

Operating Differences of Firms Led by Men and Women



BUDT 733

December 6th, 2003

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Agenda

- The Research Question
- Presentation of Data
- Analysis
- Explanation & Interpretation
- Recommendations & Implications
- Summary



The Research Question

- Is there a difference between the operation of firms in which men and women are Executives?
- What differences exist between the men and women leading these firms?



Data – Background Info

- Provided by M&A Professor Cichello
Gathered as part of his research
- Initially 100+ variables and 20K+ rows
of data
- Response – Gender; categorical data
- Predictors – firm information, executive
information; both continuous and
categorical, etc...



Data – A Quick Look

Year	NAME	Company Name				EXCHANGE	SIC	GENDER
2002	James Wang	EXPEDITORS INTL WASH INC				NAS	4731	MALE
2002	John Kelliher	STRIDE RITE CORP				NYS	3140	MALE
2002	Christopher Wing	HEALTH NET INC - CLA				NYS	6324	MALE
ANNDIRRET	ASSETS	DIVYIELD	COMMEQ	EMPL	EPSIN	MKTVAL	NI	
10	879.948	0.368	523.812	8	1.08	3398.049	112.529	
40	334.799	2.381	253.041	2.3	0.58	336.857	24.117	
30	3466.677	0	1309.049	9.4	1.84	3268.69	228.626	
OIBD	ROA	ROEAVG	ROEPER	SALES	SEQ	Liab	D-E	
198.184	12.788	23.982	21.483	2296.903	523.812	2874.237	5.487153788	
50.024	7.203	9.361	9.531	532.4	253.041	83.816	0.331234859	
523.89	6.853	19.201	18.148	10201.543	1309.049	1959.641	1.496995911	



Data – Issues

- Original data set is far too large in both sample size and number of variables
- Data set is predominantly male dominated
- Intensive data preparation required in order to conduct meaningful analysis



Data – Preparation

- 1) Qualitatively reduced data to 32 variables based on our research objective
 - Included data for 2002 only, reducing data to 15K samples



Data – Preparation

- 2) Data Reduction – reduced data set to 1600 observation, with and even proportion of male and female samples

- 3) Data Reduction – eliminated variables based on high correlation
 - Picked 0.8 as correlation threshold



Data – Preparation

Table of correlations

	ANNDIRRET	ASSETS	DIVYIELD	COMMEQ	EMPL	EPSIN	MKTVAL	NI	OIBD	ROA	ROEAVG	ROEPER	SALES	SEQ	Liab	D-E
ANNDIRRET	1.00															
ASSETS	0.25	1.00														
DIVYIELD	0.15	0.13	1.00													
COMMEQ	0.34	0.66	0.11	1.00												
EMPL	0.33	0.24	0.05	0.40	1.00											
EPSIN	0.09	0.09	-0.09	0.02	-0.01	1.00										
MKTVAL	0.37	0.54	0.08	0.80	0.38	0.09	1.00									
NI	0.09	0.16	0.04	-0.01	0.03	0.34	0.18	1.00								
OIBD	0.34	0.81	0.13	0.71	0.40	0.08	0.74	0.12	1.00							
ROA	0.15	0.00	0.02	0.02	0.05	0.35	0.07	0.17	0.05	1.00						
ROEAVG	0.14	0.03	0.04	0.04	0.06	0.33	0.09	0.15	0.09	0.57	1.00					
ROEPER	0.18	0.03	0.05	0.04	0.06	0.38	0.09	0.11	0.08	0.67	0.82	1.00				
SALES	0.41	0.51	0.13	0.70	0.62	-0.01	0.71	0.06	0.75	0.04	0.05	0.05	1.00			
SEQ	0.35	0.67	0.11	1.00	0.40	0.02	0.80	-0.01	0.71	0.01	0.04	0.04	0.70	1.00		
Liab	0.32	0.38	0.05	0.55	0.31	0.11	0.94	0.25	0.63	0.09	0.11	0.10	0.59	0.55	1.00	
D-E	-0.03	0.01	0.00	0.03	0.02	0.01	0.04	0.01	0.02	0.01	0.12	0.32	0.02	0.03	0.04	1.00



Data Summary information

Data Name	Description	Data Type
GENDER	Gender of the executive in question	Categorical
ANNDIRRET	Annual cash retained paid to each director	Continuous
ASSETS	Total Assets reported by the firm	Continuous
DIVYIELD	dividends per share, divide by close price x 100	Continuous
COMMEQ	Sum of Comm stock, Cap. Surplus, RE, Treas. Stock options	Continuous
EMPL	Total number of employees in the firm	Continuous
EPSIN	EPS including extrod. items & discount. Ops.	Continuous
MKTVAL	mkt value; FY close price / shares outstanding	Continuous
NI	Net Income after extrod. items & discount. Ops	Continuous
ROA	NI / total assets x 100	Continuous
ROEAVG	NI / current and previous yrs avg total common equity x 100	Continuous
SALES	Net Annual Sales	Continuous
D-E	Debt-to-Equity; mkt val - total equity	Continuous



Data Summary information

- Quantification of Gender Based Discrepancy:

	GENDER ▾		
Data ▾	FEMALE	MALE	Grand Total
Average of ANNDIRRET	22.9	24.5	23.7
Average of ASSETS	14033.0	15216.7	14624.8
Average of DIVYIELD	1.2	1.5	1.3
Average of COMMEQ	2126.9	2732.3	2429.6
Average of EMPL	21.6	22.0	21.8
Average of EPSIN	0.7	0.5	0.6
Average of MKTVAL	5063.5	6149.8	5606.6
Average of NI	-4.4	121.4	58.5
Average of ROA	1.9	0.5	1.2
Average of ROEAVG	8.6	3.6	6.1
Average of SALES	4580.4	5324.3	4952.3
Average of D-E	0.1	0.7	0.4



Analysis - Goal

- Analytic goal – to explain the differences between the ways firms are run between male and female executives
- Our initial assertion is that the differences found in the table of male female averages, are what drives the differences between



Analysis – Modeling Process

- Table of averages between men and women hint at which predictors differentiate male and female operations styles.
- Utilize Logistics and Discriminant models to verify that these

Analysis – Logistic Regression Modeling

Class	Prob.
MALE	0.5
FEMALE	0.5

<-- Success Class

The Regression Model

Input variables	Coefficient	Std. Error	p-value	Odds
Constant term	-0.00030984	0.05015172	0.99507064	*
NI	0.09339706	0.08754566	0.28604487	1.09789753
ROA	-0.01471771	0.06544327	0.82206285	0.98539007
ROEAVG	-0.13013919	0.07134124	0.06812502	0.8779732
D-E	0.06528015	0.05307945	0.21875054	1.06745803

Residual df	1595
Std. Dev. Estimate	2209.796875
% Success in training data	50
# Iterations used	7
Multiple R-squared	0.00373031

Classification Confusion Matrix		
	Predicted Class	
Actual Class	MALE	FEMALE
MALE	321	479
FEMALE	273	527

Error Report			
Class	# Cases	# Errors	% Error
MALE	800	479	59.88
FEMALE	800	273	34.13
Overall	1600	752	47.00

Analysis – Logistic Regression Modeling Cont'

- LR based on selected variables yielded poor results
- Attempted exhaustive best subset search to see if model performs better.
- No improvement in model

Training Data scoring - Summary Report

Cut off Prob.Val. for Success (Updatable)	0.5	(Updating the value here will NOT update value in detailed report)
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Classification Confusion Matrix		
	Predicted Class	
Actual Class	MALE	FEMALE
MALE	362	438
FEMALE	287	513

Error Report			
Class	# Cases	# Errors	% Error
MALE	800	438	54.75
FEMALE	800	287	35.88
Overall	1600	725	45.31

Analysis – Discriminant Analysis

Training Data scoring - Summary Report

Cut off Prob.Val. for Success (Updatable)

0.5

(Updating the value here will NOT update value in detailed report)

Classification Confusion Matrix		
	Predicted Class	
Actual Class	MALE	FEMALE
MALE	360	440
FEMALE	295	505

Error Report			
Class	# Cases	# Errors	% Error
MALE	800	440	55.00
FEMALE	800	295	36.88
Overall	1600	735	45.94

Classification Function

Variables	Classification Function	
	MALE	FEMALE
Constant	-0.70110959	-0.70110959
ANNDIRRET	0.04998484	-0.04998484
ASSETS	-0.06283068	0.06283068
DIVYIELD	0.06015807	-0.06015809
COMMEQ	0.09970152	-0.09970152
EMPL	-0.03284172	0.03284173
EPSIN	-0.01124432	0.01124431
MKTVAL	-0.02895472	0.02895472
NI	0.04672706	-0.04672705
ROA	-0.01222184	0.01222185
ROEAVG	-0.06186434	0.06186434
SALES	0.0099149	-0.00991492
D-E	0.03270079	-0.0327008



Analysis – Model Assessment

- Neither Logistic nor Discriminant methods provide good explanatory information
- Initial statistics show there is differentiation along many of the predictors based on Gender, however our data set and models do not capture this well



Problems

- Cutoff values are very sensitive
- Best model yields 50%
- No better than a coin flip



Other Analysis Techniques

- Cluster Analysis
 - Remember CMU?
- Principal Components
 - Reduced 33 variables to 22
 - Impetration???



Results Interpretation

- Based on the models, there is obviously more information not included in our data set that helps to explain the difference between firms run by men and women
- This is intuitive, as it is difficult to explain the operating differences between male and female run companies based on financial performance alone



Summary

- There are differences between how males and females operate a company
- However, little evidence in the data as to why?
- Our best guess



Data Summary information

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Recommendations/Implications

- Gather more data
 - BoD Composition
 - Company Beliefs
 - Management Styles
 - Risk