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Experimental model approach for decision making in Stock Index

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Abstract

Purpose of study in this paper is to find the variance analysis experimental model approach between stock exchange trend obtained by the comparison of the RMSEs by different methods of forecasting used by Chen[1], Yu & Huarng[2], Huaing[3], Yu[5], Yu & Huarng[6] and Yu & Huarng[7] .

Key words: *Forecasting, fuzzy relation equation, mathematical model, CRD, RMSEs.*

Nomenclature

z_{ij}	dependent variable,
γ	general mean effect
β_i	treatment due to ith effect,
ε_{ij}	error effect,
N	Number of observation
G	Grand total
C.F.	Correction Factor
RSS	Raw Sum of Square
TSS	Total sum of square
SST_R	Sum of square due to treatment
SSE	Sum of square due to Error
ANOVA	Analysis of variance
CRD	completely randomized design
S.O.V._1	Source of variation_1
D.F._1	Degree of Freedom_1
S.S.	Sum of squares_1
M.S.S._1	mean sum of square_1
l.o.s.	level of significance

Introduction

In Chen[1] Presenting a new method to forecast the Taiwan Stock Exchange Capitalization Weighted Stock Index(TAIEX) derived from the fuzzy time series and fuzzy variation groups. Huarng et al.[2] working on a handle non- linear problem used by fuzzy time series model and generate the non- linear arrangement of the neural network for the forecasting. Huang [3] analyzed the TAIEX historical data for forecasting based on fuzzy time series and some multivariate heuristic function. These heuristic functions are extended and integrate, which is

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improve forecasting results. Chissom[4] proposed the fuzzy time series, fuzzy relational equations. Yu[5], studied on fuzzy time series forecasting issues and compared with the local regression models on Taiwan stock index forecasting. Applied the Neural network on a fuzzy time series to forecasting moreover, use the Bivariate model for the forecasting performance by Yu and Haurang [6]. Neural network used by Yu et al. [7] on a fuzzy time series for calculate the forecasting.

In this paper, we have taken a historical data of one year and divided into two parts 10 month and 2 month. Here 10 month data for training and 2 month data for testing. These also presented in [1], [2], [5], [6] for each year. Taken historical data of Jan - Oct (2004) for training and Nov-Dec (2004) historical data for testing. Historical data of TAIEX (2004) use for main factor and the Dow Jones, the NASDAQ index for secondary factor taken for forecasting. Here target for forecasting is the daily TAIEX historical data of NOV-Dec (2004).

Here, we suppose Q be the universe of discourse, $Q = \{q_1, q_2, q_3, \dots, u_m\}$. A fuzzy set B_i in the universe of discourse Q is defined as follows:

$$B_i = \frac{f_{B_i}(q_1)}{q_1} + \frac{f_{B_i}(q_2)}{q_2} + \frac{f_{B_i}(q_3)}{q_3} + \cdots + \frac{f_{B_i}(q_m)}{q_m}$$

Where, f_{B_i} is the relationship function of the fuzzy set B and $f_{B_i}\left(q_j\right)$ represent the degree of connection of q_j belonging to the fuzzy set B.

$$f_{B_i}\left(q_j\right) \in [0,1], \qquad 1 \le j \le m$$

Suppose Y(t), t = …,-2,-1,0,1,2,3,… be the universe of discourse and be a subset of R. Let $f_i(t)$, where i=1,2,3,… be the fuzzy set defined in the universe of discourse Y(t) and let F(t) be a set of $f_i(t)$ then set F(t) is called a fuzzy series of Y(t).

Experimental model

In this section, we apply the proposed experimental model used for comparison of RMSEs average value obtained the TAIEX from 1999 to 2004 forecasting stock index.

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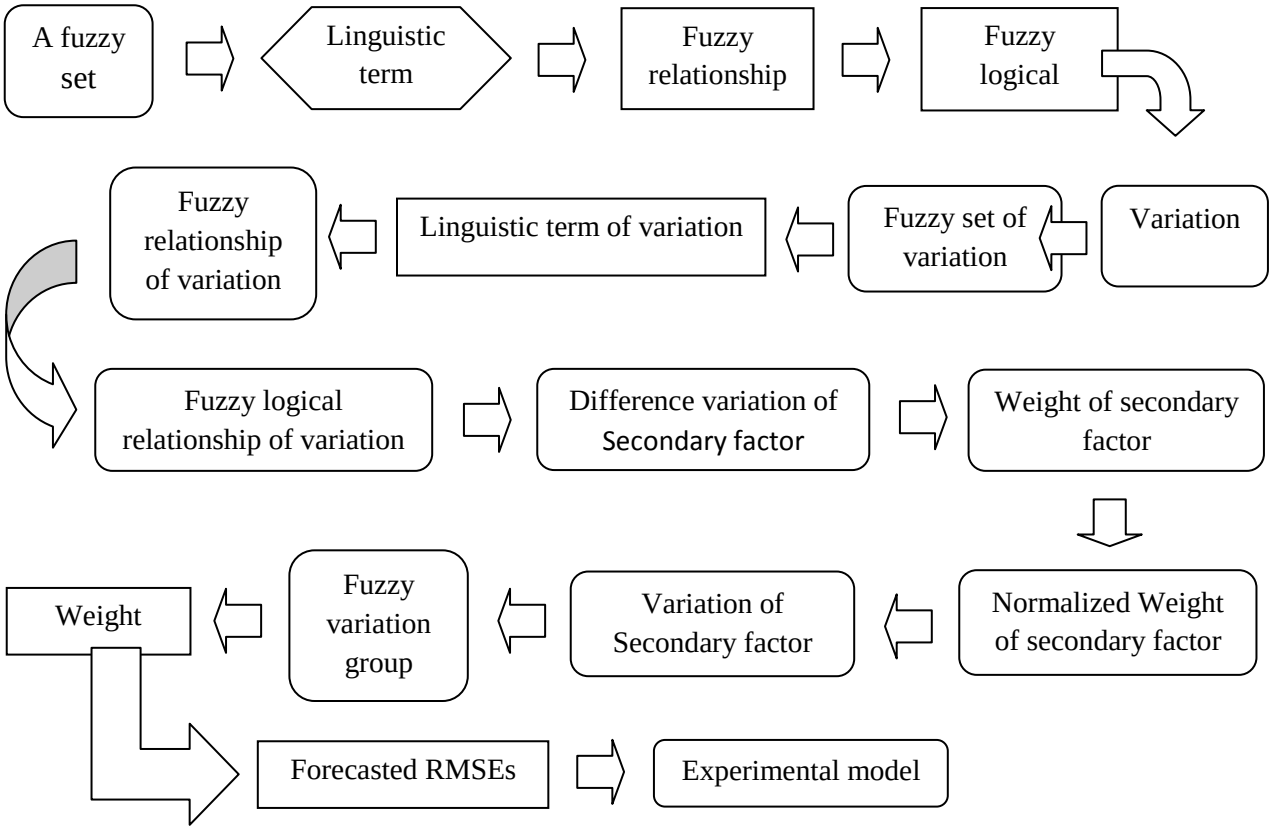

Modeling Chat of Experimental Term

Statistical analysis

Firstly the definition of completely randomized design (CRD) as when the homogenous data are taken into a single group and $\sum_{i=1}^{n} r_i = n$. Any treatment occur more than one in the design. The CRD model is define as,

$$z_{ij} = \gamma + \beta_i + \varepsilon_{ij}$$

Proposed hypothesis of the observational data for different methods,
Null hypotheses, H_0: all the methods used in literature are equal
v_s
Alternative hypothesis, H_1: some methods used are in literature are not equal.
Methods:
T_1= Huarng et al's Method
T_2= Univariate Neutral Network Method
T_3= Bivariate Univariate Neutral Method
Observation data of different methods is as follows,

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Table: RMSEs average value for different methods forecasting stock index 1999 to 2004

S.No.	Methods	Temporal Base Data						Mean of RMSE
		1999	2000	2001	2002	2003	2004	
Δ_1	(NASDAQ) by Huarng et al's method	_	158.7	136.49	95.15	65.51	73.57	105.88
	(Dow Jones) by Huarng et al's method	_	165.8	138.25	93.73	72.95	73.49	108.84
	(M1b) by Huarng et al's method	_	169.19	133.26	97.1	75.23	82.01	111.36
	(NASDAQ, Daw Jones) by Huarng et al's Method	_	157.64	131.98	93.48	65.51	73.49	104.42
	(NASDAQ, M1b) by Huarng et al's Method	_	155.51	128.44	97.15	70.76	73.48	105.07
	(NASDAQ, Daw Jones and M1b) by Huarng et al's Method	_	154.42	124.02	95.73	70.76	72.35	103.46
	Fuzzy Time Series Model by Chen's	120	176	148	101	74	84	117.4
Δ_2	Univariate Conventional Regression Model	164	420	1070	116	329	146	374.2
	Univariate Neural Network Model	107	309	259	78	57	60	145
	Univariate Neural Network based fuzzy time Series Model	109	255	130	84	56	116	125
	Univariate Neural Network based fuzzy time Series Model with Substitutes	109	152	130	84	56	116	107.8
Δ_3	Bivariate Conventional Regression Model	103	154	120	77	54	85	98.8
	Bivariate Neural Network Model	112	274	131	69	52	61	116.4
	Fuzzy Time Series Model through Bivariate Neural Network Based	108	259	133	85	58	67	118.3
	Bivariate Neural Network Based on Fuzzy Time Series Model with Substitutes	112	131	130	80	58	67	96.4

$$\text{C. F.} = \frac{G^2}{n} = 250474.879$$

Different source of variation are obtained as,

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$$RSS = \sum_{ij} y_{ij}^2 = 316782.472$$

$$TSS = RSS - C.F. = 66253.593$$

$$SST_r = \frac{\sum T_i^2}{r_i} - C.F. = 14859.785$$

$$SSE = TSS - SST_r = 51393.807$$

ANOVA Table for CRD

S.O.V._1	D.F._1	S.S.	M.S.S._1	F-Ratio
Treatment_1	2	14859.785	7429.892	1.7348
Error	12	51393.807	4282.817	
Total	14	66253.593		

CONCLUTION

The methods taken by Chen[1] on mean of RMSE for the forecasting of TAIEX is better than other. In this paper, we have the information of Chen[1] to find the variance analysis experimental model approach between stock exchange trend obtained by the comparison of the RMSEs by different methods. It has been seen that all the three methods are different as we reject the null hypothesis of the proposed model given above. It is significance at 10% but is accepted at 5% and blow.

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