



Uncertainty determinants of firm investment

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Abstract

We investigate the impact of measures of uncertainty on firms' capital investment behavior using a panel of U.S. firms. Increases in firm-specific and CAPM-based measures have a significant negative effect on investment spending, while market-based uncertainty has a positive impact.

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1. Introduction

Researchers have expended considerable effort in trying to understand the linkages between uncertainty and investment behavior at both firm-specific and aggregate levels.¹

In this paper, we consider the effects of three different forms of uncertainty on firms' investment behavior: Own uncertainty, derived from firms' stock returns; Market uncertainty, driven by S&P 500 index returns, and the relations between intrinsic and extrinsic uncertainty. To capture the latter effect, we

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¹ See, for example, Brainard, Shoven and Weiss (1980), Ghosal and Loungani (1996), Guiso and Parigi (1999), Beaudry, Caglayan and Schiantarelli (2001), Calcagnini and Saltari (2001) and Henley, Carruth and Dickerson (2003).

introduce a covariance term (our CAPM-based risk measure) and allow the data to determine the differential impact of each of these components on firms' investment.

Early research, using risk measures constructed from stock return data, has shown that uncertainty exerts a strong negative effect on investment. However, researchers also find that the effects of uncertainty on investment generally disappear (e.g., Leahy and Whited, 1996, p. 74) when Tobin's Q is introduced into the empirical model. In contrast, we show that firm-specific and macroeconomic uncertainty along with their interaction (CAPM-based uncertainty) has a significant effect on investment even in the presence of Q , cash flow and the debt-to-capital ratio.

Below we present our empirical findings. In our analysis we implement a standard investment model which incorporates various measures of uncertainty while controlling for firm financial characteristics.

2. Empirical findings

2.1. Data

The estimation sample consists of an unbalanced panel of manufacturing firms for the 1984 to 2003 period drawn from Standard and Poor's Industrial Annual COMPUSTAT database. There are 9895 firm-years for which the replacement value of the real capital stock may be imputed by the method of Salinger and Summers (1983). A number of sample selection criteria are then applied. We only consider firms who have not undergone substantial changes in their composition during the sample period (e.g., participation in a merger, acquisition or substantial divestment). As these phenomena are not observable in the data, we calculate the growth rate of each firm's real total assets, and trim the annual distribution of this growth rate by the 5th and 95th percentiles to remove firms exhibiting substantial changes in their scale. Values of the investment-to-capital, cash flow-to-capital, debt-to-capital ratios and Tobin's Q outside the 5–95th percentile range are judged implausible. Firms in clear financial distress or those facing substantial liquidity constraints are excluded. One percent from either end of the annual returns distribution was trimmed. The final data set contains 4028 firm-years pertaining to 360 firms with complete data for all variables used in the analysis.²

2.2. Generating volatility measures from daily data

We utilize daily stock returns and market index returns to compute intrinsic and extrinsic uncertainty via a method based on Merton (1980) from the intra-annual variations in stock returns and aggregate financial market series. This approach provides a more representative measure of the perceived volatility. It avoids such potential problems as high shock persistence when moving average representations are used, and low correlation in volatility when ARCH/GARCH models are applied to quantify volatility in low-frequency series. In that respect, our study improves upon much of the literature in its method of using high-frequency data to quantify volatility evaluated at a lower frequency.^{3,4}

² Empirical results drawn from the full sample yielded qualitatively similar findings; the screened data were used to reduce the potential impact of outliers upon the parameter estimates.

³ Leahy and Whited (1996), Bloom, Bond and Van Reenen (2001), and Bond and Cummins (2004) have also utilized daily stock returns to compute firm-level uncertainty. However, the methodology they used to generate a proxy for uncertainty was different from ours.

⁴ See Baum, Caglayan and Ozkan (2004) for a more detailed discussion of the Merton procedure along with its merits.

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