Why Managers Are Willing To Accept IPO Underpricing

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Abstract

The central question surrounding the IPO underpricing puzzle is why issuers are willing to sell their shares at a price that is less than what the market is willing to pay. This paper shows that a major reason why managers are willing to underprice shares at IPO is that they use options and stock grants to protect themselves from the dilution to their existing shares. Underpricing can have a large positive tax effect for options they hold in addition to making new options more valuable. I show that underpricing shares can increase the tax advantage of paying employees with options. Managers can also use underpriced shares as currency to strengthen strategic alliances and customer loyalty. A major finding of this paper is that the use of options is directly related to IPO underpricing and explains a substantial amount of the variation in firm underpricing.

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0. Introduction

Loughran and Ritter (2001) ask the question "Why don't issuers get upset about leaving money on the table in IPOs?" The answer is that many managers of firms going public earn more from underpricing on their options than they lose on their equity position.

Loughran and Ritter give another explanation, appealing to prospect theory. They look at the covariance of money left on the table with the change in wealth of the pre-IPO owners. They find that very little money is left on the table when the IPO price is adjusted downward from the preliminary pricing range. Money is only left on the table when owners are paid more for their shares than they had expected. Rather than being displeased with the dilution to their existing position, they are thrilled with the sudden increase in wealth. While this is certainly true, there is more to the story than this explanation.

Some existing owners of firms that go public must be hurt by the dilution caused by IPO underpricing. However, others, primarily those who manage the firm, often come out ahead because of underpricing. In order for this to happen, they must somehow be compensated for the dilution. Using stock options or stock grants is an effective means to accomplish this objective. In addition to compensating themselves, they can also use underpricing enable the use of equity and options as a cheap form of currency when paying employees, strengthening strategic alliances or rewarding important customers.

Analysis of the IPO market usually centers on four groups of players, the issuing company, the underwriters, the investors in the primary market and the investors in the

secondary market. Investors in the secondary market purchase the shares at the fair market value, and lose nothing because of underpricing. Some investors in the secondary market may benefit from price support after issuance. It is obvious why investors in the primary market want IPO shares to be underpriced. They gain from it. There is theory (e.g., Rock (1986) or Beatty and Ritter (1986)) suggesting that these investors demand underpricing to avoid the winner's curse due to asymmetric information or pricing uncertainty.

Underwriters also want shares to be underpriced, although their reasons are less obvious. Their fees are higher when there is no underpricing. However, there are advantages to underpricing. Taranto (2001) shows that underpricing is consistent with underwriter profit maximization. Ellis, Michaely and O'Hara (2000) show that underwriters profit from underpricing when they act as post-IPO market makers in the stock. Fulghieri and Spiegel (1993) describe how underwriters profit from collateral business when they allocate shares to their favored customers. The real unanswered questions concentrate on why issuers are willing to sell their shares for less than the fair market value.

While these four groups of players are usually considered, a fifth group is often ignored – the government. Can taxes explain why some companies are willing to underprice their shares? Rydqvist (1997) finds that issuing companies in Sweden often allocated their new shares to employees as a tax-efficient method of paying them. Issues were often underpriced by about 80%. Once the Swedish government changed tax laws, underpricing fell to the 10-15% range. In the United States, underwriters, not issuers, control allocation. Since Rydqvist's argument follows from the issuer's ability to

allocate shares, it was not pursued as an explanation of underpricing in the American market.

Stock grants and stock options allow companies to allocate shares to its employees as well as a way to compensate managers. IPOs are often accompanied by grants of options to employees and board members. Underpricing the IPO allows a company to issue options that are in-the-money even though there is a requirement that the strike price may not be below the fair market value. This is because the fair market value is considered the IPO offer price for a period of time leading up to the IPO. After the IPO, the fair market value is determined by the stock market.

Depending on the circumstances, employees who hold stock options may have to pay taxes when they are exercised. Some holders of options granted under an Incentive Stock Option Plan (ISOs) pay no taxes at exercise. However, those who are subject to the AMT tax must pay taxes on the spread between the strike price and the fair market value at exercise at the alternative minimum tax rate. Senior managers are much more likely to fall into this group. Options that do not qualify as part of a plan (nonqualified stock options – NQSOs) always trigger a tax event at exercise. Ordinary income tax is due on the spread between the strike price and the fair market value when NQSOs are exercised. If an IPO is underpriced, then there can be a substantial tax savings if options are exercised at IPO. The formula for the tax savings is shown in Proposition 1 of Section 2. The tax savings often outweighs any dilution to existing shares.

Most young firms offer stock options to their managers and key employees. For firms in the process of issuing their initial public offering, senior management holds most of the stock options. Board members are almost always compensated with NQSOs. The

very people who benefit most from underpricing an IPO issue are the ones who must decide on the offering price. While the situation seems ripe for agency problems, it could also be argued that firms have little control over underpricing, and that the benefits to employees of underpricing the IPO represent fair compensation for the those who own options. Paying them in this manner is cheaper than paying the cash equivalent. It is certainly true that employees of many high technology firms have expected compensation in the form of stock options, and that the firms benefit by keeping high salaries off of their books and by not having to pay payroll taxes on this form of compensation.

This study looks at the effects of stock options on IPO underpricing. The rest of the paper is organized as follows. Section 1 describes the different types of stock options and grants. Section 2 shows how owners and managers can benefit from IPO underpricing. Formulas are provided that show the value of underpricing. They show the after-tax dollar loss due to the dilution of any existing stock holdings, the after-tax dollar gain to options that are exercised at or just before IPO and the after-tax dollar gain to options that are granted at IPO. Anecdotal evidence that managers of firms are better off when they underprice is presented in Section 3. There are not enough data available on the exact behavior of CEOs of firms that go public to prove that they usually benefit from underpricing. However, there is evidence that some individual CEOs benefit. Section 4 describes the data used in the empirical tests. The empirical results showing that underpricing is directly related to the use of options are shown in Section 5. Section 6 concludes.

1. Employee Stock Options and Stock Grants

There are two ways that employees and investors who own stock options can benefit from a firm that underprices its initial public offering. Investors who exercise options before a firm goes public may have to pay taxes on the spread between the exercise price and the fair market value. These investors use the IPO price rather than the after-market price as the fair market value in the tax calculation. Employees can also benefit from underpricing if they are granted new options at IPO. The strike price is often based on the IPO price rather than the after-market price, so underpricing allows employees to receive options that are already in-the-money.

There are two types of employee stock options: incentive stock options (ISO) and nonqualified stock options (NQSO). ISOs must be part of a plan where a fixed number of options are made available to a prespecified group of employees. The stockholders must approve the plan. There are a number of restrictions on these options. The options must be granted within ten years of stockholder approval, and may not have an expiration date greater than ten years after the grant date. The number of options for each employee is limited to 100,000 divided by the fair market value at the time of grant. The strike price must be at least 100% of the fair market value. If the employee owns more than 10% of the firm's shares, then the exercise price must be at least 110% of the fair market value. The options cannot be transferred except in the event of death.

NQSOs do not have these restrictions. NQSOs are often used as compensation for senior managers and are the only type of options that are given to nonemployee board members. While NQSOs may have any strike price, the fair market value is often used as a benchmark. For example, an executive employment agreement may stipulate that if

certain conditions are met, the executive will receive a set number of options with the strike price set to 90% of the fair market value at some future date. Prior to IPO, the majority of options held by senior managers are NQSOs.

Tax Implications of ISOs and NQSOs

The exercise of ISOs can trigger a taxable event if the employee is subject to the Alternative Minimum Tax (AMT). If the employee is subject to the AMT, then taxes are owed at exercise at the AMT rate on the spread between the strike price and the fair market value. For most employees who receive ISOs, there are no taxes due until the stock is sold. If the stock is sold more than one year after exercise and more than two years after the options were granted, then the gains over the strike price are taxed at the capital gains rate. If the stock is sold earlier, then the ordinary tax rate is used. If taxes are paid at exercise, then the basis for tax purposes is set at the fair market value. When the stock is eventually sold, taxes will be due on capital gains relative to the fair market value at exercise. Most CEOs and senior managers are subject to the AMT when they exercise their options. If the option is exercised at IPO, then fewer taxes are paid if the issue is underpriced. Taxes will still be due on that difference when the stock is sold, but at the lower capital gains rate and at a later date. The corporation gets a small tax break when ISOs are issued. The value of the options on the grant date is treated as an expense and is deducted from pretax earnings. If an employee exercises early, then the firm may also deduct the spread between strike price and the fair market value. The firm does not have to pay payroll taxes due to this increase in ordinary income for the employee.

The tax treatment of NQSOs is similar to the AMT case. When they are exercised, the spread between the strike price and the fair market value is treated as ordinary income and is taxed at the ordinary tax rate. The tax basis is set to the fair market value, and taxes are due on any further gains at the capital gains tax rate when the stock is sold. The firm benefits when the options are exercised. The spread is considered ordinary income expense and offers a tax shield.

Tax Implications of Restricted Stock Grants

Restricted stock grants are not taxable until the shares become vested, but an employee receiving stock grants has the option to pay taxes when the shares are granted instead of when they vest. The tax due is on the fair market value at the ordinary tax rate. At IPO, the offer price is the fair market value. If the IPO is underpriced and the employee elects to pay taxes immediately, taxes on the spread between the offer price and the after-IPO market price are deferred, and may be paid at the capital gains rate if the shares are held long enough.

2. Analysis of the Tax Advantage of Underpricing IPOs

In this section, I explore how the tax advantages derived from options when IPO shares are underpriced can mitigate the loss of value due to the dilution of existing shares. Formulas are given for the dilution due to underpricing; the advantage of underpricing when managers hold options that are exercisable; the advantage of receiving restricted stock grants at or prior to IPO when the issue is underpriced; and the advantage of receiving options at IPO when the issue is underpriced.

Definitions:

Throughout this paper, the following terms are used:

N_{Out}	Number of shares outstanding before IPO.
N_{IPO}	Number of shares issued in the IPO.
N_{CEO}	Number of shares owned by the CEO (or investor) prior to IPO.
N_{Opt}	Number of options owned or exercised by the CEO.
N_{grant}	Number of shares of restricted stock granted to the CEO.
t_o	Tax rate used when options are exercised (ordinary tax rate for NQSOs or AMT rate for ISOs).
t_{cg}	Capital gains tax rate.
r	Risk free interest rate.
T	Time, in years, until shares are sold.
K	Strike price of option
P_{IPO}	IPO price.
P_M	After IPO market price.
P_T	Price at time T.
$Call(P_M,K,T)$	The value of a call option that expires at time T, with a strike price of K when the value of the underlying stock is valued at P_M.
$Bincall(P_M,K,T)$	The value of a binary call option that pays \$1.00 and expires at time T, with a strike price of K when the value of the underlying stock is valued at P_M.
$\mu(P_T)$	The risk-neutral probability measure for the distribution of prices at time T.

Dilution: When IPO shares are underpriced, the after-tax dilution to an existing share of stock is shown in the following formula.

$$(1-t_{cg})\left(\frac{P_M(N_{Out}+N_{IPO})-N_{IPO}\cdot P_{IPO}}{N_{Out}}-P_M\right)$$

This formula assumes that there will be no capital losses or that any capital losses can be used to offset other capital gains. In the event that capital losses cannot be used, the payoff has an option-like component. However, shares that were bought prior to IPO are usually bought at a small fraction of the IPO price. The probability that these shares will be sold at a capital loss is minimal.

The following proposition shows the after tax gains earned from exercising options at IPO when the issue is underpriced. The taxes that are due when there is underpricing is subtracted from the taxes that would be due if the IPO were priced at the closing price at the end of the first day of trading. These gains can be used to offset losses due to dilution.

Proposition 1: The tax advantage of underpricing IPO issues when stock options are exercised at IPO is:

$$N_{Opt}\left(P_M - P_{IPO}\right)\cdot\left(t_o - t_{cg}e^{-rT}\right)$$

when any capital losses can be used to offset other gains, or

$$N_{Opt}\cdot\left(t_o\left(P_M - P_{IPO}\right) - t_{cg}\left(Call\left(P_M, P_M, T\right) - Call\left(P_M, P_{IPO}, T\right)\right)\right)$$

when capital losses have no tax savings.[1]

Proof:

The first formula assumes that any future capital loss can be applied to an offsetting gain. At exercise, taxes must be paid on the spread between the fair market value and the strike price. If the issue is underpriced, then taxes are saved on the difference between the market value and the IPO price. This amounts to $t_o\left(P_M - P_{IPO}\right)$ per share. The tax basis for these shares now becomes the IPO price. When shares are eventually sold at time *T*, taxes of $t_{cg}\left(P_T - P_{IPO}\right)$ must be paid on the capital gains instead of taxes of $t_{cg}\left(P_T - P_M\right)$, leaving an extra cost of $t_{cg}\left(P_M - P_{IPO}\right)$.

The second formula gives the value of the tax advantage when taxes are paid on capital gains, but capital losses cannot be used to offset other gains. When shares are sold at time *T*, taxes of $t_{cg}\cdot\max\left(0, P_T - P_{IPO}\right)$ must be paid on the capital gains instead of taxes of $t_{cg}\cdot\max\left(0, P_T - P_M\right)$. The present value of this extra cost is simply the capital gains tax rate times the difference of two call option values. Note that when the IPO price is well below the market value of the stock, the second formula will be very close in value to the first. From this point on, it is assumed that any capital losses can be used to offset capital gains.

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[1] These formulas overstate the tax advantage slightly when the time until shares is sold is stochastic and 'T' represents the average time.

Proposition 1a: If an investor with stock and options exercises all options at IPO, then his after-tax wealth will be unaffected by IPO underpricing if the number of options is:

$$N_{Opt} = \frac{(1-t_{cg})N_{CEO}N_{IPO}}{N_{Out}(t_o - t_{cg}e^{-rT})}$$

If more options are owned, then wealth is increasing in underpricing. If fewer options are owned, then wealth is decreasing in underpricing. Decreasing the percentage of the firm that is sold in the IPO decreases the number of options needed to offset the dilution. This formula assumes that capital losses can be used to offset other gains.

Proof:

The investor's wealth will go down due to dilution, and up due to the tax advantage of underpricing. The change in wealth is:

$$N_{Opt}(P_M - P_{IPO})(t_o - t_{cg}e^{-rT}) -$$
$$(1-t_{cg})N_{CEO}\left(\frac{P_M(N_{Out}+N_{IPO}) - N_{IPO}\cdot P_{IPO}}{N_{Out}} - P_M\right)$$

Setting this value to zero gives:

$$N_{Opt}(P_M - P_{IPO})(t_o - t_{cg}e^{-rT}) = (1-t_{cg})N_{CEO}\left(\frac{P_M(N_{Out}+N_{IPO}) - N_{IPO}\cdot P_{IPO}}{N_{Out}} - P_M\right)$$

$$N_{Opt} = \frac{(1-t_{cg})N_{CEO}}{(P_M - P_{IPO})\cdot(t_o - t_{cg}e^{-rT})}\left(\frac{P_M(N_{Out}+N_{IPO}) - N_{IPO}\cdot P_{IPO}}{N_{Out}} - P_M\right)$$

$$N_{Opt} = \frac{(1-t_{cg})N_{CEO}}{(P_M - P_{IPO})\cdot(t_o - t_{cg}e^{-rT})}\left(\frac{N_{Out}P_M + N_{IPO}P_M - N_{IPO}\cdot P_{IPO} - N_{Out}P_M}{N_{Out}}\right)$$

$$N_{Opt} = \frac{(1-t_{cg})N_{CEO}}{(P_M - P_{IPO})\cdot(t_o - t_{cg}e^{-rT})}\left(\frac{N_{IPO}(P_M - P_{IPO})}{N_{Out}}\right)$$

$$N_{Opt} = \frac{(1-t_{cg})\cdot N_{CEO}\cdot N_{IPO}}{N_{Out}\cdot(t_o - t_{cg}e^{-rT})}$$

For a typical firm, the manager would need to have approximately as many options as shares.

Managers who are granted restricted stock can also benefit from underpricing by paying taxes at IPO. The fair market value of the stock is set at the IPO price, so fewer taxes are due if the issue is underpriced. The following proposition shows the after tax advantage to paying taxes on restricted stock is equal to the taxes due when there is underpricing subtracted from the taxes that would be due if the issue had been priced at the after-IPO market price.

Proposition 2: The after-tax advantage of underpricing IPO issues when restricted stock is granted at IPO is:

$$N_{grant}\left(P_M - P_{IPO}\right)\cdot\left(t_o - t_{cg}e^{-rT}\right)$$

Proof:

Restricted stock grants are taxable when they become vested. Ordinary income taxes are due on the fair market value when they become vested. At IPO, the present value of this tax payment is $t_o P_M$ per share. Employees who are granted restricted stock may elect to pay ordinary income tax on the fair market value at the grant date. The fair market value becomes the basis for future capital gains. When the shares are eventually sold, capital gains taxes will be due on the sale price minus the fair market value at the grant date. For an issue that is not underpriced, the taxes due would be $t_o P_M$, so there would be no advantage to paying taxes early. However, if the issue is underpriced, then there is a savings to paying taxes early. Taxes of $t_o P_{IPO}$ can be paid at the IPO date. When the shares are sold, the value above the IPO price is taxed at the capital gains rate. Underpricing allows the holder of restricted stock to shift ordinary income taxes to capital gains. The treatment of restricted stock turns out to be exactly the same as NQSOs that have a strike price of zero and are exercisable.

Proposition 2a: If an investor with stock and stock grants pays taxes on the value of the stock grant at IPO, then his after-tax wealth will be unaffected by IPO underpricing if the number of stocks granted is:

$$N_{Grant} = \frac{\left(1 - t_{cg}\right)N_{CEO}N_{IPO}}{N_{Out}\left(t_o - t_{cg}e^{-rT}\right)}$$

If more stock is granted, then wealth is increasing in underpricing. If fewer shares are granted, then wealth is decreasing in underpricing. This formula assumes that capital losses can be used to offset other gains.

Insiders who receive new options can also benefit from underpricing the IPOs if the strike price is based on the fair market value. The following proposition shows the after tax benefit of underpricing when new options are issued at IPO.

Proposition 3: The after-tax advantage of underpricing IPO issues when stock options are granted at IPO is:

$$N_{Opt}\left[\left(1+e^{-r(T-T_{ex})}t_{cg}-t_{cg}-t_o\right)\left(Call(P_M,P_{IPO},T_{ex})-Call(P_M,P_M,T_{ex})\right)+\right.$$
$$\left.\left(e^{-r(T-T_{ex})}t_{cg}-t_{cg}\right)\left(P_{IPO}\cdot Bincall(P_M,P_{IPO},T_{ex})-P_M\cdot Bincall(P_M,P_M,T_{ex})\right)\right]$$

when any capital losses can be used to offset other gains, or

$$(1-t_o)\left(Call(P_M,P_{IPO},T_{ex})-Call(P_M,P_M,T_{ex})\right)-t_{cg}e^{-rT}\int_{P_{IPO}}^{P_M}Call(P_{ex},P_{ex},T-T_{ex})d\mu(P_{ex})$$

when capital losses have no tax savings.

Proof:

The first formula assumes that any future capital loss can be applied to an offsetting gain. The second formula assumes that capital losses will not be used to offset other capital gains. There are four cash flows associated with exercising an option and later selling the stock. At exercise, the strike price is paid to the company if the option is in-the-money. This payment is priced as a binary option. At the same time, a tax payment is made on the spread between the price at exercise and the strike price. If the options are nonqualified stock options, then the spread is taxed at the ordinary income tax rate. For employees receiving options in a qualified plan, there may or may not be a tax event at exercise. If the employee is subject to the AMT, then the spread is taxed at the AMT rate instead of at the ordinary income tax rate. This will be the case for most senior managers.

The third cash flow occurs when the shares are sold. The seller receives the cash price of the stock. Taxes must then be paid on the difference between the sale price and the fair market price at exercise if there is a capital gain.

The following table describes the after-tax cash flows and present value of an option with strike price K that is exercised if it is in the money at time T_{ex} and sold at time T. It is assumed that capital losses can be used to offset other gains.

Time	Cash Flow	Present Value
T_{ex}	$-K$ if $P_{ex} > K$	$-K \cdot Bincall(P_M, K, T_{ex})$
T_{ex}	$-t_o(P_{ex} - K)$ if $P_{ex} > K$	$-t_o Call(P_M, K, T_{ex})$
T	P_T if $P_{ex} > K$	$Call(P_M, K, T_{ex}) +$
T	$t_{cg}(P_T - P_{ex})$ if $P_{ex} > K$	$-t_{cg}\left(1 - e^{-r(T-T_{ex})}\right)\left(Call(P_M, K, T_{ex}) + K \cdot Bincall(P_M, K, T_{ex})\right)$

Summing these four values gives the after-tax value of an employee stock option. The advantage of underpricing can be found by subtracting the value when the after-market price is used as the strike price from the value calculated when the IPO price is used as the strike price. This is shown in the proposition above.

If capital losses cannot be used to offset other gains, then the final tax payment looks something like an option on an option. The final tax payment will only be made if the option is exercised and the price at which it is sold is above the price at exercise. The following table describes the cash flows and their present values.

Time	Cash Flow	Present Value
T_{ex}	$-K$ if $P_{ex} > K$	$-K \cdot Bincall(P_M, K, T_{ex})$
T_{ex}	$-t_o(P_{ex} - K)$ if $P_{ex} > K$	$-t_o Call(P_M, K, T_{ex})$
T	P_T if $P_{ex} > K$	$Call(P_M, K, T_{ex}) + K \cdot Bincall(P_M, K, T_{ex})$
T	$t_{cg}(P_T - P_{ex})$ if $P_T > P_{ex}$ and $P_{ex} > K$	$-t_{cg} e^{-rT_{ex}} \int_K^\infty Call(P_{ex}, P_{ex}, T - T_{ex}) d\mu(P_{ex})$

Once again, the advantage of underpricing can be found by subtracting the value when the after-market price is used as the strike price from the value calculated when the IPO price is used as the strike price. This is also shown in the proposition above.

3. Case Evidence

Proposition 1 through *Proposition 3* show that owners of options and restricted shares may benefit from underpricing. *Proposition 1a* and *Proposition 2a* show that if wealth maximization is the manager's goal, there is no optimal underpricing but that depending

on the number of options owned, managers will either want no underpricing, as much underpricing as possible or they will be indifferent to underpricing. Other concerns may influence their decision. Too much underpricing could benefit a manager, but may bring attention to the inherent agency issues. Note that if a lot of employees have options, then the desire to compensate them may overshadow these concerns.

In this section, the actions of a few firms are examined. All three firms are taken from Jay Ritter's list of firms that left the most money on the table[2]. The first, *United Parcel Service*, is an example where it appears that senior managers protected themselves from underpricing but only increased their wealth marginally from what it would have been had there been no underpricing. The second firm, *Goldman Sachs*, is an example where insiders decided to underprice in order to exploit the tax savings. The third company, *Corvis Corporation*, is a firm where the underpriced shares and options were used as currency to pay employees and strengthen ties to customers.

United Parcel Service

In November 1999, *United Parcel Service* went public, selling 109,400,000 shares at $50 per share. At the end of the first day of trading, the price per share was $68.25. *UPS* became the third company to leave over one billion dollars on the table. The after-tax dilution to existing stock was $1.60625 per share. According to Compustat's Executive Compensation database, James Kelly, the CEO of UPS, exercised options for 42,498 shares, and was granted new options for 159,517 shares. According to the prospectus, he

[2] See Jay Ritter's web site at http://bear.cba.ufl.edu/ritter/ for a list of companies that left the most money on the table.

owned 185,923 shares of stock at IPO. His personal after-tax loss due to dilution is $298,638.08.

If the exercise of options triggered a tax event at the ordinary rate, then his tax savings due to underpricing was $220,241.39. This assumes that stock volatility is 35%, shares are held for ten years before sale, federal taxes are 39.6% and that there are no state or local taxes. The advantage increases if there are state or local taxes. Mr. Kelly's options were part of a plan, so it is more likely that he had to pay taxes at the AMT rate of 24%. In this event, his tax savings were only $99,249.58. It is likely that his new options were granted at IPO, with a strike price at the IPO price and were part of *UPS*'s ISO plan. If this is the case, then the increased value of these options due to underpricing is $407,840.79. If the options lose qualification status, he would have to pay ordinary income tax on the spread between the strike price and the market price at exercise. If this happens, then the advantage to underpricing falls to $279,750.58.

In short, the CEO of *UPS* made between $80,363.08 and $329,444.10 more after taxes than he would have made if the issue were not underpriced. It is unlikely that UPS underpriced their shares in order for Mr. Kelly to make these small gains. It is more likely that he was protecting his wealth because he knew that there would be underpricing.

Goldman Sachs

The fact that investment banks underprice their own issues is sometimes mentioned as evidence that underpricing is necessary. Most investment banks are partnerships prior to IPO, so any losses due to underpricing will be suffered by the

managers of the firm. In May 1999, *Goldman Sachs* went public, selling 69,000,000 shares at $53.00 per share. *Goldman Sachs* offered 51,000,000 shares. *Sumitomo Bank* and *Kamehameha Activities Association*, who own a stake in *Goldman Sachs*, sold the remaining shares. At the end of the first day of trading, the price was $70.375. *Goldman Sachs* left $1,198,875,000 on the table. This represents an after-tax dilution of $1.80 per share.

According to the prospectus, *Goldman Sachs*' chairman and CEO, Henry M. Paulson owned 4,132,235 shares when the firm went public. His after-tax loss due to the dilution caused by underpricing was $7,440,800. However, according to Compustat's Executive Compensation database he received restricted stock grants of 8,828,700 shares during 1999. These shares were granted concurrently with the IPO. If Paulson elected to pay taxes when they were granted, he would have saved $43,560,128.24 if he sells the shares after ten years.

Paulson spread the wealth. Concurrent with the initial public offering, *Goldman Sachs* distributed 30,025,946 units of restricted stock to employees using a formula. Each unit entitled the grantee to receive one share of stock when vested. The company also granted 33,892,869 units of restricted stock to employees on a discretionary basis and granted options on 40,127,592 shares with the strike price set equal to the IPO price. Any employees receiving restricted stock could have received a tax benefit from underpricing. All employees receiving stock options benefited from underpricing, since the strike price was set to the IPO price. It is unlikely that any of the partners lost value due to pricing the IPO below the market price. There were very few losers in this deal. Most of the owners were partners who benefited from stock grants and option grants.

Retired partners were bought out prior to the IPO, so were unaffected by the underpricing. It is unclear whether or not *Sumitomo Bank* and *Kamehameha Activities Association* were hurt by the dilution due to underpricing, since both received a cash disbursement prior to the IPO. This may have been compensation for their losses. The big loser in this deal is the IRS.

Corvis Corporation

In July 2000, the *Corvis Corporation* sold 31,625,000 shares at $36 per share in their initial public offering. In addition to these shares, 277,778 shares were placed privately. The closing price at the end of the first day of trading was $84.71875 representing an after-tax dilution of $3.16 per share. *Corvis* moved to number two, behind *UPS*, on the list of companies leaving the most money on the table. According to the prospectus, CEO Dr. David Huber owned 28,231,560 shares of stock at IPO. The after-tax dilution to his personal shares was just under $90 million. Dr. Huber was granted options for 474,840 shares. Assuming a volatility of 140%, that the strike price is set to the IPO price, that he exercises the shares in one year and then sells after ten years, the tax savings is about $7.5 million. Dr. Huber had no options outstanding as of the IPO, nor was he granted any stock. Loughran and Ritter are probably right that he did not mind giving up $82.5 million since his remaining equity position was worth nearly $2.4 billion.

A further analysis of the deal shows that Dr. Huber got something in return for his $82.5 million. By underpricing the IPO, he assured the continued allegiance of his best employees and the continued support of his customers.

At the time of the IPO, employees, directors and consultants held options for 42,472,732 shares of stock. New options for 13,377,954 shares were granted when the IPO was issued. The CFO of *Corvis*, for example, owned 1,200,000 shares at IPO and exercised options on another 360,000 shares. The tax savings on the options exercised are about $900,000 greater than her loss due to dilution.

While Dr. Huber did not benefit directly from underpricing, most of the employees of his firm did. Most of Dr. Huber's shares were either converted from preferred stock or bought by exercising options – all at very favorable prices. Most of these transactions occurred between six months and two years prior to IPO. These transactions were bought when the fair market value was set to a low price and the SEC's cheap stock rule would not apply. It is entirely possible that Dr. Huber bought more shares at a lower price because he anticipated the dilution due to underpricing.

The Corvis Corporation only had three customers at the time of the IPO: *Broadwing Communications*, *Williams Communications* and *Qwest Communications*. Concurrent with their IPO, *Corvis* sold 277,778 shares to *Broadwing* and *Williams* in a private placement. The underpricing can be thought of as a $13.5 million discount on their business that does not show up on the books. The third company, *Qwest*, held warrants that were exercisable at IPO. *Qwest* would not benefit from underpricing, since exercising warrants is not a taxable event. However, the warrants were issued when the fair market value was low, and represent another way *Corvis* was able to allocate shares to its clients.

Companies leasing equipment to *Corvis* held other warrants. *Corvis* obviously viewed underpricing their equity as a way to purchase products, service and loyalty.

4. Data

Data were gathered in order to perform an analysis on the relationship between the use of options and IPO underpricing. The data were collected for 908 firms companies that issued firm commitment IPOs. Of these 264 firms went public in 1997, 214 companies in 1998, and for 430 companies in 1999. REITs, closed-end funds, units offerings, ADRs and issues priced below five dollars were excluded from the data set. All companies are registered in the United States, and trade on the NYSE, AMEX or through NASDAQ. Aftermarket pricing information was found in the CRSP database. All other information, including shares offered, shares outstanding, offer price, options outstanding and initial offering range were collected from SEC filings through the EDGAR database and from the Securities Data Corporation. Where possible, data were cross-checked with other sources. Only recent IPOs were chosen because of the availability of data in the EDGAR database. The starting year of 1997 was also chosen because 1997 was a typical year. Average underpricing is very close to the long-term average underpricing. IPOs in 1999, on the other hand, were highly unusual. 1999 was considered a hot market for IPOs. The number of firms issuing IPOs increased and average underpricing increased dramatically.

The IPO prospectus filed with the SEC contains information on stock option plans, but rarely indicates how many options have been exercised just before IPO. While many firms issue new options at IPO, and base the strike price on the issue price, few indicate how many options are granted concurrent with the IPO. The one consistent piece of information that can be found in the prospectus is the number of stock options

outstanding as of the issue date. Managers, employees and directors of the firm hold the majority of these options. The number of outstanding warrants is also printed in the prospectus. This number was collected for the analysis. It is not included in the number of outstanding options. The number of options outstanding at IPO should be highly correlated with the number of options exercised before IPO and with the number of options granted at IPO. The ratio of options outstanding to the issue size, exclusive of the overallotment option, is calculated and used in the analysis. Underpricing is measured as the first day return using the issue price and the closing price at the end of the first day of trading. The prospectuses for 319 firms give a further breakdown of the options data, indicating how many options are granted concurrently with the IPO. These data were collected for all three years.

5. Empirical Results

For parts of the empirical analysis, the data are split into three subgroups: those priced below the low of the pricing range printed in the preliminary prospectus, those priced greater than 120% of the high of the range, and those between these two groups. Dunbar (2000) shows that the reputation of investment banks is hurt when they bring issues to market that are priced below offering range printed in the preliminary prospectus. For this reason, there is less underpricing for issues priced below the low of the range. This is consistent with the findings of Hanley (1993) who finds that underpricing is proportional to the adjustment made to the offering price. This is measured as the offering price minus the midpoint of the original offering range as a percent of the offering price. SEC regulations state that the IPO price cannot be set

above 120% of the high of the offering range filed with the SEC. If the firms wish to price the IPO higher than this price, they must refile the offering with the SEC. Refiling is not difficult to do, though it could delay going public. Both of these events can be observed. Setting the price below the offering range indicates that demand is lower than the investment bank had anticipated. Refiling with the SEC signals that there is increased demand. For this reason, some of the analysis is performed on these subgroups. Some of the regressions include a dummy variable indicating which of the subgroups contains the data.

The number of outstanding options is divided by the issue size for each firm, in order to normalize the values. Summary statistics for the ratio of options outstanding to issue size and the underpricing variables are shown in **Table 1** for each year. These statistics are also shown for three subsets of data: firms where the issue price is below the initial offering range, firms where the issuer refiled with the SEC in order to price the issue higher than 120% of the high of the initial offering range, and firms priced between the low and 120% of the high values of the range.

Insert Table 1 Here

The average underpricing for the 1997 data is 15.78%. Consistent with Hanley, the average underpricing is low for the subset of firms whose IPO price is below the preliminary offering range, close to the average for those in the middle group and high for those of firms that refiled with the SEC. The average one-day returns are 3.20%, 17.11% and 54.43% respectively. These mean returns are significantly different from each other at the five percent level.

The average underpricing for the 1998 data is higher at 24.75%. Average underpricing displays a similar pattern in that it is lower (12.58%) for the subset of firms whose IPO price is below the preliminary offering range, higher (24.13) for those in the middle group and highest (90.04%) for the firms that refiled with the SEC. The mean of the high group is significantly different from the means of the other two groups at the one percent level. The means of the other two groups are not significantly different, however this is driven by one firm, Theglobe.com, that had 605% underpricing despite being priced below the low of the preliminary offering range.

The average underpricing for the 1999 data is significantly higher at 74.49%. Average underpricing in the subgroups displays the same pattern as the other two years. Underpricing is lowest (10.30%) for the subset of firms whose IPO price is below the preliminary offering range, higher (49.05%) for those in the middle group and highest (162.76%) for the firms that refiled with the SEC. Unlike IPOs in 1997 and 1998, average underpricing of IPOs priced in the middle group have considerably less underpricing than the overall average, because a much larger percentage of firms refiled with the SEC to raise the offering range. These mean returns for these three subsets are significantly different from each other at the one percent level. Comparing data across years, the mean returns of deals priced below the offering range are not significantly different from each other when a few outliers are deleted. For deals priced within the offering range or above the range, the yearly means are significantly different from each other at the one percent or five percent levels except for the means of the high group in 1997 and 1998 where there are very few data points.

Table 1 also shows that the average ratio of options outstanding to shares offered is 37.22% in 1997, 43.24% in 1998 and 70.98% in 1999. Since options granted at IPO or that were exercised just before IPO may not included, the real ratio is higher. The average firm that issues its stock below the preliminary offering range or in the middle group has roughly the same ratio of options to shares offered at 39.20% and 41.99% respectively in 1997, 36.62% and 41.99% respectively in 1998, and 52.41% and 62.49% in 1999. However, the average ratio for firms that refiled with the SEC increases greatly at 116.50% in 1997, 89.64 and 98.96% in 1999.

The mean ratio of options outstanding to offering size is not significantly different between the IPOs that are priced below the offering range and those in the middle group in any year. However, the mean ratio for IPOs that are refiled with the SEC is significantly greater than those in the middle group at the one percent level for each year.

If the use of employee options affects IPO underpricing or if managers use options to protect themselves from underpricing, then there should be a positive relationship between option use and IPO underpricing. This relationship is tested using linear regression. The following model is assumed:

$$Underpricing = b_0 + b_1 Options/Offered + b_2 MiddleFlag + b_3 FileFlag + \varepsilon$$

Underpricing is the dependent variable. The independent variables are *Options/Offered*, *MiddleFlag* and *FileFlag*. *Options/Offered* is the ratio of outstanding options to shares issued. *MiddleFlag* is a dummy variable set to one if the offer price is between the low of the preliminary offering range in the prospectus and 120% of the high of the range. *FileFlag* is a dummy variable set to one if the issuer refiled with the SEC in order to price the issue greater than 120% of the offering range. Robust standard errors are calculated

to compensate for heteroscedastic errors. The results of the regression can be seen in the first panel of **Table 2** for all data. **Table 3** contains the results for 1997 data, **Table 4** contains the results for 1998 data, and **Table 5** contains the results for 1999 data.

Insert Table 2 Here

Regressions Using All Data

Examining **Table 2**, we see that the coefficient of the ratio of outstanding options to offering size is positively related to underpricing and is significant at the one percent level for all IPO data. The constant term of the regression is small and is not significantly different from zero. This is consistent with findings that firms priced below the preliminary offering range tend not to be underpriced. The coefficients for the dummy variables that indicate whether the offering price is in the middle group or if the issuer refiled to raise the offering price are both positive and significant at the one percent level. The coefficient is larger for the dummy variable indicating that the firm refiled with the SEC.

The dummy variables and the ratio of outstanding options to offering size explain almost 40% of the variation in underpricing in the data. The coefficient of the ratio of outstanding options to the offering size is 0.351, indicating that each extra percent increase in the ratio is associated with an extra 35 basis points of underpricing.

The other panels in **Table 2** show the results of regressing the options to offered ratio against underpricing for each of the subsets of data. Other studies have shown that some variables that explain underpricing fail when restricted to one of these subsets. For example, Hanson's partial adjustment, which is the difference between the offering price and the midpoint of the preliminary offering range divided by the offering price, is

positively related to underpricing. However, when restricting the data to firms that are priced below the offering range, the partial adjustment has no significance. Similarly, Taranto (2000) shows that underpricing is related to debt level when the offering price is below the midpoint of the preliminary offering range, but is unrelated to underpricing when the price is adjusted upwards. When the price is in the upper group, the relationship between underpricing and the options to offered ratio is similar to when the price is in the middle group. However when the offering price is set below the low of the preliminary prospectus, the ratio has less explanatory power.

Insert Table 3 Here

Regressions Using 1997 Data

Table 3 shows the results of limiting the analysis to the 1997 data. The coefficient of the ratio of outstanding options to offering size remains positively related to underpricing and is still significant at the one percent level. The constant term of the regression is small, and not significantly different from zero. The coefficients for the dummy variables are significant and positive, though smaller than in the entire sample.

The other panels in **Table 3** show the results of regressing the underpricing against options to offered ratio for each of the subsets of data. Since only seven issuers refiled to raise the price of their offering in 1997, there is no analysis of this subgroup. In the three-year sample the ratio of options to offering size is not a significant factor, at the ten percent level, in explaining underpricing in the group when the price is set below the low of the offering range. However, for 1997 data alone, the relationship is statistically

significant. The relationship between underpricing and the options to offered ratio is similar in the lowest and the middle subgroups.

The dummy variables and the ratio of outstanding options to offering size explain almost 23% of the variation in underpricing in 1997. The analysis indicates that if a firm increases the ratio of outstanding options to the offering size by one percent, then the expected underpricing should be about eight basis points higher in 1997.

Insert Table 4 Here

Regressions Using 1998 Data

As with the 1997 data, the coefficient of the ratio of outstanding options to offering size is also positively related to underpricing and is significant at the one percent level for 1998 IPO data. However, the coefficient is 0.198, which is much greater than with the 1997 data. The constant term of the regression is small, and not statistically significant. Because the sample size for 1998 is smaller, the coefficient for the dummy variable that indicates whether the offering price is in the middle group is not statistically significant, though the dummy variable indicating that the issuer refiled with the SEC is significant at the one percent level.

The other panels in **Table 4** show the results of regressing the underpricing against options to offered ratio for each of the subsets of data. Since only 12 issuers refiled to raise the price of their offering in 1997, there is no analysis of this subgroup. The relationship between underpricing and the options to offered ratio is similar to the full 1998 sample for the middle group, but not significant when the offering price is set lower than the low of the original offering range.

The dummy variables and the ratio of outstanding options to offering size explain about 11.4% of the variation in underpricing in 1998 data.

Insert Table 5 Here

Regressions Using 1999 Data

Table 5 shows the results for 1999 data. As with the data from the previous two years, the coefficient of the ratio of outstanding options to offering size is also positively related to underpricing and is significant at the one percent level for 1999 IPO data. However, at 0.391, the coefficient is five times greater than with the 1997 data. The constant term of the regression is small, and not statistically significant. The coefficients for the dummy variables that indicate whether the offering price is in the middle group or that the issuer refiled with the SEC are both significant at the one percent level. The coefficient for deals priced in the middle group and for deals where the issuer refiled are significantly larger than found from the regression on 1997 data. This may reflect a fundamental difference in the way that options are used in startups, or may reflect a difference in the types of companies going through the IPO process.

The other panels in **Table 5** show the results of regressing the underpricing against options to offered ratio for each of the subsets of data. The relationship between underpricing and the options to offered ratio is about the same as the entire year value except when the offering price is set lower than the low of the original offering range.

The dummy variables and the ratio of outstanding options to offering size explain about 38% of the variation in underpricing in 1999 data. The analysis indicates that if a firm increases the ratio of outstanding options to the offering size by one percent, then the

expected underpricing should increase by about 38-40 basis points for firms priced above the low of the original offering range.

Regressions Using Firms that Provide More Information

The number of outstanding options from the prospectus is a noisy indicator of the benefits of underpricing. There are three groups of options included in this number, but only two groups benefit from underpricing. The first group includes those options that are exercisable. If the owner of the option holds non-qualified options or holds ISOs but is subject to the alternative minimum tax, then exercising the option at IPO can save taxes. The second group of options outstanding includes those options granted at or not long before IPO. These options benefit from IPO underpricing because they have a lower strike price. The final group of options contains those that were granted well before the IPO but not yet exercisable or ISOs where the owner is not subject to the alternative minimum tax. Underpricing has no positive effect on these options.

Some of the companies in the sample break out the newly granted options from those that have been outstanding for a longer period of time. If the benefit from underpricing options is the reason why the ratio of outstanding options to offer size is a significant factor in explaining underpricing, then a regression on this subset of the data should explain more of the variance in underpricing.

Insert Table 6 Here

Panel 1 of **Table 6** shows the results of this regression. The dependent variable is, once again, IPO underpricing. The independent variables include the same two dummy variables used before plus two ratios. One ratio is the number of options outstanding, exclusive of those granted concurrently with the IPO to the offering size.

The other ratio considered is the number of newly granted options divided by the offering size. If these two variables are added together, the sum will equal the ratio used in the previous regressions. Since there is less noise in these variables, then higher coefficients and a larger R^2 would be expected when the regression is performed on this subset of data.

Information on newly granted options is provided by 109 of the companies going public in 1997, 93 of the companies going public in 1998, and 117 of the companies going public in 1999. The R^2 of this regression is higher than in the entire sample. The dummy variables and option information explain 46.8% of the variation in underpricing in this sample. The coefficients of the two option variables are 0.546 for the existing option ratio and 0.636 for concurrent option ratio. As expected, these values are considerably higher than the option ratio coefficient using the entire sample. **Panel 2** of **Table 6** shows the results of the regression without the dummy variables. The coefficients are positive and significant. The regression using option data alone explains 25.8% of the variation in underpricing.

The increased explanatory power of these regressions supports the theory that the benefit using options explains some the increase in underpricing during the period from 1997 through 1999. It is also possible that increase in underpricing in 1999 has other causes, but that issuers became more sophisticated in protecting their positions from underpricing. It might be argued that these 319 firms are not representative of the entire sample. The sample statistics in **Table 7** show that this is not the case. Sample statistics for this subset of data are similar to the values for the entire data set.

Insert Table 7 Here

Robustness

A natural question that arises is 'Is the relation between option use and underpricing just due to the fact that option use is highly correlated with some other factor that influences underpricing'? There is a rich literature showing that various factors are significant predictors of underpricing. Hanley (1993) shows that the partial adjustment, defined as the IPO price minus the midpoint of the offering range divided by the IPO price, predicts IPO underpricing. Beatty and Ritter (1986) show that the inverse of the offering size has significant explanatory power. Loughran and Ritter (2002) show that the performance of the S&P 500 prior to the issuance date is a significant factor in explaining underpricing. Other variables that have been shown to have explanatory power include a dummy variable indicating that the stock trades through the NASDAQ system, dummy variables for internet firms or technology firms, and the percent of the firm sold in the issue (issue size divided by shares outstanding after IPO).

One other variable, not looked at in the previous literature, is of interest. Warrants are similar to employee options because they represent possible future dilution since they may allow owners to purchase shares of the firm at a price lower than the stock price. However, warrants are usually sold to investors other than employees and do not trigger a taxable event when exercised. Data on the number of warrants outstanding was collected for each firm in the sample. A ratio of outstanding warrants to shares sold (the warrant ratio) is calculated and considered as a factor.

Using these data, new regressions were run to test the robustness of the results found in the previous section. The tests were also performed using Hanley's partial adjustment (IPO price minus the midpoint of the offering range divided by the IPO price)

instead of the dummy variables that are set to one when the offering price is in the middle or upper ranges. The results of these regressions were similar, in terms of the level and the significance of the coefficient of the ratio of outstanding options to offering size.

The results of four regressions are shown in **Table 8** and **Table 9**. **Table 8** shows the results using all data from 1997 through 1998. **Table 9** shows similar results using the subset of firms that supplied extra information about grants of options concurrent with the issue.

Column I of **Table 8** displays the result of regressing IPO underpricing against the option ratio, the warrant ratio, a NASDAQ dummy variable, dummy variables set to one if the firm is a technology or internet firm, the return of the S&P in the 30 days prior to the offering, the inverse of the proceeds and dummy variables set to one if the offering price is in the middle group or the group where the offering price is set higher than 120% of the high of the preliminary offering range. Column II shows the results when the option ratio and warrant ratio are dropped from the regression. Columns III and IV show the results of these regressions when Hanley's partial adjustment is used instead of the dummy variables that indicate the IPO offering price in relation to the offering range.

Insert Table 8 Here

Columns II and IV show that without the options information, all of the other factors are significant at the five percent level or better. When the options and warrant information are included, the coefficient of the options ratio is close to the value in the earlier regressions and is significant at the one percent level. The coefficient of the warrant ratio is negative, though not significant at the one percent level. In regressions

where the internet and technology dummy factors are excluded, the warrant ratio is negative and significant. These results are not included in the tables. These results show that the relationship between option use and underpricing is not because the firm has issued instruments with call option payoffs, but either because of the tax implications or the fact that employees own the options. The negative coefficient of the warrant ratio may be because warrant issuance is correlated with venture capital backing. It is known that firms that are backed by venture capital experience less underpricing than other firms. The fact that the warrant ratio coefficient becomes less significant when the internet and technology dummy variables are included lends support to this idea.

This analysis answers another possible objection. Beatty and Ritter (1986) show that IPO underpricing is related to the inverse of the proceeds. Since the options ratio has the number of shares from the offering in the dividend, it might be argued that the options ratio is just a proxy for the inverse of the proceeds. However, the coefficient of the inverse of the proceeds is negative. Increasing the issue size makes this number smaller so it increases expected underpricing. In the options ratio, increasing the offering size also makes the variable smaller, but since the coefficient is positive it decreases expected underpricing. This shows that the results are not driven by the size of the issue, but by its relationship to the number of options.

The results are similar when Hanley's partial adjustment is used instead of the two dummy variables that indicate whether the issue price was below the preliminary offering range, greater than 120% of the high of the range or in the middle group. The regressions show that the two dummy variables have slightly more explanatory power than the partial adjustment.

Table 8 shows similar regressions on the subset of data where more information is given. Because this is a smaller data set, some of the factors (such as the S&P performance prior to IPO) are no longer significant at the 10% level. However, the coefficients of both option ratios are significant at the five percent level and are similar in level to the regressions without the other factors included.

Insert Table 8 Here

Other Findings

Lungqvist and Wilhelm (2001) find that the dramatic rise in underpricing during the late 1990s was accompanied by a corresponding drop in the average percentage of the issuing firms that was sold to the public. By decreasing the percentage of the firm that is sold, the same level of dilution to existing shares allows more underpricing. It can easily be seen in *Proposition 1a* that decreasing the proportion of the firm that is sold also decreases the number of options needed to compensate insiders for their losses. **Table 7** shows average percent sold for the firms in this analysis drops from 37.2% in 1997 to 31.8% in 1998 and to 21.4% in 1999. Although the portion of the firms sold decreases, the average proceeds raised increased by over 23% per year from 1997 to 1999. Other differences can be seen from this analysis. Even accounting for the decrease in the portion of the firm sold to the public, there was still a marked increase in the use of options. The ratio of options outstanding to total shares outstanding increases from 9.7% to 12.1% between 1997 and 1998 and rises slightly to 12.4% in 1999.

6. Conclusion

In this paper, I show that there is a tax benefit to exercising options at IPO if the spread between the strike price and the fair market value is taxable. A similar tax

advantage exists for restricted stock grants. In addition to these tax benefits, insiders who receive options at IPO benefit because the strike price is usually based on the fair market value. In the case of ISOs, the strike price is required to be at or above the fair market value when the options are granted.

Evidence is given that some firms use options and stock grants to protect senior managers from any dilution to their equity positions caused by underpricing the IPO. These managers may be willing to accept underpricing as an inevitable consequence of going public since they protect their own total positions in the firm.

Other managers may underprice on purpose to reap the benefits of underpricing. While some of the benefits come at the expense of the government, any investors who have not been granted options or restricted stock will be hurt by their actions.

Yet another group of managers have realized that underpricing the IPO allows them to use options, stock and warrants as currency. They can pay their employees with options, reward their clients with stock or warrants, and may be able to strengthen strategic alliances with stock or warrants. The benefits of using the buying power of underpriced equity and equity derivatives may override the dilution to existing stock.

The empirical tests of data show conclusively that the use of options is significantly related to IPO underpricing. The dramatic increase in underpricing between 1997 and 1999 was accompanied by a similar dramatic increase in the use of options, as well as a decrease in the portion of the firms sold. Of course, the number of outstanding options is a noisy signal of the benefits of underpricing, because not all options benefit from IPO underpricing. Using a subset of the data where the number of options granted concurrent

with the IPO is revealed, the explanatory power of option use in explaining IPO underpricing increases.

Two major areas of study can follow from this analysis. The first is to discover how tax laws in other countries affect IPO underpricing. The second is to examine the relationship between corporate governance and IPO underpricing. Some managers of firms encourage more underpricing in order to benefit themselves, while others use options as a means of protecting themselves or as currency. A natural extension of this analysis is to determine whether closely monitored firms are less likely to abuse options than those that are not watched closely. This problem is complicated by the fact that outside board members benefit from underpricing the IPOs.

All of this points to an answer to the central question surrounding the IPO underpricing puzzle. Some managers are willing go along with IPO underpricing because they are able to protect their positions through the use of options and stock grants. Other managers desire to exploit the tax advantage. Still other managers see the advantage of using underpriced shares as currency. In short, they sell shares of their firm at a discount because it makes them better off.

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Table 1
Summary Statistics of Option Use and Underpricing in IPO Data

Table 1 reports the summary statistics for IPO data for 1997 through 1999. 'Percent change in price' is the percent change from the IPO price to the closing price at the end of the first day of trading. 'Options/Offering Size' indicates the ratio of outstanding options to the size of the offering (excluding the overallotment option). The data are also summarized for three subsets, those priced below the original offering range, those priced between the low of the original offering range and 120% of the high, and those priced above 120% of the high of the offering range.

Panel 1: Percent Change in Price

	Sample Size	Mean	St. Dev.	Minimum	Maximum
1997 All IPOs	264	15.78%	17.89%	-16.07%	101.72%
1998 All IPOs	214	24.75%	54.36%	-15.00%	605.56%
1999 All IPOs	430	74.49%	98.58%	-24.43%	697.50%
1997 Low Group	44	3.20%	7.54%	-16.07%	33.33%
1998 Low Group	57	12.58%	80.33%	-15.00%	605.56%
1999 Low Group	61	10.30%	31.63%	-24.43%	150.90%
1997 Middle Group	213	17.11%	16.27%	-13.63%	77.78%
1998 Middle Group	145	24.13%	35.56%	-12.50%	247.77%
1999 Middle Group	252	49.05%	63.78%	-22.91%	313.33%
1997 High Group	7	54.43%	36.08%	16.67%	101.72%
1998 High Group	12	90.04%	48.92%	17.67%	187.50%
1999 High Group	117	162.76%	123.25%	0.00%	697.50%

Panel 2: Ratio of Options Outstanding to Shares Offered

	Sample Size	Mean	St. Dev.	Minimum	Maximum
1997 All IPOs	264	37.22%	38.16%	0.65%	253.43%
1998 All IPOs	214	43.24%	39.40%	0.00%	245.26%
1999 All IPOs	430	70.98%	65.58%	0.00%	540.57%
1997 Low Group	44	39.20%	33.94%	5.50%	191.96%
1998 Low Group	57	36.62%	28.81%	6.48%	161.88%
1999 Low Group	61	52.41%	42.71%	0.00%	196.35%
1997 Middle Group	213	34.20%	34.91%	0.65%	253.43%
1998 Middle Group	145	41.99%	39.24%	0.00%	245.26%
1999 Middle Group	252	62.49%	59.33%	0.00%	466.63%
1997 High Group	7	116.51%	69.51%	31.65%	235.16%
1998 High Group	12	89.64%	55.55%	36.10%	235.40%
1999 High Group	117	98.96%	78.85%	0.00%	540.57%

Table 2
Results of OLS Regressions with Robust Standard Errors:
All Data – IPO Percent Underpricing as the Dependent Variable

$Underpricing = b_0 + b_1 Options/Offered + b_2 MiddleFlag + b_3 FileFlag$ is estimated using a sample of 908 IPOs issued between 1997 and 1999, using robust standard errors to compensate for heteroscedastic errors. *Underpricing* is the one-day return on the issue. *Options* is the number of outstanding options that have been granted as of the IPO date. Shares reserved for future option grants are not included. *Offered* is the number of shares offered in the IPO. *MiddleFlag* is a dummy variable that is set to one if the offering price is between the low of the original offering range and 120% of the high of the range as described in the prospectus. *FileFlag* is a dummy variable that is set to one if the issuer refiled with the SEC to set the offering price higher than 120% of the high of the range. Robust t-statistics are shown in parentheses below the coefficients.

Panel 1: All Firms (908 Firms)

b_0	b_1	b_2	b_3
-0.060	0.351	0.212	1.220
(-1.25)	(5.43)	(4.80)	(11.62)
F-Statistic	60.59		
Adjusted R^2	0.384		

Panel 2: Firms Priced Below the Offering Range (162 Firms)

b_0	b_1
0.027	0.151
(0.63)	(1.84)
F-Statistic	3.55
Adjusted R^2	0.011

Panel 3: Firms Priced Within the Offering Range (610 Firms)

b_0	b_1
0.147	0.363
(4.71)	(4.89)
F-Statistic	23.89
Adjusted R^2	0.139

Panel 4: Firms Priced Above 120% of the Offering Range (136 Firms)

b_0	b_1
1.127	0.384
(7.82)	(2.60)
F-Statistic	6.77
Adjusted R^2	0.061

Table 3
Results of OLS Regressions with Robust Standard Errors:
1997 Data – IPO Percent Underpricing as the Dependent Variable

$Underpricing = b_0 + b_1 Options/Offered + b_2 MiddleFlag + b_3 FileFlag$ is estimated using a sample of 264 IPOs issued in 1997, using robust standard errors to compensate for heteroscedastic errors. *Underpricing* is the one-day return on the issue. *Options* is the number of outstanding options that have been granted as of the IPO date. Shares reserved for future option grants are not included. *Offered* is the number of shares offered in the IPO. *MiddleFlag* is a dummy variable that is set to one if the offering price is between the low of the original offering range and 120% of the high of the range as described in the prospectus. *FileFlag* is a dummy variable that is set to one if the issuer refiled with the SEC to set the offering price higher than 120% of the high of the range. Robust t-statistics are shown in parentheses below the coefficients.

Panel 1 – All 1997 Firms (264 Firms)

b_0	b_1	b_2	b_3
0.001	0.078	0.143	0.452
(0.09)	(2.58)	(9.59)	(3.26)
F-Statistic	39.36		
Adjusted R^2	0.236		

Panel 2 – 1997 Firms Priced Below the Offering Range (44 Firms)

b_0	b_1
-0.007	0.100
(-0.37)	(1.92)
F-Statistic	3.66
Adjusted R^2	0.204

Panel 3 – 1997 Firms Priced Within the Offering Range (213 Firms)

b_0	b_1
0.141	0.088
(9.07)	(2.88)
F-Statistic	8.29
Adjusted R^2	0.036

Table 4
Results of OLS Regressions with Robust Standard Errors:
1998 Data – IPO Percent Underpricing as the Dependent Variable

$Underpricing = b_0 + b_1 Options/Offered + b_2 MiddleFlag + b_3 FileFlag$ is estimated using a sample of 214 IPOs issued in 1998, using robust standard errors to compensate for heteroscedastic errors. *Underpricing* is the one-day return on the issue. *Options* is the number of outstanding options that have been granted as of the IPO date. Shares reserved for future option grants are not included. *Offered* is the number of shares offered in the IPO. *MiddleFlag* is a dummy variable that is set to one if the offering price is between the low of the original offering range and 120% of the high of the range as described in the prospectus. *FileFlag* is a dummy variable that is set to one if the issuer refiled with the SEC to set the offering price higher than 120% of the high of the range. Robust t-statistics are shown in parentheses below the coefficients.

Panel 1 – All 1998 Firms (214 Firms)

b_0	b_1	b_2	b_3
0.053	0.198	0.105	0.669
(0.54)	(3.14)	(0.944)	(3.56)
F-Statistic	18.07		
Adjusted R^2	0.114		

Panel 2 – Firms Priced Below the Offering Range (57 Firms)

b_0	b_1
0.043	0.227
(0.72)	(1.17)
F-Statistic	1.36
Adjusted R^2	0.007

Panel 3 – Firms Priced Within the Offering Range (145 Firms)

b_0	b_1
0.158	0.199
(4.76)	(4.76)
F-Statistic	7.63
Adjusted R^2	0.048

Table 5
Results of OLS Regressions with Robust Standard Errors:
1999 Data – IPO Percent Underpricing as the Dependent Variable

$$Underpricing = b_0 + b_1 Options/Offered + b_2 MiddleFlag + b_3 FileFlag$$ is estimated using a sample of 430 IPOs issued in 1999, using robust standard errors to compensate for heteroscedastic errors. *Underpricing* is the one-day return on the issue. *Options* is the number of outstanding options that have been granted as of the IPO date. Shares reserved for future option grants are not included. *Offered* is the number of shares offered in the IPO. *MiddleFlag* is a dummy variable that is set to one if the offering price is between the low of the original offering range and 120% of the high of the range as described in the prospectus. *FileFlag* is a dummy variable that is set to one if the issuer refiled with the SEC to set the offering price higher than 120% of the high of the range. Robust t-statistics are shown in parentheses below the coefficients.

Panel 1 – All 1999 Firms (430 Firms)

b_0	b_1	b_2	b_3
-0.102	0.391	0.348	1.343
(-1.67)	(4.40)	(6.27)	(11.68)
F-Statistic	60.94		
Adjusted R^2	0.381		

Panel 2 – Firms Priced Below the Offering Range (61 Firms)

b_0	b_1
0.021	0.149
(0.30)	(1.05)
F-Statistic	1.20
Adjusted R^2	0.043

Panel 3 – Firms Priced Within the Offering Range (252 Firms)

b_0	b_1
0.242	0.397
(3.71)	(3.50)
F-Statistic	12.21
Adjusted R^2	0.136

Panel 4 – Firms Priced Above the Offering Range (117 Firms)

b_0	b_1
1.211	0.421
(7.74)	(2.64)
F-Statistic	6.95
Adjusted R^2	0.073

Table 6
Results of OLS Regressions with Robust Standard Errors:
Subset of Data – IPO Percent Underpricing as the Dependent Variable

$$Underpricing = b_0 + b_1\left(Old\ \ Options / Offered\right) + b_2\left(New\ Options / Offered\right) + b_3 MiddleFlag + b_4 FileFlag$$

and

$$Underpricing = b_0 + b_1\left(Old\ \ Options / Offered\right) + b_2\left(New\ Options / Offered\right)$$

are estimated using a sample of 319 IPOs issued between 1997 and 1999, using robust standard errors to compensate for heteroscedastic errors. *Underpricing* is the one-day return on the issue. *Old Options* is the number of outstanding options that have been granted prior to the IPO date. *New Options* is the number of options granted at or prior to IPO with a strike price equal to the IPO price. Shares reserved for future option grants are not included. *Offered* is the number of shares offered in the IPO. *MiddleFlag* is a dummy variable that is set to one if the offering price is between the low of the original offering range and 120% of the high of the range as described in the prospectus. *FileFlag* is a dummy variable that is set to one if the issuer refiled with the SEC to set the offering price higher than 120% of the high of the range. Robust t-statistics are shown in parentheses below the coefficients.

Firms with Information on Newly Granted Options (319 Firms)				
Panel 1 – Regression with Dummy Flags for Adjustment from Offering Range				
b_0	b_1	b_2	b_3	b_4
-0.203	0.546	0.636	0.254	1.351
(-3.79)	(3.33)	(3.12)	(6.13)	(6.94)
F-Statistic	27.54			
Adjusted R^2	0.468			

Panel 2 – Regression without Dummy Flags for Adjustment from Offering Range		
b_0	b_1	B_2
0.039	0.841	0.676
(0.60)	(4.19)	(3.00)
F-Statistic	12.59	
Adjusted R^2	0.258	

Table 7
Yearly Summary Statistics of IPO Data for 1997-1999

'Total Options/Offering Size' indicates the ratio of all outstanding options to the size of the offering (excluding the overallotment option). 'Concurrent Options/Offering Size' indicates the ratio of options offered concurrently with the issue to the size of the offering for the subset of data where this information is provided.

Yearly IPO Data for All Firms

	1997	1998	1999
Sample Size	264	214	430
Mean Offer Size (shares)	4,926,181	6,110,996	6,737,559
Mean Underpricing	15.8%	24.7%	74.5%
Mean Total Options/Offering Size	32.7%	43.2%	71.0%
Mean Total Options/Total Shares	9.7%	12.1%	12.4%
Mean Warrants/Offering Size	9.3%	9.8%	18.3%
Mean Percent of Firm Sold	37.2%	31.8%	21.4%
Percent Priced Below Offering Range	16.7%	26.6%	14.2%
Percent Priced Within Offering Range	62.5%	48.6%	35.8%
Percent Priced Above Offering Range	20.8%	24.8%	50.0%
Percent Priced Above 120% of High	2.65%	5.6%	27.2%
Mean Offer Price	$13.58	$13.14	$14.90
Mean Proceeds	$78,617,877	$96,997,755	$119,735,982

Yearly IPO Data for All Firms Providing Additional Option Information

	1997	1998	1999
Sample Size	109	93	117
Mean Offer Size (shares)	5,393,619	7,558,558	7,342,102
Mean Underpricing	15.7%	21.6%	79.3%
Mean Total Options/Offering Size	30.7%	45.6%	67.1%
Mean Total Options/Total Shares	8.87%	13.58%	11.9%
Mean Concurrent Options/Offering	17.3%	20.1%	23.4%
Mean Warrants/Offering Size	6.4%	9.2%	13.5%
Mean Percent of Firm Sold	34.9%	34.5%	22.1%
Percent Priced Below Offering Range	15.6%	28.0%	16.2%
Percent Priced Within Offering Range	64.2%	50.5%	29.1%
Percent Priced Above Offering Range	20.2%	21.5%	54.7%
Percent Priced Above 120% of High	0.9%	3.2%	27.4%
Mean Offer Price	$13.94	$13.63	$15.63
Mean Proceeds	$91,546,274	$121,042,830	$148,935,801

Table 8
Results of OLS Regressions with Robust Standard Errors
IPO Percent Underpricing as the Dependent Variable

Underpricing is estimated using four sets of regressions on a sample of 908 IPOs issued between 1997 and 1999. Robust standard errors are computed to compensate for heteroscedastic errors. Robust t-statistics are shown in parentheses below the coefficients. Regression I tests the significance of the Option Ratio (options outstanding divided by issue size) and the Warrant Ratio (warrants outstanding divided by issue size) when other factors that have been shown to predict underpricing are added to the regression. These factors include dummy variables set to one if the firm trades on NASDAQ, is a high tech firm, an internet firm, the offering price is greater than 120% of the high of the preliminary offering range or if the offering price is between the low of the range and 120% of the high. Other factors include the return on the S&P 500 in the month preceding the offering, the percent of the firm sold in the offering and the inverse of the proceeds (in $MM). Regression II shows the results of this test when the option and warrant data are excluded. Regression III and regression IV show the results of similar tests using the partial adjustment (Hanley (1993)) instead of the two dummy variables.

	I	II	III	IV
Option Ratio	0.291		0.344	
	(4.03)		(4.84)	
Warrant Ratio	-0.067		-0.075	
	(-1.63)		(-1.47)	
NASDAQ Dummy	0.103	0.126	0.117	0.147
	(3.62)	(4.48)	(3.61)	(4.36)
Technology Dummy	0.091	0.129	0.108	0.156
	(1.66)	(2.31)	(1.93)	(2.71)
Internet Dummy	0.103	0.146	0.114	0.167
	(1.78)	(2.45)	(1.91)	(2.68)
S&P Performance	1.654	1.477	1.632	1.417
	(2.69)	(2.39)	(2.54)	(2.18)
% Sold	-0.315	-0.546	-0.434	-0.728
	(-2.60)	(-4.45)	(-3.40)	(-5.59)
Between Dummy	0.145	0.146		
	(2.96)	(2.93)		
Above Dummy	1.031	1.11		
	(9.81)	(10.52)		
Inverse of Proceeds	-3.094	-3.398	-1.488	-1.692
	(-4.72)	(-5.00)	(-1.93)	(-2.13)
Partial Adjustment			1.173	1.282
			(8.52)	(8.69)
Constant	0.015	0.171	0.179	0.373
	(0.309)	(4.09)	(2.89)	(6.84)
R^2	0.414	0.383	0.362	0.319
F-Statistic	33.33	35.67	27.69	30.32
Sample Size	908	908	908	908

Table 9
Results of OLS Regressions with Robust Standard Errors
IPO Percent Underpricing as the Dependent Variable

Underpricing is estimated using four sets of regressions on a sample of 319 IPOs issued between 1997 and 1999 that provide extra information about options. Robust standard errors are computed to compensate for heteroscedastic errors. Robust t-statistics are shown in parentheses below the coefficients. Regression I tests the significance of the Old Option Ratio (old options outstanding divided by issue size), Concurrent Option Ratio (options offered concurrent with the issue divided by issue size) and the Warrant Ratio (warrants outstanding divided by issue size) when other factors that have been shown to predict underpricing are added to the regression. These factors include dummy variables set to one if the firm trades on NASDAQ, is a high tech firm, an internet firm, the offering price is greater than 120% of the high of the preliminary offering range or if the offering price is between the low of the range and 120% of the high. Other factors include the return on the S&P 500 in the month preceding the offering, the percent of the firm sold in the offering and the inverse of the proceeds (in $MM). Regression II shows the results of this test when the option and warrant data are excluded. Regression III and regression IV show the results of similar tests using the partial adjustment (Hanley (1993)) instead of the two dummy variables.

	I	II	III	IV
Old Option Ratio	0.431		0.421	
	(2.29)		(2.23)	
Concurrent Option Ratio	0.602		5.65	
	(2.94)		(2.93)	
Warrant Ratio	-0.209		-0.167	
	(-1.22)		(-1.06)	
NASDAQ Dummy	0.066	0.113	0.090	0.136
	(1.15)	(2.22)	(1.56)	(2.58)
Technology Dummy	0.212	0.287	0.295	0.367
	(2.13)	(2.71)	(3.03)	(3.46)
Internet Dummy	0.037	0.075	0.037	0.073
	(0.39)	(0.81)	(0.42)	(0.85)
S&P Performance	1.561	1.312	1.745	1.513
	(1.72)	(1.31)	(1.90)	(1.52)
% Sold	-0.337	-0.696	-0.404	-0.742
	(-2.33)	(-4.46)	(-2.72)	(-4.49)
Between Dummy	0.223	0.254		
	(4.90)	(5.44)		
Above Dummy	1.209	1.296		
	(6.64)	(6.38)		
Inverse of Proceeds	-2.504	-3.611	-0.204	-0.932
	(-2.00)	(-2.38)	(-0.16)	(-0.63)
Partial Adjustment			1.350	1.506
			(5.75)	(5.55)
Constant	-0.100	0.159	0.092	0.358
	(-1.17)	(2.31)	(1.13)	(5.54)
R^2	0.504	0.428	0.464	0.395
F-Statistic	11.08	12.63	8.19	8.33
Sample Size	319	319	319	319