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# A test of the free cash flow hypothesis*

## The case of bidder returns

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We develop a measure of free cash flow using Tobin's $q$ to distinguish between firms that have good investment opportunities and those that do not. In a sample of successful tender offers, bidder returns are significantly negatively related to cash flow for low $q$ bidders but not for high $q$ bidders; further, the relation between cash flow and bidder returns differs significantly for low $q$ and high $q$ bidders. This result holds for several cash flow measures suggested in the literature and also in multivariate regressions controlling for bidder and contest-specific characteristics.

### 1. Introduction

The free cash flow hypothesis advanced by Jensen (1988) states that managers endowed with free cash flow will invest it in negative net present value (NPV) projects rather than pay it out to shareholders. Jensen defines free cash flow as cash flow left after the firm has invested in all available positive NPV projects. In this paper, we test this hypothesis on a sample of large investments made by firms, namely decisions to acquire control of other firms through tender offers.

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Testing the hypothesis requires knowledge of firms' investment opportunities. We use Tobin's $q$, defined as the ratio of the market value of the firm's assets to their replacement cost, to distinguish between firms that have positive NPV investment opportunities under current management and those that do not. High $q$ firms are likely to have positive NPV projects. Hence, these firms are expected to use their internally generated funds productively. For these firms, the acquisition of other companies is expected to be a positive NPV project. If the acquisition is unexpected, its announcement should cause an increase in the bidder's stock price. Further, the stock-price reaction should not be related to the bidding firm's cash flow.

Low $q$ firms are not likely to have positive NPV projects. Hence, they should pay out cash flow to shareholders or invest in zero NPV projects if such projects are available rather than make acquisitions that decrease shareholder wealth. For these firms, the free cash flow hypothesis implies that the shareholder wealth effect of the tender offer announcement is inversely related to cash flow, since free cash flow considerations are more likely to influence management's actions when cash flow is large.

Our empirical results support the free cash flow hypothesis and suggest that it is economically significant. We find that (1) an increase in free cash flow equal to 1% of a bidder's total assets is associated with a decrease in the bidder's gain from the takeover equal to approximately 1% of the value of the bidder's common stock, and (2) free cash flow explains more of the cross-sectional variation in bidder returns than the joint effect of the number of bidders and the attitude of target management. Our results are statistically robust, holding when we control for variables that have been shown to affect bidder returns, such as the bidder's relative size and debt–equity ratio, target management's reaction to the bid, the means of payment, Tobin's $q$, and managerial ownership of the bidder. Since many cash flow measures have been proposed in the accounting literature, we investigate whether our results depend on the measure we use. We find that our results hold better for simple earnings and cash flow measures than for the more sophisticated but also more noisy measures proposed in the literature.

The paper is organized as follows. We formulate our test in section 2. In section 3, we present the data. In section 4, we compare the abnormal returns for subsamples stratified according to Tobin's $q$ and cash flow and provide evidence that the bidders with high cash flow and low Tobin's $q$ have the lowest abnormal return. In section 5, we show that bidder returns fall as cash flow increases for low $q$ firms, but not for high $q$ firms. Further, we demonstrate that the relation between cash flow and bidder returns differs significantly for high and low $q$ firms. In section 6, we examine the robustness of our results to alternative measures of free cash flow. In section 7, we relate target and total takeovers gains to bidder free cash flow. Concluding remarks are presented in section 8.

## 2. Bidder returns in tender offers and the free cash flow hypothesis

The free cash flow hypothesis posits that cash flow increases the agency costs of firms with poor investment opportunities.[1] It assumes that management values investments in operations more than investments in financial assets. This may be because management perquisites increase with investments in operations even when these investments have a negative NPV. So, once management has exhausted positive NPV projects, it proceeds to invest in negative NPV projects rather than pay out funds to shareholders.

To test this hypothesis, we need to obtain an estimate of the firm's investment opportunity set. To see how Tobin's $q$ serves this purpose, consider a firm that has poor investment opportunities under current management. If one views the firm's value as the value of assets in place plus the value of growth options, the firm cannot have valuable growth options. This implies that the value of the firm's assets in place is less than their replacement cost; otherwise the firm could grow profitably by expanding its current activities. Such a firm will have a Tobin's $q$ of less than one, so that a $q$ of less than one is a sufficient condition for a firm to have poor investment opportunities. We call such firms low $q$ firms.

Tobin's $q$ is an imperfect measure of investment opportunities because we observe its average value rather than its marginal value; further, $q$ itself is difficult to measure. If investment opportunities are declining and there are no distorting taxes, an average $q$ less than one implies that the expected NPV of the firm's marginal investment opportunity is negative.[2] Since investment opportunities are not always declining,[3] we are likely to classify some firms with good investment opportunities as firms with bad investment opportunities and such mistakes will bias our results against the free cash flow hypothesis.

To the extent that Tobin's $q$ measures investment opportunities, the free cash flow hypothesis suggests that firms with high cash flow and low $q$ are more likely to engage in acquisitions that do not benefit shareholders. We assume that the shareholder wealth effect of acquisitions is proportional to their NPV. Hence, cross-sectionally, the free cash flow hypothesis implies that the bidder's abnormal return is negatively related to the cash flow of firms with poor investment opportunities and unrelated to the cash flow of firms with good investment opportunities.

[1]See Stulz (1990) for a formal model that shows the conditions that have to be met for the free cash flow hypothesis to hold.

[2]See Lang, Stulz, and Walkling (1989) for further discussion and references to the literature.

[3]For instance, a firm with an obsolete capital stock might be able to invest profitably because it has a good brand name. If the current value of the capital stock is sufficiently below replacement cost, such a firm could have a $q$ below one, yet its marginal investment opportunities would have positive NPVs.

Our assumption that the stock-price effect of an acquisition is an increasing function of its NPV can be motivated as follows. Suppose that investment opportunities arrive sequentially and are drawn from a distribution known to investors. This implies that a firm with bad opportunities is less likely to draw a positive NPV project. If acquisitions are typically bad projects for these firms, the announcement effect is negative, since it corresponds to the bad-news outcome. The effect may be larger or smaller than the absolute value of the acquisition's NPV because investors may be more or less surprised by the firm's decision to make a negative NPV acquisition. For instance, if investors think the agency costs of free cash flow are trivial for a particular firm, a poor acquisition would lead them to increase their estimate of the present value of those agency costs. Alternatively, investors might expect the firm to make poor acquisitions and are therefore surprised by an acquisition with an NPV close to zero.

Our investigation lacks power because we cannot model the market's expectations of the managers' actions. A firm could have an extremely severe free cash flow problem but experience no stock-price reaction to a bad acquisition if the probability that the firm draws a positive NPV project were negligible. In this case, the only surprise has to do with the timing of the acquisition, not with how bad it is. So, our tests could fail to support the free cash flow hypothesis even when it is correct.

## 3. The data

Our initial sample of tender offers comes from two sources: (a) the Rochester Merc Data Base on tender offers covering the period from October 1968 through September 1980, and (b) the Austin Tenderbase on tender offers covering the period from September 1980 through 1986.[4] To be included in the sample, tender offers must meet the following criteria:

(1) Both the target and bidding firms are on the Center for Research in Securities Prices at the University of Chicago (CRSP) daily returns tape for 300 days before the first takeover announcement.
(2) The bidder acquired some shares.
(3) The tender offer occurs after October 1968.

Two hundred and nine tender offers satisfy these criteria (125 from the Rochester list and 84 from the Austin list). As in Bradley, Desai, and Kim (1988), an offer is defined as successful if the bidder acquires some shares. Like Bradley, Desai, and Kim (1988) and Morck, Shleifer, and Vishny (1990),

[4]See Tenderbase, Version 1.03, Douglas Austin & Associates, Inc., 1987. The Tenderbase provides machine-readable information on all tender offers registered with the SEC.

we focus on successful offers to make it less likely that our estimates of the target and bidder gains are biased downward because the probability of success is less than one.

The estimation of the target and bidder gains follows closely the method developed by Bradley, Desai, and Kim. We refer the interested reader to their extensive discussion of their method. Market model parameters are estimated on a period from 300 to 60 days before the first announcement of takeover activity for the target firm. For single-bidder unrevised offers, these parameters are used to estimate the cumulative abnormal return for a period of eleven days centered on the first announcement date of takeover activity by the bidder. For multiple-bidder and revised offers, the cumulative abnormal return is estimated from five days before the first takeover announcement to five days after the last revision in terms by the successful bidder.

To conduct our study, we need data on cash flow and Tobin's $q$. Our first measure of cash flow is that used by Lehn and Poulsen (1989), operating income before depreciation minus interest expense, taxes, preferred dividends, and common dividends.[5] Additional measures will be introduced later. We compute $q$ using the Lindenberg and Ross (1981) algorithm, with some modifications described in Lang, Stulz, and Walkling (1989). These additional data requirements limit our sample to 101 takeovers.

Our cash flow measures are normalized by the book value of assets, since the same dollar cash flow has different implications for firms of different sizes. No theoretical argument suggests it is better to normalize cash flow by the book value of assets rather than the book value of equity or the sum of the book value of equity and long-term debt. It turns out, as discussed later, that our conclusions are the same with all three methods. There is, however, a theoretical argument against normalizing cash flow by the market value of equity. The present value of cash flows equals the market value of equity. Depending on the stochastic process followed by cash flow, an increase in cash flow can increase, decrease, or leave unchanged the ratio of cash flow to the market value of equity. For instance, if cash flow follows a random walk, an increase has no effect. If the cash flow of all firms in the sample follows a random walk, a regression of bidder abnormal returns on the ratio of cash flow to the market value of equity would be a regression of abnormal returns on the discount rate that applies to cash flow. In contrast, the ratio of cash flow to the book value of assets always increases with cash flow.

Table 1 reports information on the variables used in the next two sections of the paper. In addition to measures of bidder returns, cash flow, and $q$, we use data on management's stake in the bidder, the debt-to-total assets ratio, and measures of the target's size in relation to the bidder's. To obtain data

[5]This cash flow measure is given by COMPUSTAT item #13 − #15 − (#16 − change in #35) − #19 − #21.

Table 1

Mean and median estimates of bidder returns and other variables for high and low $q$ bidders in 101 tender offers from October 1968 to December 1986.

The bidder abnormal return is estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. Except for minor differences, we follow Lindenberg and Ross (1981) in computing bidder $q$ ratios. A high $q$ firm is one with a three-year average of Tobin's $q$ in excess of one. Bidder cash flow is operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends for the fiscal year before the tender offer. Liquid assets are cash and short-term securities held by the firm two years before the tender offer. The bidder book values of debt and total assets are measured at the end of the fiscal year preceding the tender offer. Bidder managerial ownership is the fraction of bidder shares held by its management obtained from *Value Line*. (*,**,*** indicate significance at the 0.10, 0.05, and 0.01 level for $t$-tests of mean differences.)

| | Firms | | | Difference of means |
|---|---|---|---|---|
| | All | Low $q$ | High $q$ | |
| Number of offers | 101 | 78 | 23 | |
| Number of offers that are not pure cash offers | 10 | 9 | 1 | |
| Number of offers that are opposed | 30 | 23 | 7 | |
| Number of offers with multiple bidders | 29 | 22 | 7 | |
| Mean bidder abnormal return | −0.004 | −0.016 | 0.035 | −0.051* |
| Median | −0.010 | −0.017 | −0.008 | |
| Mean market value of bidder equity in million $ | 1,742 | 1,721 | 1,813 | −92 |
| Median | 546 | 509 | 762 | |
| Mean cash flow/total assets | 0.061 | 0.057 | 0.075 | −0.018* |
| Median | 0.060 | 0.061 | 0.130 | |
| Mean liquid assets/total assets | 0.093 | 0.077 | 0.146 | −0.069*** |
| Median | 0.060 | 0.050 | 0.130 | |
| Mean total debt/total assets | 0.578 | 0.602 | 0.495 | 0.107*** |
| Median | 0.596 | 0.614 | 0.460 | |
| Mean bidder managerial ownership | 0.090 | 0.077 | 0.133 | −0.064 |
| Median | 0.020 | 0.020 | 0.030 | |
| Mean target abnormal return | 0.400 | 0.393 | 0.425 | −0.032 |
| Median | 0.386 | 0.379 | 0.443 | |
| Mean market value of target equity in million $ | 466 | 471 | 447 | 24 |
| Median | 134 | 135 | 127 | |
| Mean total return for bidder and target | 0.095 | 0.087 | 0.122 | −0.034 |
| Median | 0.070 | 0.064 | 0.104 | |

on managerial ownership, we use the issue of *Value Line* immediately preceding the initial takeover announcement. *Value Line* reports ownership of officers, directors, and other insiders.[6] The mean of bidder return is negative but not significantly so.[7] If we compare the statistics for low and high $q$ firms, the average size of the bidding and target firms is the same across subgroups, but high $q$ firms have significantly higher cash flow, higher liquid assets, and lower debt. Finally, as in Lang, Stulz, and Walkling (1989) and Servaes (1991), bidder returns are higher for high $q$ firms.[8] The evidence in table 1 indicates why distinguishing between high and low $q$ firms when analyzing the relation between cash flow and abnormal returns is important. High $q$ firms have both higher cash flow and higher abnormal returns than low $q$ firms. Hence, in a sample that includes both high and low $q$ firms, a negative relation between cash flow and bidder returns for low $q$ firms could be obscured.

## 4. Comparisons of average abnormal returns for subsamples stratified according to Tobin's $q$ and cash flow

From our discussion in section 3, we would expect bidders with substantial cash flow and a low Tobin's $q$ to experience the lowest abnormal returns, since those are the firms that have the greatest agency costs of free cash flow. In table 2, we divide the sample into four groups: high $q$ firms with high and low cash flow, and low $q$ firms with high and low cash flow. High $q$ firms have a three-year average of Tobin's $q$ that exceeds one. High cash flow firms have a ratio of cash flow to total assets above the median for the sample.

The evidence in table 2 indicates that low $q$, high cash flow firms have the lowest abnormal return. As predicted by the free cash flow hypothesis, the average abnormal return is significantly lower for these firms than the average abnormal return for low $q$, low cash flow firms and high $q$, high cash

[6] *Value Line* obtains its ownership data from proxy statements, corporate news releases, and Forms 3 and 4 filed with the Securities and Exchange Commission (SEC). Form 3 is an initial ownership statement filed by officers, directors, and 10% principal stockholders. The statement must be filed within ten days after the security is acquired. Form 4 records any changes in ownership. It must be filed within ten days after the end of the month in which the change occurred. *Value Line* treats as insiders those shareholders related to management or board members.

[7] Further, 54.5% of the bidders experienced negative abnormal returns. A number of recent papers document significant negative bidder returns for the 1980s. For reviews of the literature on bidder returns, see Jensen and Ruback (1983), Roll (1986), and Jarrell, Brickley, and Netter (1988).

[8] Although the mean high $q$ bidder return is higher than the median, the difference in means is not driven by outliers. A trimmed sample constructed by eliminating the largest and lowest values in each subsample yields almost the same mean difference with almost the same significance. The sample in Lang, Stulz, and Walkling (1989) differs from the one used here because of additional data requirements for bidders in this study.

Table 2

Mean, median, and number of positive and negative bidder abnormal returns for 101 tender offers from October 1968 to December 1986 for subsamples stratified according to Tobin's $q$ and cash flow.

The bidder abnormal return is the cumulative abnormal return estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. Except for minor differences, we follow Lindenberg and Ross (1981) in computing $q$ ratios. Cash flow is operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends for the fiscal year before the tender offer, divided by the book value of total assets. High $q$ firms are firms with a three-year average of Tobin's $q$ in excess of one. High cash flow firms are firms with cash flow in excess of the sample median. For each cell, we report the mean bidder abnormal return, the median abnormal return, and, in parentheses, the number of positive and negative abnormal returns. For the comparison of means, we report the mean difference, the $t$-statistic assuming unequal variances (results are similar with the assumption of equal variances) in parentheses and the $p$-value for the nonparametric Kruskal–Wallis statistic in square brackets.

| | Low $q$ | High $q$ | Mean difference (Low $q$ − High $q$) |
|---|---|---|---|
| Low cash flow | **0.011**<br>0.027<br>(26, 22) | **0.005**<br>−0.018<br>(3, 5) | 0.006<br>(0.22)<br>[0.53] |
| High cash flow | **−0.059**<br>−0.044<br>(9, 21) | **0.054**<br>−0.003<br>(7, 8) | −0.113<br>(−2.76)<br>[0.04] |
| Mean difference (Low cash flow − High cash flow) | 0.070<br>(2.33)<br>[0.01] | −0.059<br>(−1.15)<br>[0.40] | |

flow firms. This result is robust to possible deviations from nonnormality, since it also holds for the nonparametric Kruskal–Wallis test statistic. Further, the average abnormal return for low $q$, low cash flow firms is lower, but not significantly so, than the average abnormal return for high $q$, low cash flow firms. The last comparison is probably the least instructive, because only 8 firms in the sample have both a high $q$ and low cash flow.

Further evidence on the importance of distinguishing firms with high cash flow and low $q$ from those with high cash flow and high $q$ is provided by an analysis of variance. There is some evidence that the variances differ for the populations with high and low cash flow. Consequently, we use the Brown and Forsythe (1974) test of differences in means, which is robust under inequality of variances. We find that there is no difference in means between the populations of high and low cash flow firms, that there is a significant difference, at the 0.10 level, between the high and low $q$ firms, and, most importantly, that the interaction effect between $q$ and cash flow is significant at the 0.02 level.

Table 3

Regression estimates of bidder abnormal returns on cash flow for 101 successful tender offers from October 1968 to December 1986.

The bidder abnormal return is the cumulative abnormal return estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. Except for minor differences, we follow Lindenberg and Ross (1981) in computing $q$ ratios. $q$ is the average of Tobin's $q$ for the three years preceding the tender offer. $D(q > 1) = 1$ for $q > 1$ and zero otherwise. Cash flow is operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends for the fiscal year before the tender offer. $TA$ denotes the book value of total assets estimated at the end of the fiscal year preceding the tender offer. ($t$-statistics are given in parentheses.)

| | Regressions | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Intercept | 0.037 | 0.051 | 0.041 | 0.033 | 0.054 |
| | (0.36) | (0.52) | (0.42) | (0.33) | (0.54) |
| Cash flow/$TA$ | −0.635 | −0.226 | | −0.834 | −0.144 |
| | (−1.91) | (−0.63) | | (−2.46) | (−0.25) |
| Cash flow/$TA$ if $q < 1$ (zero otherwise) | | −0.935 | −1.030 | | −1.047 |
| | | (−2.68) | (−3.27) | | (−1.47) |
| $D(q > 1)$ | | | | 0.066 | −0.011 |
| | | | | (2.21) | (−0.18) |
| $R$-square | 0.04 | 0.10 | 0.10 | 0.08 | 0.10 |
| $p$-value for $F$-test | 0.06 | 0.01 | < 0.01 | 0.02 | 0.02 |

## 5. Regression tests

Table 3 tests the hypothesis that the bidder's abnormal return is a decreasing function of cash flow for low $q$ firms and unrelated to cash flow for high $q$ firms. All regressions in table 3 and the subsequent tables are estimated using weighted least squares, with the weights equal to the inverse of the standard deviation of the market-model residual. This procedure is used to obtain efficient estimates since the variances of the market-model residuals vary across bidders.[9]

The first regression shows that bidder abnormal returns are negatively related to cash flow for the whole sample.[10] The second regression shows that the bidder gain of low $q$ firms in comparison with high $q$ firms decreases

[9]Ordinary least squares regressions yield similar results.

[10]The analysis of variance of the previous section is equivalent to estimating this regression separately for high and low $q$ firms and then testing whether the constants and slopes in the regressions are the same across subsamples. If heteroskedasticity is correctly modeled, regressions on the whole sample lead to more efficient estimates. In addition to the analysis of variance discussed at the end of the previous section, we also estimated regressions (1) and (6) in this section separately for high and low $q$ firms using weighted least squares. Cash flow is significant for the low $q$ firms, but not for the high $q$ firms, and we can reject the hypothesis of equality of constants and slope coefficients across the subsets.

with the cash flow of low $q$ firms – in other words, the greater the cash flow of a low $q$ firm, the lower its gain from a takeover in relation to a high $q$ firm. Since the two explanatory variables in the second regression are correlated, we also provide estimates in regression (3) that include only cash flow for low $q$ bidders. The estimates of the coefficient for cash flow for low $q$ bidders suggests that the free cash flow effect is economically as well as statistically significant: an increment in cash flow equal to 1% of a firm's total assets measured by book value is associated with a decrease in bidder gain equal to approximately 1% of the value of bidder common stock.

Regression (4) of table 3 suggests that the interaction between cash flow and Tobin's $q$ is important. In this regression, the explanatory variables are a dummy that takes a value of one for firms with a $q$ that exceeds one and the firm's cash flow, respectively. As one would expect from Lang, Stulz, and Walkling (1989) and Servaes (1991), the coefficient for the dummy variable for high $q$ firms is significant and positive. Once we allow for the interaction between the dummy variable for $q$ and cash flow, however, the dummy variable for high $q$ firms has no noticeable marginal explanatory power, as evidenced by regression (5). This is not surprising, since the correlation between cash flow and the dummy variable for high $q$ firms is $-0.64$. For the same reason, the significance of the coefficient on the cash flow variable for low $q$ firms falls if the independent variables also include a dummy variable for high $q$ firms.

All the regressions in table 3 were also estimated using cash flow variables normalized by the book value of equity and by the sum of the book value of equity and the book value of long-term debt. The results are generally stronger using the book value of equity. The $t$-statistics on cash flow for low $q$ firms increase, the $R^2$ of the regression increases, and the $p$-value for the $F$-test drops. For instance, the coefficient on cash flow normalized by the book value of equity for low $q$ firms is significant at the 0.10 level in regression (5). With cash flow divided by the sum of book value of equity and long-term debt, the results are similar to those of table 3.

The regressions in table 3 support the free cash flow hypothesis, but the literature suggests that several other variables could affect bidder returns. The cash flow of low $q$ firms may be significantly negatively related to bidder returns because it proxies for these other variables and not because of the relation posited by the free cash flow hypothesis. The literature shows that the following variables affect bidder returns:

(A) *The market value of the target relative to the market value of the bidder.* It has been argued that if bidders gain from acquisitions, the gain will be more noticeable if the target is large in relation to the bidder, so that bidder returns should be positively related to the relative size of the target. Asquith, Bruner, and Mullins (1987) show that bidder returns increase with the

logarithm of the ratio of target to bidder equity for a sample of mergers. Travlos (1987) finds no such relation.

(B) *Bidder management ownership of bidder equity.* If management has a large stake in the bidder, its wealth will be reduced by a bad acquisition, so the presumption is that it will be less likely to make such an acquisition. Lewellen, Loderer, and Rosenfeld (1985) show that bidder returns increase with the fraction of bidder equity held by management.

(C) *The bidder's debt–equity ratio.* The argument advanced by the proponents of this variable is that, as the bidder's debt increases, bidder management is more closely monitored by its creditors, and it has less cash flow to spend, so bad acquisitions are less likely. Maloney, McCormick, and Mitchell (1990) find that bidder returns increase with the bidder's leverage.

(D) *The means of payment.* Financing an offer with equity amounts to issuing equity. This suggests a negative announcement effect for offers financed by equity unless the NPV of the acquisition conditional on cash financing is large enough to offset the release of adverse information about the bidder's value through the issue of equity. This argument, inspired by Myers and Majluf (1984), is tested by Travlos (1987) and Asquith, Bruner, and Mullins (1987). They find that bidder returns decrease with the fraction of the premium to be paid in the bidder's common stock. Amihud, Lev, and Travlos (1990) further show that bidders with low managerial ownership are more likely to make stock offers and that the negative bidder returns frequently associated with stock offers occur mostly for offers made by bidders with low managerial ownership.

(E) *The number of bidders.* As competition for the target increases, bidder returns should fall, since the successful bidder has to pay more than in the single bidder case. Bradley, Desai, and Kim (1988) find that bidder returns differ in multiple-bidder contests.

(F) *Bidder and target performance.* Lang, Stulz, and Walkling (1989) and Servaes (1991) shows that bidder returns are larger for high $q$ bidders and low $q$ targets. Morck, Shleifer, and Vishny (1990) show that bidder returns increase with earnings-based performance measures.

In table 4, we estimate multivariate regressions controlling for these variables. To control for means of payment, we include a dummy variable that takes a value of one for offers that include a noncash component. To control for the target's $q$, we use a dummy variable that takes a value of one if the target's $q$ exceeds one. The motivation is that a sufficient condition for the availability of good investment opportunities is a $q$ that exceeds one. Since controlling for the target's $q$ reduces our sample to 88 offers, we estimated all the regressions without controlling for the target's $q$ on the larger sample of 101 offers. All our conclusions hold for the larger sample also. Since performance measures are correlated with cash flow measures, we

Table 4

Regression of bidder returns on cash flow and other dependent variables.

The sample comprises 101 successful tender offers from 1968 to 1986 but is reduced to 88 offers when data on the target's $q$ is required. The bidder return is estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. $q$ is the average of Tobin's $q$ for the three years preceding the tender offer. Cash flow is operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends for the fiscal year before the tender offer. $TA$ denotes the book value of total assets. Cash corresponds to cash and short-term securities two years before the tender offer. Managerial ownership is obtained from *Value Line*. Opposed indicates that management opposed the takeover, according to the *Wall Street Journal*. ($t$-statistics are given in parentheses.)

| | Regressions | | | |
|---|---|---|---|---|
| | (6) | (7) | (8) | (9) |
| Number of offers | 88 | 88 | 101 | 88 |
| Intercept | 0.161<br>(1.42) | 0.211<br>(1.83) | 0.057<br>(0.46) | 0.233<br>(1.96) |
| Cash flow/$TA$ | −0.205<br>(−0.52) | −0.138<br>(−0.35) | | −0.218<br>(−0.47) |
| Cash flow/$TA$ if bidder $q < 1$ (zero otherwise) | −1.125<br>(−2.98) | −1.128<br>(−3.01) | | −1.044<br>(−2.01) |
| Ownership | 0.055<br>(0.60) | 0.045<br>(0.49) | | 0.036<br>(0.39) |
| Total debt/$TA$ | −0.135<br>(−1.53) | −0.160<br>(−1.79) | | −0.165<br>(−1.76) |
| Offer includes some noncash payment | −0.053<br>(−1.09) | 0.042<br>(−0.80) | | −0.046<br>(−0.87) |
| Log(Target size/Bidder size) | 0.013<br>(0.56) | 0.025<br>(1.01) | 0.034<br>(1.53) | 0.023<br>(0.93) |
| Target $q > 1$ | −0.065<br>(−2.33) | −0.072<br>(−2.54) | | −0.067<br>(−2.34) |
| Cash/$TA$ | | | | −0.094<br>(−0.38) |
| Cash/$TA$ if bidder $q < 1$ (zero otherwise) | | | | −0.170<br>(−0.56) |
| Single bidder/Opposed | | −0.060<br>(−1.75) | −0.070<br>(−1.95) | −0.063<br>(−1.81) |
| Multiple bidders/Opposed | | −0.037<br>(−0.77) | −0.029<br>(−0.62) | −0.039<br>(−0.80) |
| Multiple bidders/Unopposed | | −0.053<br>(−1.63) | −0.050<br>(−1.60) | −0.053<br>(−1.55) |
| $R^2$ | 0.23 | 0.27 | 0.06 | 0.29 |
| $p$-value for $F$-test | < 0.01 | < 0.01 | 0.17 | < 0.01 |

postpone to the next section further discussion of whether cash flow measures are proxies for performance measures.

In regression (6), we control for ownership, debt to total assets, means of payment, size, and the target's $q$. Ownership, means of payment, and size have coefficient estimates of the same sign as previously found in the literature; however, none of the coefficients are significant. This lack of significance cannot be explained by the correlation of these variables with the cash flow variables; in univariate regressions of bidder returns on these explanatory variables, none of the coefficients are significant but all have the sign predicted in the literature except for the coefficient on debt to total assets. That coefficient is negative and insignificant, whereas in Maloney, McCormick, and Mitchell (1990) it is positive and significant. We find a positive insignificant coefficient if we use a debt variable more like theirs, namely, long-term debt divided by the market value of equity. Monitoring arguments suggest, however, that short-term debt should be included in the debt measure. The coefficient on the dummy variable for the target's $q$ is negative and significant. The coefficients on the cash flow variables in regression (6) are similar to those in table 3. Cash flow has a significant negative effect for low $q$ firms and the magnitude of the effect is the same as in table 3.

In regression (7), we also control for the nature of the contest. We find that single-bidder contests opposed by target management lead to significantly lower bidder returns than unopposed single-bidder contests. The coefficient on debt to total assets is now significantly negative. In regression (7), the cash flow of low $q$ firms has a significantly negative effect on bidder returns and the coefficient estimate seems to be unaffected by the additional variables we control for. The $R^2$ increases when we control for the nature of the contest. However, whereas much of the theoretical literature has focused on the nature of the contest, our evidence suggests that the effect of free cash flow on bidder returns is just as important. Comparing regression (4) with regression (8) shows that the cash flow variables explain more of the cross-sectional variation in bidder returns than the size of the bidder in relation to the target and the nature of the contest together.[11]

The cash flow for low $q$ firms used in the regressions presented so far is unlikely to capture the full extent of management's discretion to engage in bad acquisitions. The cash flow measures are computed for the year before the tender offer. A firm could, however, have several years of low or even

[11]We also regressed the bidder abnormal return on a constant, the bidder's relative size, the dummy variable for the means of payment, and the dummy variables for management's attitude and the number of bidders. This regression has an $R^2$ similar to the regression that includes as independent variables only a constant and the cash flow for low $q$ firms, suggesting that the cash flow for low $q$ firms explains at least as much of the cross-sectional variation in bidder returns as all other explanatory variables used in our regression tests.

negative cash flow but considerable liquid assets available to finance a tender offer. We therefore include as an explanatory variable in regression (9) a measure of liquid assets, namely cash and short-term securities held by the firm two years before the takeover. We cannot use liquid assets at the end of the year preceding the tender offer, since that includes part or all of the cash flow used in our regressions. Therefore, we use liquid assets estimated two years before the tender offer, divided by the book value of the firm's total assets.

As with cash flow, we expect the effect of liquid assets to depend on the bidder's $q$ ratio. Regression (9) shows that returns are negatively related to liquid assets for both low and high $q$ bidders, but the coefficients are not significant, probably because liquid assets convey information similar to that conveyed by our cash flow variable, but not as strongly. If we used liquid assets instead of cash flow in regressions (1) through (8), our results would be weaker but our conclusions would be similar, that is the liquid assets variable for low $q$ firms is significant whenever cash flow for low $q$ firms is significant.

The literature offers little guidance on which measures of cash flow, leverage, and relative size to use in the analysis. In the next section, we investigate the effect on our results of changing the numerator of the cash flow definition. We also estimated the regressions presented in this section using book value of equity and the sum of the book value of equity and debt. The significance levels for the cash flow variables are not affected by the choice of denominator but the coefficient on the debt measure is sensitive both to the size measure and to the denominator of the cash flow measure, so that within our sample the coefficient on the debt measure cannot be estimated reliably. Further evidence of the difficulty in estimating the relation between bidder returns and leverage measures is that the correlation between bidder abnormal returns and leverage measures depends heavily on the leverage measure used. For instance, if we use long-term debt divided by the market value of equity, the correlation is 0.05, whereas if we use long-term debt divided by the book value of assets, the correlation is $-0.16$.

The relation between cash flow and the size of the acquisition provides further evidence on free cash flow theory. If managers maximize shareholder wealth and can raise all the funds they want, there is no reason for the size of the target to be related to the cash flow of the bidder. If managers view cash flow as a source of financing for acquisitions and, given their cash flow, choose acquisitions they can afford, one would expect a positive relation between a firm's cash flow and the value of target equity. We find no relation between cash flow and the size of target equity for high $q$ firms, but a significant positive relation for low $q$ firms (the $t$-statistic is 2.94). This evidence is also consistent, however, with the hypothesis that raising funds is costly for low $q$ firms, and hence it cannot be interpreted as evidence that managers do not maximize firm value.

## 6. Alternative cash flow proxies

The analysis of sections 4 and 5 uses a definition of cash flow proposed by Lehn and Poulsen (1989). Its advantage is that it can be easily calculated with Compustat data, but it makes few adjustments to operating income to offset the effects of accrual accounting. One could argue that it serves as a proxy for performance rather than cash flow. In this section, we compare our earlier results with results obtained with alternative cash flow proxies. The largest sample for which all the alternative measures are available includes 69 tender offers. All of our earlier results hold for this smaller sample.

In table 5, we obtain results similar to those of table 3 using cash flow measures derived from working capital, operating income, operating income adjusted for changes in inventory, and net income plus depreciation. The coefficient on operating cash flow, however, which seems conceptually to be the most accurate measure, is insignificant. The most plausible explanation is that this measure is noisier than the others because it is more sensitive to accounting practices and to adjustments for nonrecurring items.[12] As evidence, we estimate two regressions, one using a two-year average of cash flow from operations and the other using a measure of cash flow from operations that adjusts only for changes in inventories, accounts payable, and accounts receivable. In both regressions, the $t$-statistic for cash flow for low $q$ firms is higher than in regression (3). Further evidence that cash flow from operations is a noisy measure is that, according to Bowen, Burgstaler, and Daley (1986), cash flow from working capital better predicts future cash flow from operations than cash flow from operations itself, in that it leads to a higher $R$-square if one regresses predicted values on realized values. Since firms now report cash from operations according to FASB rules, it will be interesting to see whether recently reported cash flow from operations is less noisy.

Operating income and net income in table 5 can be viewed as proxies for firm performance. Our evidence is that these performance measures play a role only for low $q$ firms. In regressions of bidder abnormal returns on operating income (normalized by total assets) alone, the coefficient on operating income is not significant. Hence, bidder returns in our sample are not significantly related to accounting performance measures per se, and one can therefore view this evidence as indicating that the success of our cash flow measures does not depend on their being proxies for performance.

The last two regressions in table 5 show estimates obtained with cash flow normalized by the book value of equity and by the sum of the book value of equity and long-term debt. The numerator of the cash flow measure is the

[12]See Drtina and Largay (1985). Paradoxically, cash flow from operations has a correlation coefficient of $-0.10$ with the Lehn and Poulsen (1989) measure of cash flow. We construct cash flow from operations and cash flow from working capital following Bowen, Burgstaler, and Daley (1986), who, in cross-sectional tests, also report that cash flow from operations is only weakly correlated with cash flow from working capital or earnings-based measures.

Table 5

Regression of bidders returns on cash flow for 69 successful tender offers from October 1968 to December 1986.

Bidder return is the cumulative abnormal return estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. We use three-year averages of $q$ ratios. Cash flow measures are computed using COMPUSTAT and are: (1) operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends, (2) net income plus depreciation plus adjustments for 'other' elements in income that do not affect working capital, (3) cash flow from operations, (4) cash flow from operations without adjustment for changes in 'other' current assets and liabilities, (5) two-year average of cash flow from operations, (6) operating income, (7) operating income plus change in inventory, and (8) net income plus depreciation. In regressions (1) through (8), cash flow is normalized by the book value of total assets. Regressions (9) and (10) use the same definition of cash flow as regression (1), except that in (9) cash flow is divided by the book value of equity and in (10) by the sum of the book value of equity and the book value of long-term debt.

| Cash flow measure | Intercept | Cash flow | Cash flow if $q < 1$ (zero otherwise) | $R^2$ | $p$-value |
|---|---|---|---|---|---|
| (1) | 0.054 | −0.020 | −1.242 | 0.13 | 0.01 |
| | (0.42) | (−0.04) | (−2.83) | | |
| (2) | 0.103 | −0.483 | −0.962 | 0.12 | 0.02 |
| | (0.77) | (−0.96) | (−2.66) | | |
| (3) | 0.008 | 0.145 | −0.373 | 0.02 | 0.45 |
| | (0.06) | (0.42) | (−1.09) | | |
| (4) | 0.019 | 0.094 | −0.548 | 0.05 | 0.18 |
| | (0.06) | (0.27) | (−1.52) | | |
| (5) | 0.035 | −0.064 | −0.513 | 0.05 | 0.20 |
| | (0.14) | (−0.16) | (−1.39) | | |
| (6) | 0.056 | −0.014 | −0.840 | 0.09 | 0.04 |
| | (0.41) | (−0.04) | (−2.58) | | |
| (7) | 0.055 | 0.025 | −0.584 | 0.11 | 0.02 |
| | (0.42) | (0.11) | (−2.89) | | |
| (8) | 0.033 | 0.130 | −0.561 | 0.09 | 0.04 |
| | (0.25) | (0.60) | (−2.62) | | |
| (9) | 0.051 | 0.031 | −0.503 | 0.17 | < 0.01 |
| | (0.41) | (0.16) | (−2.81) | | |
| (10) | 0.604 | −0.091 | −0.702 | 0.15 | < 0.01 |
| | (0.48) | (−0.33) | (−2.68) | | |

same as in sections 4 and 5. Obviously, these changes in the denominator have no impact on our conclusions.

## 7. Do bidders overpay?

In the previous sections, we found that returns are negatively related to cash flow for low $q$ bidders but not for high $q$ bidders. In this section, we investigate whether free cash flow leads simply to a redistribution of wealth

between bidder and target shareholders or whether it decreases their combined wealth. Free cash flow could lead bidders to pay higher takeover premiums, so that target shareholders would be better off being taken over by bidders with free cash flow, without lessening the efficiency of the uses of target and bidder assets. In this case, one could argue in the spirit of Roll (1986) that free cash flow enables management to afford its hubris and that it has only redistributive effects. Alternatively, free cash flow could lead bidders to make acquisitions that reduce the value of the bidder by imposing costs on the organization (for instance, by diverting managerial effort from existing operations) or lead to a suboptimal use of the target's assets. In this case, free cash flow affects the allocation of assets and reduces the combined wealth of target and bidder shareholders.

The first regression in table 6 shows the relation between target returns and bidder characteristics when contest characteristics are controlled for. The coefficient estimates show that target returns are not related to bidder cash flow and this result is not sensitive to the variables we control for in the regression. The same result holds for the sample of 101 offers available if information about the target's $q$ is not required. The significant negative coefficient for the leverage variable is surprising. As with the regressions of bidder returns, however, this coefficient is extremely sensitive to the definition of the leverage variable and to how we control for the relative size of the bidder.

The hypothesis that free cash flow leads bidder management to transfer wealth from bidder to target shareholders can be rejected. This hypothesis implies that the coefficient of cash flow for low $q$ bidders should be positive and significant in the first regression of table 6; instead, this coefficient is negative and insignificant. Further, the hypothesis predicts that the total gain from a takeover should not be related to the cash flow of low $q$ bidders. Instead, in the second regression of table 6, we find that the cash flow of low $q$ firms has a significant negative effect on the total gain.[13] This result is generally robust to alternative definitions of the cash flow, size, and leverage variables and holds for the larger sample of 101 offers that we use when information about the target's $q$ is not required.[14]

[13]Note that we use weighted least squares in both regressions of table 6. The weight for the target-return regression is the inverse of the standard deviation of the target's market-model residual, whereas the weight for the total return is the inverse of the standard deviation of the value-weighted average of the target and bidder market-model residuals. Consequently, the weighted dependent variable of the total return regression is not a weighted average of the dependent variables in the bidder- and target-return regressions.

[14]For the samples of 88 and 101 offers, the differential effect of cash flow for low $q$ firms is only marginally significant if we control for relative size using either the ratio of target equity to bidder equity or the ratio of target equity to bidder total assets. In regressions of the total gain on size measures, the $R^2$ with size measured as the logarithm of the market value of the target divided by the market value of the bidder exceeds the $R^2$ of regressions using alternative size measures by at least one-third suggesting that these alternative measures are not as well-specified.

Table 6

Regression estimates of target return and total return to target and bidder for 88 successful tender offers from October 1968 to December 1986.

The bidder and target abnormal returns are estimated from five days before the first *Wall Street Journal* announcement to five days after the final revision in terms by the bidder. Except for minor differences, we follow Lindenberg and Ross (1981) in computing $q$ ratios. We use three-year averages of $q$. Cash flow is operating income before depreciation minus interest expense, taxes, preferred dividends, and dividends for the fiscal year before the tender offer. The book values of the bidder's total debt and assets are measured at the end of the fiscal year preceding the tender offer. Managerial ownership is the fraction of the bidder's equity held by its management, obtained from *Value Line*. The total return to the bidder and the target is the return to a value-weighted portfolio of the target and the bidder. The market value of the target includes only the shares not held by the bidder. ($t$-statistics are given in parentheses.)

| | Dependent variables | |
|---|---|---|
| | Target return | Total return |
| Intercept | 0.474 | 0.352 |
| | (2.46) | (3.52) |
| Cash flow | −0.381 | −0.017 |
| | (−0.53) | (−0.05) |
| Cash flow if $q < 1$ | 0.069 | −0.840 |
| | (0.10) | (−2.55) |
| Managerial ownership | 0.236 | 0.014 |
| | (1.46) | (0.17) |
| Total debt/Total assets | −0.332 | −0.264 |
| | (−2.21) | (−3.47) |
| Log(Target equity/Bidder equity) | −0.119 | 0.102 |
| | (−2.56) | (4.73) |
| Target $q > 1$ | −0.066 | −0.063 |
| | (−1.26) | (−2.53) |
| Offer includes some noncash payment | 0.051 | 0.077 |
| | (0.56) | (1.61) |
| Single bidder/Opposed | 0.066 | −0.022 |
| | (1.06) | (−0.74) |
| Multiple bidders/Opposed | 0.004 | −0.045 |
| | (0.05) | (−1.12) |
| Multiple bidders/Unopposed | 0.167 | 0.012 |
| | (2.76) | (0.41) |
| $R^2$ | 0.27 | 0.48 |
| $p$-value for $F$-test | < 0.01 | < 0.01 |

The strong negative coefficient on the leverage measure in the total-gain regression is surprising in light of the arguments that more highly levered firms are monitored more closely by the capital markets. As discussed with the bidder-return regressions, however, the coefficient on leverage depends on how leverage is measured. As evidence, the correlation coefficient be-

tween the total takeover gain and the ratio of total debt to the book value of total assets is −0.20, whereas the coefficient of the gain and the ratio of long-term debt to the market value of equity is 0.02. In contrast, cash flow is negatively correlated with total gain and the correlation coefficient is similar for all cash flow measures. These results suggest that leverage may not be a good proxy for the extent to which firms are monitored by the capital markets. A more plausible measure is cash flow divided by total assets. To see this, consider two firms with equal leverage, one firm with a large cash flow and the other with no cash flow. Obviously, monitoring by the capital markets is unlikely to affect the decisions of the firm with a large cash flow, but will be important in the other firm's decisions.

Why does the cash flow of low $q$ bidders have a negative effect on bidder returns but no effect on target returns? One explanation is that competition in the market for corporate control dictates the price paid for the target. If the acquisition price is determined by the next potential bidder for the target, free cash flow enables the winning bidder to make the acquisition but does not determine the acquisition price. A bad acquisition made possible by the availability of free cash flow decreases the bidder's stock price because the price paid reflects the target's value to a potential bidder for whom the acquisition would make more sense.

An alternative explanation of the absence of a relation between target returns and bidder free cash flow is that the acquisition leads investors to increase their estimate of the bidder's agency costs of free cash flow and/or adversely affects their view of the firm's investment opportunities. The evidence seems to be easier to reconcile with the view that the acquisition signals higher agency costs of free cash flow rather than a worsening of the investment opportunity set. If an acquisition reveals bad news about the bidder's investment opportunity set, the stock-price impact should be worse for high $q$ bidders than for low $q$ bidders. This is because investors expect high $q$ firms to have valuable investment opportunities and hence would have to revise their expectations for such firms more dramatically if an acquisition revealed a lack of internal investment opportunities. The evidence does not support this prediction. However, the fact that bidder shareholder losses increase with free cash flow is consistent with the view that acquisitions by bidders with free cash flow lead shareholders to increase their estimate of the agency costs of free cash flow and that these costs increase with the amount of free cash flow available.

## 8. Conclusion

We develop a measure of free cash flow that can be used in further empirical work testing Jensen's free cash flow theory. We use Tobin's $q$ to identify firms beset by agency problems and expected to invest free cash flow

in negative NPV projects. As an application of our approach, we show that the takeover gain of low $q$ firms falls in relation to the gain of high $q$ firms as the cash flow of low $q$ firms increases. Other bidder characteristics examined in the literature, such as means of payment, bidder managerial ownership, the debt–equity ratio of the bidder, and the logarithm of the size of the target in relation to the bidder, do not affect bidder returns in our sample. The effect of free cash flow on bidder returns explains a larger fraction of the cross-sectional variation in returns than the nature of the control contest. Bidder free cash flow does not appear to affect target returns, suggesting that free cash flow does not lead to a redistribution of wealth between bidders and targets. This implies that takeover announcements by firms with high cash flow and a low $q$ decrease their shareholders' wealth because the price paid for the target reflects synergies available only to competing bidders or, somewhat less plausibly, because the acquisition reveals negative information about bidder's management or investment opportunities.

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