# The value-relevance of R&D reporting: evidence from China

Shuju Zhang [+], Yanni Wang

School of Economics and Management, Xidian University, Xi'an, China

**Abstract.** This paper investigates the value relevance of R&D reporting using a sample of 508 observations from Chinese listed companies over 2007-2009. In the paper, we associate stock prices with financial data and then we relate stock returns to changes in financial data. Unlike previous studies, we find that capitalized R&D is negatively associated with stock prices and is positively associated with stock returns. This result indicates that capitalized R&D has an incremental explanatory power. We also find a negative association between expensed R&D expenditures and stock market values (stock prices and returns), which implies that expensing signals negative information to market participants.

**Keywords:** R&D expenditures; capitalized R&D; expensed R&D; value-relevance

## 1. Introduction

Accounting for R&D expenditures is an open issue. For both accounting treatment of R&D expenditures, expensing is perfectly objective and reliable, whereas capitalization stresses relevance and usefulness. So there is a trade-off between reliability and relevance (Healy et al., 2002)[1].

The International Accounting Standards (IAS) mandates that capitalization of R&D expenditures if they meet certain criteria (IAS38). In the reliability/relevance trade-off, the international standard-setter clearly comes down on the side of relevance. U.S. Generally Accepted Accounting Principles (GAAP) allows no choice in R&D accounting treatment. Statement of Financial Accounting Standards (SFAS) $N^\circ 2$ requires corporations to immediately expense their R&D expenditures. Adopting the expensing method is likely influenced by the U.S. standard setters' perceived degree of uncertainty about future economic benefits from current R&D expenditures. As Financial Accounting Standards Board (FASB) states, "there is often a high degree of uncertainty about whether research and development expenditures will provide any future benefits". It is clear that U.S. standard-setter comes down on the side of reliability.

China issued new Accounting Standards in 2006, and the new Chinese Accounting Standards $N^\circ 6$ made significant changes about the accounting treatment of R&D expenditures. Firstly, internal research and development expenditures divided into research expenditures and development expenditures, and add the 'Development expenditure' accounts. Secondly, it prescribes full expensing for all research costs and capitalization of development expenditures only if the technical and commercial feasibility of the sale or use of the asset concerned has been established. If a R&D project does not fulfill the certain conditions then its costs must be expensed when incurred. This reform is convergence with the International Accounting Standards.

According to related accounting standards, financial reports should provide useful information to investors. An implicit assumption of the value relevance approach is that the best accounting rule is one that improves the statistical association of stock prices and/or returns with earnings, book values or other accounting variables (Cazavan-Jeny and Jeanjean, 2006)[2]. As noted by Barth et al. (2001), 'value relevance studies are designed to assess whether particular accounting amounts reflect information that is used by

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[+] *E-mail address*: (rocail1002@163.com).

investors in valuing firm's equity'[3]. In the case of R&D accounting treatment, under the value relevance criterion, full expensing should be adopted only if the value relevance of earnings and book value is higher than the value relevance when R&D expenditures are booked as assets. Existing empirical research have concluded that capitalization of R&D expenditures can achieved higher value relevance than full expensing them. According to the new Chinese Accounting Standards, both accounting treatment of R&D expenditures (expensing and capitalization) are allowed. Compared with full expensing R&D expenditures in the past, whether capitalized portion of R&D expenditures mandated by the new Accounting Standards can provide incremental information and improve the value relevance of financial statements? Under this background, we test the value relevance of the reporting methods used for R&D expenditures in a sample of Chinese listed companies.

The rest of the paper is organized as follows: Section II provided the related literature and the hypothesis. Section III describes sample selection and research design. Section IV presents descriptive statistics and empirical findings. Section V concludes.

## 2.  Relation to prior literature and Simulation

R&D activity by nature is subject to high uncertainty and information asymmetry (Aboody and Lev, 2000)[4]. Chan et al. (2001) underline the usefulness of finding a way to reduce information asymmetry[5]. Many authors argue that capitalization offers the solution. A volume of the literatures show a significantly positive association between capitalizing R&D expenditures and stock market values. For instance, Doukas and Switzer (1992) find that declaration of the increase in R&D expenditures will lead to more substantial positive stock price reaction[6]. Lev and Sougiannis (1996, 1999) show that R&D capitalization is probably relevant because it helps to reduce the information asymmetry between the firm and market participants[7], and they find a significant and inter-temporal association between capitalized R&D and future stock returns[8]. Zhao (2002) studies the relative value relevance of R&D in France, the UK, Germany and the USA. He finds that the allocation of R&D costs between capitalization and expenses provides incremental information content over the disclosure of the total R&D expenditures[9]. Han and Manry (2004) study a sample of Korean firms. They argue that the association between R&D expenditures and stock prices is stronger for the portion of capitalized R&D expenditures[10]. Callimaci and Landry (2004) show that the amount of capitalized R&D is associated with higher stock returns by studied a sample of Canadian listed firms[11]. Ahmed and Falk (2006), who study a sample of Australia, confirm this result. They show that capitalized R&D expenditures has an incremental explanatory power for stock prices[12]. In contrast to the results of these studies, which document large increases in value relevance due to capitalization, Cazavan-Jeny and Jeanjean (2006) study a sample of French firms and show that capitalized R&D is negatively associated with stock prices and returns[2]. Oswald's (2000) study of a sample of UK firms finds that the value relevance of capitalizers' (expensers') reported earnings and book value of equity is not substantially higher (lower) than that of as-if-expensed (as-if-capitalized) earnings and book value of equity. In other words, neither capitalized R&D expenditures nor expensed R&D expenditures enhances the value relevance of corporation's financial statements[13].

On the one hand, capitalized R&D expenditures is probably value relevant, it can convey more useful information to market participants and reduce information asymmetry. But capitalization of R&D expenditures also creates an opportunity for managers to engage in earnings management, and thus recognizing R&D expenditures as assets may impair financial reporting reliability. On the other hand, expensing is more reliable, but it is also less relevant and would probably impair the enthusiasm of corporation on the R&D investment as it decreases the annual profits. So in this paper, we try to address the following question: 'Is R&D reporting associated with relevant information to the market?'

Our study is also motivated by the recent developments in Chinese accounting standards. According to the new Chinese Accounting Standards, the research expenditures and the less successful or unsuccessful project's R&D expenditures should be expensed when incurred. For the development expenditures, if a R&D project achieves technical and commercial feasibility and the firm is able to demonstrate how the asset will generate future economic benefits, this part of R&D expenditures should be capitalized and be booked as assets. This situation offers an opportunity to assess the value relevance of R&D accounting treatment.

As a result of the analysis so far in the paper and in light of the prior studied, we adopt the majority's view and put forward the following hypothesis:

H1: Capitalized R&D is positively and significantly associated with stock prices and returns.

H2: Expensed R&D is positively and significantly associated with stock prices and returns.

H3: The effect of expensed R&D expenditures on market values is less positive than capitalized R&D expenditures.

# 3. Date and Research Design

## 3.1 Sample Selection

Our sample is composed of those Chinese listed companies that disclosed information on R&D expenditures over 2007-2009. We exclude ST, PT and missing data companies and get a final sample of 508 observations. We collect the data of capitalized R&D and expensed R&D by manual-checking the information disclosed in annual financial reports, the corporation annual financial reports and other data required in our research is mainly derived from CCER database and CNINFO network (www.cninfo.com.cn). Our data processing and statistical analysis are undergone by SPSS18.0.

## 3.2 Research Design

Our research design is based on two value relevance studies, that is, explanation of the year-end share price and explanation of the cross-section returns.

### 1) Stock price models

To examine the association between stock prices and the amount of capitalized and expensed R&D expenditures. We estimate the following regressions which is closely related to that of Ohlson(1995)[14]:

$$P_{i,t} = a_0 + a_1 BVPS_{i,t} + a_2 EPS_{i,t} + \varepsilon_{i,t} \tag{1}$$

$$P_{i,t} = b_0 + b_1 ABVPS_{i,t} + b_2 AEPS_{i,t} + b_3 CapRDPS_{i,t} + b_4 ExpRDPS_{i,t} + \varepsilon_{i,t} \tag{2}$$

$$P_{i,t} = c_0 + c_1 ABVPS_{i,t} + c_2 AEPS_{i,t} + c_3 CapRDPS_{i,t} + c_4 ExpRDPS_{i,t} + \sum YR_{i,t} + \sum Ind_{i,t} + \varepsilon_{i,t} \tag{3}$$

where:

$P_{i,t}$ : stock price for firm i in year t;

$BVPS_{i,t}$ : book value of equity per share for firm i in year t;

$EPS_{i,t}$ : earnings per share for firm i in year t;

$ABVPS_{i,t}$: adjusted book value of equity per share for firm i in year t;

$AEPS_{i,t}$ : adjusted earnings per share for firm i in year t;

$CapRDPS_{i,t}$ : annual amount of capitalized R&D per share;

$ExpRDPS_{i,t}$ : annual amount of expensed R&D per share;

$YR_{i,t}$ : time variable that equals 1if an observation is from fiscal year t, and 0 otherwise;

$Ind_{i,t}$ : dummy variable that coded 1if the firm belongs to energy, health care , industrial, technology or utilities, and 0 otherwise.

Model (1) tests the associations between stock prices, book value of common equity per share and *EPS*. In model (2), to determine whether capitalized R&D and expensed R&D are value relevant, *BVPS* is broken down into book value per share before capitalized R&D (*ABVPS*) and capitalized R&D per share (*CapRDPS*). Similarly, EPS is split into earnings per share before expensed R&D (*AEPS*) and expensed R&D per share (*ExpRDPS*). The model (3) is introduced time and industry control variables.

If capitalized R&D expenditures convey value-relevant information to investors, then the coefficient on CapRDPS (i.e. $b_3$, $c_3$) should be positive. If investors perceive expensed R&D as the amount of unsuccessful R&D projects, the coefficient on expensed R&D (i.e. $b_4$, $c_4$) should be negative. However, if the amount of expensed R&D included development expenditures for successful R&D project that have not been capitalized, or if it captures the effect of other economic factors such as reputation or size, then the coefficient on expensed R&D should be positive.

*2) Stock return models*

As suggested by Easton and Harris (1991)[15] and similar to Cazavan-Jeny and Jeanjean's (2006) study[2], we investigate the effect of R&D variables on stock returns by using the following models:

$$R_{i,t} = \alpha_0 + \alpha_1 EPS_{i,t} + \alpha_2 \Delta EPS_{i,t} + \varepsilon_{i,t} \tag{4}$$

$$R_{i,t} = \beta_0 + \beta_1 AEPS_{i,t} + \beta_2 \Delta AEPS_{i,t}$$
$$+ \beta_3 \Delta CapRDPS_{i,t} + \beta_4 \Delta ExpRDPS_{i,t} + \varepsilon_{i,t} \tag{5}$$

$$R_{i,t} = \gamma_0 + \gamma_1 AEPS_{i,t} + \gamma_2 \Delta AEPS_{i,t} + \gamma_3 \Delta CapRDPS_{i,t}$$
$$+ \gamma_4 \Delta ExpRDPS_{i,t} + \sum YR_{i,t} + \sum Ind_{i,t} + \varepsilon_{i,t} \tag{6}$$

where:

$R_{i,t}$ : stock returns for firm i in year t;

$EPS_{i,t}$: earnings per share for firm i in year t;

$\Delta EPS_{i,t}$: change in earnings per share between t and t-1;

$AEPS_{i,t}$ : adjusted earnings per share for firm i in year t;

$\Delta AEPS_{i,t}$ : change in adjusted earnings per share between t and t-1;

$\Delta CapRDPS_{i,t}$ : change in capitalized R&D per share;

$\Delta ExpRDPS_{i,t}$ : change in expensed R&D per share;

$YR_{i,t}$、$Ind_{i,t}$ : dummy variables as previously defined.

In model (5), $\Delta EPS$ is broken down into change in earnings per share before expensed R&D ($\Delta AEPS$) and change in expensed R&D per share ($\Delta ExpRDPS$). *EPS* is split into *AEPS* and $\Delta CapRDPS$. In model (6), we include time and industry dummies.

If the change in capitalized R&D represents value relevant information to investors then $\beta_3$ and $\gamma_3$ should be positive. Since the change in expensed R&D is likely to include R&D expenditures incurred before technical and/or commercial feasibility has been achieved, we predict $\beta_4$ and $\gamma_4$ will be negative or insignificant

# 4. Empirical Findings

## 4.1 Data Descriptive Statistics

Table I reports the descriptive statistics. It appears that the stock price, returns, book value and *EPS* of these listed firms disclosed R&D expenditures are quite different. R&D expenditures per share represents a small proportion of earnings per share, and the average amount of change in R&D expenditures is also very small, which indicates that Chinese listed companies on R&D investment is inadequate. Moreover, the number of companies that disclosed capitalized R&D expenditures is less than the number of that disclosed expensed R&D costs, but the average change in capitalized R&D per share is greater than the mean change in expensed R&D per share, it indicates that the successful R&D projects of listed companies showed an increasing trend.

TABLE I. DESCRIPTIVE STATISTICS

| Variable | N | Min | Max | Mean | SD |
|---|---|---|---|---|---|
| *P* | 508 | 1.5000 | 101.6901 | 14.3963 | 11.333 |
| *BVPS* | 508 | 0.2712 | 24.0796 | 3.6893 | 2.2037 |
| *ABVPS* | 508 | 0.2562 | 23.0772 | 3.6714 | 2.2005 |
| *EPS* | 508 | -1.890 | 6.280 | 0.3176 | 0.5175 |
| *AEPS* | 508 | -1.8872 | 6.3320 | 0.3695 | 0.5399 |
| *CapRDPS* | 508 | 0.00000 | 0.6678 | 0.0178 | 0.0583 |
| *ExpRDPS* | 508 | 0.00007 | 1.0427 | 0.0518 | 0.0991 |
| *R* | 367 | -2.3593 | 4.8742 | 0.6719 | 1.2318 |
| $\Delta EPS$ | 369 | -3.8500 | 2.5200 | 0.0210 | 0.4788 |
| $\Delta AEPS$ | 200 | -2.0666 | 2.0389 | 0.0267 | 0.4186 |

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|---|---|---|---|---|---|
| *ΔCapRDPS* | 200 | -0.2463 | 0.6678 | 0.0052 | 0.0491 |
| *ΔExpRDPS* | 369 | -1.8558 | 1.0349 | 0.0008 | 0.1913 |
| *YR1* | 508 | 0 | 1 | 0.28 | 0.448 |
| *YR2* | 508 | 0 | 1 | 0.45 | 0.498 |
| *Ind* | 508 | 0 | 1 | 0.12 | 0.325 |

*P* is the stock price, *BVPS* is the book value of equity per share, *ABVPS* is the adjusted book value of equity per share before capitalized R&D, *EPS* is the earnings per share, *AEPS* is the adjusted earnings per share before expensed R&D and amortization of R&D, *CapRDPS* is the capitalized R&D per share, *ExpRDPS* is the expensed R&D per share, *R* is the stock returns, *ΔEPS* is the change in earnings per share, *ΔAEPS* is the change in adjusted earnings per share, *ΔCapRDPS* is the change in capitalized R&D per share, *ΔExpRDPS* is the change in expensed R&D per share, N is the number of observations.

## 4.2 Value Relevance Analyses

*1) Stock price models*

Table II represents the estimates, the t-value and their significance levels for the price regression.

From Adj.$R^2$ in the table 2, all three models fit well, and the Adj.$R^2$ for model (2) is higher than the Adj.$R^2$ for model (1), indicating that the reporting of R&D are related to stock price, and it is a factor in the statistical explanation of stock prices.

For model (1), both *BVPS* and *EPS* are positive and significant. In regression (2), we isolate the effect of both capitalized and expensed R&D on stock prices. In contrast with our hypothesis, the coefficients on *CapRDPS* and ExpRDPS are negative and significant. Whatever accounting treatment is applied, R&D expenditures are associated with negative news. Theoretically, capitalized R&D expenditures represent successful R&D projects outlays, it should thus be associated with higher stock price and the sign on *CapRDPS* should be positive. In fact, the global financial crisis has brought great impact on the listed firms during 2007-2009, which is also a potential explanatory factor for stock prices. Moreover, for the listed companies, it may be less costly to disclose information about the R&D programs using the summary statistics than through capitalization. Additionally, capitalization also yields negative information such as managers managed earnings by capitalizing R&D. This finding suggests that investors do not value R&D assets positively. Expensed R&D can contain both unsuccessful and before successful R&D expenditures, the sign on *ExpRDPS* can thus be negative or positive depending on the relative magnitude of unsuccessful and successful projects. So the negative coefficient implies that expensed R&D expenditures are probably considered as the unsuccessful R&D programs expenditures.

TABLE II. PRICE MODELS

| | Model (1) | Model (2) | Model (3) |
|---|---|---|---|
| Constant | 7.161***(8.981) | 7.272***(9.143) | 12.219***(13.195) |
| *BVPS* | 0.211***(4.856) | | |
| *EPS* | 0.465***(10.693) | | |
| *ABVPS* | | 0.211***(4.766) | 0.199***(5.182) |
| *AEPS* | | 0.482***(10.716) | 0.486***(12.506) |
| *CapRDPS* | | -0.078**(-2.082) | -0.079***(-2.605) |
| *ExpRDPS* | | -0.073**(-2.158) | -.065**(-2.082) |
| *YRi* | | | Included |
| *Ind* | | | Included |
| Adj.$R^2$ | 0.373 | 0.378 | 0.539 |
| F-statistics | 152.300*** | 78.024*** | 86.016*** |
| N | 508 | 508 | 508 |

White t-statistics in parentheses.
*significant at 10%; **significant at 5%; ***significant at 1%.
*BVPS* is the book value of equity per share, *EPS* is the earnings per share, *ABVPS* is the adjusted book value of equity per share before capitalized R&D, *AEPS* is the adjusted earnings per share before expensed R&D and amortization of R&D, *CapRDPS* is the annual amount of capitalized R&D per share, *ExpRDPS* is the expensed R&D per share, N is the number of observations.

As indicated by Leuz et al. (2003), legal enforcement may play a role in value relevance studies[16]. In China, legal enforcement is weaker. The new Accounting Standards permits (but not requires) that listed firms should disclose the amount of R&D outlays that recognized as intangible assets and the amount of expensed

R&D expenditures. However, the firms are not disclose correctly, and thus impairing the reliability of R&D information.

Model (3) controls for both time and industry, and the results are qualitatively identical to those of model (2).

We also note the coefficient on *CapRDPS* is less than the coefficient on *ExpRDPS*. This suggests that capitalization has greater negative impact on stock price than expensed R&D.

*2) Stock return models*

Table III reports the return regressions results.

In model (4), the coefficient on *EPS* is negative and significant. The coefficient on Δ*EPS* is positive and significant. Findings are similar in models (5) and (6).

In models (5) and (6), the coefficient on Δ*CapRDPS* is positive and significant, which indicates that capitalized R&D is associated with higher returns and has an incremental explanatory power. This results is consistent with prior studies (Callimaci and Landry, 2004; Zhao, 2002) but contrary to our findings on price regressions. In general, change (return) regressions are better specified than level (price) regressions (Easton, 1999)[15], the positive coefficients are more credible. And Ota (2001) also indicated that inconsistencies between price and return regressions findings are usual in the value relevance field[17].

TABLE III.    RETURN MODELS

|  | Model (4) | Model (5) | Model (6) |
|---|---|---|---|
| Constant | $0.742^{***}(10.335)$ | $0.947^{***}(8.066)$ | $-0.434^{***}(-4.384)$ |
| *EPS* | $-0.118^{**}(-2.264)$ |  |  |
| Δ*EPS* | $0.338^{***}(6.472)$ |  |  |
| *AEPS* |  | $-0.225^{***}(-2.709)$ | $-0.118^{**}(-2.411)$ |
| Δ*AEPS* |  | $0.486^{***}(5.180)$ | $0.241^{***}(4.273)$ |
| Δ*CapRDPS* |  | $0.120^{*}(1.754)$ | $0.078^{*}(1.925)$ |
| Δ*ExpRDPS* |  | $-0.342^{***}(-4.270)$ | $-0.149^{***}(-3.098)$ |
| *YRi* |  |  | Included |
| *Ind* |  |  | Included |
| Adj.$R^2$ | 0.098 | 0.120 | 0.700 |
| F-statistics | $20.982^{***}$ | $7.816^{***}$ | $78.269^{***}$ |
| N | 366 | 199 | 199 |

White t-statistics in parentheses.
*significant at 10%; **significant at 5%; ***significant at 1%.
*EPS* is the earnings per share, Δ*EPS* is the change in earnings per share, *AEPS* is the adjusted earnings per share before R&D expense and amortization, Δ*AEPS* is the change in adjusted earnings per share, Δ*CapRDPS* is the change in capitalized R&D per share, Δ*ExpRDPS* is the change in expensed R&D per share, N is the number of observations.

We also find that there is a negative and significant association between stock returns and the change in expensed R&D expenditures, whereas a positive sign is expected. Expensing is not associated with higher returns, but with lower returns. This finding is similar to the results in our price models.

To summarize, capitalization is positively associated with stock returns and expensing is negatively associated with stock returns. Market participants distinguish between capitalized and expensed R&D expenditures; they tend to consider expensed R&D as the unsuccessful R&D outlays.

## 5.  Conclusion

This paper examined the value relevance of R&D accounting treatment in a sample of Chinese listed companies. Evidence from above analysis indicates that capitalized R&D expenditures is negatively associated with stock price and is positively associated with stock returns; while expensed R&D expenditures is negatively related  to stock prices and returns. Capitalization has an incremental explanatory power. Expensing conveys negative information to investors.

Overall, this paper contributes to those literatures in favor of capitalization of R&D expenditures. Our study is based on Chinese context, and the sample we used in this paper is over the period 2007-2009. Our

research has its interesting implications and positive meaning, since the new Chinese Accounting Standards has worked from 2007. However, our research also has its limitations. We just examined the value relevance from the perspective of reporting method, we didn't discuss whether there are some other factors influenced the value relevance of R&D reporting and whether our results are driven by accounting choice. This would make it possible for our further research.

## 6.  Acknowledgment

## 7.  References

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