The Pecking Order Theory and the Firm's Life Cycle

Laarni Bulan Zhipeng Yan*

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Abstract

We examine the central prediction of the pecking order theory of financing among firms in two distinct life cycle stages, namely growth and maturity. We find that within a life cycle stage, where levels of debt capacity and external financing needs are more homogeneous, and after sufficiently controlling for debt capacity constraints, firms with high adverse selection costs follow the pecking order more closely, consistent with the theory.

Key Words: Life Cycle, Pecking Order, Financing
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* Bulan: Brandeis University, International Business School, 415 South Street, MS 032, Waltham, MA 02454, lbulan@brandeis.edu, TEL: 781-736-2994; Yan: New Jersey Institute of Technology, School of Management, University Heights, Newark, NJ 07102, zyan@njit.edu, TEL: 973-596-3260. We are grateful for comments from two anonymous referees, John Ballantine, Soku Byoun, Ben Gomes-Casseres, Jens Hilscher, Li Jin, Blake LeBaron, Hong Li, Justin Murfin, Carol Osler, Paroma Sanyal, Mohamed Ariff and seminar participants at Brandeis University, Cornerstone Research, PanAgora Asset Management, the Financial Management Association 2007 annual meeting and the Midwest Finance Association 2007 annual meeting. We also thank Jay Ritter for kindly providing his IPO data. We alone are responsible for any errors or omissions.

I. Introduction

There is ongoing debate about the empirical performance of the pecking order theory of financing proposed by Myers (1984) and Myers and Majluf (1984). The theory is based on asymmetric information between the firm's investors and its managers. Due to the valuation discount that less-informed investors apply to newly issued securities, firms resort to internal funds first, and then debt and equity last to satisfy their financing needs. The empirical evidence for the theory has been mixed[1], in part due to shortcomings of the empirical tests used. As a result, the central prediction of the theory – that of asymmetric information driving pecking order behavior - has not been adequately evaluated. In this paper, we examine this central prediction within the context of a firm's life cycle.[2]

We identify firms in two major life cycle stages, namely growth and maturity. We find that growth firms have a greater need for external financing and have smaller debt capacities compared to mature firms. These two factors greatly affect a firm's financing decision and it is difficult to assess the empirical performance of the pecking order theory without accounting for differences in these characteristics across firms (Lemmon and Zender, 2007). In sorting firms according to growth and maturity stages, we are confident that external financing needs and levels of debt capacity are more homogeneous. We find that, within a life cycle stage and upon sufficiently controlling for a firm's debt capacity, firms with the highest adverse selection costs due to information asymmetry are the ones following the pecking order more closely, consistent with the theory.

II. Data and Sample Selection

[1]See Helwege and Liang (1996), Shyam-Sunder and Myers (1999), Fama and French (2002), Frank and Goyal (2003), Lemmon and Zender (2007), Agca and Mozumdar (2007) and Leary and Roberts (2008).
[2]An early proponent of the theory of a firm's life cycle is Mueller (1972).

We gather data primarily from the CRSP-COMPUSTAT merged database over the 1970-2004 period. We classify firms according to two distinct life cycle stages, namely growth and maturity. We focus on a snapshot of a firm's history where these stages are more easily determined. Prior work on firm life cycles (Miller and Friesen, 1984) has found that, on average, each stage lasts for six years.[3] Accordingly, we set the length of each stage to be six years. We find similar results using 4, 8, and 10 years for the stage length.

We define the growth stage to be the first six-year period after the year of the firm's initial public offerin (IPO)). This definition may not necessarily apply to some firms[4] from a mechanical point of view. However, the IPO is itself an important financing decision that a firm has to make. Here, we treat the IPO as the starting point of the growth stage (or the "new growth" stage). IPO dates from 1970 -1974 are provided by Jay Ritter. IPO dates from1975-1998 are obtained from Loughran and Ritter (2004).[5]

DeAngelo, DeAngelo and Stulz (2006), among others, have found that a firm's propensity to pay dividends is a function of which stage a firm is in its life cycle. In particular, Bulan, Subramanian and Tanlu (2007) find that dividend initiators are mature firms. Based on this body of work, we identify firms in their mature stage by their dividend initiation history. First, we use the entire Compustat industrial annual database to find consecutive six-year periods for which a firm has positive dividends. We require that such a period should immediately follow at least one year with zero or missing dividends[6]. We deem these 6-year dividend payment

[3] Evans (1987) defines firms six years old or younger as young firms and firms seven years or older as old firms.
[4] For example, Metro-Goldwyn-Mayer Inc. was founded in 1930 and went public in 1997.
[5] Usually, Compustat coverage begins a few years prior to a firm's IPO. Lemmon and Zender (2007) and Leary and Roberts (2008) approximate a firm's age as the age of the firm relative to the first year the firm appears on Compustat.
[6] This is similar to Baker and Wurgler's (2004) definition of dividend initiations.

periods as the mature stage of a firm's life cycle.[7] We then retain observations that occur after 1970 due to the availability of flow of funds data from Compustat. Following standard practice, we exclude financial firms and regulated utilities and consider only firms that have securities with CRSP share codes 10 or 11.

Table I provides descriptive statistics for firms in each life cycle stage. (Variable definitions are described in detail in the appendix.) On average, firms in the mature stage are older, larger and more profitable than firms in the growth stage. We find that mature firms have higher leverage, consistent with having larger debt capacities while growth firms have larger financing deficits (external finance). In terms of information asymmetry, growth firms are less liquid and have higher bid-ask spreads, consistent with greater adverse selection costs. Overall, these patterns conform to our expectations of key firm attributes in these two stages of a firm's life cycle.

More importantly, the finding that growth firms have greater financing deficits but smaller debt capacities implies that growth firms will reach their debt capacities more often than mature firms. We argue that within a broad sample of firms, inference regarding the empirical performance of the pecking order theory is weakened if differences in these two key attributes are unaccounted for in the empirical test. In controlling for life cycle stages, we are grouping firms that are more similar in terms of their need for external financing and their debt capacity levels. This allows us to draw clearer inferences from tests of the pecking order theory.

[7] Accordingly, if a firm issues dividends during the first six years after the IPO, we exclude this firm from the sample altogether, i.e. a firm cannot be in the growth and mature stages at the same time.

III. Testing the Pecking Order Theory

We draw our conclusions from the following empirical model of Lemmon and Zender (2007):

$$\Delta Debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it} \qquad (1)$$

where *ΔDebt* is net debt issued and *Deficit* is the financing deficit, i.e. uses of funds minus internal sources of funds. This deficit is financed with debt and/or equity. If firms follow the pecking order, changes in debt should track changes in the deficit one-for-one (Shyam-Sunder and Myers, 1999). The quadratic specification is used to account for binding debt capacity constraints. If firms are financing their deficit with debt first and issue equity only when they reach their debt capacities, then net debt issued is a concave function of the deficit (Chirinko and Singha, 2000) and the coefficient on the squared deficit term would be negative. If firms are issuing equity first and debt is the residual source of financing, then this relationship should be convex and the coefficient on the squared deficit term would be positive. If debt and equity are issued in fixed proportions, the deficit would have no effect on net debt issued.

To estimate equation (1), we use pooled ordinary least squares with heteroskedasticity-consistent (robust) standard errors adjusted for clustering by firm[8]. In our tests, we report the total effect of the deficit, or the *debt-deficit sensitivity*, as the percent change in net debt issued per one percent change in the financing deficit, evaluated at the sample mean. Firms that follow the pecking order more closely should have a debt-deficit sensitivity that is closer to one.

[8] In unreported robustness tests, we have included year effects as well as used firm fixed effects estimation: the results are unchanged.

IV. Empirical Tests

A. Life Cycle Stages

We begin by estimating equation (1) across life cycle stages in Table II. The results are consistent with firms following the pecking order: the coefficient on the deficit is positive and the coefficient on the deficit-squared is negative. Both growth and mature firms are issuing debt first, while equity is the residual source of financing once they reach their debt capacities. Comparing across life cycle stages however, we find that mature firms have significantly higher debt-deficit sensitivities indicating that mature firms follow the pecking order more closely. This is contrary to conventional wisdom since we would expect growth firms to suffer more from information asymmetry problems. Bulan and Yan (2009) document this result as a *maturity effect* in firm financing choice. Mature firms are older, more stable, and highly profitable with few growth opportunities and good credit histories. Hence, they are able to borrow more easily and at a lower cost. Therefore, by the very nature of their life cycle stage, mature firms are pre-disposed to utilizing debt financing first before equity.

B. Information Asymmetry

The pecking order theory predicts that firms with the greatest adverse selection costs due to information asymmetry are the ones that should follow the pecking order more closely. This is the main prediction that we test in this paper. We first pool our sample of growth and mature firms together and sort them according to adverse selection costs. Bharat, Pasquariello and Wu (2008) show that market microstructure measures of adverse selection costs affect capital structure decisions. They construct an index of adverse selection costs based on proxies for liquidity and transaction costs (bid-ask spreads) taken from the market microstructure literature.

We follow their approach and measure adverse selection costs using Amihud's (2002) illiquidity measure. Higher illiquidity denotes greater adverse selection costs. In unreported analysis, we use the average bid-ask spread as an alternative measure of adverse selection costs and our results are similar.[9]

Table III presents the results for our pooled sample sorted according to high and low illiquidity based on the sample median. We expect firms with high illiquidity suffer most from asymmetric information problems (greater adverse selection costs) and consequently, will have higher debt-deficit sensitivities. The table shows there is no difference between firms sorted according to illiquidity, contrary to our expectations.[10] Although the quadratic form of the empirical model (equation 1) accounts for debt capacity constraints, the model does not have enough power to sort out large differences in debt capacity levels between firms. This is one possible reason for the result in Table III.

To investigate this issue further, we sort firms according to life cycle stage and further according to illiquidity. Sorting according to life cycle stage ensures that we are estimating our model using a sub-sample of firms where financing needs and levels of debt capacity are more homogeneous. We repeat our regressions using these sub-samples. Table IV shows that after controlling for life cycle stage, growth firms with high illiquidity have significantly higher debt-deficit sensitivity compared to the low illiquidity growth firms. This is consistent with the pecking order theory. Among mature firms however, we observe no such difference.

[9] Strictly speaking, these measures of adverse selection costs are based on information asymmetry between informed and uninformed traders. The pecking order theory is based on information asymmetry between managers and outside investors. Bharat et al. argue that managers constitute a subset of informed investors and their microstructure measures are (imperfect) proxies for the kind of information asymmetry that the pecking order theory is based upon.
[10] In contrast, Bharat et al. find that firms with the highest adverse selection costs have the highest debt-deficit sensitivity. They do not however, control for debt capacity constraints (i.e. they use a linear form of equation (1)).

C. Controlling for Rated Debt

Lemmon and Zender (2007) further address the issue of debt capacity by using the presence of a bond rating as an indicator of a larger debt capacity. They use a logit model to calculate the predicted probability that a firm will have a bond rating based on the following firm characteristics: firm size, profitability, property, plant and equipment, market-to-book ratio, leverage ratio, age and stock return volatility. This predicted probability is their proxy for the severity of debt-capacity constraints.[11] We follow this methodology and sort firms according to high and low predicted probabilities based on the sample median. A high (low) predicted probability of having a bond rating implies a firm is less (more) likely to be debt-constrained. Table V shows the characteristics of the firms in our sample sorted according to high and low predicted probabilities.

We repeat our regressions using sub-samples based on the predicted probabilities. In Table VI, we find that once we control for differences in debt capacities as indicated by the probability of having a bond rating, firms with high illiquidity have significantly higher debt-deficit sensitivities compared to firms with low illiquidity. This result holds within each life cycle stage (growth and maturity) and predicted probability cohort.[12]

V. Conclusion

In this paper, we identify firms in two major life cycle stages, namely growth and maturity, in order to evaluate the central prediction of the pecking order theory. Within a life cycle stage where levels of debt capacity and external financing needs are more homogeneous and upon sufficiently controlling for debt capacity constraints, we find that firms with the highest

[11] Please refer to Lemmon and Zender (2007) for more details.
[12] We run numerous robustness tests, including tests on different definitions of growth and maturity stages and various lengths of each life cycle stage. The results are similar and are available upon request.

adverse selection costs are the ones following the pecking order more closely. This is evidence consistent with the basic premise of the theory.

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Table I: Summary Statistics by Life Cycle Stage

This table reports summary statistics by life cycle stage, namely growth and maturity. The sample period is from 1971-2004. Following Frank and Goyal (2003), we exclude firms with missing book value of assets, firms involved in major mergers (Compustat footnote 1 with value = AB) and a small number of firms that reported format codes (data318) 4, 5, or 6. To reduce the impact of outliers and the most extremely mis-recorded data, all variables are truncated at the top and bottom 0.5 percentiles. Variables are scaled by total assets unless otherwise noted. For variable definitions, please refer to the appendix. Means, medians and standard deviations of key variables across stages are obtained in two steps. Step 1: Calculate the mean value of a variable in each stage for each firm. Step 2: Calculate the mean, median and standard deviation of the firm mean across all the firms for each stage. Different sample sizes are due to missing values. The t-test of the difference between means of firms in growth and maturity stages (a) and the Wilcoxon rank-sum test of the difference between medians of firms in growth and maturity stages (b) are reported. + significant at 10% level; * significant at 5% level; ** significant at 1% level

	Mean[a]		Median[b]		Standard Deviation		Number of Firms	
	Growth	Maturity	Growth	Maturity	Growth	Maturity	Growth	Maturity
Age (years)	12.34**	15.65	7.50	9.50	13.85	18.28	3918	1876
Real Assets (in millions, constant 1992 Dollars)	177.59**	1342.30	38.56**	168.89	664.61	3973.26	3918	1876
Real Sales (in million, constant 1992 Dollars)	182.31**	1120.85	37.64**	211.28	701.10	2845.80	3895	1875
Annual real sales growth rate (%)	41.87**	10.91	20.66**	8.36	72.96	15.91	3887	1875
Market to Book ratio	2.53**	1.54	1.78**	1.22	2.19	1.10	3895	1780
Return on Assets (%)	-0.20**	17.56	7.28**	16.42	25.55	7.85	3915	1874
Tangible Assets (%)	27.17**	36.62	20.27**	31.31	21.44	22.28	3917	1876
Capital expenditure (%)	7.99*	8.42	5.85**	6.97	6.97	5.90	3905	1866
R&D (%)	11.47**	2.51	6.62**	1.07	15.17	3.67	2636	1029
Advertising expense (%)	3.70	3.72	1.97	2.01	5.21	5.76	1976	914
Dividend per share ($)	0.00**	0.52	0.00**	0.26	0.00	1.02	3917	1876
Retained earnings to total equity ratio (%)	-82.46**	58.88	5.06**	63.66	330.08	50.48	3917	1821
Market Leverage (%)	33.59**	40.85	30.24**	41.07	22.13	20.91	3895	1780
Book Leverage (%)	45.61*	46.79	44.89*	47.09	20.89	18.27	3894	1873
Δdebt (%)	4.50**	3.16	0.83	1.56	9.57	6.03	3907	1856
Δequity (%)	14.18**	1.67	3.99**	0.11	25.50	5.31	3844	1865
Financing Deficit (%)	19.32**	4.73	9.17**	2.48	29.82	8.82	3828	1842
Illiquidity	8.21**	2.45	1.53**	0.35	17.11	6.21	3695	1421
Bid-ask spread (%)	2.83**	1.56	2.07**	1.22	2.95	1.20	3149	807

Table II. Tests of the Pecking Order and Life Cycle Stage

Pooled OLS regression estimation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to net debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2004. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at the 10%, 5%, and 1% level respectively.

	Growth Stage	Maturity Stage
Deficit	0.391**	0.721**
	[0.005]	[0.007]
Deficit^2	-0.087**	-0.137**
	[0.002]	[0.004]
Constant	-0.006**	0.002*
	[0.001]	[0.001]
Total effect of the Deficit	35.90%	70.84%
Observations	19821	9777
Adjusted R^2	0.281	0.619

T-test: Total Effect of the Deficit
Growth vs. Maturity
c

Note: a, b, c significantly different at the 10%, 5%, and 1% level respectively. N/S: not significantly different

Table III. Tests of the Pecking Order and Asymmetric Information

Pooled OLS regression estimation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to net debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2004. Illiquidity is measured according to Amihud (2002). The pooled sample is split at the median illiquidity value. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at the 10%, 5%, and 1% level respectively.

	Low Illiquidity	High Illiquidity
Deficit	0.401**	0.435**
	[0.007]	[0.007]
Deficit^2	-0.090**	-0.102**
	[0.003]	[0.003]
Constant	0.002	-0.006**
	[0.002]	[0.001]
Total effect of the Deficit	37.09%	40.61%
Observations	12563	13476
Adjusted R^2	0.283	0.317

T-test: Total Effect of the Deficit
Low vs High Illiquidity
N/S

Note: a, b, c significantly different at the 10%, 5%, and 1% level respectively. N/S: not significantly different

Table IV. Life Cycle Stage and Asymmetric Information

Pooled OLS regression estimation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to net debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2004. We first identify the median firm illiquidity (Amihud, 2002) for the first year of the growth stage. We use this median value to sort growth firms as low or high according to each firm's illiquidity at the beginning of the growth stage. We use this same median value to sort mature firms as low or high illiquidity. We do this in order to more accurately control for firm illiquidity across life cycle stages. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each sub-group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

	Growth Stage		**Maturity Stage**		
	Low Illiquidity	**High Illiquidity**	**Low Illiquidity**	**High Illiquidity**	**T-Test: Total Effect of the Deficit**
Deficit	0.307**	0.500**	0.719**	0.768**	**Low Illiq. vs High Illiq.**
	[0.008]	[0.008]	[0.011]	[0.011]	Growth: c; Maturity: N/S
Deficit^2	-0.063**	-0.117**	-0.150**	-0.108**	
	[0.003]	[0.003]	[0.007]	[0.008]	
Constant	-0.001	-0.009**	0.001	0.003**	**Growth vs Maturity**
	[0.002]	[0.002]	[0.001]	[0.001]	Low Illiq: c; High Illiq: c
Total effect of the Deficit	27.44%	46.96%	70.11%	76.10%	
Observations	8551	8990	3777	2889	Note: a, b, c significantly different at the 10%, 5%, and 1% level respectively. N/S: not significantly different
Adjusted R^2	0.212	0.366	0.609	0.722	

Table V. Summary Statistics by Life Cycle Stage and Predicted Probability

This table reports the mean values of key firm characteristics by life cycle stage, further sorted according to high and low predicted probability of having a bond rating (based on the median value in each stage). The sample period is from 1971-2004. Variables are scaled by total assets unless otherwise noted. For variable definitions, please refer to the appendix.

	Growth Stage		**Maturity Stage**	
	Low Predicted Probability	High Predicted Probability	Low Predicted Probability	High Predicted Probability
Age (years)	10.05	18.21	13.96	21.64
Real Assets (in millions, constant 1992 Dollars)	31.50	378.02	74.19	1735.89
Annual real sales growth rate (%)	43.60	22.35	9.75	10.95
Market to Book ratio	2.69	1.70	1.56	1.55
Return on Assets (%)	-4.97	11.04	18.57	15.97
R&D (%)	13.79	5.60	3.62	2.63
Retained earnings to total equity ratio (%)	-128.22	-9.45	62.77	56.25
Book Leverage (%)	36.50	54.69	35.35	51.62
Δdebt (%)	2.56	4.44	2.70	3.33
Δequity (%)	12.32	4.23	0.83	1.05
Financing Deficit (%)	14.87	8.60	3.45	4.37
Illiquidity	11.08	4.63	7.01	1.06

Table VI. Controlling for Rated Debt

Pooled OLS regression estimation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to net debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2004. The predicted probability of having a bond rating is calculated from a logit model of the likelihood of having rated debt according to Lemmon and Zender (2007). We split our sample at the median value of predicted probabilities within each life cycle stage. Next, we identify the median firm illiquidity (Amihud, 2002) for the first year of the growth stage. We use this median value to sort growth firms as low or high according to each firm's illiquidity at the beginning of the growth stage. We use this same median value to sort mature firms as low or high. We do this in order to more accurately control for firm illiquidity across life cycle stages and within each predicted probability cohort. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each sub-group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Panel A: High Predicted Probability

	Growth Stage		Maturity Stage	
	Low Illiq.	**High Illiq.**	**Low Illiq**	**High Illiq.**
Deficit	0.559**	0.767**	0.677**	0.888**
	[0.039]	[0.027]	[0.024]	[0.043]
Deficit^2	-0.052	-0.046	0.046	-0.291+
	[0.056]	[0.053]	[0.030]	[0.160]
Constant	-0.002	-0.010**	0.002+	0.001
	[0.002]	[0.001]	[0.001]	[0.001]
Total effect of the Deficit	54.70%	76.16%	68.14%	86.79%
Observations	3123	3123	2529	1708
Adjusted R^2	0.498	0.724	0.740	0.772

T-test: Total Effect of the Deficit

Low Illiq. vs. High Illiq.

Growth	Maturity
c	c

Growth vs. Maturity

Low Illiq.	High Illiq.
c	b

Note: a, b, c significantly different at the 10%, 5%, and 1% level respectively. N/S: not significantly different

Panel B: Low Predicted Probability

	Growth Stage		Maturity Stage	
	Low Illiq.	**High Illiq.**	**Low Illiq**	**High Illiq.**
Deficit	0.247**	0.520**	0.610**	0.809**
	[0.029]	[0.033]	[0.079]	[0.060]
Deficit^2	-0.061*	-0.244**	-0.156	-0.187
	[0.028]	[0.042]	[0.143]	[0.247]
Constant	-0.006**	-0.009**	0.008**	0.009**
	[0.001]	[0.001]	[0.002]	[0.002]
Total effect of the Deficit	21.95%	48.36%	59.11%	80.45%
Observations	4412	4412	746	873
Adjusted R^2	0.163	0.343	0.504	0.751

T-test: Total Effect of the Deficit

Low Illiq. vs. High Illiq.

Growth	Maturity
c	b

Growth vs. Maturity

Low Illiq.	High Illiq.
c	c

Note: a, b, c significantly different at the 10%, 5%, and 1% level respectively. N/S: not significantly different

Appendix: Variable Definitions

Variable:	Definitions and COMPUSTAT annual data item in parenthesis:
Age	= years from birth where birth is the earliest year that we observe a non-missing observation from either Jay Ritter's incorporation dataset, Compustat, or CRSP
Real Assets	= Total Assets (6), deflated by the Consumer Price Index
Real Sales	= Sales (12), deflated by the Consumer Price Index
Market-to-Book Ratio	= Market Equity/Book Equity
Return on Assets (ROA)	= Earnings Before Interest, Tax and Depreciation (13) / Total Assets(6)
Tangible Assets	= Net Property, Plant and Equipment (8) / Total Assets(6)
Capital Expenditures	= Capital Expenditures (128)/ Total Assets (6)
R&D	= Research and Development Expense (46) /Total Assets (6)
Advertising Expense	= Advertising Expense (45)/ Total Assets(6)
Dividends	= Dividend Per Share (26)
Retained Earnings-to-Total Equity Ratio	= Retained Earnings (36)/Common Equity(60)
Book Equity	= Total Assets (6) – Liabilities (181) + Balance Sheet Deferred Taxes and Investment Tax Credit (35), if available – Preferred Stock
Preferred Stock	= Liquidating value(10), if available, else Redemption Value (56) if available, else Carrying Value (130)
Market Equity	= Stock price (199) times Shares Outstanding (25)
Book Debt	= Total Assets (6) – Book Equity
Market Leverage	= Book Debt/(Total Assets (6) – Book Equity + Market Equity)
Book Leverage	= Book Debt/ Total Assets (6)
$\Delta Debt_t$	= [Long-term Debt Issuance (111) at t – Long-term Debt Reduction (114) at t]/ (Total Assets at t-1)
$\Delta Equity_t$	= [Sale of Common and Preferred Stock (108) at t – Purchase of Common and Preferred Stock (115) at t]/(Total Assets at t-1)[13]
Financing $Deficit_t$	$=\Delta Equity_t + \Delta Debt_t$
Illiquidity	= the daily ratio of absolute stock return to its dollar volume, averaged over one year from CRSP (Amihud, 2002)
Bid-ask spread (%)	= average ((ask – bid)/(ask + bid)) in the last fiscal year from CRSP

[13] Following Frank and Goyal (2003) and Lemmon and Zender (2007).