

Research Note**Modelling Corporate Collapse: Definitional Issues of the Collapse Event**

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Abstract

This paper investigates problems associated with interpretations of corporate collapse, and argues for a unified legal, rather than financial, definition of the event.

In the absence of a formal definition of the event of corporate collapse, the integrity of sample selection becomes questionable; moreover, comparisons between empirical studies becomes less useful, if not altogether futile, due to the lack of a common ground in the basic building block.

Upon close examination of 84 studies on ratio-based modeling of corporate collapse, between 1968 and 2004, this paper finds evidence in favor of a legal interpretation of the event of corporate collapse. Specifically, studies that adopted a legal definition are five times as many as those that opted for a financial explanation.

Keywords

Corporate Collapse
Bankruptcy Prediction
Legal interpretation
Financial interpretation

Introduction

When is a corporation considered to have collapsed? Is it when it shows signs of financial fragility or is it when the courts legally declare it to have ceased to exist? What comes to mind when news about the collapse of a company is announced? Probably, what comes to mind first is the sudden death of an entity.

Even though the announcement of such an event is in itself sudden, the process is gradual and could extend over many years. Along the way, signs and symptoms appear in various forms. In most cases such signs and symptoms are visible in the reported financial variables captured in the financial reports. Because such signs and symptoms vary, this gives rise to a multitude of definitions of corporate collapse. In some cases the event is defined from a financial perspective (Karels and Prakash, 1987). However, this makes it difficult to identify the point at which returning to a strong financial position is impossible and when collapse becomes imminent.

Therefore, the event of collapse appears to be a subjective decision in which financial fragility persists until the company or its creditors decide to file a legal action. Financial fragility is thus a necessary, but not a sufficient condition for corporate collapse; which explains why a legal interpretation is necessary.

The first section of this paper discusses the problems with defining the event of corporate collapse from a financial perspective and emphasizes the necessity for adopting a legal definition. The second section provides empirical support to the conclusions presented in the first section. The results are predominantly in favour of a legal, rather than financial, interpretation of the event. The third and last section draws this paper to a conclusion.

The Necessity for a Legal Interpretation of the Event of Collapse

The dilemma with a financial interpretation of the event of corporate collapse finds its roots in the 'Failing Company Doctrine',

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which was formulated by the Supreme Court in the USA in *International v. F.T.C.* The rationale behind the ‘Doctrine’ is that the likely harm to communities, employees, creditors, and owners associated with a failing business that *might* be forced into a liquidation proceeding, outweighs harm to competition caused by allowing a failing and presumably *weak but still intact* firm to merge with a competitor (Blum, 1974, pp. 1-2). The words that are italicized in the preceding statement indicate that collapse is defined as a possibility that the firm may go into liquidation, because it is ‘weak’. However, the firm is ‘still intact’, that is it has not collapsed yet. The reason for such ambiguity is that the event of collapse is defined from a financial perspective. Companies that are experiencing financial problems do not necessarily collapse. Some may succeed in avoiding collapse and undergo full-scale reorganization (Betts and Belhoul, 1987).

What exactly constitutes financial problems, and what are some measurable descriptions of these problems? One measure looks at negative cumulative earnings over some period of time; whereby, the period of time could be anywhere from two to three consecutive years (Gilbert et al., 1990; Poston and Harmon, 1994; Hill and Perry, 1996; Lee et al., 1996). Another measure considers the amount of subsidy that a company receives from the State (Skogsvik, 1990). Other measures assess reductions in dividend payments (Ward, 1994), the presence of current ratios below unity (Poston and Harmon, 1994), the presence of negative equity ratios (Gritta et al., 2000), or going concern opinions from auditors (Coats and Fant, 1993; Flagg and Giroux, 1991; Lacher et al., 1995). Considering the inconsistency in these measurable descriptions, it is evident that a common ground is unattainable with respect to a financial definition of corporate collapse.

However, this is not the case when a legal interpretation is adopted, whereby the event

culminates in the cessation of the entity. This includes companies that have appointed an administrator, filed for bankruptcy, gone into liquidation or receivership, failed to lodge listing fees, or wound up.

The next section refers to the literature on ratio-based modelling of corporate collapse in order to provide empirical support to the conceptual framework discussed above.

Empirical Support

A total of 84-refereed studies on ratio-based modelling of corporate collapse, have been analysed in order to arrive at the results presented herein. A summary of the results is presented in Table One. The codes used refer to the following definitions:

- **A:** Administrator appointed.
- **B:** Bankruptcy filing.
- **D:** Default on debt.
- **F:** Financial problems.
- **L:** Liquidation.
- **R:** Receivership.
- **S:** Fees not lodged.
- **W:** Wind up.
- **NC:** No Clear definition.

A noticeable observation from analyzing the literature has to do with the number of studies that adopted more than one criterion in defining the event of collapse. Table Two presents a summary of the results, which indicate that, although more than half (54.0%) of the studies adopted only a single criterion, there were nevertheless a significant number that adopted multiple criteria. Specifically, 27.0% adopted two criteria, 17.5% adopted three criteria and 1.6%, that is one study, adopted four criteria; giving a total of 46.0%. When taken collectively, the results in Table Two demonstrate that the event of collapse is not necessarily restricted to a single criterion; that is, it could be broadly defined.

Table One: Summary of the Definitions of the Event of Corporate Collapse Across 84 Studies (1968 - 2004)

Study	<i>Definition</i>	Study	<i>Definition</i>
Altman (1968)	B	Koh and Killough (1990)	NC
Deakin (1972)	B	Skogsvik (1990)	B, F, S
Edmister (1972)	NC	Flagg and Giroux (1991)	D, F
Altman (1973)	B	Koh (1991)	B
Blum (1974)	F	Laitinen (1991)	NC
Elam (1975)	B, D	Aly et al. (1992)	B
Altman et al. (1977)	B	Bahnsen and Bartley (1992)	B, D
Ketz (1978)	NC	Baldwin and Glezen (1992)	NC
Norton and Smith (1979)	B	Coats and Fant (1993)	F, S
Walker et al. (1979)	NC	Fletcher and Goss (1993)	NC
Altman and Levallee (1980)	B	Johnsen and Melicher (1994)	B
Dambolena and Khoury (1980)	NC	Platt et al. (1994)	B
Ohlson (1980)	B	Poston and Harmon (1994)	F
Sharma and Mahajan (1980)	NC	Sheppard and Fraser (1994)	B
Castagna and Matolcsy (1981)	A	Ward (1994)	B, D, F
Taffler (1982)	L, R, W	Wilson and Sharda (1994)	NC
El-Hennawy and Morris (1983)	A, L, W	Boritz et al. (1995)	B
Hamer (1983)	B	Lacher et al. (1995)	F
Taffler (1983)	L, R, W	Wilson et al. (1995)	R, W
Izan (1984)	L, R	Hill and Perry (1996)	B, F, S
Lincoln (1984)	NC	Lee et al. (1996)	F, L, S
Micha (1984)	S, W	Clark et al. (1997)	NC
Takahashi and Kurokawa (1984)	B	Lenard et al. (1998)	B
Zmijewski (1984)	B	McGurr and Devaney (1998)	B
Casey and Bartczak (1985)	B	Richardson et al. (1998)	B, L
Frydman et al. (1985)	B	Dimitras et al. (1999)	NC
Gentry et al. (1985)	B, L	Kim and McLeod Jr. (1999)	L
Levitan and Knoblett (1985)	B	Kyung et al. (1999)	B
Zavgren (1985)	B	Laitinen and Kankaanpaa (1999)	NC
Keasey and Watson (1986)	S	Lennox (1999)	A, L, R
Lawrence and Bear (1986)	NC	Bongini et al. (2000)	B
Lo (1986)	B	Gritta et al. (2000)	B, F
Betts and Belhoul (1987)	B, F	Laitinen and Laitinen (2000)	NC
Gombola et al. (1987)	B	Zapranis and Ginoglou (2000)	NC
Karels and Prakash (1987)	B, R	Beynon and Peel (2001)	R
Keasey and Watson (1987)	NC	Drezner et al. (2001)	L
Lau (1987)	B, D, F, L	Lin and McClean (2001)	L, R
Peel and Peel (1987)	L, R	Ginoglou et al. (2002)	NC
Dambolena and Shulman (1988)	B	Darayseh et al. (2003)	B
Barniv and Raveh (1989)	NC	Charitou et al. (2004)	A, L, R
Hopwood et al. (1989)	NC	Jones and Hensher (2004)	A, L, R
Gilbert et al. (1990)	B, F	Neophytou and Molinero (2004)	A, L, R

Table Two: Summary Statistics Regarding the Number of Criteria Used in Defining the Event of Collapse Across 84 Studies (1968 - 2004)

Number of Criteria	Frequency	Percent (n=84)
1	34	54.0%
2	17	27.0%
3	11	17.5%
4	1	1.6%

Table Three demonstrates that the nature of such a broad definition is strongly embedded in a legal interpretation. This observation could be ascertained by considering the cumulative percentage for the codes that satisfied the legal criteria: 'A' (administrator appointed) 7.1%, 'B' (bankruptcy filing) 47.6%, 'L' (liquidation) 19.0%, 'R' (receivership) 14.3%, 'S' (fees not lodged) 7.1% and 'W' (wind up) 6.0%; giving a cumulative percentage of 101.1%¹. This cumulative percentage is considerably larger than the one for studies that adopted a financial definition of corporate collapse: code 'D' 6.0% and code 'F' 15.5%.

Table Three: Frequencies and Percentages Corresponding to Each Definition of the Event of Collapse Across 84 Studies (1968 - 2004)

Definition	Frequency	Percent
A	6	7.1%
B	40	47.6%
D	5	6.0%
F	13	15.5%
L	16	19.0%
R	12	14.3%
S	6	7.1%
W	5	6.0%

¹ The reason this is greater than 100% is because some studies adopted more than one criterion in defining corporate collapse.

Conclusion

The aim of this paper was to put forward a definition of the event of corporate collapse, which is a necessary step towards selection of companies for any attempt at modeling the event. Accordingly, this paper argued that the criteria should satisfy a legal, rather than financial, interpretation of the event. The reason primarily has to do with the problem associated with adopting a financial interpretation of the definition, which revolves around the difficulty of identifying the point at which returning to a strong financial position is impossible and when collapse becomes imminent.

Having established the necessity of a legal definition of the event, this paper went on to demonstrate that the literature on ratio-based modeling of corporate collapse is in favor of such a legal definition.

Specifically, studies that favor a legal interpretation of the event are about five times more than those that favor a financial interpretation.

References

- Altman, E.I. (1968), Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance*, 23 (4), pp. 589-610.
- Altman, E.I. (1973), Predicting Railroad Bankruptcies in America, *Bell Journal of Economics and Management Science*, 4 (1), pp. 184-212.
- Altman, E.I., Haldeman, R.G. and Narayanan, P. (1977), Zeta Analysis: A New Model to Identify Bankruptcy Risk of Corporations, *Journal of Banking and Finance*, 1 (1), pp. 29-54.
- Altman, E.I. and Levallee, M.Y. (1980), Business Failure Classification in Canada, *Journal of Business Administration*, 12 (1), pp. 147-164.
- Aly, I.M., Barlow, H.A. and Jones, R.W. (1992), The Usefulness of SFAS No. 82 (Current Cost) Information in Discriminating Business Failure: An Empirical Study, *Journal of Accounting, Auditing and Finance*, 7 (2), pp. 217-229.

- Bahnson, P.R. and Bartley, J.W. (1992), The Sensitivity of Failure Prediction Models to Alternative Definitions of Failure, *Advances in Accounting*, 10, pp. 255-278.
- Baldwin, J. and Glezen, G.W. (1992), Bankruptcy Prediction Using Quarterly Financial Statement Data, *Journal of Accounting, Auditing and Finance*, 7 (3), pp. 269-285.
- Barniv, R. and Raveh, A. (1989), Identifying Financial Distress: A New Nonparametric Approach, *Journal of Business Finance and Accounting*, 16 (3), pp. 361-383.
- Betts, J. and Belhoul, D. (1987), The Effectiveness of Incorporating Stability Measures in Company Failure Models, *Journal of Business Finance and Accounting*, 14 (3), pp. 323-334.
- Beynon, M.J. and Peel, M.J. (2001), Variable Precision Rough Set Theory and Data Discretisation: An Application to Corporate Failure Prediction, *Omega*, 29 (6), pp. 561-576.
- Blum, M. (1974), Failing Company Discriminant Analysis, *Journal of Accounting Research*, 12 (1), pp. 1-26.
- Bongini, P., Ferri, G. and Hahm, H. (2000), Corporate Bankruptcy in Korea: Only the Strong Survive?, *Financial Review*, 35 (4), pp. 31-51.
- Boritz, J.E., Kennedy, D.B. and Albuquerque, A.M. (1995), Predicting Corporate Failure Using a Neural Network Approach, *Intelligent Systems in Accounting, Finance and Management*, 4 (2), pp. 95-111.
- Casey, C. and Bartczak, N. (1985), Using Operating Cash Flow Data to Predict Financial Distress: Some Extensions, *Journal of Accounting Research*, 23, pp. 384-402.
- Castagna, A.D. and Matolcsy, Z.P. (1981), The Prediction of Corporate Failure: Testing the Australian Experience, *Australian Journal of Management*, 6 (1), pp. 23-50.
- Charitou, A., Neophytou, E. and Charalambous, C. (2004), Predicting Corporate Failure: Empirical Evidence for the UK, *European Accounting Review*, 13 (3), pp. 465-497.
- Clark, C.E., Foster, P.L., Hogan, K.M. and Webster, G.H. (1997), Judgemental Approach to Forecasting Bankruptcy, *Journal of Business Forecasting Methods and Systems*, 16 (2), pp. 14-19.
- Coats, P.K. and Fant, L.F. (1993), Recognizing Financial Distress Patterns Using a Neural Network Tool, *Financial Management*, 22 (3), pp. 142-156.
- Dambolena, I.G. and Khoury, S.J. (1980), Ratio Stability and Corporate Failure, *Journal of Finance*, 35 (4), pp. 1017-1026.
- Dambolena, I.G. and Shulman, J.M. (1988), A Primary Rule for Detecting Bankruptcy: Watch the Cash, *Financial Analyst Journal*, 44 (5), pp. 74-79.
- Darayseh, M., Waples, E. and Tsoukalas, D. (2003), Corporate Failure for Manufacturing Industries using Firms Specific and Economic Environment with Logit Analysis, *Managerial Finance*, 29 (8), pp. 23-36.
- Deakin, E.B. (1972), A Discriminant Analysis of Predictors of Business Failure, *Journal of Accounting Research*, 10 (1), pp. 167-180.
- Dimitras, A.I., Slowinski, R., Susmaga, R. and Zopounidis, C. (1999), Business Failure Prediction Using Rough Sets, *European Journal of Operational Research*, 114 (2), pp. 263-280.
- Drezner, Z., Marcoulides, G.A. and Stohs, M.H. (2001), Financial Applications of a Tabu Search Variable Selection Model, *Journal of Applied Mathematics and Decision Sciences*, 5 (4), pp. 215-235.

- Edmister, R.O. (1972), An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction, *Journal of Financial and Quantitative Analysis*, 7 (2), pp. 1477-1494.
- El-Hennawy, R.H.A. and Morris, R.C. (1983), The Significance of Base Year in Developing Failure Prediction Models, *Journal of Business Finance and Accounting*, 10 (2), pp. 209-224.
- Elam, R. (1975), The Effect of Lease Data on the Predictive Ability of Financial Ratios, *Accounting Review*, 50 (1), pp. 25-43.
- Flagg, J.C. and Giroux, G.A. (1991), Predicting Corporate Bankruptcy Using Failing Firms, *Review of Financial Economics*, 1, pp. 67-78.
- Fletcher, D. and Goss, E. (1993), Forecasting with Neural Networks: An Application Using Bankruptcy Data, *Information and Management*, 24, pp. 159-167.
- Frydman, H., Altman, E.I. and Kao, D. (1985), Introducing Recursive Partitioning for Financial Classification: the Case of Financial Distress, *Journal of Finance*, 40 (1), pp. 269-292.
- Gentry, J.A., Newbold, P. and Whitford, D.T. (1985), Classifying Bankrupt Firms with Funds Flow Components, *Journal of Accounting Research*, 23 (1), pp. 146-161.
- Gilbert, L.R., Menon, K. and Schwartz, K.B. (1990), Predicting Bankruptcy for Firms in Financial Distress, *Journal of Business Finance and Accounting*, 17 (1), pp. 161-171.
- Ginoglou, D., Agorastos, K. and Hatzigagios, T. (2002), Predicting Corporate Failure of Problematic Firms in Greece with LPM, Logit, Probit and Discriminant Analysis Models, *Journal of Financial Management and Analysis*, 15 (1), pp. 1-16.
- Gombola, M.J., Haskins, M.E., Ketz, J.E. and Williams, D.D. (1987), Cash Flow in Bankruptcy Prediction, *Financial Management*, 16 (4), pp. 55-65.
- Gritta, R.D., Wang, M., Davalos, S. and Chow, G. (2000), Forecasting Small Air Carrier Bankruptcies Using a Neural Network Approach, *Journal of Financial Management and Analysis*, 13 (1), pp. 44-50.
- Hamer, M.M. (1983), Failure Prediction: Sensitivity of Classification Accuracy to Alternative Statistical Methods and Variable Sets, *Journal of Accounting and Public Policy*, 2 (4), pp. 289-307.
- Hill, N.T. and Perry, S.E. (1996), Evaluating Firms in Financial Distress: An Event History Analysis, *Journal of Applied Business Research*, 12 (3), pp. 60-72.
- Hopwood, W., McKeown, J.C. and Mutchler, J.F. (1989), A Test of the Incremental Explanatory Power of Opinions Qualified for Consistency and Uncertainty, *Accounting Review*, 64 (1), pp. 28-48.
- Izan, H.Y. (1984), Corporate Distress in Australia, *Journal of Banking and Finance*, 8 (2), pp. 303-320.
- Johnsen, T. and Melicher, R.W. (1994), Predicting Corporate Bankruptcy and Financial Distress: Information Value Added by Multinomial Logit Models, *Journal of Economics and Business*, 46 (4), pp. 269-286.
- Jones, S. and Hensher, D.A. (2004), Predicting Firm Financial Distress: A Mixed Logit Model, *Accounting Review*, 79 (4), pp. 1011-1038.
- Karels, G.V. and Prakash, A.J. (1987), Multivariate Normality and Forecasting of Business Bankruptcy, *Journal of Business Finance and Accounting*, 14 (4), pp. 573-594.
- Keasey, K. and Watson, R. (1986), Current Cost Accounting and the Prediction of Small Company Performance, *Journal of Business Finance and Accounting*, 13 (1), pp. 51-70.

- Keasey, K. and Watson, R. (1987), Non-Financial Symptoms and the Prediction of Small Company Failure: A Test of Argenti's Hypothesis, *Journal of Business Finance and Accounting*, 14 (3), pp. 335-355.
- Ketz, J.E. (1978), The Effect of General Price-Level Adjustments on the Predictive Ability of Financial Ratios, *Journal of Accounting Research*, 16 (3), pp. 273-285.
- Kim, C.N. and McLeod Jr., R. (1999), Expert, Linear Models, and Nonlinear Models of Expert Decision Making in Bankruptcy Prediction: A Lens Model Analysis, *Journal of Management Information Systems*, 16 (1), pp. 189-207.
- Koh, H.C. (1991), Model Predictions and Auditor Assessments of Going Concern Status, *Accounting and Business Research*, 21 (84), pp. 331-338.
- Koh, H.C. and Killough, L.N. (1990), The Use of Multiple Discriminant Analysis in the Assessment of the Going-Concern Status of an Audit Client, *Journal of Business Finance and Accounting*, 17 (2), pp. 179-192.
- Kyung, S.T., Chang, N. and Lee, G. (1999), Dynamics of Modeling in Data Mining: Interpretive Approach to Bankruptcy Prediction, *Journal of Management Information Systems*, 16 (1), pp. 63-85.
- Lacher, R.C., Coats, P.K., Sharma, S.C. and Fant, L.F. (1995), A Neural Network for Classifying the Financial Health of a Firm, *European Journal of Operational Research*, 85 (1), pp. 53-65.
- Laitinen, E.K. (1991), Financial Ratios and Different Failure Processes, *Journal of Business Finance and Accounting*, 18 (5), pp. 649-673.
- Laitinen, E.K. and Laitinen, T. (2000), Bankruptcy Prediction Application of the Taylor's Expansion in Logistic Regression, *International Review of Financial Analysis*, 9 (4), pp. 327-350.
- Laitinen, T. and Kankaanpaa, M. (1999), Comparative Analysis of Failure Prediction Methods: The Finnish Case, *European Accounting Review*, 8 (1), pp. 67-92.
- Lau, A.H. (1987), A Five-State Financial Distress Prediction Model, *Journal of Accounting Research*, 25 (1), pp. 127-139.
- Lawrence, E.C. and Bear, R.M. (1986), Corporate Bankruptcy Prediction and the Impact of Leases, *Journal of Business Finance and Accounting*, 13 (4), pp. 571-585.
- Lee, K.C., Han, I. and Kwon, Y. (1996), Hybrid Neural Network Models for Bankruptcy Predictions, *Decision Support Systems*, 18 (1), pp. 63-72.
- Lenard, M.J., Madey, G.R. and Alam, P. (1998), The Design and Validation of a Hybrid Information System for the Auditor's Going Concern Decision, *Journal of Management Information Systems*, 14 (4), pp. 219-238.
- Lennox, C. (1999), Identifying Failing Companies: A Re-evaluation of the Logit, Probit and DA Approaches, *Journal of Economics and Business*, 51 (4), pp. 347-364.
- Levitan, A.S. and Knoblett, J.A. (1985), Indicators of Exceptions to the Going Concern Assumption, *Auditing*, 5 (1), pp. 26-40.
- Lin, F.Y. and McClean, S. (2001), A Data Mining Approach to the Prediction of Corporate Failure, *Knowledge-Based Systems*, 14 (3), pp. 189-195.
- Lincoln, M. (1984), An Empirical Study of the Usefulness of Accounting Ratios to Describe Levels of Insolvency Risk, *Journal of Banking and Finance*, 8 (2), pp. 321-340.
- Lo, A.W. (1986), Logit versus Discriminant Analysis: A Specification Test and Application to Corporate Bankruptcies, *Journal of Econometrics*, 31 (2), pp. 151-178.

- McGurr, P.T. and Devaney, S.A. (1998), A Retail Failure Prediction Model, *International Review of Retail*, 8 (3), pp. 259-277.
- Micha, B. (1984), Analysis of Business Failures in France, *Journal of Banking and Finance*, 8 (2), pp. 281-291.
- Neophytou, E. and Molinero, C.M. (2004), Predicting Corporate Failure in the UK: A Multidimensional Scaling Approach, *Journal of Business Finance and Accounting*, 31 (5), pp. 677-710.
- Norton, C.L. and Smith, R.E. (1979), A Comparison of General Price-Level and Historical Cost Financial Statements in the Prediction of Bankruptcy, *Accounting Review*, 54 (1), pp. 78-94.
- Ohlson, J.A. (1980), Financial Ratios and the Probabilistic Prediction of Bankruptcy, *Journal of Accounting Research*, 18 (1), pp. 109-138.
- Peel, M.J. and Peel, D.A. (1987), Some Further Empirical Evidence on Predicting Private Company Failure, *Accounting and Business Research*, 18 (69), pp. 57-66.
- Platt, H.D., Platt, M.B. and Pedersen, J.G. (1994), Bankruptcy Discrimination with Real Variables, *Journal of Business Finance and Accounting*, 21 (4), pp. 491-515.
- Poston, K.M. and Harmon, W.K. (1994), A Test of Financial Ratios as Predictors of Turnaround versus Failure Among Financially Distressed Firms, *Journal of Applied Business Research*, 10 (1), pp. 41-57.
- Richardson, F.M., Kane, G.D. and Lobinger, P. (1998), The Impact of Recession on the Prediction of Corporate Failure, *Journal of Business Finance and Accounting*, 25 (1/2), pp. 167-186.
- Sharma, S. and Mahajan, V. (1980), Early Warning Indicators of Business Failure, *Journal of Marketing*, 44 (4), pp. 80-89.
- Sheppard, J.P. and Fraser, S. (1994), The Dilemma of Matched Pairs and Diversified Firms in Bankruptcy Prediction Models, *Mid-Atlantic Journal of Business*, 30 (1), pp. 9-26.
- Skogsvik, K. (1990), Current Cost Accounting Ratios as Predictors of Business Failure: The Swedish Case, *Journal of Business Finance and Accounting*, 17 (1), pp. 137-160.
- Taffler, R. (1982), Forecasting Company Failure in the UK Using Discriminant Analysis and Financial Ratio Data, *Journal of the Royal Statistical Society*, 145 (3), pp. 342-358.
- Taffler, R. (1983), The Assessment of Company Solvency and Performance Using a Statistical Model, *Accounting and Business Research*, 13 (52), p. 295.
- Takahashi, K. and Kurokawa, Y. (1984), Corporate Bankruptcy Prediction in Japan, *Journal of Banking and Finance*, 8 (2), pp. 229-247.
- Walker, M.C., Stowe, J.D. and Moriarity, S. (1979), Decomposition Analysis of Financial Statements, *Journal of Business Finance and Accounting*, 6 (2), pp. 173-187.
- Ward, T.J. (1994), Cash Flow Information and the Prediction of Financially Distressed Mining, Oil and Gas Firms: A Comparative Study, *Journal of Applied Business Research*, 10 (3), pp. 78-86.
- Wilson, N., Chong, K.S. and Peel, M.J. (1995), Neural Network Simulation and the Prediction of Corporate Outcomes: Some Empirical Findings, *International Journal of the Economics of Business*, 2 (1), pp. 31-51.
- Wilson, R.L. and Sharda, R. (1994), Bankruptcy Prediction Using Neural Networks, *Decision Support Systems*, 11 (5), pp. 545-557.
- Zapranis, A. and Ginoglou, D. (2000), Forecasting Corporate Failure with Neural Network Approach: The Greek Case,

Journal of Financial Management and Analysis, 13 (2), pp. 11-21.

Zavgren, C.V. (1985), Assessing the Vulnerability to Failure of American Industrial Firms: A Logistic Analysis, *Journal of Business Finance and Accounting*, 12 (1), pp. 19-45.

Zmijewski, M.E. (1984), Methodological Issues Related to the Estimation of Financial Distress Prediction Models, *Journal of Accounting Research*, 22, pp. 59-82.

