Discovery of revenue management models using a Genetic –Based Machine Learning System (GBML): Iranian Evidence

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Abstract: Earnings management has been a controversial topic in recent research. The phenomenon of earnings management is not directly measurable. Most research in the field of linear relationship between earnings management and the independent variables were examined using statistical. Study to detect earnings management models using with Genetic –Based Machine Learnings System index model using the Red Flags model between the years 1387-1380 are explored. In this study, an approach based on model projections Pittsburgh to advance a simulation optimization problem was formulated. Views Corporation - Model with 13 years of training led to the rule that the variables included measures of working capital, asset quality indicators and index of Zkhayrhsabdary accounts, accruals index, stock index and index Abnormal changes in sales.
[Alireza Mehrazeen, Parisa Rezaie Pazhand and Hojat Rezaie Pazhnd. **Discovery of revenue management models using a Genetic –Based Machine Learning System (GBML): Iranian Evidence.** *Life Sci J* 2013;10(1):1529-1537] (ISSN:1097-8135). http://www.lifesciencesite.com. 225

Keyword Search: Earnings management, Genetic –Based Machine Learnings System,Red Flags model

Introduction

Separation of ownership from management is one of the most important features of corporations. The combination of the separation of ownership and management principles and accounting standards led to the choice of a category called "earnings management" is born. The managers of the various methods in order to gain their interests in conflict with the interests of other parties applying various methods to manipulate.

Very strong impact on reported earnings and widespread economic institutes all commercial activities and financial decisions are managers. Leaders who think the most important issues during the financial period in which to achieve the financial analysts' forecasts and market expectations, Because the amount of reported earnings less than expected decrease in stock value and risk management position is. Consider giving conflict of interest between managers and owners with the theory, businesses are able to maximize their wealth and incentive to manipulate earnings have. It is also in line with the interests of business owners, managers incentives for earnings management are applied. In short, managers of financial firms trying to profit from a variety of different tools and methods to manipulate accounting Suitable to the display board and provide a positive image of business.

Investors anticipate earnings management to help reduce the risk of financial crises resulting from earnings management and capital markets to avoid huge losses. Auditors as well as anomalous behavior of managers will be able to identify the financial reporting. Extensive research on the application of AI-based methods, and the advantages and accuracy of the methods of statistical procedures has been proposed in recent decades.

Today, artificial intelligence techniques such as artificial neural networks, fuzzy logic, and machine learning systems based on genetic algorithms in the upper capability to model complex problems have become the subject of current research in the field of are with the development of artificial intelligence techniques, various models have been proposed to approach shown to have better performance than traditional.

Genetic –Based Machine Learnings System in many areas of research into the role played by. Genetic –Based Machine Learnings System natural features of the knowledge to build a model that is more accurate than other methods of artificial intelligence. This research using Genetic –Based Machine Learnings System and index Red Flags model [3] tries to explain the model to be put to test. The paper outlines and discusses issues and background research are provided. The research method is described. The research topic of the next article. Finally, the conclusions and recommendations are presented.

Research problem

Reports making The financially important sources of information for economic decision process of. Managers, capital investors, creditors and other users to meet their information needs of that are used. The same as the information available to users not, by the information asymmetry between managers and

investors invest be cause. Information asymmetry and opportunistic earnings management incentives to managers to. One of the objectives of financial reporting solve the data transfer and to reduce the gap between management and shareholders information. In other words, the main role of financial reporting financial information to those outside the organization to effectively transmit validly and timely [FSB 1984]. One of the basic objectives of accounting standards is a relevant and accurate decisions to allow users to take reliance financial Brsvrthay.On the other hand managers to achieve certain goals - that logically interest of providing some special the profits to be reported 's use that is contrary to the public interest. While managers to choose accounting standards also affect Hsabday open. The problem is the fact that earnings management sometimes lead astray, if is financial.

Because the earnings management measure not directly measurable,so the earnings management literature proposes several methods to estimate the potential benefit management to. Each of these models has its own advantages and disadvantages. Review of existing models to find the model for earnings management test - that of Type I and Type II errors in statistical inference is unsatisfactory - has motivated many investigations.

Research Dechow et al (1994), Young (1999), McNichols (2000), Kathari (2000), Hribar & Collins (2002) and Kathari (2004) only to have the same issue. These results motivate to select and test the model based on genetic algorithms, machine learning systems using model parameters were warning signs in the identification and measurement of earnings management

This research is trying to be a model of learning system based on genetic algorithms to test the machine.The problem is surveyed in this study are as follows:

A: Is it possible to detect earnings management machine learning system based on genetic algorithms can be used?

B: What are the capabilities of these models in this area?

Nowadays machine learning system based on genetic algorithm as a powerful approach to the problems of knowledge discovery and pre projections have been considered. Genetic algorithms - based on evolutionary computation the first time by John Holland (1975) was introduced. Then, by John Koza (1992) become popular. search strategy of evolutionary algorithm based on population. machine learning system based on genetic algorithm, the system can be pre basal axis is projected on the basis of the input variables of its members to recognize. set of input variables can also be extracted from observations and environmental data and other research. In general two approaches in machine learning system design based on genetic algorithm is:

The first approach - the genetic algorithm, where each chromosome is only a single code base that uses the best of the last generation of GA Chromosome in the system we consider forecasting. To build a machine learning approach based on genetic algorithms by John Holland at the University of Michigan, is presented and known as the Michigan approach.

The second approach - is presented by Smith of the University of Pittsburgh and the Pittsburgh approach for building machine learning systems based on genetic algorithm is known. In this approach, each chromosome in the genetic algorithm a full set of rules pre to expected to be code.

Each approach has both strengths and weakness are and uses these two approaches and their results are shown Pittsburgh approach for problems where all training samples are available before training had a better performance and in problems where the training samples are available during the Michigan approach has better performance. Machine learning systems based on genetic algorithm consists of the following components:

Pupulation

A machine learning system based on genetic algorithms, the definition of a chromosome or an array of values that need to be optimized to be start. Each element on each chromosome is called a gene is. A set of chromosomes population will constitute the algorithm. Each iteration of the algorithm, say a generations.

Fitness function

Objective function value of the cost function for a set of parameter (a chromosome) and can is a mathematical function or a test result or outcome of a game. Objective function to determine how individuals are role models in the range, is used.

Select

Assessments of the chromosomes in the current generation, the new generation is produced using the present generation. Selection mechanism that determines which of the chromosomes of the current generation to be elected directly or indirectly for the next generation. Mating pool of chromosomes that are selected. Generally, the selection process is carried out where the strategy is Elitism strategy. The strategy is to before choosing surgery, the percentage of chromosomes with high fitness of the current population is retained and directly transferred to the next generation of ten.

Crossover (recombination)

In the process of reproduction, offspring inherit genetic characteristics of their parents are, meaning

that some biological properties similar to the biological characteristics of the child, such as characteristics of the biological mother and fatherIt is similar to the integration of the process by the operator. This function operates on a pair of chromosomes and it can be One point crossover, Two point crossover, Offspring crossovr, Uniform crossover, Multi poin crossover Be. Single cross-point operator two parent chromosomes from a population of randomly breaking point and two broken parts of the chromosomes to move. Thus obtained two new chromosomes that are called Offspring.

Muttion

Some objective functions which are local extrema points, these points are likely trapped in the algorithm. The algorithm is convergent quickly. To ensure a complete search of the parameter space and avoid getting caught in the extrema locally similar process of genetic mutation is used Genetic algorithm follows the formula can be classified:

1) Create an initial population.
2) Calculate the fitness value for each individual generations now, and choose a percentage of the current generation.
3) Select the appropriate variable parent population for the next generation of variable.
4) Integrate operator acts on the parent population and offspring population is generated.
5) Apply mutation operator on offspring population.
6) The new generation of the replacement of the current generation and the children of the elite population.
7) Repeat steps 2 to 6 until the termination condition of the loop gain.

Usually, the initial generation of random variables in the interval model is chosen with uniform distribution.

A primary election will help to better reproduction of this information should be used in order to accelerate the convergence of the algorithm. System a machine learning based on genetic algorithms are based on production and test. With regard to the issue of finding the optimal solution, and hence we can not define the loop termination condition. The other criteria for termination condition is considered.

1) specified number of generations, for example, you can bet terminate the main loop can be rotated at 100 rpm.
2) improvement in the best fitness of the population over successive generations is not reached.
3) the variance would merit more than a certain amount of low or successive generations in particular, does not change.
4) The best fitness of the population is below a certain limit.

Figure 1 shows A optimization process of genetic-based machine learning system

Literature Review

Several studies have been conducted on earnings management and financial research in the field of the The following are some of the items mentioned.

Loraschi et al (1995) for portfolio selection, using an island model (a model based on genetic algorithm for use in isolated communities from each other, given that more gracefully among the communities migrate should) proceed to solve the model portfolio without their limitations. Results in two problems were compared with 530 and 35 assets.

Chiang et al (1996) of an error back propagation neural network to predict the cost of net assets at year-end investment companies used they neural network data and their results with the results obtained by traditional econometric techniques were compared and found to be low when the neural network data significantly better than regression techniques act.

Eakins & Stansell (2003) tested the hypothesis whether we are using neural networks, provided that the rates of other economic model, able to predict stock returns and as to the expected returns on the portfolio, The portfolio performance is better than any other method or not? They use neural networks to estimate stock returns, but concluded that the estimation of portfolio risk than other methods in predicting risk of.

Safer (2003)Abnormal returns in the stock market can be expected to pre. His methodology using data mining and network models Neural inefficiency of the stock market could provide a good estimate.

Kim & Han (2003) quantitative collection of data mining techniques to identify patterns of fraud, the bank has provided

Chun & Kim (2004) Using neural networks, action before their expected returns and portfolio selection .

Koh (2004) ¬ companies to continue using the techniques artificial neural networks, and decision trees for regression review.

Oh (2005) a genetic algorithm to optimize portfolios are used. It also like previous studies of the model have been used without restrictions

Sun & Li (2006) A combination of data mining method presented in the context of pre projected decline in business applications. The model is a decision tree pre predictor attribute oriented induction combined with information theory.

Spathis et al (2006) Using a class financial statement fraud scheme to discover patterns in the company s. In order to model the such as neural

networks, Bayesian inference networks and decision trees benefited

Etemadi et al (2008) application of genetic programming in the pre bankruptcy prediction looked at the Tehran Stock Exchange. They are genetically programmed to classify 144 bankrupt and Iranian Ghyrvrshksth multiple discriminant analysis model was used to test the model's applied to genetic programming.

. Tun et al (2008) Using the methodology combines data mining and Knowledge Discovery a forecasting model to forecast stock price was provided. k to represent graphs of the model is a combination of stock price volatility conditions, in order to satisfy the constraints recursive network and a neural network self initiative was expected to pre

Chen et al (2009) The artificial neural network to predict fraud using and artificial neural network showed that it has high accuracy in detecting fraud

Tsai & Chiou (2009) Using artificial neural networks and tree 's decision to move forward with their expected level of earnings management. it included a sample of companies in the Taiwan stock between the years 2002 and 2005 and to estimate adjusted earnings management model used by Jones. The data model includes items such as their company's performance, financial leverage, risk, accruals and size of pre research the company and concluded that the neural network model accuracy was 81% and the number of rules.

Much research on the information content of earnings management and the relationship between variables in the market, made but in terms of the model forecasts and earnings management research has been done in the country. The only study to present the research results Mehrazeen (1388), entitled "Evaluate accruals to detect earnings management model based can be. This study evaluates the earnings management models widely used in developed countries for economic, environmental, social, political India has been different. The findings of this study indicate Among the models tested, the total estimated regression models of methods based on the simple model Healy, DeAngelo and adjusted DeAngelo earnings management have the potential to discover more. Based on the evidence from this study can be concluded The use of regression models to adjust Shdhjvnz particular model (1995) the most reliable results in detecting earnings management, the existing models for the economic, social, political and Iran.

Research Methodology

Community and samples

Company information for research over the period 1380 until 1387 is over. Tehran Stock Exchange is the place territory.

The population study included observations, Inc. Avrq Tehran Stock Exchange's main Drtalar in listed companies that have the following conditions:

1 - that is at least 8 years of financial statements in the period 1380 to 1387 the records of the Exchange or the data base is available.

2 - Observations of the company - in the years to purchase or merge with other companies and a year after it because of the possible effects of abnormal samples are abandoned.

3 - Observations Inc. years of investment firms and financial institutions due to the different nature of accruals samples are removed.

To test the ability of three models in the study of Type I and Type II error is used as follows: A) The first sample includes all companies since no replacement has been selected by a random process. (The sample without altering profits example is intended to test the first hypothesis.)

B) Another corresponding example of a sample set and artificial manipulation, A fixed amount as a percentage of sales revenue that has been added (Tampering includes an increase of 50% in profit and it is assumed that the manager was all about manipulating accruals as a percentage of sales revenue in the form doing the same to. The typical example of the advantage to test the second hypothesis trimmer is intended.)

C) Another example for the external validity of the test results, for example, observations of C Company has been elected. The company Shmaml that documents acceptable to manipulate earnings in its financial records or the records of the Securities Exchange Administration there the Company recognized a gain of tampering with reference to the stock exchange is performed publishers Records Administration (The model for assessing the accuracy of models A and B samples is considered). Samples A, B and C respectively as the training set, validation tests are intended.

Data from this study, and notes directly as joined the company's financial reports and stock trading has been used database as well as database information exchange, and tadbirpardaz and rahavardnovin software has been used. Initial processing of the data using excel are soft and Clementine SPSS statistical software has been used to analyze .

Research hypotheses

This research has been tested on the following two questions:

- whether the earnings management model based on machine learning systems based on genetic algorithms The first type of error is acceptable?
- whether the earnings management model based on a machine learning system based on genetic algorithms The second type of error is acceptable?

To answer these questions, the following hypotheses were formulated:

- The first hypothesis - the earnings management model based on machine learning systems based on genetic algorithm in terms of Type I error is acceptable.
- The second hypothesis - based earnings management detection model based on genetic algorithms, machine learning systems of Type II error is acceptable.

Research variables

Dependent variable is the net output of a machine learning system based on genetic algorithms, including 0 and 1 The classification derived from the actions of corporations and non-profit management of it.

Independent variables based on genetic algorithms, machine learning systems, (index of signs and Billy Taylor, 2007) as follows:

- Sales index (SLSI): The ratio of net income to reported net income estimate has not been tampered.

$$SLSI = \frac{Net\,\mathrm{Re}venue_t}{\dfrac{Net\,\mathrm{Re}venue_t - \mathrm{Re}ceivables_t}{1-(\mathrm{Re}ceivable_{t-1}/Net\,\mathrm{Re}venue_{t-1})}}$$

- Operating accrual magnitude (ACC): Accruals as Net Income Before Extraordinary Azaqlam plus depreciation expense less operating cash flow.

$$ACC = \frac{EBIT_t + D\&A_t - CFO_t}{Assets_t}$$

- Accruals index (ACCI): The difference between profit and cash flow often manipulated by lawyers as early indicators of interest are identified - be. The index change in the amplitude of the time series shows total accruals.

$$ACCI = \frac{1+((EBIT_t + D\&A_t - CFO_t)/((Assets_t + Assets_{t-1})/2))}{1+((EBIT_{t-1} + D\&A_{t-1} - CFO_{t-1})/((Assets_t + Assets_{t-1})/2))}$$

- Inventory index (INVI): Great scope for the timing of inventory management Kharjnmvdn account and transfer them expense or cost of goods sold account. In addition to production decisions and reduce inventory levels can raise the cost of goods sold through the transfer of fixed overhead Bhkargrft inventories. According to the research comment on the choice of inventory accounting procedures and the decisions regarding inventory levels of common ways to manipulate profits of stock index so is calculated as follows:

$$INVI = \frac{1+(Inventory_t / Cost\ of\ Goods\ Sold_t)}{1+(Inventory_{t-1} / Cost\ of\ Goods\ Sold_{t-1})}$$

- Reserve index (RESI): The estimated cost of large storage shed mind and judgment is doubtful receivables. Thus, the relationship between the stored reserves of doubtful receivables and the accounts receivable balance measured current is:

$$RESI = \frac{1+(BDR_{t-1} / \mathrm{Re}ceivable_{t-1})}{1+(BDR_t / \mathrm{Re}ceivable_t)}$$

- Asset quality index (AQI): Increase in the soft assets (all assets except inventories and cash and bank fixed assets) may reflect a greater tendency of capital expenditure in the current period is.

$$AQI = \frac{1+(SA_t / ((Assets_t + Assets_{t-1})/2))}{1+(SA_{t-1} / ((Assets_t + Assets_{t-1})/2))}$$

Data Analysis And Testing Of Hypotheses

Based on genetic algorithms, machine learning systems and procedures (GBML) of the initial population, fitness calculation, selection of qualified personnel, integration and mutation operator, the new generation model - and finally sum making scheme and results this section is presented.

Selection for chromosome encoding One of the most important issues are. The 6 characteristics of each rule input (independent variables) and the class number that identifies the rule to is made. Each input feature set with maximum and minimum values of the two numbers that to characteristics can be specified. In this study, a two-class prediction problem is pre,(non-profit management) and another one (earnings management) that are likely matched. First Rule of 13 houses (number of input variables, each with a maximum and minimum 6 and 1 class rule house is a total of 13), respectively. The fitted values are denoted .

After fitting the action into the next generation is used to generate an points. After the merge operator and produced two children, two chromosomes,

chromosome mutation operator applied on the is. mutation operator that is used for this purpose, a mutation operator has two stages. The first mutation operator creep, creep rate of 22% on chromosome applied to children. In this study, the creep rate of 22% means that 22% of the maximum amounts and minimum their chromosomes may be subject to mutation.

One of the parameters that can be great role models for the number of rules in the system. For this purpose, several values were examined and the value for the highest accuracy for the test data set was chosen as the final parameter. The same as Table to appropriate number of rules that the two systems are 13 because most accurately predicted in advance of a test.

Table 2 shows the reviews the rules of the system.

Also various combinations of parameters were investigated Among them the best combination of accuracy can be selected and presented. Examples of combinations of the three parameters in Table implement the algorithm parameters has shown that the most accurate tier 1 Mnasbtrbn test set is projected in.

Table 3 Compounds parameters learning algorithm for implementing a range of rules based on genetic algorithms Pittsburgh

System machine learning based on genetic algorithms, the desired outputs are needed to round out their education and their comparison with the correct. Therefore, firms should attempt to study earnings management have to be segregated from other companies.But because earnings management have attempted to identify companies that could not easily, two samples A and B was considered.

After this step, for example, a value of zero (non-profit management) and a sampling rate (earnings management) were used. And a model of machine learning systems based on genetic algorithm was run. A total of 878 companies found in case of a model with an accuracy of about 74% of the total 878 companies found - in about 92% accuracy could be obtained by sampling the model correctly pre to expected aug. accuracy (74% and 92% of a sample b) perhaps because it is assumed that a sample of what has been lost, but the company related to the size of the company - the working they have taken.

Type I error and Type II error of 26% in a sample of 8% was achieved in the first and second hypotheses imply endorsement research. Type I and Type II error Table Four experimental tests on sample data to determine educational to

Table Four - Type I and Type II error of experiment samples to train

The model of the C and B by samples were tested. Table five empirical tests of first and second type of error in the test samples are characterized to. Consequently, by the first and second hypothesis the test was confirmed.

Table Four - Type I and Type II error of experiment samples to train

resulting from the application of machine learning system model based on genetic algorithm to figure that is a. That includes 13 rules and it is easy for the user. Model allows the user to perform the following steps:

1) your company stock to choose from.

2) Independent variables were selected to participate in Stage 1 is calculated.

3) Ratios obtained from the company itself Qvadh expressed in this research to compare. If ratios were obtained in accordance with Rule 1 indicates a lack of earnings management and in accordance with Rule 2 of the expresses ¬ profit management, and so continues to rule 13. (It should be noted that if the rule is not a rule in the range of ratios is excluded)

4) 4) The number of non-profit management, and benefits management practices and to conclude the count of 3. For example, if a company selectively from 13 base models, 5 Rule 4 and Rule profit management non profit management degree, it can be concluded that the company has the choice of earnings management.

Figure 1 shows the model of the application of machine learning systems based on genetic algorithm

Conclusion

This study explored the earnings management model Using machine learning system based on genetic algorithm 1387 to do index of signs between model years 1380 to find deals. Evaluation in this study is based on the ability of the model to deal with two types of error identified in statistical inference Errors called type I (α) and Type II (β) is. For the three samples A and B, respectively, to test the first and second error using simulated samples of earnings management and (c) to test the external validity the results of the study were analyzed

Views Corporation - Model with 13 years of education leading to the maxim that important variables were: Operating accrual magnitude , *Asset quality index, Reserve index,* Accruals index, Inventory index and Sales index.

The result of this process is obtained as follows:

1) suitable combination of these parameters model will work better.

2) model based on a machine learning system based on genetic algorithms subject not be specific or industry each year.

The advantage of the proposed model compared to other existing models, earnings management is as follows:

1) easy to understand and use it to model the rules of discrete Karbrts·hyl will be.

2) Unlike the proposed model based on accruals and not rely on information from other companies, with company specific information can be used to.

3) the accuracy of the model given the training and test.

4) an appropriate combination of parameter of the model will work better.

5) The model is based on a machine learning system based on genetic algorithms subject not be specific or industry each year.

The present study has some limitations Including:

1) at least two companies in a population with no history of accepting the scholarship criteria into three samples were investigated.

2) the number of test (due to restrictions imposed on the country for the company's earnings management) is less than the train, the better and more accurate results are obtained more to come .

Suggestions for future research are presented as follows:

1) use an algorithm to identify influential variables Genetic on earnings management.

2) use an algorithm to identify influential variables Genetic on earnings management and the optimization model using techniques - such as data mining or artificial neural networks.

3) the use of smart process to find the right combination of parameters in the research that can be done using an evolutionary algorith.

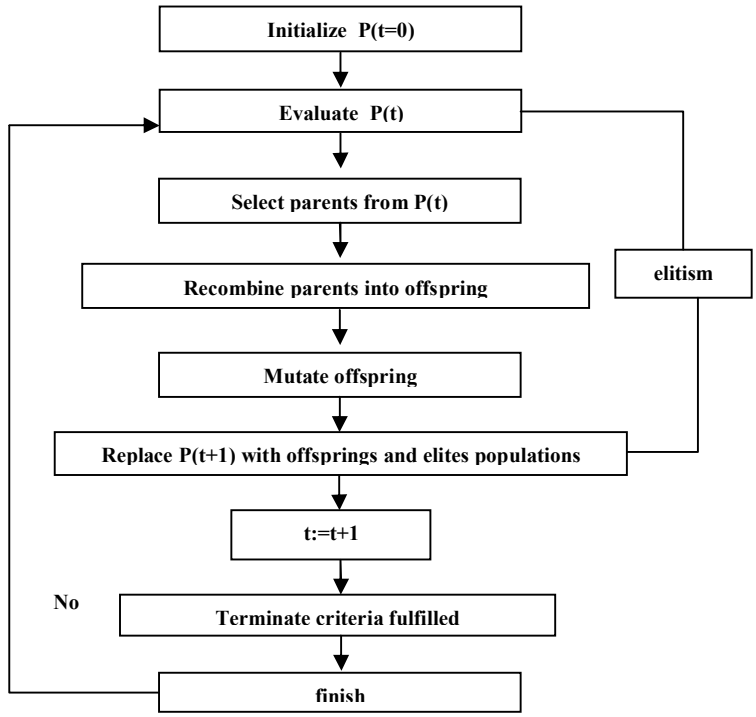

Figure A. optimization process of genetic-based machine learning system

Table 2 reviews the rules of the system

9	11	13	15	17	19	21	*Number of rules*
0.81	0.78	0.83	0.8	0.77	0.77	0.81	Accuracy of training data
0.75	0.69	0.78	0.75	0.75	0.72	0.69	Accuracy of test data

Table 3 parameters learning algorithm for implementing a range of rules based on genetic algorithms Pittsburgh

Accuracy of test data	Accuracy of training data	Number of rules	Creep Rate	Crossover Probability	Number of Generations	Population Size	Description / Row
%78	%83	13	%22	%77	10000	71	1
%72	%81	13	%12	%86	10000	71	2
%72	%85	15	%22	%80	10000	81	3
%69	%83	13	%28	%66	10000	81	4
%69	%81	15	%28	%66	10000	81	5
%72	%81	13	%28	%66	10000	91	6

Table Four - Type I and Type II error of experiment samples to train

Test result	Accuracy model	sum	Class 1 (Earnings management is carried out)	Class 0 (Earnings management has been done)	The model results
Confirm Hypothesis 1	0.74	878	(Error α) 228	650	Class 0
Confirm Hypothesis 2	0.92	878	807	(Error β) 71	Class 1
		1756	1035	721	sum

Table Four - Type I and Type II error of experiment samples to train

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Confirm Hypothesis 1	0.74	878	(Error α) 228	650	Class 0
Confirm Hypothesis 2	0.92	878	807	(Error β) 71	Class 1
		1756	1035	721	sum

Training Accuracy=0.8297266514806378
Test Accuracy=0.78125
Number of Rules=13
Rule Base:
1: X3 = [-6.269756057998652, -4.721882721556664] AND X5 = [-2.2342780843404024, -2.147173043578575] AND x6 = [-4.875823095237199, -2.5590915286173725]: A
2: X2 = [-6.939771341842943, 49.273387344273566] AND X4 = [-1.0409133591000819, 2.51149049346294]: B
3: X4 = [-2.7956440067582626, 0.6902104338992296]: B
4: X2 = [-8.527761952823953, 27.827755031583703] AND X3 = [-30.31312950081192, -22.72812570334269] AND X4 = [-2.101151466059144, 1.8716016159842161] AND x6 = [11.74149557473088, 11.965543065386608]: A
5: X4 = [-2.8769287008620337, 0.26078948276858105] AND X5 = [2.2984174357230436, 4.084037330978534] AND x6 = [-6.104969680866604, 1.2707495138321132]: A
6: X4 = [-3.619737069852157, 1.2846530160982055] AND x6 = [-0.20878851957507738, 11.694085753378456]: B
7: X4 = [-0.993571357875279, 2.019792805811641] AND x6 = [1.9651335958363774, 6.808014843084057]: B
8: X4 = [-0.7276613796389308, 1.1879732413402393]: A
9: x6 = [-4.801194084874278, 0.7790293519597604]: B
10: X2 = [92.23455558968925, 106.32482463258245]: A
11: X2 = [-11.188349554561714, 50.00157338754311]: A
12: X2 = [-3.5394607088943735, -0.004656871082816094] AND X3 = [0.8817227098584723, 1.9364208858999998] AND X5 = [-0.09340040009907437, 3.36287699404962]: B
13: X3 = [-29.904252754280694, -15.739890014151872] AND X5 = [-0.5417876318330206, 0.6851905253914463]: A

Figure 1. Model of the application of machine learning systems based on genetic algorithm

References

1. Bayley, L & Taylor, L. 2007, " Identifying Earnings Management: A Financial Statement Analysis (Red Flag) Approach "
2. Mehrazeen,Alireza 1388, An Evaluation of Alternative Accrual-Based Models for Detecting Earnings Management , Accounting Doctoral dissertation, University of Tehran Science and Research
3. S.F. Smith, A learning system based on genetic adaptive algorithms, PhD thesis,
4. University of Pittsburgh, Dissertation Abstracts International PhD thesis, University of Pittsburgh, 1980.
5. Cordon, F. Herrera, F. Hoffmann, L. Magdalena, Genetic Fuzzy Systems: Evolutionary Tuning and Learning of Fuzzy Knowledge Bases, World Scientific,Singapore, 2001.
6. Dechow, P., Sloan R., & Sweeney A. (1995). “Detecting earnings management”. The Accounting Review 70(2): PP. 193-225.
7. Han, J,C.Y., & Wong, S. (1998). "Political costs and earnings management of oil companies during the 1990 Persian Gulf Crisis". The Accounting Review, 73, 103-117
8. Halland, J. H., (1992). Adaptation in natural and artificial systems. Cambridge, MA: MIT press.(First edition, 1975,University of Michigan Press.)
9. Loraschi A, Tettamanzi A, Tomassini M, Verda P, (1995). "Distributed genetic algorithms with an application to portfolio selection problems", In: Pearson DW, Steele NC, Albrecht RF, editors. Artificial neural nets and genetic algorithms, pp. 384-87.
10. Oh K. J, Kim T. Y, Min S, (2005) "Using genetic algorithm to support portfolio optimization for index fund management", Expert Systems with Applications 28 371–379.
11. Safer A M, "A comparison of two data mining techniques to predict abnormal stock market returns", Intelligent Data Analysis, Vol. 7, pp. 3–13, 2003.

12. Chiang, W. C., Urban T, L. & Baldridge, G. W. (1996), "A neural network approach to mutual fund net asset value forecasting", *Omega, Int. J. mgmt Sci*, Vol. 24(2), PP. 205-215.
13. Chun S. K, Kim S. H," Data mining for financial prediction and trading: application to single and multiple markets", Expert Systems with Applications 26 (2004) 131–139.
14. Healy P.M.,1985, Evidence on the effect of bonus schemes on accounting procedure and accrual decisions. Journal of Accounting and Economics 7: 85-107
15. Jones, J.J. (1991). "Earnings management during import relief investigations". Journal of Accounting Research. 29, 193-228
16. DeAngelo, L.E. 1988. Managerial competition, information costs and corporate governance: The use of accounting performances measures in proxy contests. Journal of Accounting and Economics 9(1): 3-36.
17. Eakins S. G, Stansell S. R, "Can value-based stock selection criteria yield superior risk-adjusted returns: an application of neural networks", International Review of Financial Analysis 12 (2003) 83–97.
18. Tsai, chih-fong & yen-jiun chiou. (2009). "Earning mangement prediction: A pilot study of combining neural networks and decision trees". Expert systems, with applications, 36,7183-7191
19. Goldberg, D.E."Genetic Algoritm in Search, Optimization and Machine Learning" ,Addison-Wesley, 1989.
20. McNinhols M. F, 2000, Research Design issues in earnings management studies, Journal of accounting and Public Policy. 19. PP: 313-345.
21. Yong S., 1999, Systematic measurement error in the estimation of discretionary accruals: An evaluation of alternative modeling procedures, Journal of Business Finance & Accounting, 26(7)&(8).
22. Kathari S.P, A.J. Leone, C.E. Wasley, 2005, Performance matched discretionary accruals measures, Journal of accounting and economics 39, 2005, PP: 163-197.
23. Kothari S.P., 2001, Capital markets research in accounting, Journal of Accounting & Economics 31, P.108. (4)(December) P:355-363
24. Hribar P., Collins D.W ,2002, Error in estimating accruals: Implications for empirical research, Journal of Accounting Research. Vol. 40. No. 1.2002. PP: 105-134
25. Tsai, chih-fong & yen-jiun chiou. (2009). "Earning mangement prediction: A pilot study of combining neural networks and decision trees". Expert systems, with applications, 36,7183-7191
26. Kam-Wah Lai a, Ferdinand A. Gul,(2008) "Was audit quality of Laventhol and Horwath poor?" Journal of Accounting and Public Policy 27,217–237

1/20/2013