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Financing Regimes

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A B S T R A C T

In this study we revisit tests of capital structure to determine the predominant theory that correctly anticipates and relates firm financing decisions. We first identify financing decisions that are correctly classified employing commonly used tests of capital structure theory and then focus on explaining departures from these models. The results reveal a sharp divide in the financing patterns of firms across all industries (Fama-French 48) pre and post 1987. The empirical evidence suggests that the pecking-order theory is the predominant financing regime from 1970 to 1987 and after 1987 the trade-off model is the principal method of capital financing. The results are chiefly attributed to changes in tax regulation. An examination of adjustments to capital structure also offers support for the trade-off theory noting evidence of regular adjustments.

Keywords: capital structure theory, financing policy; capital structure

JEL classification: G30, G32, M48

1. Introduction

Miller and Modigliani identified conditions in which capital structure becomes irrelevant and noted that as we depart from these conditions capital structure irrelevancy does not hold. To explain how managers view and incorporate these conditions in making capital structure decisions a number of theories have emerged to link market conditions to capital structure. As market conditions have changed over time, such as tax regulation, we should consider the possibility that the strength of each theory to explain capital structure decisions may change with a change in market conditions.

In over fifty years since Miller and Modigliani's (MM) pre-eminent work on capital structure three theories lead the way in explaining observed capital structure. The three front runners: the pecking-order theory, trade-off theory, and the market-timing theory all offer plausible arguments for capital structure formation. Fama and French (2005) go so far as to say that elements of both the trade-off theory and pecking-order theory explain firm financing. Leary and Roberts (2010) append the work of Fama and French, noting that the pecking-order theory's ability in predicting financing decisions is enhanced with the inclusion of factors specified by the trade-off theory. However, despite the empirical evidence in support of the three theories, comparative testing within the literature yields a number of diverging conclusions. For example, Baker and Wurgler (2002) report persistence in capital structure in support of their market-timing theory; whereas, Huang and Ritter (2009) note "moderate" adjustments in capital structure and Flannery and Rangan (2006), along with Faulkender et al. (2007) find regular adjustments that support the trade-off theory.

The majority of empirical studies examine the pecking-order theory relative to the trade-off theory as the market-timing theory was branded relatively recently by Baker and Wurgler (2002). The capital structure literature of the seventies and early eighties typically examines optimal capital structure factors in a trade-off framework and partial adjustments to leverage, with few papers attempting to reconcile capital structure irrelevance. With Myers (1984) branding of the pecking- order theory, a setting formed where a trade-off model could be compared with a pecking-order model, as Myers contends that firms do not have an optimal debt ratio. Shyam-Sunder and Myers (1999) (from herein SSM), offer empirical evidence of the pecking-order theory by demonstrating the ability of the model to predict financing decisions. The SSM model employs a two-step approach. The first step estimates the quantity of internal funds available to the firm with the aim of singling out those firms with a funding deficit, as firms that generate an internal funds deficit will need to seek external funding. In the second step, a debt issuance will occur if the firm encounters a financing deficit. SSM find that within their sample of 157 firms that are continually listed over a period of 1971 to 1989, a pecking-order explains finance decisions for the majority of debt issuances. However, the SSM model fails to address instances of equity issuance and repurchase, only to say that factors such as information asymmetries and financial distress will push a firm toward equity use.

Shortly after SSM's findings, Chirinko and Singha (2000) call attention to the shortcomings of the SSM test, specifically questioning the ability of the SSM model to differentiate debt issuances driven by the pecking-order theory versus a trade-off approach. Additionally, Chirinko and Singha (2000) point to the model's lack of consideration for equity issuance, though offering no suggestions other than that alternative testing should be used. Notwithstanding this criticism and despite Chirinko and Singha's position, a large amount of current literature continues to use the SSM test in empirical analysis.

Myers and Maljuf (1984), as well as SSM note that an equity issuance may occur when

firms face great information asymmetries and financial distress costs. Myers and Maljuf (1984) identify two factors as determinants within a modified pecking-order framework. Studies such as Helwege and Liang (1996) and Fama and French (2005) address the influence of financial distress on debt and equity issuance. Fama and French (2005) find mixed evidence in support of the pecking-order and trade-off theory, and Helwege and Liang (1996) report that their findings do not support the pecking-order theory. Bharath et al. (2009) extend the SSM pecking-order test by incorporating an implied measure of information asymmetry, finding that increasing information asymmetry increases the cost of debt. However, information asymmetry can be beneficial to the firm. In Baker and Wurgler's (2002) market-timing theory, firm managers with superior information take advantage of information asymmetries by selling overvalued equity to outside investors. A similar example can be found in Ikenberry et al. (1995), who document equity repurchases in a manner that suggests managers repurchase when the firm is undervalued. Hence, managers may not obtain funding via equity issuance, due to a high premium demand on debt but rather equity issuance can be the result of overvalued stock.

Information asymmetry does not always increase the firm's cost of capital, as the cost of capital can be lower than the fair value as a result of information asymmetry. A point Huang and Ritter (2009) capture in their assessment of the equity risk premium. Furthermore, agents with goals asymmetric to firm claimants may promote asymmetries that facilitate the agent's wealth maximization. Such agents may be apt to debt issuance over equity to retain voting control (Novaes and Zingales 1995). Also, since Bharath et al. (2009) do not control for other factors such as agency costs, further investigation is needed.

Additional influencing factors of capital structure are corporate tax rates and reporting requirements. Two such notable events are the Tax Reform Act of 1986 and FASB Statement of Financial and Accounting Standards no.95 (1987). The Tax Reform Act of 1986 eliminated a number of tax shelters while lowering the corporate tax rate – this substantial change in tax regulation could influence a firm's use of debt as a result of the shrinking tax shelter. FASB statement no.95 brought about the transition of required cash flow reporting (Statement of Cash Flows) from fund flow reporting (Funds Statement/Sources and Uses of Funds, 1971-87).

This analysis revisits various tests of capital structure and expands on the prior tests with the inclusion of theory specified factors such as information asymmetry, bankruptcy risk, and agency cost. We obtain estimates to see if the theory specified factors improve prediction accuracy, as well assess for inaccurate predictions or "failures." The evidence suggests that the pecking-order is not a separate approach of capital structure, rather a special condition of the trade-off theory induced by conditions of tax and accounting regulation, as support for the model dramatically declines after 1987. The findings lend support for the trade-off model as the predominant method for capital structure selection relative to the pecking-order theory after 1987.

The remaining sections of the paper include a discussion of the data and analytical strategy used in the paper in section 2, followed by the methodology for testing theories of capital structure and the empirical results in section 3. Section 4 provides an examination of the speed of adjustment under capital structure theory and empirical tests and results, followed by a conclusion in Section 5.

2. Data and Analytical Strategy

Maintaining consistency with prior research we employ firm-level data from Compustat, CRSP, FRED, IBES, and Valueline databases over the period of 1965 to 2010. To maintain consistency with prior studies (e.g. Leary and Roberts 2010; Frank and Goyal 2003; Bharath, Pasquariello, and Wu 2009), utility firms with SIC codes (4900-4999) and financial firms with codes (6000-6999) are excluded from the analysis. Regulated firms face constraints that non-regulated firms do not and such restraints change the manner by which firms arrange financing (Berger and Patti 2006; Frank and Goyal 2009). In addition, Smith and Watts (1992) examine firm financial-policy and report that including regulated firms in their regressions results in noise. Firms with format code 4, 5, 6, are removed from the sample, as codes 4 and 6 are unspecified, 5 designates Canadian firms, exchange codes 7, 8, and 9 identify stocks traded on Canadian exchanges, and AB denotes firms involved in major mergers. As well, FASB financial account standards-94 requires financial reporting consolidation of all major subsidiaries. Prior to this rule change, firms used subsidiaries to place debt off the balance sheet. During the reporting transition firms experience a dramatic increase in debt relative to assets, therefore the observation for the firm is excluded for the year of transition. To moderate the impact of errors and outliers the data are windsorized by excluding the upper and lower 0.5 percent of each variable, as well for firms worth less than $15 million in 2000 purchasing power. As research and development expense is missing for more than 40 percent of the sample, the missing values are replaced with zero - Huang and Ritter (2009) and others employ this strategy to address missing values in research and development. In addition, data are manually entered from 10-K reports for firms that are present in the data for ten years or more with missing values. A unique data strategy is used to retain the data with respect to industry classification by cross-reference of SIC and NAICS codes, as well as manual entry of missing values.

The analysis is in two parts. The first part of the analysis revisits tests of capital structure theory. We estimate previously proposed models and then isolate for instances that are predicted incorrectly. The inaccurate predictions of each test are identified and categorized by type of error, such as a failure to predict a capital structure change, predicted change that did not occur, and other test failure. The purpose of this approach is to identify what firm and industry characteristics are common to successful and unsuccessful tests of capital structure theories. By identifying the shared characteristics that differentiate accurate from inaccurate predictions, we should see how each capital structure theory applies to empirical observation as well as where each theory falls short.

The variables used in each model are common characteristics taken from the capital structure literature. Variables are created according to the variable definitions of Leary and Roberts (2010). Long-term leverage values are formed by removing current debt. The trade-off, pecking-order, and market-timing theories identify factors believed to explain the financing decisions of firms; in addition, factors such as firm size, industry, macro-economic descriptors and more, that have been reported as determinants of capital structure are employed (Frank and Goyal 2009). Table 1 provides variable summary statistics of the mean, quartile, and standard deviation. The mean, median (50th percentile), as well as standard deviation values are useful for assessing variable distribution and skew such that if the mean is greater (less) than the median there is a right (left) skew in a uni-modal distribution. In table 1, market leverage is skewed to the right since the mean is greater than the median. Values reported in table 1 are non-normalized; normalizing is addressed in section three, testing the trade-off theory.

Table 1: Table 1 Summary statistics

	Mean	St.Dev.	25th Percentile	Median	75th Percentile
Market leverage (all-debt)	0.264	0. 232	0.065	0. 210	0.411
Market leverage (long-term debt)	0.201	0. 198	0.028	0. 148	0.317
Book leverage (all-debt)	0.229	0. 177	0.085	0. 213	0.335
Book leverage (long-term debt)	0.178	0. 161	0.037	0. 153	0.269
Log of assets	5.151	1. 949	3.718	5. 006	6.453
Agency costs	10.640	1. 380	9.948	10. 894	11.321
Information asymmetries	6.380	0. 664	6.018	6. 434	6.694
BSM default risk/cost	37.809	8. 551	25.718	37. 219	46.078
Firm uniqueness	5.378	1. 189	4.503	5. 231	6.178
Capex ratio	0.064	0. 061	0.026	0. 048	0.082
Two year price change	0.326	2. 037	-0.269	0. 084	0.536
Profit	0.096	0. 237	0.043	0. 107	0.172
Market to book	1.590	1. 520	0.925	1. 205	1.735
Tangible assets to debt	3.091	10. 766	1.643	2. 169	3.134
Average tax rate of EBIT	0.332	0. 153	0.346	0. 351	0.458
Average tax rate of EBT	0.308	0. 170	0.338	0. 351	0.452
Difference in the EBT from EBIT	0.024	0. 089	0.000	0. 000	0.001
Non-debt tax shields	137.916	675. 615	3.148	11. 901	52.472
Debt premium	0.011	0. 004	0.008	0. 010	0.013
Term spread	0.017	0. 011	0.010	0. 018	0.028
Interest coverage	38.137	712. 066	0.949	3. 909	10.263
Tax loss	30.351	289. 720	0.000	0. 000	0.404
Fund flow deficit	35.414	631. 251	-3.259	2. 133	16.140

Descriptive values are non-normalized, variables such as non-debt tax shield are adjusted for within the investigation.

Table 2 provides a summary of industry observations for each sub-period of the study - the analysis employs a sample of 57,220 observations with sub-period of 1970-85 including 17,481 observations, 24,746 in 1986-00, and 14,993 in the last ten years of the study. Variable descriptions are provided in the appendix in Table 1A.

Table 2: Table 2 Summary of observations by time period and industry

	1970-1985	1986-2000	2001-2010	Total
Agriculture	50	53	26	129
Aircraft	251	185	112	548
Apparel	590	541	255	1,386
Automobiles and Trucks	643	541	257	1441
Beer and Liquor	136	138	83	357
Boxes and Shipping Containers	341	237	54	632
Business Services	655	1,812	1,704	4,171
Candy and Soda	152	124	118	394
Chemicals	705	717	406	1828
Coal	58	62	30	150
Communication	151	289	288	728
Computers	435	1,029	550	2014
Construction	222	200	146	568
Construction Materials	1,285	1,181	430	2,896
Electrical Equipment	358	1,003	501	1,862
Electronic Equipment	1,040	1,807	1,283	4,130
Fabricated Products	161	174	63	398
Food and Food Products	615	659	341	1,615
Fun and Entertainment	96	192	211	499
Guns and Defense	41	71	50	162
Healthcare	46	331	274	651
Household Consumer Goods	886	894	371	2,151
Machinery	1,127	1,446	835	3,408
Measuring and Control Equip.	426	888	464	1,778
Medical Equipment	231	976	660	1,867
Mining-Industrial, Non-metallic	138	159	75	372
Mining-Precious Metals	48	139	58	245
Paper Business Supplies	401	507	303	1211
Personal Services	174	203	199	576
Petroleum and Natural Gas	963	1,553	759	3275
Pharmaceutical Products	371	634	485	1,490
Printing and Publishing	249	428	198	875
Restaurants, Hotels	326	700	411	1,437
Retail	1,177	1,416	1,013	3,606
Rubber and Plastic Products	263	366	152	781
Shipbuilding and Railroad Equip.	28	16	13	57
Steel Works Etc	654	538	292	1,484
Textiles	498	283	94	875
Tobacco Products	107	39	28	174
Toys and Recreation Goods	331	370	157	858
Transportation	331	346	286	963
Wholesale	721	1,499	958	3,178
Total	17,481	24,746	14,993	57,220

Industries defined using Fama-French 48 industry code

3. Testing Theories of Capital Structure

3.1 The Pecking-Order Tests

Following prior literature we begin our analysis with the basic pecking-order test of SSM. This analysis provides a baseline comparison and will allow for the SSM model, which employs a two- step approach. The first stage identifies firms with a funding deficit.

$$DEF_{it} = DIV_{it} + X_{it} + \delta W_{it} + R_{it} - C_{it} \quad (1)$$

The funding deficit is a summed value of cash out flows for the firm less cash inflows, where:

DIV_{it} = dividend payments
X_{it} = capital expenditures
δW_{it} = net change in working capital
R_{it} = current portion of long-term debt at start of period
C_{it} = operating cash flows after interest and taxes

The second stage obtains an estimate that indicates if a firm changes its quantity of debt. SSM note that under a strict pecking-order, a firm will sell securities to raise capital only when internal funds are exhausted. SSM note that if the supply of debt is inexhaustible, firms will not seek external capital according to the pecking-order theory. Hence, their model does not consider/predict equity issuance.

$$\delta D_{it} = \alpha + b_{P\,O} DEF_{it} + s_{it} \quad (2)$$

δD is the amount of debt issued. If DEF is negative, SSM expect $\alpha = 0$ and $b_{P\,O} = 1$.

As Chirinko and Singha (2000) and others criticize SSM's comparison of the pecking-order model power (R^2) with that of a trade-off model, we focus on the predictive ability of each model. The first stage of the SSM model will be used to as a pointer of claim issuance. Again, under the strict pecking-order, firms will issue only debt. We simplify the investigation by testing the first step of the SSM model. That is, we test if a fund flow deficit leads to acquiring debt. The predictions are also evaluated for instances when the model fails, that is, under what circumstances does the model perform well versus bad, and is there a transition of successful prediction to failure. Does the model seem to capture a period of success, chiefly 1971 to 1987? During the 1971 to 1987 period, GAAP required firms to report Sources and Uses of Funds; after this period firms were to report a Statement of Cash Flows per FASB statement no. 95 and were required to do so for fiscal years ending after July 1988. The emphasis on fund flow reporting changed to cash flow by 1989, and it is likely the method of fund flow reporting contributed to the success of the pecking-order model over the 1971 to 1989 time period. The move to cash flow perhaps provided managers and investors with improved guidance, clarification, and transparency. In addition, the Tax Reform Act of 1986 eliminated a number of tax shelters while bringing about a decline in the corporate tax rate and enactment of the alternative minimum tax – this substantial change in tax regulation could influence a firm's use of debt as a result of the declining tax shelter. Table 3 presents the mean of the sample's average tax rate for pre-1987 and post 1987. Table 4 presents the average tax rate of EBIT and EBT for each year over the sample period. Note the decline in the per dollar tax liability from 1970 through 2010.

Table 3: Table 3 Descriptive statistics of average tax rates pre and post 1987

	Average Tax Rate of EBIT		Average Tax Rate of EBT	
	Pre-1987	Post-1987	Pre-1987	Post-1987
Mean	41.1%	28.8%	38.2%	26.7%
St.Dev.	14.3%	13.9%	17.3%	15.3%
25th Percentile	46.0%	35.0%	46.0%	35.0%
Median	45.5%	34.0%	42.6%	22.9%
75th Percentile	47.9%	35.2%	47.8%	35.2%

Three conditions of model failure are examined with regard to the modified pecking-order, thus allowing for equity issuances with a funding deficit. The three types of model failure of interest are: 1) the model predicts a debt issuance that does not occur, 2) the model fails to predict a debt issuance, and 3) an equity issuance (pure) occurs in the absence of a funding deficit.[1]

The type 1 failure may be the result of two possibilities. A type 1 failure may occur when the prediction of a debt issuance is premature and the debt issuance occurs in the following period. Should the prediction be premature, we do not consider this a true failure of the model and reclassify the error as an imputed prediction. The second variety of a type 1 error is when an equity issuance occurs instead of a debt issuance. If an equity issuance occurs in place of a debt issuance, we try to assess which factor(s) result in debt being disregarded.

The type 2 error, defined as taking on debt without an immediate need as determined by the SSM model, can have many implications. For instance, the firm may want to readjust towards some target leverage, repurchase equity, obtain low-cost cash, signal the market, or access funding to grow the firm. The type 3 error is a violation of the strict pecking-order model as equity issuances should not occur (Shyam-Sunder and Myers 1999). As previously noted, a type 1 error could be the result of an equity issuance when a debt issuance is signaled. The type 3 error differs, occurring in those instances when an equity issuance occurs without a signal from the SSM model, i.e., there is not a fund-flow deficit. The type 3 error is not viewed as complying with the strict pecking-order, but it may conform with the views of the modified pecking-order, so the question is, what theory best fits the equity issuance? The market-timing theory is characterized by a manager that raises funds with an equity issuance when the market price has experienced a run up. The trade-off theory indicates that the manager adjusts the firm's capital structure towards the target leverage.

To test the type 3 error, the target leverage for each firm is estimated. An adjustment in the direction of target leverage is a beginning point towards evidence. In order to make a plausible argument for the trade-off theory, factors such as tax liability relative to risk of default, industry growth, and firm growth need to be considered. Differentiation between an issuance following the market-timing and trade-off theories can be indistinguishable in a single issuance. A similar point is made by Chirinko and Singha (2000) with regard to the pecking-order and trade-off theories. Only in a longitudinal setting can the differentiation be made, i.e., if a firm regularly moves towards the target leverage it is probable that the firm exhibits a trade-off financing regime. The firm that infrequently moves toward the target leverage and only does so

[1] A firm participates in a "pure" equity (debt) issuance when only an equity (debt) issuance for the year and a debt (equity issuance) does not occur.

during an equity price run-up, is likely a market-timing firm. Thus, firms that appear to exhibit patterns of both financing regimes in cross-sectional testing will be assessed in a longitudinal setting to identify continued patterns of financing decisions.

Table 4: Table 4 Mean tax rates by year

	Average Tax Rate of EBIT	Average Tax Rate of EBT
1970	44.0%	41.8%
1971	43.6%	41.0%
1972	44.9%	43.1%
1973	46.1%	44.5%
1974	45.1%	42.7%
1975	44.0%	41.1%
1976	44.9%	43.3%
1977	45.0%	43.1%
1978	45.5%	43.6%
1979	43.4%	40.9%
1980	42.5%	39.2%
1981	42.2%	38.5%
1982	39.0%	34.3%
1983	38.7%	35.2%
1984	39.1%	35.3%
1985	37.4%	33.3%
1986	35.7%	32.2%
1987	32.0%	29.0%
1988	31.3%	28.3%
1989	31.2%	28.0%
1990	31.4%	27.9%
1991	30.4%	27.0%
1992	31.7%	28.8%
1993	28.2%	26.1%
1994	28.7%	26.9%
1995	28.9%	26.9%
1996	29.3%	27.4%
1997	28.7%	26.9%
1998	27.9%	26.2%
1999	28.1%	26.1%
2000	27.9%	25.9%
2001	26.5%	23.8%
2002	27.2%	25.3%
2003	27.4%	25.4%
2004	29.2%	27.9%
2005	29.1%	27.7%
2006	29.0%	27.7%
2007	28.6%	27.3%
2008	26.9%	25.6%
2009	26.6%	24.5%
2010	29.2%	28.3%
Total	33.2%	30.8%

3.2 Testing the SSM Pecking-Order Model

Table 5 provides the sample statistics and prediction results of the SSM pecking-order model's ability to predict a debt or equity issuance. Column 2 reports the number of firms in the sample by year. Column 3 (debt issuance) reports the number of debt issuances per year. Column 4 notes the number of equity issuances per year. Following prior studies, debt (equity) issuance is defined as an increase in debt (equity) by more than 5 percent of beginning of year assets (Hovakimian, Opler, and Titman 2001; Huang and Ritter 2009; Leary and Roberts 2010). Note that over the sample period the ratio of debt issuance to equity issuances generally declines over time [1973: 643 to 128 (5.02) versus 2009: 359 to 378 (.95)].

Column 5 identifies the number of firms where both debt and equity issuances occur during a given year. The values of column 5 are included in columns 3 and 4, hence the number of pure debt issuances is found by subtracting column 5 from column 3 – the number of pure equity issuances is found by subtracting column 5 from column 4. Column 6 reports the number of funding deficits as indicated by the SSM pecking-order model, where equation (1) results in a value of zero or greater indicating a fund flow deficit. Column 7 reports the number of correct (debt issuances) predictions made by the SSM pecking-order model, and column 8 presents the proportional accuracy relative to the total number of funding deficits. Over the sample period the accuracy of the pecking-order relative to the funding trigger is relatively consistent with an average accuracy of 53.8 percent. Column 9 reports type one errors (model predicts a debt issuance that does not occur) and column 10 reports the number of type two errors (model fails to predict a debt issuance). The proportion of type two errors relative to the number of equity issuances is presented in column 11. Within columns 10 and 11 there are two changes in the findings worth noting. The first is the change from 1987 to 1988 and the second is 1991 to 1992, in both instances there are large increases in the number of debt issuances that the pecking-order model fails to predict. Similarly, there is an increase in the number of type three errors (pure equity issuances occurring in the absence of a funding deficit); the type three errors are presented in column 12.

3.2.1 Relaxing the Fund Flow Deficit Definition

A strong argument could be made that firms do not respond to a strict fund flow deficit; therefore firms may reach or anticipate a trigger point that results in the firm seeking external funding. To account for this the fund flow deficit definition is relaxed. Two methods of relaxing the constraint are performed; the first relaxed the sample by a set dollar amount and the second relaxed by an amount proportional to assets. Both methods produce similar results; hence we only present the set dollar amount.

The sample was relaxed by set increments of $0.5 million up to $5 million in 1970 dollars to account for the time value of money and then added to the fund flow deficit value. Note that adding the incremental values to the right hand side is algebraically equivalent to subtracting it from the left hand side and does not change the analysis.[2]

Relaxing the trigger threshold does increase the number of accurate predictions relative to the values reported in column 7 and 8 of Table 5, as well as decrease the number of type two errors observed. However, type one errors increase proportionally to the improvements in predictive accuracy. To measure the relative accuracy of the predictions we divide the number of accurate debt predictions, by the total number of debt predictions made by the model – this

[2] As an example: the threshold of 0 relative to X+5 versus threshold of -5 relative to X.

Table 5: Sample statistics and predictions of SSM pecking order model

Year	Number of firms	Debt issuance	Equity issuance	Issue en masse	Number of funding deficits	Debt issued w/ deficit	Accuracy of SSM model	Type 1 error	Type 2 error	% Type 2 error	Type 3 error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1970	680	362	136	92	553	325	58.8%	228	37	10.2%	18
1971	738	351	149	73	661	331	50.1%	330	20	5.7%	7
1972	802	443	169	97	701	421	60.1%	280	22	5.0%	17
1973	871	643	128	91	767	590	76.9%	177	53	8.2%	15
1974	950	625	114	83	832	583	70.1%	249	42	6.7%	9
1975	1003	338	122	55	802	305	38.0%	497	33	9.8%	13
1976	1052	568	152	86	848	496	58.5%	352	72	12.7%	26
1977	1153	717	180	108	951	624	65.6%	327	93	13.0%	27
1978	1170	842	210	155	973	729	74.9%	244	113	13.4%	19
1979	1146	792	225	168	990	710	71.7%	280	82	10.4%	21
1980	1113	613	265	171	961	558	58.1%	403	55	9.0%	20
1981	1092	572	311	186	920	510	55.4%	410	62	10.8%	26
1982	1060	418	191	95	876	366	41.8%	510	52	12.4%	17
1983	1573	782	491	243	1,297	674	52.0%	623	108	13.8%	67
1984	1555	888	309	189	1,241	737	59.4%	504	151	17.0%	57
1985	1523	743	341	177	1,257	649	51.6%	608	94	12.7%	60
1986	1513	738	404	209	1,207	621	51.4%	586	117	15.9%	75
1987	1473	817	350	205	1,110	657	59.2%	453	160	19.6%	82
1988	1497	803	274	155	951	541	56.9%	410	262	32.6%	105
1989	1502	777	308	154	971	529	54.5%	442	248	31.9%	105
1990	1548	761	272	152	1,009	527	52.2%	482	234	30.7%	94
1991	1661	647	369	169	1,071	437	40.8%	634	210	32.5%	154
1992	1748	806	468	221	1,009	491	48.7%	518	315	39.1%	207
1993	1750	874	488	244	1,023	536	52.4%	487	338	38.7%	220
1994	1755	985	456	273	993	576	58.0%	417	409	41.5%	199
1995	1753	937	497	315	951	538	56.6%	413	399	42.6%	247
1996	1771	880	567	331	975	523	53.6%	452	357	40.6%	241
1997	1734	910	527	312	910	496	54.5%	414	414	45.5%	246
1998	1721	976	455	302	950	562	59.2%	388	414	42.4%	219
1999	1675	896	458	289	905	470	51.9%	435	426	47.5%	212
2000	1645	770	479	257	812	417	51.4%	395	353	45.8%	237
2001	1655	567	471	213	912	327	35.9%	585	240	42.3%	219
2002	1700	679	449	212	853	360	42.2%	493	319	47.0%	219
2003	1756	731	544	262	775	338	43.6%	437	393	53.8%	307
2004	1780	959	672	377	718	406	56.5%	312	553	57.7%	395
2005	1745	875	565	344	750	410	54.7%	340	465	53.1%	317
2006	1645	873	569	344	692	381	55.1%	311	492	56.4%	296
2007	1536	826	472	285	713	412	57.8%	301	414	50.1%	244
2008	1469	637	315	159	715	323	45.2%	392	314	49.3%	157
2009	1392	359	378	106	674	174	25.8%	500	185	51.5%	199
2010	315	136	80	45	111	52	46.8%	59	84	61.8%	54
Tot/ave	57220	28916	14380	8004	36390	19712	53.8%	16678	9204	31.8%	5469

Column (1) identifies the year. Column (2) provides the total number of firms within the sample for each year of the panel data. Column (3) notes the number of debt issuances by year. Column (4) notes the number equity issuances by year. Column (5) identifies the number of firms that issue both debt and equity, these values are included in columns (3) and (4). Column (6) indicates the number of firms experiencing a funding deficit as defined in Shyam-Sunder and Myers (1999). Column (7) identifies the number of firms that issued debt in response to a funding deficit that is those firms that conform to SSM's pecking order definition. Column (8) reports the proportional accuracy of SSM's pecking order model [Column (7) / Column (6) = Column (8)]. Column (9) reports the number of type one errors, the type 1 error refers to instances where a firm does not issue debt when a funding deficit occurs [Column (6) - Column (7) = Column (9)]. Column (10) reports the number of type two errors, the type 2 error refers to instances where a firm issues debt without encountering a funding deficit. Column (11) reports the percentage of type two errors that occur relative to all debt issuances [Column (10) / Column (3) = Column (11)]. Column (12) reports the number of type 3 errors, where firms issue equity without the impetus of a funding deficit.

is equivalent to dividing accurate predictions by accurate predictions plus inaccurate predictions (type one errors). Figure 1 plots the predictive accuracy of the SSM model specification versus the relaxed model at values of $0.5m, $1m, $2m, and $5m in 1970 dollars.[3]

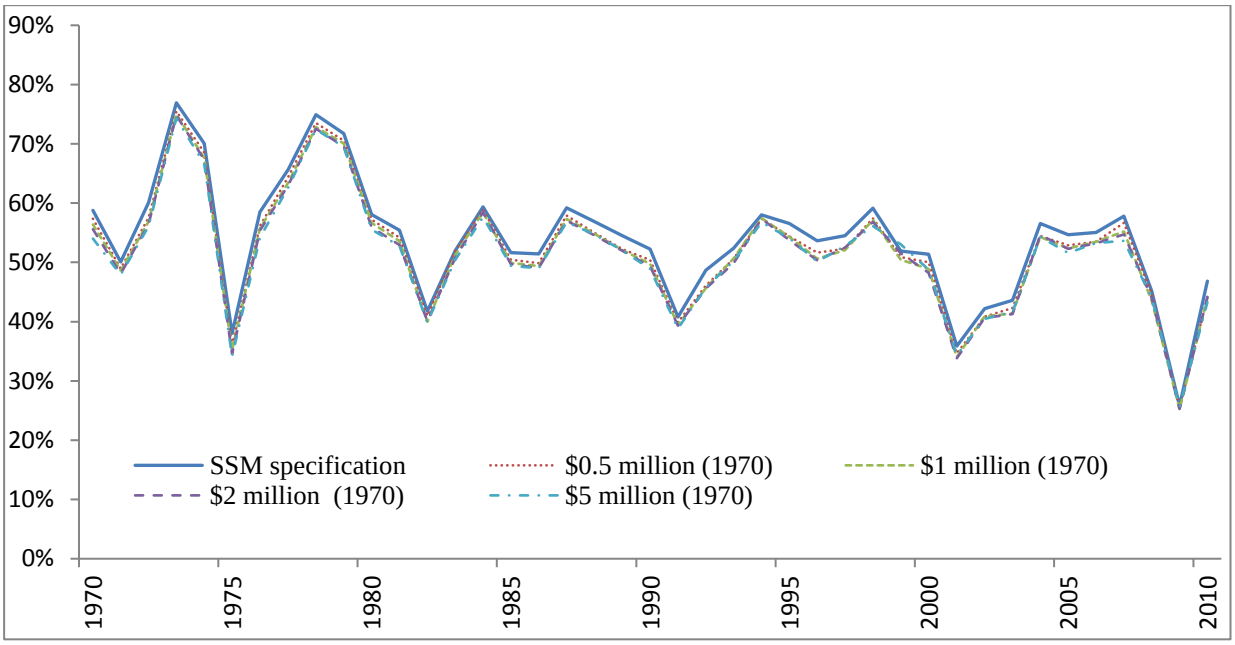

Figure 1. Accuracy of Shyam-Sunder and Myers pecking order specification.

The main result of relaxing the model is that the model does not improve when accounting for false predictions. When allowing for equity predictions under funding deficit, the accuracy increases towards the simulated values of Leary and Roberts (2010). However, once inaccurate predictions are accounted for the accuracy declines to those stated in this study. This finding empirically documents the point made by Chirinko and Singha (2000). We therefore conclude that relaxing the threshold of the external funding trigger does not improve model performance. The second notable finding is the observance of declining accuracy. During the period of 1970 to 1987 the pecking-order performance is relatively flat and declines after 1987. The decline in accuracy is supported by the prior observance of increasing type two and type three errors post-1987. It is also worthy to note that this observation is relatively consistent with the report of SSM who note a better sample fit over the period of 1971 to 1984 versus 1971 to 1989.

3.3 Determinants of Model Errors

Multilevel panel regressions that allow for firm and industry-level heterogeneity are employed to examine determinants of model errors. Although the estimates of the pecking-order model are determined using book-value data, both market and book-value data are used to examine model errors. As the prior results have shown time-varying changes in type one, two, and three errors, the data are estimated over three time periods.

Table 6 presents the panel regressions for type one errors. All of the determinants are

[3] Adjusting for inflation $5m in 1970 is equivalent to $23.1m in 2010.

observed as being statistically significant in one or more periods with the exception of firm uniqueness. The random components allowing for firm and industry heterogeneity are significant at the .01 level or better for the first two periods and not in the third. The lagged leverage is inversely related to a type one error, signifying that higher leverage firms are more likely to comply with the pecking- order model – this also applies to the change in firm equity value, profit, and tangible assets to debt ratio.

Table 6: Panel regressions of type one errors - model predicted debt issuance that does not occur

	Market Leverage			Book Leverage		
	1970-1985	1986-2000	2001-2010	1970-1985	1986-2000	2001-2010
Constant	0.4103	1.7089	0.2820	0.1716	1.8691	0.4337
	(.312)	(.313)***	(.353)	(.322)	(.323)***	(.361)
Ln Assets (t-1)	-0.0386	-0.0272	-0.0144	-0.0426	-0.0202	-0.0072
	(.012)**	(.010)**	(.014)	(.012)***	(.011)†	(.014)
Agent (t-1)	-0.0112	0.0397	0.0702	-0.0106	0.0376	0.0659
	(.015)	(.014)**	(.017)***	(.015)	(.014)**	(.017)***
Asymmetry (t-1)	-0.0329	0.0352	0.0806	-0.0346	0.0323	0.0766
	(.024)	(.032)	(.035)*	(.024)	(.033)	(.035)*
BSM Prob (t-1)	-0.0272	-0.0493	-0.0434	-0.0268	-0.0483	-0.0424
	(.002)***	(.002)***	(.003)***	(.003)***	(.002)***	(.003)***
Firm Uniqueness (t-1)	0.0003	0.0166	0.0296	-0.0014	0.0164	0.0306
	(.017)	(.056)	(.019)	(.017)	(.016)	(.019)
Leverage (t-1)	-0.6739	-0.7957	-0.8222	-1.6215	-1.5493	-1.5543
	(.123)***	(.106)***	(.146)***	(.168)***	(.129)***	(.179)***
Mean Industry Leverage (t-1)	1.3420	1.1570	1.0912	2.6131	0.6594	0.7868
	(.271)***	(.346)***	(.328)***	(.512)***	(.438)	(.427)†
CapEx (t-1)	-9.3743	-6.3170	-5.4815	-9.1457	-6.2171	-5.4278
	(.446)***	(.337)***	(.454)***	(.443)***	(.338)***	(.469)***
Price (t-2)	-0.1262	-0.0507	-0.0947	-0.1084	-0.0369	-0.0789
	(.026)***	(.014)***	(.028)***	(.025)***	(.014)**	(.026)**
Profit (t-1)	-1.0797	-1.1054	-0.1321	-1.1476	-1.1468	-0.1472
	(.203)***	(.111)***	(.099)	(.203)***	(.111)***	(.108)
Market to Book (t-1)	-0.1583	-0.1342	-0.1372	-0.1601	-0.1350	-0.1302
	(.316)***	(.016)***	(.020)***	(.030)***	(.015)***	(.019)***
Tangible Assets to Debt (t-1)	-0.0196	-0.0294	-0.0569	-0.0204	-0.0389	-0.0686
	(.007)*	(.005)***	(.009)***	(.008)*	(.006)***	(.009)***
Debt Tax Shield (t-1)	0.8632	0.7883	0.6943	0.9420	0.9049	0.8557
	(.178)***	(.189)***	(.313)*	(.177)***	(.188)***	(.313)**
Non-Debt Tax Shield (t-1)	1.5696	0.0600	1.5993	1.5631	0.0565	1.5820
	(.338)***	(.047)	(.278)***	(.334)***	(.046)	(.278)***
Debt Premia	85.7084	-6.5839	41.1556	89.0686	4.4372	42.1197
	(4.79)***	(8.620)	(7.839)***	(4.770)***	(8.133)	(7.807)***
Term Spread	14.4978	0.8412	7.5077	12.0268	-0.0579	6.8892
	(1.619)***	(1.888)	(2.561)**	(1.516)***	(1.881)	(2.566)**
Interest Coverage (t-1)	-0.0001	0.0000	0.0001	-0.0929	-0.0001	0.0002
	(.000)	(.000)	’(.000)†	(.030)**	(.000)	(.000)
Leverage (t-5)	0.6161	0.7477	0.5391	1.5726	1.0351	0.8657
	(.099)***	(.094)***	(.133)***	(.153)***	(.115)***	(.157)***
Tax Loss (t-1)	0.0016	0.0004	-0.0001	0.0017	0.0004	-0.0001
Random Components	(.001)*	(.000)*	(.000)	(.001)**	(.000)*	(.000)
Firm level	0.2253	0.2550	0.1486	0.1857	0.2524	0.1666
	(.033)***	(.029)***	(.054)	(.060)***	(.030)***	(.122)
Industry level	0.2000	0.1648	0.0654	0.1640	0.1655	0.0774
	(.051)***	(.051)***	(.135)	(.030)***	(.030)***	(.053)
Log likelihood	-9022.87	-9425.26	-4863.08	-8973.75	-9384.71	-4840.86
Model Comparison Likelihood ratio	59.68	68.53	0.90	40.06	65.99	1.38
χ^2	0.0000	0.0000	0.6377	0.0000	0.0000	0.5018

Denotes significance *** ≤ .001, ** ≤ .01, * ≤ .05, and † ≤.10 level. Random component significance level calculated according to Buis (2007). The likelihood ratio compares the model versus the null specification.

Type two errors, where the model fails to predict a debt issuance, are most consistently associated with firm size, firm leverage, capital expenditures, and firm profit. The estimates are reported in Table 7. The results indicate that the larger and more profitable firms that invest in growing fixed assets are more likely to use a debt issuance when a fund flow deficit has not occurred. These findings are consistent with the prior findings of Long and Malitz (1985), Rajan and Zingales (1995), and Kayhan and Titman (2007) who observe firm profitability is linked with future debt consumption. Factors such as interest coverage and tangible assets to debt, as well as macroeconomic factors such as term spread do not consistently influence firms issuing debt in the absence of a deficit.

Table 7: Panel regressions of type two errors - model fails to predict debt issuance

	Market Leverage			Book Leverage		
	1970-1985	1986-2000	2001-2010	1970-1985	1986-2000	2001-2010
Constant	1.0350	-0.4066	-0.3480	1.0624	-0.5235	-0.3187
	(.159)***	(.105)***	(.115)**	(.175)***	(.122)***	(.127)*
Ln Assets (t-1)	0.0992	0.0954	0.0836	0.1009	0.1021	0.0956
	(.014)***	(.011)***	(.012)***	(.014)***	(.011)***	(.012)***
Agent (t-1)	0.0740	0.0011	0.0047	0.0601	-0.0141	-0.0090
	(.164)***	(.012)	(.013)	(.016)***	(.012)	(.013)
Asymmetry (t-1)	0.0393	0.0285	-0.0359	0.0339	0.0218	-0.0584
	(.024)	(.029)	(.027)	(.024)	(.029)	(.027)*
BSM Prob (t-1)	-0.0032	0.0019	0.0037	-0.0029	0.0024	0.0030
	(.002)	(.001)	(.002)†	(.002)	(.002)	(.002)
Firm Uniqueness (t-1)	0.0402	-0.0070	-0.0443	0.0554	-0.0098	-0.0424
	(.017)*	(.014)	(.016)**	(.017)**	(.014)	(.016)**
Leverage (t-1)	-3.1649	-3.0654	-2.9394	-4.1711	-3.3958	-2.7931
	(.143)***	(.116)***	(.150)***	(.207)***	(.134)***	(.164)***
Mean Industry Leverage (t-1)	0.9274	0.1584	0.1926	0.0512	0.5348	-0.2654
	(.276)***	(.281)	(.267)	(.522)	(.369)	(.360)
CapEx (t-1)	3.5473	2.3725	2.3681	4.8805	3.0624	2.8114
	(.373)***	(.273)***	(.359)***	(.382)***	(.276)***	(.358)***
Price (t-2)	0.1235	0.0229	0.0355	0.1056	0.0283	0.0417
	(.027)***	(.008)**	(.014)*	(.026)***	(.010)**	(.015)**
Profit (t-1)	2.6533	1.5391	1.4599	3.1363	1.8687	1.7373
	(.230)***	(.104)***	(.126)***	(.231)***	(.107)***	(.130)***
Market to Book (t-1)	-0.1594	0.0023	0.0314	0.0180	0.0637	0.0910
	(.030)***	(.009)	(.013)*	(.033)	(.011)***	(.014)***
Tangible Assets to Debt (t-1)	0.0023	0.0143	0.0533	0.0020	0.0097	0.0432
	(.001)	(.004)***	(.007)***	(.001)	(.003)**	(.007)***
Debt Tax Shield (t-1)	0.1393	-0.0147	-0.0928	0.0860	-0.1186	-0.2187
	(.087)	(.066)	(.094)	(.086)	(.064)†	(.090)*
Non-Debt Tax Shield (t-1)	-0.0002	-0.0002	-0.0001	-0.0003	-0.0001	-0.0001
	(.000)*	(.000)***	(.000)**	(.000)**	(.000)***	(.000)**
Debt Premia	-87.1894	4.9139	-46.7591	-92.3686	-4.7284	-48.8910
	(4.659)***	(7.567)	(5.745)***	(4.664)***	(7.060)	(5.582)***
Term Spread	-13.1701	0.5336	-1.4637	-14.1355	-0.5020	-3.6780
	(1.579)***	(1.541)	(1.791)	(1.473)***	(.502)	(1.779)*
Interest Coverage (t-1)	-0.0001	0.0000	0.0001	-0.0001	0.0000	0.0000
	(.000)	(.000)	(.000)†	(.000)	(.000)	(.000)
Leverage (t-5)	0.6818	0.3342	0.5233	0.7489	0.3743	0.2916
	(.104)***	(.083)***	(.107)***	(.158)***	(.097)***	(.123)*
Tax Loss (t-1)	-0.0025	-0.0009	0.0000	-0.0024	-0.0010	0.0000
Random Components	(.001)**	(.000)***	(.000)	(.001)**	(.000)***	(.000)
Firm level	0.3487	0.4260	0.4119	0.3432	0.4162	0.3872
	(.038)***	(.028)***	(.037)***	(.038)***	(.028)***	(.038)***
Industry level	0.1659	0.1152	0.1242	0.1419	0.1059	0.1142
	(.033)***	(.025)***	(.032)***	(.032)***	(.025)***	(.033)***
Log likelihood	-9294.23	-14341.28	-9525.01	-9317.79	-14345.69	-9562.70
Model Comparison Likelihood ratio	82.42	130.78	64.62	61.95	116.74	49.24
χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Denotes significance *** ≤ .001, ** ≤ .01, * ≤ .05, and † ≤.10 level. Random component significance levels calculated according to Buis (2007). The likelihood ratio compares the model versus the null specification.

The regression estimates of type three errors are reported in Table 8: Firms are more likely to raise funds via equity issuance in the absence of a fund-flow deficit when firm leverage is greater, the mean industry leverage is low relative to the market, and the return on equity has increased over the past two years. Firm factors such as agency costs, information asymmetries, and bankruptcy risk/cost do not play a statistically significant role in the equity issuance process. In the second (1986-2000) and third period (2001-2010), the tangible asset to debt ratio is inversely related with type three errors, indicating that firms with lower debt to tangible assets are less likely to use equity as a source of funds when a fund flow deficit is encountered. This suggests that in the latter two periods of the analysis, firms with sufficient debt capacity will tend not to employ an equity issuance. In addition, the term spread on debt is positively associated with a type three error equity issuance, where the greater the term spread on debt, the more likely an equity issuance will happen.

3.3.1 Model Performance by Industry

The multilevel models and reports within the literature offer evidence that leverage as well as model errors differ by industry (Lemmon, Roberts, and Zender 2008; Titman and Wessels 1988). Table 9 reports the accuracy of the SSM pecking-order model in terms of a fund flow deficit triggering a debt issuance. Table 5 report the accuracy of the model predicting an issuance while Table 9 differs by considering the accuracy of issuing as well as not issuing. It is noteworthy that the mean accuracy of 72 percent in table 9 is greater than that in Table 5.

Over the complete sample period, the accuracy of the model greatly varies by industry, with the coal industry accurate 51 percent of the time and 92 percent compliance for the business services industry. The initial mean values over the sample period appear to offer great support for the pecking-order theory; however when the sample period is separated into groups in 1987 as well as 1989, a different story is evident.[4] In both instances, there is a significant decline in the accuracy of the SSM model across all industries. The decline is more pronounced in the 1987 breakpoint, suggesting the pre-1989 period is already influenced by the declining accuracy of the model.

Table 10 examines the accuracy of the SSM model in terms of debt issuances predicted by the model versus the number of debt issuances. The overall accuracy, including the sub-periods, is similar to that reported in Table 9; however the order of industry accuracy changes. The difference between tables 9 and 10 is the consideration of non-occurring predictions (type one errors).

Examination of type 1 through 3 errors is also performed with similar results to the prior tables. The results reveal increases in all error types from the pre-1987 to post-1987 period. The increase in type 2 and type 3 errors is substantial, whereas the increase in type 1 errors is not as large. The results are reported in the appendix Tables 5-8.

As the fund-flow deficit may trigger an equity issuance, the data are inspected for such instances. Table 11 shows a significant decline in the accuracy of a fund flow deficit as a predictor of equity issuance, similar to Tables 9 and 10 that show a decline in the accuracy of debt issuances.

[4] The sample was divided at 1987 based on the visual inspection of Figure 1 and the business services sector suggest a change in the performance of the model. The second date is examined as the SSM (1999) study covers a time period of 1971 to 1989, thus pre and post study period are examined.

Table 8: Panel regressions of type three errors - equity issuance in the absence of a fund flow deficit

	Market Leverage			Book Leverage		
	1970-1985	1986-2000	2001-2010	1970-1985	1986-2000	2001-2010
Constant	-3.2928	-1.9060	-1.3377	-4.1785	-1.9365	-1.4910
	(.310)***	(.185)***	(.183)***	(.334)***	(.217)***	(.210)***
Ln Assets (t-1)	0.0572	-0.0525	-0.0524	0.0666	-0.0566	-0.0511
	(.027)*	(.017)**	(.019)**	(.027)*	(.057)**	(.019)**
Agent (t-1)	-0.0695	0.0276	-0.0206	-0.0939	0.0325	-0.0182
	(.028)**	(.020)	(.019)	(.028)***	(.020)	(.019)
Asymmetry (t-1)	-0.0495	-0.0408	-0.0225	-0.0497	-0.0415	-0.0197
	(.043)	(.046)	(.039)	(.043)	(.047)	(.039)
BSM Prob (t-1)	0.0057	-0.0030	0.0063	0.0053	-0.0034	0.0064
	(.005)	(.002)	(.003)*	(.005)	(.003)	(.003)*
Firm Uniqueness (t-1)	0.0187	-0.0495	0.0088	0.0353	-0.0506	0.0128
	(.032)	(.023)*	(.024)	(.032)	(.024)*	(.023)
Leverage (t-1)	1.0517	0.6631	0.5063	2.1898	1.2308	0.6532
	(.253)***	(.163)***	(.180)**	(.298)***	(.156)***	(.197)***
Mean Industry Leverage (t-1)	-3.4367	-2.9521	-2.4714	-2.5834	-2.5896	-1.7447
	(.513)***	(.508)***	(.420)***	(.985)**	(.661)***	(.599)**
CapEx (t-1)	1.0207	-0.5382	0.9126	0.3725	-0.7510	0.6681
	(.604)†	(.437)	(.494)†	(.608)	(.437)†	(.498)
Price (t-2)	0.0597	0.0603	0.1353	0.1122	0.0646	0.1403
	(.042)	(.060)***	(.018)***	(.040)*	(.013)***	(.018)***
Profit (t-1)	1.5309	0.9897	0.2981	1.4387	1.0083	0.2673
	(.038)***	(.152)***	(.149)*	(.038)***	(.151)***	(.147)†
Market to Book (t-1)	0.1685	0.0611	0.0676	0.1618	0.0501	0.0598
	(.043)***	(.012)***	(.015)***	(.042)***	(.012)***	(.014)***
Tangible Assets to Debt (t-1)	-0.0371	-0.0579	-0.1840	-0.0058	-0.0416	-0.1677
	(.029)	(.012)***	(.019)***	(.012)	(.011)***	(.019)***
Debt Tax Shield (t-1)	0.0942	0.1780	0.1635	-0.0717	0.1554	0.0942
	(.145)	(.094)†	(.116)	(.144)	(.090)†	(.113)
Non-Debt Tax Shield (t-1)	-0.0002	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(.000)	(.000)	(.000)*	(.000)	(.000)	(.000)†
Debt Premia	24.2390	10.2023	18.0986	35.5011	-10.0121	8.5610
	(8.030)**	(12.563)	(7.925)*	(8.005)***	(11.811)	(7.699)
Term Spread	7.6978	3.1683	4.9222	11.4967	5.2785	6.4372
	(2.796)**	(2.477)	(2.569)†	(2.680)***	(2.470)*	(2.560)*
Interest Coverage (t-1)	-0.0005	-0.0001	-0.0002	-0.0004	-0.0001	-0.0001
	(.000)	(.000)	(.000)*	(.000)	(.000)	(.000)*
Leverage (t-5)	0.3950	0.3387	-0.2768	0.3870	0.0140	-0.1712
	(.184)*	(.126)**	(.147)†	(230)†	(.135)	(.163)
Tax Loss (t-1)	0.0007	0.0009	0.0001	0.0007	0.0010	0.0001
	(.000)	(.000)***	(.000)	(.000)	(.000)***	(.000)
Random Components						
Firm level	0.3078	0.2748	0.2528	0.2920	0.3006	0.2849
	(.067)***	(.053)***	(.052)***	(.063)***	(.301)***	(.053)***
Industry level	0.7016	0.6926	0.6637	0.7127	0.7175	0.6618
	(.061)***	(.045)***	(.050)***	(.061)***	(.045)***	(.050)***
Log likelihood	-3876.40	-6955.42	-5713.89	-3871.92	-6946.87	-5724.75
Model Comparison						
Likelihood ratio	91.56	177.89	128.05	94.62	202.35	148.74
χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Denotes significance *** ≤ .001, ** ≤ .01, * ≤ .05, and † ≤.10 level. Random component significance levels calculated according to Buis (2007). The likelihood ratio compares the model versus the null specification.

Table 9: Accuracy of the Shyam-Sunder and Myers (1999) model, where fund flow deficit results in a debt issuance [Column (7) / Column (6)].

	Average	Pre-87	Post-87	Pre-89	Post-89		Average	Pre-87	Post-87	Pre-89	Post-89
Coal	51%	86%	42%	81%	47%	Paper Business Supplies	72%	100%	59%	94%	68%
Petroleum and Natural Gas	55%	86%	48%	79%	52%	Steel Works Etc	73%	84%	57%	83%	67%
Mining-Precious Metals	56%	68%	44%	65%	52%	Candy and Soda	73%	87%	61%	84%	69%
Mining-Industrial, Non-metalic	58%	94%	54%	87%	56%	Machinery	74%	89%	56%	86%	68%
Agriculture	62%	90%	44%	87%	55%	Apparel	74%	90%	55%	87%	67%
Construction	63%	88%	52%	82%	58%	Aircraft	75%	87%	59%	84%	70%
Tobacco Products	63%	81%	57%	78%	60%	Retail	75%	89%	58%	88%	69%
Fabricated Products	64%	69%	60%	67%	62%	Fun and Entertainment	76%	91%	70%	88%	73%
Textiles	64%	84%	55%	82%	59%	Measuring and Control Equip.	76%	93%	57%	90%	70%
Transportation	64%	91%	49%	88%	58%	Electronic Equipment	77%	84%	56%	82%	72%
Toys and Recreation Goods	65%	89%	54%	84%	60%	Guns and Defense	77%	88%	66%	86%	73%
Boxes and Shipping Containers	65%	83%	54%	77%	61%	Communication	77%	93%	35%	90%	68%
Restaraunts, Hotels	66%	89%	53%	86%	60%	Electrical Equipment	78%	89%	64%	86%	73%
Rubber and Plastic Products	67%	88%	53%	86%	61%	Wholesale	78%	95%	62%	96%	72%
Food and Food Products	67%	79%	56%	76%	63%	Pharmaceutical Products	79%	90%	69%	91%	75%
Construction Materials	68%	86%	54%	83%	63%	Personal Services	80%	85%	66%	81%	77%
Household Consumer Goods	70%	83%	53%	81%	64%	Computers	81%	94%	42%	100%	68%
Chemicals	70%	85%	49%	82%	64%	Printing and Publishing	83%	90%	73%	90%	79%
Shipbuilding and Railroad Equip.	71%	91%	53%	89%	64%	Healthcare	88%	95%	82%	94%	86%
Automobiles and Trucks	71%	91%	52%	86%	64%	Medical Equipment	88%	97%	83%	100%	85%
Beer and Liquor	72%	87%	50%	85%	65%	Business Services	92%	97%	82%	97%	88%

Table 10: Proportion of debt issues that conform to the Shyam-Sunder and Myers (1999) pecking order model [Column (7) / Column (3)].

	Average	Pre-87	Post-87	Pre-89	Post-89		Average	Pre-87	Post-87	Pre-89	Post-89
Business Services	51%	86%	42%	81%	47%	Steel Works Etc	70%	87%	50%	85%	64%
Printing and Publishing	55%	68%	44%	65%	51%	Automobiles and Trucks	71%	84%	57%	83%	66%
Medical Equipment	55%	86%	48%	79%	52%	Candy and Soda	72%	90%	55%	87%	66%
Healthcare	58%	94%	54%	87%	56%	Chemicals	72%	89%	56%	86%	67%
Personal Services	61%	90%	44%	87%	55%	Agriculture	72%	100%	59%	94%	68%
Computers	63%	88%	52%	82%	58%	Shipbuilding and Railroad Equip.	72%	94%	42%	100%	63%
Fun and Entertainment	63%	81%	57%	78%	60%	Rubber and Plastic Products	73%	87%	61%	84%	69%
Communication	63%	69%	60%	67%	62%	Construction Materials	74%	87%	59%	84%	69%
Electrical Equipment	63%	84%	55%	82%	59%	Household Consumer Goods	74%	89%	58%	88%	68%
Measuring and Control Equip.	64%	91%	49%	88%	58%	Textiles	75%	84%	56%	82%	71%
Wholesale	64%	89%	54%	84%	60%	Tobacco Products	75%	93%	35%	90%	67%
Guns and Defense	65%	83%	54%	77%	61%	Food and Food Products	76%	89%	64%	86%	72%
Electronic Equipment	65%	89%	53%	86%	60%	Fabricated Products	76%	93%	57%	90%	70%
Pharmaceutical Products	66%	88%	53%	86%	61%	Restaraunts, Hotels	76%	91%	70%	88%	73%
Beer and Liquor	66%	79%	56%	76%	62%	Toys and Recreation Goods	76%	88%	66%	86%	73%
Retail	67%	86%	54%	83%	62%	Transportation	77%	90%	69%	91%	74%
Apparel	68%	83%	53%	81%	63%	Construction	78%	95%	62%	96%	72%
Aircraft	69%	85%	49%	82%	63%	Boxes and Shipping Containers	78%	85%	66%	81%	75%
Paper Business Supplies	69%	91%	52%	86%	63%	Mining-Industrial, Non-metalic	81%	90%	73%	90%	78%
Machinery	70%	91%	53%	89%	63%	Mining-Precious Metals	86%	97%	83%	100%	84%
Steel Works Etc	70%	87%	50%	85%	64%	Petroleum and Natural Gas	87%	95%	82%	94%	85%
Automobiles and Trucks	71%	84%	57%	83%	66%	Coal	90%	97%	82%	97%	87%

Table 11: Proportion of equity issues that occur when there is a fund flow deficit .

	Average	Pre-87	Post-87	Pre-89	Post-89		Average	Pre-87	Post-87	Pre-89	Post-89
Guns and Defense	46%	90%	30%	75%	32%	Candy and Soda	61%	94%	37%	92%	37%
Business Services	48%	85%	41%	81%	41%	Computers	61%	91%	51%	89%	50%
Personal Services	50%	80%	38%	79%	38%	Shipbuilding and Railroad Equip.	62%	100%	29%	100%	17%
Printing and Publishing	52%	70%	42%	68%	42%	Textiles	62%	77%	47%	74%	47%
Healthcare	52%	93%	46%	86%	46%	Chemicals	63%	89%	48%	85%	49%
Paper Business Supplies	52%	79%	35%	75%	34%	Retail	64%	86%	52%	84%	52%
Fun and Entertainment	53%	74%	48%	74%	47%	Automobiles and Trucks	64%	78%	52%	77%	51%
Beer and Liquor	54%	79%	36%	81%	33%	Rubber and Plastic Products	64%	90%	54%	82%	54%
Tobacco Products	54%	79%	30%	75%	32%	Household Consumer Goods	64%	84%	53%	81%	51%
Medical Equipment	55%	93%	52%	82%	51%	Construction Materials	66%	84%	45%	81%	43%
Apparel	56%	76%	45%	74%	44%	Food and Food Products	66%	87%	53%	82%	54%
Communication	57%	78%	51%	73%	51%	Transportation	69%	84%	58%	81%	58%
Boxes and Shipping Containers	59%	74%	44%	68%	44%	Toys and Recreation Goods	69%	88%	57%	85%	55%
Pharmaceutical Products	59%	87%	53%	84%	53%	Fabricated Products	69%	86%	49%	87%	45%
Steel Works Etc	59%	87%	42%	82%	42%	Aircraft	70%	91%	48%	90%	45%
Measuring and Control Equip.	60%	93%	45%	91%	44%	Restaraunts, Hotels	71%	84%	65%	83%	65%
Wholesale	60%	86%	51%	82%	51%	Construction	74%	96%	53%	96%	49%
Machinery	60%	91%	44%	88%	42%	Agriculture	77%	100%	60%	100%	57%
Electrical Equipment	60%	79%	55%	78%	55%	Mining-Industrial, Non-metalic	81%	86%	79%	83%	80%
Electronic Equipment	61%	90%	51%	89%	49%	Petroleum and Natural Gas	83%	92%	79%	91%	78%
Candy and Soda	61%	94%	37%	92%	37%	Coal	85%	89%	80%	83%	86%
Computers	61%	91%	51%	89%	50%	Mining-Precious Metals	85%	94%	83%	96%	82%

3.4 Testing the Trade-Off Theory

SSM and others, such as Hovakimian et al. (2001) and Huang and Ritter (2009), test the trade-off theory. SSM differ from the others by employing a single stage model that estimates an implied target leverage Di*, as the true target leverage is unobservable. Within the SSM study, target leverage is identified as the historic mean (leverage) over the period of the sample – employing a historic mean assumes that the target leverage Di* is time invariant.[5]

$$\delta D_{it} = \alpha + b_t(Di* - D_{it-1}) + \mu_{it} \quad (3)$$

The SSM test of the trade-off theory captures how quickly the i*th* firm reverts toward the average leverage over the sample period, where D_{it-1} is the lagged value of leverage, and $\delta Di*$ is the change in leverage. The process u_{it} allows for random error. The SSM model has an obvious defect in that the leverage difference is estimated relative to the mean of the leverage (the target leverage) over the sample's time period. Hence, all deviations from the target will be evenly spaced, i.e. sum to zero. The mean reversion model is by design biased downwards, as firms use debt versus equity at an approximate ratio of four to one during the sample period of their study. As a result, the pecking-order model must only describe instances where debt issuance occurs–this is not the case for the target adjustment model.

Hovakimian et al. (2001) differs from SSM by employing a two-step approach. The first stage employs a tobit regression on a set of six determinants (χ) that estimate a time-varying target leverage, refer to equation 4.[6] The set of determinants includes: the two year stock return, market- to-book ratio, research and development normalized by sales, selling expense normalized by sales, tangible asset ratio, and firm size. Their model does not account for tax liability, non-debt tax shields, and other adjustment factors.

$$Di* = D_{it}\chi + s_{it} \quad (4)$$

The second stage logit regression estimates a coefficient for the difference of the actual leverage from the target leverage. A second set of proxies for frictions that cause the firm to deviate from the optimal leverage are given as set F. Set F consists of variables: ROA, market-to-book, net loss carryover, two year stock return, and the absolute deviation from the target leverage (ADTL).

$$D_{it} = \alpha + b_t(Di* - D_{it-1}) + \delta_t \cdot F_{it-1} + \mu_{it} \quad (5)$$

The ADTL takes into how much debt versus equity must be exchanged to achieve the target leverage, such that the absolute value of deviation by each type of claim is considered. Empirically:

$$ADT\,L = |LevDebt - Di*| - |LevEquity - Di*| \quad (6)$$

Hovakimian et al. (2001) report that the ADTL measure greatly improves the SSM trade-off model, along with the inclusion of convertible debt – an obvious factor overlooked by SSM.

[5] SSM note that they test a three and five year moving as employed in Javiland and Harris (1984), the adjustment model coefficient is not significant. Hence, SSM employ the average leverage over the period of the study.
[6] The tobit model is bound at zero and one.

The variable is interpreted as positive coefficients support the use of equity over debt, as the distance from the target leverage is greater when using debt. This plausible approach is a definite improvement, though the model is still underspecified as it does not account for agency costs, information on asymmetries, the effect of taxes, and bankruptcy risk. Leary and Roberts (2010), Huang and Ritter (2009) and others improve on the Hovakimian et al. (2001) model with varying success. This study improves prior estimations of target adjustment models with the inclusion of theory- specified factors such as agency costs, information asymmetry, non-debt tax shields, as well as a more sophisticated and accurate measure of bankruptcy risk. This is not to say prior studies have not included such variables, rather the complete combination of variables has not been studied simultaneously.

3.4.1 Determinants of the Target Debt Level

Following Hovakimian et al. (2001) we employ their set of determinants used to identify a target leverage for each firm in the sample, from herein the H.O.T. (Hovakimian, Opler, Titman) model. In addition, we augment the H.O.T. model (A-H.O.T) with five additional lag variables: firm uniqueness, tangible assets to debt, non-debt tax shields, the average tax rate for EBIT, and the average tax rate for EBT.

The estimates are reported in Table 12. The coefficients and significance levels are consistent for the H.O.T. and A-H.O.T. specifications, and the augmenting variables are all statistically significant. As in Titman and Wessels (1988) leverage is inversely related to firm uniqueness, as consolidation costs are typically greater for unique firms (Pulvino 1998; Kale and Shahrur 2007). Non-debt tax shields are also associated with lower leverage, consistent with the substitution hypothesis of DeAngelo and Masulis (1980). A negative sign for tangible assets to debt indicates that firms maintaining substantial debt capacity continue doing so, consistent with the observation of strategic debt capacity (Donaldson and Stone 1984; Rampini and Viswanathan 2010).

The average tax rate of EBIT is positive as expected, i.e., the larger the per tax dollar of pre- interest expense earnings, the more leverage a firm will employ. The average tax rate of EBT is negative, indicating that firms that do not attempt to reduce their tax liability via the debt tax shield are more likely to continue using lower leverage levels.

3.4.2 Security Issuance in a Trade-Off Framework

Predictions of debt issuance are made to obtain predictions that are comparable with the pecking- order model. The regressions are reported in Table 13. The H.O.T. and A-H.O.T. estimates are fairly consistent, with the exception of the coefficient for deviation from target. The large coefficient observed in book-value leverage (total debt) indicates that absolute deviation of debt and equity from the target is relatively small.

Regression estimates for equity issuances are provided in Table 14. The book and market leverage estimates offer strong evidence in support of the trade-off theory. In favor of the market-timing theory, equity issuances are linked to increase in equity value; however, the remainder of the evidence is in favor of the trade-off theory. The positive coefficient for absolute deviation from target indicates that an equity issuance moves a firm closer to the target leverage than would a debt issuance. The indicator variable of an equity issuance leading to dilution of earnings is not significant. Information asymmetry is inversely related to equity issuances, which has a few implications. The relationship increases suspicion of the modified pecking-order as the theory states equity issuance occurs as a result of information asymmetries. Second, the market-timing theory identifies mispricing as the manager’s motive for equity

issuances and repurchases, this goes against the concept of lower information asymmetry. We found repurchases are not linked to information asymmetry; so results are not reported.

Table 12: Tobit regressions predicting leverage ratios

	Book Leverage (total debt)		Book Leverage (long-term debt)		Market Leverage (total debt)		Market Leverage (long-term debt)	
	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.
Constant	0.3535	0.3911	0.2473	0.2608	0.4272	0.5001	0.2932	0.3237
	(.009)***	(.009)***	(.008)***	(.008)***	(.011)***	(.011)***	(.010)***	(.010)***
Price $_{(t-2)}$	-0.0023	-0.0018	-0.0008	-0.0008	-0.0077	-0.0066	-0.0042	-0.0039
	(.000)***	(.000)***	(.000)**	(.000)**	(.000)***	(.000)***	(.000)***	(.000)***
Market to Book $_{(t-1)}$	-0.0142	-0.0131	-0.0140	-0.0131	-0.0441	-0.0429	-0.0393	-0.0383
	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***
R&D /Sales $_{(t-1)}$	0.0045	0.0061	0.0042	0.0077	0.0037	0.0052	0.0030	0.0069
	(.003)†	(.002)*	(.003)†	(.002)***	(.003)	(.003)†	(.003)	(.003)*
Selling Expense/Sales $_{(t-1)}$	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0001
	(.000)	(.000)†	(.000)	(.000)	(.000)	(.000)	(.000)*	(.000)†
Tangible Assets to Assets $_{(t-1)}$	-0.1557	-0.0862	-0.1442	-0.0931	-0.1148	-0.0316	-0.1087	-0.0485
	(.007)***	(.006)***	(.006)***	(.006)***	(.009)***	(.008)***	(.008)***	(.007)***
Ln Assets $_{(t-1)}$	0.0059	0.0054	0.0129	0.0138	-0.0008	-0.0015	0.0088	0.0097
	(.001)***	(.001)***	(.001)***	(.001)***	(.001)	(.001)†	(.001)***	(.001)***
Firm Uniqueness $_{(t-1)}$		-0.0009		-0.0014		-0.0039		-0.0035
		(.000)*		(.000)***		(.001)***		(.001)***
Tangible Assets to Debt $_{(t-1)}$		-0.0207		-0.0172		-0.0228		-0.0188
		(.000)***		(.000)***		(.000)***		(.000)***
Non-Debt Tax Shield $_{(t-1)}$		0.0000		0.0000		0.0000		0.0000
		(.000)***		(.000)***		(.000)***		(.000)***
EBIT Average Tax Rate $_{(t-1)}$		0.1191		0.1442		0.1804		0.2163
		(.007)***		(.006)***		(.008)***		(.008)***
EBT Average Tax Rate $_{(t-1)}$		-0.2487		-0.1819		-0.3987		-0.2925
		(.006)***		(.006)***		(.007)***		(.007)***

The predictions of debt issuances obtained from the H.O.T. and A-H.O.T. models employing book-value leverage are reported in Table 15. With regard to the accuracy of predictions, the models perform similarly in terms of total debt, and the A-H.O.T. specification performs slightly better in terms of long-term debt. However, in terms of type one (false issuance prediction) errors, the A-H.O.T. specification performs much better than the H.O.T. model. The improvement shows that the factors used to augment the H.O.T. model should be included in future studies.

Table 16 reports the predictions in terms of market-value leverage. Overall, the A-H.O.T. specification results in improved prediction accuracy. However, in the last three years of the sample (2008-2010) the augmented specification performs poorly relative to the H.O.T. model.

Table 13: Logit regressions of firms that issue debt.

	Book Leverage (total debt)		Book Leverage (long-term debt)		Market Leverage (total debt)		Market Leverage (long-term debt)	
	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.
Constant	-0.2345	-1.5786	-0.1961	-1.7241	-0.2278	-1.4860	-0.1575	-1.5717
	(.020)***	(.127)***	(.020)***	(.125)***	(.022)***	(.127)***	(.022)***	(.126)***
Target Lev. - Actual Lev.	-0.3314	-1.7191	0.3154	-1.2907	-0.9632	-1.8889	-0.5783	-1.5199
	(.136)*	(.124)***	(.141)*	(.121)***	(.098)***	(.100)***	(.117)***	(.113)***
Industry Lev. - Actual Lev.	0.0825	1.0825	-0.2714	1.0162	0.8715	1.3087	0.7557	1.2979
	(.139)	(.111)***	(.143)†	(.111)***	(.098)***	(.086)***	(.116)***	(.098)***
Deviation from Target	0.4305	0.8257	-0.0051	0.2720	-0.0197	-0.2802	-0.3101	-0.3631
	(.453)***	(.608)***	(.108)	(.116)*	(.088)	(.094)**	(.082)***	(.086)***
Three Year Mean ROA	0.2822	-0.3637	-0.4009	-1.0172	-0.3765	-1.0518	-0.4723	-1.1183
	(.358)	(.438)	(.303)	(.371)**	(.301)	(.377)**	(.314)	(.384)**
NOLC	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	-0.0001
	(.000)***	(.000)*	(.000)***	(.000)*	(.000)***	(.000)*	(.000)***	(.000)*
Price $_{(t-2)}$	0.0090	0.0024	0.0147	0.0071	0.0073	0.0019	0.0114	0.0044
	(.006)	(.006)	(.006)*	(.005)	(.006)	(.006)	(.006)†	(.006)
Market to Book $_{(t-1)}$	0.0885	0.0750	0.0846	0.0683	0.0568	0.0329	0.0618	0.0383
	(.009)***	(.009)***	(.008)***	(.009)***	(.009)***	(.009)***	(.009)***	(.009)***
Industry Market to Book $_{(t-1)}$	0.2301	0.2744	0.2266	0.2810	0.3031	0.3807	0.2155	0.3040
	(.021)***	(.022)***	(.021)***	(.022)***	(.024)***	(.025)***	(.023)***	(.024)***
Dilution	-0.0658	-0.0216	0.0551	0.0752	-0.0001	0.0473	0.0001	0.0576
	(.338)	(.364)	(.319)	(.331)	(.320)	(.332)	(.320)	(.331)
% Dedt Due in 3 Yrs (FD3)	-0.0832	-0.1548	-0.0962	-0.1381	-0.0784	-0.1323	-0.1219	-0.1664
	(.023)***	(.025)***	(.024)***	(.026)***	(.023)***	(.024)***	(.024)***	(.025)***
Oper. Loss Indicator $_{(t-1)}$* FD3	-0.2267	0.4141	-0.1918	0.4456	-0.1791	0.3674	-0.1973	0.4000
	(.033)***	(.046)***	(.033)***	(.045)***	(.033)***	(.045)***	(.033)***	(.045)***
Agent $_{(t-1)}$		-0.0103		-0.0082		-0.0127		-0.0109
		(.007)		(.007)		(.007)†		(.007)†
Asymmetry $_{(t-1)}$		-0.0258		-0.0195		-0.0197		-0.0193
		(.014)†		(.013)		(.013)		(.013)
BSM Prob $_{(t-1)}$		0.0404		0.0430		0.0429		0.0429
		(.001)***		(.001)***		(.001)***		(.001)***
EBIT Average Tax Rate $_{(t-1)}$		1.7138		1.8231		1.2970		1.6393
		(.089)***		(.085)***		(.090)***		(.086)***
Non-Debt Tax Shield $_{(t-1)}$		0.0000		0.0000		0.0000		0.0000
		(.000)		(.000)		(.000)		(.000)
Debt Premia		-34.243		-35.179		-39.524		-38.701
		(2.397)***		(2.368)***		(2.393)***		(2.386)***
Term Spread		-11.312		-11.621		-9.939		-10.595
		(.813)***		(.803)***		(.812)***		(.808)***
Log-likelihood	-38951.159	-37178.936	-39297.492	-37860.476	-39249.42	-37719.254	-39266.223	-37815.977

Table 14: Logit regressions of firms that issue equity.

	Book Leverage (total debt)		Book Leverage (long-term debt)		Market Leverage (total debt)		Market Leverage (long-term debt)	
	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.	H.O.T.	A - H.O.T.
Constant	-2.1826	-1.1162	-2.2354	-1.1951	-2.0722	-1.2581	-2.2084	-1.3175
	(.034)***	(.161)***	(.035)***	(.161)***	(.036)***	(.163)***	(.036)***	(.162)***
Target Lev. - Actual Lev.	1.4114	0.8410	1.1539	0.7717	1.2194	0.8238	1.5093	1.0654
	(.201)***	(.140)***	(.219)***	(.157)***	(.150)***	(.124)***	(.180)***	(.145)***
Industry Lev. - Actual Lev.	-2.4080	-1.7379	-2.2934	-1.8967	-1.9334	-1.4220	-2.4112	-1.9446
	(.205)***	(.137)***	(.221)***	(.154)***	(.150)***	(.115)***	(.178)***	(.136)***
Deviation from Target	1.3723	1.6146	1.0013	0.6541	-1.7257	-1.3543	-0.6749	-0.7169
	(.297)***	(.295)***	(.151)***	(.152)***	(.124)***	(.125)***	(.111)***	(.113)***
Three Year Mean ROA	-0.2355	-0.3745	-0.3956	-0.4961	-0.6492	-0.6925	-0.6043	-0.6979
	(.366)	(.377)	(.379)	(.383)	(.414)	(.414)†	(.403)	(.407)†
NOLC	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
	(.000)	(.000)†	(.000)	(.000)†	(.000)	(.000)†	(.000)	(.000)†
Price $_{(t-2)}$	0.1652	0.1604	0.1594	0.1587	0.1680	0.1638	0.1754	0.1703
	(.011)***	(.011)***	(.011)***	(.011)***	(.011)***	(.011)***	(.011)***	(.011)***
Market to Book $_{(t-1)}$	0.2964	0.2883	0.2940	0.2875	0.3085	0.3050	0.3247	0.3200
	(.013)***	(.013)***	(.013)***	(.013)***	(.013)***	(.013)***	(.013)***	(.013)***
Industry Market to Book $_{(t-1)}$	0.6716	0.6761	0.6905	0.6890	0.4986	0.5542	0.6312	0.6479
	(.031)***	(.031)***	(.031)***	(.031)***	(.034)***	(.034)***	(.033)***	(.033)***
Dilution	0.0916	0.0763	0.1924	0.1530	0.0448	0.0320	0.1539	0.1300
	(.396)	(.400)	(.397)	(.400)	(.399)	(.401)	(.396)	(.399)
% Dedt Due in 3 Yrs (FD3)	-0.0983	-0.1270	0.0376	-0.0034	-0.0883	-0.1333	-0.0786	-0.1165
	(.031)**	(.032)***	(.333)	(.034)	(.031)**	(.032)***	(.032)*	(.033)***
Oper. Loss Indicator $_{(t-1)}$* FD3	0.0911	0.2546	0.1658	0.3112	0.0932	0.2981	0.1011	0.2956
	(.044)*	(.057)***	(.044)***	(.057)***	(.044)*	(.057)***	(.044)*	(.057)***
Agent $_{(t-1)}$		-0.0516		-0.0500		-0.0452		-0.0460
		(.008)***		(.008)***		(.008)***		(.008)***
Asymmetry $_{(t-1)}$		-0.1724		-0.1728		-0.1713		-0.1705
		(.017)***		(.017)***		(.017)***		(.017)***
BSM Prob $_{(t-1)}$		0.0113		0.0121		0.0126		0.0126
		(.001)***		(.001)***		(.001)***		(.001)***
EBIT Average Tax Rate $_{(t-1)}$		0.5002		0.4373		0.6812		0.5366
		(.118)***		(.117)***		(.121)***		(.118)***
Non-Debt Tax Shield $_{(t-1)}$		-0.0001		0.0000		-0.0001		-0.0001
		(.000)*		(.000)*		(.000)*		(.000)*
Debt Premia		3.007		3.376		7.820		8.030
		(3.027)		(3.031)		(3.046)**		(3.049)**
Term Spread		-2.288		-2.474		-3.399		-3.313
		(1.008)*		(1.009)*		(1.015)***		(1.013)***
Log-likelihood	-29027.071	-28891.147	-29011.435	-28882.605	-28963.208	-28861.085	-29037.513	-28888.084

Table 15: Predictions of debt issuance by Hovakimian, Opler, and Titman model (H.O.T.) versus adjusted model (A-H.O.T.).

	Book Leverage (total debt)						Book Leverage (long-term debt)					
	H.O.T Correct	Type 1 errors	Type 2 errors	A-H.O.T. Correct	Type 1 errors	Type 2 errors	H.O.T Correct	Type 1 errors	Type 2 errors	A-H.O.T. Correct	Type 1 errors	Type 2 errors
1970	241	162	121	322	249	40	241	158	121	336	254	26
1971	247	217	104	282	267	69	245	217	106	298	273	53
1972	293	190	150	374	276	69	289	192	154	388	271	55
1973	215	44	428	607	200	36	253	45	390	609	193	34
1974	122	27	503	566	260	59	153	30	472	577	248	48
1975	117	130	221	109	168	229	115	135	223	105	118	233
1976	236	135	332	324	214	244	245	133	323	320	190	248
1977	280	119	437	536	289	181	286	121	431	521	267	196
1978	313	78	529	772	264	70	334	77	508	774	256	68
1979	370	126	422	752	292	40	387	117	405	751	284	41
1980	334	191	279	400	267	213	332	185	281	408	237	205
1981	300	178	272	355	219	217	300	175	272	340	194	232
1982	247	282	171	51	41	367	243	274	175	63	37	355
1983	555	489	227	398	286	384	527	463	255	407	241	375
1984	533	323	355	327	186	561	528	313	360	379	168	509
1985	535	460	208	348	267	395	525	429	218	379	212	364
1986	532	421	206	495	368	243	541	392	197	523	344	215
1987	479	320	338	383	224	434	494	290	323	427	206	390
1988	559	397	244	484	276	319	544	358	259	526	270	277
1989	520	441	257	617	450	160	529	423	248	640	449	137
1990	435	325	326	509	333	252	430	294	331	540	330	221
1991	447	579	200	386	414	261	426	537	221	394	383	253
1992	596	613	210	384	341	422	564	571	242	414	312	392
1993	696	607	178	544	378	330	637	555	237	521	327	353
1994	739	504	246	638	328	347	703	465	282	635	290	350
1995	744	558	193	790	531	147	707	512	230	775	497	162
1996	700	652	180	687	565	193	686	607	194	684	524	196
1997	757	617	153	756	498	154	732	578	178	740	483	170
1998	729	460	247	851	501	125	712	437	264	840	477	136
1999	651	455	245	707	455	189	639	438	257	697	437	199
2000	469	481	301	609	579	161	459	453	311	597	545	173
2001	408	661	159	395	544	172	379	639	188	391	502	176
2002	449	571	230	256	160	423	405	528	274	252	149	427
2003	611	747	120	325	272	406	549	700	182	291	230	440
2004	832	658	127	547	323	412	740	611	219	479	263	480
2005	721	687	154	620	487	255	649	630	226	563	436	312
2006	730	609	143	689	479	184	673	551	200	648	448	225
2007	659	498	167	650	415	176	605	453	221	621	371	205
2008	331	381	306	122	98	515	315	346	322	130	96	507
2009	265	660	94	65	72	294	231	592	128	50	49	309
2010	103	137	33	49	44	87	87	126	49	44	43	92
Total	19100	16190	9816	19081	12880	9835	18439	15150	10477	19077	11904	9839

Table 16: Predictions of debt issuance by Hovakimian, Opler, and Titman model (H.O.T.) versus adjusted model (A-H.O.T.).

	Market Leverage (total debt)						Market Leverage (long-term debt)					
	H.O.T Correct	Type 1 errors	Type 2 errors	A-H.O.T. Correct	Type 1 errors	Type 2 errors	H.O.T Correct	Type 1 errors	Type 2 errors	A-H.O.T. Correct	Type 1 errors	Type 2 errors
1970	248	165	114	329	246	33	241	165	121	325	246	37
1971	243	220	108	281	265	70	248	218	103	281	257	70
1972	295	187	148	379	267	64	296	186	147	376	265	67
1973	274	74	369	613	206	30	237	49	406	611	208	32
1974	326	151	299	602	284	23	157	54	468	587	277	38
1975	138	190	200	147	238	191	136	155	202	142	214	196
1976	256	177	312	372	251	196	254	152	314	346	226	222
1977	305	139	412	603	321	114	296	128	421	595	318	122
1978	340	95	502	779	267	63	337	90	505	784	270	58
1979	417	140	375	751	294	41	388	135	404	752	293	40
1980	344	202	269	416	273	197	346	201	267	412	271	201
1981	311	187	261	347	230	225	309	190	263	349	221	223
1982	246	291	172	41	35	377	243	286	175	49	42	369
1983	541	486	241	363	259	419	548	478	234	371	258	411
1984	533	334	355	370	197	518	521	321	367	341	181	547
1985	534	460	209	367	270	376	519	449	224	342	249	401
1986	535	437	203	479	353	259	524	426	214	472	347	266
1987	499	330	318	463	257	354	483	315	334	415	236	402
1988	562	408	241	532	283	271	542	390	261	495	276	308
1989	536	448	241	613	436	164	512	435	265	603	432	174
1990	452	347	309	547	375	214	438	322	323	519	348	242
1991	442	591	205	409	442	238	431	561	216	397	432	250
1992	578	591	228	464	382	342	562	572	244	417	365	389
1993	649	568	225	575	382	299	639	563	235	539	369	335
1994	691	458	294	661	338	324	685	465	300	663	331	322
1995	701	524	236	771	505	166	695	522	242	783	519	154
1996	647	577	233	675	523	205	645	597	235	677	545	203
1997	690	545	220	738	468	172	699	569	211	750	482	160
1998	708	445	268	843	485	133	695	455	281	841	494	135
1999	639	446	257	706	458	190	635	446	261	703	451	193
2000	464	474	306	621	586	149	463	459	307	615	589	155
2001	387	627	180	404	545	163	385	623	182	393	544	174
2002	413	542	266	291	209	388	428	544	251	282	179	397
2003	513	615	218	315	259	416	561	643	170	319	265	412
2004	676	534	283	530	303	429	733	584	226	529	301	430
2005	582	523	293	585	436	290	640	604	235	602	466	273
2006	580	463	293	644	432	229	639	534	234	666	458	207
2007	542	413	284	628	363	198	584	449	242	639	378	187
2008	329	382	308	144	122	493	307	361	330	131	111	506
2009	218	524	141	55	54	304	236	547	123	63	66	296
2010	72	97	64	44	44	92	92	114	44	47	47	89
Total	18456	15407	10460	19497	12943	9419	18329	15357	10587	19223	12827	9693

3.5 Comparing Pecking-Order and Trade-Off Model Accuracy

Tables 17 and 18 compare the predictive accuracy and error types of the H.O.T. and A-H.O.T. models with respect to the pecking-order model. The results are presented as H.O.T.(A-H.O.T.) less pecking-order, where positive values are the result of larger H.O.T.(A-H.O.T.) values, a zero value indicates an equivalence, and negative values denotes larger pecking-order values. The two errors are the inverse of the correct prediction when comparing the two models. For example, model one may accurately predict 100 more instances than model two, the failure to predict is the type 2 error. Hence, model two produced 100 more type two errors. If model two is subtracted from model one, a value of 100 would result for accurate predictions and a value of negative 100 would be reported for type two errors.

The negative values reported in the "total" row of Tables 17 and 18 shows that the pecking-order model accurately predicts more debt issuances than the trade-off model over the entire sample period. However, the predictions made with the pecking-order model results in more type one errors (false issuance prediction). Visual inspection of the data reveals a decline in the accuracy of the pecking-order over the trade-off model from 1987 to 1988. In the pre-1987 period the pecking- order model is more accurate than the trade-off model in terms of both overall accuracy and type 1 errors. In the post-1987 period, the trade-off model is superior in terms of accurate predictions. The H.O.T. and A-H.O.T. results differ in the post-1987 period, as the H.O.T. results in a greater number of type 1 errors and the A-H.O.T. specification improves prediction for both accuracy and a lower number of type one errors.

4. Examining Speed of Adjustment

The topic of speed of adjustment (SOA) has become a growing debate due to the inference on capital structure theory. A number of studies note that trade-off theory behavior can follow a market-timing approach and vice versa. The expectation of firms that follow a market-timing is one of infrequent adjustments that have persistence effect on SOA, i.e., firms following a market- timing theory should have a relatively slow SOA. Whereas firms practicing a trade-off approach should make regular adjustments towards the firm's target leverage, thus trade-off firms should have a relatively rapid SOA. However, Leary and Roberts (2005) note that slower SOA may occur due to market shocks and dynamic readjustment costs. As a change in tax rates should be felt market wide, there should be a systematic shift. For example, the Tax Reform Act of 1986 (TRA-86) brought about a net result of decreasing corporate tax rates and tax shelters. Hence, a decrease in tax rates should bring about a decrease in leverage as the debt tax benefit is reduced with a decline in the tax rate. For example, if the tax rate reduces from 40 percent to 30 percent, the tax shelter benefit of debt declines by 25 percent or 10 cents for every dollar of debt. Since the risk of bankruptcy would not decline with a tax-rate change, but rather increase due to a decrease in cash flow as a result of the smaller tax shield, the firm would continue to reduce its leverage via regular payments and not revert towards the pre-tax rate change target leverage. Firms that were underleveraged prior to the tax change would not receive a tax benefit from leveraging up and therefore these firms would decline to adjust their leverage. Only firms in need of capital or those that are deeply over-leveraged would be rationally inclined to adjust the leverage down. This example demonstrates why the Leary and Roberts (2005) supposition may hold true. It is important to note that Flannery and Rangan (2006) segment their data at periods 1978-1989 and 1990-2001, and do not observe a change in SOA. However, we note a shift in financing patterns in 1987 that is more prominent than assessing a shift in 1989 (refer to Tables 9, 10, and 11).

Table 17: Predictions of debt issuance by Hovakimian, Opler, and Titman model (H.O.T.) less SSM pecking order.

	Book Leverage (total debt)			Book Leverage (long-term debt)			Market Leverage (total debt)			Market Leverage (long-term debt)		
	H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors
1970	-84	-66	84	-84	-70	84	-77	-63	77	-84	-63	84
1971	-84	-113	84	-86	-113	86	-88	-110	88	-83	-112	83
1972	-128	-90	128	-132	-88	132	-126	-93	126	-125	-94	125
1973	-375	-133	375	-337	-132	337	-316	-103	316	-353	-128	353
1974	-461	-222	461	-430	-219	430	-257	-98	257	-426	-195	426
1975	-188	-367	188	-190	-362	190	-167	-307	167	-169	-342	169
1976	-260	-217	260	-251	-219	251	-240	-175	240	-242	-200	242
1977	-344	-208	344	-338	-206	338	-319	-188	319	-328	-199	328
1978	-416	-166	416	-395	-167	395	-389	-149	389	-392	-154	392
1979	-340	-154	340	-323	-163	323	-293	-140	293	-322	-145	322
1980	-224	-212	224	-226	-218	226	-214	-201	214	-212	-202	212
1981	-210	-232	210	-210	-235	210	-199	-223	199	-201	-220	201
1982	-119	-228	119	-123	-236	123	-120	-219	120	-123	-224	123
1983	-119	-134	119	-147	-160	147	-133	-137	133	-126	-145	126
1984	-204	-181	204	-209	-191	209	-204	-170	204	-216	-183	216
1985	-114	-148	114	-124	-179	124	-115	-148	115	-130	-159	130
1986	-89	-165	89	-80	-194	80	-86	-149	86	-97	-160	97
1987	-178	-133	178	-163	-163	163	-158	-123	158	-174	-138	174
1988	18	-13	-18	3	-52	-3	21	-2	-21	1	-20	-1
1989	-9	-1	9	0	-19	0	7	6	-7	-17	-7	17
1990	-92	-157	92	-97	-188	97	-75	-135	75	-89	-160	89
1991	10	-55	-10	-11	-97	11	5	-43	-5	-6	-73	6
1992	105	95	-105	73	53	-73	87	73	-87	71	54	-71
1993	160	120	-160	101	68	-101	113	81	-113	103	76	-103
1994	163	87	-163	127	48	-127	115	41	-115	109	48	-109
1995	206	145	-206	169	99	-169	163	111	-163	157	109	-157
1996	177	200	-177	163	155	-163	124	125	-124	122	145	-122
1997	261	203	-261	236	164	-236	194	131	-194	203	155	-203
1998	167	72	-167	150	49	-150	146	57	-146	133	67	-133
1999	181	20	-181	169	3	-169	169	11	-169	165	11	-165
2000	52	86	-52	42	58	-42	47	79	-47	46	64	-46
2001	81	76	-81	52	54	-52	60	42	-60	58	38	-58
2002	89	78	-89	45	35	-45	53	49	-53	68	51	-68
2003	273	310	-273	211	263	-211	175	178	-175	223	206	-223
2004	426	346	-426	334	299	-334	270	222	-270	327	272	-327
2005	311	347	-311	239	290	-239	172	183	-172	230	264	-230
2006	349	298	-349	292	240	-292	199	152	-199	258	223	-258
2007	247	197	-247	193	152	-193	130	112	-130	172	148	-172
2008	8	-11	-8	-8	-46	8	6	-10	-6	-16	-31	16
2009	91	160	-91	57	92	-57	44	24	-44	62	47	-62
2010	51	78	-51	35	67	-35	20	38	-20	40	55	-40
Total	-612	-488	612	-1273	-1528	1273	-1256	-1271	1256	-1383	-1321	1383
Pre-87	-3928	-3183	3928	-3845	-3386	3845	-3473	-2792	3473	-3819	-3090	3819
Post-87	3316	2695	-3316	2572	1858	-2572	2217	1521	-2217	2436	1769	-2436

Estimates are the difference of the number of predictions made by the trade-off model less predictions made by the pecking order [(# predicted by trade-off) - (# predicted by pecking order)]. Positive values denote a greater number of trade-off model predictions, zero indicates an equivalence, and negative values indicate a greater number of pecking order predictions.

Table 18: Predictions of debt issuance by Hovakimian, Opler, and Titman adjusted model (A-H.O.T.) less SSM pecking order.

	Book Leverage (total debt)			Book Leverage (long-term debt)			Market Leverage (total debt)			Market Leverage (long-term debt)		
	A-H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	A-H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	A-H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors	A-H.O.T Correct vs. Pecking order	Type 1 errors	Type 2 errors
1970	-3	21	3	11	26	-11	4	18	-4	0	18	0
1971	-49	-63	49	-33	-57	33	-50	-65	50	-50	-73	50
1972	-47	-4	47	-33	-9	33	-42	-13	42	-45	-15	45
1973	17	23	-17	19	16	-19	23	29	-23	21	31	-21
1974	-17	11	17	-6	-1	6	19	35	-19	4	28	-4
1975	-196	-329	196	-200	-379	200	-158	-259	158	-163	-283	163
1976	-172	-138	172	-176	-162	176	-124	-101	124	-150	-126	150
1977	-88	-38	88	-103	-60	103	-21	-6	21	-29	-9	29
1978	43	20	-43	45	12	-45	50	23	-50	55	26	-55
1979	42	12	-42	41	4	-41	41	14	-41	42	13	-42
1980	-158	-136	158	-150	-166	150	-142	-130	142	-146	-132	146
1981	-155	-191	155	-170	-216	170	-163	-180	163	-161	-189	161
1982	-315	-469	315	-303	-473	303	-325	-475	325	-317	-468	317
1983	-276	-337	276	-267	-382	267	-311	-364	311	-303	-365	303
1984	-410	-318	410	-358	-336	358	-367	-307	367	-396	-323	396
1985	-301	-341	301	-270	-396	270	-282	-338	282	-307	-359	307
1986	-126	-218	126	-98	-242	98	-142	-233	142	-149	-239	149
1987	-274	-229	274	-230	-247	230	-194	-196	194	-242	-217	242
1988	-57	-134	57	-15	-140	15	-9	-127	9	-46	-134	46
1989	88	8	-88	111	7	-111	84	-6	-84	74	-10	-74
1990	-18	-149	18	13	-152	-13	20	-107	-20	-8	-134	8
1991	-51	-220	51	-43	-251	43	-28	-192	28	-40	-202	40
1992	-107	-177	107	-77	-206	77	-27	-136	27	-74	-153	74
1993	8	-109	-8	-15	-160	15	39	-105	-39	3	-118	-3
1994	62	-89	-62	59	-127	-59	85	-79	-85	87	-86	-87
1995	252	118	-252	237	84	-237	233	92	-233	245	106	-245
1996	164	113	-164	161	72	-161	152	71	-152	154	93	-154
1997	260	84	-260	244	69	-244	242	54	-242	254	68	-254
1998	289	113	-289	278	89	-278	281	97	-281	279	106	-279
1999	237	20	-237	227	2	-227	236	23	-236	233	16	-233
2000	192	184	-192	180	150	-180	204	191	-204	198	194	-198
2001	68	-41	-68	64	-83	-64	77	-40	-77	66	-41	-66
2002	-104	-333	104	-108	-344	108	-69	-284	69	-78	-314	78
2003	-13	-165	13	-47	-207	47	-23	-178	23	-19	-172	19
2004	141	11	-141	73	-49	-73	124	-9	-124	123	-11	-123
2005	210	147	-210	153	96	-153	175	96	-175	192	126	-192
2006	308	168	-308	267	137	-267	263	121	-263	285	147	-285
2007	238	114	-238	209	70	-209	216	62	-216	227	77	-227
2008	-201	-294	201	-193	-296	193	-179	-270	179	-192	-281	192
2009	-109	-428	109	-124	-451	124	-119	-446	119	-111	-434	111
2010	-3	-15	3	-8	-16	8	-8	-15	8	-5	-12	5
Total	-631	-3798	631	-635	-4774	635	-215	-3735	215	-489	-3851	489
Pre-87	-2454	-2850	2454	-2185	-3201	2185	-2109	-2681	2109	-2308	-2826	2308
Post-87	1823	-948	-1823	1550	-1573	-1550	1894	-1054	-1894	1819	-1025	-1819

Estimates are the difference of the number of predictions made by the trade-off model less predictions made by the pecking order [(# predicted by trade-off) - (# predicted by pecking order)]. Positive values denote a greater number of trade-off model predictions, zero indicates an equivalence, and negative values indicate a greater number of pecking order predictions.

Little is known about the linkages between SOA and firm performance and risk. Some evidence suggests that risky-overleveraged firms visit the capital markets more frequently, while others offer contrary evidence (Titman and Tsyplakov 2007). In addition, the literature is not clear on how SOA relates to other factors such as information asymmetries, agency costs, or non-debt tax shields. The substitution hypothesis states that a firm's target leverage is influenced by non-debt tax shields, substituting for debt, such that non-debt tax shields should reduce the amount of debt employed (DeAngelo and Masulis 1980; Masulis 1983). Nevertheless, a number of studies have failed to find a linkage between leverage and non-debt tax shields. Hence, there is interest in the SOA relative to non-debt tax shields (Long and Malitz 1985; Talmor, Haugen, and Barnea 1985; Titman and Wessels 1988).

The target leverage (TL) of the ith firm at time t is a function of firm level fixed effects, firm characteristics, industry characteristics, and macroeconomic influences:

$$T\,L_{it} = \alpha_i + x_{it-1}\beta \tag{7}$$

As the target leverage is unobservable, equation (10) may not be estimated without an unknown amount of error. The target adjustment model is the change in leverage as a function of the difference in the target leverage from the actual lagged leverage:

$$L_{it} - L_{it\text{-}1} = \gamma(T\,L_{it} - L_{it\text{-}1}) + s_{it} \tag{8}$$

Substituting (10) into (11):

$$L_{it} = \gamma\,\alpha_i + \gamma x_{it-1}\beta + \gamma(1 - L_{it-1}) + s_{it} \tag{9}$$

In examination of market to debt ratios, Flannery and Rangan (2006) estimate equation 12 by employing a series of approaches including a variety of Fama-MacBeth regressions and fixed effects panels – noting that firm fixed effects are important determinants in estimating SOA. Flannery and Rangan (2006) note that potential bias may arise by using a lag of the dependent variable may result in serial correlation. Flannery and Rangan (2006) instrument the lagged market to debt ratio with the book value to debt ratio and report estimates similar to the lagged market to debt ratio. Huang and Ritter (2009) and others question the efficacy of this instrument as both debt ratios will be affected by some types of shocks. We follow the path of Flannery and Rangan of instrumenting the lagged dependent variable; however, we depart from their approach by employing the ratio of interest expense to assets and the set of target leverage determinants.

4.1 Target Leverage Determinants

The pecking-order and trade-off theories identify a number of factors that shape a firm's leverage. The pecking-or der theory states that debt issuance occurs when there is paucity of internal funding and in a relaxed setting the theory allows for factors such as agency costs and information asymmetries to influence the financing mechanism. The trade-off theory seeks to balance cost and benefits of firm characteristics, tax benefits, and capital costs. The variables employed consists of those used frequently within the literature and factors specifically

identified by the theories. Table 19 presents various estimation techniques as a baseline comparison. The demeaned Fama-Macbeth, fixed effects panel, and IV panel are relatively similar with the exception of long-term debt, the spread is 0.04 between the fixed effects on IV panels while in Flannery and Rangan (2006) their estimates differed by 0.036. The IV estimates, all debt and long-term debt, are the same when rounding to the thousandths, i.e., 0.640.

Table 19: Partial adjustments of book leverage.

	Fama-Macbeth		Fama-Macbeth Demeaned		Fixed Effects Panel		Instruemental Variable Panel	
Book leverage (all-debt)	0.8552		0.6524		0.6378		0.6396	
	(.007)***		(.016)***		(.008)***		(.017)***	
Book leverage (long-term debt)		0.8258		0.6137		0.5978		0.6404
		(.008)***		(.016)***		(.009)***		(.020)***
Δ Average tax rate	0.0207	0.0240	0.0150	0.0203	0.0167	0.0239	0.0163	0.0170
	(.006)***	(.006)***	(.006)*	(.005)***	(.006)**	(006.)***	(.006)*	(.007)**
Fund flow deficit	0.0173	0.0656	0.0183	0.0734	0.0175	0.0615	0.0174	0.0628
	(.007)*	(.008)***	(.009)*	(.008)***	(.006)**	(006.)***	(.006)**	(.006)***
Ln Assets	0.0020	0.0043	0.0088	0.0094	0.0071	0.0076	0.0071	0.0067
	(.000)***	(.000)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***
fMarket to Book	-0.0030	-0.0028	-0.0028	-0.0022	-0.0020	-0.0016	-0.0021	-0.0012
	(.001)**	(.001)**	(.001)***	(.001)**	(.001)***	(.000)***	(.001)***	(.000)**
Non-Debt Tax Shield	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(.000)***	(.000)***	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Tangible Assets to Debt	-0.0006	-0.0006	-0.0006	-0.0006	-0.0001	-0.0001	-0.0001	0.0000
	(.000)***	(.000)***	(.000)**	(.000)***	(.000)*	(.000)†	(.000)*	(.000)†
Median Industry Leverage	0.0664	0.0876	0.0610	0.0549	0.0676	0.0443	0.0669	0.0261
	(.012)***	(.011)***	(.015)***	(.014)***	(.018)***	(.021)*	(.018)***	(.021)
Term Spread	-------	-------	-------	-------	-0.3710	-0.2354	-0.3702	-0.2340
					(.035)***	(.034)***	(.035)***	(.033)***
Debt Premia	-------	-------	-------	-------	-0.3806	-0.2500	-0.3792	-0.2298
					(.115)***	(.107)*	(.115)***	(.102)*
Agent	-0.0009	-0.0004	0.0009	0.0006	0.0005	0.0003	0.0005	0.0002
	(.000)*	(.000)	(.000)**	(.000)	(.000)	(.000)	(.000)	(.000)
Asymmetry	0.0010	0.0004	0.0009	0.0007	0.0004	0.0003	0.0004	0.0003
	(.001)†	(.000)	(.001)†	(.001)	(.001)	(.001)	(.001)	(.001)
BSM Prob	0.0002	0.0001	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002
	(.000)***	(.000)**	(.000)***	(.000)***	(.000)***	(.000)***	(.000)***	(.000)***
Firm Uniqueness	-0.0002	-0.0007	0.0004	-0.0007	0.0007	-0.0008	0.0007	-0.0009
	(.000)	(.000)†	(.000)	(.000)	(.000)	(.000)†	(.000)	(.000)*
F-stat							17196.91	12523.39
R^2	0.764	0.739	0.458	0.409	0.424	0.370	0.424	0.369

Standard errors are reported within (). Denotes significance at the 1%*** , 1%**, 5%*, and 10%† level. The Stock and Yogo (2002, 2005) critical value for the F statistics is 16.38.

Δ Marginal tax rate: the change in the marginal tax rate that is brought about by the debt tax shield, measured as the marginal rate of tax of EBIT less the marginal rate of tax on EBT; **Fund flow deficit:** an indicator variable denoting if the firm is experiencing a fund flow deficit; **LnAssets:** the log of firm assets; **Market to book:** the market to book ratio of the firms assets; **Non-debt tax shields:** the value of the firm's non-debt tax shields; **Tangible assets to debt:** the ratio of the firms tangible assets to total debt; **Median industry leverage:** the annual median leverage of each Fama-French 48 industry; **Term spread:** the spread on the 3 month and ten year treasury; **Debt premia:** the spread on Baa less AAA debt; **Agent:** the measure of insider versus capital holder agency cost; **Asymmetry:** information asymmetry; **BSM Prob:** measure of default risk/cost; **Firm Uniqueness: a** measure of firm uniqueness that accounts for risk associated with consolidation costs and excessively integrated systems.

Market leverage results are similar, with slightly faster IV estimates: 0.629 to 0.624 (refer to Table 20). The implied adjustment speed of book leverage (all-debt) is 36 percent and 37.1 percent in terms of market leverage, indicating that firms adjust half way towards their target

book leverage in just over 1.5 years. The rather fast adjustment does not offer support for the pecking-order theory. The prior findings suggest a break in the data. The data are separated as pre-86 and post-86 to estimate a period where financing is neutral of the 1986 Tax Reform Act and a period subjected to the change in tax reform. The estimates indicate an increase in adjustment speed after the 1986 Tax Reform Act. Flannery and Rangan (2006) report estimates of 0.566 (1966-1977), 0.509 (1978-1989), and 0.516 (1990-2001). It is arguable that a difference in selection period results in the faster adjustment speed in the 1978 to 1989 period. Robustness checks are performed allowing for lagged horizons (2, 3, and 4 years), size leverage, and risk level. The results demonstrate stability over the dimensions. In addition, the findings show that small and low-leverage firms adjust towards target leverage values faster.

Table 20: Partial adjustments of market leverage.

	Fama-Macbeth		Fama-Macbeth Demeaned		Fixed Effects Panel		Instruemental Variable Panel	
Market leverage (all-debt)	0.8646		0.6623		0.6504		0.6289	
	(.012)***		(.012)***		(.006)***		(.014)***	
Market leverage (long-term debt)		0.8315		0.6209		0.6045		0.6240
		(.015)***		(.015)***		(.007)***		(.016)***
Δ Marginal tax rate	0.0238	0.0262	0.0183	0.0245	0.0209	0.0283	0.0276	0.0235
	(.007)**	(.010)**	(.006)**	(.008)**	(.008)**	(.008)***	(.008)***	(.009)**
Fund flow deficit	0.0274	0.0812	0.0372	0.1005	0.0179	0.0732	0.0225	0.0742
	(.012)*	(.012)***	(.016)*	(.016)***	(.006)**	(.006)***	(.006)***	(.006)***
Ln Assets	0.0016	0.0046	0.0173	0.0159	0.0105	0.0104	0.0113	0.0098
	(.001)*	(.001)***	(.002)***	(.001)***	(.001)***	(.001)***	(.001)***	(.001)***
Market to Book	-0.0035	-0.0047	-0.0045	-0.0040	-0.0015	-0.0016	-0.0020	-0.0013
	(.002)*	(.001)***	(.001)***	(.001)***	(.000)***	(.000)***	(.001)***	(.000)**
Non-Debt Tax Shield	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(.000)*	(.000)***	(.000)†	(.000)*	(.000)	(.000)	(.000)	(.000)
Tangible Assets to Debt	-0.0012	-0.0011	-0.0004	-0.0005	-0.0001	-0.0001	-0.0001	-0.0001
	(.001)*	(.000)**	(.000)	(.000)*	(.000)*	(.000)	(.000)*	(.000)†
Median Industry Leverage	0.0719	0.0757	0.0930	0.0942	0.0008	0.0152	0.0168	0.0006
	(.018)***	(.014)***	(.020)***	(.023)***	(.011)	(.013)	(.014)	(.017)
Term Spread	-------	-------	-------	-------	-1.3529	-0.9487	-1.3522	-0.9499
					(.048)***	(.044)***	(.049)***	(.043)***
Debt Premia	-------	-------	-------	-------	0.6980	0.7394	0.6776	0.7454
					(.165)***	(.143)***	(.168)***	(.141)***
Agent	-0.0032	-0.0021	0.0024	0.0018	0.0021	0.0017	0.0023	0.0015
	(.001)***	(.001)**	(.001.)***	(.001)**	(.000)***	(.000)***	(.000)***	(.000)***
Asymmetry	0.0008	0.0003	0.0009	0.0011	0.0001	0.0007	0.0002	0.0006
	(.001)	(.001)	(.001)	(.001)*	(.001)	(.001)	(.001)	(.001)
BSM Prob	(.001)*	(.000)**	(.000)	(.000)*	0.0004	0.0003	0.0004	0.0003
	0.0719	0.0757	0.0930	0.0942	(.000)***	(.000)***	(.000)***	(.000)***
Firm Uniqueness	(.018)***	(.014)***	(.020)***	(.023)***	-0.0003	-0.0019	-0.0003	-0.0020
	-------	-------	-------	-------	(.001)	(.001)***	(.001)	(.001)***
F-stat							12236.27	9585.16
R^2	0.776	0.738	0.479	0.417	0.441	0.383	0.440	0.383

Standard errors are reported within (). Denotes significance at the .1%*** , 1%**, 5%*, and 10%† level. The Stock and Yogo (2002, 2005) critical value for the F statistics is 16.38.

Δ Marginal tax rate: the change in the marginal tax rate that is brought about by the debt tax shield, measured as the marginal rate of tax of EBIT less the marginal rate of tax on EBT; Fund flow deficit: an indicator variable denoting if the firm is experiencing a fund flow deficit; LnAssets: the log of firm assets; Market to book: the market to book ratio of the firms assets; Non-debt tax shields: the value of the firm's non-debt tax shields; Tangible assets to debt: the ratio of the firms tangible assets to total debt; Median industry leverage: the annual median leverage of each Fama-French 48 industry; Term spread: the spread on the 3 month and ten year treasury; Debt premia: the spread on Baa less AAA debt; Agent: the measure of insider versus capital holder agency cost; Asymmetry: information asymmetry; BSM Prob: measure of default risk/cost; Firm Uniqueness: a measure of firm uniqueness that accounts for risk associated with consolidation costs and excessively integrated systems.

5. Conclusion

The findings offer new evidence to explain the time varying changes in capital structure regimes. Over the period of 1970 to 1987, we find sufficient evidence to show that the Shyam-Sunder and Myers model of the pecking-order theory is the predominant method of accounting for firm financing decisions. However, there is evidence that shows market-timing and trade-off theory factors are at work. In the latter half of the sample, 1988-2010, the empirical evidence strongly supports a trade-off mechanism relative to a pecking-order. The demise of pecking-order coincides with the Tax Reform Act of 1986 and the reporting transition from the "Statement on sources and uses of funds" to the "Statement of cash flows" – FASB (FSAS-95). As the 1986 Tax Reform Act brought about a reduction in the corporate tax rate, the per dollar value of tax shield generated by debt declined. This would suggest that the pecking-order is instead a financing rule that increases in occurrence with the per dollar value of the tax shield.

Examination of firm adjustments towards target leverage offers additional support. The sample- wide estimates indicate adjustments toward target levels at a rate of 36 percent per year for book leverage. The estimates also indicate that adjustments increase in 1986. The increase in adjustments coincides with firms' increased use of equity relative to debt, implying firms moved to deleverage once tax rates declined. These findings offer an explanation why researchers continue to find mixed results that support both the pecking-order and trade-off theories. Moving forward, the empirical findings suggest a potential increase in firm preference of equity financing over debt in the future with a large reduction in corporate tax rates under the Tax Cuts and Jobs Act of 2017.

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References

Baker, Malcolm and Jeffrey Wurgler (2002) "Market timing and capital structure" *The Journal of Finance (*57)1, 1–32. https://doi.org/10.1111/1540-6261.00414

Berger, Allen N. and Emilia Bonaccorsi di Patti (2006) "Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry" *Journal of Banking & Finance (*30)4, 1065–1102. https://doi.org/10.1016/j.jbankfin.2005.05.015

Bharath, Sreedhar T, Paolo Pasquariello, and Guojun Wu (2009) "Does asymmetric information drive capital structure decisions?" *Review of Financial Studies (*22)8, 3211–3243. https://doi.org/10.1093/rfs/hhn076

Buis, Marteen L. (2007) "Where did my p-values go?" *The Stata Journal"* (7)4, 584-586.

Chirinko, Robert S. & Anuja R Singha (2000) "Testing static tradeoff against pecking order models of capital structure: a critical comment" *Journal of Financial Economics (*58)3, 417–425. https://doi.org/10.1016/S0304-405X(00)00078-7

DeAngelo, Harry and Ronald W Masulis (1980) "Optimal capital structure under corporate and personal taxation" *Journal of Financial Economics (*8)1, pp. 3–29.

https://doi.org/10.1016/0304-405X(80)90019-7
Donaldson, Gordon and Nan Dundes Stone *Managing corporate wealth: The operation of a comprehensive financial goals system*. Praeger New York. 1984
Fama, Eugene F and Kenneth R French (2005) "Financing decisions: who issues stock?" *Journal of Financial Economics (*76)3, 549–582. https://doi.org/10.1016/j.jfineco.2004.10.003
Faulkender, M., Flannery, M., Hankins, K., and Smith, J. (2007) "Do adjustment costs impede the realization of target capital structure" *AFA 2008 New Orleans Meetings Paper*.
Flannery, Mark J and Kasturi P Rangan (2006) "Partial adjustment toward target capital structures" *Journal of Financial Economics (*79)3, 469–506. https://doi.org/10.1016/j.jfineco.2005.03.004
Frank, Murray Z and Vidhan K Goyal (2003) "Testing the pecking order theory of capital structure" *Journal of Financial Economics (*67)2, pp. 217–248. https://doi.org/10.1016/S0304-405X(02)00252-0
— (2009) "Capital structure decisions: which factors are reliably important?" *Financial Management (*38)1, 1–37. https://doi.org/10.1111/j.1755-053X.2009.01026.x
Helwege, Jean and Nellie Liang (1996) "Is there a pecking order? Evidence from a panel of IPO firms" *Journal of Financial Economics (*40)3, 429–458. https://doi.org/10.1016/0304-405X(95)00851-5
Hovakimian, Armen, Tim Opler, and Sheridan Titman (2001) "The debt-equity choice" *Journal of Financial and Quantitative Analysis (*36)1, 1–24. https://doi.org/10.2307/2676195
Huang, Rongbing and Jay R Ritter (2009) "Testing theories of capital structure and estimating the speed of adjustment" *Journal of Financial and Quantitative Analysis (*44)2, 237–271. https://doi.org/10.1017/S0022109009090152
Ikenberry, David, Josef Lakonishok, and Theo Vermaelen (1995) "Market underreaction to open market share repurchases" *Journal of Financial Economics (*39)2, 181–208. https://doi.org/10.1016/0304-405X(95)00826-Z
Kale, Jayant R and Husayn Shahrur (2007) "Corporate capital structure and the characteristics of suppliers and customers" *Journal of Financial Economics (*83)2, 321–365. https://doi.org/10.1016/j.jfineco.2005.12.007
Kayhan, Ayla and Sheridan Titman (2007) "Firms' histories and their capital structures"
*Journal of Financial Economics (*83)1, 1–32. https://doi.org/10.1016/j.jfineco.2005.10.007
Leary, Mark T and Michael R Roberts (2005) "Do firms rebalance their capital structures?"
*The Journal of Finance (*60)6, 2575–2619. https://doi.org/10.1111/j.1540-6261.2005.00811.x
— (2010) "The pecking order, debt capacity, and information asymmetry" *Journal of Financial Economics (*95)3, 332–355. https://doi.org/10.1016/j.jfineco.2009.10.009
Lemmon, Michael L, Michael R Roberts, and Jaime F Zender (2008) "Back to the beginning: persistence and the cross-section of corporate capital structure" *The Journal of Finance (*63)4, 1575–1608. https://doi.org/10.1111/j.1540-6261.2008.01369.x
Long, Michael S and Ileen B Malitz (1985) "Investment patterns and financial leverage" *Corporate capital structures in the United States*. University of Chicago Press, 325–352.
Masulis, Ronald W (1983) "The impact of capital structure change on firm value: Some estimates"
*The Journal of Finance (*38)1, 107–126. https://doi.org/10.1111/j.1540-6261.1983.tb03629.x
Myers, Stewart C and Nicholas S Majluf (1984) "Corporate financing and investment decisions when firms have information that investors do not have" *Journal of Financial Economics*

*(*13)2, 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Novaes, Walter and Luigi Zingales (1995) *Capital structure choice when managers are in control: Entrenchment versus efficiency*. Tech. rep. National Bureau of Economic Research

Pulvino, Todd C (1998) "Do asset fire sales exist? An empirical investigation of commercial aircraft transactions" *The Journal of Finance (*53)3, 939–978. https://doi.org/10.1111/0022-1082.00040

Rajan, Raghuram G and Luigi Zingales (1995) "What do we know about capital structure? Some evidence from international data" *The Journal of Finance (*50)5, 1421–1460 https://doi.org/10.1111/j.1540-6261.1995.tb05184.x

Rampini, Adriano A and S Viswanathan (2010) "Collateral, risk management, and the distribution of debt capacity" *The Journal of Finance (*65)6, 2293–2322. https://doi.org/10.1111/j.1540-6261.2010.01616.x

Shyam-Sunder, Lakshmi and Stewart Myers (1999) "Testing static tradeoff against pecking order models of capital structure" *Journal of Financial Economics (*51)2, 219–244. https://doi.org/10.1016/S0304-405X(98)00051-8

Smith Jr, Clifford W and, Ross L 1992) "The investment opportunity set and corporate financing, dividend, and compensation policies" *Journal of Financial Economics (*32)3, 263–292. https://doi.org/10.1016/0304-405X(92)90029-W

Talmor, Eli, Robert Haugen, and Amir Barnea (1985) "The value of the tax subsidy on risky debt" *Journal of Business* (58)2, 191–202. http://dx.doi.org/10.1086/296291

Titman, Sheridan and Sergey Tsyplakov (2007) "A dynamic model of optimal capital structure" *Review of Finance (*11)3, 401–451. https://doi.org/10.1093/rof/rfm017

Titman, Sheridan and Roberto Wessels (1988) "The determinants of capital structure choice" *The Journal of Finance (*43)1, 1–19. https://doi.org/10.1111/j.1540-6261.1988.tb02585.x

A. Appendix

Table 1A: Variable description

Net assets — Net assets as reported in the Compustat annual database, in U.S. $ per million.

Agency costs — The implied friction of insider vs. capital holder agency cost (AC). The AC measure employs the specification of Pantzalis and Park (2007). We use principal component analysis to reduce 11 factors to one, differing from Pantzalis and Park who employ an index ranking method of 11 factors to form their measure of implied index of agency cost. Two factors: Gompers et al. (2003) proxy for shareholder rights –governance index (GI) and institutional ownership (IO) are not employed. Valueline data is used to form estimates for 1970 through 1976. Valueline does not report on the number of analysts following nor analyst spread. After principal component analysis, the estimates are rescaled to a minimum value of zero.

Asymmetry — An implied measure of adverse selection between informed insiders and uninformed traders as proposed by Bharath et al. (2009). Measure is formed in two steps. First regressing daily data with robust standard errors to form ten annual factors. The second step employs principal component analysis of the ten factors reducing their variance into one measure. The estimates are re-scaled to a minimum value of zero.

BSM Prob default risk — Measure of Hillegeist et al. (2004), who approximate the Black-Scholes-Merton default Probability (BSM-P) score. The BSM-P was selected for its superior predicative ability over the Z and O-score. The BSM-P was rescaled to a minimum value of zero.

Firm uniqueness — Measure of Titman and Wessles (1988), the measure of firm uniqueness employs principal component analysis of three factors: research and development normalized relative to sales, selling expense over sales, and the mean value of the industry Herfindahl-Hirschman index. Titman and Wessels (1988) use industry quit rates, these data are not available over the entire sample period, Herfindahl-Hirschman value is used in place of quit rates. After factor analysis, the estimates are rescaled to a minimum value of zero.

Leverage — Formed according to the variable definitions of Leary and Roberts (2010), where long-term leverage values are formed by removing current debt, lags are applied when noted. **Industry book leverage** — Fama-French 48 industry definition.

Capital Expenditure — The measure indicates firm reinvestment and growth potential. Capital expenditures as reported in the Compustat annual database relative to assets.

Market-to-book — The ratio of firm market value to book value.

Tangible Assets to Debt — Tangible assets as reported in the Compustat annual database relative to book value of debt, a measure of debt capacity.

Debt tax shields — The proportion of income sheltered by debt as (DTS) $= \frac{\text{EBIT}-\text{EBT}}{\text{EBIT}}$. The DTS variable is bound to a maximum value of one and a minimum of zero, any value greater than one can be employed as a tax carry back or credit forward.

Non-debt tax shields — The quantity of non-debt tax shields relative to net revenue is obtained by dividing the total of non-debt tax shields by net revenue (NDTS)

Debt premia — The rate of return on Baa debt less AAA.

Term spread — The spread of ten year Treasury less the three month rate.

Interest coverage — The interest coverage ratio.