacturing activities with respect to certain semi-prefabricated products purchased from private intellectual property owners for distribution transactions, SaidalSaidal Algeria also acts as a distributor and participates in the promotion of Saidalceutical products.

The most important products of Saidal are Algeria, as shown in the following table, with sales amounts for 2021.

3.2 Application of the synthetic neural network model as an analytical audit measure to ensure the continuity of Saidal Society 2023

NEURONS ARTIFICIELLES 'method is one of the most important and prominent analytical examination procedures that have proven to be effective in the best prediction and analysis by many academic research and studies that deal with accounting, auditing and referred to in the theoretical part of this study. This type of analytical method has been applied to the Foundation based on a series of 72 views representing monthly sales of the Saidal Wisdom Foundation's Saidalceutical products for the period 2017 - 2022 shown in the table below:

Table No. (2-01) Actual values of monthly sales of Saidal products for the period 2017-2022

Amounts in: thousands of dinars

FROM 1-1-2017 TO 30-06-2017	261.266	267.798	274.330	264.532	267.798	280.861
FROM 1-7-2017 TO 31-12-2017	271.064	277.595	267.798	271.064	267.798	293.924
FROM 1-1-2018 TO 30-06-2018	307.576	315.265	322.954	311.420	315.265	330.644
FROM 1-7-2018 TO 31-12-2018	319.110	326.800	315.265	319.110	315.265	346.023
FROM 1-1-2019 TO 30-06-2019	298.292	305.749	313.207	302.021	305.749	320.664
FROM 1-7-2019 TO 31-12-2019	309.478	316.935	305.749	309.478	305.749	335.578
FROM 1-1-2020 TO 30-06-2020	274.809	281.680	288.550	278.245	281.680	295.420
FROM 1-7-2020 TO	285.115	291.985	281.680	285.115	281.680	309.161

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31-12-2020						
FROM 1-1-2021 TO 30-07-2021	232.173	237.977	243.781	235.075	237.977	249.586
FROM 1-7-2021 TO 31-12-2021	240.879	246.683	237.977	240.879	237.977	261.194
FROM 1-1-2022 TO 30-06-2022	274.425	281.286	288.146	277.855	281.286	295.007
FROM 1-7-2022 TO 31-12-2022	284.716	291.577	281.286	284.716	281.286	308.728

Source: Prepared by the researcher based on the monthly G50 statements of Saidal Society 2017-2022

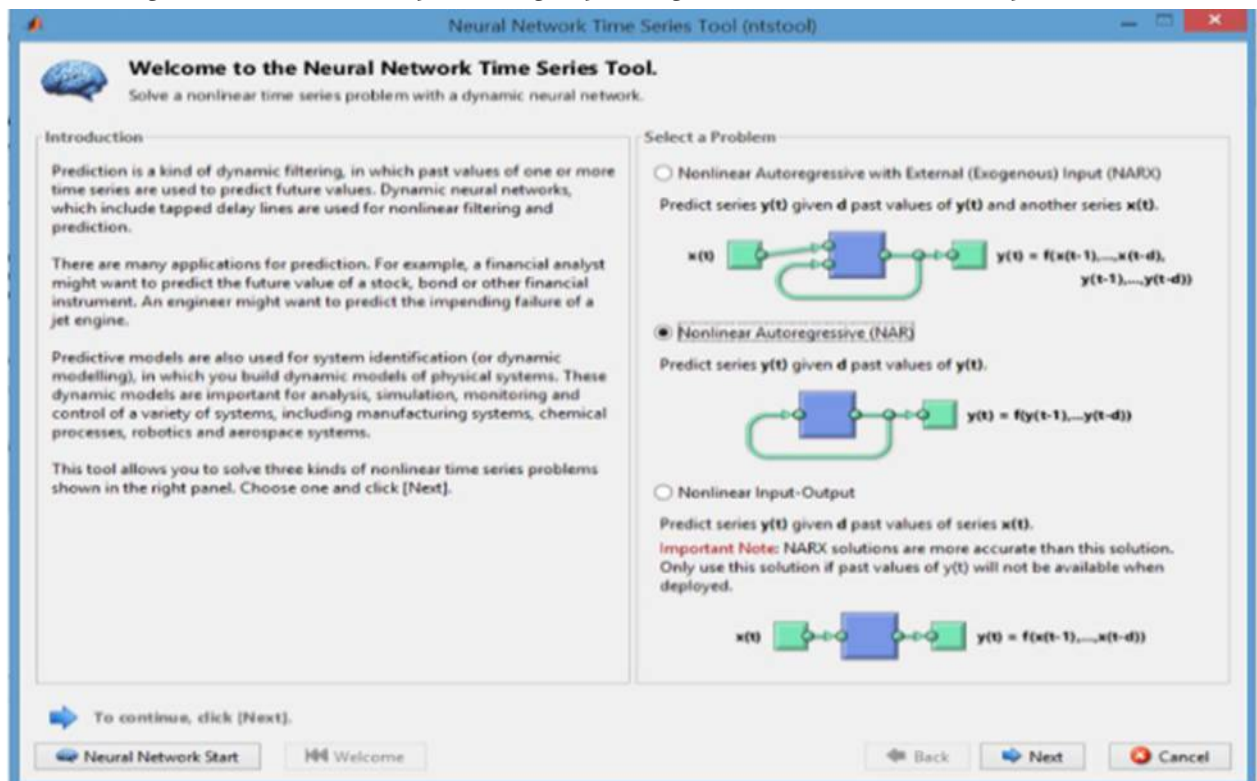
We have taken a series of interrelated steps:

3.2.1 Data processing: Based on the availability of a single series of historical values related to monthly sales data from Saidalceutical products in order to predict their future, this series can be formulated according to the following mathematical model:

$$Y(\tau)=F(Y(\tau-1),...(\tau-d))$$

This is a form of prediction of non-linear subjective decline, as shown in the following form:

Figure (1-1) Sales chain processing depending on non-linear self-decline prediction



Source: Prepared by the researcher based on the outputs of Matlab R 2013

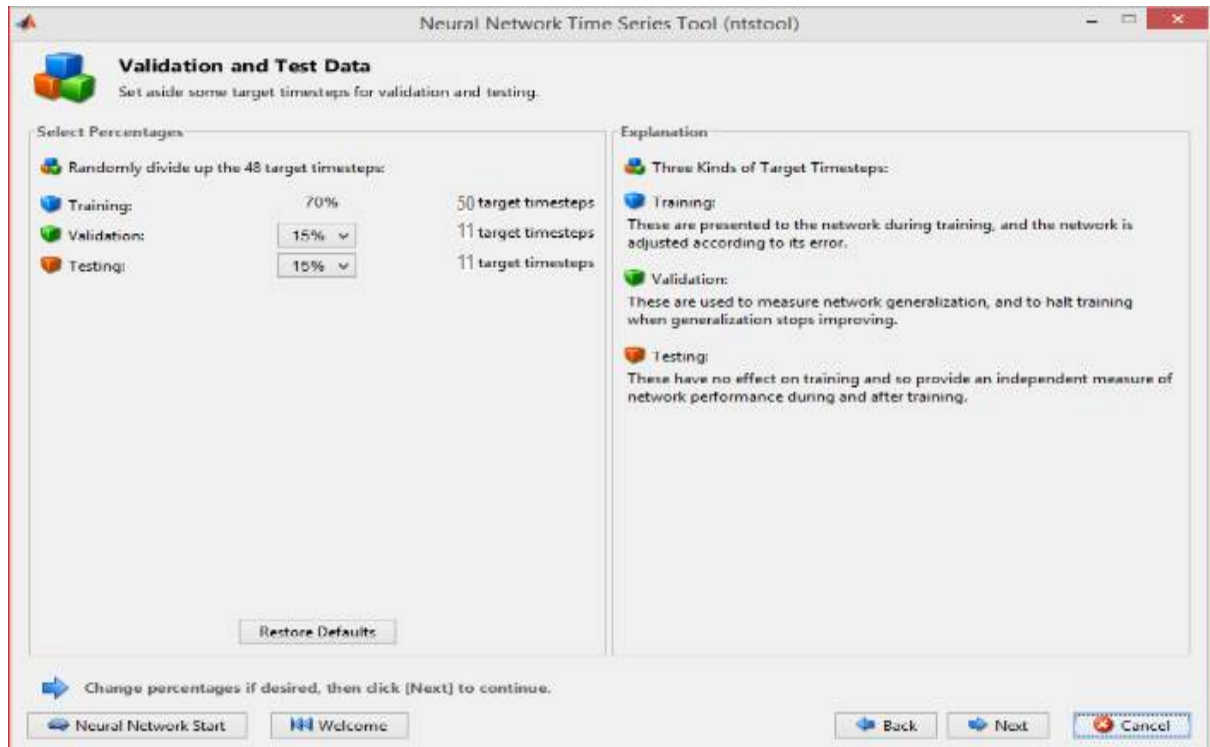
3.2.2 Data analysis: Through this step, the division of data into different aggregates is carried out by the synthetic neurological program as follows:

- Using 70% of the data for training is approximately 50 monthly views.

- Using 15% of the data is approximately 11 monthly views to verify the extent of the network's dissemination.
- Using 15% of the data is approximately 11 monthly views and is used as a verification test independent of the network's mainstreaming process.

This is as shown in the following format:

Figure (1-2) Data analysis and data selection



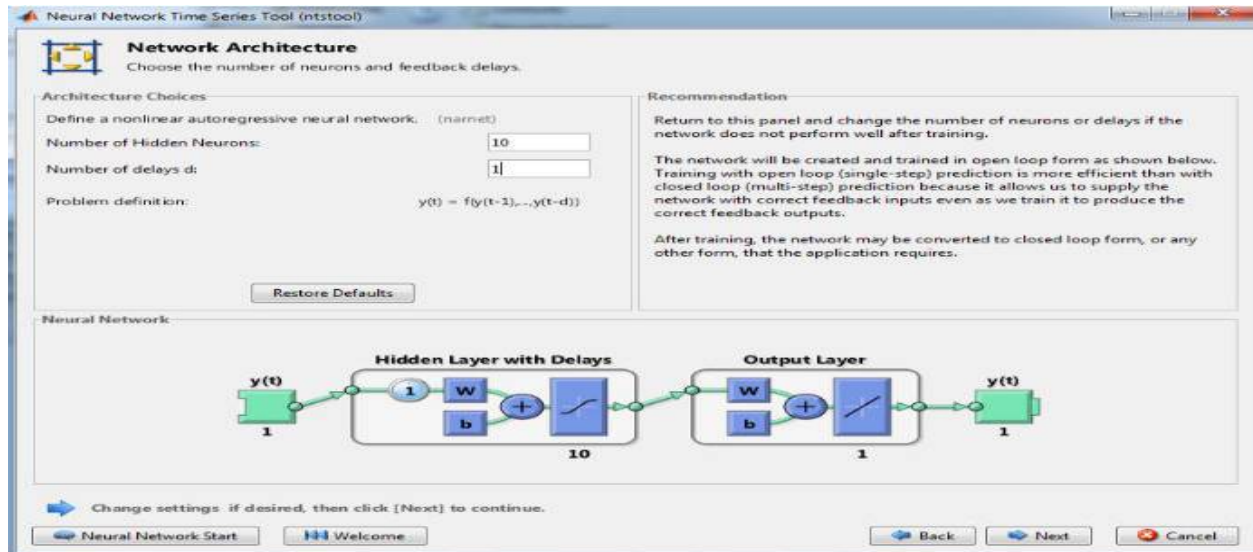
Source: Prepared by the researcher based on the outputs of Matlab R 2013

3.2.3 .Neural Network Identification:

- According to this stage, the number of variables interpreted for the phenomenon studied and equal to 72 views is determined, and the number of insertion nets is equal to one in this series $Y(t)$;
- Identify the number of hidden network layers and their values based on the value of the error used in the network that have been automatically identified by one layer;
- Identification of the number of hidden neurons identified automatically and through experimentation in: 10 layers;
- The output neuron, which is equal to 1.

The synthetic neural network algorithm can therefore be represented in this study by the following form:

Figure (1-3) Clarification of artificial network algorithm



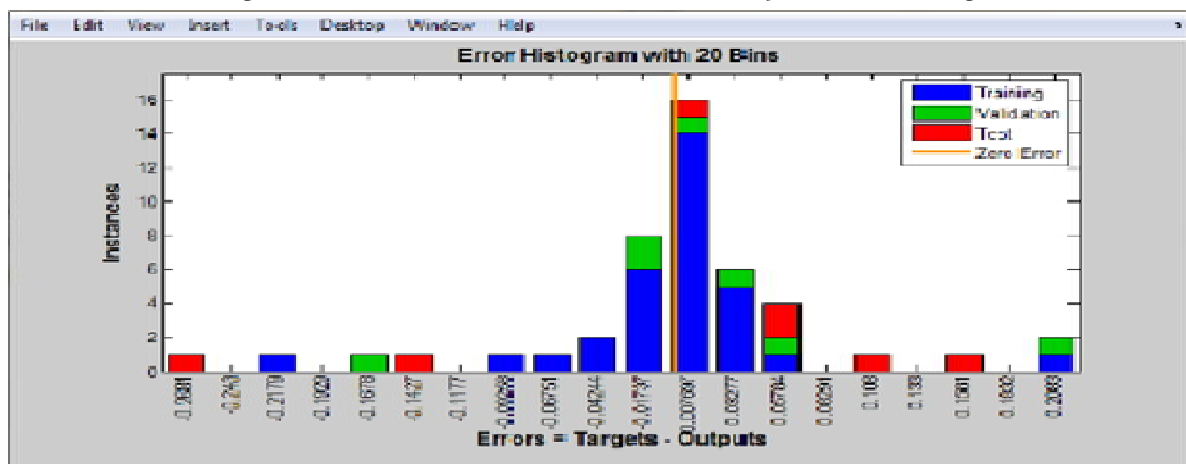
Source: Prepared by the researcher based on the outputs of Matlab R 2013

3.2.4. Training and implementation of synthetic neural network:

This phase identifies the features and options of the network training process as well as logarithmic learning's final results and the strength of their prediction through training and validity samples, focusing on clarifying their responsiveness through 3 stages of model education, by finding weights between neurons and those that determine the lowest value of the MSE error square average to determine the reliability of neural network results and to verify their fluxing, The training algorithm will then be used to reduce inclination and in the third phase the network will be tested for its ability to adapt to the state of change and reach the lowest possible error square.

Through the process of training and retraining for several consecutive times in order to reach the lowest value of the MSE error square average, we have used the self-correlation function of the errors shown in the figure below:

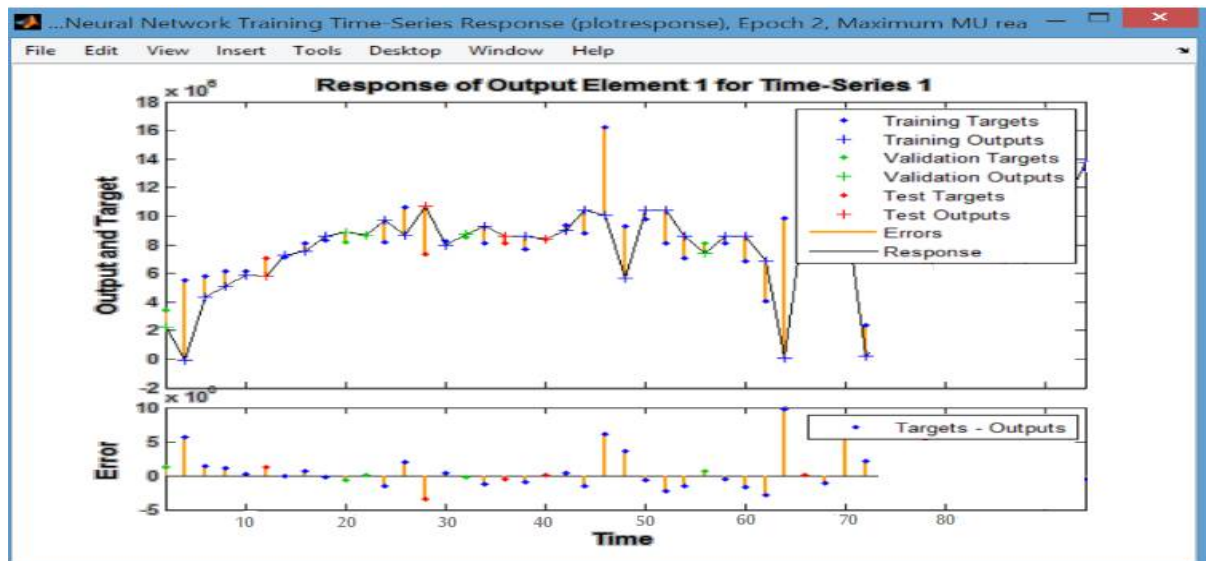
Figure (1-4) Self-correlation of errors after repeated retraining



Source: Prepared by the researcher based on the outputs of Matlab R 2013

We note from the above figure that all boundaries fall within the area of trust 0.5 and -0.5. This indicates the absence of subjective correlation between errors, which justifies the independence of time. This is illustrated by the form below:

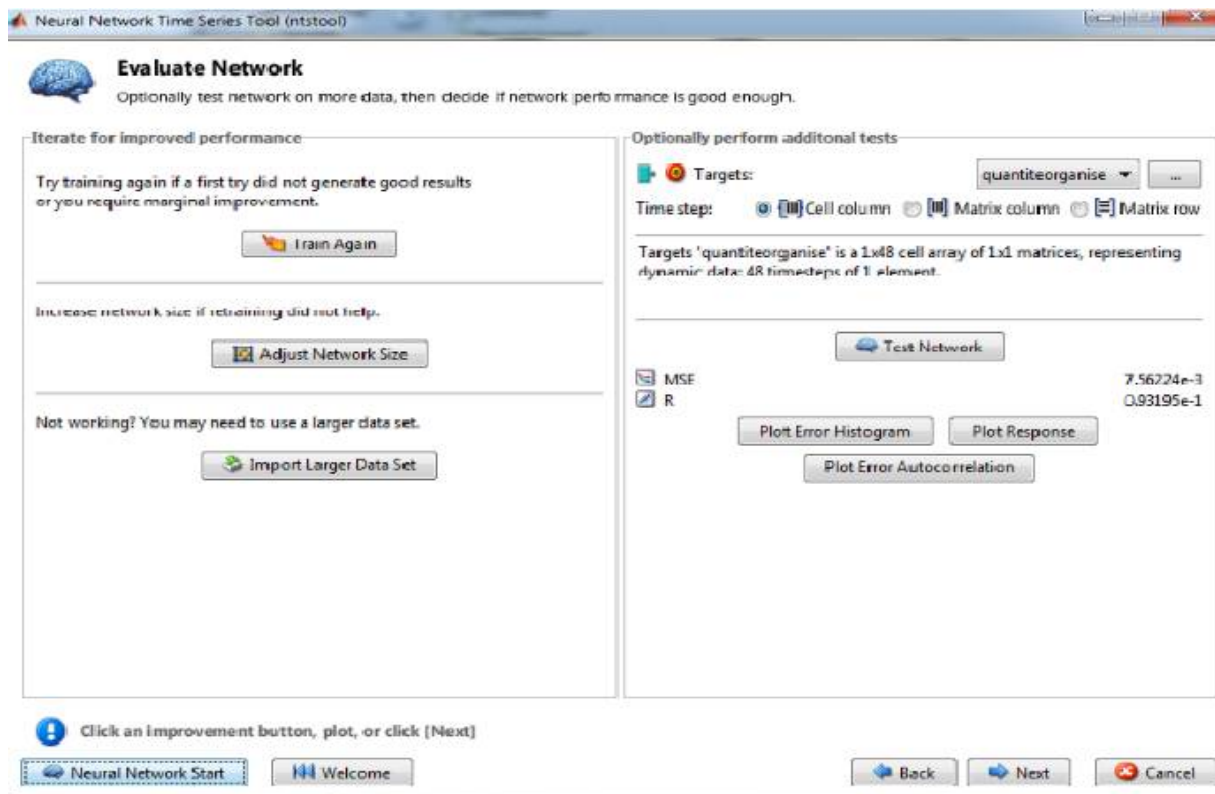
Figure (1-5) Response function to time series outputs with self-correlation function of errors



Source: Prepared by the researcher based on the outputs of Matlab R 2013

Through the above results, the approved network is acceptable and does not require retraining. This is due to the strong correlation, as well as the total error boxes shown in the following table:

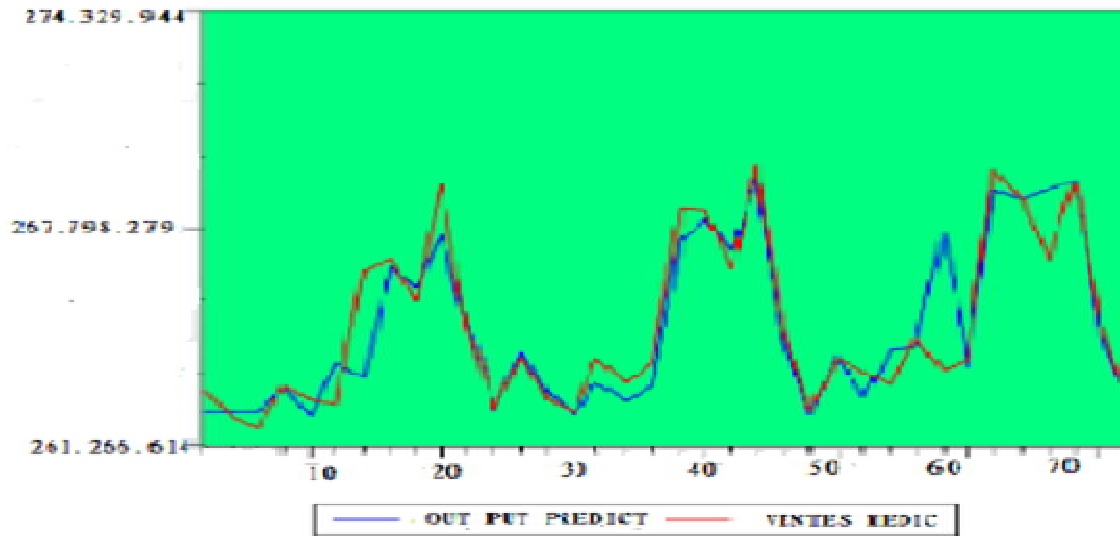
Figure (1-6) Final results of model strength criteria (R, MSE)



Source: Prepared by the researcher based on the outputs of Matlab R 2013.

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Figure (1-7) Comparison of forecast values with actual values of Saidal's sales



Source: Prepared by the researcher based on the outputs of Matlab R 2013

Thus, we have finally obtained the basic criteria for the quality of synthetic neural network harmonization, which affects the predictive strength of the model used as follows:

- Correlation coefficient R:0.9319
- Average MSE error boxes: 7.56224E-1
- Standard deviation SD:32.110, 34 (calculated by Excel)

4. Results and discussion

From what has already been presented through the theoretical and applied sides, we conclude that the synthetic neural network model is of sufficient quality and ability to assess the enterprise's ability to sustain, in addition to what has already been achieved the following results:

- The audit analytical procedures are a process of examining and comparing the relationships between financial and non-financial statements in order to ascertain the continuity of the institution under scrutiny as well as verifying the validity and authenticity of the balance of the financial statements, This demonstrates the validity of the first hypothesis.
- The external auditor uses analytical procedures to identify the financial problems and risks that he may face. Using these procedures, the auditor evaluates the risks that may cause the financial failure of the enterprise, which may adversely affect the auditor's ability to continue its mission.
- AI models are modern methods used in the analytical examination process to identify various audit risks as well as assess the sustainability of the institution under consideration based on its ability to generate growing revenues from its future sales, thereby controlling the risks of potential undiscovery about the enterprise's activity. This proves the validity of the second and third hypothesis.

- The synthetic neural network method has higher predictive quality and accuracy than other quantitative methods in analytical procedures. This is based on testing the results of this approach using a set of basic criteria (MSE-R-SD) to measure the quality of reconciliation and the strength of prediction.

5. Conclusion:

We conclude through the current study both theoretical and applied and through the models of artificial intelligence used (Synthetic neural networks) to predict sample sales in order to ascertain their sustainability based on their ability to absorb future revenues from their annual sales. The results of the study show that the synthetic neural network method has higher predictive quality and accuracy than other quantitative methods in analytical procedures. This is based on testing the results of this approach using a set of basic criteria (MSE-R-SD) to measure the quality of reconciliation and the strength of prediction., in addition to that the analytical procedures are one of the most important evidence on which the auditor relies for external auditors through the stages of his mission from the planning process of the audit programme to the expressions of his impartial technical opinion on the audited financial statements and statements, and that these procedures can be implemented either by means of methods of observation, inspections, inquiries and auditor's conclusions,... Advanced quantitative methods are the use of different models of artificial memory, which are modern methods used in the analysis process, especially those related to determining the sustainability of the institution and the same risk of scrutiny⁵

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