

University of Wollongong - Research Online

Thesis Collection

Title: An empirical analysis of financially distressed Australian companies: the application of survival analysis

Author: Nongnit Chancharat

Year: 2008

Repository DOI:

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Research Online is the open access repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

2008

An empirical analysis of financially distressed Australian companies: the application of survival analysis

Nongnit Chancharat
University of Wollongong

Follow this and additional works at: <https://ro.uow.edu.au/theses>

University of Wollongong

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Recommended Citation

Chancharat, Nongnit, An empirical analysis of financially distressed Australian companies: the application of survival analysis, PhD thesis, School of Accounting and Finance, University of Wollongong, 2008.
<http://ro.uow.edu.au/theses/401>

NOTE

This online version of the thesis may have different page formatting and pagination from the paper copy held in the University of Wollongong Library.

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

**AN EMPIRICAL ANALYSIS OF FINANCIALLY DISTRESSED AUSTRALIAN
COMPANIES: THE APPLICATION OF SURVIVAL ANALYSIS**

A thesis submitted in fulfilment of the requirements for the
award of the degree of

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

NONGNIT CHANCHARAT

B.B.A. (Finance) First Class Honours, Khon Kaen University, Thailand
M.S. (Applied Statistics), National Institute of Development Administration, Thailand

SCHOOL OF ACCOUNTING AND FINANCE

2008

CERTIFICATION

I, Nongnit Chancharat, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Accounting and Finance, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Nongnit Chancharat

26 September 2008

To my dear parents, my husband and my son

TABLE OF CONTENTS

	Page
CERTIFICATION	ii
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
ABSTRACT	xi
ACKNOWLEDGMENTS	xiii
CHAPTER 1: INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Statement of the problem and motivation of the study	1
1.3 Definition of financial distress	4
1.4 Background of financial distress prediction model.....	9
1.5 Research objectives.....	13
1.6 Research questions	16
1.7 Contribution of the study	20
1.8 Organization of the study	23
CHAPTER 2: CLASSIFICATION OF FINANCIAL DISTRESS PREDICTION	
MODELS	26
2.1 Introduction.....	26
2.2 Classical statistical financial distress prediction models	27
2.2.1 Univariate analysis.....	27
2.2.2 Multivariate discriminant analysis	29
2.2.3 Conditional probability models.....	33
2.3 Alternative statistical financial distress prediction models.....	37
2.3.1 Decision trees	37
2.3.2 Artificial neural networks	39
2.3.3 Survival analysis	44
2.4 Conclusion	53
CHAPTER 3: FINANCIAL DISTRESS PREDICTORS.....	56
3.1 Introduction.....	56
3.2 Categories of financial distress predictors	56
3.3 Financial data	56

3.3.1 Financial ratios	57
3.3.2 Non-ratio financial data	72
3.4 Non-financial data	75
3.4.1 Corporate governance attributes	76
3.4.2 Company-specific variables	86
3.4.3 Macroeconomic variables	92
3.5 Conclusion	94
CHAPTER 4: EXAMINING FINANCIALLY DISTRESSED COMPANIES: THE COX PROPORTIONAL HAZARDS MODEL	96
4.1 Introduction	96
4.2 Literature review	99
4.2.1 Survival analysis application	99
4.2.2 Financial distress predictors	101
4.3 Hypotheses development	103
4.3.1 Financial ratios	103
4.3.2 Market-based variable	106
4.3.3 Company-specific variables	107
4.4 Survival analysis technique	111
4.5 Data and sample	115
4.6 Empirical results	120
4.6.1 Descriptive statistics	120
4.6.2 Correlation coefficients	122
4.6.3 Cox proportional hazards model estimation results	125
4.6.4 Corporate survival probability evaluation	128
4.7 Conclusion	133
CHAPTER 5: MULTIPLE STATES OF FINANCIALLY DISTRESSED COMPANIES: THE COMPETING RISKS MODEL	135
5.1 Introduction	135
5.2 Literature review	139
5.2.1 Multiple states of financial distress	139
5.2.2 Competing risks model application	142
5.3 Hypotheses development	145
5.4 Competing risks model	146
5.5 Data and sample	148

5.6 Empirical results.....	150
5.6.1 Descriptive statistics	150
5.6.2 Correlation coefficients.....	152
5.6.3 The model estimation results	155
5.6.4 Corporate survival probability evaluation.....	163
5.7 Conclusion	165
CHAPTER 6: CORPORATE GOVERNANCE MECHANISMS AND NEW ECONOMY AUSTRALIAN IPO COMPANIES' SURVIVAL	167
6.1 Introduction.....	167
6.2 Literature review	170
6.3 Hypotheses development	174
6.3.1 Corporate governance attributes	174
6.3.2 Offering characteristics	184
6.3.3 Financial ratios	187
6.3.4 Company-specific variables	189
6.4 Methodology	192
6.5 Data and sample	194
6.6 Empirical results.....	196
6.6.1 Descriptive statistics	196
6.6.2 Correlation coefficients.....	198
6.6.3 Cox proportional hazards model estimation results	202
6.6.4 IPO companies' survival probability evaluation.....	206
6.7 Conclusion	211
CHAPTER 7: SUMMARY AND CONCLUSION.....	213
7.1 Introduction.....	213
7.2 Summary and discussion.....	213
7.3 Policy implications.....	223
7.4 Limitations of the study	225
7.5 Suggestions for future research.....	227
7.6 Conclusion	229
BIBLIOGRAPHY	232
LIST OF CANDIDATE'S PUBLICATIONS.....	252
APPENDIX A: INSOLVENCY ARRANGEMENT IN AUSTRALIA.....	253
APPENDIX B: THE EMPIRICAL RESULTS BEFORE TRUNCATION	259

LIST OF TABLES

	Page
Table 1.1: Definitions of financial failure in previous Australian studies	7
Table 3.1: Financial ratios used in this study and its popularity in previous literature...	67
Table 4.1: The variables used in the study	119
Table 4.2: Descriptive statistics of the data	123
Table 4.3: Pearson correlation coefficients	124
Table 4.4: Cox proportional hazards model estimation	125
Table 4.5: Summary of estimated effects of variables on financial distress	128
Table 4.6: Linear predictors of companies by company status	131
Table 4.7: Survival probabilities of companies by company status	132
Table 5.1: Descriptive statistics of the data	153
Table 5.2: Pearson correlation coefficients	154
Table 5.3: Single and competing risks Cox proportional hazards model estimation....	162
Table 5.4: Survival probabilities of companies by company status	164
Table 6.1: The variables used in the study	191
Table 6.2: New economy IPO companies stratified by GICS industry sector	195
Table 6.3: New economy IPO companies stratified by company status	196
Table 6.4: Descriptive statistics of the data	200
Table 6.5: Pearson correlation coefficients	201
Table 6.6: Cox proportional hazards model estimation	203
Table 6.7: Summary of estimated effects of variables on financial distress	205
Table 6.8: Survival probabilities of companies by company status	209
Table 6.9: Survival probabilities within calendar year by company status	210
Table B.1: Descriptive statistics of the data before truncation (Chapter 4)	259
Table B.2: Cox proportional hazards model estimation before truncation (Chapter 4)	259
Table B.3: Descriptive statistics of the data before truncation (Chapter 5)	260
Table B.4: Single and competing risks Cox proportional hazards model estimation before truncation (Chapter 5)	261
Table B.5: Descriptive statistics of the data before truncation (Chapter 6)	262
Table B.6: Cox proportional hazards model estimation before truncation (Chapter 6)	263

LIST OF FIGURES

	Page
Figure 4.1: Graph of linear predictor and time by company status.....	131
Figure 4.2: Graph of survival function and time by company status	132
Figure 5.1: Graph of survival function and survival time by financial distress states ..	164
Figure 6.1: Graph of survival function and survival time by company status	209
Figure 6.2: Graph of survival function and calendar year by company status.....	210
Figure A.1: The corporations law in Australia.....	253

LIST OF ABBREVIATIONS

AFT	Accelerated Failure Time Model
AGE	Age of Company
ANN	Artificial Neural Network
ASIC	Australian Securities and Investments Commission
ASX	Australian Stock Exchange
BACK	Underwriter Backing
BD_INDP	Percentage of Independent Directors
BD_SIZE	Board Size
BE/ME	Book to Market Equity Ratio
BIG5	Auditor Reputation
CEO	Chief Executive Officer
CM_DUAL	Dual Leadership Structure
CM_NEXC	Non-Executive Chairman
CPT	Capital Turnover
CUR	Current Ratio
C_SIZE	Size of IPO Company
DET	Debt Ratio
EBIT	Earnings Before Interest and Taxes
EBT	EBIT Margin
EXR	Excess Returns
GICS	Global Industry Classification Standard
GNP	Gross National Product
IIA	Independent of Irrelevant Alternatives Assumption
IID	Independent and Identically Distributed Assumption

IPOs	Initial Public Offerings
IPO_9900	A Company that Issued Stock Between 1999 and April 2000
ITSA	Insolvency and Trustee Service Australia
MDA	Multivariate Discriminant Analysis
MSCI	Morgan Stanley Capital International
NUM_RISK	Number of Risk Factors in the Prospectus
OF_AGE	Offering Age
OF_PRICE	Offering Price
OF_SIZE	Offering Size
QUK	Quick Ratio
RETAIN	Retained Ownership
ROA	Return on Assets
ROE	Return on Equity
RPA	Recursive Partitioning Analysis
SIZE	Size of Company
SIZE2	Squared Size of Company
TAT	Total Assets Turnover
TOP20	Top 20 Shareholders
WCA	Working Capital to Total Assets Ratio

ABSTRACT

This thesis provides an empirical analysis of financially distressed companies in the Australian context using survival analysis techniques. Three main assays are developed and presented in the thesis.

The first assay explores the effect of financial ratios and other variables on corporate financial distress and identifies the probability of corporate survival in a given time frame. The four main categories of financial ratios are profitability, liquidity, leverage and activity ratios and control variables which are a market-based variable and company-specific variables; for example, company age, company size and squared size are employed in the analysis. The Cox proportional hazards model was estimated using time-varying variables based on a sample of 1,117 publicly listed Australian companies over the period 1989 to 2005. Empirical results found that financially distressed companies have higher leverage measured by debt ratio, lower past excess returns and larger size compared to active companies.

Researchers argue that a company may exit the market in several different ways, such as through merger, acquisition, voluntary liquidation and bankruptcy and each type of exit is likely to be affected by different factors. Consequently, the second assay investigates the determinants of multiple states of financial distress by applying a competing risks Cox proportional hazards model. The unordered three-state financial distress model is defined as follows: state 0: active companies, state 1: distressed external administration companies and state 2: distressed takeover, merger or acquisition companies. The effect of financial ratios, market-based variable and company-specific variables including company age, company size and squared size on three different states of corporate financial distress are investigated based on a sample of 1,081 publicly listed Australian companies over the period 1989 to 2005.

The results indicate that it is important to distinguish between the different financial distress states. Additionally, the results suggest that distressed external administration companies have higher leverage, lower past excess returns and a larger size while distressed takeover, merger or acquisition companies have lower leverage, higher capital utilization efficiency and a bigger size compared to active companies.

In addition to examining financial ratios as the main variables, this thesis further explores the effect of corporate governance attributes on IPO companies' survival focusing on a particular sector. Accordingly, the third essay examines the influence of corporate governance mechanisms on the survival of 127 new economy IPO companies listed on the ASX between 1994 and 2002. In addition to the three main categories of corporate governance attributes include board size, board independence and ownership concentration; control variables, for example, offering characteristics, financial ratios and company-specific variables, are also included in the model.

The Cox proportional hazards model estimation results found ownership concentration significantly negative related to the survival of new economy IPO companies. For offering characteristics variables, the offering size and the underwriter backing are a significant variable in explaining IPO companies' survival; however, the estimated signs are in contrast to the expectations. Specifically, those IPO companies with a larger offering size are less likely to survive than are those that offer a smaller size. Furthermore, the results found that the hazard of financial distress for companies with an offer that is underwritten is greater than the hazard for those for which the offer is not underwritten. For financial ratios, the results indicate that the debt ratio is statistically significant in explaining IPO firms' survival. In particular, IPO companies with a low total debts to total assets ratio are less likely to fail.

ACKNOWLEDGMENTS

I would like to express my gratitude to my supervisors. I am deeply indebted to my principle supervisor, Associate Professor Gary Tian, for his thoughtful guidance, invaluable expertise, intellectual support and encouragement throughout the period of my study, which made this thesis possible. I am also indebted to my co-supervisors, Associate Professor Michael McCrae and Dr. Pam Davy, who have provided me with invaluable suggestions, comments and constructive discussion during the period of this study. I assume, of course, full responsibility for any remaining errors.

I am also grateful to Professor Andrew Worthington, Department of Accounting, Finance and Economics, Griffith University for his suggestions, advice and support during an early stage of the study.

I have had the privilege of co-authoring three of the included essays in this thesis. Besides my supervisors, my third and first joint essays were also co-authored with Associate Professor Chandrasekhar Krishnamurti, Business School, Auckland University of Technology, New Zealand and Dr. Pingzhou Liu, School of Dentistry, University of Adelaide, respectively. They have contributed with invaluable suggestions and comments that have significantly improved my work.

In addition, I am greatly indebted to the Royal Thai government, which granted me financial support to cover the tuition fees and living costs during this period of study. I would also like to express my appreciation to the Faculty of Management Sciences, Khon Kaen University, Thailand for giving me the opportunity for this study. I am grateful to the School of Accounting and Finance and the School of Mathematics and Applied Statistics, University of Wollongong for the financial support for some of the data purchasing from the Australian Securities and Investments Commission.

I would like to express my sincere thanks to Ms. Vilaiwan Thiangtong and Mr. Suthin Wianwiwat who provided me with assistance in some of the data collection. I also would like to thank to Johanna Roberts for her editorial comments.

I remain grateful to all members of the Faculty of Commerce for their support and encouragement. I am thankful to the university's library staff, who have kindly provided me with all the materials that I required for this study.

Thanks to all my friends at the Faculty of Commerce, especially Latifah Othman, Linda Lindawati, Steive Tulig, and Bubaker F. Shareia for their great friendship and encouragement during my Ph.D. journey.

My special thanks to Ms. Koolchalee Chongcharoen who has been always kinds and has given me a great sense of caring. Without her support, I might not have been strong enough to reach this stage. I have learnt the true meaning of 'giving' from her. Also, thank you to the other people I have met along the way for their great friendship throughout my journey at Wollongong.

I am very grateful to my parents who have always loved, supported and been there for me. Thank you also to my parents-in-law for their kindness and understanding and for taking care of my son for me when I have had to be away from him during the final stage of my thesis.

Finally, I would like to express my sincere thanks to my dear husband, Mr. Surachai Chancharat, who has always been patient and caring, giving me all the strength I have needed, and for being such a good dad to our son. Special thanks to my dear son, TonNam, Master Nathan Chancharat. He deserve my thanks for his patience towards his 'absent mother' when he was just seven months old. He has been a real inspiration for me to keep going and never give up with my thesis. I love you, son.