

# 信用風險模型建構：台灣上市公司實證

學生:杜奇晃

指導教授:羅志賢博士

國立高雄應用科技大學金融資訊研究所碩士班

## 摘要

信用風險為金融機構最大之風險來源，其所衍生之逾期放款，更是金融業產生損失之重要原因。而上市公司之產值佔國內GDP比值甚高，銀行授信金額更甚於中小企業，且借款利率更較一般中小企業低，享受諸多社會資源，因此依據其公開之財務報表及市場交易資訊，建構一信用風險模型，將有助於金融機構於放貸前，評估是否對於上市公司放貸之依據，放貸之利率訂價，並建立放貸後危機預警機制，亦可降低投資大眾無謂損失。

本研究主要運用統計科學方法建構財務危機預警模型，有助於企業於財務危機發生前，即可預測該公司可能發生危機之機率。實證分析上，本研究以 2000-2006 年國內上市公司財務比率及非財務比率變數，除就上市公司整體外，並嘗試將上市公司分為電子產業與非電子產業二類，建構 Robust Logit 迴歸模型以預測上市公司違約機率，透過變數顯著性檢定(Wald-Test)篩選重要解釋變數，可得區分產業後，電子產業之模型解釋能力提高，惟非電子產業之模型解釋能力降低。其後尋找最適切割點，以提高預測違約公司與預測未違約公司之準確率，並以 ROC 與 CAP 驗證模型之效力，證實模型均具違約預測能力，最後以 2007-2008 年樣本外觀測值進行所建構之模型效力驗證，以電子產業所建構之模型二，正確預測率最佳，達 95%。

關鍵字：信用風險、財務危機預警模型、Logit Robust迴歸模型、ROC、CAP

# Credit Risk Modelling : Evidence from Listed Firms in Taiwan

Student: Tu, Chi-Huang

Advisors: Dr. Lo, Chih-Hsien

Institute of Finance and Information  
National Kaohsiung University of Applied Sciences

## Abstract

Credit risk is the largest source of risk financial institutions face. Overdue loans resulting from credit risk are main factors to the losses of financial industry. The output value of listed companies is in the high ratio of gross domestic product(GDP). Their credit lines with bank are also approved more than small-medium enterprises (SMEs), and pay lower interest expense than SMEs. Listed companies acquire a lot of benefit from society. Therefore, we should construct a set of credit risk models based on their public statements and market information . They not only help financial institutions to decide whether to lend or not, lending rate pricing policy, and establishment of financial crisis early-warning mechanism after lending, but also reduce unnecessary loss of public investors.

This study uses statistical methods to construct financial distress model, and helps us to predict the probability of crisis of listed companies before crisis really occurring. The resources of the empirical analysis are form the financial ratios and non-financial ratios of domestic listed companies during 2000 to 2006. In addition to the listed companies as a whole, I try to divide whoe listed companies into two parts, including the electronics industry and the non-electronics industry. Then I construct Robust Logit Regression Model to predict the default probability of listed companies. Through the variables significant test (Wald-Test) selecting key explanatory variables which can be distinguished industry, the electronics industry model could improve the ability of explanation, instead, non-electronics industry model reduce. Third, I try to find the optimal cut-off point to enhance forecasting accuracy of default. Fourth, I verify the models effect using ROC(Receiver Operating Characteristic) and CAP(Cumulative Accuracy Profile), and get satisfying outcome. Finally, I verify the effectiveness of the constructed models using out-of- sample observations during 2007 to 2008 to test the model whether comply or not. The model constructed by the electronics industry get correct prediction rate of the best, up to 95%.

Key Words: Credit Risk, Financial Crisis Early-Warning Mechanism, Robust Logit Regression Model, ROC, CAP

## 目錄

中文摘要.....	I
英文摘要.....	II
誌謝.....	III
表目錄.....	V
圖目錄.....	V
附錄.....	VI
一、緒論.....	1
1.1 研究背景與動機.....	1
1.2 研究目的.....	2
1.3 研究架構.....	3
二、文獻回顧.....	4
2.1 上市公司、信用風險與財務危機之定義.....	4
2.2 危機預警模型及國外文獻.....	10
2.3 國內文獻.....	17
三、研究設計.....	22
3.1 研究樣本.....	22
3.2 研究變數定義.....	23
3.3 研究流程.....	30
3.4 研究方法.....	33
四、實證結果與分析.....	43
4.1 樣本資料敘述統計分析.....	43
4.2 建立違約預警模型.....	45
4.3 最適之切割點(Cut-Off Point).....	52
4.4 CAP、ROC 效力驗證.....	54
4.5 樣本外資料驗證模型效力.....	56
五、結論與建議.....	58
5.1 研究結論.....	58
5.2 研究限制.....	59
5.3 研究建議.....	60
參考文獻.....	61

## 參考文獻

### 一、 中文部份

1. 王正賢，2006，財務危機模型之風險評估－以國內上市上櫃公司為例，輔仁大學應用統計學研究所碩士論文。
2. 王嘉穎，2000，我國上市公司財務危機與監理因素之關聯性研究－實質所有權之探討，國立台灣大學會計學研究所。
3. 王馨蘭，2004，集團企業與非集團企業審計意見比較之研究，朝陽科技大學會計學系碩士論文。
4. 江文俊，2008，運用公開資訊觀測站語料勘以提昇企業財務危預警模型之績效，銘傳大學財務金融學系碩士在職專班碩士論文。
5. 何太山，1977，運用區別分析建立商業放款信用評分制度，政治大學企業管理研究所碩士論文。
6. 吳美真，2003，應用財務報表分析國內外重大會計弊案之研究，中國文化大學會計研究所碩士論文。
7. 吳蕙真，2007，台灣集團企業財務預警模式-加入公司治理變數探討，南華大學財務管理研究所碩士論文。
8. 吳聲坡，1996，查帳報告對財務危機預測能力之研究，國立中興大學會計研究所碩士論文。
9. 李明仁，2008，企業財務危機預警模型之實證研究，世新大學財務金融學系碩士論文。
10. 杜建衡，2009，金融機構風險管理，初版，新陸書局股份有限公司，台北市。
11. 沈中華，林公韻，2005，“違約機率預測與極端值”，財務金融學刊，13卷，7期，劉維琪，12月
12. 周百隆、盧俊安、許昭民，2007，“以 Cascaded Logistic Model 建構我國企業財務危機預警模型之研究”，中華管理評論，10卷，2期，頁 1-15。
13. 林竹君，2004，商業銀行如何衡量違約企業之償還率，國立中央大學財務金融研究所碩士論文。
14. 林妙宜，2002，公司信用風險之衡量，政治大學金融研究所碩士論文。
15. 姜林杰佑，2008，金融資訊管理-分析與系統設計，初版，新陸書局股份有限公司，台北市。
16. 施毓森，2007，銀行放款訂價模型之探討－ROC 分析法之應用，東吳大學會計學系碩士論文。
17. 夏百陽，2001，上市公司財務危機預警模式之建立，銘傳大學金融研究所碩士論文。
18. 陳明賢，1985，財務危機預測之計量分析研究，國立台灣大學商學研究所碩士論文。
19. 陳建賓，2003，加入公司治理指標的企業財務危機預測研究：Logistic 模

- 型的應用，淡江大學財務金融學系碩士論文。
20. 陳達新、周恆志，2006，財務風險管理：工具衡量與未來發展，初版，雙葉書廊有限公司，台北市。
  21. 陳肇榮，1983，運用財務比率預測企業財務危機之實證研究，政治大學企業管理研究所博士論文。
  22. 陳錦村，江玉娟，朱育男，2006，“商業銀行如何建置符合新巴塞爾資本協定的信用評等制度”，金融風險管理季刊，2卷，1期，頁115-140。
  23. 黃小玉，1988，銀行放款信用評估模式之研究--最佳模式之選擇，淡江大學管理科學研究所碩士論文。
  24. 黃俊雄，1994，財務危機預警模式建立與驗證，東吳大學管理科學研究所碩士論文。
  25. 黃基銘，2009，中小企業信用風險模型之比較研究，國立高雄應用科技大學金融資訊研究所碩士在職專班碩士論文。
  26. 楊世彬，2004，“TCRI 信用評等在實務上之應用”，華南金控月刊，23期，頁19-25。
  27. 萬智傑，2007，台灣中小企業之財務危機預警模型、信用評等與巴塞爾協定資本計提，東吳大學企業管理學系碩士論文。
  28. 詹益宗，2006，財務危機預警模型比較，國立交通大學財務金融研究所碩士論文。
  29. 鄧志豪，2000，以分類樣本偵測地雷股—新財務危機預警模型，政治大學金融學系碩士論文。
  30. 謝智安，2003，企業財務危機預測之研究，中正大學國際經濟研究所碩士論文。

## 二、英文部份

1. Altman, E.I., 1968, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", Journal of Finance, Vol.23 (4), pp.589-609.
2. Altman, E.I., RG Haldemann and P Narayan, 1977, "Zeta TM Analysis—A New Model to Identify Bankruptcy Risk of Corporations", Journal of Banking and Finance, 1 (1), pp. 29-54.
3. Alves, J. R., 1978, "The Prediction of Small Business Failure Utilizing Financial and Nonfinancial Data" , Ph. D Dissertation, University of Massachusetts.
4. Beaver, William H., 1966, "Fianacial Ratios as Predictors of Failure in Empirical Research in Accounting: Selected studies", Supplement to Journal of Accounting Research, Vol. 4, pp.71-111.
5. Begley, J., Ming, J. and Watts, S., 1996, "Bankruptcy Classification Errors in The 1980s: An Empirical Analysis of Altman's and Ohlson's Modles", Reviews of Accounting Studies, Vol. 1, pp. 267-284.
6. Black, Fischer; Myron Scholes, 1973, "The Pricing of Options and Corporate Liabilities", Journal of Political Economy, 81 (3), pp. 637-654.
7. Blum, M., 1974, "Failing Company Discriminant Analysis", Journal of Accounting, Research 12 (1), pp.1-25.
8. Collins, Robert A. and Richard D. Green, 1982, "Statistical Methods for Bankruptcy Forecasting" , Journal of Economics and Business, Vol.34, No.4, pp.349-354.
9. DeAngelo, L.E., 1981, "Auditor Independence, Low Balling, and Disclosure Regulation", Journal of Accounting and Economics, 3, pp.113-127.
10. Gentry, J. A., Newbold, P., and Whitford, D. T., 1987, "Flow of funds components, financial ratios and bankruptcy" , Journal of Business Finance and Accounting, Vol.14, pp.595-606.
11. Guption, GM, 1997, "The New Talk of The Town: CreditMetrics, a Credit Value-at-Risk approach", The Journal of Lending and Credit Risk Management, pp.44-54.
12. Hackenbrack, K., 1993. "The effect of experience with different sized clients on auditor evaluations of fraudulent financial reporting indicators" , Auditing: A Journal of Practice and Theory, 12 (Spring), pp. 99-110.
13. Hopwood W., J.McKeown and J.Mutchler, 1994, "A Reexamination of Auditor versus Model Accuracy Within the Context of Going Concern Opinion Decision" , Contemporary Accounting Research, 10, pp.409-431.
14. Jarrow R A, Turnbull S M., 2000, "The Intersection of Market and Credit Rsik" , Journal of Banking & Finance, 24(1~2), pp.271~299.
15. Joao Eduardo Dias Fernandes, 2006, "Corporate Credit Risk Modeling: Quantitative Rating System and Probability of Default Estimation", Banco BPI.

16. Kealhofer, S. and M. Kurbat., 2002, "The Default Prediction Power of Merton Approach, Relative to Debt Ratings and Accounting Variables", Moody's KMV Company, January.
17. Krishnan, J. and J. Krishnan, 1996, "The Role of Economic Trade-offs in the Audit Opinion Decision: An Empirical Analysis" , Journal of Accountancy, Auditing & Finance, Vol.11, pp.565-586.
18. Lau, A. H-L., 1987, "A Five- State Financial Distress Prediction Model", Journal of Accounting Research, 25(Spring), pp.127-138.
19. Lee T.S and Yeh Y.H., 2004, "Corporate Governance and Financial Distress: Evidence from Taiwan", Journal of Corporate Governance, 3, pp.378-388.
20. Lo A.W., 1986, "Logit versus Discriminant Analysis : A Specification Test and Application to Corporate Bankruptcies", Journal of Econometrics, pp.151-178.
21. Merton, Robert C., 1974, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates", Journal of Finance, Vol. 29, No. 2, pp. 449-470.
22. Odom, M. D., Sharda, R., 1990, "A Neural Network Model for Bankruptcy Prediction" , Proceedings of the IEEE International Conference on Neural Networks, pp.163-168.
23. Ohlson, J. A., 1980, "Financial Ratios and the Probabilistic Prediction of Bankruptcy", Journal of Accounting Research, Vol.18, pp.109-131.
24. Pinches , G . E. and K . A . Mingo , and J . K . Charuthers , "The Stability of Financial Patterns in Industrial Organizations" , The Journal Finance, 1973, pp.389-396.
25. Platt, H.D. and M.B. Platt, 1990, "Development of a class of stable predictive variables: The case of bankruptcy prediction" , Journal of Business Finance & Accounting, Vol.17 No.1, pp.31-51.
26. Pogue, T. F., and R. M. Soldofsky, 1969, "What's in a Bond Rating?", Journal of Financial and Quantitative Analysis, 4, pp.201-228.
27. Sobehart, J.R., Stein R., Mikitkyanskaya, V., Li L., 2000, "Moody's Public Firm Risk Model: A Hybrid Approach to Modeling Default Risk", Moody's Investors Service Special Comment (March, 2000).
28. Tor Jacobson, Kasper Roszbach, 2003, "Bank Lending Policy, Credit Scoring and Value-at-Risk" , Journal of Banking and Finance, 27(2003), pp.615-633.
29. Whitaker, R. B., 1999, "The Early Stages of Financial Distress", Journal of Economics and Finance, Vol.23, pp.123-133.
30. William F.Treacy, Mark Carey, 2000, "Credit Risk Rating Systems at Large US Bank" , Jouranal of Banking and Finance, 24 (2000), pp.167-201.
31. Zeitun, R., Tian, G. & Keen, S. ,2007, "Default Probability for the Jordanian Companies: A Test of Cash Flow Theory" , International Research Journal of Finance and Economics, 8, pp.147-162.