Intangible Assets and the Book-to-Market Effect

Hyuna Park*

February 20, 2017

Abstract

The book-to-market effect and the value premium are well known among financial economists and analysts. However, previous research did not analyze the growth of goodwill and related transformations in accounting rules that may bring significant changes to the book-to-market effect. To fill this gap, I analyze the impact of SFAS 142, *Goodwill and Other Intangible Assets*, issued in 2001. I find that the book-to-market effect became weaker in the post-SFAS 142 period especially in the firms that have goodwill. SFAS 142 abolished goodwill amortization and required periodic impairment tests, and the book-to-market effect is weaker in the firms with goodwill impairment loss or risk. The book-to-market effect becomes stronger when subsamples are formed with firms that do not have goodwill, and these findings are robust to firm size, different factor models, and test methods.

Keywords: fair-value accounting, valuation of R&D, goodwill impairment, book-to-market ratio

JEL Classification: G12, M41, O3

---

* Hyuna Park is an associate professor and Kurz Endowed Chair in Finance & Risk Management at Brooklyn College of the City University of New York. e-mail: hyuna.park38@brooklyn.cuny.edu, phone: (413) 348-9116. I thank Don Chance (discussant), Jay Choi, Byoung-Hyoun Hwang, Stephan Jank, Sunil Mohanty, Daniel Tinkelman, Celim Yildizhan (discussant), and the participants of 2015 Financial Management Association (FMA) Annual Meeting and Korea America Finance Association (KAFA)'s 25th Anniversary Conference for helpful comments and suggestions. I am grateful to SungIn Moon and Minchul Yang for inspiring me to examine the issues in intangibles valuation and goodwill impairment. A previous version of this paper "Intangible Assets and Value Investing" was a semi-finalist for the Best Paper Award in Investments at the FMA Annual Meeting in 2015.

Intangible Assets and the Book-to-Market Effect

Abstract

The book-to-market effect and the value premium are well known among financial economists and analysts. However, previous research did not analyze the growth of goodwill and related transformations in accounting rules that may bring significant changes to the book-to-market effect. To fill this gap, I analyze the impact of SFAS 142, *Goodwill and Other Intangible Assets*, issued in 2001. I find that the book-to-market effect became weaker in the post-SFAS 142 period especially in the firms that have goodwill. SFAS 142 abolished goodwill amortization and required periodic impairment tests, and the book-to-market effect is weaker in the firms with goodwill impairment loss or risk. The book-to-market effect becomes stronger when subsamples are formed with firms that do not have goodwill, and these findings are robust to firm size, different factor models, and test methods.

Keywords: fair-value accounting, valuation of R&D, goodwill impairment, book-to-market ratio

JEL Classification: G12, M41, O3

1. Introduction

During the past three decades, financial economists have used the ratio of a stock's book value to its market value to explain the cross-sectional variation in stock returns, and reported evidence on the value premium and the book-to-market effect (See Rosenberg, *et al.* (1985), Fama and French (1992, 1993, 2008 and 2012), Lakonishok, *et al.* (1994) and Asness, *et al.* (2013), among others). Since the pioneering work of Graham and Dodd (1934), value strategies have been popular among practitioners as well.

However, most previous research in the finance literature did not examine the growth in intangible assets and related transformations in accounting rules that may bring significant changes to the book-to-market effect, regarding as if book value is in a "black box." To fill this gap, I analyze the impact of SFAS (Statement of Financial Accounting Standards) 142 (Goodwill and Other Intangible Assets), issued by the FASB (Financial Accounting Standards Board) in 2001.[1]

Why is it important to consider intangible-related accounting changes when we analyze the book-to-market effect? Nakamura (2001 and 2003) of the Federal Reserve Bank of Philadelphia estimates that US firms invest at least $1 trillion in intangibles every year, and there are many challenges and inconsistencies when intangible assets are recorded in financial statements (Lev (2001 and 2003) and Damodaran (2009)). The challenges financial statement preparers and corporate financial managers face in the valuation of intangibles may affect the quality of the book value data financial economists and analysts use.

For example, when a company in the semiconductor industry hires researchers to develop a new technology, the fair value of the internally developed technology is not recorded on the

[1] In the accounting literature, Lev and Sougiannis (1999) examined the relation between R&D capital and future stocks returns, and argue that the R&D capital subsumes the book-to-market effect. However, Donelson and Resutek (2012) show that neither the level of R&D investment nor the change in R&D investment explains future returns. They argue that the excess returns of R&D firms are part of the value-growth anomaly.

firm's balance sheet. The main reason is regarding R&D expenditures as operating expenses instead of capital expenses even though those expenditures create benefits over many years (Chan *et al.*, 2001).[2]

Therefore, the book value of the firm's equity becomes significantly lower than its market value. However, when the firm is acquired by another company, the market value of the new technology enters the balance sheet of the acquirer mainly in the form of goodwill.[3] I used R&D costs as an example here, but there are many other expenses that have the same problem such as marketing costs to develop brand names.[4]

That is, the book value of intangible assets can change precipitously after the acquisition of a firm. This has been an important and very controversial issue among preparers and users of financial statements as well as regulators (FASB (1998 and 1999), Turner (1999), US House (2000), and US Senate (2000)). As a response to the challenges, the FASB issued SFAS 142 in 2001, and this means abolishing goodwill amortization and requiring all goodwill be tested periodically for impairment using estimates of its current fair value.

However, prior research points out that "fair-value accounting" practice such as SFAS 142 can be problematic when actively traded market prices are not available and thus reported fair values are unverifiable (Holthausen and Watts (2001), Ramanna (2008), and Ramanna and Watts (2012)). Another problem we should note occurs when market values go back up after impairments by changes in economic conditions and investor risk aversion. It is

---

[2] Under US GAAP (Generally Accepted Accounting Principles), costs incurred to develop, maintain, or restore intangible assets are generally expensed rather than capitalized. Exceptions include costs associated with computer software and Web site development. See US GAAP ASC (Accounting Standards Codification) 350-20-25-3, ASC 730-10-25-1 and ASC 985-20 for details.

[3] SFAS 141 (Business Combinations, 2001; par. 43) defines acquisition goodwill as the excess of the purchase price paid to the target over the estimated fair market value of the target's identifiable net assets.

[4] The categories of intangible assets include 1) marketing related, 2) customer related, 3) contract related, 4) technology related, and 5) other unspecified intangible assets. See Castedello and Klingbeil (2009) for examples of intangible assets by industry and category.

a problem because the increase in the fair market value of intangible assets would not be accounted for in financial statements under US GAAP.[5]

Figure 1 and Table 1 show the time series of total after-tax goodwill impairment loss (GDWLIA).[6] Note that i) SFAS 142 was promulgated in June 2001, ii) mandatory adoption was required for fiscal years beginning after December 15, 2001, and iii) 2001 and 2002 firms in Figure 1 were permitted to ascribe goodwill impairments below-the-line to a "change in accounting principle" while impairments in all subsequent years are charged above-the-line, to "income from continuing operations."[7] The early impairment losses in 2001 and 2002 were concentrated on Technology and Telecommunications sector while losses in subsequent years spread out across all industries especially during the financial crisis of 2008.

When analyzing the goodwill impairment loss in Figure 1, we need to consider that there are firms that should have been included in the figure but chose not to do so, and vice versa. Each year during 1996 – 2013, 167 – 787 firms had a market value lower than the book value but chose to carry $1 million or more goodwill on their balance sheets as shown in Table 1. They may have decided not to impair goodwill expecting that stock price would go back up when economic conditions improve and investors become less risk averse in the future. That is, there is subjectivity inherent in estimating goodwill's current fair value (Ramanna and

[5] Revaluation to reflect the increase in market value of intangible assets is not allowed under US GAAP, but IFRS (International Financial Reporting Standards) allows revaluation. Paragraphs 85 and 86 of IAS (International Accounting Standards) 38 state that revaluation increases and decreases are recognized either in equity or in profit or loss.

[6] Prior to SFAS 142, goodwill i) was impaired only when certain associated long-lived assets were also impaired (SFAS 121, Accounting for the Impairment of Long-Lived Assets and for Long-lived Assets to Be Disposed of, March 1995) and ii) was also subject to periodic amortization (Accounting Principles Board (APB) 17, Intangible Assets, August 1970).

[7] See Beatty and Weber (2006) for details on the implications of above-the-line vs. below-the-line treatment of goodwill impairment loss.

Watts (2012) and Li, *et al.* (2011)). Therefore, the book values recorded in financial statements may become more inconsistent as firms invest more in intangible assets.

I argue that inconsistency in book value caused by intangibles affects the book-to-market effect observed in the stock market. Figure 2 presents a time series of cumulative returns on the HML, the well-diversified zero-investment portfolio that buys high book-to-market (BM) ratio stocks and shorts low BM ratio stocks as in Fama and French (1993). The circle marks the post- SFAS 142 period. As shown in the figure, the cumulative return on the HML had increased with time in early years, but the positive trend disappears in recent years when the growing importance of intangible assets resulted in relevant accounting rule changes.

For a formal statistical test of the change, I use returns on decile portfolios formed on BM as in Fama and French (1992) and divide the sample into pre- vs. post-SFAS 142 period. I find that the average return differential between the top and the bottom decile portfolios is significantly different from zero only in the pre-SFAS 142 sample (*t*-statistic: 3.15 vs. 1.50). That is, the book-to-market effect and the value premium are not significant during the post-SFAS 142 period.

To check if this change is robust to the size of firms, I use 25 equally weighted portfolios formed on size and BM, and find similar results; the book-to-market effect is significant only during the pre-SFAS 142 period regardless of size. Value weighted portfolios show similar results.

I also use the 4-factor model as in Fama and French (1993) and Carhart (1997) and the 5-factor model as in Fama and French (2015), and find that the book-to-market factor loading becomes less significant in the post-SFAS 142 sample across all size portfolios. Fama and

MacBeth (1973) regressions using individual firm data also confirm that the book-to-market effect is weaker during the post-SFAS 142 period.

These results are consistent with Hou, Xue, and Zhang (2015) and Fama and French (2015 and 2016) who show that the book-to-market factor is losing explanatory power in the cross-section of stock returns and propose a new factor model that includes profitability and investment factors. While prior research is silent about what caused the book-to-market effect to become weaker, I argue that growth in intangible assets may be a reason. However, the insignificant book-to-market effect observed in recent years is not necessarily attributable to intangible assets. It is because the growth of quant funds that implement value strategies may also have weakened the book-to-market effect irrespective of the cause of the value premium.[8]

If the value premium is due to fair compensation for the additional risk of value stocks, broader risk sharing may lead to decrease in the premium and thus insignificant book-to-market effect. If the value premium is caused by mispricing, the premium can also become insignificant by more arbitrage capital flowing into quant funds that will reduce the arbitrage opportunity. The variability in capital flowing into and out of such funds will also increase volatility making the value premium statistically less significant. That is, whether the value premium is due to risk or mispricing, the change observed in recent years might have been caused by quant funds, and intangibles may not be a reason.[9]

It is beyond the scope of this paper to test the impact of quant funds on value premium, but sub-sample tests can be used to test if intangibles are "a reason" (if not, "the reason") for the weakened book-to-market effect. Therefore, in a portfolio-level test, I divide the sample

[8] Prior research suggests two possibilities for the cause of the value premium. For example, Fama and French (1993) use risk-based approach and Lakonishok, *et al.* (1994) provide behavioral explanation.
[9] I thank an anonymous referee for this insightful comment.

into Subsample I (Firms with neither goodwill nor R&D expenditures) and Subsample II (Firms with both goodwill and R&D expenditures) to check if the book-to-market effect is stronger in Subsample I where firms are less likely to be affected by intangibles. I find that the average return differential between the top and the bottom book-to-market decile portfolios is significantly different from zero only in Subsample I.

I also formed Subsample III using firms that reported $1 million or more goodwill impairment loss during the previous year and firms that are at a high risk of future impairment loss defined by goodwill greater than $1 million and the book-to-market ratio greater than 1. That is, Subsample III consists of firms that have goodwill impairment loss or risk, and I find that these firms do not show the BM effect (*t*-statistic for the average return differential between top and bottom deciles: 0.90).

In firm-level tests, Fama and MacBeth (1973) regressions are used. As sample size is less restrictive in this regression than in decile portfolios, I construct six subsamples based on intangibles: Subsample 1 (Firms that do not have goodwill), Subsample 2 (Firms that do not have R&D expenditures), Subsample 3 (Firms with neither goodwill nor R&D expenditures), Subsample 4 (Firms in the top decile of goodwill as a percentage of total assets (GWP)), Subsample 5 (Firms that reported $1 million or more goodwill impairment loss (GDWLIA) during the previous year), Subsample 6 (Firms with a high risk of future impairment loss defined by goodwill greater than $1 million and the book-to-market ratio greater than 1).

That is, firms in Subsamples 1, 2 and 3 are less likely to have intangible-related issues than those in Subsamples 4, 5, and 6, and thus the book-to-market effect will be weaker in Subsamples 4, 5 and 6 if intangibles are a reason for the weakened book-to-market effect. I find that the average coefficient on the book-to-market ratio in Fama-MacBeth regressions is significantly different from zero at the 1 percent level in subsamples 1, 2 and 3 while the coefficient is smaller and less significant in subsamples 4, 5 and 6 where firms have more intangibles (*t*-statistic: [4.31, 3.90, 3.70] vs. [2.47, 1.86, 2.45]).

These results suggest that the growth in intangible assets and related transformations in accounting rules are related to the weakened book-to-market effect observed in the stock market. The rest of this paper is organized as follows. Section 2 reviews literature. Section 3 describes data and methodology. Section 4 presents empirical results and Section 5 concludes.

2. Previous Research on Intangible Assets and the Book-to-Market Effect

Francis and Schipper (1999) argue that accounting standards do not appropriately recognize and measure the economic assets used to create shareholder value because the standards have remained stagnant while business has changed, or because the standards have changed in ways that diverge from providing value-relevant information, or both. Lev and Zarowin (1999) analyze the usefulness of accounting information to investors in financial markets and show that the usefulness of reported earnings, cash flows, and the book values has deteriorated over the past decades. They attribute their finding of decreased relevance of accounting information to both the increased importance of unreported intangible assets and the failure of the accounting practices to keep pace with and reflect the increased rate of change in the business environment.

The problem of unreported intangible assets arose mainly because SFAS 2 (Accounting for Research and Development Costs, 1974) required corporations to expense their R&D expenditures immediately instead of capitalizing it. This change makes the gap between the book value and the market value of a firm increase. Therefore, the book-to-market ratio starts declining after SFAS 2 became effective as shown in Figure 3.

Kothari, *et al.* (2002) point out that the high degree of the uncertainty about the future benefits of R&D expenses was the rationale behind the immediate expensing decision.[10] However, FASB's decision not to capitalize expenses that generate long-term but uncertain benefits led to another challenge accountants face in business combinations such as mergers and acquisitions (M&As). The most controversial issue was the likelihood of generating very different financial statements for the acquirer depending on whether "pooling" or "purchase" was used as an accounting method for the business combination (Turner (1999)).[11]

To respond to this challenge, the FASB issued SFAS 141 (Business Combinations, 2001) and SFAS 142 that address how intangible assets should be accounted for in financial statements. This means abolishing goodwill amortization and requiring all goodwill be tested periodically for impairment using discounted future cash flows estimated by the company. The FASB listed the following as reasons for issuing *SFAS 142*;

"Analysts and other users of financial statements, as well as company managements, noted that intangible assets are an increasingly important economic resource for many entities and are an increasing proportion of the assets acquired in many transactions. As a result, better information about intangible assets was needed. Financial statement users also indicated that they did not regard goodwill amortization expense as being useful information in analyzing investments."

The implementation of SFAS 142 means that the book value and the earnings of a firm can be significantly affected by management estimates of the value of goodwill and other

[10] As software development became more prevalent since the 1980s, accounting standards were developed that permit software R&D costs to be capitalized in certain circumstances. However, Paul and Durbin (2016) point out that despite the accounting model allowing software development costs to be capitalized often little or none are actually capitalized in practice due to many challenges in assessing feasibility.

[11] While "Purchase" accounting required the acquirer record goodwill in its balance sheet for the premium it paid in excess of the net assets of the target, "Pooling" allowed a carryover basis of all assets and liabilities without recording goodwill (APB 16: Business combinations, August 1970). FASB (1998) cited flaws and abuses of pooling as a reason for revising business combinations accounting.

intangible assets. See the following statements taken from *2002 10-K annual report of CBS* as an example;

"The Company reported net earnings of $725.7 million for the year ended December 31, 2002, compared with a net loss of $223.5 million for 2001. The substantial improvement in net earnings reflected revenue growth principally from advertising sales and the reduction of amortization expense resulting from the implementation of SFAS 142. These increases were partially offset by the goodwill impairment charge of $1.5 billion recorded in 2002 as a cumulative effect of change in accounting principle, net of minority interest and tax."

Holthausen and Watts (2001) point out that accounting standards may evolve by other roles and forces that are not perfectly correlated with the valuation role. "Fair-value accounting" such as SFAS 142 is the practice of reporting assets and liabilities at estimates of their current values, and it has been used in several US GAAP standards since 1995.[12] Ramanna (2008) warns that SFAS 142 may be misused because fair values that are not based on actively traded market prices are unverifiable and can increase the likelihood of opportunistic disclosure. Ramanna and Watts (2012) point out that the subjectivity inherent in estimating goodwill's current fair value is greater than that in most other asset classes making the goodwill impairment test under SFAS 142 particularly unreliable. Lev, *et al.* (2010) argue that accounting estimates potentially improve the relevance of financial statements by providing managers a venue to convey inside information to investors, but the quality of financial statements information is compromised by the increasing difficulty of making reliable estimates and the frequent managerial misuse of estimates. Lev and Sougiannis (1999) examines whether the off-balance sheet innovative capital proxied by

[12] Fair value accounting is used in SFAS 121 and 144 (Impairment of Long-lived Assets, 1995 and 2001), SFAS 123 and 123R (Employee Stock Options, 1995 and 2005), SFAS 133 (Derivatives and Hedging, 1998), and SFAS 142.

R&D expenditures can be used to predict future abnormal earnings and stock returns. Using a sample of about 1,200 companies during 1972-1989, they find that low BM companies have a large R&D capital. They also show that the R&D capital-to-market variable subsumes the role of the book-to-market ratio using a Fama-French regression of stock returns on lagged fundamentals

While the accounting literature presents active discussions during the past decades to overcome the challenges in the valuation of intangibles such as innovative capital and goodwill, research on intangible assets is rare in the finance literature. Lim, Macias, and Moeller (2015) analyze the impact of intangible assets on capital structure. Using self-created intangibles data available after SFAS 141, they show that intangible assets and financial leverage are positively related. Baxamusa, Mohanty, and Rao (2015) analyze the financing decision of firms in relation to asset tangibility. They show that firms are more likely to use equity to fund their investments in intangible assets, while debt is used to fund investments with lower information asymmetry about their risk such as liquidity enhancement.

Chan *et al.* (2001) point out the problem of expensing R&D in US accounting standards and examine whether R&D expenditures can explain stock returns. They find that companies with high R&D to equity market value tend to have poor past returns and they earn large excess returns. They examine advertising expenses and find a similar result. They also show that R&D intensity is positively related to return volatility.

Novy-Marx (2013) shows that earnings are inferior to gross profitability in forecasting the cross-section of stock returns. He points out that the reduced explanatory power of earnings may have been caused by the accounting practice of treating long-term investments in R&D, advertising and human capital as operating expenses. He explains that the farther down an income statement we move, the more polluted profitability measures become due to challenges in intangibles accounting, and the less related those measures are to true economic profitability.

Daniel and Titman (2006) analyze the impact of changing business environment and accounting information on the book-to-market effect. They show that a stock's future return is unrelated to the firm's past accounting-based performance, but it is strongly negatively related to intangible return, the component of past return that is orthogonal to the firm's past performance. Extending the findings of Daniel and Titman, Jiang (2010) shows that institutions tend to buy shares in response to positive intangible information, and the book-to-market effect is significant in stocks with intense past institutional trading but nonexistent in stocks with moderate institutional trading. However, their intangible return should not be confused with intangible assets analyzed in this paper as Daniel and Titman emphasized in footnote 3 of their paper.[13]

Using an empirical model similar to Daniel and Titman (2006)'s, Donelson and Resutek (2012) decompose realized stock returns into R&D returns and non-R&D returns to test whether R&D is related to mispricing or shifts in firm risk. They find that stronger future returns of R&D firms are associated with investors incorporating more value-relevant information into stock price that is not captured by R&D or other accounting measures of growth. That is, the accounting literature is rich with papers that analyze goodwill and other intangible assets, and several papers analyzed intangible-related asset pricing issues in the finance literature. However, there is no previous research that analyzed the impact of goodwill and related accounting-rule changes on the book-to-market effect.

[13] Intangible return is defined as the residual of past stock return that is orthogonal to the tangible return component explained by past book return and lagged book-to-market ratio. See Equation (8) in Section 3.4 for details.

In their seminal research, Fama and French (1992 and 1993) explain the book-to-market effect in the cross-section of stock returns and the value factor in asset pricing. For recent empirical analyses of the value premium in financial markets, see Asness, *et al.* (2013) and Fama and French (2012) among others. The finance literature suggests two possibilities for the cause of the value premium: risk-based approach and behavioral explanation. According to the risk-based theory, risky firms for which investors require higher rates of return are priced lower and consequently have higher book-to-market ratios than less risky firms for which the required returns are lower. Fama and French (1993) argue that high book-to-market firms are exposed to a priced systematic risk factor and measure this risk as the covariance between the stock returns and the return of their HML portfolio.

The behavioral explanation is the argument that the book-to-market effect is a result of investor overreaction to past firm performance. Lakonishok *et al.* (1994) argue that investors over extrapolate a firm's past earnings growth when forecasting future earnings. Therefore, stock prices of firms with poor past earnings get pushed down too far and thus they have high book-to-market ratios.

Regardless of whether the value premium is due to risk or mispricing, the estimated relation between book-to-market ratio and stock returns may have become weaker if inconsistency in book values increased with the growth in intangible assets. Paul and Durbin (2016) point out the criticism of US GAAP that many companies' most critical assets are intangibles and they do not appear on their balance sheets. To respond to this criticism, the FASB requested comments on whether their future agenda should include a project on the accounting for intangible assets, including R&D in August 2016.[14]

[14] See FASB Invitation to Comment for Agenda Consultation issued on August 4, 2016 for details. http://www.fasb.org/jsp/FASB/Document_C/DocumentPage?cid=1176168357653&acceptedDisclaimer=true

3. Data and Test Methods

3.1. Data and Summary Statistics

Stock price, returns, and shares outstanding data are from CRSP, financial statements information is from COMPUSTAT, and the sample period is January 1963 – December 2013. To be consistent with prior research, I exclude negative book equity stocks, financial institutions, American depositary receipts, real estate investment trusts, and units of benefits interest. Only ordinary common equity shares that have the share code of 10 or 11 are included.

Panel A of Table I presents summary statistics at four points in the sample history. When the sample period started in 1963, less than 12 percent of the firms (61 out of 512) reported R&D expenditures and firms had neither goodwill nor impairment losses. In the 21st century, however, more than 50 percent of the firms report R&D expenditures (2,651 out of 4,215 firms in 2001, for example). The proportion of firms that have goodwill has also increased from 41% in 2001 (1,713 out of 4,215 firms) to 68% in 2013 (1,883 out of 2,751 firms).

Panel B of Table 1 presents characteristics of the firms with goodwill impairment loss greater than $1 million during 1996-2013. Panel B starts in 1996 as it was the first year when companies started reporting goodwill impairment loss. Note that, during the financial crisis in 2008, more than 18% (593 out of 3,217) of the firms reported goodwill impairment loss. The average loss was $292 million, the total was $173 billion, and the largest was $25 billion reported by ConocoPhillips. Panel B also presents the characteristics of firms with goodwill impairment risk defined as market value less than book value and goodwill greater than $1 million. For example, there were 787 firms with goodwill impairment risk in 2008, and the average BM ratio was 3.72 with total goodwill of $546 billion. The average BM ratio of all firms was 1.77 in 2008.

To show which industries have more goodwill than others, Table II presents the distribution of goodwill as a percentage of total assets (GWP) across different industries. Telecommunications, Technology, Consumer Nondurables, and Manufacturing industries have a mean GWP above 10%, and the mean GWP is higher than the median in all industries.

3.2. Increasing Gap between Market Value and Book Value

In previous research on the book-to-market effect, sample periods usually start in the 1960s. However, the gap between market value and book value has increased significantly since then. As shown in Figure 4, when the book-to-market effect was first introduced in academic research in the 1980s, intangible assets reported on balance sheets were negligible, and the gap between book equity and market equity was small. However, during the 21st century, intangible assets have grown rapidly and so has the gap between market value and book value. The real growth rates of INTAN, GWDL, and ME – BE during 2001 – 2013 are, 109%, 303%, and 57%, respectively.

Note that INTAN in Figure 4 includes only the reported portion, not the entire intangible assets companies have. As explained in the previous section, there are a lot of unreported intangible assets because of FASB’s decision not to capitalize most intangible investments due to the uncertainty in the future benefits of these assets. For example, the most valuable asset of Amazon is not its shipping facility (a tangible asset that appears on its balance sheet), but its business model and customer recognition (an intangible asset that is not included in the balance sheet because the company has never been acquired by another firm). This is why Amazon’s reported intangible asset is small and its gap between market equity and book equity is huge. Amazon's INTAN is $3.3 billion, BE is $10.3 billion, and ME is $183.0 billion as of December 31, 2013.[15]

As the gap between market value and book value has increased significantly with the growth in intangibles, the empirical relation between expected stock returns and the book-to-market ratio may have changed. Therefore, I divided the sample into pre- vs. post-SFAS 142 to show the difference in the book-to-market effect before and after the growth in intangibles.

3.3. Portfolio-level Tests

Following the convention in the asset pricing literature, portfolios are formed on log book-to-market ratio (bm) at the end of each June in the portfolio-level tests presented in Table III. The 12 monthly returns from July of year t through June of year $t+1$ are for the portfolio formed on bm_t in June of year t.

In bm_t calculation, book value is the book equity at the end of the fiscal year ending in year $t-1$, and market value is market equity on the last trading day of year $t-1$.The minimum 6-month lag between the end of the fiscal year and the date when the returns are measured ensures that the financial statement data is publicly available information.

The portfolio-level test presented in Table IV uses monthly returns of the 25 portfolios formed on size and book-to-market (5*5). The portfolios are formed at the end of each June and the size breakpoints for year t are the NYSE market equity quintiles at the end of June of t. The book-to-market ratio for June of year t is the book equity for the last fiscal year end in $t-1$ divided by the market equity for December of $t-1$. The book-to-market breakpoints are NYSE quintiles. The portfolios for July of year t to June of $t+1$ includes all NYSE, AMEX,

[15] BE is defined as the sum of the total common equity (CEQ) and the balance sheet deferred tax (TXDB) from COMPUSTAT.

and NASDAQ stocks for which market equity data for December of *t-1* and June of *t* and book equity data for *t-1* are available.

The portfolio-level test presented in Table V uses excess returns on size quintile portfolios as the dependent variable in time-series regressions. The size portfolios are constructed at the end of each June using the June market equity and NYSE breakpoints. The independent variables in the regression are the four factors as in Fama and French (1993) and Carhart (1997): i) the excess market return ($R_M – R_f$), ii) the size factor (SMB), iii) the book-to-market factor (HML), and iv) the momentum factor (MOM).

$$R(t) - R_f(t) = a + b(R_M(t) - R_f(t)) + s\,SMB(t) + h\,HML(t) + m\,MOM(t) + e(t) \qquad (1)$$

A z-test as in Clogg *et al.* (1995) is used to test the change in h coefficient pre- vs. post-SFAS 142.

$$Z = (\hat{h}_{pre} - \hat{h}_{post})/[s^2(\hat{h}_{pre}) + s^2(\hat{h}_{post})]^{(1/2)} \qquad (2)$$

where $s(\hat{h})$ denotes the standard error of $\hat{h}$. Z has a standard normal distribution under the null hypothesis of $h_{pre} = h_{post}$.

In the portfolio-level test presented in Table VI, the independent variables are the five factors as in Fama and French (2015): i) the excess market return ($R_M – R_f$), ii) the size factor (SMB), iii) the book-to-market factor (HML), iv) the profitability factor (RMW), and v) the investment factor (CMA). RMW (Robust minus Weak) is the average return on the two, small and big, robust operating profitability portfolios minus the average return on the two weak operating profitability portfolios. CMA (Conservative minus Aggressive) is the average return on the two, small and big, conservative investment portfolios minus the average return on the two aggressive investment portfolios.[16] As in Table V, excess returns on size quintile

[16] I thank Kenneth French for the data: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

portfolios are the dependent variable in the time-series regressions, and z-tests are used to examine the change in h coefficient before and after SFAS 142.

$$R(t)–R_f(t) = a + b(R_M(t) – R_f(t)) + sSMB(t) + hHML(t) + pRMW(t) + iCMA(t)+ e(t) \quad (3)$$

3.4. Firm-level Tests

Individual firm-level tests presented in Table VIII use Fama and MacBeth (1973) regressions of monthly returns on log book-to-market ratio (bm). A firm's book-to-market ratio in year *t* is the total book value of the firm at the end of the firm's fiscal year ending anywhere in year *t-1* divided by the total market equity on the last trading day of the calendar year *t-1* as reported by CRSP. The 12 cross-sectional regressions of monthly returns from July of year *t* through June of year *t+1* all use the same log book-to-market ratio (bm_t) as the explanatory variable.

Firm-level tests presented in Table IX use Fama and MacBeth regressions of monthly returns on the three components of bm_t: 5-year lagged log book-to-market ratio (bm_{t-5}), book return (bret(t-5,t)), and market return (ret(t-5,t)). As in Daniel and Titman (2006) and Fama and French (2008), the three components of bm_t are defined as follows:

$$bm_t = \log(\frac{B_t}{P_t}) = bm_{t-5} + bret(t\text{-}5,t) - ret(t\text{-}5,t) \quad (4)$$

$$ret(t\text{-}5,t) \equiv \sum_{s=t-59}^{t} \log(\frac{P_s \cdot f_s + D_s}{P_{s-1}})$$

$$= \log\frac{P_t}{P_{t-60}} + \sum_{s=t-59}^{t} [\log(f_s) + \log(1 + \frac{D_s}{P_s \cdot f_s})] \quad (5)$$

$$bret(t\text{-}5,t) \equiv \log\frac{B_t}{B_{t-60}} + \sum_{s=t-59}^{t} [\log(f_s) + \log(1 + \frac{D_s}{P_s \cdot f_s})] \quad (6)$$

where B is book value per share, P is stock price, f is a factor to adjust price for splits, and D is dividend per share.

For the regressions in Table IX, I used cumulative return (cumtret) in CRSP to calculate ret (t-5,t). For example, if cumtret of firm i is 0.18 in December 2007 and 0.62 in December 2012, $ret_i(2007,2012)$ is (1.62/1.18) – 1 = 0.37. After calculating ret(t-5,t), I entered it into equation (4) along with bm_t and bm_{t-5}, and then solved for bret(t-5,t).

Table IX also includes Fama-MacBeth regressions that use intangible return, iret(t-5,t), as the explanatory variable. As in Daniel and Titman (2006), iret(t-5,t) of firm i is defined using the following cross-sectional regression of ret(t-5,t) on bm_{t-5} and bret(t-5,t):

$$ret_i(t\text{-}5,t) = \gamma_0 + \gamma_1 \cdot bm_{i,t-5} + \gamma_2 \cdot bret_i(t\text{-}5,t) + u_{i,t} \quad (7)$$

$$iret_i(t\text{-}5,t) \equiv u_{i,t} \quad (8)$$

I include this test to examine whether intangible return becomes less significant in the Fama-MacBeth regressions during the post-SFAS-142 period due to the diminishing explanatory power of book return. To test whether R&D affects the explanatory power of intangible return, I also include the R&D dummy variable in the regressions. As a robustness check, in Panel B of Table IX, I repeat the tests using subsamples formed on size: ABM (All but Micro) and Micro. As in Fama and French (2008), Micro is defined as NYSE, Amex, and Nasdaq stocks below the 20^{th} percentile of the market capitalization of NYSE stocks, and ABM is all else. The regressions in Table IX start in 1975 because it is the first year of SFAS 2, which required R&D to be immediately expensed. Prior to that, firms had the option to capitalize.[17]

4. Empirical Results

4.1. Portfolio-level Tests: Pre- vs. Post SFAS 142

Table III presents monthly returns of decile portfolios formed on log book-to-market ratio (bm). Consistent with previous research, I find that the book-to-market effect is significant

[17] I thank an anonymous referee for suggesting that regressions with R&D data start after SFAS 2 became effective.

when the entire sample period is used; the average return on high bm portfolios is significantly higher than that of low bm portfolios during July 1964 – December 2013 (*t*-statistic: 3.50). Consistent with the prediction of the impact of intangibles on the book-to-market effect, sub-period tests show that the return difference between high bm and low bm portfolios becomes insignificant in the post-SFAS 142 sample (*t*-statistic: 1.50). Note that bm is lower during post-SFAS 142 than pre-SFAS 142 period across all ten deciles, and it is consistent with the decreasing BM ratio shown in Figure 3 and the increasing gap between market equity and book equity with growth in intangibles as illustrated in Figure 4.

Next, I examine whether the weakened book-to-market effect in the post-SFAS 142 sample is robust to the size of firms. Using monthly returns of the 25 portfolios formed on size and book-to-market (5*5), I find that across all size portfolios the BM effect became weaker as shown in Table IV. The *t*-statistics of HML_{small}, HML_{middle}, and HML_{big} are 4.60, 3.24, and 1.68, respectively in the pre-SFAS 142 sample in the equally weighted portfolios presented in Panel A while the corresponding *t*-statistics in the post-SFAS 142 sample are 1.28, 0.85, and 0.58. Value weighted portfolios presented in Panel B show similar results. Note also that the *t*-statistic of HML decreases with size in all sample periods. This is consistent with Fama and French (2012) who show that the difference between high BM stocks and low BM stocks decreases with size.

The third test uses the four-factor model developed by Fama and French (1993) and augmented by Carhart (1997). By regressing the excess returns on quintile portfolios formed on size, I find that the HML coefficient becomes smaller and less significant in the post-SFAS 142 sample as shown in Table V. For example, the coefficient on the HML factor for the equally weighted small quintile portfolio was significantly different from zero at the 1 percent level in the pre-SFAS 142 sample, but it is no longer significant in the post-SFAS 142 sample (*t*-statistics 8.35 vs. 1.05). Z-tests as in Clogg *et al.* (1995) confirm the difference between the HML coefficients in pre- vs. post-SFAS 142 samples.

To check if this finding is robust to the addition of the new profitability and investment factors, the next test uses the five-factor model as in Fama and French (2015).
As shown in Table VI, the HML coefficient in the 5-factor model regression becomes smaller and less significantly different from zero in the post-SFAS 142 sample. Z-tests also confirm the difference between the pre- and the post-SFAS 142 samples.

In summary, the above tests all show that the book-to-market effect is weaker in the post-SFAS 142 sample (138 months) than in the pre-SFAS 142 sample (456 months). However, it is possible that random chances cause an insignificant value premium. For example, when I randomly sampled 138 out of 594 (=456+138) months with replacement 1,000 times and repeated the decile portfolio test, the average return differential between high bm and low bm portfolios was insignificant at the 10 percent level 769 out of 1,000 times. The growth of quant funds that use book-to-market ratio for trading might also have made the value premium insignificant as explained in the introduction.

Therefore, to verify that random chances and quant funds are not the only possible reasons for the weakened BM effect, I construct sub-samples using intangibles and test whether intangibles affect the book-to-market effect in the next section. As R&D expenditures generate reported as well as unreported intangibles, the R&D cost variable from COMPUSTAT (XRD) is used to construct the sub-samples along with goodwill (GDWL), BM ratio, and after-tax goodwill impairment loss (GDWLIA).

4.2. Subsamples to test the Impact of Intangibles on the Book-to-Market Effect

Table VII compares subsamples formed on intangibles using decile bm portfolios. When all firms are used during the post-SFAS 142 period, the average return differential between high bm and low bm portfolios is not significant, but the difference is significant for Subsample I (Neither R&D nor GDWL) that is less likely to be affected by intangibles. Subsample II (Both R&D and GDWL) and Subsample III ($GDWLIA_{t-1}$<0 or BM_t > 1 with $GDWL_t$>$1 million) include firms that are affected more by intangibles than others, and they do not show significant book-to-market effect (*t*-statistic for the average return differential: 0.84 and 0.90). That is, the weakened book-to-market effect during the post-SFAS 142 period is related to intangibles.

4.3. Firm-level Tests

In addition to the portfolio-level tests presented above, I test the impact of intangibles on the book-to-market effect at individual firm-level using Fama-MacBeth regressions. As presented in Table VIII, the firm-level test also shows that the book-to-market effect is stronger during the pre-SFAS 142 period than in the post-SFAS 142 period. As this firm-level regression is less restrictive than the decile portfolio test in terms of the minimum number of firms needed in each subsample, I construct six subsamples instead of three: Subsample 1) firms that do not have GDWL, 2) firms that do not report R&D, 3) firms with neither GDWL nor R&D expenditures, 4) firms that are in the top decile in terms of goodwill as a percentage of total assets (GWP), 5) firms that reported $1 million or more GDWLIA during the previous year, 6) firms that are at a high risk of impairment loss defined by GDWL greater than $1 million and BM ratio greater than 1.

Note that Subsamples 1-3 include firms that are not likely to have intangible-related issues while Subsamples 4-6 consist of firms that are highly affected by intangibles. As shown in Table VIII, *t*-statistics of the bm coefficient in Subsamples 1-3 are all significantly different from zero at the 1 percent level while Subsamples 4-6 show less significant results. That is, the book-to-market effect is stronger in subsamples that do not have intangibles, and it is weaker in subsamples where book values are affected by intangibles. These results confirm that intangibles and related accounting changes are a reason for the book-to-market effect becoming less significant in the stock market.

Another way to test the impact of intangibles on the book-to-market effect is to use the three components of bm in Fama-MacBeth regressions as in Daniel and Titman (2006) and Fama and French (2008). Table IX presents the results. This test is to examine whether book return and intangible return become less significant in the post-SFAS 142 period.

Panel A of Table IX shows that all the three components of bm were highly significant in explaining the cross-section of future stock returns in the pre-SFAS 142 sample. However, the explanatory power of the lagged bm ratio and book return decreases after SFAS 142 especially in the firms that are in the top GWP decile. When a subsample is formed using only the firms that do not have goodwill, book return becomes significant at the 1 percent level. This table also shows that the coefficient and *t*-statistic of intangible return become smaller during the post- SFAS 142 period especially in the firms with a high GWP and a high goodwill impairment risk. This finding is consistent with the other results because the intangible return is defined using book return and book return's explanatory power is reduced during the post-SFAS period.

To test whether R&D expenditures affect the explanatory power of intangible return, I also include R&D dummy ($d_{R\&D}$) and the cross-product of intangible return and $d_{R\&D}$ in the regressions number 3, 6, 9, 12, 15 and 18. Consistent with the findings of Lev and Sougiannis (1999), the R&D dummy variable is significant in Regression 3. That is, the average returns of R&D firms were higher than non-R&D firms after adjusting for the differences in intangible returns during July 1975 – June 2002. The five regressions also show that the cross-product of intangible return and R&D dummy is not significant. This finding is consistent with Donelson and Resutek (2012) who show that investors do not interpret information captured by intangible return differently for R&D and non-R&D firms.[18]

Fama and French (2008) find that Micro stocks behave differently in the Fama-MacBeth regression of future stock returns on the three components of bm. Therefore, I divide the sample into ABM and Micro and repeat the tests. As shown in Panel B of Table IX, the explanatory power of book return decreases during the post-SFAS 142 period, and more severe reduction is observed in ABM stocks.

5. Conclusion

In empirical research projects using the US stock market data, sample periods often start in the 1960s. Core assets of US firms in the 1960s - 1980s were mostly tangible and thus estimating the book values of those assets and equity were less challenging. However, as FASB (2001c) and Paul and Durbin (2016) point out, intangible assets are an increasingly important economic resource for many firms, most intangibles do not have an actively traded market, and thus estimating their fair value is a challenge. Preparers of financial statements,

[18] I thank an anonymous referee for suggesting to check if the results of this paper are consistent with the findings of Donelson and Resutek (2012).

accounting scholars, and regulators have worked hard to meet the challenge, and SFAS 142 is an outcome.

As this accounting rule has significantly changed the way book values are estimated, I examine whether there was a change in the book-to-market effect in the pre- vs. post-SFAS 142 samples. Various portfolio-level and firm-level tests show that the book-to-market effect is weaker in the post-SFAS 142 sample. However, intangibles are not necessarily a reason for this change because random chances and growth of quant funds may also have contributed to the change.

Therefore, I constructed subsamples to test whether intangible assets are related to the change. I found that the book-to-market effect is stronger in subsamples that are low in intangibles and the effect is weaker in subsamples with high intangibles. Based on these results, I conclude that growth in intangibles and related valuation challenges are a reason for the weakened book-to-market effect we observe in the stock market in recent years.

When interpreting these results, we should note that it is not an accounting rule change but the growth in intangibles that led to the change in the book-to-market effect. Accounting rule changes such as SFAS 142 is not the cause but a consequence of challenges in the valuation of intangibles. For convenience, I divided the sample into the pre- vs. post-SFAS 142 periods to show the difference in the book-to-market effect before and after the growth in intangibles. However, growing importance of intangibles and resulting challenges in valuation is a continuous process, and accounting rule changes are a response to meet the challenges.

To my knowledge, this is the first paper that analyzes the impact of goodwill on the book-to-market effect. More research needs to be done about the impacts of intangible assets on stock valuation using the findings of both the accounting and the finance literature so that the views of financial economists and analysts on intangibles may contribute to improving intangible-related financial accounting standards in the future.

References

Asness, C., Moskowitz, T. and Pedersen, L. 2013, Value and Momentum Everywhere, *Journal of Finance* 68, 929-985.

Baxamusa, M., Mohanty, S., and Rao, R., 2015, Information Asymmetry about Investment Risk and Financing Choice, *Journal of Business, Finance and Accounting*, forthcoming.

Beatty, A. and Weber, J., 2006, Accounting Discretion in Fair Value Estimates: An Examination of SFAS 142 Goodwill Impairments, *Journal of Accounting Research* 44(2), 257-288.

Carhart, M. M. 1997, On Persistence in Mutual Fund Performance, *Journal of Finance* 52, 57-82.

Castedello, M. and Klingbeil, C., 2009, Intangible Assets and Goodwill in the Context of Business Combinations: An Industry Study, KPMG.

Chan, L. K. C, Lakonishok, J. and Sougiannis, T., 2001, The Stock Market Valuation of Research and Development Expenditures, Journal of Finance 56(6), 2431-2456.

Clogg, C. C., Petkova, E. and Haritou, A., 1995, Statistical Methods for Comparing Regression Coefficients between Models, *American Journal of Sociology* 100, 1261-1293.

Daniel, K. and Titman, S., 2006, Market Reactions to Tangible and Intangible Information, *Journal of Finance* 61(4), 1605-1643.

Damodaran, A., 2009, Valuing Companies with Intangible Assets, Stern School of Business, New York University, Working Paper.

Donelson, D. and Resutek, R., 2012, The Effect of R&D on Future Returns and Earnings Forecasts, *Review of Accounting Studies* 17(4), 848-876.

Fama, E. and French, K., 1992, The Cross-Section of Expected Stock Returns, *Journal of Finance* 47, 427-465.

Fama, E. and French, K., 1993, Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics* 33, 3-56.

Fama, E. and French, K., 2008, Average Returns, B/M, and Share Issues, *Journal of Finance* 63, 2971-2995.

Fama, E. and French, K., 2012, Size, Value, and Momentum in International Stock Returns, *Journal of Financial Economics* 105, 457-472.

Fama, E. and French, K., 2015, A Five-Factor Asset Pricing Model, *Journal of Financial Economics* 116, 1-22.

Fama, E. and French, K., 2016, Dissecting Anomalies with a Five-Factor Model, *Review of Financial Studies* 29(1), 69-103

Fama, E. and MacBeth, J., 1973, "Risk, Return and Equilibrium: Empirical Tests," *Journal of Political Economy* 81, 607-636.

Financial Accounting Standards Board (FASB), 1998. Invitation to Comment 192-A: Methods of Accounting for Business Combinations: Recommendations of the G4+1 for Achieving Convergence. FASB, Norwalk, CT.

FASB, 1999. Exposure Draft 201-A: Business Combinations and Intangible Assets.

FASB, 2001a. Exposure Draft 201-R: Business Combinations and Intangible Assets - Accounting for Goodwill.

FASB, 2001b. Statement of Financial Accounting Standards No. 141 Business Combinations.

FASB, 2001c. Statement of Financial Accounting Standards No. 142 Goodwill and Other Intangible Assets.

Francis, J. and Schipper, K., 1999, Have Financial Statements Lost Their Relevance? *Journal of Accounting Research* 37(2), 319-352.

Graham, B. and Dodd, D., 1934, Security Analysis, McGraw-Hill

Holthausen, R. and Watts, R., 2001. The Relevance of the Value-relevance Literature for Financial Accounting Standard Setting. *Journal of Accounting and Economics* 31, 3–75.

Hou, K., Xue, C., and Zhang, L., 2015, Digesting Anomalies: An Investment Approach, *Review of Financial Studies* 28, 650-705

Jiang, H., 2010, Institutional Investors, Intangible Information, and the Book-to-market Effect. *Journal of Financial Economics* 96, 98-126.

Kothari, S. P., Laguerre, T. E., and Leone, A. J., 2002, Capitalization versus Expensing: Evidence on the Uncertainty of Future Earnings from Capital Expenditures versus R&D outlays, *Review of Accounting Studies* 7, 355-382.

Lakonishok, J., Shleifer, A., and Vishny, R. W, 1994, Contrarian Investment, Extrapolation, and Risk, *Journal of Finance* 49 (5), 1541-1578.

Lev, B., 2001, Intangibles: Management, Measurement, and Reporting, Brookings Institution Press.

Lev, B., 2003, Remarks on the Measurement, Valuation, and Reporting of Intangible Assets, *Federal Reserve Bank of New York (FRBNY) Economic Policy Review*, September, 17-22.

Lev, B., Li, S., and Sougiannis, T., 2010, The Usefulness of Accounting Estimates for Predicting Cash Flows and Earnings, *Review of Accounting Studies* 15, 779-807.

Lev, B and Sougiannis, T., 1999, Penetrating the Book-to-market Black Box: The R&D Effect, *Journal of Business, Finance and Accounting* 26, 419-449.

Lev, B. and Zarowin, P., 1999, The Boundaries of Financial Reporting and How to Extend Them, *Journal of Accounting Research* 37(2), 353-385.

Li, Z., Shroff, P., Venkataraman, R. and Zhang, I., 2011, Causes and Consequences of Goodwill Impairment Losses, *Review of Accounting Studies* 16, 745-778.

Lim, S., Macias, A. and Moeller, T., 2015, Intangible Assets and Capital Structure, Working Paper, Baylor University.

Nakamura, L., 2001, What Is the US Gross Investment in Intangibles? At Least One Trillion Dollars a Year, Federal Reserve Bank of Philadelphia Working Paper No. 01-15.

Nakamura, L. 2003. A Trillion Dollars a Year in Intangible Investment and the New Economy, Hand, J. and Lev, B. (editors), *Intangible Assets,* Oxford University Press.

Novy-Marx, R., 2013, The Other Side of Value: The Gross Profitability Premium, *Journal of Financial Economics* 108, 1-28.

Paul, B. and Durbin, P., Revisiting Accounting for Software Development Costs: An Ideal First Step, *Point of View*, PricewaterhouseCoopers (PwC), October 2016

Ramanna, K., 2008, The Implications of Unverifiable Fair-value Accounting: Evidence from the Political Economy of Goodwill Accounting, *Journal of Accounting and Economics* 45, 253-281.

Ramanna, K. and Watts, R., 2012, Evidence on the Use of Unverifiable Estimates in Required Goodwill Impairment, *Review of Accounting Studies* 17, 749-780.

Rosenberg, B., Reid, K. and Lanstein, R., 1985, Persuasive Evidence of Market Inefficiency, *Journal of Portfolio Management* 11, 9-17.

Turner, L., 1999. Initiatives for Improving the Quality of Financial Reporting, Remarks of the Chief Accountant to the New York Society of Security Analysts. US Securities and Exchange Commission (SEC), http://www.sec.gov/news/speech/speecharchive/1999/spch252.htm

US House, 2000. Accounting for Business Combinations: Should Pooling Be Eliminated? Hearing before the Subcommittee on Finance and Hazardous Materials of the Committee on Commerce. Serial No. 106-100. GPO, Washington, DC.

US Senate, 2000. Pooling Accounting. Hearing before the Committee on Banking, Housing and Urban Affairs. S. Hrg. 106-1035. GPO, Washington, DC.

Viacom (now CBS Corporation), 10-K Annual Report for the Fiscal Year Ended Dec 31, 2002, https://www.sec.gov/Archives/edgar/data/813828/000104746903010441/a2105801z10-k.htm

Table I. Summary Statistics

Panel A presents summary statistics at four points in the history of the sample used for the tests of the book-to-market effect. TA is total assets, XRD is R&D Expenditures, GWP is goodwill divided by TA, GDWLIA is after-tax goodwill impairment loss, ME is market equity, and BM is the ratio of book equity to market equity. TA, XRD, GDWLIA, and ME are in $ million. SD is sample standard deviation. SUM for GWP is total goodwill divided by total assets of the firms that reported goodwill, SUM for BM is total book equity divided by total ME, and SUM for the other variables is the total for the firms that report those variables. Panel B presents the summary statistics of the firms that reported goodwill impairment loss (GDWLIA) in comparison to all firms as well as the firms with goodwill impairment risk, which is defined as the book-to-market ratio (BM) greater than 1 and goodwill (GDWL) greater than $1 million. ME and XRD presented in Panel B are in $ billion, and GDWLIA presented in Panel B are in $1 million. 1996 is the first year of GDWLIA recorded in COMPUSTAT.

Panel A: All Firms

	1963 (512 Firms)						**2001** (4,215 Firms)					
	TA ($mm)	**XRD** (61 firms) ($mm)	**GWP**	**GDWLIA** ($mm)	**ME** ($mm)	**BM**	**TA** ($mm)	**XRD** (2,651 firms) ($mm)	**GWP** (1,713 firms)	**GDWLIA** (253 firms) ($mm)	**ME** ($mm)	**BM**
Mean	421	13	*No firm had goodwill or goodwill impairment loss in 1963.*		491	0.81	2,265	67	15.94%	286	2,397	1.03
SD	1,459	24			2,078	0.65	13,455	363	14.88%	2,120	14,580	2.09
Min	1.3	0.00			1.1	0.07	1.1	0.00	0.05%	1.00	0.4	0.00
Max	28,275	170			34,079	6.62	495,023	7,400	81.96%	32,555	398,105	67.0
SUM	215,392	774			251,671	117,173/ 251,671 =0.47	9,547,803	176,545	568,612 /4,364,490 =13.03%	72,368	10,101,420	3,806,703/ 10,101,420 =0.38

	2008 (3,217 Firms)						**2013** (2,751 Firms)					
	TA ($mm)	**XRD** (1,990firms) ($mm)	**GWP** (2,028 firms)	**GDWLIA** (593fms) ($mm)	**ME** ($mm)	**BM**	**TA**	**XRD** (1,740 firms) ($mm)	**GWP** (1,883 firms)	**GDWLIA** (190 firms) ($mm)	**ME** ($mm)	**BM**
Mean	3,727	110	17.73%	292	2,606	1.77	5,708	156	17.10%	96	6,147	0.62
SD	19,798	539	15.70%	1,333	13,563	6.91	25,824	731	15.07%	239	24,254	1.17
Min	1.8	0.00	0.02%	1.02	0.35	0.00	2.61	0.00	0.00%	1.08	1.78	0.00
Max	797,769	8,676	88.01%	25,443	406,067	294.43	656,560	10,611	80.76%	1,806	500,681	31.22
SUM	11,989,827	219,007	1,716,648 /9,704,685 =17.69%	173,325	8,383,310	4,902,651/ 8,383,310 =0.58	15,703,339	270,597	2,294,016 /13,633,526 =16.83%	18,335	16,909,940	7,037,901/ 16,909,940 =0.42

Panel B: All Firms in Comparison to the Firms with Goodwill Impairment Loss or Risk

Year	All Firms				Firms Goodwill Impairment Loss (GDWLIA > $1 million)									Firms with Impairment Risk (BM > 1 and GDWL > $1 million)				
	Number	Total ME ($bn)	Total XRD ($bn)	Avg BM	Number	Total ME ($bn)	Total XRD ($bn)	Avg BM	GDWLIA ($mm) Total	Mean	Median	Max	Max Name (Ticker)	Number	Total ME ($bn)	Total XRD ($bn)	Avg BM	Total GDWL ($bn)
1996	5,686	6,268	114.5	0.66	19	74	0.9	0.44	734	39	18	358	Allegiance (AEH)	267	45.5	0.9	1.95	34.2
1997	5,668	7,965	132.5	0.62	30	77	1.0	0.39	858	29	17	282	Waste Mgmt (WMX)	244	43.7	0.7	1.79	29.9
1998	5,282	10,039	144.1	0.81	46	343	10.6	0.46	2,538	55	14	900	Black&Decker (BDK)	457	97.4	2.4	1.86	87.2
1999	4,997	13,316	145.9	0.79	34	92	2.5	1.06	1,605	47	11	1,111	Fortune Brands (FO)	513	128.3	2.6	2.02	146.7
2000	4,833	11,511	168.5	1.38	99	442	6.9	1.37	9,915	100	11	4,016	AT&T (T)	662	234.7	8.3	3.28	220.5
2001	4,215	10,101	176.5	1.03	253	987	25.3	0.89	72,368	286	15	32,560	JDS Uniphase (JDSU)	448	207.5	4.0	2.57	139.6
2002	3,889	7,674	167.3	1.10	293	609	21.3	1.60	61,399	210	12	29,050	AOL Time Warner (AOL)	588	424.6	15.5	2.18	316.2
2003	3,651	9,986	169.8	0.63	199	954	19.0	0.84	23,192	117	14	3,960	Reynolds RJ Tabacco (RJR)	281	365.5	7.3	1.85	219.0
2004	3,643	11,073	180.3	0.56	148	726	11.8	0.86	46,031	311	10	17,886	Viacom (VIA)	202	273.3	9.0	1.99	171.8
2005	3,554	11,496	190.4	0.61	169	530	12.2	0.88	29,705	176	14	9,460	Viacom (VIA)	249	291.8	18.1	2.29	209.3
2006	3,495	12,537	201.8	0.59	178	846	8.8	1.02	14,784	83	18	2,088	International Paper (IP)	223	670.8	1.9	2.56	380.9
2007	3,447	13,416	221.1	0.72	190	688	14.3	1.60	50,392	265	16	29,571	Sprint Nextel (S)	367	505.7	6.9	2.37	360.6
2008	3,217	8,383	219.0	1.77	593	795	26.7	3.28	173,325	292	35	25,443	ConocoPhilips (COP)	787	797.7	19.7	3.72	546.0
2009	3,047	10,501	199.0	0.84	406	997	17.4	1.18	58,881	145	26	5,662	News Corp (NWSA)	337	619.1	3.5	2.41	358.7
2010	2,960	12,090	224.8	0.74	174	757	7.5	1.62	13,597	78	13	1,817	Boston Scientific (BSX)	249	516.8	2.3	2.56	299.8
2011	2,861	11,963	243.5	0.96	212	1,112	39.4	2.03	21,315	101	14	1,892	AT&T (T)	401	781.8	8.9	2.50	445.5
2012	2,754	13,064	257.0	0.91	220	1,453	44.0	1.20	77,915	354	19	26,889	General Motors (GM)	332	912.9	6.7	2.59	402.6
2013	2,751	16,910	270.6	0.62	190	1,559	26.8	1.09	18,335	96	16	1,806	United States Steel (X)	167	723.2	1.2	2.16	326.8

Table II. Goodwill by Industry

This table presents goodwill as a percentage of total assets (GWP) by industry during fiscal years ending between January 2001 and December 2013. The industry definition in Kenneth French's website and the SIC codes in COMPUSTAT are used for the 10-industry classification.

Industry	Number of Firm-year Observations	25% Q1	Median	Mean	75% Q3	90%	Max
Nondurables	2306	0.00	7.73	13.08	20.68	36.48	77.90
Durables	1111	0.00	4.25	9.67	17.37	28.04	51.16
Manufacturing	5830	0.33	8.01	11.71	19.36	29.64	81.96
Energy	1889	0.00	0.00	2.92	2.52	10.89	41.28
Technology	9802	0.00	7.15	13.85	23.12	39.31	87.01
Telecom	1135	1.63	9.27	14.77	23.92	38.58	65.73
Retail	4459	0.00	3.22	8.85	13.64	26.13	95.80
Healthcare	5915	0.00	0.19	9.70	14.33	34.50	80.84
Utilities	329	0.00	0.26	2.66	3.34	8.80	34.57
Others	5372	0.00	5.32	12.65	20.50	38.08	78.23
All	**38148**	**0.00**	**4.75**	**11.35**	**18.17**	**33.89**	**95.80**

Table III. Portfolio-level Tests of the Book-to-Market Effect

This table presents average monthly returns of decile portfolios formed on log book-to-market ratio (bm) each year. As in Fama and French (1992), the book value used in June of year *t* is the book equity for the last fiscal year ending in *t-1* and the market value is price per share times number of shares outstanding at the end of December of *t-1*. The average returns of the decile portfolios and the average bm are presented in the table. The sample period for the tests is July 1964 - December 2013 because the financial statements data start in 1963. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

Entire Sample Period July 1964 – December 2013 (594 months)			Pre-SFAS 142 July 1964 – June 2002 (456 months)			Post-SFAS 142 July 2002 – December 2013 (138 months)		
Deciles	bm	Return	Deciles	bm	Return	Deciles	bm	Return
Low	-2.24	0.67	Low	-2.18	0.57	Low	-2.45	1.01
2	-1.35	0.93	2	-1.30	0.85	2	-1.55	1.17
3	-0.98	1.01	3	-0.92	0.95	3	-1.20	1.20
4	-0.72	1.20	4	-0.66	1.18	4	-0.95	1.27
5	-0.51	1.28	5	-0.44	1.24	5	-0.74	1.39
6	-0.32	1.42	6	-0.25	1.42	6	-0.53	1.43
7	-0.13	1.51	7	-0.06	1.53	7	-0.34	1.44
8	0.07	1.61	8	0.13	1.64	8	-0.13	1.53
9	0.32	1.75	9	0.38	1.75	9	0.13	1.72
High	0.84	2.13	High	0.88	2.09	High	0.72	2.25
Average Return Differential			Average Return Differential			Average Return Differential		
High – Low		*1.46*	*High – Low*		*1.52*	*High – Low*		*1.24*
t-statistic		*3.50****	*t-statistic*		*3.15****	*t-statistic*		*1.50*

Table IV. Portfolios Formed on BM and Size

This table uses monthly returns of the 25 portfolios formed on size and BM (5*5). "H" denotes a firm in the top BM quintile and "L" denotes a firm in the bottom BM quintile. The result reported in this table centers on three H minus L portfolios: i) HML_{small}: the average return on the HML portfolios in the two smallest size quintiles; ii) HML_{middle}: the return on the HML portfolio of stocks in the third size quintile; and iii) HML_{big}: the average return on the HML portfolios in the two biggest size quintiles. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

Panel A: Equally Weighted Portfolios

Sample Period	HML Portfolios by Size		
	HML_{small}	HML_{middle}	HML_{big}
July 1964 – December 13	0.77 *(4.74)******	0.59 *(3.32)******	0.28 *(1.78)****
July 1964 – June 2002 (pre- SFAS 142)	0.91 *(4.60)******	0.70 *(3.24)******	0.32 *(1.68)**
July 2002 – December 2013 (post- SFAS 142)	0.33 *(1.28)*	0.24 *(0.85)*	0.16 *(0.58)*

Panel B: Value Weighted Portfolios

Sample Period	HML Portfolios by Size		
	HML_{small}	HML_{middle}	HML_{big}
July 1964 – December 13	0.69 *(4.32)******	0.55 *(3.10)******	0.19 *(1.28)*
July 1964 – June 2002 (pre- SFAS 142)	0.81 *(4.17)******	0.63 *(2.89)******	0.25 *(1.38)*
July 2002 – December 2013 (post-SFAS 142)	0.33 *(1.23)*	0.29 *(1.11)*	0.00 *(0.01)*

Table V. The Four-factor Model

This table presents time series regressions of the excess returns on size quintile portfolios on the four factors as in Fama and French (1993) and Carhart (1997): i) the excess market return ($R_M - R_f$), ii) the size factor (SMB), iii) the book-to-market factor (HML), and iv) the momentum factor (MOM). The sample period is July 1964 – Dec 2013. $R(t) - R_f(t) = a + b(R_M(t) - R_f(t)) + s\,SMB(t) + h\,HML(t) + m\,MOM(t) + e(t)$, The dependent variable, $R(t) - R_f(t)$, is the excess return on size quintile portfolios. The portfolios are equally weighted in Panel A and value-weighted in Panel B. A z-test as in Clogg *et al.* (1995) is used to test the change in h coefficient pre- vs. post-SFAS 142. $Z = (\hat{h}_{pre} - \hat{h}_{post})/[s^2(\hat{h}_{pre}) + s^2(\hat{h}_{post})]^{(1/2)}$. $s(\hat{h})$ denotes the standard error of $\hat{h}$. Z has a standard normal distribution under the null hypothesis of $h_{pre} = h_{post}$. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

	July 1964 – June 2002 (pre-SFAS 142)						***July 2002 – December 2013 (post-SFAS 142)***						***z-test***
	a	b	s	**h**	m	Adj-R^2	a	b	s	**h**	m	Adj-R^2	**H_0: $h_{pre} = h_{post}$**
Panel A: Equally Weighted Portfolios													
Small	0.15	0.99	1.06	**0.45**	-0.02	0.79	0.17	0.93	0.93	**0.08**	-0.23	0.89	3.88***
	(0.95)	(28.10)***	(22.77)***	**(8.35)*** **	(-0.65)		(0.94)	(19.09)***	(10.75)***	**(1.05)**	(-5.78)***		
2	0.00	1.12	0.75	**0.25**	-0.07	0.93	0.07	1.04	0.99	**0.14**	-0.16	0.99	2.68***
	(0.05)	(59.94)***	(30.70)***	**(8.85)*** **	(-3.83)***		(1.10)	(56.47)***	(30.46)***	**(4.64)*** **	(-11.11)***		
3	0.11	1.10	0.52	**0.16**	-0.12	0.94	0.18	1.06	0.66	**0.06**	-0.13	0.97	2.25**
	(1.61)	(67.43)***	(24.14)***	**(6.56)*** **	(-6.89)***		(2.13)**	(46.83)***	(16.36)***	**(1.71)* **	(-7.08)***		
4	0.12	1.11	0.24	**0.15**	-0.13	0.95	0.10	1.06	0.41	**0.00**	-0.15	0.96	3.23***
	(2.09)**	(82.74)***	(13.65)***	**(7.36)*** **	(-9.33)***		(1.01)	(41.25)***	(8.98)***	**(0.05)**	(-7.21)***		
Big	0.14	1.02	-0.06	**0.01**	-0.15	0.97	0.09	1.02	0.03	**0.00**	-0.10	0.97	0.30
	(3.19)***	(104.92)***	(-4.56)***	**(0.67)**	(-14.47)***		(1.27)	(55.49)***	(0.83)	**(0.08)**	(-6.84)***		
Panel B: Value Weighted Portfolios													
Small	-0.22	1.07	0.93	**0.43**	0.16	0.84	-0.13	0.99	1.07	**0.19**	-0.04	0.98	4.18***
	(-1.72)*	(36.01)***	(23.73)***	**(9.56)*** **	(5.28)***		(-1.64)	(45.56)***	(20.70)***	**(5.23)*** **	(-2.56)**		
2	-0.11	1.11	0.73	**0.29**	0.09	0.92	-0.01	1.02	0.95	**0.16**	0.00	0.99	3.47***
	(-1.28)	(57.95)***	(28.90)***	**(9.98)*** **	(4.60)***		(-0.19)	(70.02)***	(36.65)***	**(6.83)*** **	(0.03)		
3	-0.04	1.08	0.50	**0.22**	0.05	0.94	0.17	1.04	0.61	**0.06**	-0.02	0.98	4.08***
	(-0.65)	(71.68)***	(25.10)***	**(9.73)*** **	(2.96)***		(2.36)**	(53.03)***	(17.67)***	**(1.95)* **	(-1.02)		
4	-0.02	1.10	0.22	**0.20**	0.02	0.99	0.08	1.05	0.38	**0.00**	-0.01	0.97	4.78***
	(-0.38)	(83.27)***	(12.55)***	**(9.71)*** **	(1.20)		(0.99)	(46.58)***	(9.41)***	**(0.01)**	(-0.72)		
Big	0.07	0.96	-0.19	**-0.07**	-0.04	0.99	0.00	0.99	-0.19	**-0.02**	0.00	0.99	-4.60***
	(2.78)***	(167.11)***	(-24.54)***	**(-8.09)*** **	(-5.95)***		(0.23)	(245.24)***	(-26.72)***	**(-3.77)*** **	(0.30)		

Table VI. The Five-factor Model

This table presents time series regressions of the excess returns on size quintile portfolios on the five factors as in Fama and French (2015): i) the excess market return ($R_M - R_f$), ii) the size factor (SMB), iii) the book-to-market factor (HML), iv) the profitability factor (RMW), and v) the investment factor (CMA). The sample period is July 1964 – Dec 2013. $R(t) – R_f(t) = a + b(R_M(t) – R_f(t)) + sSMB(t) + hHML(t) + pRMW(t) + iCMA(t)+ e(t)$, The dependent variable, $R(t) – R_f(t)$, is the excess return on size quintile portfolios. The portfolios are equally weighted in Panel A and value-weighted in Panel B. A z-test as in Clogg *et al.* (1995) is used to test the change in h coefficient pre- vs. post-SFAS 142. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

	July 1964 – June 2002 (pre-SFAS 142)							***July 2002 – December 2013 (post-SFAS 142)***							***z-test***
	a	b	s	**h**	p	i	Adj-R^2	a	b	s	**h**	p	i	Adj-R^2	**H_0: $h_{pre}=h_{post}$**
	Panel A: Equally Weighted Portfolios														
Small	0.41	0.89	1.04	**0.64**	-0.51	-0.53	0.83	0.42	0.86	0.75	**0.25**	-0.78	-0.24	0.89	3.64***
	(2.96)***	(25.97)***	(24.99)***	**(9.54)*** **	(-8.35)***	(-5.57)***		(2.25)**	(16.18)***	(8.40)***	**(3.04)*** **	(-5.96)***	(-1.69)*		
2	0.11	1.04	0.76	**0.42**	-0.25	-0.42	0.94	0.15	1.06	0.93	**0.24**	-0.25	-0.26	0.98	3.28***
	(1.59)	(58.37)***	(35.05)***	**(12.03)*** **	(-7.97)***	(-8.49)***		(1.68)*	(40.32)***	(21.27)***	**(5.94)*** **	(-3.93)***	(-3.61)***		
3	0.13	1.04	0.54	**0.33**	-0.17	-0.37	0.94	0.20	1.11	0.65	**0.14**	-0.06	-0.27	0.97	3.35***
	(1.87)*	(62.03)***	(26.66)***	**(9.97)*** **	(-5.67)***	(-7.86)***		(2.03)**	(39.62)***	(13.81)***	**(3.27)*** **	(-0.90)	(-3.56)***		
4	0.03	1.09	0.27	**0.22**	-0.05	-0.14	0.94	0.17	1.08	0.35	**0.09**	-0.24	-0.21	0.95	2.24**
	(0.54)	(69.99)***	(14.41)***	**(7.37)*** **	(-1.78)*	(-3.29)***		(1.50)	(33.47)***	(6.56)***	**(1.82)* **	(-2.99)***	(-2.45)**		
Big	-0.05	1.03	-0.02	**0.01**	0.08	0.06	0.95	0.13	1.05	0.01	**0.08**	-0.12	-0.27	0.97	-1.79*
	(-1.03)	(82.66)***	(-1.38)	**(0.24)**	(3.58)***	(1.61)		(1.71)*	(47.53)***	(0.26)	**(2.36)** **	(-2.13)**	(-4.54)***		
	Panel B: Value Weighted Portfolios														
Small	0.26	0.97	0.87	**0.60**	-0.54	-0.53	0.87	-0.05	0.95	1.01	**0.22**	-0.27	-0.01	0.98	5.70***
	(2.23)**	(34.08)***	(25.13)***	**(10.74)*** **	(-10.79)***	(-6.69)***		(-0.60)	(42.58)***	(26.95)***	**(6.37)*** **	(-4.86)***	(-0.12)		
2	0.17	1.04	0.69	**0.41**	-0.27	-0.36	0.93	0.04	1.00	0.94	**0.19**	-0.10	-0.13	0.99	4.95***
	(2.21)**	(55.26)***	(30.29)***	**(11.10)*** **	(-8.14)***	(-6.77)***		(0.70)	(64.63)***	(36.36)***	**(7.91)*** **	(-2.72)***	(-3.03)***		
3	0.12	1.04	0.48	**0.31**	-0.18	-0.24	0.95	0.18	1.04	0.64	**0.08**	0.03	-0.14	0.98	5.30***
	(1.88)*	(68.50)***	(26.16)***	**(10.46)*** **	(-6.68)***	(-5.66)***		(2.42)**	(49.46)***	(18.12)***	**(2.34)** **	(0.56)	(-2.48)**		
4	0.06	1.08	0.21	**0.22**	-0.14	-0.08	0.95	0.14	1.03	0.36	**0.04**	-0.13	-0.12	0.97	3.84***
	(1.14)	(77.83)***	(12.42)***	**(7.92)*** **	(-5.79)***	(-2.05)**		(1.59)	(42.04)***	(8.78)***	**(0.92)**	(-2.13)**	(-1.85)*		
Big	-0.02	0.98	-0.17	**-0.09**	0.11	0.07	0.99	-0.02	0.99	-0.19	**-0.03**	0.02	0.04	0.99	-4.13***
	(-0.99)	(175.25)***	(-25.36)***	**(-7.88)*** **	(11.47)***	(4.42)		(-1.03)	(232.75)***	(-26.60)***	**(-4.98)*** **	(2.30)**	(3.36)***		

Table VII. Impact of R&D, Goodwill, and Impairment on the Book-to-Market Effect

This table presents average monthly returns of decile portfolios formed on log book-to-market ratio during July 2002 - December 2013. Sub-samples are formed on R&D expenditures, goodwill, goodwill impairment loss and risk to test the impact of intangible assets on the book-to-market effect. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

All Firms			Sub-sample I Firms with neither R&D expenditures nor Goodwill			Sub-sample II Firms with R&D expenditures and Goodwill			Sub-sample III Firms with Goodwill Impairment Loss or Risk		
Deciles	bm	Return	Deciles	bm	Return	Deciles	bm	Return	Deciles	bm	Return
Low	-2.45	1.01	Low	-2.24	0.88	Low	-2.39	1.26	Low	-1.61	1.29
2	-1.55	1.17	2	-1.30	0.99	2	-1.59	1.31	2	-0.75	1.61
3	-1.20	1.20	3	-0.93	1.23	3	-1.29	1.44	3	-0.36	1.60
4	-0.95	1.27	4	-0.66	1.37	4	-1.07	1.15	4	-0.11	1.38
5	-0.74	1.39	5	-0.44	1.00	5	-0.88	1.54	5	0.07	1.53
6	-0.53	1.43	6	-0.26	1.59	6	-0.70	1.43	6	0.18	1.71
7	-0.34	1.44	7	-0.09	1.24	7	-0.52	1.53	7	0.29	1.69
8	-0.13	1.53	8	0.11	1.54	8	-0.33	1.51	8	0.44	1.75
9	0.13	1.72	9	0.39	1.91	9	-0.09	1.73	9	0.66	1.76
High	0.72	2.25	High	0.98	2.53	High	0.41	1.94	High	1.21	2.16
Average Return Differential			Average Return Differential			Average Return Differential			Average Return Differential		
High – Low		*1.24*	*High – Low*		*1.65*	*High – Low*		*0.68*	*High – Low*		*0.87*
t-statistic		*1.50*	*t-statistic*		*1.88**	*t-statistic*		*0.84*	*t-statistic*		*0.90*

Table VIII. Fama-MacBeth Regressions with Sub-samples Formed on Intangibles

This table presents the time-series average coefficients of cross-sectional regressions of monthly stock return on the firm's log book-to-market ratio (bm). To test the impact of intangible assets on the book-to-market effect, sub-samples are formed on goodwill (GDWL), R&D expenditures, goodwill as a percentage of total assets (GWP), after-tax goodwill impairment loss (GDWLIA) and the book-to-market ratio (BM). All coefficients are X100. ***, **, and * denote statistical significance at the 1 percent, 5 percent, and 10 percent level respectively.

Regression Number	Period of Monthly Returns	Sample Description	Intercept	bm
1	Entire Period July 1964 – Dec 2013	All firms	1.497 (6.19)***	0.448 (7.45)***
2	Pre-SFAS 142 July 1964 – June 2002	All firms	1.484 (5.53)***	0.487 (6.61)***
3	Post-SFAS 142 July 2002 – Dec 2013	All firms	1.542 (2.82)***	0.322 (3.65)***
4		Sub-sample 1: Firms without GDWL	1.660 (3.12)***	0.454 (4.31)***
5		Sub-sample 2: Firms without R&D expenditures	1.398 (2.67)***	0.377 (3.90)***
6		Sub-sample 3: Firms with neither GDWL nor R&D expenditures	1.525 (3.18)***	0.474 (3.70)***
7		Sub-sample 4: Firms with GWP Top Decile	1.272 (2.36)**	0.277 (2.47)**
8		Sub-sample 5: Firms with Impairment Loss (GDWLIA > $1 million)	1.581 (2.19)**	0.274 (1.86)*
9		Sub-sample 6: Firms with Impairment Risk (BM > 1 and GDWL > $1 million)	1.242 (2.01)**	0.412 (2.45)**

Table IX. Fama-MacBeth Regressions Using the Three Components of bm

This table presents regressions of monthly returns on the three components of log book-to-market ratio (bm_t): 5-year lagged log book-to-market ratio (bm_{t-5}), book return (bret(t-5,t)), and market return (ret(t-5,t)) as in Daniel and Titman (2006). Explanatory variables also include, intangible return (iret), R&D dummy ($d_{R\&D}$), and the cross-product of iret and $d_{R\&D}$ to test whether R&D expenditures affect the explanatory power of intangible return. In Panel B, sub-samples are formed on size: ABM (All but Micro) and Micro. Micro is defined as NYSE, Amex, and Nasdaq stocks below the 20th percentile of the market capitalization of NYSE stocks, and ABM is all else. All coefficients are X100. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent level respectively.

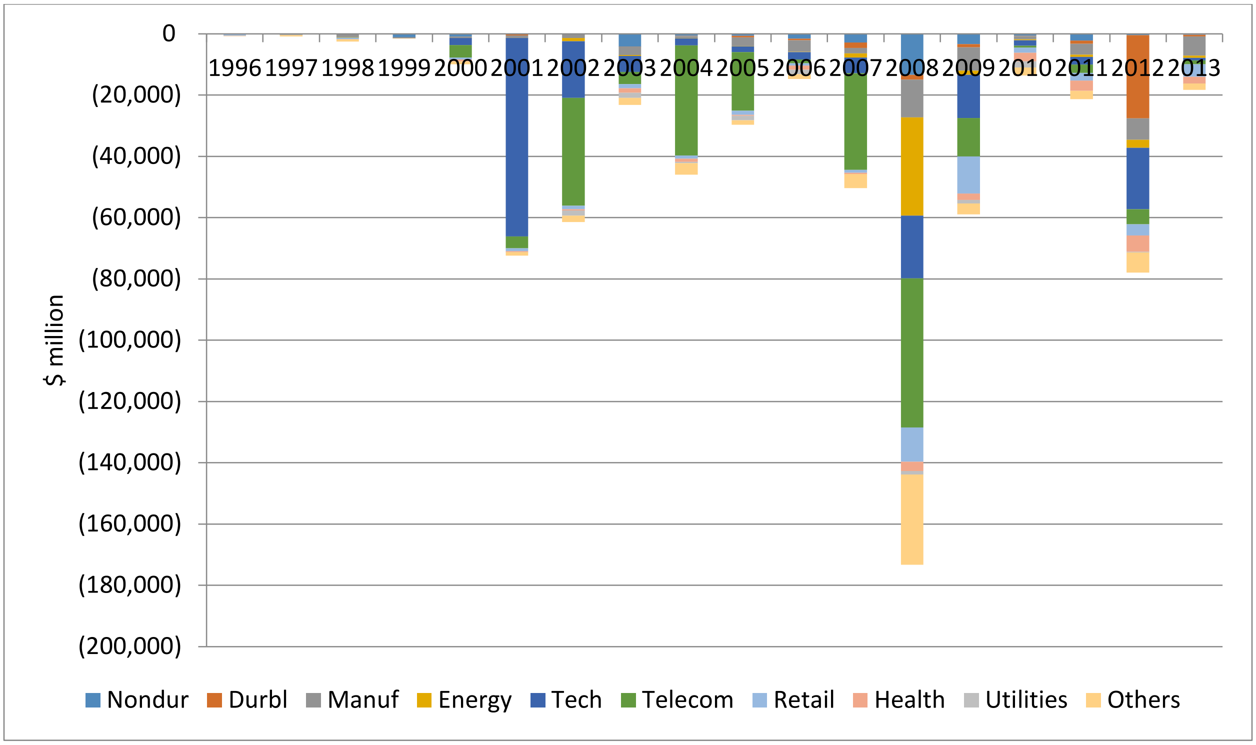
Panel A. All Size

Regression Number	Period of Monthly Returns	Sample Description	Intercept	bm_{t-5}	bret(t-5,t)	ret(t-5,t)	iret(t-5,t)	$d_{R\&D}$	$d_{R\&D}$ *iret	Adj-R^2(%)
1	Pre-SFAS 142 July 1975 – June 2002	All firms	1.567	0.355	0.418	-0.460				1.279
			(6.06)***	(4.08)***	(4.66)***	(-4.61)***				
2			1.546				-0.462			0.588
			(5.36)***				(-4.61)***			
3			1.437				-0.473	0.244	-0.029	1.050
			(5.53)***				(-4.50)***	(1.77)*	(-0.34)	
4	Post-SFAS 142 July 2002 – Dec 2013	All firms	1.478	0.239	0.277	-0.334				0.660
			(2.86)***	(2.10)**	(2.49)**	(-2.91)***				
5			1.393				-0.337			0.348
			(2.71)***				(-2.92)***			
6			1.311				-0.309	0.176	-0.050	0.737
			(2.68)***				(-2.04)**	(1.04)	(-0.40)	
7		Firms with GWP Top Decile	1.215	0.255	0.290	-0.288				0.883
			(2.34)**	(1.41)	(1.41)	(-1.52)				
8			1.116				-0.231			0.465
			(2.36)**				(-1.26)			
9			0.965				-0.169	0.372	-0.055	1.196
			(2.04)**				(-0.63)	(1.56)	(-0.15)	
10		Firms with Goodwill Impairment Loss (GDWLIA > $1 million)	1.213	0.087	0.512	-0.442				1.184
			(1.82)*	(0.43)	(2.36)**	(-1.78)*				
11			1.415				-0.534			0.664
			(2.11)**				(-2.33)**			
12			1.352				-0.392	0.132	-0.119	1.850
			(1.91)*				(-1.25)	(0.39)	(-0.26)	
13		Firms with Impairment Risk (BM>1 and GDWL > $1 million)	1.173	0.426	0.216	-0.689				0.733
			(1.95)*	(2.05)**	(0.81)	(-2.26)**				
14			1.315				-0.365			0.539
			(2.27)**				(-1.30)			
15			1.342				-0.303	-0.322	-0.447	0.968
			(2.16)**				(-0.97)	(-0.75)	(-0.89)	
16		Firms with GWP=0	1.465	0.245	0.358	-0.461				0.902
			(3.18)***	(1.74)*	(2.61)***	(-3.40)***				
17			1.395				-0.455			0.421
			(2.78)***				(-3.36)***			
18			1.356				-0.374	0.064	-0.137	1.081
			(3.02)***				(-2.32)**	(0.24)	(-0.74)	

Panel B. ABM vs. Micro

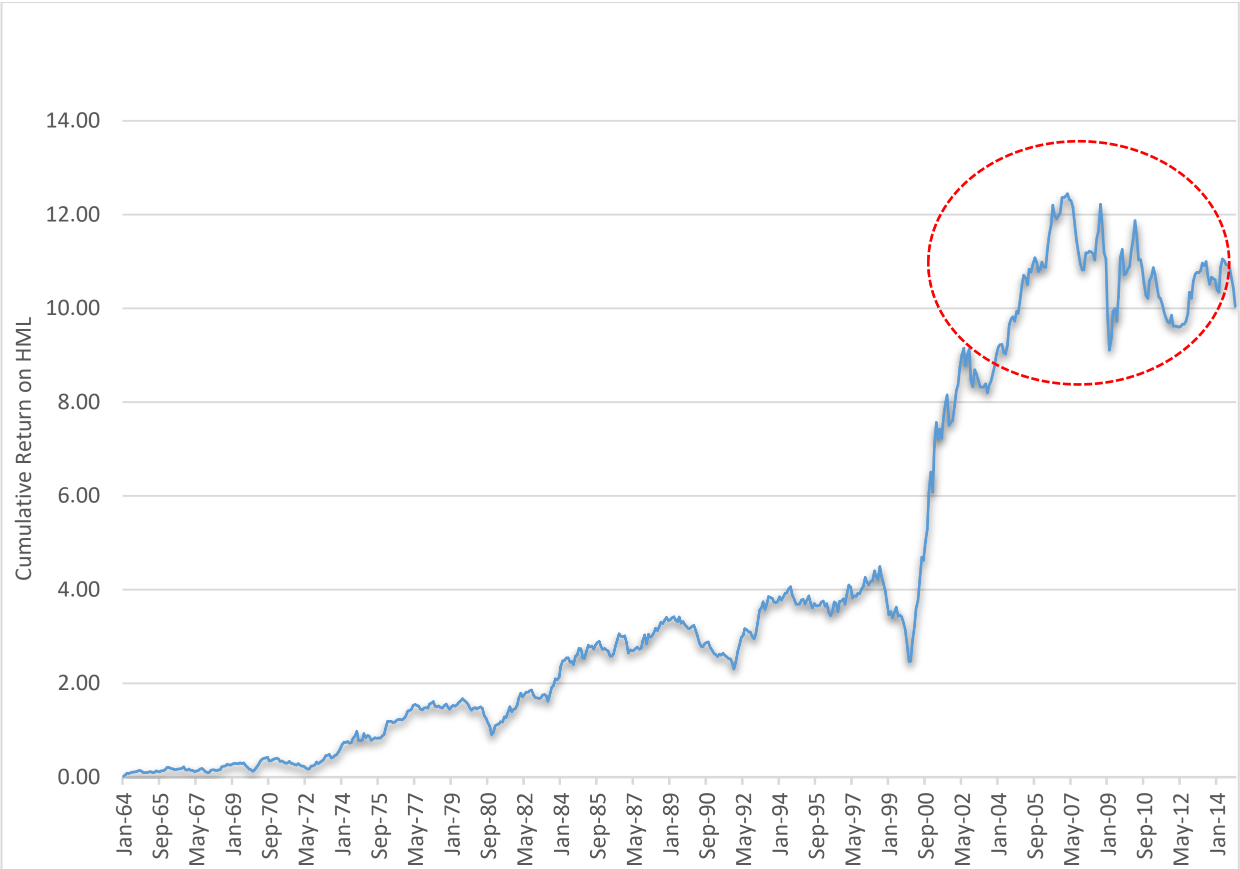
Regression Number	Period of Monthly Returns	Sample Description	Intercept	bm_{t-5}	bret(t-5,t)	ret(t-5,t)	iret(t-5,t)	$d_{R\&D}$	$d_{R\&D}$ *iret	Adj-R^2(%)
1	Pre-SFAS 142 July 1975 – June 2002	ABM	1.296 (5.55)***	0.145 (1.64)	0.289 (2.56)**	-0.280 (-2.59)***				2.415
2			1.366 (5.38)***				-0.279 (-2.59)***			0.765
3			1.331 (5.66)***				-0.354 (-3.05)***	0.089 (0.79)	0.134 (1.11)	1.775
4	Post-SFAS 142 July 2002 – Dec 2013		1.212 (2.40)**	-0.002 (-0.01)	-0.046 (-0.39)	-0.017 (-0.13)				1.610
5			1.179 (2.51)**				-0.018 (-0.14)			0.596
6			1.093 (2.45)**				0.025 (0.15)	0.189 (1.16)	-0.099 (-0.72)	1.552
7	Pre-SFAS 142 July 1975 – June 2002	Micro	1.838 (5.92)***	0.284 (2.76)***	0.417 (4.36)***	-0.507 (-3.81)***				0.919
8			1.830 (5.44)***				-0.513 (-3.86)***			0.421
9			1.644 (5.45)***				-0.527 (-3.98)***	0.409 (2.62)***	-0.040 (-0.28)	0.782
10	Post-SFAS 142 July 2002 – Dec 2013		1.615 (3.17)***	0.343 (2.63)***	0.400 (3.25)***	-0.545 (-4.26)***				0.546
11			1.618 (3.13)***				-0.545 (-4.29)***			0.245
12			1.574 (3.18)***				-0.509 (-3.36)***	0.094 (0.56)	-0.071 (-0.43)	0.424

Figure 1. Goodwill Impairment Loss by Industry: 1996 - 2013



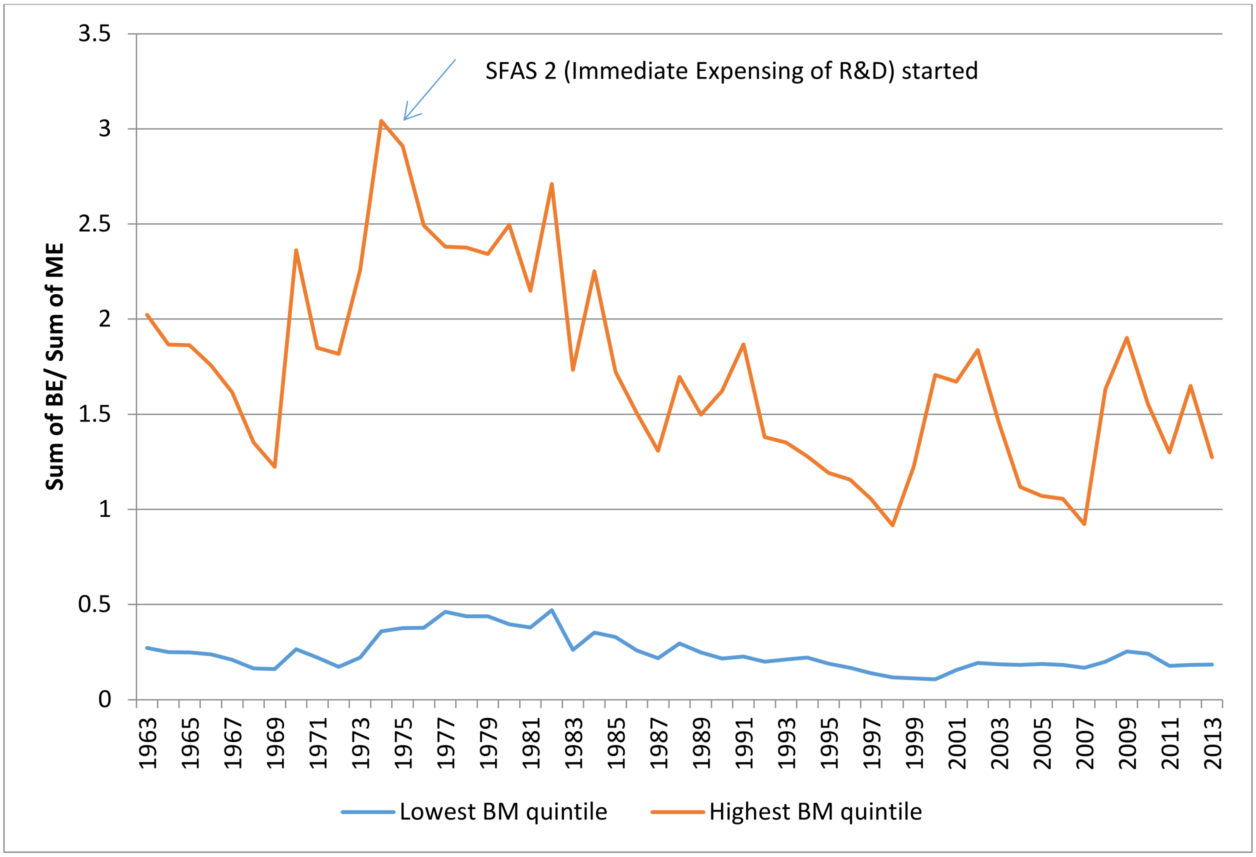
The horizontal axis is calendar year. For example, 2001 shows all firms in the data that report an after-tax goodwill impairment loss (GDWLIA) in a fiscal year that ends at any time during the calendar year 2001. The 10-industry definition in Kenneth French's website and the SIC codes in COMPUSTAT is used for industry classification.

Figure 2. Cumulative Return on the HML Portfolio



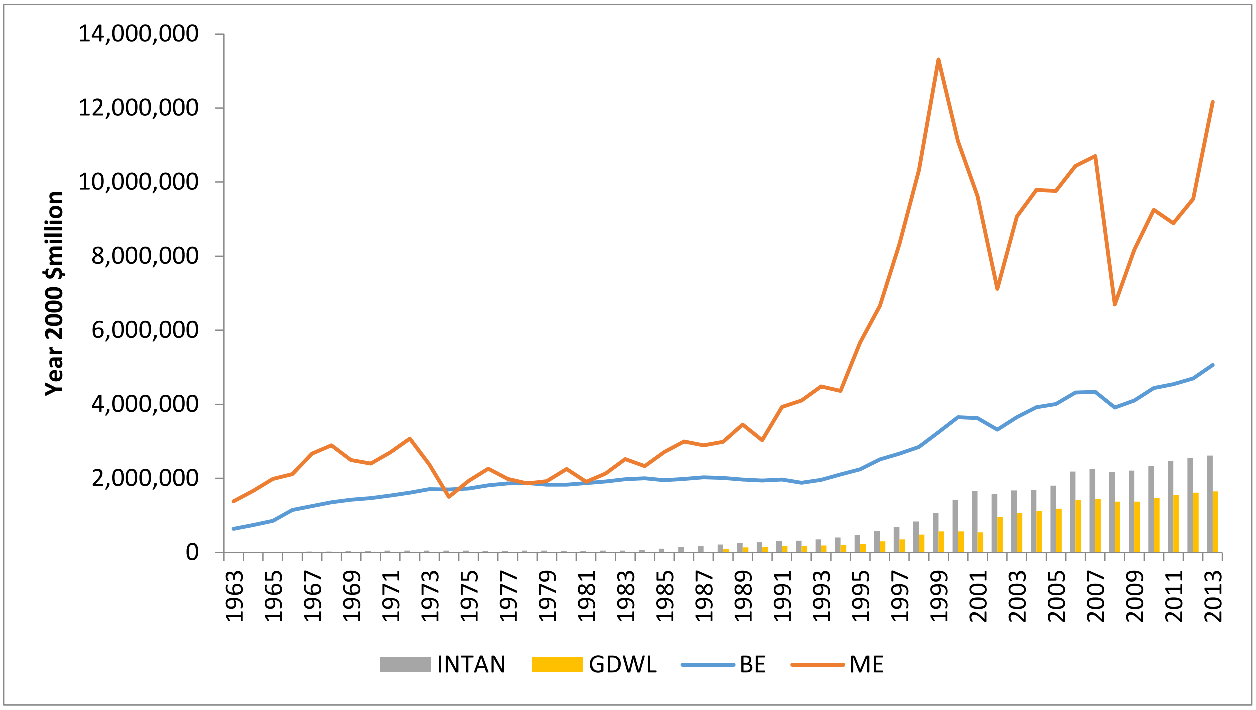
The book-to-market factor, HML, is the average return on the two high book-to-market ratio portfolios minus the average return on the two low book-to-market ratio portfolios. The cumulative return is the compounded return on HML. For example, the cumulative return on HML as of Mar 1964 is 1.0164*1.0283*1.0336-1 = 0.0803 because HML in Jan, Feb, and Mar of 1964 is 1.64%, 2.83%, and 3.36%.

Figure 3. Book-to-Market Ratios of the Top and the Bottom Quintile Portfolios



BE is book equity, ME is market equity, and the quintile BM portfolio data is from Kenneth French's website.

Figure 4. Market Equity, Book Equity, Intangible Assets and Goodwill: 1963 – 2013



The horizontal axis shows calendar year end including firms that have a fiscal year ending any time during the calendar year. BE is book equity, ME is market equity, INTAN is intangible assets, and GDWL is goodwill. According to COMPUSTAT's variable definition, GDWL is a subset of INTAN. All numbers are expressed in January 1, 2000 US dollars. For the adjustment, I use the US. Bureau of Labor Statistics' seasonally adjusted Consumer Price Index for all urban consumers in https://fred.stlouisfed.org/series/CPIAUCSL/downloaddata.