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The valuation relevance of R&D expenditures: Time series evidence

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Abstract

The literature on the valuation relevance of R&D investments is based primarily on cross-sectional regressions or panel data regressions with time and firm (or industry) fixed effects such that the parameters relating R&D to market value are cross-sectionally constant. In an alternative approach, this paper investigates the value relevance of R&D investment using an earnings-based time series valuation model. Model parameters are estimated for each firm separately. In contradistinction to the results obtained from cross-sectional and fixed effects panel models, this study finds weak empirical support at best for the value relevance of R&D expenditures at the firm level.

JEL classification: G12; O32
Keywords: R&D; Market value; Time series; Ohlson model

1. Introduction

There is an extensive empirical literature showing that security prices impound the information contained in R&D investment.[1] Most studies measure R&D investment in terms of contemporaneous (and sometimes lagged) R&D expenditures. Other studies measure R&D investment in terms of some estimate of R&D capital. With few exceptions, these studies find that the impact of R&D on firm market values is significant and positive

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irrespective of how R&D is measured.[2] The only significant exceptions to date are variance decomposition studies that find that R&D investment explains very little if any of the variance of firm (industry) returns.[3]

The purpose of this paper is to test the value relevance of R&D investment in a time series context. Despite the apparent robust result that R&D investment has a positive and significant effect on market values, we find that in a firm-level time series context the relationship between R&D and market values is significant at conventional levels for no more than 25% of our sample (and often far less), depending upon the specific valuation model. Much of the empirical evidence to date concerning the value relevance of R&D investment is based upon (pooled or annual) cross-sectional regressions.[4] The cross-sectional approach makes use of comparisons across firm (or industry) expenditures on R&D. The primary advantage of the cross-sectional approach comes where R&D expenditures vary substantially across firms and where there are a large number of sample firms. Then the data yield multiple comparisons from which the effects of R&D on market value may be isolated. However, comparisons across firms can only isolate the effects of R&D if they control for other influences on market value that may vary from one firm to the next. For example, most studies control for firm size because market values are likely to be at least partially size driven as are R&D expenditures. Absent a control for size, the relationship between market value and R&D may be spurious and size driven. Unfortunately, it is not always possible to observe and control for all firm differences that could affect market values. For example, no cross-sectional study relating R&D and market values to date has controlled for the talent and expertise of the managerial team, which may be driving both firm market values and R&D expenditures. This possibility of correlated omitted variables bias is the primary disadvantage of cross-sectional models of R&D. Moreover, in an attempt to solve the correlated omitted variables problem, ad hoc control variables may be included in the regressions having no intrinsic relationship to the

[1] Ballester, Garcia-Ayuso and Livnat (2003), Ben-Zion (1984), Bublitz and Ettredge (1989), Chan, Martin and Kensinger (1990), Chauvin and Herschey (1993, 1994), Cockburn and Griliches (1988), Connolly and Hirschey (1984), Doukas and Switzer (1992), Green, Stark, and Thomas (1996), Griliches (1981), Hall (1993a,b), Hirschey (1982, 1985), Hirschey and Spencer (1992), Hirschey and Weyengandt (1985), Johnson and Pazderka (1993), Jose, Nichols and Stevens (1986), Joseph (2001), Kotabe, Srinivasan and Aulakh (2002), Lev and Sougiannis (1996), Lev and Zarowin (1998), Pakes (1985), Sougiannis (1994), Sundaram, John and John (1996), Szewczyk, Tsetsekos and Zantout (1996), Woolridge (1988), Wu and Wei (1998), Zhao (2002). Hall (2000) provides a partial summary of the literature.

[2] There is also an extensive parallel literature on the relationship between market values and patents. Except for a number of studies that include both R&D and patents as explanatory variables, the patent literature is beyond the scope of this paper. However, it is worth noting that the relationship between R&D expenditures and market values is typically far more robust than the relationship between patents (counts or citations) and market values. Moreover, when both patent data and R&D expenditures are included as explanatory variables the former are often insignificant. There is some evidence that this may be due to the high correlation between them. On these issues, see Bosworth and Rogers (2001).

[3] See Lach and Schankerman (1989) and Toivanen and Stoneman (1998). In cross-sectional regressions, by contrast, Chan, Lakonishok, and Sougiannis (2001) find that R&D intensity and return volatility are positively correlated.

[4] See Ashenfelter, Ashmore, Baker, Gleason, and Hasken (2004) for an enlightening discussion of the econometric differences between cross-sectional and fixed effects panel techniques.