



# R&D investments and high-tech firms' stock return volatility



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## ABSTRACT

The empirical evidence suggests that firms in high-tech industries exhibit high stock return volatility. In this paper, we conceive of the R&D investment intensity as a possible explanation for the stock volatility behavior in these industries. We suggest that R&D activities generate information asymmetry about the prospects of the firm and make its stock riskier. Relying on Panel data models, we investigate this relationship for French high-tech firms. We find out a strong positive relationship between stock return volatility and R&D investment intensity. This finding suggests that R&D intensive firms should implement an efficient information disclosure policy to reduce information asymmetry and to avoid excessive stock return volatility.

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## 1. Introduction

Stock return volatility is a widely used measure of risk both in financial theory and practice. Stock return volatility is varying across time and firms. The investigation of the determinants of stock return volatility still forms an attractive research area.

Shiller [1] indicates that stock prices change so much that they cannot be merely explained by fluctuations in dividends or earnings. Schwert [2] finds little evidence that macroeconomic factors can explain stock market volatility movements.

Campbell, Lettau, Malkiel and Xu [3] provide formal empirical evidence that US idiosyncratic stock volatility has witnessed an upward trend. Kearney and Poti [4] confirm this finding for the European stock markets.

A large body of literature underlines the fact that idiosyncratic volatility is not only relevant in predicting stock market returns and volatility, but it is also priced. Goyal and Santa Clara

[5] show that aggregate idiosyncratic volatility has a significant predictive power on the market's rate of return. Taylor [6] reports that the inclusion of idiosyncratic volatility improves the quality of market volatility predictions. Fu [7] documents a significant positive relationship between idiosyncratic volatility and expected returns. Stocks with an elevated idiosyncratic risk get a higher return than stocks with low idiosyncratic risk. Accordingly, the analysis of the features that affect idiosyncratic volatility enhances portfolio managers' and corporate directors' decisions.

In this paper, we propose the R&D investment as a possible determinant of stock return volatility. R&D expenditures have grown over the last decades. A firm invests in R&D activities and offers new products and services to differentiate itself and mitigate competition. Empirical results show that R&D investments, actually, create value for the firm. Some authors find a positive relationship between the stock returns or the market value of the US firms and the R&D intensity (Griliches [8], Hirschey and Weygandt [9], Sougiannis [10], Lev and Sougiannis [11]). Hall and Oriani [12] find the same results for France. Other authors report that corporate announcements about new R&D investment generate positive abnormal returns (Chan, Martin and Kensinger [13] and Eberhart, Maxwell and

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Siddique [14]). However, many studies investigate the riskiness of R&D investments and find that R&D intensive firms are riskier than others (Chan, Lakonishok and Sougiannis [15], Kothari, Laguerre and Leone [16]).

This paper contributes to the literature by examining the relationship between R&D investment and stock return volatility. This analysis is performed within the context of the French market because as we know, this problem has been researched exclusively on the United States and studies on European markets barely exist. The analysis of the European context is useful for two reasons. First, US firms invest more in R&D than their European counterparts (Moncada-Paterno-Castello [17] and Moncada-Paterno-Castello, Ciupagea, Smith, Tubke and Tubbs [18]). Second, the R&D reporting reveals a difference between the USA and France. While US firms adopt R&D expensing, IAS-IFRS accounting rules, adopted by French firms, they differently cover research costs and development costs. Research costs are expensed, when development costs could be capitalized under certain conditions (IAS 38). Lantz and Sahut [19] point out that R&D capitalization seems to limit the information asymmetry between firms and exchange markets. Accordingly, the study of the relationship between stock volatility and R&D investment for non US firms, such as the French firms seems to be relevant due to these structural and accounting differences.

Stock volatility is positively related to the degree of information asymmetry encountering the firm's prospects and profits (Gennotte and Leland [20], Eden and Jovanovic [21]). R&D investments are expected to generate higher information asymmetry than tangible investments (Aboody and Lev [22]). We will test the hypothesis that stock volatility increases with the R&D investment intensity. We focus our analysis on high tech firms. These firms are R&D intensive and exhibit higher stock return volatility. Our empirical results provide strong evidence of the checked hypothesis, as for the US context. R&D investments make the firms' stocks riskier. The differences in accounting rules and investment behavior do not matter. These results contribute to the literature on the determinants of idiosyncratic volatility and also on the market valuation of R&D expenditures. The implications and recommendations will be discussed later.

The paper is organized as follows. Section 2 presents the theoretical background on stock volatility, information asymmetry and R&D. Section 3 provides empirical evidence on high tech firms. Section 4 develops the hypotheses. Section 5 presents and describes the sample and the research design. Section 6 evaluates the relationship between R&D and stock return volatility. The last section is devoted to concluding remarks and recommendations.

## 2. Theoretical background

### 2.1. Volatility and information asymmetry

Many studies investigate the nature of the relationship between stock volatility and asymmetric information. Theoretical models predict that stock return volatility increases as the degree of information asymmetry becomes higher. Gennotte and Leland [20] suggest that volatility excess and market crashes, such as the 1987 market crash, could be explained to a greater extent by the trades of uninformed

investors in a context of information asymmetry. Attanasio [23] argues that in the presence of asymmetric information and risk aversion, the stock prices tend to be more volatile than in full information environment. Eden and Jovanovic [21] formalize a theoretical model that explains the excessive volatility in financial markets by fluctuation of the amount of public information over time.

Since the level of information asymmetry cannot be directly measured, empirical studies use different proxies to approximate it. Analyst coverage, analyst prediction error, analysts' prediction dispersion, institutional ownership and bid ask spread are commonly used to measure the level of information asymmetry.

Sahut, Gharbi and Othmani Gharbi [24] corroborate theoretical models and find that stock volatility is negatively related to the institutional ownership and analysts' coverage for French firms. They find that analysts and institutional investors can mitigate the asymmetric information problem and reduce stock volatility.

### 2.2. R&D and information asymmetry

All types of projects generate some degree of asymmetric information between the managers (the insiders), who possess detailed information about the productivity of individual assets, and investors (outsiders) who have global and inaccurate information (Aboody and Lev [22]).

Hubbard [25] suggests that informational asymmetry related to R&D investments is particularly important. Alam and Walton [26] indicate that the level of information asymmetry between managers and shareholders is higher for the firms with R&D expenses compared to firms with no R&D investments. Blazenko [27] shows that managers have more knowledge about the state and the outcome of R&D activities compared to outsiders.

Boone and Raman [28] report a positive and significant relationship between R&D and bid ask spread. The bid ask spread increases with the level of information asymmetry.

R&D investments are associated with higher information asymmetry than physical and financial ones for many reasons.

First, R&D intensive firms have little incentive to disclose detailed information about their projects since they consider secrecy as an effective way to protect innovation and competitive advantage. Cohen, Nelson and Walsh [29] have examined the strategies of 1478 US R&D laboratories in protecting their innovations and found that the firm's secrecy is apparently much more practiced than patents, marketing and manufacturing complementary proficiencies.

Second, R&D projects are unique for the firms which conduct the projects. Aboody and Lev [22] (p 2750) explained: "The relative uniqueness of R&D investments makes it difficult for outsiders to learn about the productivity and value of a given firms' R&D from the performance and products of other firms in the industry thereby contributing to information asymmetry". The lack of organized markets for R&D projects worsens the problem.

Third, the accounting handling of R&D investment does not convey complete information about R&D valuation and profitability. Generally, R&D investments are never reported in the balance sheet but fully expensed in the profit and loss account, although, these expenditures can generate profits for several coming years and can be considered as assets (Oswald and Zarowin [30]). Franzen, Rodgers and Simin [31]

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