The Value Relevance of Key Accounting Information for Biotech Firms at the IPO: A Test of Assets, Cumulative R&D Expenses, and Cumulative Losses

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ABSTRACT

This study examines the value relevance of key accounting information disclosed to investors of biotech firms at their initial public offerings (IPO). This study uses a sample of biotech companies whose primary business is biopharmaceuticals development and whose IPO took place in 1995 through 2005. A log linear regression model was used to assess the value relevance of the financial information at the time of the IPO. We find that assets are incrementally value relevant for biotech firms at the IPO. This finding conforms to the theory that investors value how well the firm has converted future investment opportunities into assets-in-place. However, we find that investors do not fully value cumulative research and development (R&D) expenses at the IPO which may be attributed to the anomaly of the IPO prices and high risks associated with the long development period in the biotech industry’s value chain. Finally, we find that cumulative losses are not value relevant for biotech firms at the IPO even if they contain a large R&D component. Our findings have implications for biotech IPO valuation, the biotech industry, and accounting standards setters and they extend the prior pre-IPO and post-IPO biotech firms’ valuation studies.

Keywords: biotechnology; financial statements; firm maturity; investment opportunities; nonfinancial key indicators; value relevance; assets; cumulative R&D expenses; cumulative losses

Data Availability: Key data items used in this paper were obtained from publicly available sources including the SEC’s EDGAR Database.

INTRODUCTION

The biotechnology (hereafter biotech) industry emerged in the 1970s, when two U.S. scientists published information about a new recombinant DNA technique. One of these scientists became the co-founder of Genentech. In 1980 Genentech became the first biotech firm to enter the public equity market. During the past 10 years, the biotech industry has experienced rapid growth in initial public offerings (IPO). By the end of 2006, there were 1,452 biotech companies in the U.S.; 336 of these were publicly held (Biotechnology Industry Organization [BIO] 2008).

The biotech industry distinguishes itself from conventional industries due to its unique value chain, long product development cycle, huge research and development input, and high uncertainty of successful product (drug) development. This makes investments in this industry highly risky but also potentially worthwhile investment. Most biotech firms conduct research and development rather than producing or selling a product. Therefore, the major source of revenue comes from the sale or license of patents to pharmaceutical companies. Initially, a biotech company usually relies on private equity financing. Successful firms choose to go public as fast as possible to obtain a larger amount of capital from public equity markets. However, when a biotech firm makes its initial public offering, it typically has not reported any earnings. Instead, it may have incurred huge cumulative losses, and is very similar to a more traditional start-up business. In the case of a start-up business, “one would not immediately assume that the business has no value because it has no earnings of the moment. That is why we stress that earnings capability, and not actual earnings, is the key” (Smith and Parr, 2005: 76). This unique characteristic of biotech firms at their IPOs makes the traditional valuation methods, based on metrics such as earnings, less appropriate.
The valuation literature describes the various methodologies for valuing intellectual property. Smith and Parr (2005) recommend that the income method be used to value intellectual property because it provides the most credible results. “The income approach, when applied to a business enterprise, begins with a projection of the income-producing capability of the business. It is based on the assumption that the value of the enterprise is dependent on the ability of all the assets to earn a reasonable return” (Smith and Parr, 2005: 75). This paper focuses on the valuation of biotech firms at the initial public offering stage. These companies, as previously stated, make significant R&D expenditures and incur cumulative losses during their start up. This intellectual property, the biotech firm’s intangible assets, is the primary contributor to “the earning power of the enterprise. Their value [intangible assets] is dependent on the presence, or expectation, of enterprise earnings” (Smith and Parr, 2005: 13).

This paper examines the value relevance of the financial information assets, R&D expenses, and cumulative losses. The goal is to empirically examine the association between the value of biotech firms at their IPO and financial information disclosed in the prospectus. Questions to be answered include: What role does financial information play in a biotech IPO valuation? What specific items of information disclosed in the prospectus do investors value?

Using a sample of biotech firms that went public from 1995 to 2005, we find that biotech IPO valuation is based on disclosed assets. This demonstrates that investors do not fully value the disclosed cumulative R&D expenses or the cumulative losses. This may be attributed to the anomaly of IPO prices and the high risk of failure in the biotech industry.

The results of this study have implications for valuation theory, the biotech industry, and accounting standards setters. This study is important in that it helps us to better understand more of the valuation puzzle of the biotech industry. Identification of factors that determine equity value at the IPO will effectively substitute for traditional valuation methods such as earnings multiples. Furthermore, the findings of this study provide empirical evidence for the debate about reforming the accounting for intangibles. According to Skinner (2008), reform is needed because 1) financial statements have become less relevant as the economy has changed and 2) the existing accounting model fails to recognize many knowledge-based intangibles. However, opponents of reform believe that the market works well in valuing firms including their intellectual property.

This study contributes to the literature in several ways. First, it adds to prior literature Hand (2005) on pre-IPO and post-IPO valuations and Joos and Zhandov (2008) on post-IPO valuations by testing the value relevance of assets for biotech firms at the IPO. Second, in this study we test the value relevance of cumulative R&D expenses at the IPO using cumulative R&D expenses rather than a one-year snapshot of R&D expense as the proxy of R&D investment. Third, following Joos and Plesko (2005) and Joos and Zhandov (2008), this study tests the value relevance of cumulative losses for the biotech industry. Fourth, our study expands on the results of Guo, Lev and Zhou (2005) and Tan and Lim (2007) by using a sample that contains only strictly defined biotech firms not the expanded classification of biotech firms used in those prior studies.

PRIOR RESEARCH AND THE BIOTECHNOLOGY INDUSTRY

“Biotechnology firms harness living organisms and biological components at the molecular, sub-cellular and cellular levels to create marketable products” (Gale Group, 2009). Biotechnology requires skills in molecular biology and biochemistry, which are quite distinct from those demanded by the chemistry-based technologies for which they are expected to substitute. Hence, biotechnology relies on different methodologies, which existing chemical and pharmaceutical firms find difficult to acquire. (Tushman and Anderson, 1986) As a result, the commercialization of biotechnology is shepherded by start-up, dedicated biotech firms (Stuart, Hoang and Hybels, 1999). Biotech is “one of the most research-intensive industries in the world. U.S. publicly traded biotech companies spent $27.1 billion on research and development in 2006” (BIO, 2008: 2). Biotech firms are highly dependent on intellectual property (ideas, discoveries, patents) generated through their large R&D expenditures. “Intellectual properties are now at the very core of corporate success... scarcity makes such assets very valuable” (Smith and Parr, 2005: 8). In “1975 more than eighty percent of corporate value reflected in the S&P 500 was tangible assets, while intangible assets comprised less than

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1 These methods are the cost, market, and income approaches. For a detailed description of these methods see Pratt (2008).
twenty percent of market capitalization. Today, the ratio of tangible to intangible assets has inverted – nearly eighty percent of corporate value resides in intangible assets” (Ocean Tomo, 2009).  

The development cycle for the typical biotech firm can range from 10-15 years. Biotech companies usually start with an idea for a new technology that is then patented. This is followed by preclinical testing, trials, and, it is hoped, successful FDA approval and subsequent product sales. Phase I clinical trials check the safety and dosage on healthy volunteers and can take up to two years to complete. Phase II trials test the effectiveness of the drug at different doses to confirm its safety using volunteers with the related disease. This phase can last two years and in many cases there are multiple Phase II trials. The objective of Phase III trials is to achieve a result that clearly proves that the drug can successfully fight the target disease. Phase III trials can last two or three years and the drug being tested may undergo several Phase III trials. The FDA approval process can take up to two years. The company must first pull together all its data for the FDA advisory panel to review and make a recommendation. The FDA will then either grant or deny marketing approval (Ernst and Young, 2000). Biotech firms compete with each other to be the first to discover, patent and market new drugs. “Biotech companies … are typically funded with seed money contributed by venture capitalists. … If a firm can come up with what appears to be a promising product, a financial partner will inevitably step in, usually a large drug company … Some companies acquire additional funds by going public” (Gale Group, 2009).

A key question arises as to how to value a biotech firm at its IPO. A number of studies have been done in the field of entrepreneurial finance by Lerner (1994a, 1994b), Gompers and Lerner (1999, 2000a, 2000b), Seppa (2003), and Hand (2005) on pre-IPO and post-IPO valuations of high tech industries. Hand (2005) found that biotech firms’ financial information such as cash, non-cash assets and R&D expense are value relevant in the pre-IPO, venture capitalist market. He used snap-shot financial statement data one year before the IPO in his test. However, due to the long time span between the R&D investment and revenue generation, the previous year’s R&D may not have an immediate effect on the current year’s earnings. Moreover, R&D expenditures incurred several years ago may very likely contribute to future earnings. Tan and Lim (2007) consider this issue in their paper by using five years of R&D spending. They find that this measure has an incremental but not significant explanatory power. Joos and Zhdanov (2008) use a real option valuation framework to examine the price-earnings relationship over a life cycle of 40 years. They find that “R&D investments are positively correlated with market equity value” (Joos and Zhdanov, 2008: 456). In this study we use cumulative R&D expenses as the proxy for R&D investment. We test the value relevance of assets and cumulative R&D expenses at the time of the IPO. We hypothesize that the biotech firms’ valuations at their IPOs are positively related to assets and cumulative R&D expenses.

Joos and Plesko (2005) argue that investors do not price persistent losses without an R&D component and find that when persistent losses contain R&D, investors separately value the R&D component as an asset and the non-R&D component as if it is a transitory loss. Joos and Zhdanov (2008) also find that losses are significantly related to value. If their arguments hold, investors should price cumulative losses for biotech companies as a positive signal in firm valuation. In this paper, we test whether investors value cumulative losses that contain a significant R&D component. We propose that biotech firms’ valuations at their IPOs are positively related to cumulative losses. Because most biotech firms have no earnings before their IPOs, and even for several years after their IPOs, investors tend to value non-financial information. Many nonfinancial indicators have been found to be value relevant.  

In this study, we control for two nonfinancial indicators – age of the firm and performance of the stock market.

(a) The age of the firms is indicative of the uncertainty about firm quality because very young companies have limited performance histories on which quality can be assessed (Beatty and Ritter, 1986). Joos and Zhdanov (2008) find that older biotech firms have higher valuations. They attribute this to older firms being less risky because their R&D activity has been successful which allows them to continue operating.

(b) The level of the AMEX Biotechnology Index on the valuation date: Lerner (1994a), Gompers and Lerner (2000b), and Seppa (2003) find that biotech firms have higher valuations when the overall publicly traded biotech equity

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2 Ocean Tomo is an integrated intellectual capital merchant bank. Their website is www.oceantomo.com.
3 Hand (2005) notes the following nonfinancial information includes number of patents, strategic alliances with pharmaceutical firms, Nobel-laureate chaired research committees, area of researches, and quality of academic publications by the firm. Some of these measures may be anecdotal.
index is higher because overall publicly traded biotech equity values provide a strong indication of the economic prospects of the biotech sector (Hand, 2005). However, the AMEX Biotechnology Index consists of only 13 firms and may not reflect the performance of the industry as a whole. In our study, we use the level of the NASDAQ Biotech Index (NBI) on the IPO day. The NBI is comprised of more than 120 biotech firms that meet the listing maintenance criteria of $100 million in market capitalization and 50,000 shares average daily trading volume. We believe this more accurately represents market performance for a broader spectrum of biotech firms.

HYPOTHESES

First, following the prior literature on pre-IPO and post-IPO valuation studies (Lerner, 1994a; Gompers and Lerner, 1999, 2000a, 2000b; Seppa, 2003; Hand, 2005) we hypothesize that assets disclosed in the prospectus are value relevant at biotech firms’ IPOs. Assets contain information regarding a firm’s actual assets-in-place. Biotech firms convert potential investment opportunities into actual assets-in-place through operating, financing and investing activities (Hand, 2005). The higher the assets disclosed to investors, the higher the firm value at its IPO. Thus: Hypothesis I: “Assets are incrementally value relevant to a biotech firm’s value at its IPO.”

Second, we hypothesize that cumulative R&D expenses are value relevant for biotech firms’ IPOs and that the higher the cumulative R&D expenses, the higher the firm’s value at the IPO. Cumulative R&D expenses represent the firm’s investment in its research and development activities. Prior literature (Lev and Sougiannis, 1995; Barron et al, 2002; Barth et al, 2001) categorized the current year’s R&D expense as a proxy of intangible assets. According to the investment opportunity approach taken by Miller and Modigliani (1961), the net contribution of intangible assets to the current market value of the firm depends on the expectation of continued future success. For the biotech industry, continued future success is to continue progressing through each stage of the value chain including key technology discovery, drug development, FDA clinical trials and sale of the drug or patent to a pharmaceutical company. In the race biotech industry, R&D expenditures are a necessary condition for future earnings. Moreover, R&D expenses may also contain information about the extent of progress in product development. Thus: Hypothesis II: “Cumulative R&D expenses” are incrementally value relevant to a biotech firm’s value at its IPO.

Third, we hypothesize that cumulative losses are value relevant at biotech firms’ IPOs. Following the conclusion drawn by Joos and Plesko (2005) that losses containing an R&D component are valued by investors in the public equity market, investors should consider cumulative losses as a positive signal in firm valuation. In our sample, the average R&D component is 76 percent of the cumulative losses. Therefore, cumulative losses should have a positive association with biotech firms’ value at the IPO. However, it remains an empirical question whether losses with a significant R&D component are valued by the market. The Joos and Plesko (2005) sample consists of the broadly defined biotech industry with the majority having losses with only a modest R&D component. Do the findings still hold when the R&D component becomes too high? Thus: Hypothesis III: “Cumulative Losses” are incrementally value relevant to a biotech firm’s value at its IPO.

METHODOLOGY

Data

This study uses archival data to empirically exam the relationship between assets, cumulative R&D, cumulative losses, and firm value at the time of the IPO. The sample of biotech firms was gathered from Hoover’s IPO Central, a well established database containing information on all aspects of IPO firms. The database contained 64 U.S. IPOs during the period 1995 to 2005 for companies whose primary business is biopharmaceuticals development.4 “Biopharmaceuticals are medical drugs produced using biotechnology. They are proteins, nucleic acids used for therapeutic or diagnostic purposes, and are produced by means other than direct extraction from a native (non-engineered) biological source” (Walsh, 2003). Unlike previous studies, we use a more precise group of biotechnology firms, specifically excluding the biotechnology research equipment firms, biotechnology research

4 Genentech and a company who trades using ADRs were excluded from the sample resulting in a total sample of 62 companies.
services firms, surgical and medical instruments, analytical instruments that were used in prior studies. Table 1 shows the distribution of SIC codes.

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2834</td>
<td>44</td>
</tr>
<tr>
<td>2835</td>
<td>1</td>
</tr>
<tr>
<td>2836</td>
<td>11</td>
</tr>
<tr>
<td>2854</td>
<td>1</td>
</tr>
<tr>
<td>8731</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62</strong></td>
</tr>
</tbody>
</table>

Hoovers IPO Central also provides IPO information such as IPO price, post-offering shares, and date of the IPO, etc. The financial and non-financial data for the IPOs are hand collected from the prospectus filed with the SEC immediately before the IPO. Section 5(b) of the Securities Act of 1933 requires issuing firms to file an S-1 registration form with the SEC prior to the sale of securities to the public. The first part of the S-1 form is the prospectus (Bartov et al, 2001). Of the total of 62 biotech IPO firms in our sample, 37 disclosed cumulative R&D expenses in their prospectus and 25 did not disclose such information. Therefore, we segment the sample into two groups: firms that disclosed cumulative R&D (Group A) and firms that did not (Group B). NASDAQ Biotech Index data on the day of the IPO are obtained from the official website of NASDAQ.

Model

We use a log linear regression model to assess the value relevance of financial information at the time of the IPO. This approach differs from the linear specifications applied in prior value relevance research. This is consistent with the methodology used in economics and in venture capital valuations as described in the entrepreneurial finance literature (Hand, 2005) and is the methodology used by him to assess the nature and associations between equity values, financial, and non-financial statement information in the pre-IPO private equity and post-IPO public equity markets. The major advantages of this model are its flexibility in accommodating nonlinear relationships and the econometric robustness it provides in dealing with outliers in the underlying non-logged data (Hand, 2005).

\[
\ln \text{MVE} = \gamma_0 + \gamma_1 \ln \text{Loss} + \gamma_2 \ln \text{Assets} + \gamma_3 \ln \text{CRD} + \gamma_4 \ln \text{NBI} + \gamma_5 \ln \text{Age} + \xi
\]

The dependent variable is the market value of equity (\(\ln \text{MVE}\)). Stuart, Hoang and Hybels (1999) measured biotech firm value at the IPO using the subscription price. Their results were similar when they used the closing price of the first trading day. Bartov, et al (2001) examine internet companies and find that there are significant differences between the initial valuation of firms at the prospectus and their valuation by the stock market at the end of the first trading day. In our study, we calculate the market value of equity using the first trading day’s closing price multiplied by the post-offering number of shares. The rationale is that prospectus prices and offering prices are largely the result of negotiation between the firms and underwriters. Only after the shares are transferred from underwriters to investors and traded in the open market, will prices capture investors’ perceptions.

Assets (\(\ln \text{Assets}\)) and cumulative losses (\(\ln \text{Loss}\)) (or accumulated deficit) are financial statement items defined by generally accepted accounting principles and are obtained from the prospectus. Cumulative R&D expenses (\(\ln \text{CRD}\)) are not required to be disclosed, but many companies do disclose this information; in our sample, only 60 percent of the firms make this disclose so we segment our sample into two groups: those that disclose this information and those that don’t.

Hand (2005) used the level of the AMEX Biotechnology Index on the IPO date. However, the AMEX Biotechnology Index consists of only 13 firms which may not reflect the performance of the industry. In this study, we control for general economic conditions and stock market performance using the NBI on the day of the IPO as the proxy for the level of the for the biotech industry market (\(\ln \text{NBI}\)).

Consistent with Gompers and Lerner (1999), Nicholson et al. (2003), Seppa (2003), and Hand (2005), the age of the firm (\(\ln \text{Age}\)) is defined as the number of years between the start of operations and the IPO.
Two regressions are performed. The first incorporates nonfinancial control variables. Financial information i.e. the testing variables are then added to the second regression. The change in adjusted $R^2$ represents the value relevance of the financial information. The individual variable is value relevant if its coefficient is significantly different from zero.

We investigate the value relevance of the financial variables given other nonfinancial variables. The accounting information is considered relevant if it explains firm value. Relevance is measured using the estimated regression coefficient; the information is considered relevant if $R^2$ is significantly different from zero.  

**RESULTS AND DISCUSSION**

Tables 2A and 2B are the correlation matrices for Groups A and B. It should be noted that in both groups, the three financial indicators are highly correlated. The market value of equity is correlated with all three financial indicators in Group A but not the cumulative loss in Group B.

| Table 2A: Pearson Correlations – Group A – Firms That Disclosed Cumulative R&D |
|-----------------------------------------------|-----|-----|---------|---------|---------|
|                  | LnCRD | LnNBI | LnAssets | LnAge | LnCLoss | LnMVE |
| LnCRD            | 1     | 0.121 | 0.537**  | 0.468** | 0.923** | 0.388* |
| LnNBI            | 1     |       | 0.166    | -0.087 | 0.213   | 0.654** |
| LnAssets         | 1     | 0.537** | 1       | -0.144 | 0.531** | 0.494** |
| LnAge            | 1     | 0.468** | 0.166    | 1      | 0.458** | 0.001  |
| LnCLoss          |       | 0.923** | 0.531**  | 0.458** | 1       | 0.396* |
| LnMVE            |       |        | 0.388*   | 0.494** | 0.001   | 1      |

| Table 2B: Pearson Correlations – Group B - Firms That Did Not Disclose Cumulative R&D |
|-----------------------------------------------|-----|-----|---------|---------|---------|
|                  | LnMVE | LnCLoss | LnAge | LnAssets | LnNBI |
| LnMVE            | 1     | 0.256 | 0.055  | 0.660**  | 0.324  |
| LnCLoss          | 1     | 0.158 | 0.519** | 0.190    |       |
| LnAge            | 1     | 0.156 | 1      | 0.260    |       |
| LnAssets         | 1     | 0.044 | 1      | 1        |       |
| LnNBI            |       | 1     |        |          |       |

Notes: **Significant at the 0.01 level (2-tailed); *significant at the 0.05 level (2-tailed).

Group A: N = 37; Group B: N = 25

Variable definitions: LnMVE is the log of market value of equity computed at the closing price on the IPO date. LnCLoss is the log of the company’s cumulative loss at the IPO date. LnCRD is the log of the company’s cumulative R&D expenditures disclosed in the prospectus. Since this information is not required to be disclosed, we segment our sample into two groups, those that disclose this information and those that don’t. LnAge is the log of the age of the company measured by the number of years from the start of operations to the IPO date. LnNBI is the log of the level of the NASDAQ Biotech Index on the day of the IPO.

Regression results for Groups A and B are contained in Table 3.

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5 Collins et al, 1997; Barth et al, 1998; Holthausen and Watts, 2001, and others use the incremental adjusted $R^2$ to measure value relevance. We also measure whether these three accounting variable significantly explain variances in equity using a joint F test. The joint F test results are consistent with the results measured by the change in adjusted $R^2$. 

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Table 3: Regression Results

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LnCLoss</td>
<td>-0.265</td>
<td>-0.159</td>
</tr>
<tr>
<td>LnNBI</td>
<td>0.616</td>
<td>0.389</td>
</tr>
<tr>
<td>LnCRD</td>
<td>0.371</td>
<td>0.798</td>
</tr>
<tr>
<td>LnAssets</td>
<td>0.321</td>
<td>0.308</td>
</tr>
<tr>
<td>LnAge</td>
<td>0.079</td>
<td>-0.164</td>
</tr>
<tr>
<td>Number of firms</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>R²</td>
<td>0.606**</td>
<td>0.581**</td>
</tr>
<tr>
<td>R² change</td>
<td>0.175</td>
<td>0.509</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.542</td>
<td>0.497</td>
</tr>
<tr>
<td>Adjusted R² change</td>
<td>0.145</td>
<td>0.509</td>
</tr>
<tr>
<td>F change</td>
<td>4.601</td>
<td>12.137</td>
</tr>
<tr>
<td>Significance of F change</td>
<td>0.009**</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

Notes: **Significant at the 0.01 level (2-tailed); *significant at the 0.05 level (2-tailed).

Group A firms disclosed cumulative R&D and Group B firms did not disclose this information.

Variable definitions: LnMVE is the log of market value of equity computed at the closing price on the IPO date. LnCLoss is the log of the company’s cumulative loss at the IPO date. LnCRD is the log of the company’s cumulative R&D expenditures disclosed in the prospectus. Since this information is not required to be disclosed, we segment our sample into two groups, those that disclose this information and those that don’t. LnAge is the log of the age of the company measured by the number of years from the start of operations to the IPO date. LnNBI is the log of the level of the NASDAQ Biotech Index on the day of the IPO.

Results from the regression for Group A (firms that disclose cumulative R&D expenses) show that the three financial indicators explained approximately 60% of the variance of the data. Results from the regression for Group B (firms that do not disclose cumulative R&D expenses) shows that the two financial indicators explained approximately 58% of the variance of the data.

For both groups, the coefficients of assets are significantly different from zero, which is consistent with the theory that investors value how well the firm has converted potential investment opportunities into assets-in-place. These findings support the first hypothesis that assets are incrementally value relevant for biotech firms at their IPO.

In the regression of Group A, the coefficient of cumulative R&D expenses (LnCRD) is not significantly different from zero. This difference from our hypothesis may be attributed partially to the unsophisticated investor proposition and the unique characteristics of the biotech industry. The biotech industry has a time lag of 10 to 15 years between the innovative idea and profit realization. It is highly uncertain whether the drug under development will successfully complete clinical trials. Therefore, when investors value the implied future profitability, they also incorporate the associated high risk into stock prices. The perceived risk of R&D activity may have reduced the value relevance of R&D expenses. Therefore, our second hypothesis is not supported. Our findings concur with the findings of Hand (2005), but do not concur with the findings of Guo, Lev and Zhou (2005) and Tan and Lim (2007). Hand (2005) finds that R&D expenditures are not valued at the biotech’s IPO but are valued pre-IPO and post-IPO. He attributes this to the IPO pricing anomaly. One of the explanations for IPO-related pricing anomalies is the proposition that IPOs are sold by sophisticated underwriters to unsophisticated investors who are extremely optimistic during the early months of the firms’ public lives. The action of the IPO market may cause unsophisticated investors to place too much weight on non-financial information and too little weight on the accounting data (Hand, 2005). This may be why both Hand (2005) and this study find that R&D is not valued when controlled for nonfinancial variables at the IPO. Tan and Lim (2007) find that use of the current and prior four years of R&D expenditures is value relevant. Guo, Lev and Zhou (2005) find
that current year R&D expense is value relevant at biotech firms’ IPOs. We attribute this discrepancy to their different sampling techniques. Guo, Lev and Zhou (2005) and Tan and Lim (2007) define biotech firms more broadly than we do. Their sample contains pharmaceutical, chemical, agricultural, food, physical research and manufacturing and industrial laboratories. Biotech firms specializing in human diagnosis and therapeutics have a unique long product development cycle while biotech service or biotech equipment, animal health, chemical, pharmaceutical and agriculture industries do not have a long value chain. The fact that their data does not isolate biotech firms from other industries may fail to reveal unique risks.

For both groups, the coefficient of cumulative losses (LnCLoss) is not significantly different from zero. Our results differ from the Joos and Plesko (2005) findings. The reason may be that they use post-IPO data from multiple industries as described previously. The IPO valuation for the biotech industry may not be consistent with other industries. In addition, the fact that investors do not price cumulative losses may be due to the biotech industry’s extremely high risk and long time lag between input and output of R&D investments. The predictability of cumulative losses for future earnings is very weak for the biotech industry. Therefore, it is not surprising that investors do not value cumulative losses even if they contain a significant R&D component. Therefore, our third hypothesis is not supported.

The coefficient of firm age (LnAge) is not significant for both groups. These results contradict the prior literature of Gompers and Lerner (1999), Nicholson et al. (2003), and Seppa (2003). However, they conform to Hand (2005) in his value relevance study of pre-IPO and post-IPO biotech firms.

The coefficient of the NASDAQ Biotech Index (LnNBI) is significant for both groups which suggests that NASDAQ Biotech Index is a relevant indicator of general economic conditions and stock market performance.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

One limitation is that we use a population of biotech firms from Hoover’s IPO central database. Although we could not find additional firms, it is not clear whether Hoover’s IPO central contains all the biotech firms that went public between 1995 and 2005.

In conclusion, we find that assets are incrementally value relevant to biotech firms’ IPO valuation. Our finding conforms to the theory that investors value assets-in-place at the IPO. However, investors may not fully value cumulative R&D expenses which are usually valued in IPO studies. This shows that investors value tangible assets but do no value intangible assets due to the high risk and long time span of the industry’s development cycle. This reveals an anomaly of IPO pricing for biotech firms. Our findings add to the biotech IPO valuation literature and extend the prior pre-IPO and post-IPO biotech firms’ valuation studies. We show that traditional valuation methods based on earnings metrics are less appropriate in valuing biotech firms and that the potential for earnings is more important actual earnings. In addition we provide evidence that further study of intangibles is needed to assist in the debate regarding the valuation of intangibles.

In future studies, it may be beneficial to use the closing price at the end of the first month after the IPO in order to eliminate the price anomaly at the IPO. However, it is still questionable whether investors will become rational one month after the IPO.

REFERENCES


