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Corporate Default Prediction

Chong CAO

chong.cao.2019@Anderson.ucla.edu

MFE 431
Credit Market

UCLA Anderson
SCHOOL of MANAGEMENT

Corporate Bankruptcy Prediction

- Variables are constructed using COMPUSTAT and CRSP data.

$$RSIZE_{i,t} = \log\left(\frac{Firm\ Market\ Equity_{i,t}}{Total\ S\&P500\ Market\ Value_t}\right)$$

$$EXRET_{i,t} = \log(1 + R_{i,t}) - \log(1 + R_{S\&P500,t})$$

$$NIMTA_{i,t} = \frac{Net\ Income_{i,t}}{(Firm\ Market\ Equity_{i,t} + Total\ Liabilities_{i,t})}$$

$$TLMTA_{i,t} = \frac{Total\ Liabilities_{i,t}}{(Firm\ Market\ Equity_{i,t} + Total\ Liabilities_{i,t})}$$

$$CASHMTA_{i,t} = \frac{Cash\ and\ Short\ Term\ Investments_{i,t}}{(Firm\ Market\ Equity_{i,t} + Total\ Liabilities_{i,t})}.$$

$$SIGMA_{i,t-1,t-3} = \left(252 * \frac{1}{N-1} \sum_{k \in \{t-1,t-2,t-3\}} r_{i,k}^2\right)^{\frac{1}{2}}.$$

Corporate Bankruptcy Prediction … cont'd

- Ass lagged information about profitability and excess returns.

$$NIMTAAVG_{t-1,t-12} = \frac{1-\phi^3}{1-\phi^{12}}\left(NIMTA_{t-1,t-3} + \cdots + \phi^9 NIMTA_{t-10,t-12}\right),$$

$$EXRETAVG_{t-1,t-12} = \frac{1-\phi}{1-\phi^{12}}\left(EXRET_{t-1} + \cdots + \phi^{11} EXRET_{t-12}\right),$$

where $\phi = 2^{-\frac{1}{3}}$, implying that the weight is halved each quarter.

Corporate Bankruptcy Prediction … cont'd

- Descriptive statistics for **full data set**

	min	max	mean	median	sd
MB	0.1503	6.0884	1.9938	1.8703	1.3703
NIMTA	-0.026978	0.024481	0.0043708	0.0059035	0.011848
TLMTA	0.169	0.95986	0.57331	0.56228	0.24476
CASHMTA	0.0017208	0.23049	0.055061	0.029942	0.062869
SIGMA	0.1534	0.9621	0.40913	0.3462	0.226
RSIZE	-11.772	-5.6959	-8.7502	-8.7412	1.6375
LOG_PRICE	-2.9469	2.7081	2.4385	2.7081	0.63857
NIMTAAVG	-0.026917	0.024481	0.0041868	0.0055385	0.0095716
EXRETAVG	-0.16535	0.11192	-0.0041506	-0.00172	0.035348

Corporate Bankruptcy Prediction … cont'd

- Descriptive statistics for **subsample of defaulted firms**

	min	max	mean	median	sd
MB	0.1503	6.0884	1.6328	0.86729	1.8687
NIMTA	-0.026978	0.0055191	-0.020712	-0.026978	0.0095209
TLMTA	0.69265	0.95986	0.9104	0.95986	0.076635
CASHMTA	0.0017208	0.23049	0.057565	0.021308	0.068097
SIGMA	0.5886	0.9621	0.92021	0.9621	0.1061
RSIZE	-11.772	-8.5921	-11.358	-11.772	0.75514
LOG_PRICE	-1.8326	2.2576	0.15693	0.085925	1.0392
NIMTAAVG	-0.026917	0.012218	-0.014711	-0.016359	0.01126
EXRETAVG	-0.14719	0.017383	-0.071304	-0.069222	0.044075

Corporate Bankruptcy Prediction … cont'd

- Descriptive statistics for **subsample of non-defaulted firms**

	min	max	mean	median	sd
MB	0.1503	6.0884	1.9998	1.8798	1.36
NIMTA	-0.026978	0.024481	0.0047889	0.0061142	0.011427
TLMTA	0.169	0.95986	0.5677	0.55788	0.24266
CASHMTA	0.0017208	0.23049	0.05502	0.029995	0.062789
SIGMA	0.1534	0.9621	0.40061	0.34245	0.21753
RSIZE	-11.772	-5.6959	-8.7067	-8.7056	1.6129
LOG_PRICE	-2.9469	2.7081	2.4766	2.7081	0.5556
NIMTAAVG	-0.026917	0.024481	0.0045018	0.0056402	0.0092206
EXRETAVG	-0.16535	0.11192	-0.0030314	-0.001218	0.034091

Corporate Bankruptcy Prediction … cont'd

- Descriptive statistics comparison (normalized by non-defaulted)

	min	max	mean	median	sd
MB	0	0	-0.1835	-0.53862	0.37405
NIMTA	0	-0.77456	-5.325	-5.4124	-0.16682
TLMTA	3.0986	0	0.60367	0.72053	-0.68419
CASHMTA	0	0	0.046264	-0.2896	0.084536
SIGMA	2.837	0	1.297	1.8095	-0.51224
RSIZE	0	0.50848	0.30448	0.35219	-0.53181
LOG_PRICE	-0.37814	-0.16634	-0.93663	-0.96827	0.87048
NIMTAAVG	0	-0.50093	-4.2677	-3.9004	0.22122
EXRETAVG	-0.10985	-0.84467	22.522	55.832	0.29287

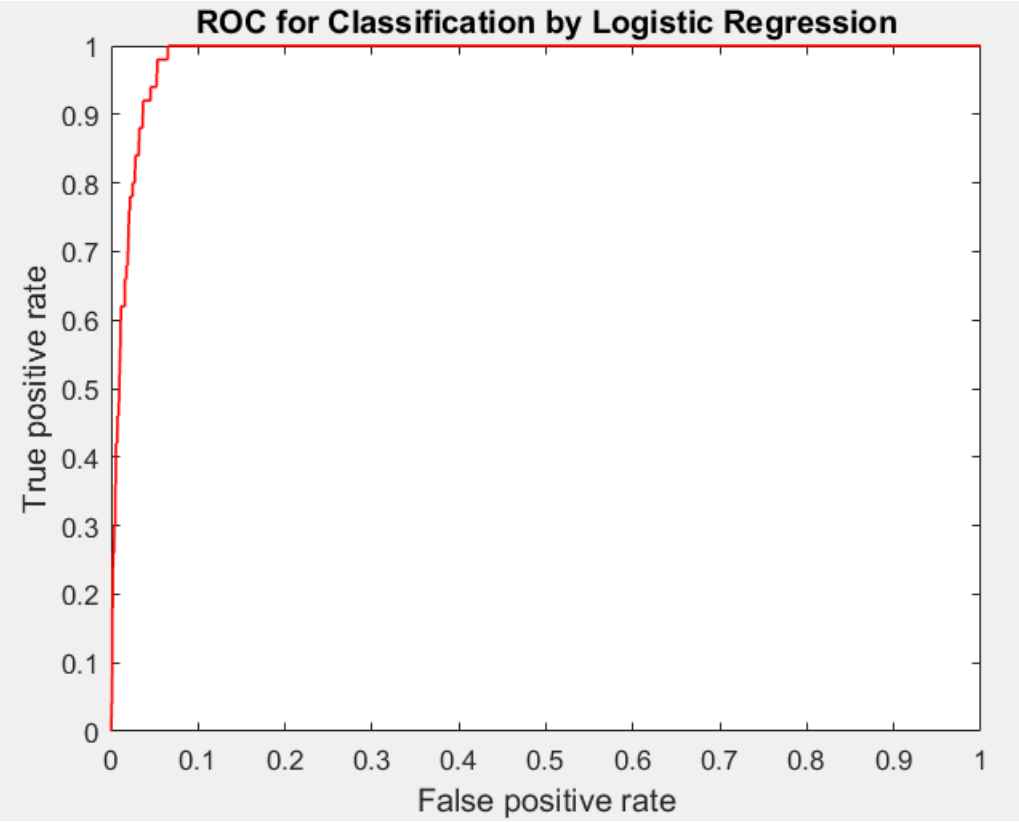
Corporate Bankruptcy Prediction … cont'd

- Results of Logit Regression
  - Positive relation: **TLMTA** (Total Liability over Market Value of Total Assets), **NIMTAAVG** (Lagged Net Income to Market-valued Total Assets)
  - Negative relation: **MB** (Market-to-Book ratio), **CASHMTA** (Ratio of Cash and Short-term Asset to Market-valued Total Assets), **EXRETAVG** (Lagged Log Excess Return), **RSIZE** (Relative Market Cap Size)

	Estimate	SE	tStat	pValue
(Intercept)	-11.137	3.1657	-3.5181	0.00043467
MB	-0.042792	0.097178	-0.44035	0.65969
NIMTA	-72.238	19.059	-3.7902	0.00015055
TLMTA	4.6113	2.1063	2.1893	0.028577
CASHMTA	-3.295	2.782	-1.1844	0.23625
SIGMA	4.8849	1.4642	3.3362	0.00084919
RSIZE	-0.032292	0.25301	-0.12763	0.89844
LOG_PRICE	-0.49153	0.24032	-2.0453	0.040827
NIMTAAVG	10.6	20.962	0.5057	0.61307
EXRETAVG	-3.1576	4.3483	-0.72618	0.46773

Corporate Bankruptcy Prediction … cont'd

- Results of Logit Regression



Corporate Bankruptcy Prediction … cont'd

- Comparison of Logistic Regression, SVM, Naïve Bayes Classification