

Value Relevance of R&D Expenditure before and After IFRS Mandatory Implementation: Evidence From France

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Abstract

the adoption of International Accounting Standards (IAS/IFRS) by an important and growing number of countries is one of the most important changes in the international accounting field. In France, there is a real change in the firm's accounting practice related to the intangibles, and in particular accounting treatment for research and development (R&D) costs, following the adoption of international standards since January 2005. Consequently, the aim of our research is to analyze the impact of the adoption of International Accounting Standards (IAS/IFRS) on the value relevance of R&D expenditures based on a sample of 36 French companies (SBF120). The main results indicate that adopting IAS/IFRS did not affect the value relevance of expensed R&D, whereas, applying the international standards positively affects the value relevance of capitalized R&D.

Keywords: *capitalized R&D; expensed R&D; IFRS; value relevance*

1. Introduction

This study examines the value relevance of research and development (R&D) expenditures in the pre- and post-International Financial Reporting Standards (IFRS) adoption periods in France. The international accounting landscape is characterized by the adoption of universal accounting standards (IAS/IFRS). The application of these standards represents a transition to a new accounting philosophy based on the communication of financial information useful in the decision-making, considering the investor as the privileged user of financial statements.

The creation of these standards aims to harmonize the accounting practice in different countries of the world, so that the national standards gradually converge. By applying this reference, significant changes are expected in the annual company reports; the intangible is one of the themes that have been debated. Thus, there have been major changes in the accounting treatment of intangible assets, and in particular R&D costs.

Before adopting IFRS in France, in 2005, the general rule was the immediate recognition of expenses the R&D as a cost, unless the R&D project meets certain conditions. The General Accounting Plan (GAP) specifies that the R&D costs can be exceptionnally included in intangible assets on condition that they relate to a specific individual projects with a serious chance of technical success and commercial profitability, and whose cost can be clearly established. However, since 1 January 2005, all European listed companies are required to prepare their consolidated financial statements under IFRS. The major difference between the French GAP and IFRS regarding the accounting treatment of R&D expenditures is that under International Accounting Standard (IAS) 38, "an intangible asset arising from development (or the development phase of an internal project) shall be recognized if six criteria are satisfied". Therefore, the capitalization of R&D expenses, which was an option under french GAP, has become an obligation under IAS/IFRS.

Several studies investigate the relevance of capitalized R&D expenditures during the pre-IFRS adoption period. In France, Ding and Stolowy (2003) reveal the lack of relevance regarding the decision to capitalize R&D expenses in relation to the market value of the company. Cazavan-Jeny and Jeanjean (2006) provide an evidence suggesting that R&D expenditures are negatively associated with market value. There are other studies that explore the value relevance of R&D costs in other countries, providing similar results on the relevance of capitalizing R&D expenses. Zhao (2002) finds no significant relevance in spending on R&D in the UK, while Oswald (2008) shows little difference between the value relevance of the expensed and capitalized portion of R&D expenditures.

Nevertheless, few studies have examined the period following the transition to IFRS and particularly the comparison of the relevance of R&D expenses between the periods before and after adoption of IFRS. Therefore, this study aims to explore the value relevance of R&D expenditures during the pre- and post-period of the adoption of IFRS by fixing three different research objectives. First, we aim to determine whether the R&D costs (capitalized or expensed) have relevant value throughout the sample period (both pre- and post-IFRS adoption period). Second, this study tries to examine whether there is any difference in the value relevance of R&D (capitalized or expensed) during the pre- and post-IFRS period. Third, in addition to the above two objectives, other issues regarding the sector effects will also be examined. In this regard, Lev and Zarowin (1999) provide that it is necessary to control the sectoral effects in any study on the R&D costs, because these expenses are specific to the nature of sectors. Companies operating in different sectors have different behaviors in terms of investment in R&D. As a consequence, the third and final objective of this study is to examine the separate value relevance of R&D across manufacturing and nonmanufacturing sectors in the pre and post-IFRS period.

In order to address the above objectives, this study uses a set of panel data of French firms during the period between 2001 and 2009. This implementation resulted in sub-periods of four-years data before the IFRS adoption and five years data after the IFRS implementation in France. We adopt the Ohlson (1995) valuation framework as a theoretical basis for the study of the value relevance of R&D expenditure during the pre- and post-IFRS period.

Our paper contributes to the existing literature primarily in two ways. First, this study extends the limited and inconclusive research on the value relevance of R&D expenses in post-IFRS period by considering the French firms, a rarely studied context. Actually, while the most early accounting studies have documented benefits of the adoption of the IFRS, more recent evidence is mixed (Gong and Wang, 2016; Horton et al., 2013). Second, we examine the influence of the treatment of R&D expenditures on the market value of firms across the manufacturing and nonmanufacturing firms.

The rest of the paper is organized as follows. Section 2 presents a short overview of the existing literature on R&D expenditures. Section 3 presents the details of the research methodology, hypotheses and related valuation models. Section 4 provides an overview of the data selection process and related issues. Section 5 shows the results of the empirical analysis and discussion of the main findings. Finally, section 6 concludes the study.

2. Previous literature

2.1. The accounting treatment of R&D expenditures in France

From 1 January 2005, companies listed on the European markets and their subsidiaries must establish their consolidated financial statements according to international accounting standards IAS/IFRS. They sometimes have significant differences with the French accounting regulations. As a result, numerous changes in the accounting treatment of intangible assets including the R&D costs occur. Actually, capitalization of R&D expenses, which was an option under French GAAP, became an obligation under IAS/IFRS.

The French accounting regulations of the processing of R&D expenses has experienced several changes. The CRC regulation 04-06 resulted in a change to the French rule relating the accounting treatment of R&D costs while bringing it closer to IAS 38. Under French GAAP, R&D costs are capitalized on condition of relating to specific individual projects with a serious chance of technical success and commercial profitability, and whose the cost can be clearly established. The CRC regulation 04-06 just makes changes to the provisions of PCG 99. First, the distinction between basic research, applied research and development fixed by the PCG 99 was abandoned in favor of a dichotomy between research phase and development phase. Second, the criteria for capitalization of retained development costs by the PCG 99 have been clarified and brought to the criteria of IAS 38. Accordingly, the costs of research must be expensed as they are incurred, while development costs can be recognized as assets if they relate to specific individual

projects, with a serious chance of technical and commercial viability. The Regulation also adds that capitalizing development costs is considered as the preferred method.

The expensing of research costs is motivated by the fact that "during the research phase of a project, a company cannot demonstrate that an intangible asset will generate probable future economic benefits" (IAS 38). The expenditure on development (or the development phase of an internal project) are required to be recognized as assets if the company has the ability to prove the six criteria¹ of capitalization, while the costs incurred are expensed if any of these criteria cannot be validated.

A comparative study of the provisions of CRC Regulation 04-06 and IAS 38 relating to the accounting for development costs in assets reveals the persistence of considerable divergence despite the similarity of the criteria for capitalization. Indeed, if the CRC 04-06 makes possible the accounting for development costs as assets, IAS 38 makes it mandatory from the moment the conditions are met. The table given in Appendix A, shows the different accounting treatment of R&D recommended by the IASB "IFRS" and French standards.

Studies that support the idea of giving the option of capitalizing R&D expenditures support that this choice can help companies to communicate information to outside investors. Indeed, because of the asymmetry of information, managers have better understanding of their business and can make correct business decisions. In light of this argument, the implementation of IAS 38 that enhances the association between capitalized R&D and market value is a debatable issue, which was discussed by a number of recently published studies (for example, Oswald, 2008).

Capitalizing R&D expenditures is discussed in numerous countries (i.e., the USA, Canada, Australia, Italy and Korea). Nevertheless, no agreement has been reached so far. Actually, according to US GAAP, all R&D expenditures are expensed, except in the case of software development costs when technological feasibility of new products has been approved by the standard (SFAS² 2). Under SFAS 2 regulations, the researchers investigate the value relevance of R&D in the United States (Aboody and Lev, 1998; Lev and Sougiannis, 1996). They principally test if the value relevance of R&D expenses improve or not when the capitalization of development costs is permitted by the regulations. Nonetheless, findings obtained from the most of these studies are mixed. Therefore, investigating IFRS adoption effects in France and compare the findings obtained to different accounting standards can provide a useful way to study the issue in depth.

2.2. The value relevance of the R&D expenditures

Even today, the accounting treatment of R&D costs is a sensitive issue. Indeed, supporters of both solutions, expensing or capitalizing, use a variety of arguments. Proponents of capitalization argue that R&D costs are among the best regarded economic assets of the current economy. Investment in successful R&D projects involving the generation of cash flow. It is, therefore, preferable to include expenditures on these projects to the assets (for compliance with business continuity principle). Cazavan-Jeny (2007) provides that the capitalization of the profitable R&D projects helps to bring the book value of a company to its fair value. It takes into account future income prospects associated with this investment and thus increases the relevance of accounting information for the assessment.

¹ IAS 38 Development Capitalisation Criteria stipulate: "*An intangible asset arising from development (or from the development phase of an internal project) shall be recognised if and only if, an entity can demonstrate all of the following:*

(a) The technical feasibility of completing the intangible asset so that it will be available for use or sale.

(b) Its intention to complete the intangible asset and use or sell it.

(c) Its ability to use or sell the intangible asset.

(d) How the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset.

(e) The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset.

(f) Its ability to measure reliably the expenditure attributable to the intangible asset during its development."

² The Statement of Financial Accounting Standards

Those against the capitalization of R&D expenses support the following concept: because of the uncertainty surrounding these investments for the implementation of the future economic benefits, expensing the R&D costs as they are incurred represents the accounting method recommended by accounting standard setters (in respect of the precautionary principle). Therefore, even if the manager decides in good faith to capitalize R&D believes that it is profitable, may not be able to reliably assess the future profitability of this R&D project. The risk consists on a decline in the reliability of accounting information (Cazavan-Jeny, 2007). This finding means that expensed R&D costs seems to increase the objectivity of the financial statements since it avoids the capitalization of costs related to projects whose success is unlikely can reduce the quality of accounting numbers.

Because of its importance in the evaluation of futures performance, the revelation of information on R&D by companies is of a vital interest for investors. A growing literature studying the determinants of choice and relevance of accounting for R&D expenses is thus observed. Previous studies conducted on the impact of the activation of intangible expenditure on the reaction of the financial market have found that companies using the activation of these expenditures are more valued. In fact, next to the perception of intangible investments, as the additional cash flows producers to the company, the activation of these intangible expenditure is considered an informative signal market-oriented learning about the quality of the projects maintained (Zhao, 2002).

Hughes and Kao (1991) show that it is possible that the capitalization of R&D expenditures is treated as a signal to the market to indicate the quality of R&D spending. They demonstrate that capitalization of R&D expenses reflects a decision statement from the managers in order to transmit a signal on their profitable R&D projects for the market and thus distinguish themselves from competitors. Similarly, the study of Callimaci and Landry (2004) shows that in the Canadian context, (where from the moment when the capitalization conditions are met, the capitalization of R&D expenses is imperative), capitalization of development costs provides relevant information to investors.

Empirical studies in the American context and for the convenience of the choice of accounting treatment of R&D costs tend to reach for the adequacy of the capitalization of R&D costs. Aboody and Lev (1998) reveal that in United States, where it is prohibited to include in the assets of R&D expenses related to software development are positively associated with the stock market returns and thus improve forecasting futures profits. Similarly, according to Oswald and Zarowin (2007), the capitalization of R&D expenses allows obtaining more relevant information to the market about future benefits than expensing R&D costs. Similarly, a number of other studies (Lev and Sougiannis 1996, among others) provide evidence of the relevance of R&D in the US value.

In the UK, there is conflicting evidence on the association between R&D costs and the market value of companies. A negative association between capitalized R&D and the market value is supported by Oswald (2008). The findings of the study are consistent with the arguments raised in Stark (2008), the adoption of IFRS, particularly IAS 38, cannot lead to efficiency with regard to the relevance of reports R&D value and the elimination of discretion in the treatment of R&D expenses will result in removal of a useful way that businesses communicate information to the stock market. A recent study by Tsoligkas and Tsalavoutas (2011) report that the capitalized portion R&D is positively related to the UK market value while the portion expense was negatively associated with the company's market value suggesting that the market realizes subsequent benefits of R&D capitalization.

However, in the French context, the studies that were conducted there show that where the two accounting treatments for R&D are allowed (expensing and capitalization), it is not possible to guarantee the rule in matters of relevance, the method of capitalization of R&D expenses in relation to the expensing method. The study of Ding and Stolowy (2003), conducted among a sample of French companies reveals the lack of relevance regarding the decision to capitalize R&D expenses in relation to the market value of the business which means that the capitalization of R&D spending contributes insignificantly to the informational quality of accounting numbers. The contradiction found between these results and those obtained in the North American context is explained, according to the researchers, by the disparities in the French governance

systems and Anglo-Saxon. The latter can have implications, particularly on the diffusion characteristics of financial information on R&D. Cazavan-Jeny and Jeanjean (2006) studied a sample of 197 French listed companies from 1993 to 2002. Their results indicate that the capitalization of R&D is important, but negatively associated with stock prices and yields.

Zhao (2002) conduct a comparative study of the relevance of the capitalization of R&D expenses in France, Britain, Germany and the United States. The study reveals that where it is impossible to list costs R&D in assets (Germany, USA), published information on R&D spending improves the usefulness of results and book values for the markets.

2.3. Controversial views on the transition to IFRS

Several researchers have studied with interest the accounting and financial concepts that have been influenced by the adoption of IFRS, some of which suggest that standards improve the information content of accounting data (Affes and Callimaci, 2007). However, other studies show the difficulty of predicting the impact of the modification of certain accounting rules for quality of accounting data, which it is influenced by many complex institutional factors (Ding et al., 2007).

Hung and Subramanyam (2007), for their part, conducted research examining the impact of the transition to IFRS by examining the evolution of the informational relevance of the accounting figures on a panel of 80 German companies that have intentionally adopted the international standard (IAS) during the period from 1982 to 2002. The results show that the informational relevance of the accounting figures under IAS/IFRS is lower than the figures established according to local standards.

Jermakwicz et al. (2006) studied the market reaction after the application of IFRS in 157 European firms. They noted that the IFRS adoption has improved the perception of investors about the progress of accounting numbers, which causes a decrease in the cost of capital.

For their part, Bao and Chow (1999) reveal that earnings and shareholders' equity under IAS posted a better informational relevance compared to Chinese standards. However, these results do not agree with those of Eccher and Healy (2000) which show that the usefulness of the information issued in IAS does not differ from that prepared in accordance with Chinese standards. Niskanen et al. (2000) find, on the Finnish market, that adoption of international accounting standards does not represent any significant informational relevance.

Harris and Muller (1999) yield similar results following the comparison by the latter between the informational relevance of international accounting standards IAS and US GAAP. The study was conducted on accounting profits and capital from a sample of 31 companies applying IAS and took place over a period of four years between 1992 and 1996. They find that IAS are closer to US GAAP than other foreign GAAP in terms the reconciliations.

Lenormand and Touchais (2008) examine, in a separate study, the favorable evolution of the informational content of intangible assets under IFRS. Thus, 160 companies listed on the SBF 250 were selected. The accounting data were obtained by consulting the annual and / or semi-annual reports posted on websites own to these companies or, failing that, on the BALO sites or the AMF. The authors used two types of models. First, they studied the existing association between the carrying values of intangible in each repository (French and IFRS) and market values. Then they operated models facilitating the direct assessment of the interest of IFRS compared to French GAAP. The test results show that the transition to IAS / IFRS is reflected in significantly different amounts with a significant increase in goodwill. Conversely, there were a considerable decrease of identifiable intangible. In addition, the information content obtained under IFRS seems fully most important, whatever the modeling used. Actually, their introduction is systematically accompanied by a significant elevation of R2. Concerning the intangible, the results obtained are more mixed. Therefore, the use of prices on models indicates that, although the two repositories lead to intangible assets (identifiable or not) showing an informative value, international standards provide further useful

information. In other words, financial information under IFRS are more representative of events incorporated in market values (share price or returns).

Tsoligkas and Tsalavoutas (2011) show that the capitalized portion of R&D is positively associated with market values, which implies that the market absorbs these elements to successful projects promising future economic benefits. A significantly negative correlation exists between R&D and market value under IFRS, by not supporting any future economic benefit and should be expensed. Consequently, we believe that the transition to IFRS induced implications for the evaluation of R&D expenditure in UK.

Recently, Shah et al. (2013) analyzes the value relevance of R&D expenses in the periods before and after IFRS in UK. This study also examines the impact of the size of companies and sectors on the relevance value of R&D during the period between 2001 and 2011. The results affirm the relevance of the capitalized value of R&D in the 11 years of the sample period. However, no improvement is recorded at the R&D capitalized value relevance in the post-IFRS period. Large companies have a higher relevance of the R&D expenses capitalized than small firms. Indeed, firm size has significant effects on the relevance of R&D. However, the sectors do not appear to have a significant effect on the relevance of R & D costs. Gong and Wang (2016) find that the value relevance of R&D expenses declines after IFRS adoption in countries that previously mandated immediate expensing or allowed optional capitalization of R&D expenditures. Nonetheless, they do not find change in the value relevance of R&D expenses for countries that changed from the mandatory capitalization rule to IFRS.

To summarize, it should be noted that most of the research described above have studied the period before the implementation of IFRS. However, during this period, despite the capitalization of R&D is optional, only some companies choose to capitalize their development costs (Green et al. 1996; Oswald, 2008). Thus, the availability of data on R&D capitalized before 2005 is limited. In addition, previous studies have provided some evidence that the variables specific to the company may influence the decision to capitalize or not R&D expenditures (Oswald, 2008; Shah et al., 2008), but no agreement has been reached. Moreover, limited study has examined the question of the value relevance of R&D expenditures (capitalized or expensed) in considering both the pre- and post-IFRS effects.

Therefore, we will try to contribute to the existing literature on accounting by examining whether there is a difference in the value relevance of R&D costs (expensed or capitalized) in the pre- and post-IFRS period in France. Moreover, this study provides evidence on sector of firms by investigating any potential differences in the relevance of R&D expenditure (expensed or capitalized) between manufacturing companies and nonmanufacturing ones over the period 2001-2009.

3. Research methodology

3.1. Modeling the value relevance of R&D expenditures

To examine the value relevance of accounting figures, most previously published studies (Cazavan-Jeny and Jeanjean, 2006; Oswald, 2008; Tsoligkas and Tsalavoutas, 2011; Shah et al., 2013) have adopted Ohlson valuation model (1995). He considers the market value of a company based on the book value of equity and net profit expected future residual. Moreover, Barth et al. (2001) point out that the advantage of Ohlson model is that earnings and book value of equity can be divided to examine the relevance of the value of separate accounting figures. In our study, the R&D costs will be decomposed to (1) capitalized R&D costs and (2) expensed R&D expenses, and the Ohlson (1995) valuation framework will be the benchmark model throughout the study:

$$MV_{it} = \alpha_0 + \alpha_1 E_{it} + \alpha_2 BV + \varepsilon_{it} \quad (1)$$

Where,

MV_{it} : the market value of the company i at time t (the market capitalization of the company), which is measured four months after the end of the year for each company.³

E_{it} : the earnings of company i at time t .

BV_{it} : the book value of equity of company i at time t .

ε_{it} : an error term.

Firstly, we begin our empirical study by testing the value relevance of R&D expenditures (expensed or capitalized) during the years of the sample, namely before and after the implementation of IFRS, and therefore we formulate the appropriate hypothesis:

H1: R&D costs negatively affect the market value of French companies

Therefore, this first hypothesis tries to test the overall effects of R&D expenses (capitalized and expensed) over the years the sample. In order to isolate the effects of capitalized R&D and expensed R&D on market value from earnings and book value of equity, we follow Tsoligkas and Tsalavoutas (2011) and Shah et al. (2013), and we divide accounting incomes into two components: (1) the earnings before R&D expenses and the (2) amounts of expensed R&D. Similarly, we decompose the book value of equity into (1) the book value before capitalized R&D and (2) the amount of R&D in the assets. Therefore, the following equation is formed.

$$VM_{it} = \beta_0 + \beta_1 AE_{it} + \beta_2 ABV_{it} + \beta_3 CAP_RD_{it} + \beta_4 EXP_RD_{it} + \varepsilon_{it} \quad (2)$$

Where,

AE_{it} : the adjusted earnings of firm i in year t , that is, before the processing of R&D expenditures;

ABV_{it} : the adjusted book value of equity of firm i in year t , which is net of capitalized R&D;

CAP_RD_{it} : the annual amount of capitalized R&D costs;

EXP_RD_{it} : the annual amount of expensed R&D costs;

ε_{it} : an error term.

3.2. IFRS effects on the value relevance of R&D

The main difference between French GAAP and IAS (38) is that before IFRS implementation, the capitalization of R&D costs was an option, whereas under IFRS it had become an obligation. So, we try to examine if the implementation of IAS (38) is associated with greater relevance to the value of R&D (capitalized or expensed) compared to the period before IFRS. Therefore, our second research hypothesis is formulated as follows:

H2: R&D costs are more value relevant after the adoption of IFRS

In order to capture the effects of transition to IFRS we include a dummy variable in the model (2), controlling the time effect (Slah et al, 2013). Thus, the model (2) is rewritten by incorporating a year dummy variable YR , which represents the effect of the transition to IFRS. YR is equal to 0 for the pre-IFRS period, and is equal to 1 for the post-IFRS period. We so obtain the following model:

³ Actually, the information on the value of R&D expenses and other values is only available when the financial statements are published, namely four months after the closing date of the accounting period.

$$VM_{it} = \gamma_0 + \gamma_1 YR + \gamma_2 AE_{it} + \gamma_3 AE_{it} \times YR + \gamma_4 ABV_{it} + \gamma_5 ABV_{it} \times YR + \gamma_6 CAP_RD_{it} + \gamma_7 CAP_RD_{it} \times YR + \gamma_8 EXP_RD_{it} + \gamma_9 EXP_RD_{it} \times YR + \varepsilon_{it} \quad (3)$$

Where,

YR: a dummy variable which is set to 0 if an observation is in pre-IFRS period, and 1 otherwise;

$AE_{it} \times YR$: the adjusted earnings multiplied by the year dummy variable;

$ABV_{it} \times YR$: the adjusted book value of equity multiplied by the year dummy variable;

$CAP_RD_{it} \times YR$: the annual amount of capitalized R&D costs multiplied by the year dummy variable;

$EXP_RD_{it} \times YR$: the annual amount of expensed R&D costs multiplied by the year dummy variable;

ε_{it} : an error term.

3.3. Industry effects on the value relevance of R&D

Another point of debate in the literature is whether the value relevance of capitalized R&D is different across different sectors. For example, Shah et al. (2008) find a positive and significant influence of capitalized R&D costs on the market value for both sectors: manufacturing and nonmanufacturing. Similarly, Shah et al. (2009) also show that, compared to nonmanufacturing companies, manufacturing ones are likely to adopt an intensive investment in R&D strategy to maximize their market value. Therefore, there is no consistent conclusion confirming if manufacturing or nonmanufacturing firms are associated with a higher relevance in terms of R&D. Thus, our third research hypothesis is as follow:

H3: the industry has no effect on the relevance of R&D costs

In order to control the effect of the sector and to test whether there is a significant difference in the value relevance of R&D expenditure across sectors, we follow Shah (2013) and we include a dummy variable, SEC, in the model (2), identifying the sector to which the company belongs. We so obtain the following model:

$$VM_{it} = \delta_0 + \delta_1 SEC + \delta_2 AE_{it} + \delta_3 AE_{it} \times SEC + \delta_4 ABV_{it} + \delta_5 ABV_{it} \times SEC + \delta_6 CAP_RD_{it} + \delta_7 CAP_RD_{it} \times SEC + \delta_8 EXP_RD_{it} + \delta_9 EXP_RD_{it} \times SEC + \varepsilon_{it} \quad (4)$$

Where,

SEC: a dummy variable which is set to 0 if the company is a nonmanufacturing one, and set to 1 if it is a manufacturing one;

$AE_{it} \times SEC$: the adjusted earnings multiplied by the year dummy variable;

$ABV_{it} \times SEC$: the adjusted book value of equity multiplied by the year dummy variable;

$CAP_RD_{it} \times SEC$: the annual amount of capitalized R&D costs multiplied by the year dummy variable;

$EXP_RD_{it} \times SEC$: the annual amount of expensed R&D costs multiplied by the year dummy variable;

ε_{it} : an error term.

4. Analysis and Results

4.1. Data and sample

The sample of our study concerns the French companies listed in the Stock Exchange of Paris during 2001-2009. Companies belonging to the financial sector are excluded because they are prepared with special accounting regulations. Our sample consists of 36 companies listed on the Stock Exchange of Paris resulting from the SBF 120 index with fiscal year ended after 1st January 2001. We take 4-year period (2001-2004) prior to the implementation of IFRS in 2005, and 5-year period (2005-2009) after the implementation of IFRS.

To retrieve the necessary data, we downloaded the annual reports (or references) issued by companies from their website or from the website of the Global Library annual reports (www.annupedia.com). We needed also share price data to obtain the market value of sample firms. Therefore, we downloaded the daily quotations of each business, throughout the period from 2001 to 2009, from the ABC Stock Exchange website.

4.2. Descriptive statistics

Table 1 presents descriptive statistics of the variables included in the study during the period from 2001 to 2009. The table exposes that the mean of expensed R&D costs is higher than the mean of capitalized R&D expenses, which proves that businesses are likely to save the costs of R&D that the capitalization of these expenses. Table 1 also shows that there is a significant disparity in the intensity of R&D expressed by the existence of a remarkable difference between the minimum and maximum variables: CAP_RD and EXP_RD.

Table 1. Descriptive statistics of variables for the period from 2001 to 2009

Variable	Nombre of observations	Mean	Std. dev	Min	Max
MV	324	14813.01	26618.47	16.05	296492.7
AE	324	9708.78	14288.79	-483	129049
ABV	324	1493.21	3044.334	-23184	16871
CAP_RD	324	112.09	241.02	0	1287
EXP_RD	324	600.94	837.02	2.8	4583

MV represents the market value of the company; AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs.

Table 2 presents the descriptive statistics of the variables in both periods before and after IFRS taken separately (2001-2004 and 2005-2009). It is clear that the mean of capitalized R&D during 2005-2009 is higher than in 2001-2004 period. Similarly, the mean of expensed R&D during the period under IFRS is higher than in the period before IFRS. This may suggest that, after the implementation of IFRS, companies put more spending on R&D. Student test is used to compare means. The test results led us to conclude that the amounts capitalized research and development costs between 2001 and 2004 is significantly different from the amounts capitalized costs of research and development between 2005 and 2009 at the 1%, while the mean of the variable EXP_RD does not present a significant difference between both periods (before and after IFRS).

Table 2. Descriptive statistics of variables separately in pre- and post-IFRS period (2001-2004 and 2005-2009)

Variable	Mean		Std. dev		Difference	P-value
	2001-2004	2005-2009	2001-2004	2005-2009		
MV	14538.42	15032.68	31268.94	22300.89	-494.2607	0.8731
AE	7647.236	11358.02	9859.66	16870.15	-3710.785	0.0141
ABV	954.8458	1922.123	3005.866	3015.282	-967.2774	0.0043
CAP_RD	55.41667	157.435	148.3646	287.3869	-102.0184	0.0000
EXP_RD	567.3146	627.855	725.6803	917.5423	-60.54042	0.5077

MV represents the market value of the company; AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs.

Table 3 presents the descriptive statistics of the R&D variables by sector. The mean value of R&D costs expensed and capitalized in the manufacturing sector is higher than in the nonmanufacturing sector. The difference is statistically significant. One can conclude that the manufacturing firms invest more in R&D activities than the nonmanufacturing ones.

Table 3. Descriptive statistics of R&D variables by sectors

CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs.

Variables	Nombre of observations		Std. dev		Mean		Difference	P-value
	Manu	Non-manu	Manu	Non-manu	Manu	Non-manu		
CAP_RD	243	81	271.75	60.85	136.84	37.826	99.023	0.0000
EXP_RD	243	81	876.38	686.47	653.93	441.97	211.96	0.0266

4.3. Correlation matrix

The examination of the correlation matrix (Table 4) shows that all correlation coefficients are below 0.8 which correspond to the limit at which it usually starts to have serious problems of multicollinearity. Actually, the highest correlation coefficient is 0.6574, and it is between the variables CAP_RD and EXP_RD. Moreover, we can notice that all our variables have a value of VIF "Variance Inflation Factor" that is less than 10. These results allow us to conclude that we do not have a serious problem of multicollinearity.

Table 4. Correlation matrix and VIF

MV	Variable	VM	AE	ABV	EXP_RD	CAP_RD	VIF	1/ VIF
	VM	1.0000						
	AE	0.3341	1.0000				1,86	0,5390
	ABV	0.3262	0.6574	1.0000			1,77	0,5655
	EXP_RD	0.3255	0.2594	0.3300	1.0000		1,37	0,7304
	CAP_RD	0.0622	0.1318	0.1927	0.4534	1.0000	1,26	0,7920

represents the market value of the company; AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs.

5. Interpretation of results of the multivariate analysis⁴

5.1. Results for the value relevance of R&D

Table 5 shows that all independent variables have significant effects, at different levels of 1%, 5% and 10%, on the market value of French firms. The adjusted shareholders equity and the adjusted earnings variables are positively correlated with the market value, at 1% and 10% levels, respectively.

The results show that the firms that capitalize their R&D costs are less valued by the market than companies that expense R&D costs. Specifically, there is a negative association between CAP_RD and the market value, but a positive relationship with EXP_RD. Therefore, this leads to partially accept our first hypothesis (H1), since there has been a positive relationship between expensed R&D costs and the market value, against a negative association with capitalized costs. However, we can confirm the value relevance of R&D

⁴ The sample contains observations on multiple times to different companies, As a result, we use panel data. We control our models for heteroscedasticity, and according to the Hausman test, the fixed effects model seems most appropriate to our data.

costs given that these costs present a usability from French investor which is measured by the degree of the strength of association between the market value and R&D expenditure.

These results are consistent with Cazavan-Jeny and Jeanjean (2005, 2006) who found a negative relationship between the capitalization of R&D expenses and stock returns. Similarly Cazavan-Jeny et al. (2007) show that the decision to capitalize a part of R&D expenses is associated with a lower future performance, their studies focus on the French context.

Nevertheless, our results are completely contradictory to the research conducted in the same frame of Aboody and Lev (1998). They find that software development costs recognized as assets are positively associated with stock returns and prices. Callimaci and Landry (2004) find the same results by studying the capitalization of R&D spending in Canada. These results suggest that the capitalization of R&D, under certain conditions of success, is useful because it acts as a positive signal to investors.

Indeed, our results can be explained by the control structure in France exerted on the manager, that does not prevent an opportunistic use of capitalization. Aurtherwise, even if managers count capitalize R&D costs in good faith, they are not able to distinguish between profitable R&D projects and unprofitable ones.

Table 5. Value relevance of R&D (model 1)

Variable	Coefficient	t value	P> t
AE	0,3545	2,84	0,005
ABV	1,1285	1,88	0,061
EXP_RD	9,1245	4,87	0,000
CAP_RD	-13,0150	-2,08	0,038
Intercept	5661,158	3,15	0,002

AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs. The model is with fixed effects and under control of heteroscedasticity.

5.2. Results for the comparison in the value relevance of R&D

Our second model (equation 3) is used to test the impact of IAS/IFRS adoption on the value relevance of R&D costs. Model (2) is separately estimated for two sub-periods: 2001-2004 and 2005-2009 (pre- and post IFRS). The estimation results for the period 2001-2004 show that the equity capital is positively correlated with the market value, at 1% level, while the coefficient of adjusted earnings is insignificant. Table 6 reveals a significant and positive association between EXP_RD costs and the market value, which proves that accounting in charge of these expenses provides relevant information to investors. While for the CAP_RD variable, the results show a non-significant relationship, explaining that the decision to capitalize R&D costs is not relevant to the market value of French firms, in concordance with the evidence of Ding and Stolowy (2003).

The estimation results for the period after adoption of IFRS (2005-2009) show that the variable equity capital is negatively correlated with the market value, MV, against adjusted earnings that are significant and positively related to the market value. EXP_RD keeps its positive relation to the market value, revealing that these expenses always provide relevant information on both periods before and after the adoption of the international IAS/IFRS standards, which can be explained by the absence of any difference in accounting requirements for the R&D expense in both periods. This finding is consistent with Shah et al. (2013), shoing also no significant difference between the coefficients of expensed R&D in pre- and post-IFRS periods in the UK.

When considering the period 2005-2009, the results suggest that the CAP_ RD costs are negative and significant at the 5% level, while during 2001-2004, this variable is non-significant. Consequently, we can deduce from this negative association between CAP_RD and the market value that the adoption of

IAS/IFRS, which made mandatory the capitalization of R&D, has impact on the value relevance of R & D costs.

Our result is consistent with other studies that examined the impact of the adoption of IAS/IFRS on the appropriateness of accounting figures. For example, the study of Lenormand and Touchais (2008) affirm that the information content of intangible assets improves with IFRS. Paglietti (2009) studied the quality of accounting figures in Italy from 2002 to 2007. By comparing the results of tests performed on the companies during the pre-adoption period (2002 to 2004) with those on the post-adoption period (2005-2007), the author highlights the improving the informational relevance and a capacity of accounting figures to provide investors with useful information for decision-making purposes. Nevertheless, our finding is not consistent with Shah et al. (2013), revealing that the value relevance of capitalized R&D appears to decrease from the pre-IFRS period to the post-IFRS period.

Therefore, the second hypothesis (H2) is partially supported because there is no difference in the value relevance of expensed R&D between the periods before and after IAS/IFRS. However, there is a value relevance of capitalized R&D costs, introduced with the adoption of IAS/IFRS.

Table 6. Value relevance of R&D - IFRS effects (model 2)

Variable	Coefficient	t value	P> t
<i>Period: 2001-2004 (pre-IFRS)</i>			
AE	0,7845	2,97	0,004
ABV	-0,1898	-0,21	0,835
EXP_RD	8,7756	2,23	0,022
CAP_RD	-18,1238	-1,02	0,311
Intercept	4746,412	1,34	0,183
<i>Period: 2005-2009 (post-IFRS)</i>			
AE	-0,5155	-3,58	0,000
ABV	6,2911	7,68	0,000
EXP_RD	8,4303	5,20	0,000
CAP_RD	-12,0255	-2,43	0,016
Intercept	5395,703	2,99	0,001

AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs. The model is with fixed effects and under control of heteroscedasticity.

5.3. Results of the study area effects

Our third model (equation 3) is used to test the value relevance of R&D expenses (capitalized or expensed) in different sectors, manely manufacturing and nonmanufacturing, during the overall sample period. Primarily, the coefficient of EXP_RD variable is positive and significant for manufacturing companies, but it is no significant for nonmanufacturing ones. However, results show that for manufacturing ones, CAP_RD variable is significant and negatively correlated with the company's market value, but it is no significant for the nonmanufacturing sector.

Indeed, our results are consistent with Tsai (2001). The author has shown that the relationship between R&D expenditure and market returns depends heavily on the activity area. Similarly, Chan et al. (2000) show that the market reaction is significantly positive for firms operating in high-tech industry while it is significantly negative for firms belonging to traditional sectors. Nevertheless, these results leads us to reject our third hypothesis H3, since we observe a value relevance of R&D costs for manufacturing firms against to the nonmanufacturing sector.

Table 7. Value relevance of R&D - sector effects (model 3)

	Coefficient	t value	P> t
<i>Manufacturing firms</i>			
AE	-0.5032	-2.92	0.004
ABV	6.9868	6.76	0.000
EXP_RD	6.7666	3.19	0.002
CAP_RD	-13.3503	-2.15	0.033
Intercept	3940.723	1.97	0.051
<i>Nonmanufacturing firms</i>			
AE	0.9561	2.67	0.009
ABV	-1.4368	-2.09	0.040
EXP_RD	2.8165	0.84	0.402
CAP_RD	1.3592	0.03	0.973
Intercept	8063.496	2.31	0.024

AE represents the adjusted earnings; ABV represents the adjusted book value of equity; CAP_RD represents the annual amount of capitalized R&D costs; EXP_RD represents the annual amount of expensed R&D costs. The model is with fixed effects and under control of heteroscedasticity.

6. Conclusion

This study examines the value relevance of R&D (expensed or capitalized) over the 2001-2009 period in France. To conduct this investigation, we use a sample of 36 French companies listed on the SFB 120 whose data are extracted from the website of ABC Stock Exchange and from annual reports and documents of the companies for the period from 2001 to 2009. We borrow the models from Shah et al. (2013). Indeed, we adopte the modeling technique on panel data, and we determined all the necessary statistical tests.

Subsequently, we present the results of empirical tests, which involve firstly that the expensed R&D costs have a relevance to the company's market value, in contrast to the capitalized ones. These results are consistent with Ding and Stolowy (2003) and Cazavan-Jeny and Jeanjean (2005, 2006). Secondly, following the adoption of international standards, we find that there is a negative significant association between R&D expenses recognized in assets and market value of the firm. Unlike under French GAAP, there is a non-significant association. This indicates the impact brought by the adoption of IFRS on the relevance of R&D costs. Finally, our results assert the relationship between the relevance of R&D and the industry, given the existence of a difference between the value relevance of R&D expenses between companies in manufacturing and those of the nonmanufacturing sector.

This work presents some contributions. On the one hand, it allows better understand the effect of the mandatory application of IAS/IFRS on the relevance of R&D costs of French companies listed on the SFB 120, whose values are part of the largest capitalizations in the country. On the other hand, our research contributes by the appreciation of the consequences of the standards setters on financial markets.

In fine, as a way to research, our study can be developed in the coming years by examining many other financial markets such as China, which in 2007 adopted a set of accounting standards entirely new (comparable with IFRS), Canada, India and Korea that have just adopt IFRS in 2011, or Brazil which adopted IFRS in 2010.

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Appendix A. Summary of accounting treatment for R&D under the French system and the international standards

	Standards	Expended R&D		Capitalized R&D		
		General Rule	Separated Information	Authorized	Option	Amortization & impairment
French	Art. 361-2, PCG 99	yes	No	Yes, under conditions	Yes, exceptional	Amortization over max 5 years
	Replaced by : CRC 2004-06	yes	yes	Yes, under conditions	Yes, preferred method	Amortization on useful life test Annual impairment
IASB	IAS 38	yes	yes	Yes, under conditions	No	Amortization on useful life test + impairment if the duration life is > 20 years

source: Cazavan-Jeny (2005)