Options Trading Activity and Firm Valuation

by

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We study the effect of options trading volume on the value of the underlying firm after controlling for other variables that may affect firm value. The volume of options trading might have an effect on firm value because it helps to complete the market (allocational efficiency) and because the options market impounds information faster than the stock market (informational efficiency). We find that firms with more options trading have higher values. This result holds for all sample firms and for the subset of firms with positive options volume.

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Abstract

We study the effect of options trading volume on the value of the underlying firm after controlling for other variables that may affect firm value. The volume of options trading might have an effect on firm value because it helps to complete the market (allocational efficiency) and because the options market impounds information faster than the stock market (informational efficiency). We find that firms with more options trading have higher values. This result holds for all sample firms and for the subset of firms with positive options volume.

1. Introduction

More than thirty years ago Ross (1976) argued that options written on existing assets can improve market efficiency by permitting an expansion of the contingencies that are covered by traded securities. In the absence of complete markets, simple options are powerful abettors of efficiency in competitive equilibrium. Since Ross' writing, options markets have experienced an exponential growth, both in the number of underlying assets on which options are written, and in the volume of trading.

This paper provides empirical evidence about options activity and the market values of traded companies. Our central arguments revolve around how options affect incentives to trade on private information. If options help to complete the market, agents with information about future contingencies should be able to trade more effectively on their information, thus improving informational efficiency. In addition, informed traders may prefer to trade options rather than stock, because of increased opportunities for leverage (Back, 1992, Biais and Hillion, 1992).

Supporting the preceding notions, Cao and Wei (2007) find evidence that information asymmetry is greater for options than for the underlying stock, implying that agents with information find the options market a more efficient venue for trading. This finding is bolstered further by Easley, O'Hara, and Srinivas (1998) and Chakravarty, Gulen, and Mayhew (2004) who find that options order flows contain information about the future direction of the underlying stock price. Finally, the analysis of Admati and Pfleiderer

(1988) indicates that informed traders are more active when volume is greater. These arguments together imply that informational efficiency would be greater in more actively traded options.

In order to link informational efficiency to valuation, we allude to the argument that if prices reveal more information, then resources are allocated more efficiently, which translates to higher firm valuations. A more direct argument is that greater informational efficiency reduces the risk of investing in an asset because market prices reflect information more precisely; which also would tend to make the asset more valuable. It can thus be argued that, *ceteris paribus*, markets for claims in firms with higher options trading volume should be more informationally efficient and thus valued more highly.

It is worth noting that the mere *listing* of an option does not necessarily imply a valuation benefit of the type discussed above. If the options market has insufficient volume or liquidity, the incremental valuation benefit from listing would be minor or even immaterial because informed traders see no advantage to trading in options (Admati and Pfleiderer, 1988). Any valuation benefit of options listing should depend on substantial trading activity. To the best of our knowledge, the relation between options trading activity and firm valuation has not been examined previously.

For a large sample of firm during the 10-year period 1996 to 2005 we analyze the effect of options trading volume on firm value after controlling for other variables that may also affect firm value such as firm size, share turnover, return on assets, capital expenditures, leverage and dividend payments. Following other studies (Lang and Stulz, 1992, Allayannis and Weston, 2001, and Carter, Rogers, and Simkins, 2006) we use a measure of Tobin's q as the valuation metric.

We find strong evidence that firms with more options trading have higher value. This result is robust to the inclusion of all sample firms, or to the restricted set of firms with positive options volume.

The paper proceeds as follows. Section 2 reviews the literature and describes our hypotheses. Section 3 describes the data. Section 4 presents the main empirical results, Section 5 presents some robustness checks, and Section 5 concludes.

2. Literature Review and Economic Hypotheses

Our paper lies at the intersection of the literatures on derivatives pricing, market microstructure, and corporate finance. Black and Scholes (1973) treat options as securities that are redundant and can be replicated in continuous time by investments in stocks and bonds. However, it is well-known that when markets are incomplete, options cannot be replicated by simple securities such as stocks and bonds (see Ross, 1976, Hakansson, 1982, and Detemple and Selden, 1991). Another branch of the literature shows that options cannot be dynamically replicated with stocks and bonds when the stochastic process for the underlying stock involves features such as stochastic discontinuities (see, for example, Naik and Lee, 1990, and Pan and Liu, 2003).

If options are not redundant, then their introduction may allow agents to expand the set of contingencies available through trading and thus may be associated with a positive price effect on the underlying stock. Indeed, Conrad (1989) documents an upward effect on stock prices following an options listing using an event study approach. However, Sorescu (2000) argues that that Conrad's (1989) results are specific to her chosen sample period, and find different results for a more recent sample period. This indicates that there is not yet consensus on the effects of options *listing* on stock prices.

We contend, however, that the valuation benefit of options should depend on trading activity in options, not merely listing; i.e., there is a link between options volume and informational efficiency. Previous literature, both theoretical and empirical, has argued that options increase the amount of private information conveyed by prices (see Biais and Hillion, 1994, Easley, O'Hara, and Srinivas, 1998, or Chakravarty, Gulen, and Mayhew, 2004). Such increases in informational efficiency may occur because informed agents are able to cover more states when options markets are available.[1] In the presence of frictions, options may also allow informed agents to obtain leverage more readily.

Option listing does not automatically imply that informed agents can take better advantage of their information. Indeed, as Kyle (1985) points out, agents with private information need to camouflage their trades from other agents to be effective. Do new markets always attract a large number of agents? Pagano (1989) sheds light on this question by arguing that microstructure models have multiple equilibria where "liquidity begets liquidity." Thus, if agents conjecture that a new market will have no liquidity they optimally desist from trading and this belief becomes self-fulfilling. On the other hand if the conjecture is the opposite, then a market with active trading is sustainable. This line of thinking indicates that different options markets may have varying degrees of thinness, which also implies different degrees of informational efficiency, with greater option volumes implying greater price informativeness.

What is the link between informational efficiency and firm valuation? A vast literature examines this question. Fishman and Hagerty (1992), Khanna, Bradley, and Slezak (1994), Dow and Gorton (1997), and Subrahmanyam and Titman (1999) all conclude that

[1] Note that more informed trading affects the costs of liquidity trading. But the valuation effects of such costs are limited because they are a zero sum transfer from liquidity to informed traders.

if prices convey more information, corporate resources are allocated more efficiently, and this leads to greater firm valuation. Alternatively, one could also argue that greater informational efficiency reduces the conditional risk of investing in a risky asset (Kyle, 1985), which would tend to make an asset more valuable.[2]

All of the preceding arguments imply that options with greater trading activity would be accompanied by higher firm valuations. This hypothesis can be examined empirically. At the same time, it is worth noting other possible hypotheses. For example, if options lead to increased price uncertainty due to more speculative trading by uninformed agents (De Long, Shleifer, Summers, and Waldmann, 1990) then the valuation effect of options could be negative. Our tests may thus be viewed as an effort to distinguish between these competing hypotheses.

[2] To see this consider the extreme case where informed agents have perfectly precise information and the price reveals all of their information. In this case the conditional risk of investing in the asset is zero and it is clearly worth more to invest more in this asset, *ceteris paribus*, relative to an asset where the price reflects the information imprecisely.

3. Data

We collect data on options trading from Options Metrics. This database includes daily trading volume for each individual put and call option traded on U.S. listed equities. We calculate total annual options volume for each stock in the database and then match these stocks with data from Compustat on Tobin's q as well as a constellation of control variables.[3]

Tobin's q is computed as the sum of the market capitalization of the firm's common equity, the liquidation value of its preferred stock, and the book value of its debt divided by the book value of the firm's assets. Our control variables are as follows. A proxy for the firm's leverage, long-term debt to total assets, is intended to measure the likelihood of distress. Profitability, measured by return on assets (ROA), is net income divided by the book value of assets. This variable is intended to capture the notion that more profitable firms may have more favorable investment opportunities, leading to higher valuations. On the other hand, high ROA may also signal that the firm is in a mature phase, and has limited growth opportunities, so that the effect of ROA on q is an empirical issue.

A direct measure of investment opportunities that the firm actually availed of is constructed as capital expenditures divided by sales. Firms that invest more presumably have higher growth opportunities that should translate to a higher q. A dummy variable

[3]An annual observation interval is dictated by the necessity of using accounting data from the annual report.

for whether the firm pays a dividend proxies for capital constraints (firms that pay dividends may have more free cash flow, which may potentially be used to overinvest in marginal projects). All these controls have been used in previous literature, e.g., Allayannis and Weston (2001), Carter, Rogers, and Simkins (2006). In addition, we include share turnover in the underlying stock to account for any spurious conclusions arising from co-movements in stock and options volume.

Table 1 gives the number of firms in each sample year. The number of firms with non-missing Compustat data ranges from more than 6300 in 1996 to about 4400 in 2005. The decrease in is likely due to the tech bust, which was accompanied by financial distress, bankruptcy and eventual delisting. The number of firms with positive options trading volume increased modestly during this same period, from 1342 in 1996 to 1705 in 2004, its peak year.

Any firm with no options volume data in Options Metrics for a particular year is assumed to have an options volume of zero in that year. This suggests a natural bifurcation of samples into one consisting of all firms, (with the majority having zero options volume), and a second consisting only of firms with positive options volume.

Table 2 presents summary statistics (over all firms and years) for Tobin's q, the control variables, and options volume. Panel A, covers all firms while Panel B includes firms with positive options volume. The mean value of q for the whole sample is about 1.9. The mean value of return on assets is negative, presumably because small (tech) firms did not perform well during this period. Panel B shows that firms with positive options volume have a higher Tobin's q, both mean and median. Such firms are also larger and more profitable on average than those without options volume.

Table 3 presents correlations among the variables (again, pooled over firms and years.) Again, Panel A is for the full sample while Panel B is for firms with positive options volume. The correlation between Tobin's q and options volume is positive for both samples and reaches almost 18% for the subsample with positive options volume.

Options volume is strongly positively correlated with firm size as well as share turnover. Tobin's q is negatively related to return on assets, which is counterintuitive, but may be because stocks with high current income are in the "mature" phase of their life-cycle with fewer opportunities for future growth.

As a pre-amble to the main analysis, consider the subsample of firms with positive options volume sorted into deciles by options volume each year. For each decile, we calculate the average value of Tobin's q across all years within our sample. The plot of average q as a function of options volume ranking appears in Figure 1.

As can be seen, the valuation metric q monotonically increases with options volume, supporting the positive correlation between q and options trading activity documented in Table 3. In terms of magnitudes, q for the decile with the highest options volume is about 140% higher than that for the lowest options volume decile, and an unreported test indicates that this difference is statistically significant.

The next section tests formally whether options volume has an incremental effect on q after accounting for the effects of controls.

4. Regression Results

We now examine the determinants of Tobin's q. Since our arguments are cross-sectional in nature, the initial approach is to run year-by-year cross-sectional regressions and then test the significance of the time series mean of the cross-sectional coefficients. But the residuals of the cross-sectional regressions are likely to be serially correlated due to autocorrelation in Tobin's q, so simple t-statistics may be misleading. To overcome this potential problem, t-statistics are corrected according to the procedure of Newey and West (1987).[4] Results for the full sample of firms and for the subsample with positive options volume are reported in Tables 4 and 5, respectively.

Both dividends and leverage have significantly negative impacts on valuation, as postulated in the previous section. ROA also is inversely related to q, indicating that high ROA signals firm maturity and relative paucity of future growth options. On the other hand, capital expenditures, presumably proxying for future growth opportunities, have a positive impact on valuation for the full sample of firms.

Share turnover has a positive impact on valuation, consistent with the presence of a liquidity premium in asset prices (Amihud and Mendelson, 1986). Size has a weak but positive impact on Tobin's q. In general, these results are consistent with the rationales for the controls provided in the previous section.

[4] As suggested by Newey and West (1994), the lag-length equals the integer portion of $4(T/100\}^{2/9}$, where T is the number of observations.

The coefficient of options volume is positive and significant for both subsamples indicating that options volume has an upward impact on firm valuation. For all firms, the magnitude of the coefficient implies that a one standard deviation move in options volume implies a 16% higher q relative to its mean value. The effect for the subsample of firms with positive options value is much stronger: in this case, a one-standard deviation move in options volume implies a q that is higher relative to its mean by 118%. Thus, the effect of options trading on firm valuation is both statistically and economically significant.

5. Robustness Checks

We perform various checks on our results, and in all of these additional tests, the central results are unchanged.

Table 6 presents a panel regression that pools the time series and cross-sectional data. The Parks (1967) procedure is used to control for serial correlation in the error terms. The results are qualitatively similar to those in Tables 4 and 5. Thus q is negatively associated with the dividend dummy and leverage, but positively associated with firm size. Options volume continues to be positively and significantly associated with q.

The next issue we consider is endogeneity; specifically, whether high Tobin's q causes increased options trading, rather than the reverse. One could argue, albeit implausibly, that high q firms may attract more attention and this may translate to greater options volume. To address this issue, one needs an instrument for options volume that is inherently unrelated to q. Finding such an instrument is a difficult endeavor and inevitably involves an element of subjectivity.

We propose that options volume may be related to the average absolute moneyness, the relative difference between the stock's market price and the option's strike price. Since the vega of an option is highest at-the-money, agents speculating on volatility would prefer at-the-money options for their greater sensitivity. On the other hand, for someone without volatility information, at-the-money options have the greatest exposure to volatility risk and hence may be eschewed for this reason. Moreover, it could also be the case that informed traders may be attracted to out of the money options because they provide the maximum leverage, but uninformed traders may migrate to in the money options to avoid risky positions.[5]

The preceding arguments provide a link between absolute moneyness and options volume, but do not specify an unambiguous direction, which remains an empirical issue. There is no reason, however, that moneyness should be inherently related to q, since exchanges periodically list new options with strike prices close to the recent market price of the underlying stock, so there should be no mechanical link between moneyness and stock prices.

Given the preceding arguments, we calculate the annual average of the daily absolute deviation of the exercise price of each option from the closing price of the underlying stock.[6] We then compute an instrumental variable estimation of the regression in Table 5, using the average absolute moneyness as an instrument for options volume.[7] Estimates of this regression appear in Table 7. (Note that this regression necessarily uses

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[5] Pan and Poteshman (2006) document that volume from customers of discount brokers is slightly higher in out of the money options than other ones.

[6] For option k on stock j for day t, the absolute deviation is $|\ln(price_{j,t}/strike_k)|$. This is averaged over all k and t within a year for each stock j.

[7] The even-moneyness variable is positively and significantly related to volume for the overall sample. Paradoxically, this does not necessarily mean that volume tends to be higher in options that are away from the money. It might also be induced if the options exchange lists a larger number of options, with different exercise prices, on firms with more overall options trading. But regardless of the underlying reason, so long as the instrument is well correlated with the explanatory variable (options volume) and does not inherently depend on the dependent variable (Tobin's q), the instrumental variable procedure is well-specified.

only that subsample for which the options volume is strictly positive because the instrument is undefined when no option is traded.) As can be seen, the coefficient for options volume remains significant in this regression and its magnitude is close to that in Table 5, suggesting that the main result is not due to reverse causality.

Next, from Table 2, it may be seen that the distribution of options volume is skewed because the mean is quite different from the median. To address this, we perform a robustness check using the logarithm of options volume (by definition, using only those firms with positive levels of options trading activity). Results from this alternative specification (the analog of Table 5) appear in Table 8. As can be seen, the coefficient of options volume remains positive and strongly significant, while the other coefficients are largely unchanged relative to those in Table 5.

To obtain a more complete picture of the effect of options trading on valuation, Table 9 reports the year-by-year regression coefficients that are used in computing the averages reported in Table 8. In every year, the coefficient of options trading is positive and strongly significant. This provides reassurance that the results are not driven by high coefficient magnitudes in one or two years.

We also performed the analog of the panel regression presented in Table 6 (using the Parks (1967) procedure) for the logarithm of options volume, and found the coefficient of options volume to be 0.1328, with a t-statistic of 23.88. The statistical significance of this coefficient is greater than that in Table 6. Thus, the results are qualitatively unchanged for the logarithmic transformation of options volume.

In other unreported regressions, we have tried alternative specifications by using logarithms of firm size and share turnover;[8] the coefficient of options volume does not change appreciably in these specifications. Using share volume instead of share turnover and scaling options volume by shares outstanding also have little impact on the significance of the options volume coefficient.[9]

We also included a measure of return volatility (measured by the annual standard deviation of daily returns) in the regression corresponding to Table 7. The concern is that options trading activity proxies for stock riskiness which could potentially affect q. However, the return volatility variable was not significant (its t-statistic was 1.32), which indicates that perhaps some of the other variables, such as leverage, account for the effect of stock riskiness on q. Even in the presence of return volatility, however, the options volume variable remained significant with a coefficient of 0.094 and a t-statistic of 4.75.

Finally, we examined whether options volume proxied for another measure of information production, such as the extent of analyst following. We thus included the number of analysts following a company (from I/B/ES). We did not find the role of

[8] The other variables in the regression are not constrained to be strictly positive, thus precluding us from taking their logarithms.
[9] Another issue is whether options volume is simply proxying for stock price runup (stocks that have gone up would attract options volume and past returns may also be related to q). It is debatable whether past return should be included as an explanatory variable for q over and above profitability measures such as ROA. We found, however that including the past year's return in the equation for q did not alter the significance of options volume (though the past return was marginally significant at the 10% level).

analysts to be significant in the analog of Table 5, whereas options volume remained significant. Details of all of these additional robustness checks are available upon request.

5. Conclusion

We find reliable evidence that the volume of options trading is associated with higher firm valuations. This result is consistent with the dual notions that more options trading is associated with greater informational efficiency of prices and superior resource allocation.

The key point of our paper is that the degree to which an option is traded, not its mere listing, is associated with higher valuations. Thus, an illiquid option provides no opportunity for informed agents to exploit their information. It would be interesting to consider whether this notion extends to other scenarios. For example, countries such as India have futures contracts on individual stocks, and the effect of such contracts on valuation could be ascertained. In addition, the impact of index options and futures on market valuation seems like a worthwhile exercise. Such issues are left for future research.

References

Admati, A., and P. Pfleiderer, 1988, A theory of intraday patterns: Volume and price variability, *Review of Financial Studies* 1, 3-40.

Allayannis, G., and J. Weston, 2001, The use of foreign currency derivatives and firm market value, *Review of Financial Studies* 14, 243-276.

Amihud, Yakov, and Haim Mendelson, 1986, Asset pricing and the bid-ask spread, *Journal of Financial Economics* 17, 223-249.

Back, K., 1992, Asymmetric information and options, *Review of Financial Studies* 6, 435-472.

Biais, B., and P. Hillion, 1994, Insider and Liquidity Trading in Stock and Options Markets, *Review of Financial Studies* 7, 743-780.

Black, F., and M. Scholes, 1973, The pricing of options and corporate liabilities, *Journal of Political Economy* 81, 637-654.

Khanna, N., S. Slezak, and M. Bradley, 1994, Insider trading, outside search, and resource allocation: why firms and society may disagree on insider trading restrictions, *Review of Financial Studies* 7, 575-608.

Cao, M., and J. Wei, 2007, Commonality in liquidity: Evidence from the option market, working paper, University of Toronto.

Carter, D., D. Rogers, and B. Simkins, 2006, Hedging and value in the U.S. airline industry, *Journal of Applied Corporate Finance* 18, 21-33.

Chakravarty, S., H. Gulen, and S. Mayhew, 2004, Informed Trading in Stock and Option Markets, *Journal of Finance* 59, 1235–1258.

Conrad, J., 1989, The price effect of option introduction, *Journal of Finance* 44, 487-498.

De Long, B., A. Shleifer, L. Summers, and R. Waldmann, 1990, Noise trader risk in financial markets, *Journal of Political Economy* 98, 703-738.

Detemple, J., and L. Selden, 1991, A general equilibrium analysis of option and stock market interactions, *International Economic Review* 32, 279-303.

Dow, J., and G. Gorton, 1997, Stock market efficiency and economic efficiency: Is there a connection?, *Journal of Finance* 52, 1087-1129.

Easley, D., M. O'Hara, and P. Srinivas, 1998, Option volume and stock prices: Evidence on where informed traders trade, *Journal of Finance* 53 431-465.

Fishman, M., and K. Hagerty, 1992, Insider Trading and the Efficiency of Stock Prices, *RAND Journal of Economics* 23, 106-122.

Hakansson, N., 1982, Changes in the financial market: Welfare and price effects and the basic theorems of value conservation, *Journal of Finance* 37, 977-1004.

Lang, L., and R. Stulz, 1994, Tobin's q, Corporate Diversification, and Firm Performance, *Journal of Political Economy* 102, 1248-1280.

Naik, V., and M. Lee, 1990, General equilibrium pricing of options on the market portfolio with discontinuous returns, *Review of Financial Studies* 3, 493-521.

Newey, W., and K. West, 1987, A simple positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, *Econometrica* 55, 703-708.

Newey, W., and K. West, 1994, Automatic lag selection in covariance matrix estimation, *Review of Economic Studies* 61, 631-653.

Pagano, M., 1989, Trading Volume and Asset Liquidity, *Quarterly Journal of Economics* 104, 255-274.

Pan, J., and J. Liu, 2003, Dynamic derivative strategies, *Journal of Financial Economics* 69, 401-430.

Pan, J., and A. Poteshman, 2006, The information in options volume for future stock prices, Review of Financial Studies 19, 871-908.

Parks, R., 1967, Efficient estimation of a system of regression equations when disturbances are both serially correlated and contemporaneously correlated, *Journal of the American Statistical Association* **62**, 500-509.

Ross, S., 1976, Options and efficiency, *Quarterly Journal of Economics* 90, 75-89.

Sorescu, S., 2000, The effect of options on stock prices: 1973 to 1995, *Journal of Finance* 55, 487–514.

Subrahmanyam, A., and S. Titman, 1999, The Going-Public Decision and the Development of Financial Markets, *Journal of Finance* 54, 1045-1082.

Table 1
Number of firms with non-missing data.

This table contains the sample size of firms each year. The second column lists the total number of firms with available data for the dependent variable (Tobin's q) and the control variables. The third column lists the number of firms with positive options volume. Firms with no data on options trading activity are assumed to have options volume of zero.

Year	All firms	Positive options volume
1996	6376	1342
1997	6441	1575
1998	6185	1717
1999	5970	1686
2000	5817	1638
2001	5336	1503
2002	5087	1597
2003	4862	1565
2004	4886	1705
2005	4396	1655

Table 2
Summary statistics

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Panel A: All firms

Variable	Mean	Median	Standard Deviation
Tobin's q	1.930	1.157	3.378
Options volume	1842	0	23128
Size	2.157	0.1878	12.44
Share turnover	1.547	0.9500	3.405
ROA	-0.0695	0.0253	0.573
CapX	0.6855	0.0402	33.13
LTD	0.1813	0.1104	0.2685
DivDum	0.3168	0	0.465

Panel B: Firms with positive options volume

Variable	Mean	Median	Standard Deviation
Tobin's q	2.258	1.457	2.922
Options volume	6379	388.2	42706
Size	5.154	1.012	19.68
Share Turnover	2.242	1.602	2.455
ROA	-0.0109	0.0399	0.2990
CapX	0.6269	0.0492	41.46
LTD	0.1850	0.1333	0.2105
DivDum	0.3883	0	0.4874

Table 3
Correlation matrix

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Panel A: All firms

	Tobin's q	Options Volume	Size	Share turnover	ROA	CapX	LTD
Options volume	0.0899						
Size	0.0609	0.4134					
Share Turnover	0.0783	0.0691	-0.0084				
ROA	-0.1312	0.0156	0.0402	-0.0589			
CapX	0.0081	0.0003	-0.0013	-0.0007	-0.0075		
LTD	-0.0470	-0.0149	-0.0091	-0.0453	-0.0760	0.0141	
DivDum	-0.0993	0.0149	0.1495	-0.1024	0.1489	-0.0118	0.0838

Panel B: Firms with positive options volume

	Tobin's q	Options Volume	Size	Share turnover	ROA	CapX	LTD
Options volume	0.1778						
Size	0.1038	0.4676					
Share Turnover	0.1513	0.1376	-0.0788				
ROA	-0.0545	0.0266	0.0748	-0.0633			
CapX	0.0028	0.0006	-0.0006	-0.0004	-0.0045		
LTD	-0.1273	-0.0383	-0.0330	-0.0975	-0.0716	0.0127	
DivDum	-0.1667	0.0049	0.1829	-0.2933	0.1838	-0.0104	0.0655

Table 4
Time-series coefficient averages and Newey-West corrected t-statistics for year-by-year cross-sectional regressions from 1996 through 2005 for Tobin's q as the dependent variable, using the full sample of firms with available data.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Variable	Coefficient	t-statistic
Optvol	0.1329	5.11
Size	0.9767	2.13
Stkturn	0.1123	2.95
ROA	-1.0257	-4.32
CapX*100	0.8206	4.05
LTD	-1.1218	-2.80
Divdum	-0.4502	-5.17

Average number of firms: 5536

Table 5
Time-series coefficient averages and Newey-West corrected t-statistics for year-by-year cross-sectional regressions from 1996 through 2005 for Tobin's q as the dependent variable, using only those firms with positive options volume.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Variable	Coefficient	t-statistic
Optvol	0.1185	3.37
Size	7.110	2.05
Stkturn	0.1431	2.76
ROA	-0.6258	-1.39
CapX*100	4.690	1.29
LTD	-1.542	-4.01
Divdum	-0.7555	-5.52

Avg no. of firms: 1598

Table 6
Panel estimation for the period 1996 to 2005 for Tobin's q as the dependent variable.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend. The Parks (1967) procedure is used to account for autocorrelation, using a balanced panel of 2290 firms present in every year of the sample.

	Panel Estimates	
Variable	Coefficient	t-statistic
Optvol	0.0460	3.06
Size	36.41	4.78
Stkturn	0.0616	7.26
ROA	0.1781	1.20
CapX*100	-11.48	-1.70
LTD	-1.316	-16.80
Divdum	-0.3618	-4.57

Number of firms: 2290

Table 7
Time-series coefficient averages and Newey-West corrected t-statistics for year-by-year cross-sectional regressions from 1996 through 2005 for Tobin's q as the dependent variable, using only those firms with positive options volume and using annual average absolute moneyness as an instrument for options volume.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, IV(Optvol) is the instrumental variable estimate of annual options volume (in ten thousands of shares) using the average absolute deviations from even-moneyness as the instrument, Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Variable	Coefficient	t-statistic
IV(optvol)	0.0278	3.03
Size	15.26	3.16
Stkturn	0.0262	1.78
ROA	0.7266	4.03
CapX*100	12.77	2.51
LTD	-0.2265	-0.95
Divdum	-0.6284	-4.74

Average number of firms: 1598

Table 8
Time-series coefficient averages and Newey-West corrected t-statistics for year-by-year cross-sectional regressions from 1996 through 2005 for Tobin's q as the dependent variable, using the logarithm of options volume.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets, Optvol is the annual options volume (in ten thousands of shares), Size is market capitalization (in billions of dollars), Stkturn is the annual share turnover in the underlying stock, ROA is the return on assets defined as net income divided by the book value of assets, CapX is capital expenditures divided by sales, LTD is long-term debt divided by book value of assets, and DivDum is an indicator variable for whether the firm pays a dividend.

Variable	Coefficient	t-statistic
Ln(Optvol)	0.1993	3.78
Size	8.209	3.77
Stkturn	0.0850	2.26
ROA	-0.7229	-1.59
CapX*100	4.247	1.26
LTD	-1.552	-4.14
Divdum	-0.8167	-5.84

Average number of firms: 1598

Table 9
Year-by-year coefficients and t-statistics for annual cross-sectional regressions from 1996 through 2005 for Tobin's q as the dependent variable, using the logarithm of options volume.

Tobin's q is defined as the market capitalization of common stock plus liquidation value of preferred shares plus book value of long-term debt divided by total assets. The explanatory variables are the natural logarithm of optvol, i.e., the annual options volume, Size: market capitalization, Stkturn: the annual share turnover in the underlying stock, ROA: the return on assets defined as net income divided by the book value of assets, CapX: capital expenditures divided by sales, LTD: long-term debt divided by book value of assets, and DivDum, which is an indicator variable for whether the firm pays a dividend. Only the coefficients of ln(options volume) are reported.

Year	Coefficient	t-statistic
1996	0.1453	4.06
1997	0.1794	5.55
1998	0.2211	6.23
1999	0.5521	8.40
2000	0.2845	9.41
2001	0.1631	6.26
2002	0.0997	5.45
2003	0.0863	4.79
2004	0.1058	5.57
2005	0.1557	8.35

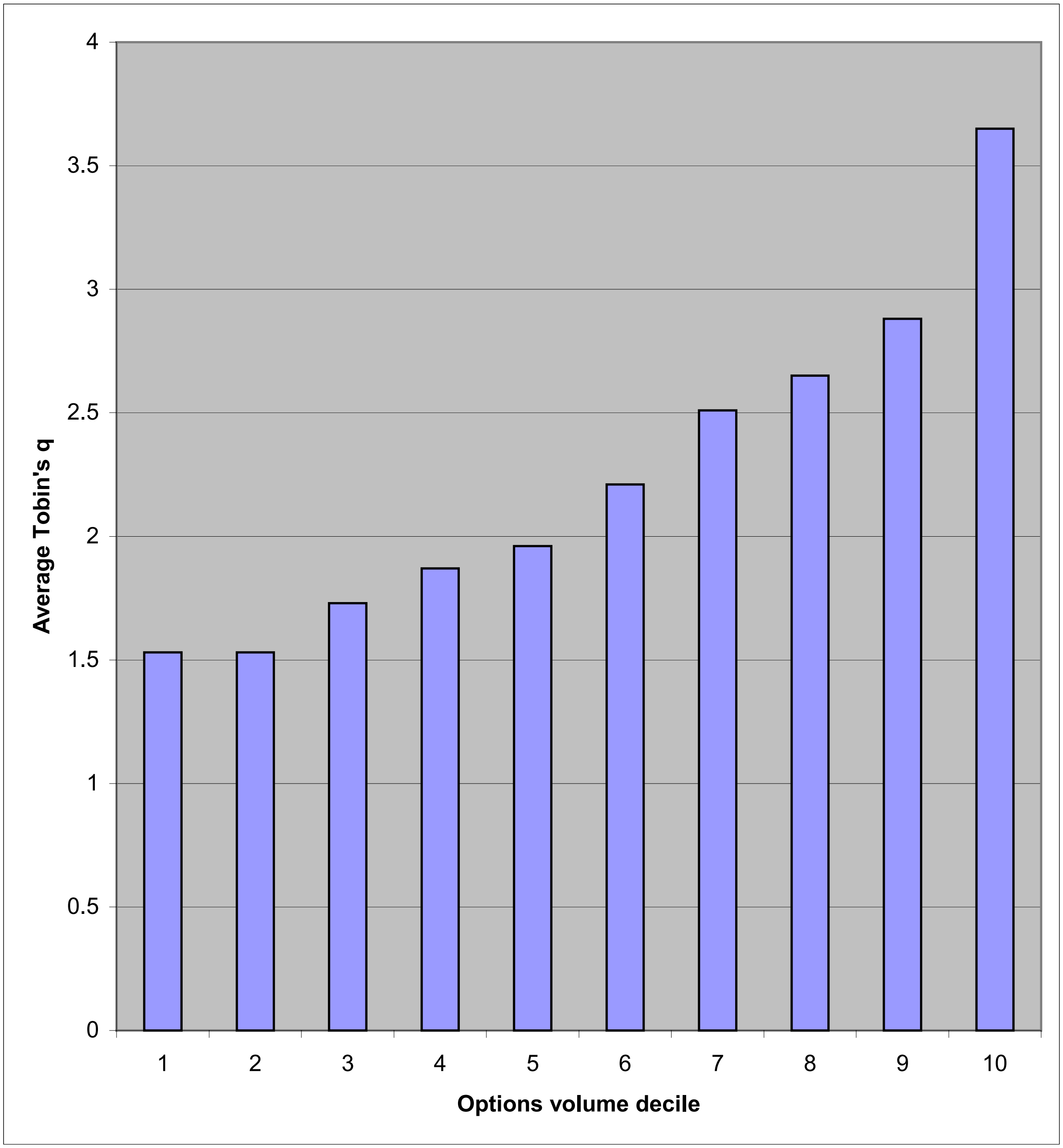

Figure 1. Average Tobin's q and Options Volume

Firms with positive options volume during 1996-2005 are sorted into ten deciles by options volume. The mean value of Tobin's q over all sample years within each decile is depicted above.