Replication Assignment

Corporate Finance Theory I

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What Was Done

1) Imported data set from WRDS COMPUSTAT database following Frank and Goyal's (2003) description of variables
2) Treated the data with respect to accounting identities and cash flow reporting formats
3) Calculated relevant dependent, independent and control variables for analysis
4) Winsorization: trimmed all variables at 0.5% level on both tails following Frank and Goyal (2003)
5) Ran respective regressions as specified in the 'Assignment' pdf file.
    - Choice of software: SAS

What Was Done Differently

1) Extended the sample up to 2019 (from 1971 as in Rajan and Zingales (1995))
    - To check whether the relationship still holds in recent years
2) Removed observations with negative net worth (or capital impairment), i.e. negative value for book equity (approx. 1,400 firm-year obs removed)
    - Extending the sample led to the inclusion of firms with extreme negative values for book equity
    - Not removing them had a serious impact on book leverage analysis
    - Keeping them did not qualitatively affect the results for market leverage

Descriptive Data

*Note: Some firms report figures in different accounts (ex. Cash and Cash Equivalents instead of Cash). Such missing values are treated as zeros, but the alternative accounts are not reported to save space.

Mnemonic	Item Name	N	Mean	Median	Min	Q1	Q3	Max
-Selected Balance Sheet Items								
CH	Cash	214236	38.31	3.21	0.00	0.46	20.16	5293.10
IVST	Short-Term Investments - Total	214236	13.77	0.00	0.00	0.00	2.20	2422.70
INVT	Inventories - Total	212882	60.86	5.18	0.00	0.32	32.74	5857.00
RECT	Receivables - Total	212126	72.58	9.82	0.00	1.88	46.95	6945.50
ACO	Current Assets - Other - Total	214236	14.89	1.24	0.00	0.21	7.50	2281.00
ACT	Current Assets - Total	209891	198.36	36.70	0.04	8.77	150.52	15337.00
PPENT	Property, Plant and Equipment - Total (Net)	214236	194.13	13.08	0.00	2.30	82.66	25534.51
INTAN	Intangible Assets - Total	214236	94.73	0.11	0.00	0.00	11.39	16214.00
AO	Assets - Other	214236	24.80	1.20	0.00	0.15	9.27	4783.25
AT	Assets - Total	214236	533.14	70.57	0.27	16.51	342.52	33271.05
DLC	Debt in Current Liabilities - Total	214040	20.93	1.04	0.00	0.06	6.74	5190.55
AP	Accounts Payable - Trade	214160	42.97	4.61	0.00	1.09	21.98	6907.80
LCO	Current Liabilities - Other - Total	214236	50.16	5.20	0.00	0.97	28.27	7563.00
LCT	Current Liabilities - Total	210958	117.47	15.45	0.02	3.74	70.49	12484.80
TXDITC	Deferred Taxes and Investment Tax Credit	214236	19.62	0.00	0.00	0.00	2.75	3754.00
TXP	Income Taxes Payable	212128	4.53	0.01	0.00	0.00	1.20	929.00
DLTT	Long-Term Debt - Total	213804	131.50	3.97	0.00	0.09	47.98	13760.00
MIB	Noncontrolling Interest (Balance Sheet)	214236	2.46	0.00	0.00	0.00	0.00	792.46
LT	Liabilities - Total	213915	301.49	27.52	0.02	5.93	161.38	21924.26
SEQ	Stockholders Equity - Parent	214236	227.49	34.89	0.05	7.75	160.35	16972.00
LSE	Liabilities and Stockholders Equity - Total	214236	533.14	70.57	0.27	16.51	342.52	33271.05

Descriptive Data

*Note: Some firms have no price (PRCC_F), presumably private firms that report financial data but are not listed. Market values are thus missing for these firms.

Mnemonic	Label	N	Mean	Median	Min	Q1	Q3	Max
-Selected Income Statement Items								
SALE	Sales/Turnover (Net)	214085	543.32	72.19	0.00	14.25	355.32	58727.32
OIBDP	Operating Income Before Depreciation	213739	70.83	5.79	-112.10	0.21	41.22	6541.30
-Calculated Values								
MEQ	Market Value of Equity (CSHO*PRCC_F)	183164	647.26	72.29	0.36	16.38	376.07	85429.89
MAT	Market Value of Assets (AT-SEQ+MEQ)	183164	961.45	122.92	1.05	30.72	601.34	95982.53
FD	Financial Debt (DLC+DLTT)	213618	152.43	7.48	0.00	0.64	63.93	13783.00
BLEV	Book Leverage (FD/AT)	213618	0.22	0.19	0.00	0.04	0.36	0.81
MLEV	Market Leverage (FD/MAT)	182653	0.17	0.12	0.00	0.01	0.28	0.77
BLEV_W1	Book Leverage – Welch 1 (LT/AT)	213915	0.47	0.48	0.02	0.30	0.64	0.98
MLEV_W1	Market Leverage – Welch 1 (LT/MAT)	182893	0.36	0.32	0.00	0.15	0.54	0.96
BLEV_W2	Book Leverage – Welch 2 (FD/(FD+SEQ))	213618	0.30	0.27	0.00	0.05	0.49	0.97
MLEV_W2	Market Leverage – Welch 2 (FD/(FD+SEQ))	182653	0.23	0.15	0.00	0.02	0.38	0.94
MTOB	Market-to-Book Ratio (MAT/AT)	183164	1.98	1.35	0.41	0.99	2.14	24.61
TANG	Tangibility (PPENT/AT)	214236	0.29	0.22	0.00	0.10	0.41	0.94
LSALE	Size (log(SALE))	214085	4.28	4.29	0.00	2.72	5.88	10.98
PROFIT	Profitability (OIBDP/AT)	213739	0.05	0.11	-2.01	0.02	0.17	0.50
BMED	Industry Median Book Leverage	214231	0.20	0.20	0.00	0.09	0.28	0.81
MMED	Industry Median Market Leverage	213819	0.15	0.13	0.00	0.04	0.23	0.77
BMED_W1	Industry Median Book Leverage (Welch 1)	214234	0.47	0.47	0.02	0.38	0.56	0.98
MMED_W1	Industry Median Market Leverage (Welch 1)	213822	0.34	0.32	0.01	0.20	0.47	0.95
BMED_W2	Industry Median Book Leverage (Welch 2)	214231	0.27	0.28	0.00	0.13	0.38	0.97
MMED_W2	Industry Median Market Leverage (Welch 2)	213819	0.20	0.16	0.00	0.05	0.30	0.93

Regression Results (1)

The table below reports the regression coefficients (and respective t statistics in parentheses) for each regression specification. The baseline models use BLEV and MLEV (as in Rajan and Zingales (1995)) as the dependent variable and include year fixed effects (coefficients not reported to save space). Welch 1 and 2 use the leverage measure suggested by Welch (2011), LT/AT and FD/CP, respectively. Last two columns use Welch 1 measure (LT/AT) and incorporate firm fixed effects into the model (coefficients not reported, again, to save space).

	Baseline		Welch 1		Welch 2		Firm fixed effect	
DV:	BLEV	MLEV	BLEV_W1	MLEV_W1	BLEV_W2	MLEV_W2	BLEV_W1	MLEV_W1
IVs and CVs								
MTOB	-0.0094	-0.0211	-0.0085	-0.0455	-0.0125	-0.0297	-0.0036	-0.0338
	(-46.23)	(-117.72)	(-35.73)	(-202.01)	(-46.1)	(-125.46)	(-15.58)	(-155.39)
TANG	0.1217	0.0981	0.0729	0.0594	0.1320	0.1030	0.1786	0.1574
	(66.84)	(62.72)	(35.96)	(31.55)	(55.22)	(50.5)	(49.84)	(46.82)
LSALE	0.0106	0.0074	0.0290	0.0190	0.0200	0.0127	0.0391	0.0315
	(48.79)	(38.63)	(111.05)	(78.89)	(68.72)	(50.28)	(74.86)	(64.33)
PROFIT	-0.0808	-0.0766	-0.1842	-0.1753	-0.1432	-0.1226	-0.1858	-0.1910
	(-43.93)	(-47.75)	(-85.53)	(-87.8)	(-58.62)	(-57.95)	(-80.47)	(-88.14)
Industry Median	0.5865	0.6331	0.6144	0.5695	0.5635	0.6228	0.4587	0.4665
	(167.91)	(193.46)	(157.56)	(190.73)	(161.46)	(191.05)	(91.59)	(121.99)

Regression Results (2)

The table below reports the regression coefficients (and respective t statistics in parentheses) for the model specified by Lemmon, Roberts and Zender (2008). The baseline models use BLEV and MLEV, measures defined by Rajan and Zingales (1995), as the dependent variable. Welch 1 and 2 use the leverage measure suggested by Welch (2011), LT/AT and FD/CP, respectively. All models include year fixed effects, coefficients of which are not reported to save space, and respective industry median values. Initial leverage is defined as the first non-missing leverage value for each firm, as in Lemmon, Roberts and Zender (2008).

Including Initial Leverage	Baseline		Welch 1		Welch 2	
DV:	BLEV	MLEV	BLEV_W1	MLEV_W1	BLEV_W2	MLEV_W2
IVs and CVs						
Initial Leverage	0.2772	0.2434	0.3969	0.3686	0.3987	0.3593
	(118.14)	(111.71)	(149.65)	(141.35)	(129.22)	(126.04)
MTOB	-0.0082	-0.0161	-0.0063	-0.0374	-0.0109	-0.0227
	(-31.5)	(-66.79)	(-21.58)	(-129.63)	(-31.82)	(-72.18)
TANG	0.1189	0.0868	0.0524	0.0321	0.1243	0.0842
	(51.81)	(42.63)	(21.33)	(13.6)	(41.76)	(31.99)
LSALE	0.0026	0.0006	0.0203	0.0110	0.0097	0.0037
	(9.7)	(2.3)	(65.99)	(37.17)	(27.16)	(11.53)
PROFIT	-0.0676	-0.0695	-0.1644	-0.1593	-0.1248	-0.1166
	(-29.22)	(-33.35)	(-63.53)	(-64.14)	(-41.12)	(-42.84)
Industry Median	0.4662	0.5092	0.4127	0.4186	0.4259	0.4775
	(99.45)	(115.12)	(82.48)	(107.43)	(91.35)	(110.11)

What Was Learned

1) The findings in Rajan and Zingales (1995) continue to hold even to the inclusion of recent data.
    - Key variables are statistically and economically significant, and the signs are still consistent
2) The four determinants are robust to the inclusion of many other control variables and changes in model specification.
    - Welch's (2011) measures did not qualitatively alter the results
    - Tangibility and profitability seem to have larger economic impact
3) Initial leverage is still a powerful factor in explaining firm leverage.

Further Questions

1) Since initial leverage seems to play an important role, is there a notable trend in leverage for firms that IPO-ed during major economic turmoil? (e.g. subprime mortgage crisis, COVID-19 Pandemic, etc.)
2) Do corporate governance and agency theory play a role in explaining the negative correlation between profitability and leverage?
    - Firms with owner-managers may be more profitable, since they are better managed with less conflicts of interest.
    - Owner-managers may be more conservative toward leverage, since they are emotionally attached to the firm and overestimate the risk of default.

Thank You