

Predication of performance of merger and acquisition of companies accepted in Tehran stock exchange by using neural networks

Samira Zamanian *, Mohammad Hasan Janani

Department of Accounting, Boroujerd Branch, Islamic Azad University, Boroujerd, Iran

Abstract: The present research was performed by aiming predication of merger performance and integration of companies accepted in Tehran Stock Exchange during 2005-2012. As for research aim and its application, 62 companies were selected as sample during years studied. For estimation scale of success and failure of the companies, the neural networks were used. In this pattern, independent variable of research which showed financial rate as 16:1 for financial risk, were used. In this pattern, by using multi layers perception neural networks, (MLP) which was used in order to educate learning algorithm, we discussed hypothesis. For establishing hypothesis, RMSE, MAE, SSE was used. The results derived from neural networks showed that use of neural networks is suitable tool in order to estimate and predicate future performance of companies.

Key words: Company performance; Merger and acquisition; Stock exchange; Neural networks

1. Introduction

Strategic management cites strategy levels in three operational, commercial and company (Arefi, 2006), one of the important domains in company's strategies is company's growth which is made by different methods, and company growth is made by internal growth and gradual extension of different sections. But important growth which is considered today is external growth of company. The commercial units prefer to use their commercial compounds. Economic institutes can obtain target companies in regard to develop market products and increase coordination in supply chain and renew properties structure and its debts in form of merger and acquisition. Merger and acquisition is pertinent to financial domains of corporate and corporate governance which consider problems pertinent to sale, purchase and combination of companies.

Merger and acquisition is one of the publicized maneuvers in today competitive world which the companies are forced to perform it. There are motivations which encourage senior management in order to perform transactions including optimal use of management, increase production by other units, more efficiencies, low production cost, taxation advantages, reduce risk and increase more sales as for dominance on market.

Economics, financial management and strategy, make suitable merger and acquisition, because merger and acquisition is income free current which is applied in regard to aims of senior managers based on optimal use from sources and properties. (Hobard, 1999) in other side, advocates of merger and acquisition of companies cited another insight as

destruction factor for owners of wealth. The advocates claimed that the researches showed that growth by internal development, setup new projects and companies established new have more suitability to merger of companies. In this regard, one of the most important research subjects is to discuss scale of success and performance of mergers and acquisition of companies. (Arefi, 2009)

Evaluation of merger and acquisition performance is important tool for testing effects of merger in management of acquisition. But one of the problems is what method is estimated for it. One of the important tools in decision patterns is artificial neural networks (Zehi bin and Ping, 2008), efficiency of neural networks was compared by many studies and in some of them there are witnesses.

2. Necessity of research

Privatization program for governmental industries and increasing investment and financial and specialized holding companies increases transaction of companies in Iran. And it is anticipated that the research discussions becomes one of the important financial and economical discussions which there is not compiled literature in regard to discussion of performances due to strategy of owners (buyer and target) in Iran. Thus, discussion of merger performance of companies is one of the necessities of this research.

In this research, we can prove this hypothesis that artificial neural networks are suitable methods in order to predicate financial performance of companies.

3. Research domain

* Corresponding Au thor.

Subject of this research is to predicate merger and acquisition performance of companies by using artificial neural networks which is considered to investigate merger and acquisition performance and is offered perfect predication model for success and failure.

The companies studied are active companies participated in Tehran Stock Exchange which were integrated during time period. In this research, the sample companies were investigated during 2005-2012 at 8 years.

4. Theoretical bases of research

Acquisition is defined in terms of two economical and legal points of view. This difference is pertinent to discussions by new transactions, regulations issued and strategic programs.

5. Merger from legal point of view

Legal structure of transactions is made in terms of nature of transactions. Merger is combination of two or some companies with comparable sizes which one of them exists as legal, the companies combined are operated under single name which is not resolved after merger. In merger, the shareholders of Target Company – after voting for consent merger- transact their shares – with shares of company. Thus shareholders are minority without voting and it is necessary replace their shares with shares of company bought it. When target shareholders sell their shares as cash, don't benefit from long term benefits. Such mergers are recognized as exit merger by receiving cash money.

Commercial combination of these companies are different in similar industries and their situation is defined in value chain, these definitions are so important for analyzing advocates in order to form trusts of industries great institutes.

Horizontal merger is occurred between two companies by similar industries. This merger is made in order to increase market share. The samples of this merger if merger of commercial banks in banking industry. In this method, rival companies are been possessed by similar products in geographical region.

Conglomerate merger are mergers that the buyers companies buy companies which are irrelevant industries. In this merger which is named as irrelevant merger, the companies' buyers enter into profitable industries and buy the irrelevant companies.

Vertical merger is merger of institutes which have contribution in different steps of production or chain value. Simple chain value is possible to difference between basic materials like coal, iron stone in chain value in steel industries. Similarly, in chain value of oil industry and gas, exploration is separate from refine and marketing. In vertical merger the companies are operated in section of chain value, for example in indirect production or direct production are regarded as distributors which

this strategy is obtained in order to reach in saving in purchase, sale and distribution costs. (Donald, 2010)

6. Causes and motivations of merger and acquisition of companies

Some of the noblest theories pertinent to causes of merger and acquisition are:

7. Synergy

Synergy is simple relatively concept in which combination of two companies are made as separately for shareholders. Two basic types of synergy are operational and financial.

7.1. Operational synergy

Operational synergy consists of saving in scale and domain which can be important factors in making wealth for shareholders. Efficiency in profits can be due to restoring management activity or their agencies.

7.2. Financial synergy

Financial synergy is pointing to effect of merger and acquisition in capital expenditures for investment institutes or institute which is made which is due to merger and acquisition. Capital expenditures have minimum yield for investors and creditors which encourage them to buy shares and giving loan. In theory, capital expenditures is reduced when the institutes have cash flowing as fixed (that is reliance insurance). Economical financial scales are realized by issuance stock exchange by lower price and lower transactional costs or by better compare with investment opportunity.

8. Twin Q rate

Q rate is rate of market value of shares to replaced costs of properties. The beneficiary institutes can select to purchase properties, machines and new equipment in order to investment or pay properties of companies by lower price (that is book value is lower than first manner than q). This theory is so suitable in order to explain activity of company and merger of companies for time period which is lower than market price (or final price). (Holbeche and Garrow)

9. Type of merger

In legal of commercial companies, merger means concept as control two or some commercial companies (especially limited company) by another commercial company. Type of merger is: legal merger (real merger): in which the companies are merged without refine, are dissolved and its

commitments are transferred into new company. And the residual company is deleted. Practical merger is due to obtaining controlled shares and merger by total obtain or majority of it. It is worth to say that in practical merger, legal identity is maintained after merger.

In Iran's legal, real merger is not possible without prescription of law makers, because, firstly, in Iran's Law, it is not predicated dissolution without consents. Secondly, transferring commitment is due to conversion commitment. Thirdly, transferring shares of shareholders is not legal without consent of compulsory cases; meanwhile, the regulations predicated are not accelerated for legal merger of cooperative companies and some of governmental companies to other commercial companies.

10. Define neural networks:

An artificial neural network ANN is idea that is inspired for processing information from neural bio-networks and process information like brain. In artificial neural networks it is tried that it is made similar structure same as human brain and neural networks having learning power, integration and decision like brain.

A neural network has similar structure as following. In this shape, every group has representative of neural network. The information is entered by entrance layer. This entrance is transferred by interfaces to latent layers and after processing, is void by different layers from exit layer.

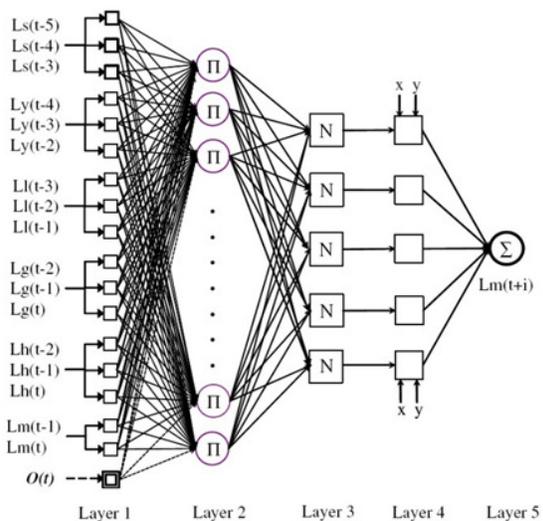


Fig. 1: A neural network

Neural networks locate in consequent layers and the relation is one line and when entrance pattern is done on network, the first layer calculates exit value and locates in to other layers. Next layers receive it as input and output is transferred. Every node transfers signal to other nodes. Multi layers Preceptor networks are from these networks.

11. Review studies performed:

Lue and Shen 2008, considered estimation of merger and acquisition by using new neural networks based on multi steps fuzzy performance. They were seeking non- linear methods in order estimate merger and acquisition performance and overcome to linear models estimation and offered evaluation method which is unified neural network algorithms after spreading multi steps fuzzy judgments. The results showed that this method show dominance of superiority on neural networks but can overcome of seeking shapes for educational data. After discussion on 12 institutes they showed that this evaluation method is perfect and can restore efficiency.

Chirstodoulou et al. 2006, discussed performance of 50 companies which are accepted in Greece Stock Exchange. The scales for discussion were profitability, cash and debt. The results showed that yield rate of property and other profits are reduced after acquisition and were significant by statistical point of view. Cash and debt rates did not reduce significantly.

Marquesand Altunbas 2005, discussed bank acquiesced during 1992-2001 at Europe. The researchers were looking for similarity effect for merger and acquisition of bank and divided them as European and Non- European. The most important factor was yield rate. The results showed that rate of yield income is restored and increment of yield of rate is higher than others and was significant from statistical point of view.

There were not any researches in this filed, at 2009, Asghar Arefi considered financial performance of companies in Iran which was done by financial evaluation indices (accounting variables) like rate of yield of owners, rate of yield of properties, operational cash and rate of sale, transactions during 1997-2002 by T-Student and Frieddman (non-paraetric) were analyzed and compared the results in order to identify economical macro effects by companies not possessed. The results showed that the managers don't ability to purchase company and make value for owners and often, the transactions are defeated in Iran and resulted to transferring wealth from shareholders of Buyer Company to target shareholders.

He performed another research at 2010 named economical added value in company's acquisition in Tehran Stock Exchange and performance of those companies were investigated experimented by T-Student method and their indices were restored and significant by statistical point of view and in other side, the results showed that economical added value reduced to other companies little but were not significant by statistical point of view which shows the companies confronted to reduction.

Arab Mazar Yazdi and Ghasemi 2009 performed research named pricing raw public domains: combination of artificial neural networks and genetic algorithm, which its aim is to make suitable predication tools for pricing raw materials by neural and genetics networks and the results showed that combination of neural and genetic networks

increased predication power in order to select optimal variables. In another research which was done by Makkiyan and Kraimi Takalo 2009 named Predication bankruptcy for manufacturing companies by using artificial neural networks (case study of Kerman companies), neural networks were used in predication bankruptcy of Kerman province

and the results showed that neural networks has high perfection in predication of bankruptcy.

12. Variables

Dependent and Output variables are financial risk and independent variable is as following Table 1:

Table 1: Dependent and Output variables

Variables	Classification of Independent Variable
Current rate= current properties/current debts Immediate rate= current property-inventory/current debt Rate of cash=cash/current debt Rate of debt to property=total debt-total property/ Rate of coverage of interest(EBIT)-interest before taxation/ interest costs(Index of power for paying liability
Interest margin,NPM= net interest /net sale (Rate of yield of shareholder rights, ROE- net interest/total right of shareholders(Rate of yield or properties, ROA, net interest/ total properties(Interest of every share f) EPS)= (interest after tax deduction /total shares (Profitability Index
Rate of properties)=total price of article / rate of interest Rate of account circulation)=sale /receivable accounts(Rate of fixed properties =sale /net of property(Rate of circulation properties) =sale /total properties (Index for ability management
Share of institute market) =total sale of company /total sold commodities Ability for develop new product) =total current property × rate of growth(Ability for develop market) =sale of current year -sale of previous year / (sale of previous year	Competitiveness Index

13. Analyzing data

In this research, neural network was used in order to make it; all independent variables are used as Multi layers preceptors MLP. Multi layers preceptors are most prevailing architecture or neural networks which are used today. In this research, algorithm pre fault is used for training network. Sigmoid function is used as transferring function for latent layer and linear function for output layer. Network fault is cited after fault expression and this function is most prevalent fault in education of neural network.

Pattern model: in multi layers neural preceptor network, (usually two layers one input and one output which is as latent) sigmoid transferring function is used.

$$f(n) = \frac{1}{1 + e^{-n}}$$

In this network, every layer has matrix of its weight w and bayes b and entrance n and exit a vector. The mathematical relation is following:

$$Y = b_2 + w_2 * S(b_1 + w_1 * p)$$

In which y is final output and s is transferring function pertinent to every layer, vectors bi and wi are bayes factors and weight of network in layer. Dimensions of vectors display number of neurons for that layer.

After data searching, data or entrance and exit variables are normalized that as for selection sigmoid function input and output functions are normalized between 0,1. In order to evaluate scale of fault of network, three faults like RMSE, ASE, SSE are used. The software used is MATLAB which has advantages like ease of education, ease of application, high speed and simultaneous display for educational charts (learning and experimental)

14. Results and discussion

As for number of neurons data of 16 variables, number of neurons of first layer is 16 and there is latent layer which considered neurons as 20 and output layer is pertinent to output variable and is trained. After operating networks for some cases, the results are as following Table 2:

Table 2: Number of neurons data of 16 variables

Fault of test data	Fault of Education Data	Fault Criteria
0.1513	0.10329	RMSE
0.086534	0.070608	MAE
1.1445	4.7583	SSE

R value is 0.58 for neural network.

As for value of criterion, validity of criterion was designed; we can conclude that use of neural networks is suitable method in order to estimate merger and acquisition of companies.

The results of research showed that use of artificial neural networks is suitable method for predication of future performance of companies.

We have to point that artificial neural networks are named as black box means it doesn't show manner of relations by its power in recognition of relation between variables.

Thus manner of relation between independent and dependent variables (from severity and weakness and direction) is not recognized.

By using results, following suggestions are:

- It is suggested that the managers of companies predicate and evaluate future performance in order to reduce costs due to acquisition and merger of companies.

It is suggested that too, the shareholders of target companies use model applied in this research in order to reduce or increase price of their shares after transaction.

References

- Altunbas and marques. (2005). Mergers and Acquisitions and Bank Performance in Europe. Working paper, European Central Bank .PP:10-25.
- Arab mazar Yazdi, Mohaamad and Ghasemi Mahsa, 2009, pricing of first public articles: combination of neural and genetic algorithms, accounting discussion, no.58, pp 87-102
- Arefi Asghar, Ali Saghafi and Jahankhani Ali, 2006, theoretical and applied bases of companies merger, financial researches, no.21, pp 47-74
- Arfei Asghar, 2009, discussion financial performance for companies in Iran, commercial magazine, no. 50, pp 225-245
- Arfei Asghar, 2010, economical added value in companies at Tehran Stock Exchange, accounting discussion, no.59, pp 47-62
- Botshekan, Mahmoud, 1997, predication of price share by using neural- fuzzy networks and its compare with predication linear patterns, Master degree thesis, Tehran University
- Christodoulou and et al. (2006). Exploring the Improvement of Corporate Performance After Mergers. International Research journal of Finance and Economics.
- Galpin, T.J. and Herndon, M. (2000). The Complete Guide to Mergers and Acquisitions. Jossey-Bass, San Francisco.
- Holbeche, L. and Garrow, V. (2000). Effective Mergers and Acquisition. Horsham: Roffey Park Management Institute.
- Hubbard , N (1999). Acquisition: strategy and Implementation. Working paper, Uacmillan Business.
- Kalataeh Rahmani Raheleh and Chahardah cheriki Masoumeh, 2009, artificial intelligence and its application in accounting and financial affairs. No.8, pp 135-140
- Liu, Z.B., and Shen, P. (2008). A Novel Neural Network Model of Merger and Acquisitions Performance Measurement Based on Multistage Dynamic Fuzzy Judgement .Proceedings of the Seventh International Conference on Machine Learning and Cybernetics. Kunming. PP: 12-15.
- Marques, D. Altunbas, Y. (2005). Mergers and Acquisitions and Bank Performance in Europe: The Role of Strategic Similarities. ECB Working Paper No. 398.
- Menhaj Mohammadbagher, 1989, Calculation intelligent of neural networks, Tehran, Professor Hesabi Printing Complex
- Nakagawa, T. Hayashi, Y. and Iwamoto, S., (1991). Neural network application to state estimation computation. IEEE Tran on CAS. 9. PP: 188-192.
- Rahman, R. Abdul and Limmack R.J. (2000). Corporate Acquisitions and the Operating Performance of Malaysian Companies. Social Science Research Network Electronic Paper Collection.
- Sarfaraz Leila and Afsar Ai, 2005, discussion effective factors on price of gold and offer predication model based on neural fuzzy networks, economical research magazine, no,16
- Thompson' Jr. and A.J. Strickland (1991). Management strategic . MC. Graw Hill . 11th Edition.