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VALUE RELEVANCE OF R&D REPORTING: A SIGNALLING INTERPRETATION[1]

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ABSTRACT

Accounting for research and development (R&D) costs is an open issue. *SFAS N°2* mandates that all R&D costs are immediately expensed. International standards prescribe a capitalization of R&D costs if they meet certain criteria (*IAS 38*). Recent research papers (Healy et al., 2002; Lev and Sougiannis, 1996, 1999; Aboody and Lev, 1998, Zhao, 2002) show that capitalization of R&D costs and software development costs is value relevant. However critics can be leveled at previous research because prior empirical tests are based on simulated or partial data.

Our purpose is to test empirically R&D accounting issues on a sample of 95 French firms on a three years period (1998-2000). French context provides an experimental field for studying the value relevance of R&D capitalization, because both accounting treatments of R&D costs (expensing and capitalization) are allowed. We find that capitalized R&D is positively associated with stock returns and stock prices, whereas expensed R&D is negatively related to stock prices and stock returns. R&D accounting reduces the information asymmetry on the successfulness of R&D projects: it acts as a signal to investors.

This paper extends previous literature by using real data on capitalized R&D, instead of estimated data. Moreover, we show not only that capitalized R&D is value relevant but also that expensing of R&D projects conveys a negative signal.

Key words: value relevance, R&D, France, financial reporting, capital markets, accounting choice.

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0. INTRODUCTION

This paper deals with the value relevance of research and development (R&D) costs' financial reporting. Accounting for R&D efforts is an open issue. US standard setters mandate that all R&D costs are immediately expensed (*SFAS N°2*), whereas International standards prescribe a capitalization of R&D costs if they meet certain criteria (*IAS 38*).

On one hand, proponents of the cost method argue that expensing is preferable to capitalization because it eliminates the opportunity for managers to capitalize costs of projects that have a low probability of success or to delay writing down impaired R&D assets. On the other hand proponents of the capitalization method argue that R&D outlays generate some of the most prized economic assets in the economy. As Rimerman (1990) notes "intangible, unmeasured assets have great importance in an economy increasingly dependant on expertise, data and technology, an economy in which an expanding service sector does not rely on fixed assets as the primary generator of revenue". As a consequence accountants refusal to capitalize these expenditures as assets seriously affects the relevance of financial reporting. Lev and Sougiannis (1999) argue that the significant decline in the relevance and the usefulness of financial statements is due to the non recognition of intangible assets in the balance sheet. To summarize, the cost method is perfectly objective and verifiable. The capitalization of R&D costs may be used to convey information but is also less reliable. There is a trade off between reliability and objectivity (Healy et al., 2002).

This trade off is of importance both to market participants and to standard setters. For investors, the financial reporting of research and development outlays has a great impact on the reported net income (if the R&D effort is not constant over time). Moreover, a uniform way to report for R&D expenditures (e.g. cost method) disallows outsiders to properly evaluate the growth opportunity set in a context of information asymmetry. For standard setters, the accounting of R&D outlays is important as it relates to their conceptual framework. According to both the IASB and the FASB, financial reports should provide useful information to investors. As a consequence, most of the literature (with some exception, e.g. Boone and Raman, 2001) has concentrated on the value relevance of R&D accounting regimes (expensing or capitalizing). An implicit assumption of the value relevance approach is that an accounting rule is preferred if it improves the statistical association of stock prices and/or returns with earnings, book values or other accounting variables. In the case of R&D accounting, under the value relevance criterion, full cost accounting should be adopted only if the value relevance of earnings and book value is higher than under a recognition of R&D outlays as assets.

The empirical challenge for testing the value relevance of R&D regimes rests on the data requirements. Such tests require a set of data with capitalizers and expensers, but most standard setters require the cost method. Researchers developed three answers to this challenge:

(1) *The use of artificial data*: since capitalization of R&D costs is not allowed in the US, some authors chose to model the amounts of capitalized R&D. For instance, Lev and Sougiannis (1996), Horwitz and Zhao (1997) and Chambers et al. (1998) developed a model to price R&D assets if successful R&D outlays were capitalized instead of being expensed. Healy et al. (2002) go even farther: they use Monte Carlo simulations to generate financial statements of pharmaceutical firms. They were then able to test the association between economic values (ROE, net present value of the firms,…) and

the R&D accounting treatment (full cost or successful efforts). Overall, those studies document the value relevance of capitalizing R&D costs.

(2) *The use of real data:* Other authors prefer to use real data to create samples of capitalizers and expensers. For instance Aboody and Lev (1998) studied software development costs' capitalization, which is the only exception in the United States to the full expensing rule of R&D. The disadvantage of this approach is a scope's reduction compared to the previous studies.

(3) *A comparative approach:* Some authors choose to implement a comparative approach. Since some accounting setters require full expensing of R&D expenses and other authorize capitalization, it is possible to carry out value relevance studies on a sample of international firms. For instance, Zhao (2002) notes that the USA or Germany require a full expense of R&D costs, whereas France or the UK allow a capitalization of such costs. Zhao (2002) compares the ability of accounting figures to explain share prices in those countries.

Overall, previous studies conclude to a higher value relevance of capitalized R&D costs if they meet certain criteria of successfulness instead of just expensing them. However, this conclusion is based on studies that can be criticized. The relevance of studies with artificial data is based on the ability of the researcher to compute an economically sound asset of R&D. This ability can be questioned. For instance, Lev and Sougiannis (1996) use polynomial Almon lag method that is highly dependant on the number of observations. The range of the papers on software development costs capitalization are too narrow to be easily generalized. Finally, comparative studies fail to control the many biases that can affects the empirical findings (market microstructure, institutional factors, the functions of accounting across countries,…)

Our goal is to take advantage of a specific feature of the French institutional context. French standard setters allow conditional capitalization of R&D costs or expensing of such R&D costs. French firms have the *option* to choose the expensing or the capitalization of R&D outlays (under conditions). This framework provides a laboratory experiment for an accounting treatment of intangibles that differs from the nearly universal full expensing of intangible assets. Under French GAAP, managers can signal to market participants the expected return of their R&D outlays by capitalizing such costs[4]. Since capitalization is an option, managers can also align their practices on international standards and expense their R&D outlays. This design offers a unique opportunity to assess the value relevance of R&D accounting. More precisely, the issues raised by the value relevance of R&D accounting are twofold. First, do market participants value R&D assets? This question is open due to the trade off between relevance and reliability. A positive and significant association provides a strong support to the IASB position. Second, if the recognition in the balance sheet of R&D outlays is relevant, then expensing R&D outlays should provide a negative signal to the market because unsuccessful investments can be expected.

Our research design is based on two value relevance studies (explanation of the cross sectional returns and explanation of the year-end share price). Our sample is composed of 95 French listed firms which disclosed information on R&D on the 1998-2000 period. In France,

[4] Only the cost of successful projects can be capitalized. To capitalized, R&D outlays must meet three criteria: to be specific to an identifiable project, to be related to applied research (fundamental research is not eligible), to have significant chances of commercial success. Given the last condition, only successful projects can be recognized as assets.

the income statement usually classifies expenses by nature rather than by function[5]. R&D expenses, like advertising expenses, are therefore not shown in French Group financial statements, in contrast to the situation under US GAAP. The sample size is 254 observations due to data limitations. Our empirical findings suggest that capitalization of R&D costs is value relevant. The recognition in the balance sheet of such assets is perceived as a positive signal by the market. On the opposite, an expensing of R&D costs produces lower share prices and lower returns (ceteris paribus).

The reminder of the paper is organized as follows. Section 1 describes our theoretical background, section 2 presents our methodology, section 3 our empirical findings and section 4 concludes.

1. THEORETICAL BACKGROUND

1.1. Accounting treatment of Research & Development costs

Research and development reporting in French consolidated statement could follow different GAAP (but R&D reporting must follow French accounting rules in the individual accounts). With the creation of CRC (*Comité de la réglementation comptable, Règlement 99-02*), quoted companies could use either French rules or IAS GAAP or, until the 31st December 2002, international GAAP as US GAAP. As shown in table 1, the accounting treatments of R&D costs are different across standards.

Insert Table 1

French rules state that R&D expenditures are expensed as incurred unless the project satisfies certain conditions. PCG 99 (*Plan comptable général*, 1999) express that: "Exceptionally, applied research and development costs could be capitalized if the projects concerned are clearly identifiable, their respective costs are distinctly evaluated, and each project has a serious chance of technical success and commercial profitability" (Art. 361-2).
Capitalized R&D expenditures must be amortized over a period not exceeding 5 years. There are no clearly established rules concerning the starting date for amortization. In exceptional circumstances, and relating only to particular projects, R&D capitalized expenditures may be amortized over a longer period not exceeding the useful life of the assets. If R&D costs are expensed as incurred, they shall be disclosed in the management report[6].
The capitalization of R&D costs under French rules remains an option for the company if the project satisfy the above criteria. Thus the capitalization of R&D costs is a strategic decision for the group. The literature suggests that when firms make reporting decisions, there is a trade-off between the cost of revealing proprietary information and the resulting benefit (Verrechia, 1983). This trade-off is likely to be very sensitive in the case of R&D reporting because of its highly confidential nature.

On the other hand, no choice of R&D accounting treatment exists under US GAAP. *SFAS N°2* established standards of financial accounting and reporting for research and

[5] Ding, Stolowy and Tenenhaus (2002) show that only 32 French companies, in the top 100, used the presentation by function in 1998.
[6] In France, the income statement presentation usually presents a classification of expenses by nature rather than by function. R&D expenses, like advertising expenses, are not therefore shown in French Group financial statements, in contrast to the situation under US GAAP. All intangible expenditure is distributed between the various operating expenses. For example, software development costs will be divided between personnel costs for the employees who worked on the project, purchases of raw materials for any components, and other relevant items in the same way.

development (R&D) costs. This statement requires that R&D costs to be expensed when incurred. It also requires the company to disclose in its financial statements the amount of R&D expensed (i.e. there is no optional treatment of R&D costs, but their amount is available). However, separate rules apply to development costs for computer software that is to be sold: capitalization (and amortization) applies once technological feasibility is established. Capitalization ceases when the product is available for general release to customers. Similar rules apply to certain elements of development costs for computer software for internal use (*SFAS N°86*).
In conclusion, US GAAP do not allow capitalization of R&D costs, but require a distinct disclosure of these costs.

At last, French listed companies could follow the international standards. The objective of *IAS 38* is to prescribe the accounting treatment for intangible assets that are not explicitly covered in another IAS[7]. *IAS 38* mandates:

- a full expensing of all research costs (IAS 38.42).
- a capitalization of development outlays only if technical and commercial feasibility of the asset for sale or use has been established. This means that the firm must intend and be able to complete the intangible asset and either use it or sell it and be able to demonstrate how the asset will generate future economic benefits (IAS 38.45)

An intangible asset (i.e. capitalized R&D) should be amortized over the best estimate of its useful life (IAS 38.79). Nevertheless, *IAS 38* does not permit an enterprise to assign an infinite useful life to an intangible asset. It includes a presumption that the useful life of an intangible asset will not exceed 20 years. Impairment (*IAS 36*) applies to intangible assets. There is a compulsory annual test if the amortization period exceeds 20 years or intangible is not ready for use. Finally, additional disclosures are required about the amount of research and development expenditure recognized as an expense in the current period (IAS 38.115).

1.2. Value relevance of R&D outlays

French context provides an experimental field for studying the value relevance of R&D capitalization, because both accounting treatment of R&D costs (expensing and capitalization) are allowed.

Zhao (2002) studies the relative value relevance of R&D capitalization in France, the UK, Germany and the USA. He shows that the reporting of total R&D costs increases the association of equity price with accounting earnings and book-value with complete R&D accounting standards (Germany and the USA). The allocation of R&D costs between capitalization and expense provides incremental information content over the disclosure of the total R&D costs. However, this study presents caveats due to the international comparison. Recent comparative studies indicate that earnings quality is subject to several country specific factors other than legal systems (e.g. Pope and Walker, 1999; Ali and Hwang, 2000). Zhao (2002) follows Francis and Schipper (1999) in examining only the information content of R&D costs level. Lev and Zarowin (1999) find that change in R&D intensity bears significant additional information and that it is necessary to control for industry effect in R&D accounting research because industrial R&D is industry specific by nature (Lev and Sougiannis, 1996).

[7] IAS 9 (1993), « Research and development costs » was replaced by IAS 38 in July 1999.

The relation between the stock returns and investments in R&D has been extensively studied in prior literature. For instance, Hirschey (1982) shows that, on average, advertising expenses and R&D outlays have a positive and significant effect on the share price. Connolly and Hirschey (1984) document the same relation between R&D expenses and share price on a sample of 390 firms representing more than 90% of the R&D expense of the US industrial firms. More recently, Lev and Sougiannis (1996) documented a significant and inter temporal association between a capital of R&D and future stock returns. If R&D costs are relevant, some authors suggest the existence of a systematic mispricing of the intensive R&D firms, or of a compensation with a factor of risk. For instance, Chan et al. (2001) give support to this proposition. They show that R&D intensive firms have low past returns and show signs of mispricing.
Overall, these articles show:

- a positive link between R&D expenses and various market values.
- that market participants' perception of R&D effectiveness is blurred by information asymmetry. As consequence, R&D outlays are mispriced by the market.

These conclusions raise the question of the value relevance of R&D outlays reporting. Standard setters may require that all R&D be expensed immediately or could authorize a capitalization of R&D outlays under conditions. Capitalization (or expensing) of R&D efforts is value relevant if a significant association is found with market values (share price or cross sectional returns for instance).

Our research question is the following: "Is it possible to convey information on R&D by reporting R&D as expenses or as assets"? This question is not trivial due to the trade off between relevance and reliability in the case of R&D capitalization (Healy et al., 2002). As noted by Lev and Sougiannis (1996, 1999), R&D capitalization is probably relevant because it allows to reduce the information asymmetry between the firm and market participants. Nevertheless, capitalizing such costs also creates an opportunity for managers to engage into earnings management. Recognizing R&D as assets may impair financial reports reliability. Our goal in this paper is to take advantage of the French local context:

- Since, French standard setters authorize the recognition of R&D efforts either as an expense or as an asset, we have the opportunity to study the value relevance of each accounting treatment.
- Compared to prior studies, we have an access to real data about capitalized R&D. As a consequence, we do not have to compute an estimated R&D asset as in Lev and Sougiannis (1999) or in Lev et al. (2002).
- We also have the opportunity to control the differences in accounting rules enforcement or in market microstructure that can impair the relevance of comparative studies (as in Zhao, 2002).

Consistent with prior studies, we can state the following hypothesis:
H1: *Recognition of R&D outlays as assets is value relevant*. We expect a positive and significant association between capitalized R&D and market values.

Since French managers have the option to recognize development costs as assets, recognition as expense should signal non profitable or non achieved R&D projects. We can state H2:
H2: *Recognition of R&D outlays as expense conveys a negative information to the market*. We expect a negative and significant association between expensed R&D and markets values.

2. DATA AND METHODOLOGY

2.1. Sample

To carry out our research, we need to create a sample of expensers and capitalizers among the French listed firms. The main difficulty was to identify capitalizers because most of the databases use a US format of balance sheet, where R&D assets are not identified. For instance, on the Thomson financial database, R&D assets are registered as intangible assets (as with brands, patents, other intangibles). To identify expensers, we use the Thomson financial database (who reports the amount of R&D expensed). To identify capitalizers, we use the DIANE (DIsque pour l'Analyse Economique) database, specialized on French firms. Capitalized R&D is reported on a specific line of the balance sheet. Since there are doubts on the reliability of this data base, we cross checked the data gathered from DIANE with the information disclosed in annual reports.
95 large French listed firms compose our sample on a three year period (1998-2000). The total sample size is 254 observations (firm-year), which can appear to be quite small given that 1,404 non financial firms are present on the Thomson Financial database (table 2): our sample represent only 6.77% of the French listed firms.

Insert Table 2

To explain this result, it should be noted that under French regulations, firms do not have to disclose their R&D outlays. As a consequence, our sample is biased towards firms with an incentive to disclose additional information. By comparing our sample with the total population of listed firms, we note that our sample is biased towards high technology, high growth firm, small capitalization (see table 3).

Insert Table 3

Since our sample is mainly compounded of high tech firms, we present the descriptive statistics for each sub sample (high tech versus traditional firms) in table 4. On the whole, this table suggests that high tech firms have higher growth opportunities (Price-Earnings-Ratio is 32.5% versus 15.52% for traditional firms, Price-to-Book ratio is 5.3 versus 2.8), are less leveraged (25% of total assets versus 29.57%, significant at 5%), more risky (β is 1.30 versus 0.62 for traditional firms) and have smaller market capitalization (5.7 billions of euros versus 8.9 billions) than traditional firms.
Surprisingly the average R&D outlays per share (R&D per share) of high tech firms is not statistically different from the average spending of traditional firms (*RDPS*: R&D per share) as shown in table 4. This result is probably due to the sample bias (made of firms who voluntarily disclosed information). However, as table 4 shows, high tech firms clearly choose to capitalize their R&D outlays. This feature of our sample is consistent with prior studies (Ding and Stolowy, 2003).

Insert Table 4

2.2. Research design

We examine the value relevance of R&D accounting treatment (expensed versus capitalized) using two approaches: associating stock returns with contemporaneous financial data and associating stock prices with financial data.

We control our models by the following variables coming from previous literature.

- *Size*, measured by the market value of equity at the end of fiscal year. Large firms tend to spend a substantial part of research and development costs on basic research, on maintenance and upgrades of their products. Theses costs, and particularly basic research costs are expensed accordingly to PCG 99, *IAS 38* or *SFAS N°2*. Consequently, large firms are expected to expense a larger part of development costs than smaller firms.

- *Growth,* measured by the annual change of sales. We expect that firms having the higher level of growth are the most engaged in R&D.
- *ROE (Profitability),* measured by the ratio return on equity per share. Given analysts' scepticism about research and development capitalization, it is widely believed that profitable companies avoid capitalization in order not to taint the perceived quality of their earnings in analysts' eyes.
- *Leverage,* measured by long-term debt divided by total capital[8]. Leverage is a proxy for the restrictiveness of loan covenants as motivators of capitalization; firms closer to loan restrictions may favour capitalization which increases equity and earnings.
- *Systematic risk, or* β. Basic research more risky than product development. Basic research is also expensed according to French, international or US GAAP, while product development could be capitalized. Thus riskier firms, namely, those devoting a larger share of developments efforts to basic research, can be expected to expense more than less risky companies.
- *Book-to-market ratio*, indicates investors' growth expectations irrespective of when the underlying information reaches the market. This ratio allows to control for performance and risk (Fama and French, 1992). We expect firms with high (low) book-to-market ratio have low (high) R&D intensity.

2.2.1. Stock returns model

First we examine the link between stock returns, annual R&D capitalization and expensed R&D data using a model derived from the Fama and French (1992) and Aboody and Lev (1998) models.

The association between capitalized R&D variable and contemporaneous annual stock returns indicates the extent to which the information conveyed by R&D capitalization is used by investors. Such a test cannot indicates whether investors actually used capitalization data in assessing security values. We estimate the following cross sectional regression:

$$R_{i,t} = a_0 + a_1 RDES_{i,t} + a_2 RDCapTA_{i,t} + a_3 \ln(Size)_{i,t} + a_4 Growth_{i,t} + a_5 ROE_{i,t} + a_6 Beta_{i,t} + a_7 Lev_{i,t} + a_8 \ln(BTP)_{i,t} + a_9 HT_{i,t} + a_{10} YR_{i,t} + \varepsilon_{i,t} \quad (1)$$

With,

- R_{it}: annual stock return at the end of year *t for firm i*.
- $RDES_{it}$: annual amount of expensed R&D costs to sales, for firm *i* and year *t*.
- $RDCapTA_{it}$: annual amount of net capitalized R&D costs to total assets, for firm *i* and year *t*.
- Ln($Size_{it}$): logarithm of market value of the firm *i* at the end of fiscal year *t*.
- $Growth_{it}$: rate of growth for company *i*, measured as change in sales between *t* and *t-1*.
- ROE_{it}: return on equity ratio (earnings / book value) for firm *i* at the end of year *t*. It measures the profitability of the firm

[8] Total capital represents the total investment in the company. It is the sum of common equity, preferred stock, minority interest, long-term debt, non-equity reserves and deferred tax liability in untaxed reserves.

- $Beta_{it}$: measure of risk, CAPM-based beta of company *i*.
- Lev_{it}: leverage ratio for firm *i* in year *t*, measured as long term debts on total capital.
- Ln(BTP_{it}): logarythm of book value (minus capitalized R&D) per share to price at the end of year *t*.
- HT_{it}: dummy variable for industry group coded one for high-technology firms and zero for traditional firms.
- YR_{it}: time indicator variable that equals to one if an observation is from fiscal year Y, and zero otherwise.

If the annual capitalized R&D represents value relevant information to investors then a_2 in model (1) should be positive. Since *RDES* is likely to include R&D expenditures incurred before technical and/or commercial feasibility has been achieved, we predict a_1 to be negative and smaller than a_2.
We assume that while firms generally undertake positive expected value projects, achieving technological or commercial feasibility (indicated by capitalization) confirms to investors that the project has a positive expected value. Whereas R&D expensed could be seen as non profitable or non achieved R&D projects, which are not considered as vehicle for value creation.

2.2.2. Stock price Model

Model (1) deals with the value relevance of the annual capitalized and expensed R&D costs. To study the value relevance, in the association sense, of the R&D asset reported on the balance sheet and the expensed R&D costs, we ran the following regression:

$$P_{i,t} = b_0 + b_1 RDEPS_{i,t} + b_2 RDCapPS_{i,t} + b_3 EPS_{i,t} + b_4 BVPS_{i,t} + b_5 \ln(Size)_{i,t} + b_6 Beta_{i,t} + b_7 HT_{i,t} + b_8 YR_{i,t} + e_{i,t} \quad (2)$$

With,

- $P_{i,t}$: stock price at the end of the fiscal year *t for firm i*.
- $RDEPS_{i,t}$: annual amount of expensed R&D costs per share.
- $RDCapPS_{i,t}$: annual amount of net capitalized R&D costs per share.
- $EPS_{i,t}$: reported annual earnings per share.
- $BVPS_{i,t}$: book value of equity per share.
- Ln($Size_{it}$), $Beta_{it}$, HT_{it} and YR_{it}: as defined above.

Model (2) was motivated by recent empirical work on earnings models, in which the market value of the company is regressed on alternative measures of earnings, book value, and other relevant information (Aboody and Lev, 1998, p. 172; Zhao, 2002, p.158).

3. EMPIRICAL FINDINGS

3.1. Univariate tests

First, we carry out a few univariate tests to check the value relevance of R&D accounting methods. Table 5 shows that no significant relation can be found between R&D outlays per share (*RDPS = RDEPS + change in RDCapPS*) and stock returns, whatever may be their recognition in financial statements (in the income statement or in the balance sheet).

However, the positive relation between price and R&D per share is positive and not far from being significant at 5%.

Insert Table 5

As table 5 shows the relation between price (P) and the R&D reporting is contrary to what is expected since *RDCapPS* (resp. *RDEPS*) is negatively (resp. positively) related to price. The univariate correlation between *RDCapTA* (net RD costs capitalized) and return is significant and positive as expected, but the correlation between *RDES* (RD expensed divided by sales) is not significant.

Overall univariate tests indicate that R&D reporting in the financial statements matters to explain the cross sectional variation of returns and the share price. However, the sign of the relation is not clear due to high correlation between the financial reporting of R&D and growth opportunities that have an impact on share price or return. Table 6 and table 7 show that correlations between R&D outlays and various measures of performance (probably related to share price and returns) are significant. Thus, we have to carry out multivariate tests to control for potential opposite effects.

Insert Tables 6 and 7

3.2. Multivariate tests

3.2.1. Value relevance analysis

Table 8 represents the estimates for the stock returns regression, model (1), for the full sample (panel A), for the traditional firms (panel B) and for the high-technology firms (panel C).

Insert Table 8

In panel A (total sample) the coefficient of annual capitalization of R&D (*RDCapTA*) has the expected sign (2.544) and is highly statistically significant (t = 3.766). In addition, as reported in panel C, the coefficient of capitalized R&D is positive and significant for high-tech companies and insignificant for traditional firms, as reported in panel B.

In contrast to the large and highly significant coefficient of the capitalized R&D variable, the estimated coefficient of expensed R&D costs (*RDES*) is negative (- 0.651), only significant at 10% (for panels A and C) and insignificant for panel B.

Coefficients for the size control variable, ln(*Size*), are positive and significant for the three panels, whereas growth control variable presents a positive association with stock returns only for the full sample and high-tech firms.

Evidence from the stock return analysis indicates that investors distinguish between capitalized and expensed R&D costs; while values of the former are positively associated with stock returns, values of the latter are negatively associated. This result indicates that capitalization of R&D is not a signal of earnings manipulation, but is a relevant information for investors of the firm's value creation capacity.

After having studied the effect of R&D capitalization on stock returns, we examine its influence on stock prices. Table 9 represents estimates of the stock price regression, model (2), for the full sample (panel A), then for the traditional companies (panel B) and the high-technology companies (panel C).

Insert Table 9

Table 9 indicates that the coefficient of capitalized R&D per share (*RDCapPS*) is statistically significant and highly positive for the three samples (full, traditional and high-tech). The coefficients are high relative to book value (26.095 versus 0.886, 40.021 versus 0.462 and 18.497 versus 1.643). On the other hand, as for the stock returns regression, the coefficient of expensed R&D per share (*RDEPS*) is negative and significant for panel A, and negative and insignificant in panels B and C.

In addition, as reported for the full sample, coefficients of earnings per share (*EPS*) and book value per share (*BVPS*) have the expected sign, as for the ln(*Size*).

To summarize, our results show for both regressions a positive association between capitalized R&D costs and stock return or stock price and a negative relation between expensed R&D and return or price. The way of reporting R&D costs seems obviously not to be neutral, it carries a signal to investors. These results give support to the capitalization of R&D when the project fulfils certain conditions, as recommended by *IAS 38* and PCG 99.Currently, capitalized R&D bears a value relevant and positive information for investors in assessing the value of companies. And if one of the most important objective of financial accounting is to provide a useful information to investors[9], then capitalization of R&D should be recommended.

3.2.2. Robustness Tests

Our empirical findings clearly show that the market attributes value to the financial reporting of R&D outlays. However, a systematic association between high levels of R&D outlays and capitalization of such expenditures could impair our results.
To test, for that possibility, we run a logistic regression (3) to explain the determinants of the accounting method for R&D costs. Specifically, we test the following model:

$$RDCap_{i,t} = a + b_1 \ln(Size) + b_2 RDPS + b_3 \ln(BTP) + b_4 Beta + b_5 HT + b_6 Lev + b_7 YR00 + b_8 YR99 + e_{i,t} \quad (3)$$

RDCap is a dummy variable coded 1 if the firm capitalizes its R&D costs, 0 otherwise. *RDPS* is the amount of R&D outlays per share. We compute *RDPS* as (*RDEPS* + *change in RDCapPS*)[10]. All other variables were previously defined. The assumptions for this model are the following:

(1) Managers can decide to use accounting for R&D to manage their contractual relations. As a consequence, a significant relation is supposed between leverage, size and the decision to capitalize R&D.
(2) As noted earlier, capitalization may be preferred by high tech firms because of the importance of their R&D costs. As a consequence, *HT* and Ln(*BTP*) are supposed to influence the decision to capitalize R&D costs.
(3) To test the association between the R&D accounting and the level of R&D outlays, the variable *RDPS* is added as an exploratory variable.
(4) *Beta* and *YR* are control variables (defined above).

We carry out this model over our full sample. Table 10 presents the empirical results. Overall the model is significant (Nagelkerke R² is 0.613). The level of R&D per share seems to be

[9] *"The objective of financial statements is to provide information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of users in making economic decisions"*, IAS Framework.
[10] We tried other scaling variables (total assets, sales). Results (not reported) are qualitatively similar.

highly significant (sig < 0.1%): the more R&D per share, the more likely the capitalization of such costs[11].

Insert Table 10

As a consequence, our empirical findings of the previous section may only reflect the fact that capitalizers spend more in R&D and have higher returns and higher share prices (all other things being equal). To test for that possibility, we compute again the return regression (resp. stock price regression) substituting *RDPS* to *RDCapTA* and *RDES* (resp. *RDCapPS* and *RDEPS*). Our goal is to check the existence of a systematic effect of R&D on returns and share prices.

Tables 11 and 12 shows our results. Returns (table 11) are not explained by the overall R&D outlays. Since table 8 reports significant association between *RDCapPS* and *RDEPS*, it means that investors attach a different information content on R&D outlays according to their accounting treatment.

Stock price is negatively associated with *RDPS* (research and development per share, see table 12). As a consequence, the positive coefficient found in table 9 on *RDCapPS* is all the more significant and reliable that, on average, R&D outlays have a negative impact on share price.

Insert Tables 11 and 12

Those results suggest that our empirical findings are not driven by a R&D level effect[12].

4. CONCLUSION AND AVENUES FOR FUTURE RESEARCH

We examined the value relevance of R&D accounting treatment (expensing versus capitalization) on a sample of French listed companies. Our results indicate on one hand that R&D capitalization-related variables (*RDCapTA* and *RDCapPS*) are significantly and positively associated with stock returns and prices. On the other hand, R&D expensed-related variables (*RDES* and *RDEPS*) are negatively or not associated with stock prices and returns.

We conclude that R&D capitalization summarizes relevant information for investors and reflects the profitability of R&D projects.

The negative sign of the association of the R&D costs incurred by expensers and market values (price and returns) could reflect investors' reaction to the absence of compulsory disclosure of information about R&D in France in the financial reports. Especially, two biases exist:

- *Best firms' confidentiality*. Firms with high quality R&D do not desire to disclose their research level, nor their advertising and training expenditures because the disclosure of such costs may provide relevant information to competitors.
- *Worst firms' jamming effect*. Poorly performing firms have an incentive to disclose high level of R&D to signal favourable future prospects to the market. The information on R&D is not easily verifiable and managers could disclose information on R&D as to manipulate market participants' beliefs.

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[11] The robustness of this result was checked by using different procedures to run the logistic regression: ascending or descending (tables not reported). *RDPS* was always significant.

[12] Our results are not driven by other sources of information correlated with the accounting choice concerning R&D because Ding and Stolowy (2003) show no significant association between R&D reporting and the level of voluntary disclosure.

In addition to these economic effects, Luft and Shields (2003), using an experimental approach, note that market participants undervalue the future effect of R&D when R&D outlays are expensed. They explain this empirical finding by psychological biases (fixation,…).

Overall, our findings give support to a capitalization of R&D costs under conditions of commercial success. The accounting treatment of R&D carries a signal to investors. This result gives support to the capitalization of R&D when the project fulfil certain conditions, as recommended by *IAS 38* and PCG 99. And if providing useful information to investors is one of the most important objective of financial accounting, then capitalization of R&D should be recommended. However, our research suffers from limits and future avenues of research can be suggested.
Our study belongs to the value relevance literature that has been extensively criticized since 2001 (Holthausen and Watts, 2001; Ronen, 2001). Even if some authors disagree with such critics (e.g. Barth, Beaver and Landsman, 2001), it is clear that the information content of financial reporting is not limited to the association of accounting numbers with market values. A first possibility would be a study of the interaction between voluntary disclosure and value relevance of R&D. Such study would allow us to test if the significance of R&D reporting is due to the absence of alternative sources of information or to a signal conveyed by R&D reporting. A possible further investigation of our sample, would be to test the impact of R&D financial reporting on information asymmetry (measured by the bid-ask spread as in Leuz and Verrechia, 2000). If our interpretation in terms of signal is correct, than we should expect a smaller bid-ask spread for capitalizers than for expensers.

Another possibility to further investigate our results would be to explore the factors that influence the credibility of the signal provided by capitalizers. Since considerable discretion exists to recognize R&D outlays as assets, managers can use opportunistically this accounting choice. Some institutional and corporate governance factors probably influence the choice of capitalizing R&D costs and the credibility of this signal.

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Table 1 - R&D Accounting treatments

	Standards	R&D expensed as incurred		R&D capitalized		
		General rule	***Disclosed Separately***	***Allowed***	***Option***	***Amortization & Impairment***
French GAAP	Art. 361-2, PCG 99	Yes	No	Yes, under conditions	Yes	Amortized over 5 years max
US GAAP	SFAS N°2	Yes	Yes	No		
	SFAS N°86 (software development costs)	Yes	Yes	Yes, if technological feasibility	Yes	Amortized over economic life
International GAAP	IAS 38 & IAS 36	Yes	Yes	Yes, under conditions	No	Amortized over useful life Impairment test if useful life > 20 years

Table 2 - Sample constitution

From Thomson financial database	Number of observations
Firms listed on the French stock exchange	1477
Excluding banks, financial services, insurance	(33)
Total	1404
Number of firms in our sample	95
- % of listed firms	*6,77%*
Number of potential observations over the 1998-2000 period (95*3)	285
Number of valid observations	254
- % of potential observations	*89%*

Table 3 - Descriptive statistics for the full sample

	Full sample		All French listed firms		Diff.
	Mean	S.E.	Mean	S.E.	
HT	50%	0.5	4%	0.1981	yes
Beta	0.96	0.92	0.78542	0.9062	yes
Lev	27.37%	17.54	24.14%	57.55	no
Ln(BTP)	4.02	5.62	4.2018	19.98	yes
Ln(Size)	7328.56	18639.03	1632.22	8880.51	yes
Growth	20.19	32.85	31.58	103.21	no
	N=254		N=1,404		

HT is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, *Beta* is the CAPM specific risk, *Lev* is the ratio of long term debts to total capital, *ln(BTP)* is the log of the book-to-market ratio, *ln(Size)* is the log of the year-end market value, *Growth* is the annual change of Sales.

Table 4 - Comparison of low tech and high tech sub samples

	Beta		*Lev*		*PER*		*ln(PTB)*		*ROE*		*ln(size)*		*RDPS*		*RDEPS*		*RDCapPS*		*RDCap*	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Low tech firms	0.62	0.53	29.57	15.19	15.52	73.67	1.02	0.92	12.81	14.43	9.10	9.99	194.2	394.85	192.14	393.34	0.07	0.25	0.2	0.4
High tech firms	1.3	1.1	25.14	19.45	32.5	262.6	1.67	2.00	9.2	23.54	8.65	9.59	111.18	179.35	107.86	177.49	0.22	0.41	0.41	0.49
N(low tech/high tech)	126/128		126/128		126/128		126/128		126/128		126/128		97/99		98/102		126/120		126/128	
P - level for T tests													5.90%		5.00%		0.01%		<0.01%	

Beta is the CAPM specific risk, *Lev* is the ratio of long term debts to total capital , *PER* is the price earnings ratio, ln*(BTP)* is the log of the book-to-market ratio, *ROE* is the earnings on equity ratio, *ln(Size)* is the log of the year-end market value, *RDPS* is the R&D costs per share either expensed or capitalized and is computed as ($RDEPS_i$+ *change in* $RDCapPS_i$), $RDEPS_{it}$ is the annual RD costs expensed per share, $RDCapPS_{it}$ is the net capitalized RD costs per share, RDCap is a dummy variable coded 1 if the firm capitalizes its R&D costs, 0 otherwise.

Table 5 - Univariate tests: R&D outlays, price and return

	P_{it}	R_{it}
P_{it}	1	
R_{it}	0.134**	1
RDPS	0.136*	-0.110
RDEPS	0.131**	-0.103
RDCapPS	-0.125**	-0.126
RDES	0.012	-0.027
RDCapTA	-0.106*	0.202***

R_{it} is the firm's annual stock return *,* P_{it} is the firm's stock price at the end of year t, *RDPS* is the R&D costs per share either expensed or capitalized and is computed as (*RDEPS+ change in RDCapPS*), $RDEPS_{it}$ is the annual RD costs expensed per share, $RDCapPS_{it}$ is the net capitalized RD costs per share, $RDES_{it}$ is the annual RD costs expensed on sales, $RDCapTA_{it}$ is the net capitalized RD costs on Total Assets.

Table 6 - Correlation matrix, Stock returns regression

N = 254 observations

		RDES	*RDCapTA*	*ln(Size)*	*Growth*	*ROE*	*Beta*	*Lev*	*ln(BTP)*	*HT*	*YR00*	*YR99*
RDES	Pearson's Correlation	1.000										
	Sig.	.										
RDCapTA	Pearson's Correlation	**0.239**	1.000									
	Sig.	0.000	.									
ln(Size)	Pearson's Correlation	0.072	**-0.173**	1.000								
	Sig.	0.253	0.006	.								
Growth	Pearson's Correlation	0.022	0.030	0.046	1.000							
	Sig.	0.728	0.640	0.468	.							
ROE	Pearson's Correlation	**-0.202**	-0.072	**0.187**	**0.352**	1.000						
	Sig.	0.001	0.256	0.003	0.000	.						
Beta	Pearson's Correlation	0.104	**0.165**	**0.233**	**0.203**	**0.183**	1.000					
	Sig.	0.099	0.008	0.000	0.001	0.003	.					
Lev	Pearson's Correlation	-0.042	**-0.144**	0.056	0.096	**-0.138**	0.059	1.000				
	Sig.	0.509	0.021	0.378	0.126	0.028	0.346	.				
ln(BTP)	Pearson's Correlation	**-0.170**	**-0.237**	**-0.268**	**-0.125**	**-0.185**	**-0.332**	-0.001	1.000			
	Sig.	0.007	0.000	0.000	0.046	0.003	0.000	0.988	.			
HT	Pearson's Correlation	**0.172**	**0.166**	**-0.225**	**0.208**	-0.092	**0.370**	**-0.126**	**-0.264**	1.000		
	Sig.	0.006	0.008	0.000	0.001	0.142	0.000	0.044	0.000	.		
YR00	Pearson's Correlation	0.003	0.006	0.031	**0.142**	-0.046	0.013	0.045	-0.005	0.014	1.000	
	Sig.	0.962	0.928	0.628	0.023	0.469	0.833	0.474	0.942	0.824	.	
YR99	Pearson's Correlation	0.008	-0.011	0.017	0.026	0.058	0.016	0.002	0.007	0.006	**-0.525**	1.000
	Sig.	0.896	0.856	0.789	0.683	0.353	0.795	0.976	0.911	0.929	0.000	.

$RDES_{it}$ is the annual RD costs expensed on sales, *$RDCapTA_{it}$* is the net capitalized RD costs on Total Assets, *ln(Size)* is the log of the year-end market value, *Growth* is the annual change of Sales, *ROE* is the earnings on equity ratio, *Beta* is the CAPM specific risk, *Lev* is the ratio of long term debts to total capital, *ln(BTP)* is the log of the book-to-market ratio, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 7 - Correlation Matrix, Stock price regression

		RDEPS	*RDCapPS*	*EPS*	*BVPS*	*ln(Size)*	*Beta*	*HT*	*YR00*	*YR99*
REDPS	Pearson's correlation	1								
	Sig.	.								
	N	200								
RDCapPS	Pearson's correlation	**-0.234**	1							
	Sig.	0.001.								
	N	192	246							
EPS	Pearson's correlation	0.129	**-0.177**	1						
	Sig.	0.075	0.014.							
	N	192	192	192						
BVPS	Pearson's correlation	**0.506**	**-0.247**	**0.618**	1					
	Sig.	0.000	0.001	0.000.						
	N	192	192	192	192					
ln(Size)	Pearson's correlation	**0.148**	**-0.470**	**0.248**	**0.155**	1				
	Sig.	0.036	0.000	0.001	0.032 .					
	N	200	246	192	192	254				
Beta	Pearson's correlation	-0.071	**-0.148**	**-0.150**	**-0.272**	**0.233**	1			
	Sig.	0.318	0.020	0.037	0.000	0.000.				
	N	200	246	192	192	254	254			
HAT	Pearson's correlation	-0.138	**0.211**	**-0.412**	**-0.421**	**-0.225**	**0.370**	1		
	Sig.	0.051	0.001	0.000	0.000	0.000	0.000.			
	N	200	246	192	192	254	254	254		
YR00	Pearson's correlation	0.060	0.057	0.062	0.078	0.031	0.013	0.014	1	
	Sig.	0.401	0.377	0.395	0.283	0.628	0.833	0.824.		
	N	200	246	192	192	254	254	254	254	
YR99	Pearson's correlation	0.035	-0.025	-0.021	0.037	0.017	0.016	0.006	**-0.525**	1
	Sig.	0.627	0.693	0.777	0.613	0.789	0.795	0.929	0.000.	
	N	200	246	192	192	254	254	254	254	254

$RDEPS_{it}$ is the annual RD costs expensed per share, $RDCapPS_{it}$ is the net capitalized RD costs per share, *EPS* is the reported earnings per share, *BVPS* is the book value of equity per share, *ln(Size)* is the log of the year-end market value, *Beta* is the CAPM specific risk, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 8 - Stock returns regression

$$R_{i,t} = a_0 + a_1 RDES_{i,t} + a_2 RDCapTA_{i,t} + a_3 \ln(Size)_{i,t} + a_4 Growth_{i,t} + a_5 ROE_{i,t} + a_6 Beta_{i,t} + a_7 Lev_{i,t} + a_8 \ln(BTP)_{i,t} + a_9 HT_{i,t} + a_{10} YR_{i,t} + \boldsymbol{e}_{i,t}$$

Panel A: Full sample

	Constant	*RDES*	*RDCapTA*	*Ln(Size)*	*Growth*	*ROE*	*Beta*	*Lev*	*Ln(BTP)*	*HT*	*YR00*	*YR99*
Coef.	-48.075	-.651	2.544	6.981	.549	.026	6.602	-.217	-5.622	4.493	2.423	22.545
T-test	-3.376	-2.389	3.766	4.219	4.251	.115	1.375	-.696	-1.386	.484	.264	2.469
Sig.	.001	.018	.000	.000	.000	.909	.170	.334	.167	.629	.792	.014
R^2	.292											
Adjusted R^2	.260											
F	9.157	Sig.	.000									

Panel B: Traditional industry

	Constant	*RDES*	*RDCapTA*	*Ln(Size)*	*Growth*	*ROE*	*Beta*	*Lev*	*Ln(BTP)*	*YR00*	*YR99*
Coef.	-46.667	-2.160	-.710	6.317	.043	.234	-.059	.366	-3.192	-8.633	30.130
T-test	-2.564	-1.423	-.175	2.818	.214	.791	-.006	1.259	-.717	-.890	3.166
Sig.	.012	.157	.861	.006	.831	.430	.995	.211	.475	.375	.002
R^2	.273										
Adjusted R^2	.211										
F	4.404	Sig.	.000								

Panel C : High-technology industry

	Constant	*RDES*	*RDCapTA*	*Ln(Size)*	*Growth*	*ROE*	*Beta*	*Lev*	*Ln(BTP)*	*YR00*	*YR99*
Coef.	-53.100	-.737	2.499	9.252	.783	-.128	5.518	-.714	-8.816	15.155	17.762
T-test	-2.787	-2.205	3.009	3.285	4.232	-.370	.879	-2.097	-1.262	.963	1.154
Sig.	.006	.029	.003	.001	.000	.712	.381	.038	.210	.337	.251
R^2	.369										
Adjusted R^2	.314										
F	6.722	Sig.	.000								

Regression results are based on 254 firm-years (Panel A), 127 firm-years (Panel B), 125 firm-years (Panel C).
R_{it} is the firm's annual stock return, $RDES_{it}$ is the annual RD costs expensed on sales, $RDCapTA_{it}$ is the net capitalized RD costs on Total Assets, *ln(Size)* is the log of the year-end market value, *Growth* is the annual change of Sales, *ROE* is the earnings on equity ratio, *Beta* is the CAPM specific risk, *Lev* is the ratio of long term debts to total capital, *ln(BTP)* is the log of the book-to-market ratio, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 9 - Stock price regression

$$P_{i,t} = b_0 + b_1 RDEPS_{i,t} + b_2 RDCapPS_{i,t} + b_3 EPS_{i,t} + b_4 BVPS_{i,t} + b_5 \ln(Size)_{i,t} + b_6 Beta_{,t} + b_7 HT_{i,t} + b_8 YR_{i,t} + e_{i,t}$$

Panel A: Full sample

	Constant	*RDEPS*	*RDCapPS*	*EPS*	*BVPS*	*Ln(Size)*	*Beta*	*YR00*	*YR99*	*HT*
Coef.	-34.821	-0.015	26.095	2.798	0.886	9.252	-2.086	-2.328	1.811	9.055
T-test	-3.519	-1.875	3.870	3.080	5.039	9.544	-0.809	-0.323	0.248	1.778
Sig.	0.001	0.062	0.000	0.002	0.000	0.000	0.419	0.747	0.804	0.077
R^2	0.547									
Adjusted R^2	0.524									
F	24.376	Sig.	0.000							

Panel B: traditional industry

	Constant	*RDEPS*	*RDCapPS*	*EPS*	*BVPS*	*Ln(Size)*	*Beta*	*YR00*	*YR99*	*HT*
Coef.	-40.473	-0.008	40.021	3.891	0.462	10.758	-12.627	4.628	12.232	
T-test	-2.531	-0.832	2.894	2.825	1.801	5.888	-1.642	0.400	1.060	
Sig.	0.013	0.408	0.005	0.006	0.075	0.000	0.104	0.690	0.292	
R^2	0.471									
Adjusted R^2	0.423									
F	9.702	Sig.	0.000							

Panel C: High technology industry

	Constant	*RDEPS*	*RDCapPS*	*EPS*	*BVPS*	*Ln(Size)*	*Beta*	*YR00*	*YR99*	*HT*
Coef.	-25.203	-0.023	18.497	1.436	1.643	8.472	0.738	-6.448	-7.357	
T-test	-2.366	-1.324	2.644	1.243	6.806	7.42	0.315	-0.789	-0.883	
Sig.	0.020	0.189	0.010	0.217	0.000	0.000	0.753	0.432	0.379	
R^2	0.673									
Adjusted R^2	0.643									
F	22.423	Sig.	0.000							

Regression results are based on 192 firm-years (Panel A), 95 firm-years (Panel B), 95 firm-years (Panel C).
P_{it} is the firm's stock price at the end of year t, $RDEPS_{it}$ is the annual RD costs expensed per share, $RDCapPS_{it}$ is the net capitalized RD costs per share, *EPS* is the reported earnings per share, *BVPS* is the book value of equity per share, *ln(Size)* is the log of the year-end market value, *Beta* is the CAPM specific risk, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 10 - Accounting choice regression

$$RDCap_{i,t} = \alpha + \beta_1 \ln(Size) + \beta_2 RDPS + \beta_3 \ln(BTP) + \beta_4 Beta + \beta_5 HT + \beta_6 Lev + \beta_7 YR00 + \beta_8 YR99 + \varepsilon_{i,t}$$

Panel A: Full sample									
	Constant	*Ln(Size)*	*RDPS*	*Ln(BTP)*	*Beta*	*HT*	*Lev*	*YR00*	*YR99*
Wald	16.338	21.916	12.827	8.663	0.227	0.124	0.118	4.694	5.810
Sig.	0.000	0.000	0.000	0.003	0.634	0.725	0.731	0.030	0.016
Cox & Snell R²	0.449								
Nagelkerke R²	0.613								

Regression results are based on 196 firm-years (Panel A).
$RDCap_{it}$ is a dummy variable coded 1 if the firm capitalizes its R&D costs, 0 otherwise, *ln(Size)* is the log of the year-end market value, *RDPS* is the total R&D outlays per share, Ln(*BTP*) is the log of the Book-to-Price ratio, *Beta* is the CAPM specific risk, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, *Lev* is the leverage ratio of the firm and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 11 - Return regression with R&D outlays per share

$$R_{i,t} = a_0 + a_1 RDPS_{i,t} + a_2 \ln(Size)_{i,t} + a_3 Growth_{i,t} + a_4 ROE_{i,t} + a_5 Beta_{i,t} + a_6 Lev_{i,t} + a_6 \ln(BTP)_{i,t} + a_8 HT_{i,t} + a_9 YR_{i,t} + \varepsilon_{i,t}$$

Panel A: Full sample											
	constant	*RDPS*	*Ln(Size)*	*Growth*	*ROE*	β	*Lev*	*Ln(BTP)*	*HT*	*YR00*	*YR99*
Coef.	-27.977	-0.026	5.963	0.477	0.012	9.693	-0.428	-6.031	1.773	-0.701	18.392
T-test	-1.359	-1.617	2.880	3.044	0.043	1.638	-1.561	-1.273	0.147	-0.043	1.126
Sig.	0.176	0.108	0.004	0.003	0.966	0.103	0.120	0.205	0.883	0.966	0.262
R²	0.206										
Adjusted R²	0.163										
F	4.806	Sig.	0.000								

Regression results are based on 254 firm-years (Panel A).
R_{it} is the firm's annual stock return, *RDPS* is the total R&D outlays per share, *ln(Size)* is the log of the year-end market value, *Growth* is the annual change of Sales, *ROE* is the earnings on equity ratio, *Beta* is the CAPM specific risk, *Lev* is the ratio of long term debts to total capital, *ln(BTP)* is the log of the book-to-price ratio, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.

Table 12 - Stock price regression with R&D outlay

$$P_{i,t} = b_0 + b_1 RDPS_{i,t} + b_2 EPS_{i,t} + b_3 BVPS_{i,t} + b_4 \ln(Size)_{i,t} + b_5 Beta_{,t} + b_6 HT_{i,t} + b_7 YR_{i,t} + e_{i,t}$$

Panel A: Full sample

	Constant	*RDPS*	*EPS*	*BVPS*	*Ln(Size)*	*Beta*	*HT*	*YR00*	*YR99*
Coef.	-14.864	-0.018	2.987	0.816	7.700	-3.590	11.675	-6.140	-2.903
T-test	-1.696	-2.154	3.172	4.493	8.407	-1.358	2.230	-0.828	-0.389
Sig.	0.092	0.033	0.002	0.000	0.000	0.176	0.027	0.409	0.698
R^2	0.509								
Adjusted R^2	0.488								
F	23.724Sig.		0.000						

Regression results are based on 192 firm-years (Panel A);

P_{it} is the firm's stock price at the end of year t, $RDPS_{it}$ is the annual total R&D outlays per share, *EPS* is the reported earnings per share, *BVPS* is the book value of equity per share, *ln(Size)* is the log of the year-end market value, *Beta* is the CAPM specific risk, *HT* is a dummy variable for industry group coded 1 for high-technology firms, 0 otherwise, and *YR*, is a time indicator variable that equals 1 if the observation is from fiscal year Y, and 0 otherwise.