World Academy of Science, Engineering and Technology
International Journal of Economics and Management Engineering
Vol:7, No:9, 2013

Financing Decision and Productivity Growth for the Venture Capital Industry Using High-Order Fuzzy Time Series

Shang-En Yu

***Abstract*—**Human society, there are many uncertainties, such as economic growth rate forecast of the financial crisis, many scholars have, since the the Song Chissom two scholars in 1993 the concept of the so-called fuzzy time series (Fuzzy Time Series)different mode to deal with these problems, a previous study, however, usually does not consider the relevant variables selected and fuzzy process based solely on subjective opinions the fuzzy semantic discrete, so can not objectively reflect the characteristics of the data set, in addition to carrying outforecasts are often fuzzy rules as equally important, failed to consider the importance of each fuzzy rule. For these reasons, the variable selection (Factor Selection) through self-organizing map (Self-Organizing Map, SOM) and proposed high-end weighted multivariate fuzzy time series model based on fuzzy neural network (Fuzzy-BPN), and using the the sequential weighted average operator (Ordered Weighted Averaging operator, OWA) weighted prediction. Therefore, in order to verify the proposed method, the Taiwan stock exchange (Taiwan Stock Exchange Corporation) Taiwan Weighted Stock Index (Taiwan Stock Exchange Capitalization Weighted Stock Index, TAIEX) as experimental forecast target, in order to filter the appropriate variables in the experiment Finally, included in other studies in recent years mode in conjunction with this study, the results showed that the predictive ability of this study further improve.

***Keywords*—**Heterogeneity, residential mortgage loans, foreclosure.

I. Introduction

THE innovation of information technology has increased the development of information production and gathering. Lots of companies have setup information systems to collect the daily operation data and stored these data in the database, in order to enforce the competitive advantage for company. Therefore, how to smartly and automatically transfer data into useful information and knowledge becomes a very pioneering goal of data application. As a result, data mining gradually becomes important. The researches of data mining techniques have been developed very well in many fields. The application of data mining techniques in maintenance field being in paid much attention in these years.

Many researchers have focused on finding the correlation of mortgage markets to provide meaningful rules. The rules can be used as the references or predictions to investors or decision-makers to discover some valuable information which tends to be overlooked. We pick up the useful information by the technologies of data mining, in order to provide the meaningful knowledge. The so-called "best recommendation" by means of data mining technology is to find out related information as well as historical transaction data, so as to discover the inter-relationship.

There are many factors that could have an influence on the default behavior of residential mortgages, such as the present value of the mortgage payments, characteristics of the family, loan to value (LTV) ratio, home equity, unemployment rate, and divorce rate [1]-[5]. In their study of the effects of counseling on mortgage default behavior, Hartarska and Gonzalez-Vega [6], [7] concluded that counseled borrowers were less likely to default on their mortgage than non-counseled borrowers, and that this also affected the optimal exercise. In this study we test homogeneity in different city districts. The remaining part of this paper is organized as follows.

Several problems can cause overdispersion in a fitted model, such as a large residual deviance relative to the number of degrees of freedom or a lack of important explanatory variables [8]. Allison [9] suggested that lack-of-fit could be associated with the dependence of the observations. Collett [8] suggested that overdispersion might be accommodated by including a random effect in the model.

There are two conventional goodness-of-fit tests, the Pearson χ^2 and the likelihood ratio χ^2 tests, also known as deviance χ^2 [9]-[11]. Pregibon [12] carried out a theoretical analysis that extended linear regression diagnostics to a logistic regression.

Sample fractions may give only a poor estimation of πi for some cells with few observations, and produce large standard errors [13]. Collett [8] proposed that overdispersion could be accommodated for by including a random effect in the model.

Davidian and Gallant [5] used Gaussian quadrature methods for noliear mixed models. Davidian and Giltinan [5] and Vonesh and Chinchilli [6] provided an overview and a discussion of the general theoretical development of nonlinear mixed models. In the present study, an empirical study was conducted and the results showed the practical viability of this approach.

II. Sample Description

The original data set collected for this study includes data on individual residential foreclosed mortgages from 1987 to 2007. Data were collected from the Taiwan Kaohsiung District Court in the Cianjin District, Kaohsiung City, Taiwan. The data set included 891 cases without a bidder and 989 cases with a bidder. The censoring time was at the end of 2007.

Shang-En Yu is with the Tourism Department, School of Tourism, Ming Chuan University, 5 De Ming Rd., Gui Shan Township, Taoyuan County 333, Taiwan, ROC (phone: + 03-350-7001; fax: +886-3- 3593863; e-mail: yushineen@mail.mcu.edu).

When there is bidder for the foreclosed mortgage, the case is classified as a "bid". The bids for foreclosed mortgages are associated with the following factors: upset price (reserve bid) (X_1), average price per square foot (X_2), square footage (X_3), square meters of ground (X_4), number of bids (X_5), rented or not (X_6), handed over or not (X_7), floors (X_8), total stories (X_9), width of the road (X_{10}), distance from MRT (X_{11}), distance from a school (X_{12}), economic growth rate (X_{13}), and unemployment rate (X_{14}); all these factors are considered in the regression model.

III. Fixed-Effects Logit Model

The upset price, total number of stories, MRT station distance, and economic growth rate, all have significantly positive effects on the default behavior. The price of average square footage, the number of bids, width of road, and unemployment rate, all have significantly negative effects on the default behavior. The others variables are not significant. It can be seen that each of the explanatory variables has a significant effect on the bid for the foreclosed residential mortgages [1]-[30].

IV. Goodness-of-Fit Statistics

Knowing a model's degree of effectiveness is very important when describing outcome variables. Consequently, assessing the degree of closeness of the model-predicted values to their corresponding observed values is useful when applying a regression model; this is referred to as the goodness-of-fit. Two conventional goodness-of-fit tests are described in section IIB.

In Table I, it can be seen that the estimate of deviance, labeled Value/DF, contains a dispersion parameter (value/DF) of 1.3006 and a Pearson Chi-square dispersion parameter of 1.0150. The values of the deviance χ^2 and Pearson χ^2 are larger than the degrees of freedom; the P-values for deviance χ^2 are smaller than 0.05 (<.0001). Therefore, this model seems to have an overdispersion of the data.

TABLE I
Goodness-of-Fit Statistics: Explanatory Varible X_1

Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	DF	Value	Value/DF	Pr>Chi-Sq
Deviance	1818	2364.5166	1.3006	<.0001
Pearson	1818	1845.3329	1.0150	0.3220
Number of unique profiles: 1826				

V. Conclusion

Many factors, such as the upset price (X_1), price of average square footage (X_2), square footage (X_3), number of bids (X_5), total stories (X_9), MRT station distance (X_{11}), and unemployment rate (X_{14}), have a significant impact on successful bids for foreclosed mortgages. A nonlinear mixed model can be used to classify the foreclosed mortgages into two groups, with a bidder and without a bidder.

Acknowledgment

The authors would like to thank the National Science Council of the Republic of China, Taiwan, for their financial support of this research under Contract. The authors are also most grateful for the kind assistance of the constructive suggestions of the anonymous reviewers all of which has led to the making of several corrections and suggestions that have greatly aided us in the presentation of this paper.

References

[1] Y. H. Deng, J. M. Quigley and R. Van Order, "Mortgage default and low downpayment loans: The costs of public subsidy," *Regional Science and Urban Economics,* vol.26, pp.263-285, 1996.
[2] Y. H. Deng, "Mortgage Termination: An empirical harzard model with stochastic term structure," *Journal of Real Estate Finance and Economics,* vol.14, pp.309-331, 1997.
[3] Y. H. Deng, J. M. Quigley and R. Van Order, "Mortgage terminations, heterogeneity and the exercise of mortgage options," *Econometrica,* vol.68, no.2, pp.275-307, 2000.
[4] C. Marrison, The fundamentals of Risk measurement, New York: McGraw-Hill, 2002.
[5] B. M. Lambrecht, W. R. M. Perraudin and S. Satchell, "Mortgage Default and Possession under Recourse: A Competing Hazards Approach," *Journal of Money, Credit and Banking,* vol.35, no.3, pp.425-442, 2003.
[6] V. Hartarska and C. Gonzalez-Vega, "Credit Counseling and Mortgage Termination by Low-Income Households." *The Journal of Real Estate Finance and Economics,* vol.30, no.3, pp.227-243, 2005.
[7] V. Hartarska and C. Gonzalez-Vega, "Evidence on the effect of credit counseling on mortgage loan default by low-income households," *Journal of Housing Economics*, vol.15, no.1, pp.63-79, 2006.
[8] D. Collett, Modeling binary data (2nd ed.), London: Chapman & Hall, 2003.
[9] P. D. Allison, Logistic regression using the SAS system: Theory and application, Cary, NC: SAS Institute, 1999.
[10] R. H. Myers, D. C. Montgomery and G. G. Vining, Generalized linear models: With applications in engineering and sciences, New York : John Wiley, 2002.
[11] B. Lawal, Categorical data analysis with SAS and SPSS applications, London: Lawrence Erlbaum Associates, 2003.
[12] D. Pregibon, "Logistic regression diagnostics," Annals of statistics, vol.9, no.3: pp.705-724, 1981.
[13] A. Agresti, An Introduction to Categorical Date Analysis (2nd ed.), New York: John Wiley, 2007.
[14] B. A. Ciochetti, G. Lee, J. Shilling, and R. Yao, "Aproportional hazards model of commercial mortgage default with originator bias," *Umpublished working paper*, 2001.
[15] M. Davidian, and R. A. Gallant, "The nonlinear mixed effects with a smooth random effects density," *Biometrika*, vol.80, pp.475-488, 1993.
[16] M. Davidian, and D. M. Giltinan, "Nonlinear models for repeated measurement data," *New York: Chapman & Hall*, 1995.
[17] T. Yamamoto, A. Yoshida, T. Ijima, Dynamics of Elastically Moored Floating Objects, In DYNAMIC ANALYSIS OF OFFSHORE STRUCTURES, Kirk, C.L. (ed.), 106-113. CML, Southampton, 1982.
[18] C.C. Mei, Numerical Methods in Water Wave Diffraction and Radiation, Ann. Rev. Fluid Mech. 10, 393, 1978.
[19] L. A. Zadeh, Fuzzy sets, Information and Control, 8 (1965) 338-353.
[20] T. Takagi, M. Sugeno, Fuzzy identification of systems and its applications to modeling and control, IEEE Trans. Syst., Man, Cybern., 15 (1985) 116-132.
[21] T.Y. Hsieh, M.H.L. Wang, C.W. Chen et al., A new viewpoint of S-curve regression model and its application to construction management, Int. J. Artif. Intell. Tools, 15 (2006) 131-142.
[22] M. Cococcioni, P. Guasqui, B. Lazzerini et al., Identification of Takagi-Sugeno fuzzy systems based on multi-objective genetic algorithms, Lect. Note Artif. Int., 3849 (2006) 172-177.
[23] Z.Y. Zhang, H.L. Zhou, S.D. Liu et al., An application of Takagi-Sugeno fuzzy system to the classification of cancer patients based on elemental contents in serum samples, Chemometr. Intell. Lab. Syst., 82 (2006) 294-299.
[24] M. Sugeno, G.T. Kang, Fuzzy modeling and control of multilayer incinerator, Fuzzy Sets Syst., 18 (1986) 329-346.

[25] K. Tanaka, M. Sugeno, Stability analysis and design of fuzzy control systems, Fuzzy Sets Syst., 45 (1992) 135-156.
[26] H.O. Wang, K. Tanaka, M.F. Griffin, "Parallel distributed compensation of nonlinear systems by Tanaka-Sugeno fuzzy model," Proc. FUZZ IEEE/IFES'95, (1995) 531-538.
[27] C.W. Chen, W.L. Chiang, F.H. Hsiao, Stability analysis of T-S fuzzy models for nonlinear multiple time-delay interconnected systems, Math. Comput. Simul., 66 (2004) 523-537.
[28] C.W. Chen, W.L. Chiang, C.H. Tsai et al., Fuzzy Lyapunov method for stability conditions of nonlinear systems, Int. J. Artif. Intell. Tools, 15 (2006) 163-171.
[29] K. Tanaka, H.O. Wang, Fuzzy Control Systems Design and Analysis, John Wiley & Sons. Inc., New York, 2001.
[30] E. F. Vonesh and V. M. Chinchilli, Linear and nolinear models for the analysis of repeated measurement, New York: Marcel Dekker, 1996.