RESEARCH ARTICLE

Change in Capital Gains Tax Rates and IPO Underpricing

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Abstract

The purpose of this paper is to re-examine the relationship between the reduction in capital gains tax rates as a result of the 1997 U.S. Taxpayer Relief Act and the magnitude of IPO underpricing. Previous studies show that the tax law changes in 1986, 1993 and 1997 affected IPO underpricing significantly. In contrast to the study by Robinson and Robinson [1], this study uses a larger sample of 1,898 IPOs from the Securities Data Company (SDC) U.S. New Issues Database for the period from 1995 to 1999. Ordinary least squares regression analysis is applied to examine the effect of reducing the capital gains tax rate on the degree of IPO underpricing by controlling widely examined variables such as share overhang, partial price adjustment, ownership retention, venture capitalist certification, and industry effect. The results confirm that the reduction in capital gains tax rates increases the IPO underpricing significantly. Moreover, the relationship is robust in IPOs that are venture capitalist backed, non-venture capitalist backed, high technology, non-high technology, and Nasdaq-listed.

Keywords: Initial public offerings; capital gains tax; underpricing.

1. Introduction

Many theories and empirical evidence explain the phenomenon of initial public offering (IPO) underpricing by focusing on the interplay among corporate financial policies, capital market behavior, and functions of financial intermediaries [2]. One exogenous variable that can potentially affect the IPO underpricing is the change in capital gains tax rates. However, there is limited research on the relationship between the change in capital gains tax rates and IPO underpricing.

Reese [3] provides empirical support for capital gains tax-motivated price pressure around the long-term qualification date by examining the trading volume of IPOs before and after the U.S. Tax Reform Act of 1986. He finds that IPOs that appreciated prior to long-term qualification show increased trading volume and decreased returns just after their qualification date, while IPOs that depreciated prior to long-term qualification show these effects just prior to their qualification date. In other words, the Tax Reform Act of 1986 affects the trading volume of IPOs, thereby influencing the IPO prices.

Guenther and Willenborg [4] examine the issue prices of small initial public offerings around the 1993 tax law change that reduced the capital gains tax on qualified small business stock. They compare the actual issue price of new stock with a benchmark price that is not affected by the change in capital gains tax. They find that, after controlling for IPO underpricing, the issue prices of qualifying small business stock after the tax rate change are significantly higher than the issue prices before the change. Their results provide evidence that the 1993 tax change is associated with a significant increase in the prices received for small IPOs, a result that is consistent with the intent of Congress when the legislation was introduced.

Robinson and Robinson [1] present a model of entrepreneurial wealth maximization for the pricing of IPOs. Their model shows that, when underwriters are allowed to establish the IPO price, personal tax rates on ordinary income and capital gains may partially determine IPO pricing; that is, a decrease in the capital gains tax rate increases the degree of underpricing. They test their model by performing empirical analysis of the effect of the 1997 U.S. Taxpayer Relief Act on IPO underpricing with a sample of 605 Nasdaq-listed IPOs from 1995 to 1999. After controlling for underwriter, size, and risk effects, they find that reduction in capital gains tax rates as a result of the 1997 U.S. Taxpayer Relief Act can increase IPO underpricing.

The purpose of this paper is to re-examine Robinson and Robinson's [1] study by considering a larger sample of 1,898 IPOs. In addition, in my empirical analysis, I have included more variables (e.g., share overhang,

partial price adjustment, ownership retention, venture capitalist certification, industry effect) that are widely examined in recent IPO studies.

My overall results show that the reduction in capital gains tax rates as a result of the 1997 Taxpayer Relief Act increases the IPO underpricing. As a robust check, I find that the issues, whether they are backed by venture capitalists or whether they are issued by high technology firms, have a significantly higher underpricing under the tax rule change. Consistent with Robinson and Robinson [1], the Nasdaq-listed issues are associated with higher underpricing when capital gains tax rates are reduced. The following sections are devoted to describe the data and model specification, present the descriptive statistics and regression results, and offer conclusions.

2. Data and Model Specification

I collected IPO data from the Securities Data Company (SDC) U.S. New Issues Database for the period from 1995 to 1999. I eliminated American Depositary Receipts, closed-end funds, reverse leverage buyouts, real estate investment trusts, spin-offs, unit issues, savings and loans. I also eliminated firms that have missing data on venture capital affiliation and initial returns as well as issues with offer prices less than $5. The final sample consists of 1,898 IPOs.

I examined initial returns, focusing on the influence of the Taxpayer Relief Act of 1997. To control for influences previously found to be significantly related to underpricing, I followed the previous literature in estimating the following model of initial returns:

$$INITIAL_i = \beta_0 + \beta_1 OVERHANG + \beta_2 UP + \beta_3 DOWN + \beta_4 SIZE + \beta_5 RISK + \beta_6 UNDERWRITER + \beta_7 \%RETAINED + \beta_8 EPS + \beta_9 VC + \beta_{10} TECH + \beta_{11} NASDAQ + \beta_{12} BIG6A + \beta_{13} TAXDUM + \varepsilon_i \tag{1}$$

where,

$INITIAL_i$	=	initial return in percent from issue i, calculated as the difference between the first-day closing price and the IPO offer price as a percentage of the IPO offer price;
OVERHANG	=	pre-IPO shares retained for all classes divided by shares filed (including primary and secondary shares);
UP	=	percentage difference between the original midrange file price and the amended midrange file price for those companies that amend their file range up, zero otherwise;
DOWN	=	percentage difference between the original midrange file price and the amended midrange file price for those companies that amend their file range down, zero otherwise;
SIZE	=	natural log of the original file amount;
RISK	=	reciprocal of the original midrange file price;
UNDERWRITER	=	equity IPO market share of the lead underwriter in each year;
%RETAINED	=	percentage of voting common stock retained by pre-IPO shareholders;
EPS	=	earnings per share in last audited year;
VC	=	dummy variable equal to 1 if the firm is venture capitalists backed, 0 otherwise;
TECH	=	dummy variable equal to 1 if the firm is biotechnology and drugs, computer and related, electronics and communication, medical equipment, and software, 0 otherwise;
NASDAQ	=	dummy variable equal to 1 if the issue is listed on Nasdaq, 0 otherwise;
BIG6A	=	dummy variable equal to 1 if the firm is audited by a Big six accounting firm, 0 otherwise;
TAXDUM	=	dummy variable equal to 1 if IPO date is issued on July 30, 1997 or later, 0 otherwise.

Variables similar to those in the model are widely used in various recent studies of IPO underpricing such as Guenther and Willenborg [4] and Bradley and Jordan [5]. Firms that go public often sell only a small portion of their outstanding shares in the IPO. The unsold shares are frequently referred to as the "overhang." Loughran and Ritter's [6] prospect theory explanation of IPO pricing suggests that firms with greater overhang will have greater

underpricing. UP and DOWN variables control for the well-known partial adjustment phenomenon. Following Bradley and Jordan [5], I included separate variables for upward and downward adjustments because recent studies find evidence of an asymmetric effect (upward adjustments have a greater effect).

In addition, many studies include a measure of size. I used the original file amount, calculated using the midpoint of the file range, as a proxy of size because it is observable ex ante. The reciprocal of the offer price has been used as a proxy for the risk of the offer in several studies [7, 8]. I used the reciprocal of the original midrange file price as a measure of risk because it is observable on the file date.

Underwriter reputation (UNDERWRITER) is also examined in the model. Early empirical studies [9] show that higher quality underwriters create greater certification value, as is evidence by lower underpricing. However, recent evidence [10] contradicts earlier findings, suggesting that higher quality underwriters are associated with higher levels of underpricing and thus do not possess certification value. Dolvin [11] provides a potential explanation for this conflict, that is, that higher quality underwriters do certify initial public offerings, resulting in lower underpricing. However, effects associated with increasing market shares tend to offset certification benefits, particularly for issues underwritten by the largest investment banks.

Following Guenther and Willenborg [4], I included %RETAINED to control for the effects of entrepreneurial ownership by including the percentage of voting shares retained by pre-IPO shareholders. EPS (Earnings Per Share) is also examined in the model. Ogden *et al.* [12] find that firms with lower earnings per share will make a greater price concession to investors who purchase at the offering, either as a reward for greater risk or perhaps because these firms are subject to greater value uncertainty related to information asymmetry. In addition, the role of venture capitalists to IPO issuers is examined in the model. Megginson and Weiss [13] find that venture capitalists perform a certification role while Loughran and Ritter [14] suggest that venture capital backing has no significant effect. To complete the model, high-technology and auditing variables are added. IPOs issued by firms in high-technology industries or listed on the Nasdaq are more likely to be underpriced and IPOs issued by firms audited by big six accounting firms are less likely to be underpriced. Finally, as suggested by Robinson and Robinson [1], the event date of July 30, 1997 is chosen because bills involving the decrease in the capital gains taxes passed both Houses of Congress and the Joint Tax Committee of Congress on that date.

3. Descriptive Statistics

Table 1 provides descriptive statistics (means and medians) for my overall sample and for the pre-tax change and post-tax change subsamples. The last column compares the pre-tax change and post-tax change using a standard t-test and a Wilcoxon rank-sum test to evaluate differences in means and medians, respectively. As indicated in the first two rows, the average gross proceeds are about $58.63 million with an average offer price of $12.91. My post-tax change sample has a significantly larger offer price and offer size in mean and median than the pre-tax change sample.

Table 1 also shows that initial returns average 29.2% over the sample period. The median is much smaller (12.5%), reflecting significant positive skewness. My post-tax change sample has a higher initial return (47.3%) than the pre-tax change sample (17.2%), and the difference in means is significant at the 5% level. Following the initial return is my measure of overhang. All firms have some level of overhang. I define a firm's overhang as the ratio of shares retained (including all classes of stock) divided by the number of shares filed (including primary and secondary shares). As shown, the overhang ratio for the whole sample is 3.48, and this ratio is significantly higher in the post-tax change sample than in the pre-tax change sample.

The fifth row of Table 1 examines underwriter market share. As in Megginson and Weiss [13], we rank underwriters using percentage market share based on equity IPO gross proceeds brought to the market in each year during the sample period. As shown, the average underwriter market share is 4.1%. The average underwriter market share is significantly higher in post-tax change sample than in pre-tax change sample.

The percentage of voting common stock retained by pre-IPO shareholders and earnings per share has also been examined in the previous studies. The percentage of voting common stock retained by pre-IPO shareholders averages 64.9% and is not significantly lower in post-tax change sample than in pre-tax change sample. The average earnings per share for the whole sample are –0.724, and the ratio is significantly lower in post-tax change sample than in pre-tax change sample.

The rest of the variables of interest in Table 1 are categorical variables. Venture capitalists back 44.1% of the issues while high technology firms issue 52.6% of IPOs. Nasdaq-listed firms issue 82.2% of IPOs and the big six accounting firms audit 92.8% of the issues.

Table 1: Descriptive statistics.

Variables	Sample size	All	Pre-tax change	Post-tax change	p-value
OFFER	1898	12.911 (12)	12.384 (12)	13.701 (13)	0.000 (0.000)
PROCEEDS	1898	58.625 (36)	44.603 (30.2)	79.621 (45.5)	0.000 (0.000)
INITIAL	1898	0.292 (0.125)	0.172 (0.108)	0.473 (0.175)	0.000 (0.000)
OVERHANG	1701	3.482 (2.474)	3.247 (2.387)	3.796 (2.656)	0.036 (0.005)
UNDERWRITER	1898	0.041 (0.02)	0.034 (0.017)	0.052 (0.032)	0.000 (0.000)
%RETAINED	1663	0.649 (0.672)	0.656 (0.683)	0.638 (0.659)	0.186 (0.097)
EPS	1529	-0.724 (0.01)	-0.055 (0.12)	-1.659 (-0.31)	0.000 (0.000)
VC	1898	0.441 (0)	0.426 (0)	0.463 (0)	0.112 (0.112)
TECH	1898	0.526 (1)	0.527 (1)	0.525 (1)	0.924 (0.924)
NASDAQ	1896	0.822 (1)	0.821 (1)	0.825 (1)	0.815 (0.815)
BIG6A	1878	0.928 (1)	0.932 (1)	0.921 (1)	0.387 (0.387)
TAXDUM	1898	0.400 (0)	0 (0)	1 (1)	-

4. Results and Discussion

I estimated the parameters of the equation (1) using ordinary least squares with a sample size of 1,349 IPOs, and reported the results in Table 2. The table reports coefficient values and p-values for standard two-tailed tests of statistical significance. In estimation, the variable TAXDUM initially excluded and then included. The intent of this presentation is to show the impact of TAXDUM and whether its inclusion in the regression affects the other coefficients. With inclusion of TAXDUM, the R-squared increases from 31.71% to 35.21%.

Table 2: Regression results for full sample.

	Regression 1		Regression 2	
Variable	Coefficient	p-value	Coefficient	p-value
Intercept	0.160	0.829	1.414	0.064
OVERHANG	0.011	0.001	0.011	0.001
UP	1.206	0.001	1.157	0.001
DOWN	0.333	0.065	0.320	0.066
SIZE	-0.006	0.867	-0.080	0.032
RISK	-0.912	0.539	-1.816	0.215
UNDERWRITER	2.920	0.000	2.797	0.000
%RETAINED	0.022	0.663	0.029	0.545
EPS	0.000	0.847	0.002	0.113
VC	0.101	0.000	0.098	0.000
TECH	0.128	0.000	0.117	0.000
NASDAQ	0.099	0.000	0.087	0.001
BIG6A	-0.088	0.015	-0.047	0.205
TAXDUM			0.250	0.000
R-squared	31.71%		35.21%	
Sample size	1349		1349	

TAXDUM is positively significant at the 5% level, suggesting that the lower capital gains tax rate as a result of the 1997 Taxpayer Relief Act increases the underpricing of IPOs. The relationships for some control variables are in line with previous studies. For example, issues that have larger overhang levels, upward or downward adjustments are associated with higher underpricing. Larger issues are associated with lower underpricing. Issues underwritten by underwriters with larger market share are associated with higher underpricing. Issues backed by

venture capitalists are associated with higher underpricing. High-technology or Nasdaq-listed issues are associated with higher underpricing.

I disaggregated the sample by whether issues are backed by venture capitalists and estimate the parameters of the model using ordinary least squares. The coefficients and p-values in parentheses are presented in Table 3. There are 692 non-venture capitalist backed and 657 venture capitalist backed issues. With inclusion of TAXDUM, the R-squared increases from 13.00% to 14.04% in regressions with non-venture capitalist backed issues and from 39.04% to 44.23% in regressions with venture capitalist backed issues.

Table 3: Regression results: non-venture capitalist backed issues vs. venture capitalist backed issues.

	Non-venture capitalist backed issues		Venture capitalist backed issues	
Variable	**Regression 1**	**Regression 2**	**Regression 1**	**Regression 2**
Intercept	0.202 (0.645)	0.431 (0.324)	-2.308 (0.023)	0.975 (0.338)
OVERHANG	0.010 (0.011)	0.010 (0.009)	0.010 (0.029)	0.009 (0.041)
UP	0.400 (0.065)	0.391 (0.068)	1.792 (0.000)	1.671 (0.000)
DOWN	0.138 (0.666)	0.131 (0.682)	0.288 (0.131)	0.300 (0.094)
SIZE	-0.007 (0.747)	-0.022 (0.326)	0.123 (0.022)	-0.064 (0.242)
RISK	-0.212 (0.757)	-0.334 (0.629)	1.041 (0.519)	-1.593 (0.313)
UNDERWRITER	1.177 (0.001)	1.164 (0.001)	3.546 (0.000)	3.414 (0.000)
%RETAINED	0.012 (0.761)	0.016 (0.690)	-0.047 (0.650)	-0.044 (0.650)
EPS	0.000 (0.501)	0.001 (0.102)	0.009 (0.133)	0.018 (0.001)
TECH	0.105 (0.000)	0.104 (0.000)	0.168 (0.001)	0.130 (0.006)
NASDAQ	0.046 (0.055)	0.046 (0.059)	0.138 (0.018)	0.112 (0.040)
BIG6A	-0.036 (0.213)	-0.027 (0.360)	-0.033 (0.749)	0.074 (0.285)
TAXDUM		0.075 (0.011)		0.414 (0.000)
R-squared	13.00%	14.04%	39.04%	44.23%
Sample size	692	692	657	657

In subsample regressions, I found that the lower capital gains tax rate as a result of the 1997 Taxpayer Relief Act increases the underpricing of IPOs for both venture capitalists and non-venture capitalists backed issuers. Both venture capitalists and non-venture capitalists backed issues that have larger overhang levels, upward adjustment or are underwritten by underwriters with larger market share are associated with higher underpricing. High-technology or Nasdaq-listed issues that are backed by venture capitalists and not backed by venture capitalists are associated with higher underpricing.

Focusing on industry effect, I disaggregated the sample by whether IPOs are issued by high technology firms. The coefficients and p-values in parentheses are presented in Table 4. There are 573 non-high technology issues and 776 high technology issues. With inclusion of TAXDUM, the R-squared increases from 20.54% to 22.35% in regressions with non-high technology issues and from 36.44% to 40.93% in regressions with high technology issues.

In subsample regressions, I find that the lower capital gains tax rate as a result of the 1997 Taxpayer Relief Act increases the underpricing of IPOs for both high technology and non-high technology issuers. High technology issues that have larger overhang levels are associated with higher underpricing. High technology issues that have upward adjustments and non-high technology issues that have downward adjustments are associated with higher underpricing. Both high technology and non-high technology issues underwritten by underwriters with larger market share are associated with higher underpricing. Venture capitalist backed or Nasdaq-listed IPOs issued by both high technology and non-high technology firms is associated with higher underpricing.

I focused finally on market listing effect and disaggregated the sample by whether IPOs are issued by Nasdaq-listed firms. The coefficients and p-values in parentheses are presented in Table 5. There are 185 non-Nasdaq-listed issues and 1,164 Nasdaq-listed issues. With inclusion of TAXDUM, the R-squared increases from 16.02% to 17.79% in regressions with non-Nasdaq-listed issues and from 37.06% to 40.25% in regressions with Nasdaq-listed issues.

In subsample regressions, I found that the lower capital gains tax rate as a result of the 1997 Taxpayer Relief Act increases the underpricing of IPOs only for Nasdaq-listed issues. Nasdaq-listed issues that have upward adjustments and non-Nasdaq-listed issues that have downward adjustments are associated with higher

underpricing.   Both Nasdaq-listed and non-Nasdaq-listed issues that have higher overhang levels or are underwritten by underwriters with larger market share are associated with higher underpricing. Venture capitalist backed or high technology, Nasdaq-listed issues are associated with higher underpricing.

Table 4: Regression results: non-high technology issues vs. high technology issues.

	Non-high technology issues		High technology issues	
Variable	Regression 1	Regression 2	Regression 1	Regression 2
Intercept	-0.028 (0.954)	0.320 (0.515)	-1.732 (0.075)	0.844 (0.381)
OVERHANG	0.014 (0.156)	0.014 (0.143)	0.008 (0.012)	0.008 (0.016)
UP	0.447 (0.101)	0.430 (0.103)	1.748 (0.000)	1.672 (0.000)
DOWN	0.428 (0.008)	0.409 (0.010)	0.195 (0.469)	0.216 (0.403)
SIZE	0.000 (1.000)	-0.022 (0.385)	0.096 (0.054)	-0.052 (0.299)
RISK	0.439 (0.597)	0.155 (0.852)	1.377 (0.323)	-0.454 (0.733)
UNDERWRITER	1.620 (0.002)	1.556 (0.002)	3.380 (0.000)	3.263 (0.000)
%RETAINED	0.058 (0.196)	0.063 (0.160)	-0.028 (0.750)	-0.027 (0.747)
EPS	-0.000 (0.537)	0.000 (0.799)	0.006 (0.272)	0.013 (0.006)
VC	0.130 (0.000)	0.130 (0.000)	0.084 (0.041)	0.077 (0.057)
NASDAQ	0.065 (0.014)	0.061 (0.021)	0.135 (0.021)	0.138 (0.013)
BIG6A	-0.056 (0.109)	-0.035 (0.346)	-0.085 (0.132)	-0.053 (0.323)
TAXDUM		0.106 (0.000)		0.349 (0.000)
Adjusted R-squared	20.54%	22.35%	36.44%	40.93%
Sample size	573	573	776	776

Table 5: Regression results: non-Nasdaq-listed issues vs. Nasdaq-listed issues.

	Non-Nasdaq-listed issues		Nasdaq-listed issues	
Variable	Regression 1	Regression 2	Regression 1	Regression 2
Intercept	0.943 (0.202)	0.916 (0.230)	-1.450 (0.017)	0.213 (0.726)
OVERHANG	0.027 (0.040)	0.026 (0.045)	0.010 (0.002)	0.009 (0.002)
UP	0.075 (0.498)	0.079 (0.467)	1.713 (0.000)	1.630 (0.000)
DOWN	0.494 (0.059)	0.482 (0.065)	0.223 (0.215)	0.196 (0.262)
SIZE	-0.046 (0.231)	-0.044 (0.277)	0.080 (0.011)	-0.018 (0.578)
RISK	-0.002 (0.998)	-0.008 (0.994)	1.076 (0.300)	-0.114 (0.913)
UNDERWRITER	0.995 (0.070)	0.995 (0.073)	2.773 (0.000)	2.669 (0.000)
%RETAINED	-0.005 (0.923)	-0.004 (0.938)	-0.012 (0.837)	0.003 (0.961)
EPS	-0.013 (0.383)	-0.015 (0.338)	0.001 (0.384)	0.003 (0.080)
VC	0.031 (0.483)	0.029 (0.516)	0.065 (0.026)	0.066 (0.021)
TECH	0.031 (0.467)	0.031 (0.463)	0.119 (0.000)	0.109 (0.000)
BIG6A	-0.115 (0.128)	-0.117 (0.123)	-0.015 (0.656)	0.020 (0.564)
TAXDUM		-0.019 (0.631)		0.261 (0.000)
Adjusted R-squared	16.02%	17.79%	37.06%	40.25%
Sample size	185	185	1164	1164

5. Conclusion

I examined the effect of the 1997 Taxpayer Relief Act on 1,898 IPOs from 1995 to 1999. By controlling for the variables that are popularly examined in recent IPO studies, I found that the reduction in capital gains tax rates increases the IPO underpricing. Moreover, the results are robust in venture capitalist backed, non-venture capitalist backed, high technology, and non-high technology issues. Consistent with Robinson and Robinson [1], the IPOs that are issued by Nasdaq-listed firms also have a significantly higher underpricing.

Competing Interests

The author declares that he has no competing interests.

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