

# **TESTING CAPITAL STRUCTURE: EVIDENCE FROM MEXICO**

**October, 2009**



**Miguel Calzada M  
October 29th, 2009**

## Theories under study in this Paper

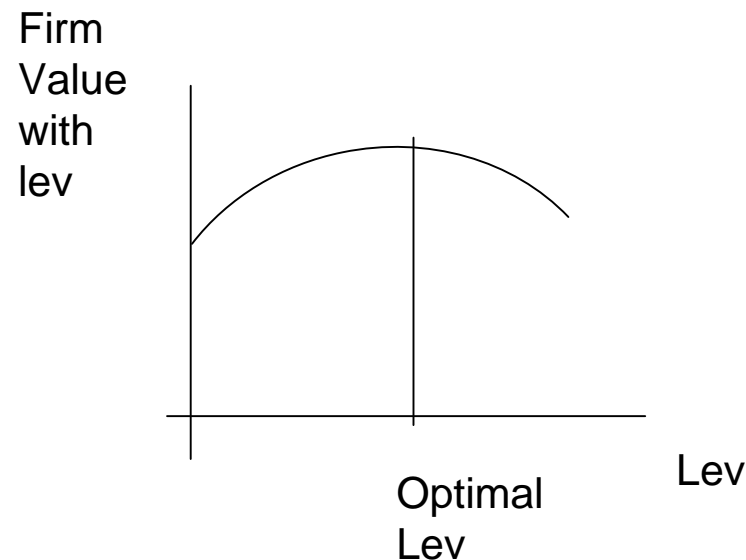
---

- Recent capital structure theories have proved to be so complex that experts continue to produce mixed evidence about the basic economic behavior of capital structure
- Of particular interest in this study are two theories for capital structure, the tradeoff theory and the pecking order theory

# Pecking order theory and tradeoff theory

---

- The central prediction of the pecking order is that, before the firm issues external funds internal funds are first exhausted, followed by external financing starting with the least risky source then the next least risky source
- In the tradeoff theory capital structure is based on tradeoffs between tax benefits from borrowing money and the costs of financial distress



## Contribution of this Paper

---

- While the debate over the relative importance of the two central theories continues, much of the evidence that has been amassed has been drawn chiefly from U.S. firms
- This study's main contribution is to provide new evidence about the theories that draws from capital structure behavior at public Mexican firms

# Tests in this Paper – Part 1

---

H1.-

Classical Capital Structure Target Test  
(Shyam-Sunder & Myers, 1999)

H2.-

Moving Capital Structure Target Test  
(Kayhan & Titman, 2007)

## Tests in this Paper – Part 2

---

H3.-

Investing Financing Policy under Descriptive Statistics  
(Elsas, Flannery & Garfinkel 2004)

H4.-

External Financing Sources Test  
(Myers & Majluf 1984)

H5.-

Empirical Models on Debt and Equity Issuances  
(Mayer & Sussman, 2004)

H6.-

Equity Issuances Behavior Test  
(Mayer & Sussman, 2004)

H7.-

Size and frequency of Equity Issuance  
(Mayer & Sussman, 2004)

# H1.- Classical Capital Structure Target Test (Shyam-Sunder & Myers, 1999)

PART 1



# Sample

---

- The sample includes firms who traded on the Mexican Stock Exchange MSE from 1993 to 2002
- Firms that tend or have very extreme capital structures are also excluded from the sample, analyzing only leverage debt ratios from 1% to 125%

# Predictions for Classical Capital Structure Test

<b>Variables Used for the Classical Model</b>	<b>Pecking Order Theory</b>	<b>Tradeoff Theory</b>
Asset Tangibility PPE/TA	-	+
Profitability EBITDA/TA	-	+
Firm Size Ln Sales	-	+
Asset Uniqueness IA/TA & OpExp/ Sales	N/A	-
Current Taxes Taxes / EBITDA	-	+
NDTS Dep. and amort. / EBIT	-	-

# Results for the Classical Capital Structure Test

TABLE 4

## Estimates of Capital Structure Coefficients under Classical Models

Debt leverage measures	Parameter Coefficient	Parameter Coefficient	Parameter Coefficient	Parameter Coefficient
Constant	0.0389 (0.7549)	0.0789* (1.6609)	0.0475 (0.9272)	
PP&E	-0.0631** (-2.1581)	-0.0515* (-1.7943)	-0.0572** (-2.0091)	-0.0543** (-1.9192)
EBITDA	-0.4685*** (-6.3033)	-0.4796*** (-6.4602)	-0.4644*** (-6.3154)	-0.4748*** (-6.5350)
Size	0.0327*** (9.4851)	0.0307*** (9.2913)	0.0319*** (9.3639)	0.0348*** (28.4555)
Intangible assets	-0.0598 (-0.7563)	-0.0087 (-0.1155)		
Op. expenses	0.0731** (1.9839)		0.0607* (1.7465)	0.0732** (2.2865)
Taxes	-0.0310* (-1.8626)	-0.0327** (-1.9654)	-0.0199** (-2.0052)	-0.0194** (-1.9633)
NDTS	-0.0031 (-0.6656)	-0.0029 (-0.6258)	-0.0059 (-1.3393)	-0.0062 (-1.4166)
Observations	989	989	981	981
Mean dep. variable	0.4518	0.4518	0.4518	0.4518
R <sup>2</sup>	0.1027	0.0991	0.1007	0.0999

# Conclusions for Classical Capital Structure Test

Variables Used for the Classical Model	Pecking Order Theory	Tradeoff Theory
Asset Tangibility PPE/TA	-	+
Profitability EBITDA/TA	-	+
Firm Size Ln Sales	-	+
Asset Uniqueness IA/TA & OpExp/ Sales	N/A	-
Current Taxes Taxes / EBITDA	-	+
NDTS Dep. and amort. / EBIT	-	-

# H2.- Moving Capital Structure Target Test (Kayhan & Titman, 2007)

PART 1



## H2 .- Moving Target Capital Structure Test (Kayhan & Titman, 2007)

---

Firms' target capital structures are highly sensitive to deviations, and if the cost to adjust to the target is relatively low, then history variables should only have a fleeting influence on observed capital structure.

## H2 .- Moving Target Capital Structure Test (Kayhan & Titman 2007)

---

$$L^t = \hat{\alpha}_1 \text{PPE} + \hat{\alpha}_2 \text{EBITDA} + \hat{\alpha}_3 \text{Size} + \hat{\alpha}_4 \text{Op. Exp} + \hat{\alpha}_5 \text{Taxes} + \hat{\alpha}_6 \text{NDTS}$$

Where:

$$\hat{\alpha}_1 = -0.0543, \hat{\alpha}_2 = -0.4748, \hat{\alpha}_3 = 0.0348, \hat{\alpha}_4 = 0.0732, \hat{\alpha}_5 = -0.0194 \text{ and } \hat{\alpha}_6 = -0.0062$$

$$L - L_{-2} = \beta_1 \text{FD}_{t,t-2} + \beta_2 \text{EBITDA}_{t,t-2} + \beta_3 \text{PPE}_{t,t-2} + \beta_4 \text{Size}_{t,t-2} + \beta_5 \text{Op Exp}_{t,t-2} + \beta_6 \text{Taxes}_{t,t-2} + \beta_7 \text{NDTS}_{t,t-2} + \beta_8 \text{Levdef}_{t-2} + \beta_9 \text{Change target}_{t-2} + \varepsilon_t$$

# Predictions for Moving Target Capital Structure Test

Variables Used	Pecking Order Theory	Tradeoff Theory
<b>Variables of Cost and Benefits Proxies of Debt</b> (Cumulative effects of the variables)	+	-
<b>Leverage Deficit</b> (Difference between the observed leverage at $t = -2$ and the target ratio predicted $t = -2$ )	$> = 0$	-
<b>Change in Target</b> (difference between target leverage at $t = 0$ , and target leverage at $t = -2$ )	-	+
<b>Financial deficit (FD)</b> (Represents the amount of external capital that is raised over a period of time)	N/A	+

# Results for Moving Target Capital Structure Test

**Table 5**  
Effects of Capital Structure Measures over Time on Leverage Ratios  
(t, t-2), (t, t-3), (t, t-4) and (t, t-5)

Changes in leverage debt ratios	Parameter Coefficient (t,t-2)	Parameter Coefficient (t,t-3)	Parameter Coefficient (t,t-4)	Parameter Coefficient (t,t-5)
Financial deficit	0.0032*** (4.8238)	0.0046*** (4.4649)	0.0041*** (3.7393)	0.0024** (1.8668)
EBITDA	-0.0495*** (-3.5752)	-0.0421*** (-2.9426)	-0.0476*** (-3.5917)	-0.0364*** (-2.8232)
PPE	-0.0164* (-1.6874)	-0.0293* (-1.6670)	-0.0022 (-0.1574)	0.0054 (0.3688)
Size	-0.2763* (-1.7530)	-0.2701 (-1.3840)	-0.6097*** (-3.0134)	-0.4965** (-2.4422)
Op. expenses	0.1110** (2.3352)	0.0947* (1.6722)	0.0373 (0.6957)	-0.1125 (-1.3025)
Taxes	0.0010 (0.0478)	-0.0134 (-0.5165)	0.0311 (1.1410)	0.0119 (0.4025)
NDTS	0.0531** (2.2937)	0.0497 (1.5432)	0.0547* (1.6758)	0.0812** (2.3544)
Leverage deficit	-0.2237*** (-8.1069)	-0.3144*** (-8.6627)	-0.4457*** (-10.4034)	-0.5292*** (-10.6435)
Change in target	0.3498*** (5.2588)	0.4857*** (4.9524)	0.5967*** (4.9727)	0.4008*** (3.8854)
Observations	831	702	578	467
Mean dep variable	0.0134	0.0169	0.0164	0.0154
R <sup>2</sup>	0.1515	0.1680	0.2251	0.2539

Note: Financial Deficit coefficients are presented in thousands.

# Conclusions for Moving Target Capital Structure Test

Variables Used	Pecking Order Theory	Tradeoff Theory
<b>Variables of Cost and Benefits Proxies of Debt</b> (Cumulative effects of the variables)	+	-
<b>Leverage Deficit</b> (Difference between the observed lev at $t = -2$ and the target ratio pred = -2)	$> = 0$	-
<b>Change in Target</b> (difference between target leverage at $t = 0$ , and target leverage at $t = -2$ )	-	+
<b>Financial deficit (FD)</b> (Represents the amount of external capital that is raised over a period of time)	N/A	+

H3.-  
Investing Financing Policy under  
Descriptive Statistics  
(Elsas, Flannery & Garfinkel 2004)

PART 2



## H3.- Investing Financing Policy under Descriptive Statistics

---

- We look at firms under certain situations that tend to move away from their previous target capital structure
  - Tradeoff theory states that when firms displace from target ratios, firms tend to move back to the previous leverage
  - Pecking order theory argues that after extinguish their internal resources, firms issue debt then equity
- Under the pecking order theory, firms first use internal financing, then debt is the dominant financing source

## Sample for the Investing Financing Policy under Descriptive Statistics

---

- Major investment: as at least 20% of the firm's prior year-end total assets (Elsas, Flannery & Garfinkel 2004)
- This study identifies 99 firms and 180 observations

# Pecking Order Theory when Firms Undertake Large Investments

---

$$\text{Major Investment} = \text{Equity}_{it} + \text{Debt}_{it} + \text{Internal Resources}_{it}$$

Where:

*Equity*<sub>ti</sub> is the net common and preferred equity financing during year t.

*Lt Debt*<sub>ti</sub> is the net change in long-term and short-term debt financing during year t.

*Internal Resources*<sub>ti</sub> is operating cash flows, divests, retained earnings and all other funds flows categories during year t.

i is a company index and

t is a time index.

# Results of Major Investments Financing Patterns

Financing results during 1993 to 2002 based on previous equation

TABLE 8

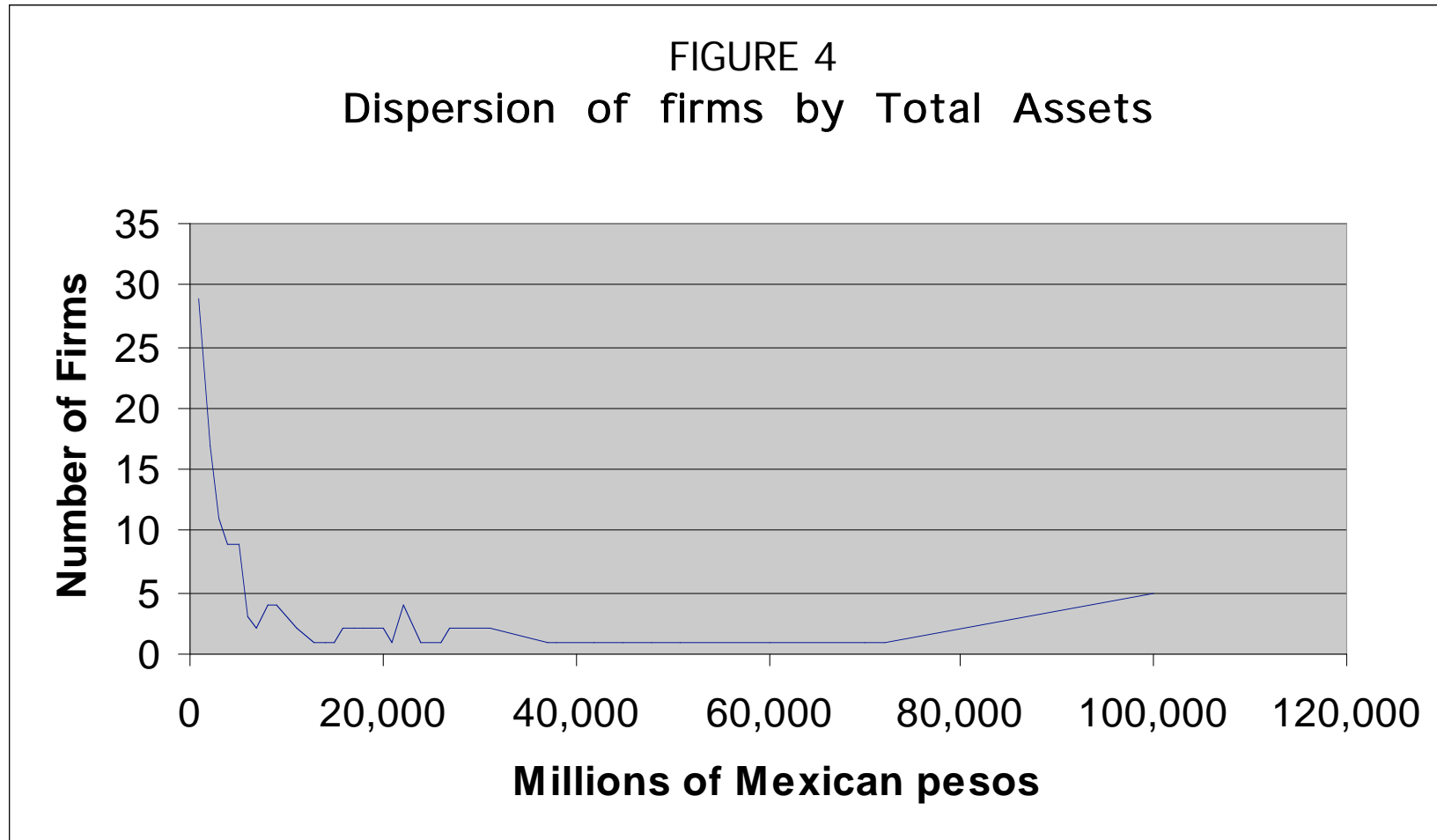
## Financing Patterns Associated with Major Investments

\*, \*\*, \*\*\* denotes that the mean ratio on event  $t = 0$  is significantly different from  $t = (-1, 1)$  at 10%, 5% and 1% respectively.

	Event $t = 0$	Event $t = (-1, +1)$
<b>Debt / Investments</b>	49.9%	50.3%
Equity/Investments	23.0%	26.0%
Internal /Investments	27.1%	23.7%

Similar to previous studies, major investments are primarily financed by external funds, and predominantly debt.

# Robustness of Pecking Order Theory when Firms Undertake Large Investments



# Robustness of Pecking Order Theory when Firms Undertake Large Investments

TABLE 10  
**Financing Patterns Differentiated by Quintile**

	Event t = 0	Event t = (-1, +1)
Panel A: Firms on Quintile 1 (N= 40)		
Equity	46.0%	33.8%
Debt	67.8%	55.4%
Internal	-13.8%	10.8%
Panel B: Firms on Quintile 2 (N= 40)		
Equity	25.5%	33.1%
Debt	51.2%	51.3%
Internal	23.2% **	15.7% **
Panel C: Firms on Quintile 3 (N= 40)		
Equity	24.3% *	34.6% *
Debt	60.2%	46.2%
Internal	15.5%	19.2%
Panel D: Firms on Quintile 4 (N= 40)		
Equity	6.8%	25.0%
Debt	49.6%	43.3%
Internal	43.6%	31.7%
Panel E: Firms on Quintile 5 (N= 40)		
Equity	9.0%	7.5%
Debt	62.0%	56.4%
Internal	29.0%	36.1%

## Conclusion of Pecking Order Theory when Firms Undertake Large Investments

---

Debt is the dominant financing resource and equity finance is observed among firms that are more financially constrained in accordance with the pecking order theory

# H4.- External Financing Sources Test (Myers & Majluf 1984)

PART 2



## H4.-External Financing Sources Test for Pecking Order Theory

---

(Myers & Majluf 1984)

Good quality firms issue debt to avoid underpricing problem and that they use the signaling effect in order to distinguish themselves from bad firms

Equity issuance / Major Investment =  $\beta_1$  Operating Cash flow +  $\varepsilon_t$

Debt issuance / Major Investment =  $\beta_1$  Operating Cash flow +  $\varepsilon_t$

# Predictions on External Financing Sources Test

---

Operating Cash Flow	Equity issuances	Debt issuances
Financially-constrained firms	+	$\leq 0$
Large Firms	$\leq 0$	+

# Results on External Financing Sources Test for Pecking Order Theory

TABLE 11  
Regression of External Sources on Operating Cash Flow

	Parameter Coefficient Equity Issues	Parameter Coefficient Debt Issues
Quintile I	1.5155*** (2.8863)	-0.3750 (-0.4487)
Quintile II	0.3876 (0.5920)	0.5123 (0.4916)
Quintile III	-0.5751 (-0.8946)	-0.9694 (-0.9472)
Quintile IV	0.2252 (0.2988)	1.6895 (1.4082)
Quintile V	0.0457 (0.1673)	0.7731* (1.7774)
Observations	40	40
St. dev. of dependent variable	0.4460	0.5304
R <sup>2</sup>	0.05	0.03

# Conclusions on External Financing Sources Test for Pecking Order Theory

---

Operating Cash Flow	Equity issuances	Debt issuances
Financially-constrained firms	+	$\leq 0$
Large Firms	$\leq 0$	+

H5.-  
Empirical Models on Debt and Equity  
Issuances  
(Mayer & Sussman, 2004)

PART 2



H5.-

## Empirical Models on Debt and Equity Issuances

---

(Mayer & Sussman, 2004)

Firms turn first to internal resources, for new investments. Firms should use up all their internal financing, before issuing any external finance

# Empirical Models to test the Pecking Order Theory (Mayer & Sussman, 2004)

	<b>Debt</b>	<b>Equity</b>
Investment	+	+
Cash flow from operations	Coefficient close to - 1	Coefficient close to - 1
Positive cash flow from operations	Coefficient close to - 1	Coefficient close to - 1
Slack (Cash flow minus investment over the year of the investment)	-	-
Initial leverage	+	+

# Results of Empirical Models to test the Pecking Order Theory

TABLE 12  
Regression of Large Project Finance (t = 0)

PANEL A								
QUINTILE 1 (N=40)								
	Debt financing				Equity financing			
	Eq 6	Eq 7	Eq 8	Eq 9	Eq 10	Eq 11	Eq 12	Eq 13
Investment	0.71*** (4.16)	0.46* (1.90)	0.27 (0.89)	0.49*** (4.78)	0.26** (2.04)	0.32* (1.76)	0.38 (1.67)	0.86*** (8.29)
Operation	-0.51** (-2.40)			-0.44** (-2.26)	0.81*** (5.17)			0.43** (2.17)
Slack	0.29* (1.69)	0.20 (1.07)	0.10 (0.50)		-0.70*** (-5.51)	-0.68*** (-4.87)	-0.65*** (-4.16)	
Slack t =-1				0.19 (0.83)				0.28 (1.16)
Operations +		-0.05 (-0.12)	-0.15 (-0.37)			0.70** (2.36)	0.73** (2.37)	
Operations -		-0.87** (-2.55)	-0.69* (-1.82)			0.88*** (3.42)	0.83*** (2.85)	
Initial leverage			78685 (1.11)				-24219 (-0.45)	
R <sup>2</sup>	0.16	0.21	0.24	0.21	0.81	0.81	0.81	0.67

# Results of Empirical Models to test the Pecking Order Theory

**PANEL E**  
**QUINTILE 5 (N=40)**

	Debt financing				Equity financing			
	Eq 6	Eq 7	Eq 8	Eq 9	Eq 10	Eq 11	Eq 12	Eq 13
Investment	0.38*** (7.93)	0.38*** (7.57)	0.38*** (7.47)	0.50*** (6.91)	0.00 (0.08)	0.00 (-0.19)	0.00 (-0.24)	0.00 (-0.07)
Operation	0.27** (2.24)			-0.04 (-0.21)	0.03 (0.68)			0.04 (0.84)
Slack	-0.62*** (-4.97)	-0.61*** (-4.65)	-0.60*** (-4.10)		-0.04 (-1.02)	-0.03 (-0.67)	0.01 (0.21)	
Slack t =-1				0.01 (0.02)				-0.03 (-0.53)
Operations +		0.28** (2.25)	0.26* (1.92)			0.03 (0.90)	0.00 (-0.04)	
Operations -		-0.08 (-0.09)	0.00 (0.00)			-0.31 (-1.15)	-0.11 (-0.39)	
Initial leverage			886383 (0.22)				2413108* (2.09)	
R <sup>2</sup>	0.80	0.80	0.80	0.65	0.00	0.00	0.00	0.00

# Conclusions on the Empirical Models to test the Pecking Order Theory

	Debt	Equity
Investment	+	+
Cash flow from operations	Coefficient close to - 1	Coefficient close to - 1
Positive cash flow from operations	Coefficient close to - 1	Coefficient close to - 1
Slack (Cash flow minus investment over the year of the investment)	-	-
Initial leverage	+	+

H6.-  
Equity Issuances Behavior Test  
(Mayer & Sussman, 2004)

PART 2



## H6.- Equity Issuances Behavior Test (Mayer & Sussman, 2004)

---

Under pecking order theory equity issuance is only used as a last financing resource. The absence of a target is predominant and equity issuance is only used as the last source

## H6.- Equity Issuances Behavior Test (Mayer & Sussman, 2004)

---

Leverage adjustments =  $\hat{a}_1$  Leverage perturbations  $_{t-1}$  +  $\hat{a}_t$

Where:

*Leverage adjustments* is defined as actual leverage minus notional leverage.

*Leverage perturbation* is defined as notional leverage minus initial leverage.

Thus:

Actual leverage is defined as total liabilities over total assets on  $t=+2$ .

Initial leverage is defined as a total liabilities over total assets on  $t=-2$ .

Notional Leverage is a hypothetical leverage that a firm would have had at  $t = +1, +2$ , or  $0,2$ . If firms do not issue any equity over the one- two years period or the window of  $0,2$ . Converting all equity issuances into debt and sum those with new debt finance makes this hypothetical leverage.

# Predictions

---

	<b>Pecking Order Theory</b>	<b>Tradeoff theory</b>
Leverage perturbation	$\geq 0$	-

# Results on Leverage Adjustment on Leverage Perturbation

TABLE 13  
Leverage Adjustment on Leverage Perturbation Coefficients

	t = +1	t = +2	t = (0, +2)
Panel A: Major Investments on Quintile 1			
Leverage perturbation	-0.3105***	-0.1030***	-0.1616**
	(-3.4820)	(-3.0914)	(-2.6240)
R <sup>2</sup>	0.24	0.25	0.44
Panel B: Major Investments on Quintile 2			
Leverage perturbation	-0.1293***	-0.1124	-0.1421
	(-2.8040)	(-1.3948)	(-1.4274)
R <sup>2</sup>	0.18	0.06	0.26
Panel C: Major Investments on Quintile 3			
Leverage perturbation	-0.3021***	-0.0299	-0.1920***
	(-4.1576)	(-0.9420)	(3.5014)
R <sup>2</sup>	0.32	0.03	0.55
Panel D: Major Investments on Quintile 4			
Leverage perturbation	-0.0458	-0.0273	-0.1668*
	(-1.0197)	(-0.6356)	(-1.9055)
R <sup>2</sup>	0.03	0.01	0.33
Panel E: Major Investments on Quintile 5			
Leverage perturbation	-0.0305	-0.0009	-0.1987**
	(-0.4499)	(-0.0447)	(-2.6366)
R <sup>2</sup>	0.01	0.01	0.41

## Conclusion on Equity Issuances Behavior

---

	Pecking Order Theory	Tradeoff theory
Leverage perturbation	$\geq 0$	-

H7.-

Size and frequency of Equity Issuance  
(Mayer & Sussman, 2004)

PART 2



H7.-

## Size and frequency of Equity Issuance

---

Equity should be issued as the last resource and a way to reduce the threat of bankruptcy. This hypothesis implies that equity should be issued infrequently and in large amounts

# Size and frequency of Equity Issuance

---

# Summary

TESTS	POT	TO
Classical Capital Structure Target Test	Green	Red
Moving Capital Structure Target Test	Red	Green
Investing Financing Policy under Descriptive Statistics	Green	Red
External Financing Sources Test	Green	Red
Empirical Models on Debt and Equity Issuances	Red	Green
Equity Issuances Behavior Analysis	Red	Green
Size and frequency of New Equity Issuance	Red	Green

The findings suggest that capital structure changes agree with the pecking order theory in the short-term, but in the long-term they agree with the tradeoff theory