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Abnormal research and development investments and stock returns

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ABSTRACT

We investigate the relation between abnormal research and development (R&D) investments change and expected stock returns. We provide evidence that firms that abnormally increase their R&D investments (*RDI*) earn higher returns in comparison to the market portfolio. Specifically, our findings document an economically significant annual positive abnormal *RDI* returns that ranges from 3.2% to 11.5%. These findings are robust to well-established risk factors in the literature and suggest that the abnormal increases in RDI impacts stock returns.

1. Introduction

Many researchers (Hall, 1993; Stein, 1988) argue that investors focus excessively on short-term profits and do not value research and development (R&D) investments which create new strategic options for firms. So, firms with significant R&D investments may be undervalued. Many R&D investments are not profitable and hence the valuation of some R&D-intensive stocks is excessively high and leads to value destructive action of the managers (Jensen, 1993, 2005). Further, R&D investments generate more uncertain future benefits than investment in tangible assets (Kothari, Laguerre, and Leone (2002). Current literature documents that, due to limited investor attention, prices do not fully and immediately impound the relevant public information, specifically when such information is less noticeable (e.g., Barber & Odean, 2008; DellaVigna & Pollet, 2009; Fang & Peress, 2009; Hirshleifer, Lim, & Teoh, 2009; Hirshleifer & Teoh, 2003; Hong & Stein, 1999; Hou, Xiong, & Peng, 2009; Huberman & Regev, 2001; Klibanoff, Lamont, and Wizman,1998; Peng & Xiong, 2006; Yuan, 2015). Accordingly, we expect investors to have difficulty processing information that is less tangible and more ambiguous (such as unexpected increases in R&D investments). In other words, it is highly likely that information about the prospects of a firm developing new products, technologies or other innovations is difficult to efficiently impound into the stock pricing process. This is mainly due to the significance of such news upon strategic options and potential disruptions in the industry. Additionally, it is documented that individuals/investors pay less attention to information that is harder to process (Corwin & Coughenour, 2008; Song & Schwarz, 2010). Collectively, these discussions raise the question of whether stock market values of companies reflect the changes in large intangible assets associated with R&D expenditures. Furthermore, there is a dearth of empirical literature that investigates the relations between the changes in R&D investments and stock returns. One of the main reasons behind the limited scope of the literature is that the accounting value of R&D expenditures provides an aggregate value, and hence does not provide clear information about the content of these investments.

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Therefore, investors using traditional measures (i.e., market-to-book, earnings-to-price) could misprice these stocks. Also, poor disclosure of R&D expenditures under the current accounting standards leads to information asymmetry and gains to insiders (Aboody & Lev, 2000).

Empirical evidence in the literature on whether investors in U.S. capital markets value corporate R&D investment efficiently is mixed. The main strand of the literature that focuses on examining the market reaction to the announcement of R&D expenditures (Chan, Martin, & Kensinger, 1990; Woolridge, 1988; Zantout & Tsetsekos, 1994) using event study method document inconclusive results (i.e. both positive and negative abnormal returns). For instance, Szewczyk, Tsetsekos, and Zantout (1996) investigate the role of investment opportunities and free cash flow in explaining R&D-induced abnormal returns. They document a significant positive relation between a firm's Tobin's Q and its stock price reaction to announcements of increases in R&D expenditures in support of investment opportunities hypothesis. Another strand of the literature studies the relation between R&D expenditures and stock returns and documents inconclusive results. For instance, Chan, Lakonishok, and Sougiannis (2001) examine whether the stock prices fully reflect firms' expenditures on R&D using data over the period of 1975–1995. They specifically study the relation between R&D spending and subsequent stock price performance by comparing the firms with R&D expenditure and firms with no R&D expenditure and find that "*. . .firms engaged in R&D do not experience superior stock price performance, compared to firms with no R&D*". Accordingly, they argue that "*. . .the absence of any differences is consistent with the notion that the market price on average incorporates fully the benefits of R&D spending*". Eberhart, Maxwell, and Siddique (2004) investigate the long-term abnormal stock returns and operating performance following R&D increases and find significant positive abnormal stock returns during the five-year period following the increases and conclude that market initially undervalues R&D investment. More recently, Li (2011) reports that high R&D-intensive firms earn higher average stock returns than low R&D-intensive firms.

Given the question of whether investors value R&D-investing firms efficiently and inconclusive findings in the literature, we investigate whether a portfolio with positive abnormal R&D investment changes perform better than market portfolio over the 1975–2015 period for all domestic, primary stocks listed on the NYSE, Amex, and Nasdaq stock markets. Our sample of firm-year observations includes cases of R&D investment increases and R&D investment decreases. We adopt a modified version of measure developed by Titman, Wei, and Xie (2004) to calculate the abnormal R&D investment changes (*RDI*) and examine stock returns following these changes.

We contribute to the literature in many ways. First studies in the literature (i.e. Eberhart et al. 2004) relating to R&D and the stock returns examine only the increase in R&D intensity but do not consider an abnormal/unexpected change. Our study is different since we focus on the abnormal change in R&D investments and use the last three-year average R&D expenditures to project the firm's formation year's benchmark R&D investment, and interpret firms with positive (negative) *RDI* as positive (negative) R&D investors. We present that firms with abnormal increase in *RDI* earn higher returns than market portfolio. Our findings show abnormal and positive *RDI* returns as we find economically and statistically significant alpha values in all models. The alpha in the models ranges between 46 basis points per month to 97 basis points. These results indicate annual significantly positive abnormal *RDI* returns that range from 5.5% to 11.6%. Moreover, our results are robust to well-established risk factors in the literature. Second, we examine whether our results differ across certain groups of firms since previous literature show that there is a difference between the R&D investments and stock returns in terms of size, technological endowments (Chan et al., 1990), and investment opportunities (Szewczyk et al., 1996). Hence, we split our sample into three sub groups; (i) small and large (ii) high-tech and low-tech, and (iii) high-growth and low-growth. We find that in all three groups of stocks that increase in *RDI* earn significantly higher abnormal stock returns compared to the market portfolio. Specifically, small size, high-growth, and high tech stocks that increase *RDI* earn higher returns. However, *RDI* effect prevails regardless of the size, growth, and technological endowments of the firms. Third, our study expands and complements the literature on the relation between R&D investments and stock returns (e.g., Chambers, Jennings, & Thompson 2002; Chan et al., 1990; Chu, 2007; Li, 2011; Lin, 2012; Li, Liu & Xue, 2014). Our results also address the puzzle regarding R&D investment and physical investment. That is high R&D-intensive firms earn higher average stock returns compared to low R&D-intensive firms (e.g., Chan et al., 2001; Li, 2011), and high physical investment intensive firms earn lower average stock returns compared to low physical investment intensive firms (e.g., Titman et al., 2004; Xing, 2008) since we use the method which is employed to examine the relation between the physical investment and stock prices. Specifically, our results point out that the puzzle is a result of the failure of the previous studies to employ comparable measures.

The remainder of the paper is organized as follows. Section 2 presents the method, data, estimated models, and the construction the testing portfolios. Section 3 exhibits the empirical tests and discusses the results. Finally, Section 4 concludes.

2. Method and data

To test the relation between abnormal R&D investments and subsequent stock returns we examine the returns on portfolios formed on the basis of abnormal levels of R&D investment following the methodology employed in Titman et al. (2004). More specifically, we test whether returns on portfolios with positive abnormal R&D investment changes are significantly different than those with negative abnormal R&D investment changes.

To conduct the tests, we consider all domestic stocks listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ over the 1975–2015 period. Following Titman et al. (2004), we exclude ADRs, closed-end funds, trusts, REITs, units of beneficial interest, and other financial institutions; we also excluded utilities since item 46