Managing Financial Performance Via Financial Stress Models

Professor Thomas E. McKee
Ph.D., CPA, CMA, CIA
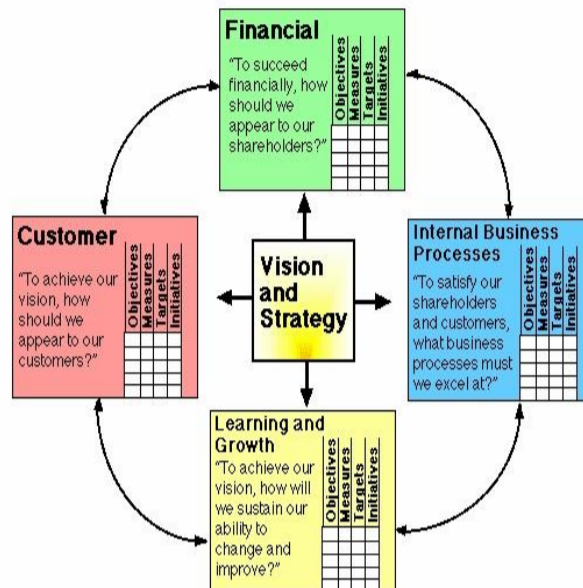
Don Trow Visiting Fellow In
Accounting Research

"Balanced Scorecard"

○ Strategic management approach from 1990's by Kaplan and Norton

○ Management system to enable organizations to clarify vision and strategy in order to put into action:

- Develop metrics
- Collect data
- Analyze data

○ Four perspectives utilized

Balanced Scorecard Perspectives

"Take A Swim"   vs. "Get My Toes Wet"

○ "Balanced Scorecard" involves taking a swim with lots of :
- **TIME and RESOURCES!**

○ Is It Possible To Start In A Small, Manageable, Less Risky Way?

- Yes, you can get your toes wet with→ **Financial Stress Model Analysis**

Information Competition

- Users have multiple information channels

  - Financial statements

  - Analyst forecasts

  - Financial news about economy, industry

  - Friends/Internet chat groups

  - Direct observations

- Value of Financial Statements?

Financial Stress Models & Information Theory

- **Information Theory** view of the financial statements:

  - Purpose of financial statements is to provide information signals which facilitate economic activity

Possible Financial Statement Signals

- ○ **Current Operating Risk**
  - Short-term Liquidity

- ○ **Capital Growth Capacity**
  - Asset Financing Structure

- ○ **Earnings Quality**
  - Persistence [sustainability]
  - Variability

How Can We Determine Value of Financial Statements?

- ○ One way to measure value is to examine various financial statement components' linkage with stock price changes

  - Stock prices theoretically impound [reflect] information from all information channels

- ○ If the stock prices change as financial components change, then we presume someone is reading the financial statements.

Net Income Changes and Stock Prices

○ Studies have repeatedly linked accounting net income to stock prices:

- Ball & Brown 1968
  ○ EPS sign change = 16.8% price changes over 1957-1965 period

- Nichols & Wahlen, 2004
  ○ EPS sign change = 35.6% price changes over 1988-2001 period

Earnings Persistence & Stock Returns

○ Uninterrupted positive net income returns are associated with higher stock prices

- Nichols & Wahlen, 2004
  ○ When earnings increase "high persistence" firms experience abnormal returns of 25.3% as compared to 13.6% for "low persistence" firms

What Is A "Financial Stress" Model?

○ Model which uses various metrics to assess the degree to which an organization is under financial pressures which may lead to :

- Bankruptcy
- Reorganization
- Merger

External Auditor Role

○ Auditors are required to issue a modified opinion if it appears a company has a significant probability of going into bankruptcy during the year following the financial statement date.

- Modified opinion if NOT a "Going Concern"

Auditor Going-Concern Opinion Outcomes

○ **Nogler, 1995** Tracked 157 firms which had received going-concern opinions from their external auditors between 1983 and 1991

○ Results

- 33% filed bankruptcy
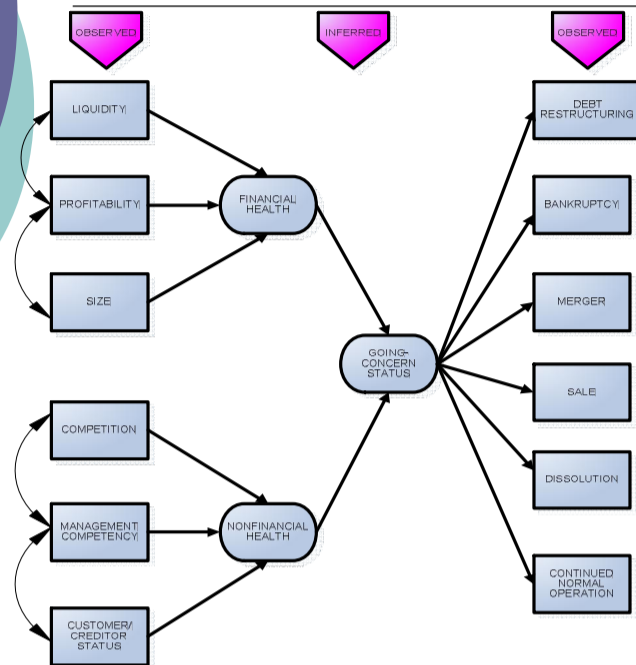
- 32% had dissolution, liquidation, or merger

- 35% subsequently received an unqualified opinion

What Information Is Portrayed By Financial Distress Models ?

○ Financial stress models typically measure various financial dimensions

○ Non-financial dimensions are typically NOT DIRECTLY included in model variables

Hypothesized Going Concern Model

Selected Financial Stress Models

- **Multiple discriminant analysis**
  - 1968 Altman 95% accurate on 66 company sample

- **Logistic regression**
  - 1990 Bell, Ribar, Vericho 90% with .1 cutoff

- **Recursive partitioning**
  - 1996 McKee 92% on 202 company sample

- **Genetic programming**
  - 2002 McKee-Lensburg 80% accurate on 291 U.S. public company sample

1968 Altman Model Variables

Variable	Financial Ratio	Economic Characteristic
X_1	Working Capital/Total Assets	Liquidity
X_2	Retained Earnings/ Total Assets	Age of Firm
X_3	Earnings Before Interest Taxes/ Total Assets	Asset Productivity
X_4	Market Value of Equity/ Book Value of Total Debt	Insolvency Risk
X_5	Sales/ Total Assets	Management's Capability In Dealing With Competition

1968 Altman Model

○ Z is the bankruptcy score and is a linear combination of the five variables

○ **Z =**
- **.1.2 X_1 +**
- **.1.4 X_2 +**
- **3.3 X_3 +**
- **0.6 X_4 +**
- **.999 X_5**

○ Interpreting Z score:

- Z > 2.99 = Non-bankrupt

- Z < 1.81 = Bankrupt

- 2.99 > Z < 1.81 = Zone of Ignorance

- Note: Mnemonic is ZSCORE in Standard & Poor's Compustat

Z Score Linkage To Bond Ratings

Exhibit 2: Average Z-Scores by S&P Bond Rating, 1995 – 1999

	Average Annual Number of Firms	Average Z-Score	Standard Deviation
AAA	11	5.02	1.50
AA	46	4.30	1.81
A	131	3.60	2.26
BBB	107	2.78	1.50
BB	50	2.45	1.62
B	80	1.67	1.22
CCC	10	0.95	1.10

Source: Compustat Data Tapes, 1995-1999.

Source: Altman, Quantitative Techniques For The Assessment of Credit Risk

---

Progressive Decline Symptoms

SYMPTOMS OF DECLINE

STAGE 5 DISSOLUTION	STAGE 4 CRISIS	STAGE 3 FAULTY ACTION	STAGE 2 INACTION	STAGE 1 BLINDED

Subtle changes

Initial profit decline

Occasional Losses
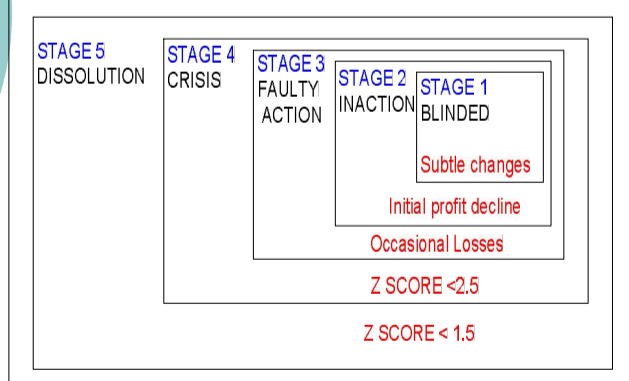
Z SCORE <2.5

Z SCORE < 1.5

Source: Castrogiovanni et.al. Curing Sick Businesses: Changing CEOs in Turnaround Efforts

GTI Turnaround Strategies

○ Z-score was 0.38 in May 1975 when turnaround started

○ Z-score identified basic problem as underutilized assets

○ Turnaround activities:
  • Sale of excess inventory
  • Collection efforts accelerated
  • Staff reduced
  • Capital improvements frozen
  • Sale of product line to raise cash to reduce debt

○ Z-score was 7 in 1979

21

## GTI Financial Turnaround Using Altman Z Score

EXHIBIT 2
GTI's 1972-1979 Z-Score Curve With Annual EPS Notations
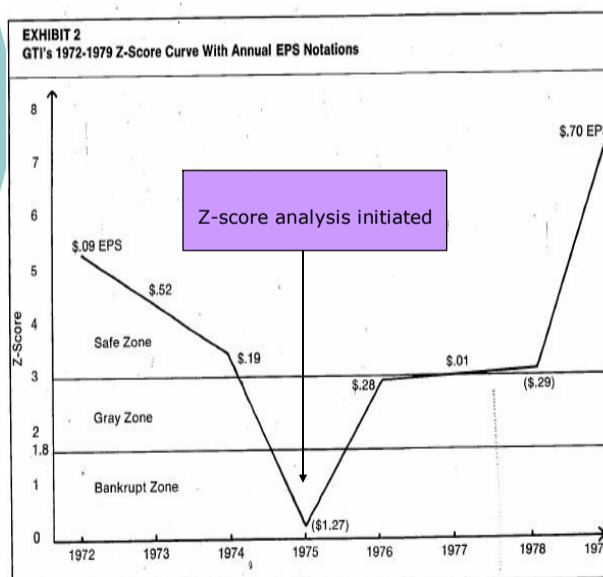
Source: Altman & La Fleur, Managing A Return To Financial Health

22

2002 McKee-Lensberg Model Variables

Variable	Financial Ratio	Economic Characteristic
V_0	Total Assets	Size
V_1	Net Income/ Total Assets	Asset Productivity
V_2	Cash/Current Liabilities	Liquidity

M-L Bankruptcy Probability For Two Airlines
[Delta filed for bankruptcy 9/15/05]

Airline Bankruptcy Probability
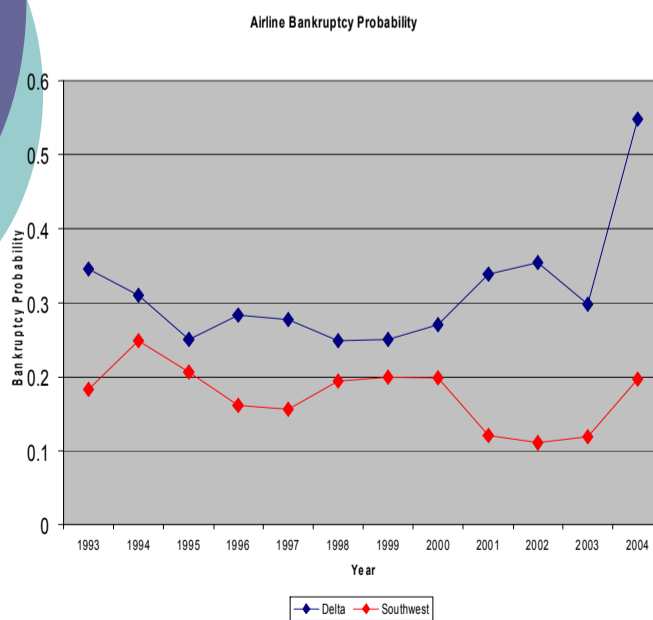
McKee-Lensburg Genetic Programming Model

$$(V_0, V_1, V_3) = \frac{X^2}{X^2 + Y^2} \qquad \varepsilon[\,0,1\,],$$
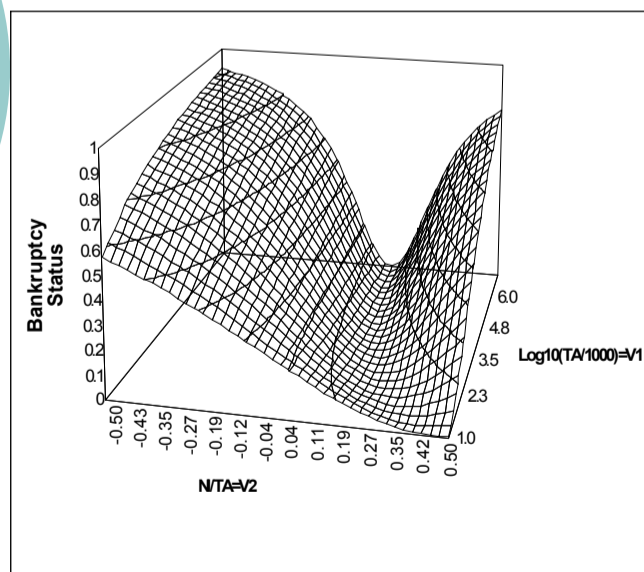
where
$$X = ((V_0 + .85) * V_1) - .85$$
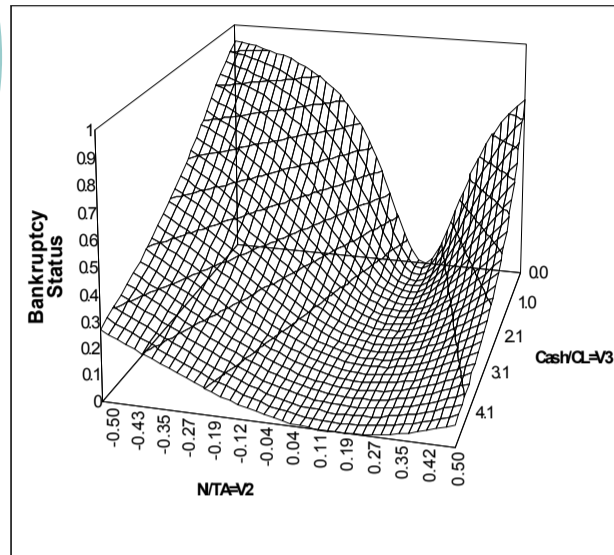$$Y = (1 + V_3)$$

And
$$V_0 = Log_{10}(Total\ Assets/1000)$$
$$V_1 = Net\ Income\ /\ Total\ Assets$$
$$V_3 = Cash\ /\ Current\ Liabilities$$

M-L Bankruptcy Probability As Function of V_1 and V_2 When V_3 Held Constant

M-L Bankruptcy Probability As Function of V_2 and V_3 When V_1 Held Constant

Altman Bankruptcy Model And IBM

Company Name	IBM [amounts in $ millions]	
Fiscal Year	31-Dec-04	
Inputs	Account	Amount
	Current Assets	46970
	Current Liabilities	39798
	Total Assets	109183
	Retained Earnings	44525
	Sales	96293
	Earnings Before Interest, Taxes	12028
	Total Liabilities	79436
	Market Value of Equity	160149
Output	Computed Z Score	3.10
[Note: Z > 2.99 = Nonbankrupt, Z<1.81 = Bankrupt]		

McKee-Lensburg Bankruptcy Model and IBM

Company Name	IBM [amounts in $ millions]	
Fiscal Year	"December 31, 2004	
Inputs	Account	Amount
	Cash	1240
	Total Assets	81091
	Current Liabilities	1771
	Net Income	3021
Output	Computed Bankruptcy Probability	0.162

http://business.etsu.edu/mckee/audit_models.htm
User "business.etsu.edu/" , Password "estimate"

Two Distress Models and IBM Stock Price

IBM Financial Turnaround
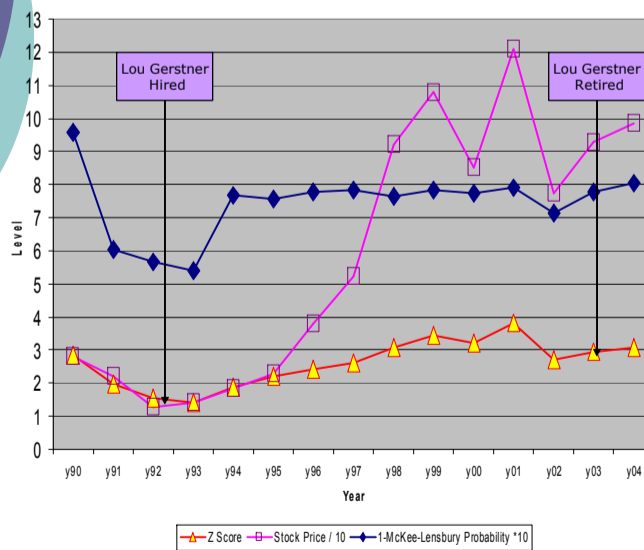
Summary

○ Financial stress impacts stock prices

○ Quantitative financial stress models are highly correlated with financial health and, therefore, stock prices

○ A "Quick and Dirty" way to manage financial performance is by "reverse engineering" financial stress models

○ Various companies have successfully implemented analysis of financial stress models as way of gaining insights into needed changes

31

Take-Away

○ If you want to try this approach:

1. Download this presentation from the VU website

2. Find the slide containing the model you want

3. Double click on the model to activate the Excel spreadsheet

4. Enter your company's data

5. Play "What If" by changing selected data

6. Brainstorm on operational decisions that will transform business in desired direction

32

Selected References

○ Altman, E.I.   1968. "Financial Ratios, Discriminant Analysis and The Prediction of Corporate Bankruptcy." *Journal of Finance.*Vol. XXIII, No. 4 : 589-609.

○ Altman, E.I. 2003. "Quantitative Techniques For The Assessement of Credit Risk." *AFP Exchange.* March-April: 6-12.

○ Altman, E.I. and J.K. La Fleur. 1981 "Managing A Return To Financial Health." *Journal of Business Strategy*. Summer : 31-38.

○ Castrogiovanni, G.J. , B.R. Baliga, and R.E. Kidwell, Jr. 1992. "Curing Sick Businesses: Changing CEOs In Turnaround Efforts." *The Executive.* August : 26-41.

○ McKee, T.E. 2005. ***Earnings Management: An Executive Perspective***. Thomson/Southwestern (Mason, Ohio).ISBN: 0-324-22323-0.

○ McKee, T.E. and T. Lensberg. 2002. "Genetic Programming and Rough Sets: A Hybrid Approach To Bankruptcy Classification." *European Journal of Operational Research.* 138 : 436-451.

○ Nichols, D.C. and J.M. Wahlen. 2004. "How Do Earnings Numbers Relate To Stock Returns? A Review of Classic Accounting Research With Updated Evidence." *Accounting Horizons*. Vol 18, No. 4 : 263-286.