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INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

REFERENCES

APPENDIX/ANNEXURE

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BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

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WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

USING RADIAL BASIS FUNCTION NETWORKS TO EXAMINE SEMIOTIC THEORIES OF ACCOUNTING ACCRUALS

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ABSTRACT

Forecasting is an important component in the decision making process, because decisions reflect future events. Furthermore, financial forecasting is an important activity in economic decision-making. Since the cash flows are a basis for payment of dividends, interest and debt repayment and so on, users need to forecast future cash flows. In this paper, utility of accounting accruals in predicting future cash flows were investigated using the semiotics theory in Iranian companies. To this end, 60 firms were selected on the Tehran Stock Exchange and their financial information were analyzed by a valid method that called Radial Basis Function (RBF for the first time) in Iran. The evidence indicate that accounting accruals (that based on performance can be divided into two categories: syntactic and semantic accounting accruals) have information value. Furthermore, they are effective in predicting future operating cash flows. Accounting accruals also improve predicting of future operating cash flows when added to cash item.

KEYWORDS
Operation cash flows, Semiotic theories of accounting accruals, Syntactic accounting accruals, Semantic accounting accruals, Radial Basis Function (RBF) Networks.

INTRODUCTION

In today's world, accounting was not very successful without the theoretical framework and foundations. Accounting theory is a logical reasoning system that provides a framework for building universal principles. These principles used to evaluate the procedure of accounting and they are also guidelines for the development of new methods in accounting (Ghaemi, 1996). Theory in its broad sense means to describe and predict a phenomenon. In fact, the theory finds a correlation between past events that can be extended to future or to predict unobserved events (Pur Azarsa, 1985).

Semiotic theory of accounting accruals is one of theories that do to the focus on accounting reporting aspect has critical importance. This theory looks at the accounting from the standpoint of linguistics. Two basic theories of semiotics theory are:

1) Theory of the functions of accounting accruals: This theory classifies accounting accruals based on their performance and expresses that there are two main types of accruals: semantic accounting accruals and syntactic accounting accruals.

2) Theory of the pragmatic information of accounting accruals: This theory explains why accruals accounting have information value (information content) and it also states that semantic and syntactic accounting accruals have information content because they improve prediction of future cash flows when add to cash item.

Since accounting can be considered as a kind of language, aspects of reporting accounting should be part of the evolution of accounting. Theories that describe the process of reporting should be improving the meaning of accounting reporting and their components (Etheridge and Hsu, 2004).

Accrual accounting is one of component of accounting reporting that we can examine it by reporting theory. Semiotic theory of accounting accrual has been noticeable for Researchers in recent decades. On one hand, these signs offer the current status of firm's perspective and the other hand, they allowing users to make more accurate predictions of the future status, especially for predicting of future cash flows. However the accrual accounting reduce scheduling problems and inconsistencies inherent in the cash figures, but usefulness and reliability of accruals accounting are dubitable. Due to considering the estimative and subjective nature of these items managers can be manipulate them to adjust the reported earnings that prepare by accepted accounting principles. Hence, despite the consensus about the usefulness of accounting accruals in forecasting and decision making, there are some dissidents among experts (Arabmazar et al, 2006). Therefore, this study examined the objective and usefulness of accounting accruals by semiotic, theory of signs and symptoms, with a valid method that called Radial Basis Function Networks. The theoretical foundations performed by researchers indicate that accounting accruals have information content (e.g. the relationship between accruals and return on equity (Seifi,2006), the role of accruals and cash flows in the valuation (Ali Ahmadi, 2005), examining the relationship between profitability current cash flow and accounting accruals with future operation cash flows (Taheri, 2005). Figure 1 shows Effective factors in prediction of future operating cash flows.

FIG. 1: THE EFFECTIVE FACTORS IN PREDICTION OF FUTURE OPERATING CASH FLOWS
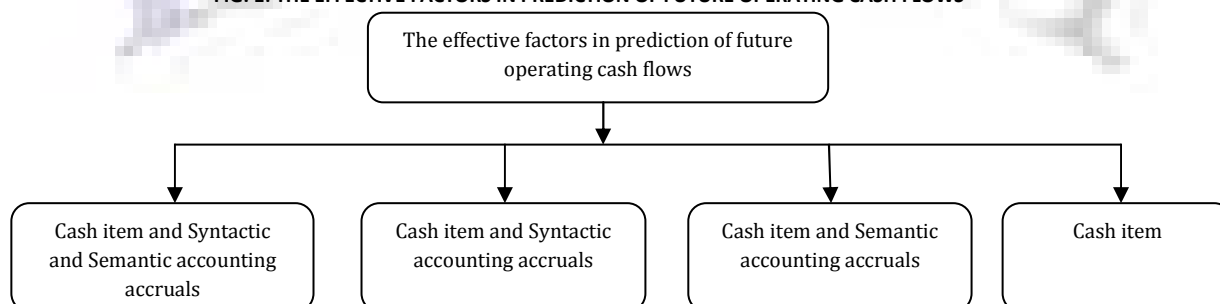
In the following are expressed literature review, hypotheses and methods of research, and finally findings of research and conclusions are presented.

LITRATURE REVIEW

Barth et al (2001) in a study entitled "accruals and prediction of future cash flow" examined the relationship between operating cash flow and accrual components of earnings using multivariate regression models. The results showed that the accounting accrual component of earnings increases predictability of future cash flows, markedly. Etheridge and Hsu (2004) in a research entitled "using artificial neural networks to examine semiotic theories of accounting accruals" examined the theory of semiotics accruals. In this study the theory of pragmatic information of accounting accruals and theory of the functions of accounting accruals were presented. As well as researchers used an artificial neural network. They predicted future cash flows using the cash item and cash item with accounting accrual. They found error rate of prediction is reduced by adding accounting accruals to the cash item. Thus it can be expressed that the accounting accruals have information content.

Saghafi (2006) in his research presented an efficient model for predicting of cash flow for companies that listed in Tehran Stock Exchange. He compared his model with other models. Based on the results, models that use cash item have higher error rate compared to models that using accounting accruals. Khajavi and Nazemi (2006) in their studies Investigated financial statements of 96 companies during the period 1998 to 2003. Their results showed that average stock returns do not affect on the accrual accounting amounts and related components. In other words, there is not a significant difference in average of return of companies with the lowest and the highest figure of accounting accruals.

Arab Mazar Yazdi et al (**2006**) have iinvestigated the information value of accounting accruals and cash flows in capital market of Iran. The results show that earnings have higher information content than operating cash flows. On the other hand, other researches in this area Implies the increasing information content of accounting accruals compared to the operating cash flows.

Bracket et al (**2007**) concluded that the average absolute prediction errors for future cash flows when accruals are added as a predictor of operating cash flows, is smaller than when the cash flows from operations are used alone as a predictor.

Hashemi et al (2010) in a study evaluated capability of cash and accrual components of earnings in prediction of abnormal earnings and valuation of the companies listed on the Stock Exchange. The results show that cash flows and total accounting accruals affect on the value of the companies and prediction of abnormal earning. Another result of this study shows that the component of accounting accrual can forecast abnormal earnings, although only some of the coefficients of accounting accruals component are statistically significant.

RESEARCH HYPOTHESES

Based on the theoretical foundations this study is to investigate the effect of accounting accruals on predicting of future cash flows. It will answer the question whether accounting accruals improves prediction of future cash flow or not. Therefore, the following hypotheses have been developed to answer these questions:

Hypothesis **1**: Adding up of syntactic accruals to cash items can improve prediction of future operating cash flows.

Hypothesis **2**: Adding up of semantic accruals to cash items can improve prediction of future operating cash flows.

Hypothesis **3**: Adding up of syntactic and semantic accruals together to cash items can improve prediction of future operating cash flows.

Hypothesis **4**: Syntactic and semantic accruals equally improve prediction of future operating cash flows.

SAMPLE SELECTION AND DATA COLLECTION

Sample of this research consists of listed companies on the Stock Exchange. Due to the vast volume of sample, the under following conditions were considered for selection of sample:

1. The company should be listed on Tehran Stock Exchange from the beginning of 2007 financial year.

2. The every financial year of the company should end in March.

3. The company should not change the financial year from 2009 to 2011.

4. The company should not be a financial trading company or an investment company.

5. Consistency should be observed during the studied period during 2007 to 2009.

6. Operating cash flows, accounting accrual components of earnings and balance sheet data should be available for entire period under examination.

Among the companies listed on Tehran Exchange that have all of the above conditions, **60** companies were selected during 2009 to 2011.

VARIABLE OF RESEARCH

Independent variables are:

1 - Cash Items,

2 - Cash Items with syntactic accounting accruals items,

3 - Cash items with semantic accounting accruals items,

4 - Cash Items with syntactic and semantic accounting accruals items,

Dependent variable in this research is the annual operating cash flow of future.

RESEARCH METHODOLOGY

Artificial neural networks are models for information processing that built by mimic from biological neural networks, like a human brain. The Key element of these patterns is a new structure for data processing system. Artificial neural networks with processing on the experimental data are extracted knowledge or hidden lows beyond the data and transferred it to the network structure. These processes are called Learning. Essentially the most important feature of an intelligent system is learning ability.

The learner systems are more flexible and planned simply, so they can be held accountable on new issues and equations. Firstly, this research was used artificial intelligence techniques (Radial Basis Function Networks) in order to organize the relationship between dependent and independent variables and forecasting future operating cash flow. Network was trained in 2009 by operating cash item and tested by data in 2010 for each of the independent variables. In the end, the designed network was predicted future operating cash flow by four independent variables.

RADIAL BASIS FUNCTION NETWORKS

Networks with radial based function widely used to estimate the non-parametric multi-dimensional functions through a limited set of training data. Due to the rapid and widespread training of radial neural network, they are extremely interesting and useful. Radial basis functions (RBF) networks have been introduced by Broomhead and Lowe (1998). It is one of the leading networks with three layers: an input layer, a hidden layer with a non-linear RBF activation function and a linear output layer (see Fig.2).

FIG. 2: ARCHITECTURE OF A RADIAL BASIS FUNCTION NETWORK
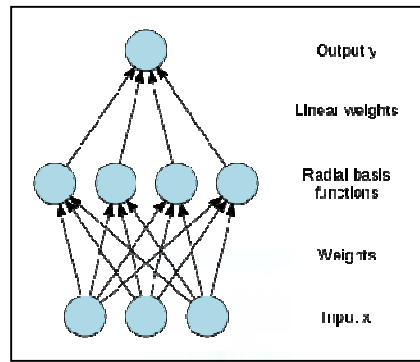
(Broomhead & Lowe ,1998).

The input modeled as a vector of real numbers $\mathbf{x} \in \mathbb{R}^n$ and then output of the network is a scalar function of the input vector, $\varphi : \mathbb{R}^n \to \mathbb{R}$, and is calculated by

$$\varphi(\mathbf{x}) = \sum_{i=1}^{N} a_i \rho(\|\mathbf{x} - \mathbf{c}_i\|)$$

In this equation N is the number of neurons in the hidden layer and $\mathbf{c}_i$ is the center vector for neuron i, and a_i is the weight of neuron i in the linear output neuron. Functions that depend only on the distance from a center vector are radially symmetric about that vector, hence the reason this is called radial basis function. In the basic state all inputs are attached to each hidden neuron. The norm is frequently taken to be the Euclidean distance and the radial basis function is typically taken to be Gaussian

$$\rho(\|\mathbf{x} - \mathbf{c}_i\|) = \exp\left[-\beta \|\mathbf{x} - \mathbf{c}_i\|^2\right].$$

The Gaussian basis functions are local to the center vector in the event that

$$\lim_{\|x\| \to \infty} \rho(\|\mathbf{x} - \mathbf{c}_i\|) = 0$$

By having certain mild conditions on the figure of the activation function, RBF networks are universal approximators on a compact subset of $\mathbb{R}^n$ (Park & Sandberg ,1991) This means that an RBF network with enough hidden neurons can approximate any continuous function with arbitrary precision. The parameters a_i, $\mathbf{c}_i$, and β_i are defined in a manner that optimizes the fit between φ and the data (Broomhead and Lowe ,1998)

DESIGN AND IMPLEMENTATION OF RBF NETWORKS

After data collection, the data were cleaned and prepared. it means that absent, incomplete or not calculable data are removed. After normalizing, the data are divided into two categories: learning and test. Network builds model by learning data and assessment model with test data. The results of the models related to the first, second and third hypotheses are presented in Tables 1,2 and 3.

TABLE 1: PREDICTIVE ACCURACIES (%) OF RBF NETWORK BY ADDING UP OF SYNTACTIC ACCRUALS TO CASH ITEMS

	Accuracy	The correlation coefficient	Error type I	Error type II
Result of learning data	99.8925	0.9876	0.0328	0.0011
Result of test data	99.5097	0.9981	0.0700	0.0049
Result of all data	99.7777	0.9860	0.0472	0.0022

TABLE 2: PREDICTIVE ACCURACIES (%) OF RBF NETWORK BY ADDING UP OF SEMANTIC ACCRUALS TO CASH ITEMS

	Accuracy	The correlation coefficient	Error type I	Error type II
Result of learning data	99.9477	-0.0035	0.0229	0.0005
Result of test data	99.9495	0.4211	0.0225	0.0005
Result of all data	99.9482	0.99511	0.0228	0.0005

TABLE 3: PREDICTIVE ACCURACIES (%) OF RBF NETWORK BY ADDING UP OF SYNTACTIC AND SEMANTIC ACCRUALS TOGETHER TO CASH ITEMS

	Accuracy	The correlation coefficient	Error type I	Error type II
Result of learning data	99.9723	0.99593	0.0167	0.0003
Result of test data	98.9536	0.9804	0.1022	0.0105
Result of all data	99.6667	0.97577	0.0577	0.0033

DATA ANALYSIS

In this section the observations of standard error will be described and evaluated in different situations.

TABLE 4: DESCRIPTIVE STATISTICS FOR THE OBSERVATION

Descriptive criteria	Total	Average	Minimum	Maximum	Standard deviation	Skewness coefficient
Error Metric of prediction of future operating cash flow considering cash items	60	546/1	011/0	263/44	789/5	085/7
Error Metric of prediction of future operating cash flow considering cash items and syntactic accruals	60	466/1	010/0	887/66	598/8	719/7
Error Metric of prediction of future operating cash flow considering cash items and semantic accruals	60	375/0	004/0	010/6	823/0	832/5
Error Metric of prediction of future operating cash flow considering cash items and syntactic and semantic accruals	60	216/0	002/0	220/1	263/0	534/2

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The results in table 4 show that the highest average standard error of prediction occurs when no accruals have been added to it. So adding syntactic and semantic accounting accruals decreases the average standard error of prediction. In the first column of the above table represent the number 60 that implies there is no missing observation. Skewness coefficient in the last column indicates that none of the standard error s has not normally distributed. As well as, normality assumption is examined in more in detail.

The hypothesis tested in this study by SPSS and MATLAB software. Average standard errors were calculated based on each of the independent variables. For determining the appropriate test methods in inferential statistics basic assumption is normality of the observations that we have collected. This work was performed by Kolmogrov-Smirnov test. Since the observations weren't normal, we used nonparametric statistical methods specifically Wilcoxon test. Also the correlation coefficient was used to endorsing the result.

in this section to assess the impact of cash item, cash item and syntactic accounting accruals, cash item and semantic accounting accruals and cash item and semantic and syntactic accounting accruals on predicting of operating cash flows the test Kolmogrov - Smirnov done. Since all four cases in the Table 6, the significance level is less than **0.05** (P< **0.05**) the normality assumption will be rejected in all cases.

TABLE 5: ONE-SAMPLE KOLMOGOROV- SMIRNOV TEST

Normality test	Error Metric related to adding syntactic accruals to cash items	Error Metric related to adding semantic accruals to cash items	Error Metric related to adding syntactic and semantic accruals to cash items	Error Metric associated with considering only
Mean	*0.0094*	*0.0061*	*0.0085*	*0.0041*
Standard Deviation	*0.0228*	*0.01321*	*0.02334*	*0.01058*
Z	*1.642*	*1.597*	*1.514*	*1.507*
p- value	*0.009*	*0.012*	*0.02*	*0.021*

Due to observations weren't normal, we used to Wilcoxon test at the 5% level that is a non-parametric test. Furthermore, the results of RBF network were tested by Wilcoxon test.

THE FIRST HYPOTHESIS TEST

According to table 1, it is seen that the correlation coefficient of 0.986 and this figure is closer to 1.It means that syntactic accounting accruals have a direct and perfect relationship with operating cash flow and adding up of syntactic accruals to cash items can improve prediction of future operating.

TABLE 6: WILCOXON TEST FOR DIFFERENCES OF ERROR METRIC OF THE PREDICTION OF OPERATING CASH FLOW IN TWO MODES (CONSIDERING ONLY CASH ITEM-CONSIDERING CASH ITEMS ADDED WITH SYNTACTIC ACCRUALS)

Test Statistics[b]	[a] -2.711
Asymp. Sig. (2- tailed)	0.007
a. Based on positive ranks.	
b. Wilcoxon Signed Ranks Test	

Also Wilcoxon test results in table 6 show that significant level is 0.007 and less than 0.05 (P <0.05), therefore, with the probability of 95%, we conclude that there is a significant difference between the Error Metric of the prediction of operating cash flow in only cash items and cash items added with syntactic accruals. Therefore the first hypothesis is accepted at level 0.05%.

THE SECOND HYPOTHESIS TEST

According to table 2, it is seen that the correlation coefficient of 0.9994 and this figure is closer to 1.It means that semantic accounting accruals have a direct and perfect relationship with operating cash flow and adding up of semantic accruals to cash items can improve prediction of future operating.

TABLE 7: WILCOXON TEST FOR DIFFERENCES OF ERROR METRIC OF THE PREDICTION OF OPERATING CASH FLOW IN TWO MODES (CONSIDERING ONLY CASH ITEM-CONSIDERING CASH ITEMS ADDED WITH SEMANTIC ACCRUALS)

Test Statistics[b]	[a] -2195
Asymp. Sig. (2- tailed)	0.028
a. Based on positive ranks.	
b. Wilcoxon Signed Ranks Test	

Wilcoxon test results in table 7 indicate that significant level is 0.028 and less than 0.05 (P <0.05), therefore, with the probability of 95%, we conclude that there is a significant difference between the Error Metric of the prediction of operating cash flow in only cash items and cash items added with semantic accruals. Therefore the first hypothesis is accepted at level 0.05%.

THE THIRD HYPOTHESIS TEST

According to table 3, it is seen that the correlation coefficient of 0.9994 and this figure is closer to 1. It means that semantic accounting accruals have a direct and perfect relationship with operating cash flow and adding up of semantic and syntactic accruals to cash items can improve prediction of future operating.

TABLE 8: WILCOXON TEST FOR DIFFERENCES OF ERROR METRIC OF THE PREDICTION OF OPERATING CASH FLOW IN TWO MODES (CONSIDERING ONLY CASH ITEM-CONSIDERING CASH ITEMS ADDED WITH SEMANTIC AND SYNTACTIC ACCRUALS)

Test Statistics[b]	[a] -1.420
Asymp. Sig. (2- tailed)	0.004
a. Based on positive ranks.	
b. Wilcoxon Signed Ranks Test	

Wilcoxon test results in table 8 show that significant level is 0.004 and less than 0.05 (P <0.05), therefore, with the probability of 95%, we conclude that there is a significant difference between the Error Metric of the prediction of operating cash flow in only cash items and cash items added with semantic and syntactic accruals. Therefore the first hypothesis is accepted at level 0.05%.

THE FORTH HYPOTHESIS TEST

For the fourth hypothesis, we should compare the results of first and second hypothesis. If ratio of division of MSE and RMSE of hypothesis be less than 1, efficiency of a hypothesis to another hypothesis is accepted. Therefore, Based on the results in Table 9, adding up semantic accounting accruals item cash items in prediction of operation cash flow is much more improvement than adding up syntactic accounting accruals item . Therefore syntactic and semantic accruals don't improve prediction of future operating cash flows equally and forth hypothesis is rejected.

TABLE 9: THE RESULTS OF COMPARISON OF HYPOTHESES

hypothesis	items	Division MSE	Division RMSE
1	Cash items/ syntactic accruals+ cash items	1.2774	1.1307
2	Cash items/ semantic accruals+ cash items	0.2975	0.5454
3	Cash items/ syntactic and semantic accruals+ cash items	1.91442	1.3837

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CONCLUSION

This study examines the role of information content of accounting accruals. In this regard, four hypotheses were proposed. After normalization of data, four models were presented by Radial Basis Function networks for every hypothesis. Results show that syntactic and semantic accounting accruals have information content in prediction of future operation cash flows and as a result, first, second and third hypotheses is accepted. Furthermore, syntactic and semantic accruals don't improve prediction of future operating cash flows equally and this leads to the fourth hypotheses is rejected.

RECOMMENDATIONS FOR FURTHER RESEARCH

Research findings showed that semiotic theory of accounting accruals can be used to predict future operating cash flows and it can provide useful information for users (managers, investors, creditor and so on). Therefore, we propose the following research for future:

1. Dividing of accounting accruals items into its components and then comparing of the results for finding that which component have better prediction of future operating cash flow.
2. Separation of firms according to their industry and its effect on different industry.
3. Comparison of cash item and accounting accrual data to predict future cash flows using the quarterly financial information.
4. Predict operating cash flows in companies such as investment firms, insurance and banking using cash and accounting accrual data.
5. Predict cash flows using stock market and investment information.

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