Earnings volatility, cash flow volatility, and firm value

George Allayannis[1]
Darden Graduate School of Business, University of Virginia
PO Box 6550, Charlottesville, VA 22906
(434) 924-3434, allayannisy@darden.virginia.edu

Brian Rountree
Jones Graduate School of Management Rice University
6100 Main Street, Houston TX 77005
(713) 348-5328, rountree@rice.edu

James P. Weston
Jones Graduate School of Management Rice University
6100 Main Street, Houston TX 77005
(713) 348-4480, westonj@rice.edu

This version: December 2005

[1] We would like to thank Jennifer Blouin, Susan Chaplinsky, Ken Eades, Gustavo Grullon, Mike Lemmon, Bernadette Minton, Thomas Moeller, Karen Nelson and seminar participants at McGill University and the University of Utah for their many helpful suggestions. The first author also wishes to thank the Darden School Foundation and the Batten Institute for summer support and the third author a research fellowship from the Batten Institute.

Abstract

This paper presents empirical evidence that cash flow volatility is negatively valued by investors. The magnitude of the effect is substantial with a one standard deviation increase in cash flow volatility resulting in approximately a 32 percent decrease in firm value. We fail to document an increase in value associated with earnings smoothing resulting from managers' accrual estimates. Our results are consistent with risk management theory and suggest that managers' efforts to produce smooth financial statements may add value to the firm, but only via the cash component of earnings.

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) argue that smooth cash flows can add value by reducing a firm's reliance on costly external finance.[2] Empirically, Minton and Schrand (1999) show that cash flow volatility is costly as it affects a firm's investment policy by increasing both the likelihood and the costs of raising external capital.[3] One recurring theme in this literature is that, ceteris paribus, firms with smoother financial statements should be more highly valued. While previous research finds that cash flow volatility is costly, no direct evidence exists linking financial statement volatility to firm value. Such a link is important because, in order for risk management to matter, smooth financials must be valued at a premium to more volatile ones. 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. Consistent with risk management theory, we find strong evidence that cash flow volatility is negatively related to proxies for firm value.

Given investors', analysts', and managers' apparent focus on earnings, rather than cash flows, we further investigate whether earnings volatility also plays a role as a signal of financial smoothness, in addition to cash flow volatility. There are a number of reasons why earnings volatility may matter to the firm, independent of cash flow volatility. For example, prior empirical work suggests that analysts tend to avoid covering firms with

---

[2] 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

[3] Earlier related work documents an inverse relation between investment and financial liquidity (see., e.g., Fazzari, Hubbard, and Petersen (1988); Kaplan and Zingales (1997); and Lamont (1997))

volatile earnings, as it increases the likelihood of forecast errors (see, e.g., Brennan and Hughes (1991), and Schipper (1991)).[4] Similarly, Badrinath, Gay, and Kale (1989) find that institutional investors avoid companies that experience large variations in earnings. High earnings volatility also increases the likelihood of negative earnings surprises; in response, managers have engaged in extensive earnings smoothing. Trueman and Titman (1988) suggest that earnings smoothing reduces a firm's perceived probability of default and therefore a firm's borrowing costs. Goel and Thakor (2003) suggest that a firm may smooth earnings so as to reduce the informational advantage of informed investors over uninformed investors, and therefore protect these investors who may need to trade for liquidity reasons. Finally, Francis, Lafond, Olsen, and Schipper (2004) find firms with greater earnings smoothing have a lower cost of capital even after accounting for cash flow volatility.

In this paper, we examine whether earnings volatility is also negatively associated with firm value, in addition to cash flow volatility. Our results indicate the market does not value earnings smoothing behavior after accounting for the volatility in the underlying cash flows.[5] In fact, under certain specifications the market appears to punish firms for undertaking smoothing behavior preferring earnings volatility mirror cash flow

---

[4] Although Barth, Kasznik, and McNichols (1999) argue that analyst following could be greater for highly volatile stocks, as these are the stocks for which analysts can potentially add more value through coverage and hence stand to benefit more. Low analyst coverage is associated with lower value due to higher information asymmetries (see e.g., Merton (1987) for theoretical argument, and Lang, Lins, and Miller (2003), among others, for empirical evidence.)

[5] Early work in the accounting literature documented a negative stock price reaction upon announcements of changes in accounting rules expected to increase earnings volatility (see, e.g., Collins, Rozeff, and Dhaliwal (1981), and Lys (1984)). More recently, Zenner (2001) using a simulation approach shows that a reduction in earnings volatility from 85% to 20% increases firm value by roughly 4.5%. Finally, Hunt, Moyer, and Shevlin (2000) suggest that smoothing results in higher multiples on reported earnings and Thomas and Zhang (2002) find that smoothing generates higher forward P/E ratios.

volatility. These results are important and suggest managers focus their actions on smoothing cash flows rather than necessarily utilizing accruals to smooth earnings.

Of course, there are a number of other ways in which financial uncertainty interacts with firm value. According to the CAPM, systematic risk should be negatively related to value, since higher discount rates yield a lower value, ceteris paribus. Further, recent empirical work suggests that not only does systematic risk affect value, but also idiosyncratic risk may be priced (Shin and Stulz, 2000). We find a negative relation between systematic risk and firm value, as well as a negative and significant association between unsystematic risk and firm value.[6] 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 actual stability of the firms' financial statements and are directly affected by managerial decisions and the firms' risk management policies.

Using a large sample of non-financial firms, we present evidence that cash flow volatility is negatively and significantly associated with Tobin's Q utilizing the market-to-book ratio as a proxy. The magnitude of the effect varies across different tests, but is always large. Specifically, we find that a one standard deviation increase in cash flow volatility is associated with a 30-37 percent reduction in firm value. Our results are robust to various sets of control variables, estimation techniques, sub-periods, sub-samples, and to a number of different methods for estimating earnings and cash flow volatility.

Although we find that cash flow volatility has a negative effect on firm value in all of our tests, we are unable to find a similarly negative effect for earnings volatility at

[6] 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), and Malkiel and Xu (2002))

the same time.   These results are robust to several alternative measures of earnings volatility as well as more direct measures of earnings smoothing like the ratio of earnings volatility to cash flow volatility and the association between contemporaneous changes in accruals and changes in cash flows (Leuz et al. (2003)). These findings are inconsistent with the market valuing earnings smoothing behavior via accrual management, and instead indicate value from any earnings smoothing activities stems from management of the cash flow component of earnings.

The remainder of the article is organized as follows. Section 1 describes our sample and develops our hypothesis. Section 2 presents our empirical methodology and the tests of the relation between earnings and cash flow volatility and firm value. Section 3 examines the robustness of our empirical results and Section 4 concludes.

1. Sample Description and Hypothesis Development

1.1 Related Literature and Hypothesis Development

Prior empirical research in risk management has answered a series of important questions. For example, Nance, Smith and Smithson (1993), Tufano (1996), Mian (1996), Geczy, Minton, and Schrand (1997), Haushalter (2000), Brown (2001), and Graham and Rogers (2002), among others, have examined currency, interest rate, and commodity hedging activities by firms across industries or within a particular industry and the extent to which these activities are consistent with existing hedging theories (e.g., Stulz (1984), Smith and Stulz (1985), Froot et al (1993), DeMarzo and Duffe (1995), Leland (1998), etc.). Related work has examined alternative hedging practices, such as the use and relationship of financial derivatives and accrual management (Barton (2001)).

Another more recent strand of the literature has focused on linking hedging activities to firm value and on examining the basic premise behind hedging, namely that the volatility of cash flow is costly for firms. For example, Allayannis and Weston (2001) find that the use of currency derivatives, a proxy for hedging, improves value substantially. Similarly, Minton and Schrand (1999) find evidence that cash flow volatility is costly and that it permanently affects investment. They find a strong negative association between cash flow volatility and average levels of investment in capital expenditures, R&D and advertising and a positive association between cash flow volatility and costs of accessing external capital. These findings suggest that cash flow volatility increases both the likelihood as well as the costs of accessing external capital markets.

Our study contributes to this literature by directly testing the hypothesis that firms with smooth financials are valued at a premium relative to firms with volatile financials while controlling for other determinants of firm value, such as size, leverage, profitability, and growth, as well as alternative types of risk, such as systematic and idiosyncratic. Specifically, if cash flow volatility is costly as documented by Minton and Schrand (1999), then it should negatively affect firm value. Our test of this hypothesis extends the findings in Allayannis and Weston (2001) by explaining why hedging may have a positive impact on firm value. This is an important result because it identifies the transmission mechanism through which risk management can impact firm value, namely, by producing a smoother series of financial statements. In addition, this result also complements evidence by Minton and Schrand (1999) on the costs of cash flow volatility, as it documents the negative impact of cash flow volatility on value.

We also test the hypothesis that earnings volatility negatively affects firm value. Financial risk management affects cash flow volatility, and in turn, earnings volatility. However, firms can also affect earnings volatility directly by engaging in earnings smoothing via accrual estimates. The literature has documented a number of reasons firms may want to report smooth earnings. For instance, low earnings volatility may increase analysts' following and improve value (Lang et al. (2002)), attract a larger number of institutional investors (Badrinath et al. (1989)), and/or reduce the perceived borrowing costs (Trueman and Titman (1988), Francis et al. (2004)). Several theoretical models have been developed arguing that income smoothing relates to managers desire to signal their private information about future earnings to investors (Kirschenheiter and Melamud, (2002), Sankar and Subramanyam (2001), Demski (1998). Given these arguments, if income smoothing via accruals is valued by investors then we expect earnings volatility to be negatively related to firm value after accounting for cash flow volatility.

1.2 Sample Description and Methodology

Our initial sample includes all firms with non-missing observations for assets and sales for which we find matching data on CRSP and both quarterly and annual COMPUSTAT databases between 1983 and 2002. However, the nature of our tests, which requires estimation of earnings and cash flow volatility and systematic/unsystematic risk imposes strong data requirements for inclusion in our final sample. In order to compute market model betas and residuals, we select only firms with at least 30 non-missing monthly returns for a given five-year period (1983-87, 1988-92, and 1993-1997). Further, to estimate the volatility of quarterly earnings we require each firm to have at least ten non-missing quarterly observations for earnings per share during each five-year period. Since our tests use five-year measures that are both forward and backward looking, firms must have sufficient data in both the previous five years, and in the following five years to be included in our sample. Thus, we use only valid observations for 1987, 1992 and 1997 in our analysis.

The use of independent sample periods to estimate earnings and cash flow volatilities ensures that our measures of earnings and cash flow volatility (as well as idiosyncratic and systematic risk) are not suffering from severe serial correlation; however, the drawback is that such requirement reduces the number of observations used. Even so, the correlations between the earnings (cash flow) volatilities estimated between the periods are high (0.51 and 0.73 respectively), which makes the use of overlapping data, an unattractive alternative. The final sample consists of a total of 6,997 firm-year observations. While our sample selection may be restrictive, our sample is generally representative of the COMPUSTAT population, though our firms are a little larger and hold less debt. Nevertheless, our inferences are not contaminated by any selection bias induced by our screens since our tests are entirely restricted to within-sample comparisons.

Table 1 reports summary statistics of our main variables. Panel A reports statistics on the sample characteristics and Panel B reports statistics on our risk measures. Our sample firms have a mean value of assets of $1,396 million (median of $143) and a mean equity value of $1,239 million. On average our sample's debt-to-assets ratio is 0.19 (median of 0.14). We measure growth a number of different ways with the first one being the compound annual sales growth rate over the future five years. Mean (median) sales growth for our sample firms was 0.08 (0.06). 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 0 in order 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.[7] Our sample mean market-to-book ratio is 1.57 and the median is 1.10.[8] These values are similar to values for *Q* documented in earlier studies (see, e.g., Allayannis and Weston (2001)).

Our primary measure of cash flow is cash flow from operations from the statement of cash flows (COMPUSTAT quarterly data108) scaled by shares outstanding (quarterly data61) adjusted for stock splits (quarterly data17). 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 this somewhat restrictive, the purpose of our tests is to examine the valuation of smooth financial statements therefore we view it as necessary to utilize financial statement numbers that are actually reported by the firm rather than the alternative of constructing cash flow numbers utilizing income statements and changes in balance sheet items. Further, Hribar and Collins (2002) illustrate that utilizing income statements and balance sheets to estimate accruals can severely bias estimates sometimes completely altering statistical relations. Given cash flows are also

[7] This methodology is common in the literature. For example, the methodology has been used in cross-listing (see Doidge, Karolyi, and Stulz (2003)), corporate diversification (Lang and Stulz (1994), and Servaes (1996)), takeovers (Servaes (1991)), equity ownership (La Porta, Lopez de Silanes, Shleifer, and Vishny (2002) and Lins (2003)), and risk management (Shin and Stulz (2000), and Allayannis and Weston (2001)).
[8] 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.

calculated utilizing changes in balance sheet items, the bias documented in Hribar and Collins (2002) also potentially extends to cash flows. We address this issue in the robustness section of the paper.

Our main measure of earnings is diluted earnings per share before extraordinary items (quarterly data9), but we have also used alternatively a) earnings per share from operations (data177) b) operating income before depreciation (data 21) scaled by average total assets, as well as c) basic earnings per share (both with and without extraordinary items). Our results are robust to the use of these alternative earnings measures. As shown on Table 1, Panel B, the mean (median) quarterly earnings per share for our sample firms is 0.06 (0.09), and the average (median) standard deviation of earnings per share is 0.37 (0.19).

It is important to note exactly which measures of risk should be related to firm value. Of course, past volatility should be priced into firm value at time t: Therefore, it is somewhat difficult to make inferences regarding Tobin's *Q* and past levels of earnings or cash flow volatility. What should matter for firm value at time t is the expectation of future cash flows or earnings volatility. Since risk measures do not follow a random walk (see Shin and Stulz (2000) for a discussion) we cannot assume that earnings/cash flow volatility at time t equals earnings/cash flow volatility at time t + 1. As a result, we follow Shin and Stulz (2000) in constructing a "perfect foresight" model of earnings and cash flow volatility. We use earnings or cash flow volatility in t + 1 as our measure of the time *t* expected future volatility. For example, our measure of earnings/cash flow volatility for firm *i* in 1987 would be the standard deviation of quarterly earnings/cash flow in years 1988-1992. 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 over-estimate financial statement volatility.[9]

Our measures of cash flow and earnings volatility are constructed as the standard deviation of quarterly earnings per share and cash flow per share, respectively, over a five-year period.[10] That is, our measure for earnings volatility for each firm in 1987 is the standard deviation of quarterly earnings per share over the 20 quarterly observations between 1988 and 1992. While this method may be crude, Section 3.4 explores the sensitivity of our results to alternative measures based on alternative time-series models and illustrates our results are robust to a variety of different measurement schemes. To compare with earnings volatility, we use cash flow scaled by the number of shares, and alternatively cash flow scaled by assets, in our estimation of cash flow volatility. These two 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 0.32 and the mean cash flow volatility is 0.61. The average cash flow volatility is large and reflects the significant left-skewness present in many of our cash flow, earnings, and volatility measures. 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 impact of outliers in Section 3.1.

We estimate both systematic and firm-specific risk using a one-factor market model with returns on the CRSP value-weighted index as a proxy for the market. We

[9] Given the high observed autocorrelation of cash flow and earnings volatility, our results also do not change if we use "contemporaneous" estimates of earnings or cash flow volatility instead of the "perfect foresight" ones.
[10] Following Minton and Schrand (1999) we also utilized the coefficient of variation as a measure of earnings and cash flow volatility. The results are unaltered.

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 sample, we use alternatively the "contemporaneous" systematic risk estimated during 1984-1987, as well as the "perfect foresight" estimates during 1988-1992 (the same methodologies were utilized for the 1992 and 1997 periods). Firm specific risk is the difference between total risk and systematic risk, where we estimate total risk as the standard deviation of monthly returns over the five-year period. Similar to systematic risk, we use alternatively the "contemporaneous" as well as the "perfect foresight" estimates. This has no significant impact on our results and therefore we report results utilizing the contemporaneous measures. Our sample's average systematic risk is 0.020 and its average firm-specific risk is 0.140.

Table 2 presents correlations of our main variables. We note several interesting findings, although it is difficult to draw broad conclusions from such univariate statistics. Consistent with our hypothesis, both earnings and cash flow volatility are negatively correlated with firm value (-0.21 and -0.37 respectively). Further, Tobin's *Q* is positively associated with all of the growth measures and negatively associated with debt-to-total assets. Firm specific risk actually appears to be positively related to Tobin's *Q*, but given the univariate nature of this analysis we are hesitant to make conclusions from any of the results.

2. Cash flow volatility, earnings volatility, and firm value

2.1 Univariate tests

In this sub-section we present univariate tests of the hypothesis that earnings and cash flow 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 earnings volatility (Columns 1&2) or cash flow volatility (Columns 3&4). We then compute the average *Q* (columns 1 & 3) and the median *Q* (columns 2 & 4) for each quintile and compare *Q*s across the volatility quintiles. Consistent with our hypothesis, firms in the largest earnings volatility quintile have the lowest average *Q* of any quintile (1.21), while firms in the smallest earnings volatility quintile have the highest average *Q* of 1.98. In fact, *Q* declines monotonically across quintiles, that is, firms in the quintile with the second highest earnings volatility have the second lowest average *Q* (1.39), firms in the third quintile have the third lowest value (1.54) and so forth until the quintile with the lowest earnings volatility, which has the highest average *Q*. We obtain similar results using median *Q* instead of average *Q* (column 2). A similar pattern is observed when we classify firms into quintiles according to cash flow volatility (i.e., a monotonically declining average *Q* as cash flow volatility increases), the pattern is somewhat stronger as witnessed by the greater dispersion between the high and low categories in the both the mean and median columns. This is the first indication that perhaps the cash flow effect is stronger than the earnings effect.

Clearly, many factors may affect *Q* in a similar way as earnings/cash flow volatility, so to infer that earnings/cash flow volatility is inversely related to value, we need to exclude the impact of other factors on *Q*. While we develop multivariate tests of our hypothesis below, we also perform univariate tests with portfolios formed on conditional sorts. For example, we first classify firms according to size quintile and then, within each quintile, we sort again by earnings/cash flow volatility. Given the greater information asymmetries that exist for small firms and the potential larger bankruptcy costs that small firms face (see Warner (1977)), we expect that the negative relationship between volatility and value is stronger (more severe) among small firms than among large firms. Table 3, Panels B, C and D present the results of these conditional univariate tests utilizing the earnings volatility measure as a proxy for financial statement risk.[11] Within each size quintile, we find that the average *Q* decreases almost monotonically as we move from low to high earnings volatility quintile. For example, within the largest size firms, the average *Q* goes down from 1.81 for the firms with the lowest earnings volatility to 0.99 for the firms with the highest earnings volatility with the difference being highly significant. A similar monotonic decrease is observed within most quintiles. The decrease in value in absolute magnitude and percentage terms occurs in the larger size quintiles, opposite from what we expected.

Table 3, Panel C shows results of a similar univariate test where we classify firms into quintiles according to their debt-to-assets ratio and earnings volatility. We expect firms with the highest debt-to-assets ratio to be more affected by earnings volatility than firms with the lowest debt-to-assets ratio, because firms with high debt-to-assets have presumably higher costs of accessing external capital markets and face higher bankruptcy costs. Surprisingly, we find that it is within the smallest debt-to-assets quintile that we find the largest decline in value as we move from low to high earnings volatility. Specifically, the average *Q* drops from 1.37 to 1.08 (a drop of 0.29 or 21.2 percent) within the largest debt-to-equity quintile, while it drops from 2.80 to 1.70 (a drop of 1.10 or 39.3 percent) within the smallest debt-to-equity quintile. A possible explanation is that these firms are associated with most entrenched management who dislike being

[11] The results are similar if we utilize cash flow volatility.

monitored (Berger, Ofek, and Yermack (1997)) or alternatively, that these are firms which cannot take on more debt as their future prospects are slim.

In addition to size and capital structure, the level of earnings may also reflect the cost of accessing external capital markets. As a result, the relationship between earnings volatility and value may differ depending on the level of earnings. Table 3, Panel D presents our results based on earnings level conditional sorts. Consistent with our expectations we find that for firms within the smallest quintile, there is a larger decline in value as we move from the quintile with the lowest earnings volatility to the quintile with the highest one (*Q* declines by 2.45, from 3.79 to 1.34 or 64.7 percent vs. 1.37 or 53.8 percent within the quintile with the highest earnings level). The decline however is not monotonic across earnings level quintiles.

Finally, Panel E reports results from univariate tests in which we classify firms based on both cash flow and earnings volatility. With the exception of quintiles 4 and 5, where the decline is not uniformly monotonic, we find that within each earnings volatility quintile, the average *Q* monotonically declines as cash flow volatility increases. Conversely, within each cash flow volatility quintile, the average *Q* either does not change significantly or it increases (see for example cash flow volatility quintile 5). The largest two cash flow volatility quintiles actually illustrate a significant increase in value as one moves from low to high earnings volatility. This is inconsistent with a market preference for smooth earnings (controlling for the underlying cash flow volatility) and in fact suggests that earnings smoothing actually destroys value in these two quintiles. This is an intriguing result given the benefits associated with earnings smoothing behavior documented in prior studies (i.e. lower cost of capital, more analyst following, greater institutional investor ownership, etc.). Given the seemingly contradictory findings, we will investigate this relation more fully below.

Overall, our univariate tests document a negative relationship between earnings and 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 earnings/cash flow level. In the next section we perform further multivariate tests, in which we control for other factors that have been shown previously to be related to value.

2.2 Multivariate tests

2.2.1 Earnings and Cash flow volatility levels

In this sub-section we present further regression-based tests of the hypothesis that cash flow and earnings volatility are 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 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 2-digit 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 put our data through two transformations before estimating our regression models. First, we take log transforms of our risk measures and size to reduce the potential impact of outliers on our analysis. Second, we standardize all of our variables by subtracting the sample mean and dividing by the sample standard deviation. Thus, all regression coefficients are presented in comparable units. None of these transformations 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 where 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 OLS regression with our log-scaled-transformed *Q* as the dependent variable and the variables described above as independent variables. The results we obtain are very similar to what theory predicts and are in line 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 not associated with value after controlling for these other factors. Note also the relatively high R^2 (0.24) obtained in the regression.

In Table 4, Column 2 we add our market measures of systematic and firm-specific risk to the explanatory variables used in column 1. This regression is similar to the one in Shin and Stulz (2000). We find a negative and significant association between systematic risk and firm value and a negative and significant association between firm-specific risk and firm value. These results are not perfectly consistent with the CAPM, which postulates a negative relationship between systematic risk and value and an insignificant relationship between firm-specific risk and value. However, 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), and Goyal and Santa Clara (2003)).

Proceeding with our regressions, Table 4, Column 3, adds earnings volatility as an alternative measure of risk. Our hypothesis is that earnings 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 our hypothesis, we find that earnings volatility is negative and significantly associated with *Q* suggesting that earnings volatility decreases value, as it increases the likelihood of negative earnings surprises and the perceived borrowing costs, and may result in lower analysts' coverage and lower institutional investor following (see e.g., Trueman and Titman (1988), Brennan and Hughes (1991), Lang et al. (2003), and Badrinath, et al. (1989), and Francis et al. (2004)). This finding is also interesting because it documents that the effect of earnings volatility is above and beyond the effect of firm-specific risk. Further, earnings volatility significantly improves the explanatory power of the regression. Specifically, the adjusted R^2 increases by 2.3 percentage points when we add earnings volatility to the model.

Our fourth regression (Table 4, Column 4) performs a similar test using cash flow volatility instead of earnings volatility. We find that cash flow volatility is also negatively and significantly related to firm value, consistent with the risk management hypothesis that cash flow volatility is costly. The R^2 improvement in this regression is even more substantial resulting in an increase of 8.2 percentage points. This is an indication that cash flow volatility matters more than earnings volatility for valuation purposes.

Finally, regression 5 includes all measures of risk together. Our results for our control variables and market risk measures remain unaltered. Further, the results for cash flow volatility remain unchanged even after the addition of earnings volatility. The effect on value is quite strong with the coefficient indicating a one standard deviation increase in cash flow volatility results in 36.8 percent decrease in value. This is consistent with Minton and Schrand (1999) and illustrates the value to presenting smooth cash flows.

By including cash flow volatility in the regression, we have altered the interpretation of the coefficient on earnings volatility. As previously discussed, earnings volatility can be reduced via cash flow management or via the accrual estimates of managers. When both cash flow and earnings volatility are included in the model, the coefficient on earnings volatility represents the value of smoothing earnings via accrual management. With this in mind, the result for earnings volatility is drastically altered when considered simultaneously with cash flow volatility as witnessed by the fact that the coefficient switches from negative and significant in regression 3 to positive and significant in regression 5. Further, the presence of earnings volatility only marginally improves the explanatory power of the model when cash flow volatility is included by itself (0.2 percentage point improvement in R^2 relative to regression 4), whereas cash flow volatility significantly enhances the explanatory power relative to regression 3, which only includes earnings volatility. The positive and significant coefficient on earnings volatility is inconsistent with earnings smoothing behavior adding value. In fact, it suggests that earnings smoothing via accrual management actually reduces value.

In unreported analyses, we included two additional measures of earnings smoothing behavior utilized by Leuz et al. (2003): 1) the ratio of earnings volatility to cash flow volatility and 2) the association between accruals and contemporaneous cash flows, as well as the association between changes in accruals and cash flows. We utilized five years of quarterly data to calculate both measures and required that a firm have at least ten observations to be included in the sample. The lower the ratio of earnings to cash flow volatility the greater the earnings smoothing related to accrual activity. Likewise the more negative the association between accruals and cash flows the greater the smoothing.[12] The results from these tests again failed to illustrate that earnings smoothing was valued by the market.

To control for potential period specific effects, as well as the lack of independence from multiple observations of the same firm, we estimate the full model (regression 5 of Table 4) each period and report the results in Table 5. Our sub-periods were chosen to 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 sub-periods with cash flow volatility always being negative and significant.[13] This indicates that regardless of the economy's performance low cash flow volatility is seen as valuable after controlling for risk and growth opportunities. The results also illustrate that earnings volatility is generally not priced or if so (1992) the pricing is not consistent with

[12] The negative correlation indicates income smoothing since for a negative shortfall in cash flows there would be a positive accrual estimate offsetting the effect of the shortfall (or vice versa).

[13] The results for firm specific risk and size vary over the periods, with firm specific risk and size actually being positively priced in 1997. However, results for earnings and cash flow volatility, our variables of interest, are unaltered if we exclude these variables from the analysis.

market participants valuing earnings smoothing that results from managerial estimates of accruals.

Although we have been unable to document earnings smoothing behavior adds value, it may be that smoothing behavior is only valuable when cash flow volatilities are relatively high. With high cash flow volatility, earnings smoothing may signal to the market that management believes the unobservable economic income is more stable than the cash flows would have one believe. It is more difficult to make this argument if cash flow volatility is already low. The current regressions hold cash flow volatility constant when assessing the importance of earnings volatility, but the coefficient may actually vary across differing levels of cash flow volatility. In order to assess this, we separate sample firms into cash flow volatility quintiles and re-estimate regression 3 from Table 4 by cash flow volatility quintile including only earnings volatility.[14] The results presented in Table 6, Panel A again fail to detect any value to earnings smoothing behavior as witnessed by the lack of significance on the coefficient for earnings volatility in any quintile. As a final robustness check on this result, we sorted firms on earnings volatility quintiles and then performed the same regressions this time including cash flow volatility instead of earnings volatility. If the market utilizes earnings volatility instead of cash flow volatility to judge the risk of economic income then here we would expect the coefficient on cash flow volatility to be insignificant (at least in the lower earnings volatility quintiles where smoothing is more likely). The results presented in Panel B indicate this is not the case with all quintiles exhibiting a significantly negative coefficient on cash flow volatility.

[14] Cash flow volatility is implicitly controlled for by separating firms into cash flow volatility quintiles prior to estimating the regressions. Results are unaltered if cash flow volatility is included in the regressions.

Overall, our results are consistent with the findings in Minton and Schrand (1999) and further illustrate that cash flow volatility is valued even after controlling for risk and growth opportunities. Further, the findings indicate that earnings smoothing has no inherent value after controlling for cash flow volatility.

In all of our tests above we have found 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 and earnings volatility, if high *Q* and high earnings and 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 story suggesting that volatility is costly and that it negatively impacts value. As a result, we think it is unlikely that our results are systematically biased by endogeneity between cash flow/earnings volatility and value.

Another potential concern is that earnings/cash flow volatility may simply pick up the impact of hedging on Q, which Allayannis and Weston (2001) document. Hedging would reduce cash flow volatility and therefore low cash flow volatility may be an indication that firms hedge, which in turn leads to a higher value. Our findings are broadly consistent with this explanation, however our results extend to other forms of cash flow management, including timing of payments/collections and tax planning among others. Further, we provide an incremental contribution to Allayanis and Weston (2001) since we provide evidence for the transmission mechanism whereby hedging can create value by producing a smoother time-series of financial statements.

3. Robustness

This section explores the robustness of our results to a number of different regression specifications and estimation methodologies. We begin with tests of the hypothesis that earnings and cash flow volatility are negatively related to firm value based on five-year change regressions (rather than levels). We also investigate the sensitivity of our results to a variety of specifications and estimation techniques, the role of financial distress, and our estimation of earnings/cash flow volatility. All of these tests do not change the conclusions from our tests presented in Section 2 and continue to support the hypothesis that relatively smooth financial statements are valued at a premium.

3.1 Alternative specifications and estimation techniques.

Overall, both our pooled and annual regression results are robust. Our results are almost identical regardless of the estimation technique or particular regression specification that we use. Specifically we find qualitatively similar results under the following specifications:

a) 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.
b) The inclusion of cash flow level and earnings per share as additional controls.
c) The inclusion of 3-, or 4-digit SIC industry controls (instead of 2-digit SICs).

d) The use of total risk in lieu of systematic and idiosyncratic risk.
e) Using the variance (instead of the standard deviation) of earnings and cash flow.
f) Using either the "perfect-foresight" measures described in section 1.2 or the contemporaneous value for either earnings or cash flow volatility.
g) Sensitivity to outliers: We find qualitatively similar results based on a sample where we winsorize all of our variables at ten percent.
h) The use of long run changes in Tobin's *Q* as the dependent variable (i.e. changes rather than levels).
i) Following Minton and Schrand (1999), we also utilized coefficients of variation as measures of earnings and cash flow volatilities.
j) The use of Price-to-Earnings ratios as a measure of firm value rather than Tobin's *Q*.

Given the strength of our results, our robustness tests find support for the conclusions presented in Section 2 that financial statement smoothness matters, ceteris paribus, to investors. Further, we are unable to detect earnings smoothing matters after controlling for risk, growth factors, and cash flow volatility.

Our results are however sensitive to the estimation of cash flows utilizing income statement and balance sheet information rather than the reported cash flows from the financial statements. For instance, if we adopt the methodology in Minton and Schrand (1999) to calculate cash flows (i.e. Sales less cost of goods sold less selling, general and administrative expenses, less the change in working capital), then the coefficient on earnings volatility is negative and significant, incrementally to the negative and significant coefficient on cash flows. In fact, the effect of earnings volatility is larger than the effect of cash flow volatility suggesting earnings smoothing via accruals is valued more than smoothing via cash flow management. Although Barth et al. (2001) illustrates that current earnings are better predictors of future cash flows than current cash flows our use of future realized volatilities reduces the apparent information advantage in earnings for future cash flows.[15] Therefore, given our research design, we find it implausible for earnings volatility to have a greater effect on value than cash flow volatility leading us to conclude the calculation of cash flows utilizing income statement and balance sheet accounts is measured with considerable error for our sample of firms. This is consistent with the findings in Hribar and Collins (2002) and helps to illustrate that their findings are not only important for accrual estimation, but they are also important for analyses using cash flows.

3.2 Financial Distress

It could simply be the case that our measures of earnings and cash flow volatility serve as a proxy for firms facing 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 sub-sample of firms that are in (or near) financial distress, we test our hypothesis based on a sub-sample of firms excluding firms that meet any of the following selection criteria:

a) Negative average quarterly earnings over the five-year period.

b) Negative average quarterly cash flows over the five-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;

[15] However, as previously mentioned, our results are robust to utilizing contemporaneous measures of volatility.

these are firms that are unlikely to be in financial distress. Such filters eliminate over 60 percent of our observations to a final sample of 2,548 firm years. Nevertheless, we continue to find that cash flow volatility has a negative effect on firm value and earnings smoothing is not valued. These results are, again, both statistically and economically significant.

3.3 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 five-year period. This measure is somewhat crude and could be biased if earnings or cash flows are non-stationary (i.e., exhibit persistence, trend, or seasonality). In this sub-section we explore the sensitivity of our results to our estimation of the volatility. Our general approach is to estimate a time-series model for earnings and cash flows and compute the time-series volatility only for the stationary component of the data.

There is a vast literature in accounting (see e.g., Brown (1993) and references therein) suggesting that generally, earnings are strongly persistent and exhibit seasonality. To account for such time-series properties, 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:

$$E_t = \alpha + \beta_1 E_{t-1} + \sum_{q=2}^{4} \beta_q I_{Quarter} + \varepsilon_t \tag{1}$$

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. We estimate the above model for each firm separately based on our full sample of fifteen years of quarterly earnings data (1988-2002). Using the results from this regression for each firm, we compute the five-year sample standard deviation of the estimated residuals:

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

We use a similar model to estimate cash flow volatility. In addition to the simple time-series model described above, we also computed residuals using alternative time-series models that include additional lags of earnings or cash flows as well as a mean reversion (E_{t-4}) term. Using the residuals from any of these alternative time-series models to compute earnings or cash flow volatility does not qualitatively alter any of our results.

As in Section 2, and consistent with the alternative specifications described above, 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 and earnings smoothing is not valued by investors.

4. Conclusions

This paper tests the hypothesis that earnings and cash flow volatility have 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 investigated directly such a relation between value and the smoothness of financial statements. This is important as it provides a justification for the widespread risk management activities that firms engage in.[16]

In general, we find that cash flow volatility is significantly and negatively associated with firm value, while earnings volatility is either not valued or positively

---

[16] Allayannis and Weston (2001) report that approximately 64% of their sample firms with exposure to exchange rate risk use currency derivatives to hedge their exposures.

valued after controlling for cash flow volatility. These findings illustrate the importance of risk management activities aimed at reducing future cash flow volatility. Furthermore, our results indicate that earnings smoothing accomplished through accrual estimates does not appear to be valued by the market. 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.

In general, our paper contributes to the broader risk management literature by documenting that financial statement volatility is costly and that it directly affects value. Our results are consistent with risk management theory and suggest that managers' efforts to produce smooth financial statements add value to the firm.

References

Allayannis, G., and Weston J., 2001, The Use of Foreign Currency Derivatives and Firm Market Value, *The Review of Financial Studies*, 14, 243-276.

Badrinath, S.G., Gay, G.D., and Kale, J.D., 1989, Patterns of Institutional Investment, Prudence and the "Managerial Safety Net" Hypothesis, *Journal of Risk and Insurance* 56, 605-629.

Barton, J., 2001, Does the use of Financial Derivatives Affect Earnings Management Decisions? *The Accounting Review*, 76, 1-26.

Barth, M., Cram, D., and Nelson, K., 2001, Accruals and the prediction of future cash flows, *The Accounting Review*, 76, 27-58.

Barth, M., Kasznik, R., and McNichols, M., 1998, Analyst Coverage and Intangible Assets, *Journal of Accounting Research* 39, 1-34.

Berger, P., Ofek, E., and Yermack, D., 1997, Managerial Entrenchment and Capital Structure Decisions, *Journal of Finance* 52, 1411-1438.

Berk, J., Green, R., and Naik, V., 1999, Optimal Investment, Growth Opportunity, and Security Returns, *Journal of Finance* 54, 1553-1607.

Brennan, M., and Hughes, P., 1991, Stock Prices and the Supply of Information, *Journal of Finance* 46, 1665-1691.

Brown, G., 2001, Managing Foreign Exchange Risk with Derivatives, *Journal of Financial Economics*, 60, 401-448.

Brown, L.D., 1993, Earnings Forecasting Research: its Implications for Capital Markets Research, *International Journal of Forecasting* 9, 295-320.

Collins, D., Rozeff, M., and Dhaliwal, D., 1981, The Economic Determinants of the Market Re- action to Proposed Mandatory Accounting Changes in the Oil and Gas Industry, *Journal of Accounting and Economics* 3, 37-71.

DeMarzo, P., and Duffe, D., 1995, Corporate incentives for hedging and hedge accounting, *The Review of Financial Studies* 8.

Demski, J.S., 1998, Performance measure manipulation, *Contemporary Accounting Research*, 15, 261-285.

Doidge, C., Karolyi, G.A., and Stulz, R., 2002, Why are foreign firms listed in the U.S. worth more? forthcoming, *Journal of Financial Economics*.

Fazzari, S., Hubbard, G., and Petersen, B., 1988, Financing constraints and corporate investment, *Brookings Papers in Economic Activity*, 141-195.

Francis, J., LaFond, R., Olsson, P.M., and Schipper, K., 2004, Costs of Equity and Earnings Attributes, *The Accounting Review* 79 No. 4, 967-1010.

Froot, K., Scharfstein, D., and Stein, J., 1993, Risk management: Coordinating corporate investment and financing policies, *Journal of Finance*, 48, 1624-1658.

Geczy, C., Minton, B., and Schrand, C., 1997, Why firms use currency derivatives? *Journal of Finance*, 52, 1324-1354.

Goel, A.M., and Thakor, A.V., 2003, Why do firms smooth earnings? *Journal of Business*76, 151-192.

Goyal, A., and Santa-Clara, P., 2003, Idiosyncratic Risk Matters, *Journal of Finance* 58, 975-1007.

Green, R.C., and Rydquist, K., 1997, The Valuation of Nonsystematic Risks and the Pricing of Swedish Lottery Bonds, *Review of Financial Studies* 10, 447-480.

Graham, J., and Rogers, D., 2002, Do Firms Hedge in Response to Tax Incentives? *Journal of Finance* 57, pp. 815-839.

Haushalter, D., 2000, Financing Policy, Basis Risk, and Corporate Hedging: Evidence from Oil and Gas Producers, *Journal of Finance* 55, pp. 107-152.

Hunt, A., Moyer, S., and Shevlin, T., 2000, Earnings volatility, earnings management and equity value, University of Washington Working paper.

Hausman, J., and Taylor, W., 1981, Panel Data and Unobservable Individual Effects, *Econometrica*, 49, 1377-1398.

Kaplan, S., and Zingales, L., 1997, Do investment-cash flow sensitivities provide useful measures of financing constraints?, *Quarterly Journal of Economics*, 169-215.

Kirschenheiter, M., and Melamud, N., 2002, Earnings quality and smoothing, *Journal of Accounting Research* 40, 761-796.

Lamont, O., 1997, Cash Flow and Investment: Internal Capital Markets Evidence, *Journal of Finance*, 83-109.

Lang, L., and Stulz, R., 1994, Tobin's Q, corporate diversification and firm performance, *Journal of Political Economy*, 102, 1248-1280.

Lang, M., Lins, K., and Miller, D., 2003, ADRs, Analysts, and Accuracy: Does Cross Listing in the US Improve a Firm's Information Environment and Increase Market Value? forthcoming *Journal of Accounting Research*

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny, R.W., Investor Protection and Corporate valuation, 2002, *Journal of Finance* 58, 1147-1170.

Leland, H., 1998, Agency Costs, Risk Management, and Capital Structure, *Journal of Finance* 53, 1213-1243.

Lessard, D., 1990, Global Competition and Corporate Finance in the 1990s, *Journal of Applied Corporate Finance* 3, 59-72.

Leuz, C., Nanda, D., and Wysocki, P.D., 2003, Earnings management and investor protection: an international comparison, *Journal of Financial Economics* 69, 505-527.

Lins, K., 2003, Equity Ownership and Firm Value in Emerging Markets, forthcoming, *Journal of Financial and Quantitative Analysis.*

Lys, T., 1984, Mandated Accounting Changes and Debt Covenants: The Case of Oil and Gas Accounting, *Journal of Accounting and Economics* 6, 39-65.

Malkiel, B., and Xu, Y., 2002, Idiosyncratic Risk and Security Returns, University of Texas at Dallas Working Paper.

Merton, R.C., 1987, A simple model of capital market equilibrium with incomplete information, *Journal of Finance* 42, 483-510.

Mian, S., 1996, Evidence on corporate hedging policy, *Journal of Financial and Quantitative Analysis* 31, 419-439.

Minton, B., and Schrand, C., 1999, The Impact of Cash Flow Volatility on Discretionary Investment and the Costs of Debt and Equity Financing, *Journal of Financial Economics* 54, 423-460.

Minton, B., Schrand, C., and Walther, B., 2002, The role of volatility in forecasting, *Review of Accounting Studies* 7, 195-215.

Nance, D., Smith, C., and Smithson, C., 1993, On the determinants of corporate hedging, *Journal of Finance*, 48, 267-284.

Sankar, M., and Subramanyam, K.R., 2001, Reporting discretion and private information communication through earnings, *Journal of Accounting Research* 39, 365-386.

Schipper, K., 1991, Commentary on Analysts' Forecasts, *Accounting Horizons* 5, pp. 105-121.

Servaes, H., 1991, Tobin's Q and the Gains from Takeovers, *Journal of Finance* 46, 409-419.

Servaes, H., 1996, The Value of Diversification during the Conglomerate Merger Wave, *Journal of Finance* 51, 1201-1225.

Shapiro, A., and Titman, S., 1986, An Integrated Approach to Corporate Risk Management, in Stern, J., Chew, D.(Eds.), The Revolution in Corporate Finance, Basil Blackwell, New York, pp.331-354.

Shin, H., and Stulz, R., 2000, Firm Value and Growth Opportunities, Ohio State Working Paper.

Smith, C., and Stulz, R., 1985, The determinants of firms' hedging policies, *Journal of Financial and Quantitative Analysis* 20, 391-405.

Smith, C., and Watts, R., 1992, The Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies, *Journal of Financial Economics*, 32, 263-292.

Stulz, R., 1984, Optimal hedging policies, *Journal of Financial and Quantitative Analysis* 19, 127-140.

Stulz, R., 1990, Managerial Discretion and Optimal Financing Policies, *Journal of Financial Economics*, 26, 3-27.

Thomas, J.K., and Zhang, H., 2002, Value-relevant properties of smoothed earnings, Columbia University Working Paper.

Trueman, B., and Titman, S., 1988, An explanation of accounting income smoothing, *Journal of Accounting Research* 26, suppl: S127-S139.

Tucker, X.J., and Zarowin, P., 2005, Does income smoothing improve earnings informativeness? forthcoming *The Accounting Review*.

Tufano, P., 1996, Who manages risk? An empirical examination of risk management practices in the gold mining industry, *Journal of Finance* 51, 1097-1137.

Warner, J., 1977, Bankruptcy costs: Some evidence, *Journal of Finance* 32, 337-347.

Zenner, M., 2001, How risk management creates shareholder value, Financial Strategy Group, Salomon Smith Barney.

Appendix 1

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

Beta: Computed from the market model based on five 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 (M M): This item represents capital expenditures restated up to 10 years for acquisitions, accounting changes, and/or discontinued operations. Restated data is collected from summary presentations and is 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).

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 et al. (2002). Earnings measure 1 is constructed using Compustat quarterly data9 which is 'EPS (Diluted) Excluding EI.' We also use earnings measure 2, which is constructed using Compustat quarterly data177 which is 'Earnings per share from operations.' Earnings measure 3 is constructed using Compustat quarterly data7 which is 'Earnings per share (diluted) including extraordinary items.' Earnings measure 4 is constructed using Compustat quarterly data11 which is 'Earnings per share (basic) including extraordinary items.' Earnings measure 5 is constructed using Compustat quarterly data19 which is 'Earnings per share (basic) excluding extraordinary items.'

Firm-specific risk: Computed as the residual risk from the market model as in Shin and Stulz (2000). That is, we take total risk and subtract beta squared times the variance of the market return (or total risk minus systematic risk).

Long-term debt (M M): Compustat annual data item 9. This item represents debt obligations due more than one 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 five years of monthly returns over the previous five years of the observation unit. That is, the 1987 value for market reflects the 1983 to 1987 period. However, in our statistical tests, we use alternatively the contemporaneous as well as the perfect foresight forecast as estimators of the market return.

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

Operating cash flows: Compustat quarterly data108, '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 five year period.

Research & Development Expenses (MM): 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 data item 12) over a five 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 data item 199.

Systematic risk: Constructed as beta squared multiplied by the variance of the market return. This measure follows the same construction as for the other market risk measures.

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 the standard deviation of monthly returns over the five year period. Again, the 1987 measure for total risk is simply the standard deviation of monthly returns over the previous five years. In the regressions, we use either contemporaneous measures or the 'perfect foresight' measures as in Shin and Stulz (2000).

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 2,175 firms in 1987, 2,575 firms in 1992 and 2,247 firms in 1997 for a total of 6,997 observations. All variables are defined in Appendix 1.

Panel A: Descriptive Variables					
Variable	Mean	Std.	25%	Median	75%
Total Assets (M$)	1,396	4,265	36	145	706
Equity Market Value (M$)	1,239	3,530	28	126	700
Return on Assets	0.004	0.168	-0.005	0.039	0.079
Debt-to-assets	0.185	0.186	0.018	0.138	0.292
Sales growth	0.082	0.184	0.002	0.063	0.147
CAPX-to-Sales	0.134	0.342	0.021	0.044	0.092
R&D-to-Sales	0.063	0.260	0.000	0.000	0.024
Advertising-to-Sales	0.012	0.029	0.000	0.000	0.012
Tobin's Q	1.565	1.451	0.740	1.095	1.795
Panel B: Measures of Risk					
Systematic risk	0.020	0.023	0.005	0.012	0.025
Firm-specific risk	0.140	0.063	0.092	0.128	0.179
Earnings per share (EPS)	0.064	0.367	-0.047	0.086	0.234
Volatility of EPS (std. dev.)	0.373	0.524	0.090	0.189	0.413
Cash flow per share (CFPS)	0.322	0.474	0.038	0.208	0.485
Volatility of CFPS (std. dev.)	0.612	0.702	0.184	0.363	0.737
Total earnings	21.726	69.745	-0.060	1.516	11.575
Total cash flow	38.710	119.196	0.236	2.925	20.465

Table 2
Correlation Table

This table presents 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 Appendix 1. P-values are reported in parentheses.

	Tobin's Q	Syst. Risk	Firm Risk	EPS	CFPS	St. dev. EPS	St. dev. CFPS	Total earnings	Total cash flow
Systematic Risk	0.010	1							
	(0.406)								
Firm Specific Risk	0.100	0.380	1						
	(0.000)	(0.000)							
Earnings (EPS)	0.005	-0.238	-0.486	1					
	(0.659)	(0.000)	(0.000)						
Cash flow (CFPS)	-0.124	-0.201	-0.378	0.479	1				
	(0.000)	(0.000)	(0.000)	(0.000)					
Volatility of EPS	-0.205	0.031	0.145	-0.297	0.237	1			
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)				
Volatility of CFPS	-0.366	-0.092	-0.136	0.057	0.391	0.647	1		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Total earnings	0.071	-0.116	-0.295	0.293	0.287	-0.012	0.049	1	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.337)	(0.000)		
Total cash flow	0.046	-0.118	-0.272	0.248	0.381	0.044	0.073	0.928	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

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 earnings volatility we also sort firms on size, leverage and total earnings levels. Panel E presents results sorting on both earnings and cash flow volatility quintiles.

Panel A: Average Tobin's Q

	Earnings Volatility		Cash Flow Volatility	
	Mean	Median	Mean	Median
Low	1.976	1.333	2.347	1.564
2	1.709	1.239	1.763	1.327
3	1.542	1.106	1.526	1.192
4	1.388	1.026	1.221	0.979
High	1.207	0.909	0.966	0.804
Difference (Low-High)	0.769	0.424	1.381	0.759
P-value	(0.00)	(0.00)	(0.00)	(0.00)

Panel B: Average Tobin's Q

	Size Quintile				
	Smallest	2	3	4	Largest
Low Earnings Volatility	2.192	1.805	1.841	1.945	1.805
2	1.923	1.584	1.692	1.691	1.602
3	1.829	1.553	1.416	1.467	1.509
4	1.746	1.328	1.451	1.367	1.221
High Earnings Volatility	2.058	1.154	1.204	1.101	0.987
Difference (Low-High)	0.134	0.651	0.637	0.844	0.818
P-value	(0.44)	(0.00)	(0.00)	(0.00)	(0.00)

Table 3 (Continued)
Univariate Results

Panel C: Average Tobin's Q

	Debt to Total Assets Quintile				
	Smallest	2	3	4	Largest
Low Earnings Volatility	2.799	1.931	1.705	1.618	1.372
2	2.323	1.772	1.513	1.369	1.412
3	2.083	1.813	1.350	1.186	1.317
4	1.902	1.438	1.287	1.155	1.238
High Earnings Volatility	1.700	1.381	1.071	1.057	1.082
Difference (Low-High)	1.100	0.550	0.634	0.561	0.291
P-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Panel D: Average Tobin's Q

	Earnings Level Quintile				
	Low	2	3	4	High
Low Earnings Volatility	3.786	1.579	1.576	1.955	2.550
2	2.685	1.275	1.333	1.728	2.125
3	1.938	1.352	1.378	1.521	1.766
4	1.739	1.104	1.114	1.348	1.556
High Earnings Volatility	1.336	1.115	1.044	1.155	1.177
Difference (Low-High)	2.450	0.464	0.532	0.801	1.373
P-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Panel E: Average Tobin's Q

	Cash Flow Volatility				
	Low	2	3	4	High
Low Earnings Volatility	2.385	1.641	1.345	1.004	0.683
2	2.423	1.764	1.532	1.147	0.839
3	2.282	1.887	1.533	1.265	0.944
4	1.817	1.983	1.618	1.225	0.949
High Earnings Volatility	2.431	1.445	1.504	1.256	1.005
Difference (Low-High)	-0.05	0.20	-0.16	-0.25	-0.32
P-value	(0.90)	(0.12)	(0.19)	(0.03)	(0.00)

Table 4
Pooled Regressions

The table presents results from pooled regressions of the natural logarithm of Tobin's *Q*, a proxy for firm value, on cash flow and earnings volatility along with measures capturing risk and growth opportunities. All regressions include 2-digit SIC controls and all variables are defined in Appendix 1.

Dependent variable: ln(Tobin's *Q*)					
	(1)	(2)	(3)	(4)	(5)
ln(Earnings Volatility)			-0.172		0.060
			(-15.08)		(4.17)
ln(Cash Flow Volatility)				-0.328	-0.368
				(-29.22)	(-25.02)
ln(Systematic Risk)		-0.045	-0.044	-0.045	-0.046
		(-3.93)	(-3.88)	(-4.16)	(-4.21)
ln(Firm-specific Risk)		-0.064	-0.013	-0.040	-0.054
		(-4.68)	(-0.94)	(-3.07)	(-4.07)
ln(Total Assets)	-0.130	-0.172	-0.110	-0.050	-0.057
	(-10.91)	(-12.74)	(-7.94)	(-3.75)	(-4.22)
Return on Assets	0.169	0.156	0.146	0.165	0.170
	(13.68)	(12.56)	(11.89)	(14.06)	(14.41)
Sales Growth	0.181	0.177	0.155	0.164	0.170
	(16.50)	(16.13)	(14.19)	(15.81)	(16.26)
CAPX-to-Sales	0.009	0.011	0.020	0.011	0.008
	(0.73)	(0.89)	(1.63)	(0.92)	(0.65)
Debt-to-Total Assets	-0.014	-0.007	0.003	0.010	0.009
	(-1.21)	(-0.62)	(0.28)	(0.94)	(0.81)
R&D-to-Sales	0.226	0.232	0.218	0.191	0.191
	(17.50)	(17.92)	(17.06)	(15.56)	(15.57)
Advertising-to-Sales	0.079	0.080	0.077	0.076	0.076
	(7.25)	(7.38)	(7.20)	(7.35)	(7.41)
Constant	0.283	0.322	0.264	0.241	0.251
	(2.10)	(2.39)	(1.99)	(1.90)	(1.98)
Year Indicator (1987)	-0.511	-0.577	-0.596	-0.597	-0.593
	(-18.87)	(-20.01)	(-21.01)	(-21.95)	(-21.79)
Year Indicator (1992)	-0.370	-0.439	-0.431	-0.438	-0.441
	(-14.41)	(-15.89)	(-15.85)	(-16.81)	(-16.93)
Adj. R^2	0.237	0.242	0.265	0.324	0.326

Table 5
Annual Regressions

The table presents results from annual regressions for the three years utilized in the analysis. The dependent variable is the natural logarithm of Tobin's Q, a proxy for firm value. All regressions include 2-digit SIC controls and all variables are defined in Appendix 1.

Dependent variable: ln(Tobin's Q)			
	1987	1992	1997
ln(Earnings Volatility)	0.054	0.076	-0.044
	(1.75)	(2.22)	(-1.06)
ln(Cash Flow Volatility)	-0.282	-0.429	-0.584
	(-8.90)	(-12.06)	(-13.07)
ln(Systematic Risk)	-0.049	-0.023	-0.050
	(-2.08)	(-0.91)	(-1.48)
ln(Firm-specific Risk)	0.018	-0.058	0.137
	(0.84)	(-1.65)	(3.53)
ln(Total Assets)	-0.174	-0.093	0.202
	(-6.83)	(-2.68)	(5.05)
Return on Assets	0.192	-0.047	0.066
	(7.98)	(-1.68)	(1.77)
Sales Growth	0.136	0.258	0.291
	(5.93)	(10.10)	(9.15)
CAPX-to-Sales	0.025	0.034	-0.075
	(1.06)	(1.11)	(-2.04)
Debt-to-Total Assets	-0.062	-0.148	-0.201
	(-2.78)	(-5.72)	(-6.00)
R&D-to-Sales	0.212	0.229	0.256
	(8.49)	(7.32)	(7.00)
Advertising-to-Sales	0.109	0.104	0.059
	(4.98)	(4.18)	(1.89)
Constant	1.145	1.432	1.799
	(4.57)	(4.44)	(4.67)
N	2,175	2,575	2,247
Adj. R^2	0.244	0.270	0.275

Table 6
Cash Flow and Earnings Volatility Quintiles

This table presents results from regressions of the natural logarithm of Tobin's Q, a proxy for firm value, by cash flow (panel A) and earnings (panel B) volatility quintiles determined on an annual basis on either cash flow or earnings volatility and other measures capturing risk and growth opportunities. All regressions include 2-digit SIC controls and all variables are defined in Appendix 1.

Panel A: Cash Flow Volatility

	CASH FLOW VOLATILITY QUINTILE									
	1 (LOW)		2		3		4		5 (HIGH)	
Variable	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat
ln(Earnings Volatility)	-0.046	-1.71	-0.023	-0.85	0.028	1.03	0.049	1.75	0.025	1.04
ln(Systematic Risk)	-0.034	-1.25	-0.040	-1.52	-0.054	-2.13	-0.028	-1.20	-0.034	-1.50
ln(Firm-specific Risk)	0.004	0.16	-0.038	-1.17	-0.026	-0.81	-0.042	-1.42	-0.110	-3.92
ln(Total Assets)	0.044	1.48	0.019	0.61	0.023	0.79	-0.090	-3.27	-0.195	-7.20
Return on Assets	-0.097	-3.40	0.246	9.10	0.314	11.66	0.363	15.12	0.333	13.84
Sales Growth	0.164	6.32	0.215	8.39	0.173	6.96	0.162	7.04	0.130	5.84
CAPX-to-Sales	0.020	0.62	0.024	0.88	0.035	1.21	0.075	2.95	0.061	2.43
Debt-to-Total Assets	-0.113	-4.38	-0.050	-1.94	0.022	0.86	0.120	4.91	0.233	9.70
R&D-to-Sales	0.036	1.09	0.206	7.35	0.348	12.93	0.225	8.92	0.267	10.82
Advertising-to-Sales	0.014	0.52	0.118	4.80	0.093	3.84	0.127	5.58	0.063	2.76
Constant	0.153	0.59	0.119	0.40	0.429	1.32	0.057	0.14	0.410	1.63
Year Indicator (1987)	-0.411	-5.87	-0.639	-9.58	-0.521	-8.02	-0.573	-9.61	-0.577	-9.97
Year Indicator (1992)	-0.281	-4.38	-0.426	-6.68	-0.338	-5.43	-0.491	-8.40	-0.391	-6.97
N		1,399		1,400		1,399		1,400		1,399
Adj R^2		0.17		0.24		0.28		0.35		0.38

Table 6 (Continued)
Cash Flow and Earnings Volatility Quintiles

Panel B: Earnings Volatility

	EARNINGS VOLATILITY QUINTILE									
	1 (LOW)		2		3		4		5 (HIGH)	
Variable	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat	Coeff. Est	t-stat
ln(Cash Flow Volatility)	-0.324	-12.14	-0.336	-12.36	-0.350	-14.02	-0.290	-11.26	-0.153	-6.32
ln(Systematic Risk)	-0.042	-1.61	-0.056	-2.21	-0.046	-1.93	-0.041	-1.72	-0.052	-2.14
ln(Firm-specific Risk)	-0.055	-1.80	-0.053	-1.65	-0.049	-1.65	-0.028	-0.98	-0.067	-2.28
ln(Total Assets)	0.092	3.05	0.030	0.93	-0.018	-0.61	-0.070	-2.43	-0.267	-9.05
Return on Assets	0.005	0.19	0.235	8.21	0.240	9.49	0.255	10.09	0.237	9.10
Sales Growth	0.177	7.29	0.144	5.70	0.206	9.42	0.185	8.08	0.114	4.77
CAPX-to-Sales	-0.031	-1.12	-0.080	-2.69	0.055	2.25	0.061	2.35	0.024	0.88
Debt-to-Total Assets	-0.117	-4.79	-0.018	-0.73	-0.013	-0.56	0.109	4.59	0.145	5.87
R&D-to-Sales	0.095	3.30	0.264	8.44	0.222	8.39	0.240	9.16	0.295	10.91
Advertising-to-Sales	0.031	1.27	0.096	3.96	0.098	4.42	0.093	4.04	0.039	1.64
Constant	-0.102	-0.44	0.652	2.13	0.472	1.03	0.124	0.45	0.541	1.95
Year Indicator (1987)	-0.643	-9.72	-0.697	-10.36	-0.703	-11.51	-0.611	-10.07	-0.527	-8.54
Year Indicator (1992)	-0.426	-6.85	-0.559	-8.88	-0.499	-8.50	-0.457	-7.84	-0.410	-6.88
N		1,399		1,400		1,399		1,400		1,399
Adj R^2		0.27		0.28		0.38		0.35		0.32