



The impact of cash flow volatility on discretionary investment and the costs of debt and equity financing ☆

Bernadette A. Minton^a  , Catherine Schrand^b

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Abstract

We show that higher cash flow volatility is associated with lower average levels of investment in capital expenditures, R&D, and advertising. This association suggests that firms do not use external capital markets to fully cover cash flow shortfalls but rather permanently forgo investment. Cash flow volatility also is associated with higher costs of accessing external capital. Moreover, these higher costs, as measured by some proxies, imply a greater sensitivity of investment to cash flow volatility. Thus, cash flow volatility not only increases the likelihood that a firm will need to access capital markets, it also increases the costs of doing so.

Introduction

'As risk managers, we spend much of our time examining the factors that cause cash flows to fluctuate. This is important work, since low cash flows may throw budgets into disarray, distract managers from productive work, defer capital expenditure or delay debt repayments. By avoiding these deadweight losses, risk managers can rightly claim they add to shareholder value'. (See Shimko, 1997.) Consistent with this claim that cash flow volatility is costly, we document that cash flow volatility is associated both with lower investment and with higher costs of accessing external capital.

Higher cash flow volatility implies that a firm is more likely to have periods of internal cash flow shortfalls. Our analysis indicates that firms do not simply react to these shortfalls by changing the timing of discretionary investment to match cash flow realizations. Rather, firms forgo investment. Firms could smooth internal cash flow fluctuations using external capital markets. However, Myers and Majluf (1984) show that external capital is more costly than internal capital. Consequently, firms that require more external capital relative to internal capital will have lower investment, all else equal, assuming firms follow the basic net present value (NPV) decision rule for capital budgeting.

A higher frequency of cash flow shortfalls, however, is not the only reason that volatility affects investment decisions. Cash flow volatility also is positively related to a firm's cost of accessing external capital. Volatility can affect capital costs because of capital market imperfections including information asymmetry and contracting (e.g., debt covenants). For example, consider that analysts are less likely to follow firms with volatile cash flows. Assuming that lower analyst following implies greater information asymmetry and a higher cost of accessing equity capital, firms with higher cash flow volatility will have higher equity capital costs. Together, the two effects of cash flow volatility imply that reductions in cash flow volatility through risk management activities can reduce a firm's expected 'underinvestment' costs (Froot et al., 1993; Myers, 1977).

The basic finding of the analysis is that cash flow volatility is associated with lower investment in *average* annual capital expenditures, research and development costs, and advertising expenses, even after industry-adjusting and controlling for the level of a firm's average cash flows and its growth opportunities. In addition, firms experiencing cash flow shortfalls in a given year relative to their peers or relative to their own historical experience have significantly lower discretionary investment in that year than firms that are not experiencing shortfalls. Sensitivity analyses indicate that the results are not driven by firms in financial distress or cross-sectional differences in investment opportunities.

Fazzari, Hubbard, and Petersen (FHP, 1988, FHP, 1998), Hoshi et al. (1991), Kaplan and Zingales (KZ, 1997), and Lamont (1997) find a negative contemporaneous relation between annual investment levels and liquidity. These studies cannot distinguish whether firms with volatile cash flows time their investment decisions to match internal cash flow realizations or actually decrease their overall level of investment. Our findings reveal a negative relation between volatility, measured over a period, and the average level of investment measured over the same period, suggesting that firms that experience shortfalls ultimately forgo investment. The magnitude of the forgone investment is large. Capital expenditures by firms with high cash flow volatility (in the highest quartile relative to firms in the same industry) are 19% below the mean level of capital expenditures for the sample while capital expenditures by firms with low cash flow volatility are 11% above the mean.

Three pieces of related evidence emerge from tests designed to further explain our basic finding. First, the negative relation between volatility remains after controlling for a firm's cost of accessing external capital. Second, there is a direct relation between capital costs and investment levels. Moreover, firms that we claim have higher costs of accessing external capital (e.g., small firms) have a higher sensitivity of investment to volatility. Third, cash flow volatility is positively related to the costs of accessing external capital. Specifically, higher cash flow volatility is associated with worse S&P bond ratings, higher yields-to-maturity, lower analyst following, lower dividend payout ratios, higher bid-ask spreads, and higher weighted average costs of capital. Taken together, the evidence suggests that the basic finding of an association between investment and cash flow volatility is not just a relation between investment and project risk in disguise.

The results provide a benchmark for assessing the value of risk management activities. However, the sensitivity of investment to volatility does not suggest that firms should necessarily reduce or eliminate cash flow volatility. We recognize that volatility is a choice variable and assume that managers make rational decisions based on all available information. Our results provide an additional source of information that managers can use to assess the benefits of reducing cash flow volatility. Firms must weigh these benefits against the costs, which can vary across firms and industries. Risk management costs are likely to be low, for example, for firms in the oil and gas, mining, and agriculture industries where liquid, well-developed derivatives markets exist for a risk that represents a significant source of a firm's cash flow volatility. In contrast, hedging costs are likely to be higher for firms in which significant cash flow volatility

results from factors that are relatively uncorrelated with interest rates, foreign exchange prices, or commodity prices. The cross-sectional variation in these costs, relative to the potential benefits of reduced volatility, leads to interesting cross-sectional implications about risk management decisions.

The positive association between a firm's *current* cost of external capital and its *historical* cash flow volatility is a subtle but important distinction for risk managers. One interpretation of this result is that debt and equityholders use historical volatility to predict future cash flow volatility when they set prices. This interpretation implies that a firm's cost of accessing capital will depend on the expected persistence of cash flow volatility into future periods. Hence, cross-sectional differences in the persistence of the effects of risk management activities will be associated with cross-sectional differences in the association between volatility and the firm's cost of accessing capital. In the extreme case, risk management activities that have successfully reduced volatility, but which are not expected to have a persistent effect on volatility in future periods, will not necessarily reduce a firm's current cost of accessing external markets. One conjecture is that debt and equityholders do not view the use of short-term financial derivatives to reduce volatility in the same way as the use of longer-term risk reduction activities, such as moving a plant overseas to reduce foreign exchange price risk. Understanding how different types of risk management activities affect the costs that we document is an interesting avenue for future research.

Although this paper provides the first direct evidence that cash flow volatility is related to lower investment, we are not the first to make this claim. Shapiro and Titman (1986), Lessard (1990), Stulz (1990), and Froot et al. (1993) propose a link between volatility and investment in the context of explaining hedging activities that reduce cash flow volatility. Consistent with these theories, Dolde (1995), Géczy et al. (1997), Mian (1996), Nance et al. (1993), and Tufano (1996) find that firms that have the greatest expected benefits from reducing volatility are more active in risk management activities. These papers jointly test two hypotheses: (1) volatility is costly for the reasons predicted by a particular theory (or theories), and (2) firms engage in a specific risk-management activity (such as using derivatives) to reduce the volatility that creates the cost. Our direct evidence of an association between volatility and discretionary investment complements the findings of these indirect tests.

The paper proceeds as follows. Section 2 provides an outline of the various predictions and tests. Section 3 describes the measure of cash flow volatility and the methodology for the analysis of the association between volatility and investment. Section 4 reports the results of these tests. In Section 5, we examine the relation between costs of accessing capital markets and investment. Section 6 presents the analyses of the relations between cash flow volatility and these costs. Section 7 provides concluding remarks.

Section snippets

Overview of the paper

This paper analyzes a large and representative sample of firms over a seven-year period. The primary advantage of this sample is that the evidence can be generalized to a broad class of firms and investment decisions. A disadvantage is that the results are particularly susceptible to criticisms related to endogeneity issues and omitted correlated variables, despite the use of industry-adjusted data in the analysis. To mitigate these concerns, we perform three separate sets of tests of the...

Methodology

Section 3.1 defines cash flow and the methodology for measuring cash flow volatility. Section 3.2 defines the proxies for investment and the regression equations used to estimate the association between investment and cash flow volatility....

Results

4.1 Regression analysis of investment and volatility, 4.2 Cash flow shortfalls and investment present empirical results on the relation between cash flow volatility and investment. Section 4.3 provides robustness checks of the analyses....

Investment, volatility, and the costs of accessing external capital

This section investigates whether firms' investment decisions are directly related to the costs of accessing capital markets and whether these costs affect the sensitivity of investment to cash flow volatility. This analysis also demonstrates whether cash flow volatility remains a significant determinant of investment after controlling for a firm's cost of accessing capital. This cost, in part, captures a firm's average project risk. Therefore, the analysis provides evidence about whether...

Volatility and the cost of accessing capital markets

This section presents evidence that the negative association between investment and volatility is consistent with the basic NPV investment rule by showing that volatility is directly related to the costs of accessing external capital. Unlike the tests of the association between volatility and investment, however, the dependent variables in each of the separate regressions of CAPCOST on volatility are measured at the end of the period over which volatility is measured. For example, volatility...

Summary and conclusions

This paper provides direct evidence that cash flow volatility is associated with lower average levels of investment in capital expenditures, research and development costs, and advertising expenses. Cash flow volatility remains a significant negative determinant of investment even after controlling for the costs of accessing external capital. Moreover, cash flow volatility increases these costs. In particular, cash flow volatility is related to worse S&P bond ratings, higher yields-to-maturity, ...

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