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Do investors value smooth performance? ☆

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ABSTRACT

This paper presents empirical evidence that cash-flow volatility is negatively valued by investors. The magnitude of the effect is substantial with a 1% increase in cash-flow volatility, resulting in approximately a 0.15% decrease in firm value. We show that this increase, however, is not associated with earnings smoothing resulting from managers' accrual estimates. Our results are consistent with a preference by the market for less volatile cash flows and suggest that managers' efforts to produce smooth financial statements add value, but only via the cash component of earnings.

1. Introduction

Corporate risk management theory argues that shareholders are better off if a firm maintains smooth cash flows. For example, Froot, Scharfstein, and Stein (1993) illustrate that smooth cash flows can add value by reducing a firm's reliance on costly external finance.[1] Other evidence points towards investors preferring smooth cash flows in making capital allocation decisions. For instance, low earnings volatility, of which cash flow is a major component, is associated with greater analyst following (Lang, Lins, and Miller, 2003), a larger number of institutional investors (Badrinath, Gay, and Kale, 1989), and smaller perceived borrowing costs (Trueman and Titman, 1988). On the other hand, however, if equity represents a call option on the value of the firm (Merton, 1974) or if cash-flow volatility represents uncertainty over future growth opportunities (Pastor and Veronesi, 2003), then an increase in volatility could actually be value-enhancing, *ceteris paribus.* In this paper, we test the hypothesis that investors value firms with smooth cash flows at a premium relative to firms with more volatile cash flows.

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[1] See also earlier related work by Shapiro and Titman (1986), Lessard (1990), and Stulz (1990). See Geczy, Minton, and Schrand (1997) for empirical evidence consistent with the Froot, Scharfstein, and Stein (1993) theory; and Nance, Smith, and Smithson (1993), Tufano (1996), Mian (1996), Haushalter (2000), Brown (2001), and Graham and Rogers (2002) for empirical evidence supportive of alternative risk management theories. Related work has examined alternative hedging practices, such as the use and relation of financial derivatives and accrual management (Barton, 2001).

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We find strong evidence that cash-flow volatility is negatively related to proxies for firm value. Using a large sample of non-financial firms, we present evidence that cash-flow volatility is negatively and significantly associated with proxies for Tobin's *q*. The magnitude of the effect varies across different tests, but is always large. Specifically, we find that a 1% increase in cash-flow volatility is associated with approximately a 0.15% reduction in firm value. To gauge the magnitude of this result, consider a firm in our sample that moves from the median cash-flow volatility to the lower quartile. This large decrease in cash-flow volatility would be associated with roughly an 8% increase in value. Our results and conclusions are robust to various sets of control variables and estimation techniques.

Our paper is the first to show directly in a broad sample that investors prefer smooth cash flows, which helps to understand the value of risk-management activities. Our paper also speaks to recent work by Graham, Harvey, and Rajgopal (2005) which finds that a large sample of CFOs exhibit a nearly exclusive focus on earnings as opposed to cash flow targets. In fact, they report that firms may even forego positive Net Present Value (NPV) projects in an effort to produce a smooth earnings stream, implying that corporate managers perceive a positive market premium from lower earnings volatility.

While earnings volatility is directly related to cash-flow volatility, it also contains information about the variance of accruals and the covariance between cash flows and accruals. That is, unlike cash flows, earnings can be smoothed via accruals, which represent managerial estimates of future cash flows and therefore are subject to measurement error and potential manipulation. We test whether the market discriminates between these sources of earnings volatility. Our results indicate that earnings smoothing via accruals does not add value, suggesting that managerial actions to smooth earnings that are not supported by the underlying cash flows are not value-enhancing.

Taken together, these findings both support and clarify the extant literature on the valuation implications of earnings smoothing. For instance, Lambert (1984) provides an equilibrium model where agents smooth income via real operational choices (i.e., cash flow related) as opposed to accrual estimates. Trueman and Titman (1988) note that when market participants observe firms with low earnings volatility, they may have trouble distinguishing those firms with truly high volatility, but who have the flexibility in their accrual estimates to smooth earnings, from those with inherently low volatility. Our results help clarify this issue by showing that investors appear to focus on cash-flow volatility and ignore smoothing behavior resulting from accrual flexibility. That is to say, our results indicate the method of obtaining smooth earnings is important. This is broadly consistent with the findings in Pincus and Rajgopal (2002), which show that firms in the oil and gas industry first design their hedging strategies and then utilize accruals as a secondary mechanism to smooth earnings. Our results indicate the market values the hedging activities, which directly influence cash-flow volatility, but does not place significant value on the subsequent smoothing activities accomplished via accruals.

Our findings are also related to recent work on the value of risk management. For example, Allayannis and Weston (2001), Carter, Rogers, and Simkins (2006), and Nelson, Moffitt, and Affleck-Graves (2005) find that the use of derivatives improves firm value. Our results are consistent with these studies; further, we also find an increase in firm value associated with the use of derivatives. However, we find that the effect of cash-flow or earnings volatility remains strong even after controlling for derivatives use, as well as for a subsample of firms that do not use any derivatives. We interpret this as evidence that management of cash-flow volatility is in general value-enhancing and captures more than simply the use of financial derivatives.

Finally, our work is also related to Minton and Schrand (1999) who find evidence that cash-flow volatility can directly affect investment policy through the cost of capital. Using the Kaplan and Zingales (1997) measure of the need for external financing, our results illustrate that cash-flow volatility negatively affects firm value, especially for firms that rely heavily on external financing. In this sense, we provide supporting evidence for the findings in Minton and Schrand (1999). At the same time, our results illustrate that the market prefers less cash-flow volatility even for firms with lower external financing needs, again highlighting the general importance of cash-flow volatility.

Of course, there are myriad ways in which financial uncertainty interacts with firm value. According to the Capital Asset Pricing Model (CAPM), systematic risk should be negatively related to prices, since higher discount rates yield a lower value, *ceteris paribus*.[2] Further, recent empirical work suggests that idiosyncratic risk may be priced in addition to systematic risk (see, e.g., Goyal and Santa-Clara, 2003). Consistent with Shin and Stulz (2000), we find a positive (negative) relation between systematic (idiosyncratic) risk and firm value.[3] Our paper further contributes to the literature by focusing on the value effect of two alternative types of risk, namely, cash-flow and earnings volatility. These measures are of primary importance since unlike financial market variables, they reflect the stability of firms' reported financial statements and are directly affected by managerial decisions and firms' risk management policies.

Since our results are based on large sample association tests, natural concerns could arise over whether omitted variables or methodological issues drive our results. As a

[2] However, since Tobin's *q* represents the present value of expected future cash flows scaled by the replacement costs of assets, it is not immediately clear how these predictions translate into the valuation *ratios* we consider here. That is, as Lang and Stulz (1994) point out, Tobin's *q* should be a risk-free valuation metric in the sense that our analysis does not, theoretically, require any risk adjustment in order to make comparisons across firms.

[3] The negative association between idiosyncratic risk and firm value parallels recent asset pricing literature, which finds evidence that idiosyncratic risk matters (see, e.g., Green and Rydquist, 1997; Goyal and Santa-Clara, 2003; Malkiel and Xu, 2002).

result, we perform a large battery of robustness checks, specification tests, and alternative methodologies. The statistical relationship between smooth performance and value is strong. Our results are not sensitive to any particular estimation technique, sample selection criteria, subperiod, cross-sectional factors, financial distress, or various sets of control variables.

The remainder of the article is organized as follows. Section 2 describes our sample and develops our hypotheses. Section 3 presents our empirical methodology and the tests of the relation between cash-flow and earnings volatility and firm value. Section 4 presents a broad range of robustness tests and Section 5 concludes.

2. Sample description and methodology

2.1. Sample construction

Our initial sample includes all firms with non-missing observations for assets and sales for which we find matching data on the Center for Research in Security Prices (CRSP) and both quarterly and annual Compustat databases between 1987 and 2002. However, the nature of our tests imposes several strong data requirements for inclusion in our final sample. To compute market model betas and residuals, we select only firms with at least 30 non-missing monthly returns for each of three 5-year periods: 1988–1992, 1993–1997, and 1998–2002. Further, to estimate the volatility of quarterly cash flows we also require each firm to have at least 10 non-missing quarterly observations for cash flows during each 5-year period.

We select observations from fiscal years 1987, 1992, and 1997. Our sample selection is specifically designed to ensure the independence of sample periods to avoid potential severe serial correlation in our volatility measures (as well as idiosyncratic and systematic risk); however, the drawback is that such a requirement reduces the number of observations. Even so, the correlations between the cash-flow volatilities estimated between the periods are high (0.54–0.79), rendering the use of overlapping data an unattractive alternative. The final sample consists of a total of 11,991 firm-year observations or roughly 4,000 firms in each period.

The conservative nature of our sample selection procedure provides greater assurance that any statistical results are economically meaningful rather than the manifestation of a large sample size. If anything, our sample selection criteria bias against finding systematic relations between value and volatilities/control variables. With that said, our sample is generally representative of the Compustat population, though our firms are a little larger and hold less debt. Finally, our inferences are not likely to be contaminated by any selection bias induced by our screens, as our tests are restricted to within-sample comparisons.

Table 1, Panel A reports summary statistics on the sample characteristics. Our sample firms have a mean (median) value of assets of \$1,105 (\$92) million and a mean equity value of \$956 million. On average our sample's debt-to-assets ratio is 0.19 (median of 0.14). We measure growth in a number of different ways; first among these is the compound annual sales growth rate over the future 5 years. Mean (median) sales growth for our sample firms is 0.09 (0.07). Our other measures of growth are the annual ratios of capital expenditures (CAPX-to-sales), research and development (R&D-to-sales) and advertising (Advertising-to-sales) all over contemporaneous sales. For the last two variables we equate missing observations to zero to maintain the sample size. The results are unaltered if we exclude these variables. We use the market-to-book ratio as an approximation of Tobin's q, which in turn is a proxy for firm value.[4] Our sample mean market-to-book ratio is 1.69 and the median is 1.17.[5] These values are similar to values for q documented in earlier studies (see, e.g., Allayannis and Weston, 2001).

Our main measure of earnings is basic earnings per share before extraordinary items (quarterly data item 19) adjusted for stock splits (quarterly data item 17).[6] As shown in Table 1, Panel B, the mean (median) quarterly

Table 1
Summary statistics

This table presents descriptive statistics for our sample of firms. The sample contains all Compustat firms with available annual and quarterly data and matching data on CRSP during 1987, 1992, and 1997. The final sample consists of 3,528 firms in 1987, 4,014 firms in 1992, and 4,449 firms in 1997 for a total of 11,991 observations. All variables are defined in the Appendix.

	Mean	Std.	25%	Median	75%
Panel A: Descriptive variables					
Total assets (M\$)	1,105	3,875	25	92	421
Equity market value (M\$)	956	3,482	23	89	420
Return on assets	−0.010	0.191	−0.019	0.035	0.078
Debt-to-assets	0.193	0.196	0.016	0.141	0.311
Sales growth	0.085	0.198	−0.002	0.065	0.155
CAPX-to-sales	0.146	0.410	0.019	0.042	0.094
R&D-to-sales	0.141	0.730	0.000	0.000	0.037
Advertising-to-sales	0.012	0.029	0.000	0.000	0.011
Tobin's q	1.693	1.602	0.775	1.166	1.941
Panel B: Measures of risk					
Systematic risk	0.004	0.007	0.000	0.001	0.004
Idiosyncratic risk	0.030	0.033	0.008	0.018	0.039
Earnings per share (EPS)	−0.088	1.059	−0.077	0.054	0.199
Volatility of EPS (std. dev.)	0.722	2.597	0.089	0.192	0.438
Cash flow per share (CFPS)	0.276	0.680	0.013	0.166	0.437
Volatility of CFPS (std. dev.)	0.961	2.989	0.158	0.327	0.710
Total earnings	11.687	48.966	−0.440	0.468	5.082
Total cash flow	28.789	100.331	0.072	1.662	12.062

[4] This methodology is common in the literature. For example, the methodology has been used in cross-listing (see Doidge, Karolyi, and Stulz, 2004), corporate diversification (Lang and Stulz, 1994; Servaes, 1996), takeovers (Servaes, 1991), equity ownership (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2002; Lins, 2003), and risk management (Shin and Stulz, 2000; Allayannis and Weston, 2001).

[5] Allayannis and Weston (2001) show that several measures used to proxy for Tobin's q are highly correlated with each other and also highly correlated with the simple market-to-book ratio used here.

[6] Our results are generally robust to the following alternatives: (a) earnings per share from operations (data item 177); (b) operating income before depreciation (data item 21) scaled by average total assets; and (c) diluted earnings per share (both with and without extraordinary items).

earnings per share for our sample firms is −0.09 (0.05), and the average (median) standard deviation of earnings per share is 0.72 (0.19). Our primary measure of cash flow is cash flow from operations from the statement of cash flows (quarterly data item 108) scaled by shares outstanding (quarterly data item 61) adjusted for stock splits (quarterly data item 17). Use of this measure limits the sample period to post-1987 because the statement of cash flows was not required for all publicly traded firms until 1988. Although our results are insensitive to calculating cash flows using the procedures from Minton and Schrand (1999), we report the results utilizing cash flows from publicly available financial statements, since this is the figure provided by firms. In addition to cash flow and earnings, we also use accruals, which are defined as earnings less cash flow from operations (quarterly data item 19 minus quarterly data item 108).

2.2. Construction of the risk measures and their correlations

It is important to note exactly which measures of risk should be related to firm value. Of course, past estimates of risk should already be priced into firm value at time t so it is difficult to make any causal inferences regarding Tobin's q and past levels of risk variables. What should matter for firm value at time t is the expectation of future risk. As a result, we follow Shin and Stulz (2000) in constructing "perfect foresight" measures of risk including systematic and idiosyncratic risk, as well as cash-flow and earnings volatilities.

We estimate both systematic and idiosyncratic risk using a one-factor market model with returns on the CRSP value-weighted index as a proxy for the market. Following Shin and Stulz (2000), we compute systematic risk for each firm, i, as the product of the square of its market risk (β^2) and the market volatility σ^2_{m}. For the 1987 period we utilize the perfect foresight estimates of systematic risk estimated utilizing monthly observations over the fiscal years 1988–1992 (the same methodology is utilized for the 1992 and 1997 periods). Idiosyncratic risk is the variance of the residual from the market model estimated above. Panel B of Table 1 provides information on the risk profile of our sample firms. Our sample's average systematic risk is 0.004 and its average idiosyncratic risk is 0.030.

Similar to our market-based measures of risk, we also construct earnings, cash-flow, and accrual volatility in t+1 as our measure of the time t expected future volatility. For example, our measure of earnings volatility for firm i in 1987 is the standard deviation of quarterly earnings per share over the 20 quarterly observations in the years 1988–1992.[7] To compare with earnings volatility, we use cash flow or accruals scaled by the number of shares (alternatively we scale by assets) in our estimation of volatility. These measures are highly correlated and produce similar results. Further, our estimates of earnings/cash-flow volatility are not qualitatively changed by inclusion/exclusion of extraordinary items. The average quarterly cash flow per share of our sample firms is 0.28 and the mean cash-flow volatility is 0.96. The average cash-flow volatility is large and reflects the significant skewness present in many of our cash-flow and earnings volatility measures.[8] This measure gives us a clean way to test how firm value relates to expected future volatility based only on the no-arbitrage assumption that the market does not systematically under- or overestimate financial statement volatility.

Table 2 reports correlations between our risk measures and firm characteristics. On a univariate basis, Tobin's q is positively correlated with both systematic and idiosyncratic risk. This is, perhaps, not surprising given that large firms generally have less volatile equity returns and lower values of q. On the other hand, earnings and cash-flow volatility are both negatively associated with firm value, although both of these measures are positively (though weakly) related to firm size as measured by total assets.

Overall, our risk measures are positively correlated with each other. For example, earnings and cash-flow volatility have 0.82 correlation, which is not surprising given that cash flows are a component of earnings. The fact that the correlation between these measures is so high lends some justification to managers' focus on earnings as opposed to cash flows as reported in Graham, Harvey, and Rajgopal (2005). Unfortunately, from a research perspective such a high correlation also makes it difficult to disentangle the marginal effects of earnings and cash-flow volatility, though we return to this issue in Section 4.6.

Cash-flow and earnings volatilities have modest correlations with systematic risk and both have a strong positive correlation with idiosyncratic risk. This also makes sense given that our methodology for constructing earnings and cash-flow volatilities does not remove any systematic variation and as a result is capturing total variation, which is predominantly firm-specific.

3. Cash-flow volatility, earnings volatility, and firm value

3.1. Univariate tests

In this subsection we present some simple univariate tests of the hypothesis that cash-flow and earnings volatility are inversely related to firm value. Table 3, Panel A presents the results of these univariate tests. First, we divide our sample into quintiles according to cash-flow volatility (columns 1 and 2) or earnings volatility (columns 3 and 4). We then compute the average q (columns 1 and 3) and the median q (columns 2 and 4) for each quintile and compare q across the volatility quintiles. Consistent with our hypothesis, both average and median q decline monotonically across quintiles for

[7] While this method is crude, Section 4.4 explores the sensitivity of our results to alternative measures based on time-series models, and demonstrates that our results are robust to a variety of different measurement schemes.

[8] As a result, we use log transformations of these variables in our regression-based tests as well as check the robustness of our results to the influence of outliers in Section 4.

Table 2
Correlation table
This table presents Pearson correlations among our main risk variables utilized in subsequent tests as well as our proxy for firm value, Tobin's q. All variables are defined in the Appendix. p-Values are reported in parentheses.

	Firm characteristics				Risk measures		
	Tobin's q (1)	EPS (2)	CFPS (3)	Total assets	Systematic risk (6)	Idiosyncratic risk (7)	Volatility of EPS (8)
Earnings (EPS)	−0.046 (0.000)	1					
Cash flow (CFPS)	−0.177 (0.000)	0.310 (0.000)	1				
Total assets	−0.095 (0.000)	0.101 (0.000)	0.265 (0.000)	1			
Systematic risk	0.202 (0.000)	−0.119 (0.000)	−0.152 (0.000)	−0.039 (0.000)	1		
Idiosyncratic risk	0.168 (0.000)	−0.329 (0.000)	−0.313 (0.000)	−0.159 (0.000)	0.483 (0.000)	1	
Volatility of EPS	−0.024 (0.008)	−0.812 (0.000)	−0.057 (0.000)	0.002 (0.864)	0.036 (0.000)	0.181 (0.000)	1
Volatility of CFPS	−0.077 (0.000)	−0.649 (0.000)	0.072 (0.000)	0.049 (0.000)	−0.021 (0.019)	0.092 (0.000)	0.822 (0.000)

both cash-flow and earnings volatility. Table 3 results indicate that q varies more across cash-flow volatility quintiles versus earnings volatility quintiles. We investigate the relative effects of cash-flow and earnings volatility on q further in Section 3.3, and for now focus our attention on cash-flow volatility.

Clearly, many factors affect q in a similar way as cash-flow volatility, and so we also perform univariate tests with portfolios formed on conditional sorts. Panels B–D of Table 3 present the results of these conditional univariate tests in which portfolios are first sorted based on size, debt ratio, and the cash-flow level, respectively. We focus on these conditioning variables simply to test whether there are rough variations by information asymmetry, bankruptcy costs, or the costs of accessing external capital markets. Regardless of how the conditional portfolio sorts are formed, we continue to find that higher cash-flow volatility is associated with lower value. Further, the effect appears to be strongest for large firms, firms with little debt, and low cash-flow levels.

Finally, Panel E reports results from univariate tests in which we classify firms based on both cash-flow and earnings volatility. Generally, we find a monotonic decline in the average q as cash-flow volatility increases. Conversely, within each cash-flow volatility quintile (presented in rows), the average q either does not change significantly or it increases as earnings volatility increases. The largest three cash-flow volatility quintiles actually reveal a significant increase in value as we move from low to high earnings volatility. We explore this interaction between earnings and cash-flow volatility further in Section 3.3.

Overall, our univariate tests demonstrate a strong negative relation between cash-flow volatility and firm value, which is more severe among firms that are large in size, have low debt-to-assets ratio, and low cash-flow levels. In the next section we perform multivariate tests, in which we control for other factors that have been shown previously to be related to value.

3.2. Multivariate tests

In this subsection we present regression-based tests of the hypothesis that cash-flow volatility is negatively linked to firm value. Our multivariate tests control for other factors that theory suggests and prior empirical work has shown to have a significant effect on firm value. Specifically, following Lang and Stulz (1994) and Allayannis and Weston (2001), we control for the following factors: (1) size, by using the log of total assets as a proxy; (2) profitability, by using return on assets (ROA) as a proxy; (3) investment growth and intangible assets, by using as proxies the ratio of capital expenditures-to-sales, the ratio of R&D-to-sales, and the ratio of advertising expenditures-to-sales, as well as future sales growth; and (4) leverage, by using the ratio of long-term debt-to-total assets. We also control for industry effects using two-digit Standard Industrial Classification (SIC) industry controls and time-effects using year indicators (1987 and 1992).

Given the significant skewness present in many of our variables, and to ease interpretation of our results, we take log transforms of our risk measures, size, and q, which reduce the potential impact of outliers on our analysis. This transformation converts the interpretation of all logged independent variables to elasticities. The logarithmic transformations do not have a qualitative impact on our results and are performed only for robustness and ease of interpretation.

In Table 4 we present a series of regression results in which our risk measures are added in sequence to a standard set of confounding factors for Tobin's q. To provide a basis for comparison, Table 4, column 1, presents the results of an ordinary least squares (OLS) regression

Table 3
Univariate results

This table presents univariate results. We group firms into quintiles based on their earnings and cash-flow volatility. Panel A reports mean and median Tobin's q for earnings and cash-flow volatility quintiles arranged from low to high. The difference in mean and median q between the low and high quintiles is reported at the bottom of the panel along with the associated p-values in parentheses. Panels B–D present further univariate results where, in addition to cash-flow volatility we also sort firms on size, leverage, and total cash-flow levels. Panel E presents results sorting on both earnings and cash-flow volatility quintiles.

Panel A: Average Tobin's q

	Cash-flow volatility		Earnings volatility	
	Mean	Median	Mean	Median
Low	2.464	1.639	2.099	1.395
2	1.910	1.381	1.810	1.309
3	1.657	1.251	1.643	1.116
4	1.326	1.020	1.486	1.066
High	1.114	0.836	1.430	0.977
Difference (low−high)	1.350	0.803	0.669	0.418
p-Value	(0.00)	(0.00)	(0.00)	(0.00)

Panel B: Average Tobin's q

	Size quintile					Difference	*p*-Value
	Smallest	2	3	4	Largest		
Low cash-flow volatility	2.736	2.232	2.270	2.245	2.267	0.469	(0.00)
2	2.070	1.855	1.919	1.843	1.780	0.290	(0.01)
3	1.837	1.597	1.715	1.631	1.561	0.276	(0.02)
4	2.046	1.290	1.300	1.282	1.170	0.876	(0.00)
High cash-flow volatility	2.322	1.188	0.981	0.992	0.864	1.458	(0.00)
Difference (low−high)	0.414	1.044	1.289	1.253	1.403		
p-Value	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)		

Panel C: Average Tobin's q

	Debt to total-assets-quintile					Difference	*p*-Value
	Low	2	3	4	High		
Low cash-flow volatility	3.176	2.562	2.074	1.980	1.869	1.307	(0.00)
2	2.539	2.124	1.770	1.450	1.407	1.132	(0.00)
3	2.256	1.854	1.482	1.365	1.403	0.853	(0.00)
4	1.858	1.404	1.215	1.108	1.223	0.635	(0.00)
High cash-flow volatility	1.506	1.164	1.058	0.981	1.041	0.465	(0.00)
Difference (low−high)	1.670	1.398	1.016	0.999	0.828		
p-Value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		

Panel D: Average Tobin's q

	Cash-flow level quintile					Difference	*p*-Value
	Low	2	3	4	High		
Low cash-flow volatility	3.489	1.750	1.874	2.500	2.804	0.685	(0.00)
2	2.477	1.413	1.762	1.972	2.057	0.420	(0.00)
3	2.022	1.250	1.551	1.713	1.783	0.239	(0.03)
4	1.828	1.086	1.139	1.326	1.343	0.485	(0.00)
High cash-flow volatility	1.558	1.001	0.914	1.017	0.984	0.574	(0.00)
Difference (low−high)	1.931	0.749	0.960	1.483	1.820		
p-Value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		

Panel E: Average Tobin's q

	Earnings volatility quintile					Difference	*p*-Value
	Low	2	3	4	High		
Low cash-flow volatility	2.485	2.543	2.329	2.153	2.436	0.049	(0.91)
2	1.719	1.907	2.033	1.977	1.945	−0.226	(0.14)
3	1.415	1.530	1.667	1.850	1.748	−0.333	(0.00)
4	1.204	1.295	1.260	1.308	1.463	−0.259	(0.03)
High cash-flow volatility	0.725	0.878	0.981	0.949	1.255	−0.530	(0.00)
Difference (low−high)	1.759	1.664	1.348	1.204	1.181		
p-Value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		

Table 4
Tobin's *q* and cash-flow volatility

The table presents results from pooled regressions of the natural logarithm of Tobin's *q*, a proxy for firm value, on cash-flow volatility along with measures capturing risk and growth opportunities. All regressions include two-digit SIC controls and all variables are defined in the Appendix. *p*-Values are reported beneath the coefficient estimates in parentheses and are computed using standard errors robust to both firm and year clustering.

Dependent variable: ln(Tobin's *q*)			
	(1)	(2)	(3)
ln(Cash-flow volatility)			−0.150
			(0.000)
ln(Systematic risk)		0.060	0.051
		(0.000)	(0.000)
ln(Idiosyncratic risk)		−0.048	−0.010
		(0.007)	(0.610)
ln(Total assets)	−0.078	−0.093	−0.055
	(0.000)	(0.000)	(0.052)
Return on assets	0.220	0.262	0.248
	(0.129)	(0.037)	(0.002)
Sales growth	0.681	0.629	0.580
	(0.000)	(0.000)	(0.000)
CAPX-to-sales	0.076	0.081	0.070
	(0.032)	(0.080)	(0.129)
Debt-to-total assets	−0.092	−0.030	−0.002
	(0.584)	(0.847)	(0.988)
R&D-to-sales	0.127	0.121	0.114
	(0.000)	(0.000)	(0.000)
Advertising-to-sales	2.238	2.247	2.258
	(0.000)	(0.000)	(0.000)
Constant	0.682	0.974	0.718
	(0.000)	(0.000)	(0.000)
Year indicator (1987)	−0.409	−0.418	−0.397
	(0.000)	(0.000)	(0.000)
Year indicator (1992)	−0.280	−0.288	−0.263
	(0.000)	(0.000)	(0.000)
Adj. R^2	0.200	0.221	0.270

with our log-scaled-transformed *q* as the dependent variable and the variables described above as independent variables. Robust standard errors are constructed following Petersen (2007) and Thompson (2007). The results we obtain are very similar to what theory predicts, and are consistent with Lang and Stulz (1994) and Allayannis and Weston (2001). For example, we find that size is negatively related to *q*, suggesting that smaller firms have higher values. On the other hand, profitability (as measured by ROA), sales growth, and intangible assets (as measured by R&D and Advertising) are all positively and significantly related to value, consistent with prior findings and arguments by Myers (1977) and Smith and Watts (1992). Finally, leverage is negatively (though not significantly) associated with value after controlling for these other factors.

In Table 4, column 2 we add our market measures of systematic and idiosyncratic risk to the explanatory variables used in column 1. Consistent with Shin and Stulz (2000) we estimate a positive coefficient on systematic risk and a negative coefficient on idiosyncratic risk. The negative association between idiosyncratic risk and firm value is consistent with the findings in recent asset pricing literature which finds that idiosyncratic risk matters (see, e.g., Green and Rydquist, 1997; Malkiel and Xu, 2002; Goyal and Santa-Clara, 2003).

In column 3 of Table 4, we add cash-flow volatility as an additional measure of risk. Our risk management hypothesis is that cash-flow volatility adversely affects firm value, even after controlling for other measures of risk and factors that are related to value such as size, profitability, growth, leverage, and industry affiliation. Consistent with this hypothesis, we find that cash-flow volatility is negative and significantly associated with *q* suggesting that cash-flow volatility decreases value. This finding is also interesting because it shows that the effect of cash-flow volatility is above and beyond the effect of systematic and idiosyncratic risk. Further, cash-flow volatility significantly improves the explanatory power of the regression as evidenced by the 4.9% increase in adjusted R^2 between columns 2 and 3.

To control for potential period-specific effects, as well as the lack of independence from multiple observations of the same firm, we estimate the primary model (column 3 of Table 4) each period and report the results in Table 5. Our subperiods include observations from a recessionary period (1987), a recovery (1992), and a boom (1997). It could be that volatility is particularly important in one period and not as important in others. The results are generally consistent across the subperiods with cash-flow volatility always being negative and significant. Regardless of the economy or market performance, low cash-flow volatility is seen as valuable after controlling for risk and growth opportunities.

Table 5
Annual regressions

The table presents results from annual regressions for the 3 years utilized in the analysis. The dependent variable is the natural logarithm of Tobin's *q*, a proxy for firm value. All regressions include two-digit SIC controls and all variables are defined in the Appendix.

Dependent variable: ln(Tobin's *q*)			
Year	1987	1992	1997
ln(Cash-flow volatility)	−0.097	−0.152	−0.217
	(0.000)	(0.000)	(0.000)
ln(Systematic risk)	0.057	0.040	0.062
	(0.000)	(0.000)	(0.000)
ln(Idiosyncratic risk)	−0.066	−0.006	−0.012
	(0.000)	(0.687)	(0.340)
ln(Total assets)	−0.102	−0.069	−0.003
	(0.000)	(0.000)	(0.582)
Return on assets	0.525	0.255	0.114
	(0.000)	(0.000)	(0.022)
Sales growth	0.476	0.561	0.580
	(0.000)	(0.000)	(0.000)
CAPX-to-sales	0.064	0.138	−0.011
	(0.019)	(0.002)	(0.655)
Debt-to-total assets	0.366	−0.026	−0.180
	(0.000)	(0.655)	(0.000)
R&D-to-sales	0.563	0.108	0.094
	(0.000)	(0.000)	(0.000)
Advertising-to-sales	2.106	3.120	1.456
	(0.000)	(0.000)	(0.000)
Constant	0.288	0.444	0.505
	(0.000)	(0.000)	(0.000)
N	3,528	4,014	4,449
Adj. R^2	0.275	0.251	0.269

In all of our tests above we find a strong negative association between cash-flow volatility and Tobin's *q*. We have implied that it is the volatility that causes a reduction in value. However, it could be that high-*q* firms have low cash-flow volatility, and not the other way round as we have implied. Intuitively, one would expect that high-*q* firms would be associated with high (not low) cash-flow volatility, if high-*q* and high cash-flow volatility are both associated with growth firms. Further, it is difficult to imagine why low-*q* firms (those with a relatively lower present value of growth opportunities) should, *ceteris paribus*, have more volatile cash flows. In fact, on the contrary, Berk, Green, and Naik (1999) argue that the growth options of a firm are an additional source of priced risk. Our finding—that it is low cash-flow volatility that is associated with high-*q*—gives more credence to our theory suggesting that volatility is costly and that it negatively impacts value. As a result, we think it is unlikely that our results are driven by endogeneity between cash-flow volatility and value because the direction of the bias would only serve to weaken our results.

3.3. *Earnings volatility and firm value*

The results presented above illustrate that cash-flow volatility has a strong negative effect on firm value. However, while cash-flow volatility is a theoretically appealing measure of risk, earnings per share (EPS) or bottom line income appears to be the primary metric by which investors, analysts, the financial press, and CFOs gauge performance (Graham, Harvey, and Rajgopal, 2005). In fact, there is evidence that the non-cash flow (accrual) component of earnings is an informative incremental signal about future cash flows and stock returns (see, for example, Chan, Chan, Jegadeesh, and Lakonishok, 2006; Sloan, 1996; Barth, Cram, and Nelson, 2001). In this section we dig deeper into financial statement volatility and test the hypothesis that earnings volatility is related to firm value. Moreover, we also test whether the market discriminates between earnings that are smooth as a result of the underlying cash flows and those that are smooth as a result of accruals.[9]

Our analysis of earnings volatility begins with the simple variance decomposition of earnings volatility given by

$$\sigma^2_{\text{Earnings}} = \sigma^2_{\text{Cash Flows}} + \sigma^2_{\text{Accruals}} + 2Cov(Cash\ Flows, Accruals), \quad (1)$$

where accruals are constructed as earnings less cash flows using the definitions from Section 2.1. Again, variances are constructed using the $t+1$ estimate based on 5 years of quarterly observations.

Our basic empirical strategy is to test whether earnings volatility is negatively related to firm value, and then test how each of the components of earnings volatility incrementally contribute to the relationship. Dechow (1994) notes that accruals and cash flows have a strong negative correlation, which means accruals tend to offset cash-flow shocks. This helps to explain the result in Table 1, Panel B that earnings volatility is smaller than cash-flow volatility on average. Leuz, Nanda, and Wysocki (2003) further note that the more negative the correlation between cash flows and accruals the more smoothing the firm is doing via accruals, which does not necessarily reflect the underlying economic performance of the firm. In our tests we use the correlation between quarterly cash flows and accruals over the same 5-year period that cash-flow volatility is measured as a proxy for earnings smoothing via accruals similar to Barton (2001), Leuz, Nanda, and Wysocki (2003), and Lang, Raedy, and Yetman (2003), among others.[10]

Table 6 presents regression estimates of Tobin's *q* on earnings volatility and on the separate components of earnings volatility. In the first column, we simply reconstruct column 3 of Table 4, but replace cash-flow volatility with earnings volatility. As expected, the results illustrate that firm value has a strong negative relation to earnings volatility. The point estimate indicates that a 1%

[9] In this study, we do not distinguish between discretionary and non-discretionary accrual estimates, but rather investigate the valuation characteristics of earnings smoothing via accruals on average.

[10] Results are not sensitive to using the correlation between changes in accruals and cash flows as in Leuz, Nanda, and Wysocki (2003). We utilize the non-change correlation because it is most closely related to the covariance obtained in the decomposition of earnings volatility in Eq. (1).

Table 6
Tobin's *q* and earnings volatility

The table presents results from pooled regressions of the log of Tobin's *q*, on earnings volatility, the components of earnings volatility (cash-flow volatility, accrual volatility, and the correlation of cash flows and accruals), along with measures capturing risk and growth opportunities. All regressions include two-digit SIC controls and all variables are defined in the Appendix. *p*-Values are reported beneath the coefficient estimates in parentheses and are computed using standard errors robust to both firm and year clustering.

Dependent variable: ln(Tobin's *q*)	(1)	(2)	(3)	(4)
ln(Earnings volatility)	−0.069			
	(0.000)			
ln(Cash-flow volatility)		−0.051	−0.137	
		(0.019)	(0.000)	
ln(Accrual volatility)		−0.086		
		(0.000)		
Corr (Cash flow, accruals)		0.281	0.217	0.344
		(0.000)	(0.000)	(0.000)
ln(Systematic risk)	0.056	0.049	0.050	0.057
	(0.000)	(0.000)	(0.000)	(0.000)
ln(Idiosyncratic risk)	−0.004	−0.022	−0.028	−0.073
	(0.610)	(0.301)	(0.188)	(0.000)
ln(Total assets)	−0.069	−0.053	−0.054	−0.090
	(0.052)	(0.078)	(0.068)	(0.000)
Return on assets	0.184	0.267	0.261	0.307
	(0.002)	(0.000)	(0.000)	(0.000)
Sales growth	0.589	0.605	0.612	0.672
	(0.000)	(0.000)	(0.000)	(0.000)
CAPX-to-sales	0.085	0.056	0.055	0.058
	(0.129)	(0.152)	(0.163)	(0.144)
Debt-to-total assets	−0.024	−0.013	−0.022	−0.053
	(0.988)	(0.922)	(0.872)	(0.854)
R&D-to-sales	0.117	0.102	0.108	0.112
	(0.000)	(0.000)	(0.000)	(0.000)
Advertising-to-sales	2.148	2.146	2.190	2.187
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.892	0.878	0.807	1.089
	(0.000)	(0.000)	(0.000)	(0.000)
Year indicator (1987)	−0.401	−0.377	−0.380	−0.395
	(0.000)	(0.000)	(0.000)	(0.000)
Year indicator (1992)	−0.266	−0.258	−0.260	−0.284
	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R^2	0.229	0.273	0.272	0.232

change in earnings volatility leads to only a 0.07% change in value, which is smaller than the cash-flow effect shown in Table 4. Similarly, the adjusted R^2 of the model is smaller (22.9% for earnings volatility versus 27.0% for cash-flow volatility) again indicating that cash-flow volatility is the primitive variable influencing value. Nevertheless, we continue to find that financial statement volatility is strongly associated with firm value using earnings volatility.

In column 2 of Table 6, we report results for each of the separate components of earnings volatility. The results indicate that both cash-flow and accrual volatility are negatively valued. However, these results must be interpreted with serious caution. Variance inflation factors for both volatilities exceed 11 indicating that the variables suffer from severe multicollinearity (Belsley, Kuh, and Welsch, 1980). This is not surprising given the average correlation between cash flows and accruals is −0.73 for the sample, with 44% of the observations having correlations in the −0.90 to −1.00 range. Further, it is not clear exactly what accrual volatility represents in this context. For instance, high accrual volatility may offset high cash-flow volatility resulting in low earnings volatility. Conversely, low accrual volatility may actually result in high earnings volatility. Given the difficulty in separating these two offsetting effects, we focus our attention on the *correlation* between cash flows and accruals since this is a more direct measure of earnings smoothing via accruals (Leuz, Nanda, and Wysocki, 2003; Barton, 2001), where a more negative correlation would be consistent with a higher level of earnings smoothing.[11]

The results in column 2 indicate Tobin's *q* increases as the correlation between cash flow and accrual volatility becomes more positive. This is consistent with investors' preference for smooth earnings that are supported by the underlying cash flows rather than smoothed by accruals. This result is confirmed in columns 3 and 4 where we remove the multicollinearity between cash-flow and accrual volatility by excluding the latter and both, respectively. Although the coefficient on the cash-flow/accrual correlation is positive and significant in columns 2–4 of Table 6, the economic magnitude is modest. Even for a very large change in earnings smoothing (from the median to the first quartile) firm value would change by less than 2% for the average firm in our sample. Further, a comparison of the incremental R^2 indicates that the correlation between cash flows and accruals adds less than a half a percent to the explanatory power of the model. As such, we refrain from making strong inferences regarding the value *destruction* from earnings smoothing. Nevertheless, we can conclude that earnings smoothing via accruals certainly does not appear to *add* value beyond the cash-flow component of earnings.

Overall, the results from Tables 4–6 illustrate that investors value smooth performance after controlling for a number of factors including risk, size, operating performance, growth, intangible intensity, and industry. This is consistent with risk, management activities adding value in general. The results further reveal that investors value earnings that have been smoothed via the cash-flow component as opposed to the accrual component of earnings indicating managers should focus their efforts on producing smooth cash flows as opposed to smoothing via accruals.

4. Robustness

This section explores the robustness of our results to a number of different regression specifications and estimation methodologies. While our results are potentially susceptible to time-varying omitted correlated variables, our results are generally robust to a variety of specifications and estimation techniques.

[11] We return to this issue in Section 4.6 using a matched sample analysis to test for incremental differences between cash-flow and earnings volatility.

4.1. Alternative specifications and estimation techniques

Our basic results are unchanged regardless of the estimation technique or particular regression specification that we use. Specifically we find qualitatively similar results under the following alternative regression specifications:

(a) *Five-year change regressions*: we test the hypothesis that cash-flow and earnings volatility are negatively related to firm value based on 5-year change regressions (rather than levels). These results are consistent with those reported and indicate our results are robust to time-invariant omitted correlated variables.
(b) Measuring cash flows using income statement and changes in balance sheet items as in Minton and Schrand (1999).
(c) *Four different measures of earnings*: earnings per share from operations, earnings per share (diluted) from operations, earnings per share (basic) including extraordinary items, and earnings per share (basic) excluding extraordinary items.
(d) The inclusion of cash-flow level and earnings per share as additional controls.
(e) The inclusion of three-, or four-digit SIC industry controls (instead of two-digit SICs).
(f) The use of total risk in lieu of systematic and idiosyncratic risk.
(g) Using the variance (instead of the standard deviation) of earnings and cash flow.
(h) Using either the perfect foresight measures described in Section 2 or the contemporaneous value for either earnings or cash-flow volatility.
(i) Sensitivity to outliers: we find qualitatively similar results based on a sample in which we winsorize all of our variables at 10%. We also find similar results estimating median regressions (least absolute deviation) and least trimmed squares.
(j) Utilizing the coefficients of variation as measures of earnings and cash-flow volatilities as in Minton and Schrand (1999).
(k) The use of price-to-earnings or value-to-sales ratios as measures of firm value rather than Tobin's q.
(l) Using all fiscal year observations between 1987 and 2000 with the requisite data and calculating results following Fama and MacBeth (1973).
(m) Industry adjusting all continuous variables in the regression as opposed to including industry indicator variables.

Given the strength of our results, our robustness tests find support for the conclusions presented in Section 3 that financial statement smoothness matters, *ceteris paribus*, to investors. Further, we are unable to detect any benefit from earnings smoothing after controlling for risk, growth factors, and cash-flow volatility.

4.2. Financial distress

If cash-flow volatility serves as a proxy for firms facing financial distress, then our results may simply be a reflection of financial distress. Since there is nothing novel about the finding that firms in financial distress have lower value, we must be sure that our results hold even for firms that are in relatively good financial health. To test whether our results are driven by a subsample of firms that are in (or near) financial distress, we test our hypothesis based on a subsample of firms excluding those that meet any of the following selection criteria:

(a) Negative average quarterly earnings over the 5-year period.
(b) Negative average quarterly cash flows over the 5-year period.
(c) Average total assets in the lowest sample quintile.
(d) Observations in the highest leverage quintile.
(e) Observations in the lowest leverage quintile.

These filters ensure that our tests are performed only on larger, profitable companies with a moderate capital structure and positive cash flows from operations, meaning these firms are unlikely to be in financial distress. Such filters eliminate over 65% of our observations to a final sample of 4016 firm years. In unreported tables, we continue to find that cash-flow volatility has a negative effect on firm value with the results being both statistically (p-value 0.00) and economically significant (coefficient estimate −0.19). Further, the results remain unchanged if we maintain the firms in the lowest leverage quintile (coefficient estimate −0.18, p-value 0.00), which do not have a moderate capital structure, but are not necessarily financially distressed given the removal of small, poorly performing firms via steps a–c above.

4.3. Need for external financing

Froot, Scharfstein, and Stein (1993) argue that smooth cash flows can add value by reducing a firm's reliance on costly external finance. Our results could therefore be a manifestation of the need for external financing, which would be consistent with the findings in Minton and Schrand (1999). To assess the influence of the need for external financing on our results, we estimate external financing needs utilizing the coefficient estimates reported in Kaplan and Zingales (1997) to create an ex ante measure of external financing needs. We then sort firms by external financing needs and year into quintiles and create an indicator variable for those firms in the upper quintile and interact it with our cash-flow volatility measure. We expect Tobin's q to be incrementally more sensitive to cash-flow volatility for firms with greater needs for external financing. Unreported analyses confirm this expectation providing further support for the findings in Minton and Schrand (1999). However, Tobin's q remains sensitive to cash-flow volatility for the sample of firms with lower needs for external financing indicating cash-flow volatility is an important valuation attribute even for firms not financially constrained.

4.4. Earnings persistence and the estimation of cash-flow/ earnings volatility

In our previous tests, we estimate both cash-flow and earnings volatility by simply computing the time-series standard deviation of a firm's quarterly earnings over a 5-year period. There is a large literature in accounting (see, e.g., Brown, 1993 and references therein) suggesting that quarterly earnings are strongly persistent and exhibit seasonality. Further, Kormendi and Lipe (1987) show that persistent earnings are more highly valued for a given level of earnings, which stems from the fact they are better estimates of future permanent earnings.

In order to be sure that our results are not simply the manifestation of persistence of earnings, we estimate a model of earnings (cash flows) that accounts for this persistence with lagged values of earnings (cash flows), as well as quarterly dummy variables. Our estimation equation for each firm is

$$E_t = \alpha + \beta_1 E_{t-1} + \beta_2 E_{t-4} + \sum_{q=3}^{5} \beta_q I_{\text{Quarter}} + \varepsilon_t. \quad (2)$$

In this regression the constant term, α, along with the AR(1) coefficient β_1 captures serial correlation and any time-series trend in earnings.[12] We estimate the above model for each firm separately based on our full sample of 15 years of quarterly earnings data (1988–2002). Using the results from this regression for each firm, we compute the 5-year sample standard deviation of the estimated residuals:

$$\text{Volatility of earnings} = \text{Stdev}(\hat{\varepsilon}_t). \quad (3)$$

We use a similar model to estimate cash-flow volatility. As in Section 3, we find that all measures of cash-flow/ earnings volatility continue to measure the same phenomena. Using any of the various measures of financial statement volatility, we continue to find that cash-flow volatility is negatively valued even after including earnings persistence (i.e., the β_1 coefficient described in Eq. (2) above).

4.5. The role of financial derivatives

Since our empirical methods focus on the real volatility of financial statement items, our measures depend on a variety of factors that fall under the discretion of managers. For example, managers may enter into forwards, futures, options, or swaps to mitigate expected cash-flow volatility. In fact, Barton (2001) finds firms that use financial derivatives have lower levels of cash-flow volatility. Further, Allayannis and Ofek (2001) find that firms that use financial derivatives reduce their exposure to risk (as opposed to increasing risk exposure through speculation). As a result, our results may simply replicate the findings of Allayannis and Weston (2001) and Nelson, Moffitt, and Affleck-Graves (2005) who find a significant "hedging premium" associated with the use of derivatives. That is, our results on cash-flow volatility may simply be a proxy for the use of derivatives.

To control for the use of financial derivatives, we estimate a set of augmented regression models where we add an indicator variable equal to one if the company uses derivatives, zero otherwise. The data on derivatives usage are collected from a variety of sources beginning with the data from a large sample collected by Nelson, Moffitt, and Affleck-Graves (2005). We then augment this sample with the data collected by Allayannis and Weston (2001) and Pantzalis, Simkins, and Laux (2001) along with a small sample from our own collection.[13] In total, the data include currency, interest rate, and commodity derivatives for a sample of approximately 16,000 firm-year observations ranging from 1990 to 1999. Given that disclosures of financial derivatives by U.S. firms were not required for most firms until 1994 (Statement of Financial Accounting Standards (SFAS) 119), our data for the 1987 and 1992 periods are based only on very limited voluntary disclosures. To address this issue, we take two approaches. First, we classify any firm that reports derivative usage at any point in the sample as a user and any firm that does not report as a non-user. Second, we estimate our regressions using only the 1997 sample period and the 1997 derivatives usage data since this is where we expect that the data are most representative.

Table 7 presents our results using the two approaches. The results for all sample years with inferred derivatives usage is reported in columns 1 (all firms) and 2 (non-users only). The results for 1997 are reported similarly in columns 3 and 4. Our results are consistent with the findings in Allayannis and Weston (2001) and Nelson, Moffitt, and Affleck-Graves (2005) with the use of derivatives resulting in increased Tobin's q. For the full sample of firms and for 1997 separately, we estimate a positive and significant coefficient on the derivatives indicator variable. At the same time, the derivatives variable has little influence on the sign and significance of cash-flow volatility, indicating that our results are capturing more than just the usage of derivatives. Further, when we estimate the effect of cash-flow volatility for the sample of non-derivative users, we continue to find a negative and significant effect on firm value. Given that there are a variety of mechanisms with which firms can manage cash-flow volatility (i.e., tax planning, payment/collection management, investment timing), our results are consistent with the notion that risk-management activities in general add value, but also highlight the market's preference for smooth cash flows that goes beyond a firm's financial risk-management activities.

[12] The results are not sensitive to different autoregressive integrated moving average (ARIMA) model forms suggested by Brown and Rozeff (1979).

[13] We thank Jacquelyn Moffitt and Betty Simkins for providing the derivatives usage data. Although all three studies use slightly different methodologies to collect derivatives usage data, they all employ the same basic strategy of searching the footnotes of firms' annual reports for key phrases associated with the use of financial derivatives. In a small sample of overlapping observations between the different samples, we found the correlation of the derivatives usage indicator is greater than 90%.

Table 7
The effect of financial derivatives

The table presents results from pooled regressions of the log of Tobin's *q*, on cash-flow volatility, the use of financial derivatives, and other measures capturing risk and growth opportunities. All regressions include two-digit SIC controls and all variables are defined in the Appendix. *p*-Values are reported beneath the coefficient estimates in parentheses and are computed using standard errors robust to both firm and year clustering

Dependent variable: ln(Tobin's *q*)	All years		Year = 1997	
	Full sample (1)	Non-users only (2)	Full sample (3)	Non-users only (4)
Derivatives indicator	0.102		0.083	
	(0.000)		(0.000)	
ln(Cash-flow volatility)	−0.149	−0.130	−0.217	−0.204
	(0.000)	(0.000)	(0.000)	(0.000)
ln(Systematic risk)	0.049	0.054	0.061	0.069
	(0.000)	(0.000)	(0.000)	(0.000)
ln(Idiosyncratic risk)	−0.008	−0.014	−0.013	−0.017
	(0.676)	(0.437)	(0.335)	(0.321)
ln(Total assets)	−0.064	−0.100	−0.010	−0.038
	(0.027)	(0.003)	(0.161)	(0.000)
Return on assets	0.238	0.112	0.110	0.021
	(0.004)	(0.050)	(0.126)	(0.780)
Sales growth	0.566	0.546	0.589	0.559
	(0.000)	(0.000)	(0.000)	(0.000)
CAPX-to-sales	0.071	0.068	−0.011	0.005
	(0.134)	(0.052)	(0.616)	(0.859)
Debt-to-total assets	−0.004	0.141	−0.185	−0.069
	(0.981)	(0.385)	(0.000)	(0.288)
R&D-to-sales	0.116	0.100	0.094	0.081
	(0.000)	(0.000)	(0.000)	(0.000)
Advertising-to-sales	2.227	1.670	1.397	0.607
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.297	0.328	0.518	0.668
	(0.000)	(0.000)	(0.000)	(0.000)
Year indicator (1987)	−0.398	−0.395		
	(0.000)	(0.000)		
Year indicator (1992)	−0.264	−0.258		
	(0.000)	(0.000)		
Adj. R^2	0.275	0.289	0.276	0.295

4.6. Matched sample analysis

Although the regression results presented above suggest a negative relation between cash-flow/earnings volatility and firm value, these results may be suspect if there is a nonlinear relation between Tobin's *q* and our control variables. Further, the tests presented in Section 3 were ill-suited to uncovering any incremental effect of earnings smoothing via accruals after controlling for cash-flow volatility given the multicollinearity between the two measures. To address concerns over potential regression misspecification, we also estimate the effect of cash-flow/earnings volatility on firm value using a matched sample methodology.

For each firm-year, we find another firm-year in our sample that closely resembles that observation in size (total assets), profitability (ROA), and idiosyncratic risk.[14] After constructing a sample of closely matched pairs of observations, we examine how the differences in cash-flow volatility (or alternatively earnings volatility) between each pair affect the differences in Tobin's *q*. The advantage of this procedure is that we are comparing observations in our sample that, ideally, differ only in their cash-flow or earnings volatility. As a result, our inference does not depend on the ad hoc assumption of a linear relationship.

The results from this analysis (not reported in a table) suggest that our results are not driven by nonlinearities. Consistent with our previous results, we find a strong negative relationship between cash-flow volatility and firm value. We find similar results based on earnings volatility as well. Further, the economic magnitude and statistical significance of our results from the matched sample analysis are consistent with those from the regression analysis.

In a second matched sampling exercise, we again form a sample of matched pairs but we also match on cash-flow volatility. We then separate the pairs into two subsets based on *earnings* volatility. That is, we construct two subsets of the data that have (statistically) the same size, ROA, idiosyncratic risk, and cash-flow volatility but differ

[14] The matching is done by minimizing the squared relative distance between all potential matches equally weighted across each matching characteristic without replacement.

significantly in their earnings volatility. Consistent with our regression results, we find no statistically significant difference in Tobin's q between the high-earnings volatility and low-earnings volatility subsets. Again, we conclude that earnings volatility matters only to the extent that it reflects the volatility of the underlying cash flows.

5. Conclusion

This paper tests the hypothesis that cash-flow volatility has a negative effect on firm value. While prior work suggests that cash-flow volatility is costly, that it permanently affects investment, and that risk management adds value, no prior work has directly investigated such a relation between value and the smoothness of financial statements. This is important as it provides a justification for the wide range of risk-management activities that firms engage in.

In general, we find that cash-flow volatility is significantly and negatively associated with firm value. These findings highlight the significance of risk-management activities aimed at mitigating cash-flow volatility but also indicate a more general preference for smooth cash flows that goes beyond a firm's financial risk-management activities. It is also important to note that our tests do not specifically reject the positive effect of volatility on firm value as argued by Merton (1974) or Pastor and Veronesi (2003). However, in our sample, the value destruction from an increase in cash-flow volatility appears to outweigh any potential gain.

Our results also show that earnings smoothing via accruals does not add value. This is an important distinction from the prior literature and suggests that managers focus their activities on producing smooth cash flows rather than concerning themselves necessarily with reporting smooth earnings via accrual estimates. These findings are not entirely consistent with the views of CFOs found in the survey results of Graham, Harvey, and Rajgopal (2005), which indicate that firms appear to focus solely on the production of smooth earnings streams, without distinguishing between the two components of earnings: cash flows and accruals. Our paper demonstrates that the common perception among CFOs in their sample that smooth earnings produce a market premium is related to the cash-flow portion of earnings.

Financial statement volatility has a direct effect on a firm's perception in the public capital markets (e.g., through analyst following, institutional investor activity, and perceived borrowing costs). As a result, our paper contributes broadly to the risk management literature by identifying a channel through which real financial statement volatility is costly and directly affects value. Our results indicate that managers' efforts to produce smooth financial statements add substantial value to the firm, but only through the management of real cash flows.

Appendix

Accrual volatility: Standard deviation of accruals, calculated as income before extraordinary items (Compustat quarterly data item 76) less operating cash flows (Compustat quarterly data item 108) all divided by basic shares outstanding (Compustat quarterly data item 15). We also utilized the coefficient of variation along with dividing by total assets as opposed to shares. Reported results utilize the perfect foresight measure utilizing up to 5 years of quarterly data to calculate volatility.

Advertising expenditures: This item represents the cost of advertising media (radio, television, newspapers, periodicals) and promotional expense (Compustat annual data item 45).

Beta: Computed from the market model based on 5 years of monthly returns against the CRSP value-weighted index. For example, the beta for a firm for the 1990 observation is based on the monthly returns between 1986 and 1990. In the regressions, we use alternatively contemporaneous and perfect foresight betas following Shin and Stulz (2000).

Capital expenditures: This item represents capital expenditures restated up to 10 years for acquisitions, accounting changes, and/or discontinued operations. Restated data are collected from summary presentations and are reported by the company.

Cash-flow volatility: Standard deviation of operating cash flows (Compustat quarterly data item 108). Also use alternatively the standard deviation of the residuals from various time-series models described in text. Finally, we also utilized the coefficient of variation as in Minton and Schrand (1999). Reported results utilize the perfect foresight measure including up to 5 years of quarterly data to calculate volatility.

Derivates indicator: Equal to one if the company utilized derivatives at any point during the period 1990–2001 according to the combination of the Nelson, Moffitt, and Affleck-Graves (2005), Allayannis and Weston (2001), and Pantzalis, Simkins, and Laux (2001) databases. Results are insensitive to restricting the derivatives indicator to equal one only if the company utilized derivatives in the fiscal year in question (i.e., either 1987, 1992, or 1997).

Earnings persistence: Computed as the AR(1) coefficient from regression of quarterly earnings on lagged four quarters earnings.

Earnings volatility-alternative measures: Standard deviation of earnings (using earnings measure (1). Also use alternatively the standard deviation of the residuals from various time-series models described in text, (2) further utilized the coefficient of variation of operating earnings as in Minton, Schrand, and Walther (2002). Earnings measure 1 is constructed using Compustat quarterly data item 9 which is 'EPS (Diluted) Excluding EI.' We also use earnings measure 2, which is constructed using Compustat quarterly data item 177 which is 'Earnings per share from operations.' Earnings measure 3 is constructed using Compustat quarterly data item 7 which is 'Earnings per share (diluted) including extraordinary items.' Earnings measure 4 is constructed using Compustat quarterly data item 11 which is 'Earnings per share (basic) including extraordinary items.' Earnings measure 5 is constructed using Compustat quarterly data item 19 which is 'Earnings per share (basic) excluding extraordinary items.'

Idiosyncratic risk: Computed as the residual risk from the market model as in Shin and Stulz (2000) utilizing up to 5 years of monthly returns and the value-weighted CRSP index as a proxy for the market returns.

Long-term debt: Compustat annual data item 9. This item represents debt obligations due more than 1 year from the company's balance sheet date or due after the current operating cycle.

Market risk: Standard deviation of the CRSP value-weighted market return based on 5 years of monthly returns over the future 5 years of the observation unit. That is, the 1987 value for market reflects the 1988–1992 period. However, in our statistical tests, we use alternatively the contemporaneous as well as the perfect foresight forecast measures.

Number of common shares outstanding: Measured at the end of the calendar year in millions. Compustat annual data item 25. This item represents the net number of all common shares outstanding at year-end.

Operating cash flows: Compustat quarterly data item 108, 'Operating Activities Net Cash Flow.' We compute this measure each quarter for each firm and take the equally weighted time-series average over all quarters during each 5-year period.

Research & development expenses: This item represents spending on research and development expenses as reported by the firm. Compustat annual data item 46.

Sales growth: The compound annual growth rate of annual sales (Compustat annual data item 12) over a 5-year period, where we utilize both the perfect foresight measure as well as the contemporaneous version.

Share price: Measured at the close of the fiscal year. Compustat annual data item 199.

Systematic risk: Constructed as beta squared multiplied by the variance of the market return (CRSP value-weighted index). Beta and the variance of the market return are estimated over a 5-year period utilizing logged monthly returns including distributions. Reported results utilize the perfect foresight measure as in Shin and Stulz (2000).

Tobin's q: Utilize the market-to-book ratio as a proxy. Constructed as the ratio of the market value of equity and book value of long-term debt all divided by total assets. The market value of equity is constructed by multiplying the share price times the number of common shares outstanding.

Total assets: Compustat annual data item 6. This item represents current assets plus property, plant, and equipment, plus other non-current assets (including intangible assets, deferred charges, and investments and advances).

Total risk: Constructed as systematic risk plus idiosyncratic risk as in Shin and Stulz (2000). In the reported results, we use the perfect foresight measure as in Shin and Stulz (2000), but conduct robustness tests utilizing contemporaneous measures.

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