The Missing Ingredient: How to improve value investing in the information age

An empirical study on value investing using an intangible-adjusted book-to-market ratio

ROBIN GRAWE

KJELL THOMSEN

Master Thesis

Stockholm School of Economics

2023

The Missing Ingredient: How to improve value investing in the information age

Abstract

This thesis aims to inform a value investing strategy in specific niches of European firms by adjusting the book-to-market (B/M) ratio for intangible assets. An increase in intangible assets' importance for corporate value creation coupled with a lack of amendments to their accounting treatment has led to debates on the value relevance and accuracy of accounting information, including the B/M ratio used to derive value premiums. Motivated by this observation, the thesis artificially capitalizes intangible investments such as R&D and SG&A expenses to create the intangible-adjusted B/M (iB/M) ratio and related premiums such as the High-Minus-Low (HML) factor. Focusing on European public firms beginning in 2005, this study offers unique insights into the impact of intangible adjustments in an IFRS environment. The results demonstrate the superior predictive power for returns of the iB/M ratio in Europe. These effects are especially pronounced in the niches of firms with no or low levels of goodwill and no or low acquisition activity. Ultimately, the thesis formulates a value investing strategy by employing extreme breakpoints, investing exclusively in the long side portfolio, and focusing on said niches. Our study further contributes to the ongoing academic discussion regarding the evolution of value investing in an era defined by intangible assets. By offering a nuanced understanding of how intangible assets influence firm valuations, this thesis paves the way for more informed investment decisions and empirical-backed standard setting in accounting.

Keywords:

Value investing, Fama-French, Intangible Assets, Accounting-based valuation

Authors:

Robin Grawe (42033)
Kjell Thomsen (42050)

Tutor:

Irina Gazizova, Assistant Professor, Department of Accounting

Master Thesis
Master Program in Accounting, Valuation and Financial Management
Stockholm School of Economics

Contents

1. INTRODUCTION 1

2. PRIOR RESEARCH AND LITERATURE REVIEW 2

2.1. The efficient market hypothesis 2
2.2. Accounting-based value investing strategies 3
2.2.1. Reasons for the premium factor performance 4
2.2.2. Advantages & disadvantages of accounting-based investing 4
2.3. Value relevance of accounting information 5
2.4. Accounting for intangible assets 7
2.4.1. IFRS accounting for internally generated intangibles 8
2.4.2. IFRS accounting for acquired intangibles 8
2.4.3. Suggested solutions for the improvement of intangible accounting 9
2.5. The intangible-adjusted book-to-market ratio 10
2.5.1. Capitalization and depreciation of R&D 11
2.5.2. Capitalization and depreciation of SG&A 11
2.6. Investing with the intangible book-to-market portfolio 11
2.7. Hypotheses motivation & formulation 13

3. METHODOLOGY 14

3.1. Research design 14
3.2. Capitalization and depreciation of intangible capital 15
3.3. Subsample classification 15
3.4. Portfolio creation 15

4. DATA 17

4.1. Sample selection 17
4.2. Sample modifications 17
4.3. Sample descriptions 18

5. RESULTS 20

5.1. Results overview 21
5.2. Tests of statistical significance 22
5.2.1. T-test results for (sub-) sample portfolios 23
5.2.2. Regression analysis 25
5.3. Robustness across time 28
5.4. Long-term returns and compound effects 29

6. DISCUSSION 30

6.1. Performance of the iB/M ratio in Europe 31
6.1.1. Performance in the Old and New Economy niches 32
6.1.2. Performance in the acquisitions and goodwill niches 34
6.2. Practical usefulness of the iHi as an investing strategy 37
6.3. Implications for accounting 39

7. CONCLUSION AND LIMITATIONS 40

BIBLIOGRAPHY 43

APPENDIX 47

Tables and Figures Overview

Figures

Figure 1. Portfolio creation methodology 16
Figure 2. R&D and SG&A intensity 19
Figure 3. Compound results of investment over full sample period 30
Figure 4. Simplified numerical example 36

Tables

Table 1. Research overview regarding premium factors and intangible capital adjustments 12
Table 2. Sample modifications 18
Table 3. Sample - Industry overview 18
Table 4. Sample - Country overview 19
Table 5. Sample - Old and New Economy overview 20
Table 6. Sample - Acquisition activity overview 20
Table 7. Overview of observed results based on section 3.4 21
Table 8. Old & New Economy - observed results 21
Table 9. Acquisition activity - observed results 22
Table 10. Goodwill intensity - observed results 22
Table 11. Statistical significance of observed results 24
Table 12. Hypothesis results 25
Table 13. Overview of (multiple) regression results 26
Table 14. Comparison of value premium returns in the US and Europe 32
Table 15. Overview of R&D intensity (R&D expenses / Revenue) per industry 48
Table 16. Overview of SG&A intensity (SG&A expenses / Revenue) per industry 48
Table 17. Y06-11: Basic portfolio results 48
Table 18. Y06-11: Old & New Economy - portfolio results 49
Table 19. Y06-11: Acquisition activity - portfolio results 49
Table 20. Y06-11: Goodwill intensity - portfolio results 49
Table 21. Y06-11: Results overview - t-tests (1/2) 49
Table 22. Y06-11: Results overview - t-tests (2/2) 50
Table 23. Y06-11: Overview of (multiple) regression results 50
Table 24. Y11-17: Basic portfolio results Y11-17 51
Table 25. Y11-17: Old & New Economy - portfolio results 51
Table 26. Y11-17: Acquisition activity - portfolio results 51
Table 27. Y11-17: Goodwill intensity - portfolio results 51
Table 28. Y11-17: Results overview - t-tests (1/2) 52
Table 29. Y11-17: Results overview - t-tests (2/2) 52
Table 30. Y11-17: Overview of (multiple) regression results 53
Table 31. Y17-23: Basic portfolio returns 53
Table 32. Y17-23: Old & New Economy - portfolio results 53
Table 33. Y17-23: Acquisition activity - portfolio results 54
Table 34. Y17-23: Goodwill intensity - portfolio results 54
Table 35. Y17-23: Results overview - t-tests (1/2) 54
Table 36. Y17-23: Results overview - t-tests (2/2) 54
Table 37. Y17-23: Overview of (multiple) regression results 55

1. Introduction

Societal and economic advancements over the last decades have transformed most developed countries from industrial to information societies. Symptomatic of this evolution is the increasing importance of intangible assets as opposed to tangible assets as sources of value creation. This newly gained importance brings forth challenges for standard setters to revise accounting standards and allow them to convey an accurate image of a firm's financial position given the new circumstances. Thus far, they have arguably failed to do so (Barker, Lennard, Penman, & Teixeira, 2022). Consequently, today's value relevance of accounting information is heavily debated. We believe that the efficacy of accounting-based figures used in investors' decision-making and investing strategies should be equally put into question.

A central element informing investor decisions is a stock's expected return. Eugene Fama & Kenneth French are among the most well-established academics in this field. Famously, they introduced the High-Minus-Low (HML) factor illustrating the predictable power of the book-to-market (B/M) ratio in identifying undervalued and overvalued, value and growth, stocks (Fama & French, 1992). Their insights lend credence to the claim often associated with value investing: *"Price is what you pay. Value is what you get"* (Graham, 1949). This principle is practiced by investors such as Warren Buffet and Benjamin Graham and supports the notion of value investing as a superior investing strategy. It suggests that long-term investment success comes from purchasing stocks that trade below their intrinsic values.

But while Fama and French initially demonstrated the robustness of their findings across two distinct time periods, from 1963 to 1991 (1992) and later from 1989 to 2011 (2012), recent studies have revealed a shift. For the period spanning 2007 to 2020, the HML factor based on the B/M ratio not only lost its outperformance but, in fact, indicated an underperformance of value stocks relative to growth stocks[1] (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021). The value factor has practically disappeared.

Scholars argue that the difference in accounting treatment of tangible and intangible assets distorts the accuracy of the earnings measure and the book value (e.g., (Lev & Gu, 2016)). It is here that this thesis plants its flag. We aim to contribute a new chapter to the narrative of accounting-based value investing in the era of intangible assets in Europe. We conduct an empirical analysis to evaluate the potency of an intangible book-to-market ratio (iB/M) as a predictor of abnormal stock returns, with a focus on European public, IFRS adopting, firms. By integrating intangible investments such as research & development (R&D) and selling, general, and administrative expenses (SG&A) into the traditional book-to-market ratio, we seek to expand existing studies such as Li (2022), Eisfeldt & Papanikolaou (2014) and Arnott et al. (2021), to not only reverse the HML factors deficiency, but to inform a new value investing strategy.

To achieve the above, this thesis delves into differences in accounting treatment between US Gaap and IFRS of which the latter is significantly less researched in existing literature.

[1] This observation is based on a HML portfolio with breaking points at the 30th and 70th percentile of the B/M ratio for the high and low portion of the portfolio, respectively.

Moreover, we define specific niches based on firms' affiliation to the New or Old Economy, acquisition-activity, and relative level of acquired goodwill. This approach represents an attempt to further define an investment strategy generating superior returns in Europe which has not been done before.

It is a quest to redefine the parameters of value investing in a rapidly evolving, innovation-focused, market landscape. By unraveling the nuances of the iB/M ratio, this thesis aspires to show new pathways for investors and reshape their employed strategies behind investment decisions in Europe and beyond. This leads us to our main research question:

Can an intangible-adjusted B/M ratio predict superior returns in a European niche?

The remainder of the thesis is structured as follows. Section 2 gives an overview of the current state of academic literature with regards to value investing strategies, accounting's value relevance and the accounting treatment of intangible assets prescribed by IFRS. It ends with an outline of previous attempts to improve value factor performance using intangible capital and how it relates to this thesis. The following sections 3 and 4 explain the methodology and data set used in this study. Thereafter, section 5 describes our results and tests for statistical significance to show outperformance and abnormal returns. Lastly, the findings are discussed regarding the strategy's practical applicability and implications for standard setters. In addition, an overview of limitations and areas for further research is provided.

2. Prior research and literature review

The following literature review provides a comprehensive overview of previous literature and empirical studies which we use as a basis for our research. We start with the concept of the efficient market hypothesis and outline how its anomalies have led to the formulation of investing strategies. Among these strategies, we focus on the value premium by Fama and French and emphasize its reliance on accurate accounting information. Continuing with accounting information, the next subsection collects several studies which study the development of value relevance in recent decades considering the societal transition towards information-based assets as sources of value creation. This is complemented with an explanation of current accounting standards' treatment of intangible assets in the context of internal creation and acquisitions. Integrating the previous sections, section 2.5 introduces the concept of a book-to-market ratio adjusted for intangible investments and explains which thresholds were previously used in creating these ratios. It further connects acquisition activity and a firm's goodwill intensity to the amount of intangible expenses incurred. We conclude the literature review by collecting existing studies which replicated Fama and French's value premium using intangible-adjusted book-to-market ratios, illustrate which areas remain unexplored and ultimately motivate the choice of our hypotheses.

2.1. The efficient market hypothesis

In finance and accounting literature, the Efficient Market Hypothesis (EMH), initially outlined by Eugene Fama in 1970, is a fundamental concept that categorizes market efficiency into three forms. Strong form efficiency reflects a perfect market where no strategy nor information yields

superior returns - in other words: any information, may it be publicly available or not, is reflected in the market price at any given time. Semi-strong form efficiency limits outperformance to non-public insider information. And weak form efficient markets allow investors to find opportunities for abnormal returns based on public information, albeit not any to persist over time (Fama, 1970). Any factors contradicting the EMH are referred to as anomalies. Harvey et al. (2016) catalogue 316 of such anomalies detected since 1967 and warn that this number is likely understated and constantly rising. Most anomalies were found in the 21st century, but empirical studies on asset-pricing models already challenged the efficient market doctrine for the real world shortly after its initial formulation, positing that markets display inefficiencies that can be systematically exploited for profit, meaning the EMH does not hold and consistent opportunities for abnormal returns exist (Basu, 1977).

2.2. Accounting-based value investing strategies

Several anomalies of the EMH have been found in connection with value factor premiums (e.g. (Fama & French, 1992) (Carhart, 1997) (Daniel & Titman, 1997)). A starting point to delve into these is the capital asset pricing model (CAPM). It is closely linked to the EMH and derives a stock's expected return from the link between its systematic risk and the market return premium by accounting for volatility in the beta factor. In 1992, Fama & French illustrated shortcomings of the CAPM and introduced said premium factors for value (HML) and size (SMB) (Fama & French, 1992). They illustrate that, on average, smaller firms outperform larger firms; and firms with a high B/M ratio (value-stocks) outperform those with a low B/M ratio (growth stocks) despite being less risky, i.e., having a lower beta. Introducing a value premium reverses the effect of the misleading risk-adjustment in the CAPM. Their model was later extended with a momentum factor accounting for the effect of recent stock price performance (Carhart, 1997).

Since then, alternative key measures other than the B/M ratio have been used to detect value stocks and derive value premiums. For example, Haugen (1995) uses the dividend yield, price-to-earnings ratio (P/E), and earnings growth to identify stocks to use in a value investing strategy. He argues that market participants overlook mean-reversion in earnings growth and consequently overestimate the future earnings potential of growth stocks while underestimating that of value stocks. The notion that investors incorrectly predict future outcomes based on historical results is supported by other research (Lakonishok, Shliefer, & Vishny, 1994). Like Fama and French, Haugen undermines the notion that higher risk is rewarded with higher returns, concluding that value stocks outperform growth stocks despite being less risky (Haugen, 1995).

Fama & French have shown that their results are robust across periods and most geographic regions (Fama & French, 1993) (Fama & French, 2012). Haugen claims that value stock outperformance will persist due to stock market performance being shaped by institutional investors whose managers are benchmarked against indexes dominated by growth stocks (e.g., the S&P500). As value stocks might underperform over a benchmarking horizon of three to five years, institutional investors are hesitant to adopt a value investing strategy to avoid short-

term underperformance and risking their job or a secure flow of funds. This hesitance creates a unique *"Golden Opportunity"* in value investing for individual investors (Haugen, 1995).

2.2.1. Reasons for the premium factor performance

The mentioned *"Golden Opportunity"* only holds if the superior return is not only related to additional risk factors. The CAPM assumes that an efficient and diversified market accounts only for a firm's systematic but not firm-specific risk. Fama and French (1993) argue that a firm's systematic risk is also dependent on their size and value classification. Hence, their value and size premiums can be seen as proxies for non-diversifiable factor risk complementing the CAPM. Consequently, they lead to a correlation of value and size characteristics and returns.

Daniel and Titman (1997) acknowledge the superior returns generated by small market capitalization and high book-to-market stocks. However, they do not agree with Fama and French in attributing these higher returns to greater risk. Instead, they state that the returns are correlated to the nature of the firm characteristics, size and value, exclusively. This illustrates an even further move away from the CAPM and the risk-return correlation.

The cut-off used to classify firms as small or big in most studies, including Fama and French's is the median market capitalization on the New York Stock Exchange (NYSE) which historically equals around a sample's 80^{th} and 90^{th} percentile market capitalization, depending on the time of the study (e.g., (Fama & French, 1993) (Li, 2022)). Whether to choose the NYSE or percentile cut-off depends on whether the study targets US firms only or international markets (Asness & Frazzini, 2013).

2.2.2. Advantages & disadvantages of accounting-based investing

A major advantage of accounting-based value investing strategies is that their superior returns seem to persist over time (Fama & French, 1993). In addition, value stocks generally bear less risk than growth stocks, making the downside of value investing smaller than that of growth investing (Haugen & Baker, 1996). Moreover, the strategies are based on publicly available information such as the market value of owner's equity and a firm's reported book value of equity, allowing anyone to replicate the strategy successfully without needing special finance knowledge or insider information. Importantly, all necessary information being publicly available allows for the strategies to be employed by private investors as well. Lastly, decisions concerning specific investments are unequivocal when grounded in undoubted accounting information and regulations.

On the negative side, maintaining a portfolio of current value stocks requires regular rebalancing. The transaction costs caused by the rebalancing may harm the portfolio's returns significantly, especially for individual private investors with relatively lower investment volumes (Carhart, 1997). Moreover, whether a firm has a high or low B/M ratio does not only depend on it being a growth or value stock, but to a large part on the industry they operate in. The levels of capital intensity required to operate differ based on the industry's nature, which directly affects the numerator of and therefore the book-to-market ratio. Another disadvantage of accounting-based valuation methods in general and the B/M ratio in particular is their inherent nature of relying on accurate accounting information. While this is problematic in

cases of fraud and other forms of misconduct, it also is in cases where accounting standards structurally fail to fulfill their purpose. Whether accounting standards fulfill their purpose is indicated by their value relevance. This is explored in the next section.

2.3. Value relevance of accounting information

Accounting's overarching mission is to establish a set of principles that allow external stakeholders to attain a transparent and comparable image of a company's performance through its financial statements. The degree to which investors find accounting information useful and act to reflect it in market equity prices is referred to as accounting's value relevance[2] (Lev & Gu, 2016) (Barth, Li, & McClure, 2023).

Traditionally, accounting standards focused on achieving high-quality earnings by matching revenues with expenses using the income statement approach. Accordingly, outsiders deemed the earnings figure most relevant for investment decisions (Graham, Harvey, & Rajgopal, 2005). In contrast, modern-day accounting, influenced by standard-setting bodies like the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB), adopts a different approach. The IFRS Conceptual Framework outlines a balance sheet model that places emphasis on the definition, recognition, and measurement of assets and liabilities (IASB, International Accounting Standards Board, 2018). Unlike the income statement approach, this model derives earnings indirectly as an outcome of valuing balance sheet items where earnings reflect the changes in (net) assets over a specific period (Barker, Penman, Linsmeier, & Cooper, 2020) (Lev, 2018).

The evolution from production-centric to information-heavy assets as companies' main sources of value creation puts new requirements on accounting standards. Critics of the current accounting regime claim that it fails to meet these requirements and spark widespread debates on accounting's relevance, making it a well-established concern in the field (Lev, 2018) (Barker, Lennard, Penman, & Teixeira, 2022). Some of the most relevant studies on the value relevance of accounting information are summarized below.

Starting with observations from the 1960s, Dichev & Tang (2008) conducted a comprehensive study analyzing the performance of the 1,000 largest US firms over the four decades leading up to 2003. Corresponding to standard setters beginning to shift towards the balance sheet model in the 1980s, their research substantiated that relying solely on earnings as a proxy for a company's value creation has diminished in significance due to an increasingly poor alignment of revenues and expenses. They anticipated a continuing decline in the value relevance of earnings with the adoption of the IFRS' balance sheet model in Europe (Dichev & Tang, 2008).

In support of earnings losing their relevance as the primary value proxy, Lev & Gu (2016) uncover a clear correlation between rising R&D and SG&A expenses and a diminishing relevance of accounting information in the US market since 1950 – illustrating accounting

[2] In the following, we refer to "value relevance" of accounting information and "relevance" of accounting information interchangeably unless otherwise stated.

bodies' problems to account for intangible forms of value creation. Besides the treatment of intangible assets, they attribute the decline in relevance to increased reliance on accounting estimates and unrecorded business events becoming value drivers. They criticize standard setters for neglecting the importance of revenue and expense matching in this context (Lev & Gu, 2016). Additionally, Lev (2018) proposed ways to improve usefulness of accounting information including a return to the income statement model and an easing of recognition criteria for intangible assets which are further discussed in section 2.4.3.

Lev & Gu's (2016) claims inherently assume that firms practicing a high degree of conservatism, i.e., active expensing of intangible investments, produce less value relevant accounting information. In contrast to these assertions, Balachandran & Mohanram (2011) found that the overall decline of accounting information is not more pronounced in firms that practice conservatism. Rather, they state that the opposite is true, meaning there is a heavier decline in the value relevance of accounting information in firms that do not adhere to accounting conservatism. Their study included 100,984 observations over the 30-year period from 1975 to 2004.

More recently, Barth, Li & McClure (2023) conducted a detailed examination of US firms and various accounting items from 1962 to 2018. They do not agree with either side of the discussion. Instead of supporting the claims of a uniform trend in declining relevance, their results reveal more pronounced nuances in the importance of accounting items. Further, they criticize prior research for too little differentiation of accounting items and consequently jumping to conclusions of a decline in value relevance too quickly.

Like previous studies, they found earnings held the utmost relevance in the 1970s. They further found that earnings' significance has persistently diminished over the decades, reaching just over half of their initial importance in the 2010s. Filling the void created by earnings' deterioration, numerous other items, particularly those associated with intangibles and growth opportunities, emerged as increasingly relevant. Their study distinguishes the developments of value relevance for (1) Old Economy loss firms (2) Old Economy profit firms, and (3) New Economy firms (Barth, Li, & McClure, 2023).[3]

Unsurprisingly, earnings were confirmed to be the single most value relevant factor for Old Economy profit firms in the 1970s. But in contrast to the development in the overall sample, this relevance sustained and highlights earnings' enduring importance for profit generating firms. Similarly, Old Economy loss firms exhibited sustained significance of the book value of equity and total assets in both periods. For New Economy firms, they also found earnings was the single most value relevant accounting item in the 1970s. In contrast, cash flow, earnings, book value of equity, cash, and R&D expenses had a similarly high combined relevance in 2010 as earnings did alone forty years prior, highlighting increased nuances over the decades. Notably, the relevance of items relating to intangibles, growth opportunities and alternative

[3] According to their definition (1) Old Economy loss firms comprise companies that report negative earnings during the study period; (2) Old Economy profit firms denote companies that report a profit; and (3) New Economy firms represent entities from the Information Technology sector that reported negative earnings in the year of their Initial Public Offering (IPO).

performance measures has increased across the entire sample and is – albeit more extreme - not limited to the New Economy (Barth, Li, & McClure, 2023).

In summary, reports of decreased relevance of accounting information are often centered around the earnings figure and the balance sheet model deteriorating its usefulness. Looking at it from a more differentiated point of view, value relevance might not be deteriorating as much as it is shifting towards increased nuances, especially with regards to intangible assets and growth.

2.4. Accounting for intangible assets

As illustrated in the discussion on value relevance, a lot of the frustration stems from shifts in economic value creation and a growing importance of intangibles, arguably without effective accounting treatment. Incidentally in the US, the R&D expensing rule was found to be one of the worst standards in terms of accurately measuring shareholder value (Khan, Li, Rajgopal, & Venkatchalam, 2018). While criticizing current regulations is easy, understanding the rationale behind standard setters' current capitalization and expensing rules offers some degree of clarity. The following will shed some light on the considerations in accounting rule formulation and describe the current accounting regime in IFRS.

Within the double-entry system of accounting, economic events such as investments can be portrayed either in the income statement (i.e., expense) or the balance sheet (i.e., capitalize). In the double-entry system's logic, assets recognized on the balance sheet help generate the revenues in the income statement (Barker, Lennard, Penman, & Teixeira, 2022). We see two main factors standard setters are concerned with when deciding whether to prescribe expensing or capitalization of intangibles, or to give practitioners some degree of freedom in choosing an option.

1) *Uncertainty:* Intangibles, by nature, are uncertain. Not only is their ability to contribute to future income unclear, but also their recoverability usually impossible, meaning they become sunk cost if unsuccessful. Excessive capitalization can cause book values to be overstated and convey a misleadingly stable perception of a company's – potentially uncertain - financial position, which is a case standard setters aim to avoid (Lev, 2019).
2) *Matching:* Immediate expensing reveals deficiencies in the matching of income and expenses. It depresses current-period earnings despite the expenses' potential contribution to future revenue generation. Conversely, capitalizing such investments, despite uncertainty about their ability to generate future cash flows can result in subsequent depreciation and amortization. This, too, negatively impacts earnings for a period other than the one the costs were incurred in. The inherent uncertainty regarding intangible investments' future revenue potential makes some degree of mismatching inevitable. Standard setters are therefore barely aiming at minimizing the degree to which mismatches occur (Barker, Lennard, Penman, & Teixeira, 2022).

Other factors which are often put forth as important considerations in the treatment of intangibles include the risk of managerial earnings manipulation and problems with accurate

fair value estimates. Due to these uncertainties and a seeming desire to avoid overly optimistic capitalization of intangibles, standard setters often practice conservatism (Lev, 2019).

2.4.1. IFRS accounting for internally generated intangibles

The IFRS are slightly less conservative than US Gaap. In IFRS, an intangible asset is defined as an identifiable non-monetary asset without physical substance. It is considered identifiable if it is separable, i.e., can be sold separately from the entity, or it arises from legal rights or obligations (IAS 38.12). Whether to treat it as an expense or capitalize it hinges upon its fulfillment of specific recognition criteria. Accordingly, an intangible asset is only recognized when (1) it is probable to lead to a future economic benefit, and (2) its cost can be accurately and reliably measured (IAS 38.21). This does, however, only apply to the development portion of R&D expenses which are recorded at cost upon initial recognition while research costs must always be expensed (IAS 38.24&54) ((IASB), 2001a).

With the opportunity to capitalize development costs in place, managers behave differently. Some use it excessively to beat earnings targets while others are reluctant to presenting intangible assets on the balance sheet (Lev, 2019). Investors seem to accurately assess the justification of R&D capitalization by negatively reacting to capitalization aimed at meeting earnings forecasts and positively reacting to capitalization in well-performing firms (Dinh, Kang, & Schultze, 2016). The portion of managers hesitating to capitalize argue that the capitalization conveys no real informative value and rather fear the negative consequences of future impairments these assets may incur when faced with technological disruption (Lev, 2019).

The second intangible investment component, sales, general and administrative costs (SG&A) must always be entirely expensed, irrespective of the fulfillment of criteria. US GAAP is slightly different from IFRS in that it requires full expensing of both, SG&A and R&D expenses. Overall, the threshold for capitalization described is much higher than for tangible assets (i.e., IAS 16 ((IASB), 2001b)).

2.4.2. IFRS accounting for acquired intangibles

Logically, the uncertainty of an intangible asset leading to future economic benefits should not depend on it being internally generated or acquired (Barker, Penman, Linsmeier, & Cooper, 2020). However, the IASB applies different accounting rules for internally generated and acquired intangible assets in IAS 38 and IFRS 3 (2004).[4] More concrete, investments in intangibles which were expensed by the acquiree are reconsidered in the process of the purchase price allocation (PPA) and potentially capitalized in the acquirer's financial statements regardless of their fulfillment of recognition criteria (Hellman, 2022). Accordingly, intangibles' impact on book value can change significantly after an acquisition (Park, 2019).

The portion of the purchase price exceeding the value of net assets acquired in a business combination is accounted for as goodwill, which is also an intangible asset. It usually is the single largest item accounted for in a PPA (Shalev, Zhang, & Zhang, 2013). Subsequent

[4] IAS 38 – Intangible Assets; IFRS 3 – Business combinations

accounting for Goodwill, like all indefinite-lived assets, follows the impairment-only approach. Instead of being amortized, it is tested for impairments by comparing carrying amount to recoverable amount (IAS 36.6 ((IASB), 2001c)). The impairment test has several deficiencies allowing practitioners to avoid impairments although they might be economically justified (Hellman & Hjelström, 2023). Executives whose compensation is tied to firm earnings have been shown to make use of the ineffectiveness by delaying impairments (Shalev, Zhang, & Zhang, 2013). However, speaking in favor of the impairment only approach, incurred goodwill impairments currently are value relevant whereas a model of regular amortization is not. Instead, linear amortization would make investors opt for alternative earnings figures such as EBITA and adjusted EBITA, which entirely neglect subsequent accounting for goodwill (Bagna, Ramusino, & Ogliari, 2023) (Hellman, 2022). The size of goodwill and its unlikely impairment are surprising in the context of standard setters trying to avoid the capitalization of uncertain assets, given that the items that drive goodwill value (e.g., synergies) are uncertain (Hoogervorst, 2012).

Collectively, the described effects arguably favor inorganic over organic growth initiatives by failing to penalize overpaying and immediately depressing the current period's earnings (Hellman, 2022). Lev (2018) argues further that the capitalization of intangibles depending on being internally generated or acquired leads to a decrease in the usefulness of earnings – this correlates with the deterioration of earnings' value relevance discussed above.

2.4.3. Suggested solutions for the improvement of intangible accounting

Barker et al. (2022) outline the general discontent with accounting standards in current literature and illustrate four alternatives to intangibles accounting of which some contrast balance sheet recognition. Their suggestions bridge the gap between the requirements practitioners, researchers and standard setters have on accounting research by building on empirical and normative-deductive research. Since empirical research is constrained by accounting practice (Hellman, 2022), findings on the real-world impact of partial R&D capitalization are currently only feasible for IFRS adopting firms.

The four alternative approaches are (1) initial expensing; (2) initial capitalization; (3) capitalization given an uncertainty threshold; and (4) conditional capitalization. Of these, the latter is least explored in current research, albeit technically allowed under IFRS by reversing depreciations (Barker, Lennard, Penman, & Teixeira, 2022). In a similar vein, Lev (2018) also contrasts the balance sheet model by advocating for improved income matching. He suggests the capitalization of long-term growth-oriented ('value creating' or 'sales sustaining') investments given the fulfillment of a new set of criteria (Lev, 2018). To overcome difficulties regarding uncertainty of capitalized intangibles, Hellman (2022) suggests looking at R&D investments as portfolios with net positive values rather than single projects – this is already practiced on the liabilities side, for example for warranties. Although a need for change seems evident, progress is hesitant and slow.

To lower the barriers for changes in standard setting, Lev (2018) suggests conducting extensive research ex ante and later adopting a trial-and-error approach to implement changes in control

groups such as industries or market sub-segments to see the real-world implications before prescribing a universal adoption of new standards.

2.5. The intangible-adjusted book-to-market ratio

The difference of organic and inorganic growth initiatives is especially relevant in the logic of the B/M ratio. Low B/M rates are indicators for an expensive valuation, high B/M rates indicate a comparably cheap valuation. Considering the treatment of intangible assets in this context further illustrates the problem. Each Euro spent on a tangible asset has no immediate impact on book value but lowers it subsequently at the asset's depreciation rate. In contrast, each Euro spent on R&D or SG&A, assuming no identifiability, decreases the book value immediately to the full extent. Accordingly, high spending on intangibles makes firms seem more expensive in the B/M logic in the short-term (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021).

Integrating this phenomenon with the previous section, an alternative to incurring intangible investments as expenses is acquiring innovative companies and capitalizing the acquired intangibles on the balance sheet. And indeed, there is a correlation between R&D expenses and acquisition activity. Evidently, frequent acquirers are reporting lower levels of R&D than firms which rarely engage in M&A activity (Bena & Li, 2014). The B/M effect does, however, deteriorate the higher a company's goodwill is compared to total assets (Park, 2019).

To avoid expensing of investments in intangibles playing a role in the B/M ratio, previously expensed costs can be artificially capitalized and amortized as intangible capital and thus be treated as an ordinary tangible asset. In the following, artificially capitalized investments will be referred to as intangible capital.

Intangible capital consists of R&D capital and organizational capital. R&D capital just refers to the portion of R&D expenses which is capitalized. Organizational capital includes capitalized expenses for things such as brand management, marketing and training which are classified as SG&A expenses under IFRS (Falato, Kadyrzhanova, Sim, & Steri, 2022). Introducing SG&A expenses to the B/M ratio as a performance predictor is crucial because higher SG&A expenses relative to total assets are associated with higher stock returns (Eisfeldt & Papanikolaou, 2014). When expensed, it was shown that analysts underestimate the value of SG&A expenses. In that study, a portfolio of firms with high SG&A expenses generated excess returns of 7.3% (with no prove for higher risk) compared to low SG&A firms (Banker, Huang, Natarajan, & Zhao, 2019). This recent finding contradicts previous theories suggesting that high SG&A expenses are associated with weak cost control (Lev & Thiagarajan, 1993).

There are two schools of thought for both capitalization and depreciation rates of intangible capital: using a uniform or an industry specific approach. It is noteworthy, however, that the perpetual inventory method is universally applied for depreciation. Rajgopal et al. (2023) argue that both approaches are too mechanical. Instead, they propose a regression-based model to modify capitalization and depreciation rules for specific industries and business models. Their model is compared to the mechanical approach in the following sections.

2.5.1. Capitalization and depreciation of R&D

Previous research mostly does not follow IAS 38 in differentiating investment and maintenance R&D. Instead, all R&D expenses are assumed to be investments into the creation of intangible assets aimed at generating future economic benefits. Usually, the full amount of R&D expenses is capitalized (e.g., (Li, 2022) (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021)). Regarding depreciation, the useful lifespan of R&D capital in previous studies spans between five and seven years, meaning a depreciation rate of 15% to 20% (Falato, Kadyrzhanova, Sim, & Steri, 2022) (Li, 2022). Upon further investigation, the most often assumed 15% depreciation rate was found to be too low in most instances (Hall & Li, 2016).

Looking through the lens of Rajgopal et al. (2023) the capitalization rate of R&D should be 87% on average with an average useful life of 4.8 years. Although the industry specific rates vary around these averages, the assumptions in the mechanical approach do not deviate significantly and are seemingly good proxies.

2.5.2. Capitalization and depreciation of SG&A

SG&A expenses, which consist of recurring operating expenses, are different from R&D expenses in that it is not as logical to assume all of them are investments that will generate future economic benefits. Various approaches to capitalization were used in prior studies ranging from the most common 30% (Li, 2022) (Peters & Taylor, 2017) up to 100% (Eisfeldt & Papanikolaou, 2013). Empirically tested, around 30% of SG&A expenditure of US firms is invested in intangible capital while the remainder are operating costs for the period (Peters & Taylor, 2017).

Just like for capitalized R&D, most studies depreciate organizational capital at a standardized rate of 15% to 20% (Li, 2022) (Peters & Taylor, 2017) (Falato, Kadyrzhanova, Sim, & Steri, 2022). Again, comparing to Rajgopal et al. (2023), they capitalize 69% of SG&A expenses and assume a finite lifetime of capitalized SG&A of 3.4 years. This means, average regression-based capitalization is about twice as large as the assumption in most other studies but is also depreciated over a useful life which is circa 1.5 years shorter. The two effects offset each other's impact on the book value at least partially.

The small differences between mechanically assumed and regression-based depreciation rates for both forms of intangible capital are in line with Li (2022) who tested her returns of an intangible-adjusted HML factor for robustness using various depreciation rates and found barely marginal differences.

2.6. Investing with the intangible book-to-market portfolio

Fama & French created HML portfolios with breakpoints at the 70th and 30th percentile of the full sample's B/M ratio. Their value premium's outperformance was shown to be robust across periods and developed markets globally (2012). But a decade later, this is outdated. Arnott et al. (2021) illustrated an underperformance of 55% from 2007 to 2020 for the B/M value investing strategy in the US, the longest and most severe downturn in the strategy's history.

Table 1. Research overview regarding premium factors and intangible capital adjustments

Reference	Focus	Sample	Intangible Capital				Portfolio			Regression	Results
			R&D CAP	R&D DEP	SG&A CAP	SG&A DEP	Type	Weighting / Rebalancing	Breakpoints		
Fama & French (1993)	• EMH • Fama-French • US Gaap	• US firms • 1963-1990 • Max. 4,797 stocks in 1991	/	/	/	/	• HML • SMB	Value July – June	Size: NYSE Med. B/M: 70th; 30th	Fama-MacBeth regression	HML and SMB factors improve performance of the CAPM in deriving expected returns.
Fama & French (2012)	• EMH • Fama-French • US Gaap, IFRS	• US, Europe, Japan, APAC firms • 1989-2011 • Observation: N/A	/	/	/	/	• HML • SMB	Value July - June	Size: 90th;10th B/M: 70th; 30th	Multiple regression	Value premiums exist in all developed markets and have persisted over the previous decades.
Peters & Taylor (2017)	• Intangible capital • Tobin's q • US Gaap	• US firms • 1975-2011 • 140,000 observations	100%	15%[5]	30%	20%	/	/	/	OLS regression	An intangible-adjusted Tobin's q is a superior proxy for both physical and intangible investment opportunities.
Park (2019)	• Intangible capital • B/M • Goodwill • US Gaap	• US firms • 1964-2013 • Max. 5,686 stocks (in 1996)	/	/	/	/	• HML • Goodwill	Value June-July	Size: NYSE quint. B/M: Deciles	Fama-MacBeth regression	Intangible assets such as goodwill are related to the weakening of the B/M effect.
Arnott et al. (2021)	• Intangible capital • B/M • US Gaap	• US firms • 1963-2020 • 3,600 stocks (in 2020)	100%	15%[5]	30%	20%	• iHML • SMB	Both Monthly	Size: NYSE Med. B/M: 70th; 30th	Linear regression	The iHML outperforms the HML factor by 1.3 pps over sample period; + 1pps pre-2007 and +2.2 pps for 2007-2020.
Li (2022)	• Intangible capital • B/M • US Gaap, IFRS	• US, UK, Japan, Asia ex Japan, Europe (ex UK) • Max. 4,402 stocks (post-1975)	100%	15%	30%	15%	• iHML • SMB	Value July-June	Size: NYSE Med. B/M: 70th; 30th	Fama-MacBeth regression	Adjusting the B/M ratio for intangibles improves value factor performance across subsample periods and geographic regions.
Eisfeldt et al. (2022)	• Intangible capital • B/M • US Gaap	• US firms • 1975-2018 • 180,457 observations	0%	0%	100%	20%	• iHML • SMB	Value July-June	Size: NYSE Med. B/M: 70th; 30th	Fama-MacBeth regression	There is a 76% percent correlation of HML and iHML portfolio.
Grawe & Thomsen (2023)	• **Intangible capital** • **B/M** • **Goodwill / M&A** • **IFRS**	• **European firms** • **2005-2023** • **3,788 stocks** • **570,612 observations**	**100%**	**20%**	**30%**	**20%**	• **iHML** • **SMB** • **Goodwill** • **M&A**	**Value Apr-Mar**	**See Chapter 3**	**Multiple regression**	**see Chapter 5**

[5] U.S. Bureau of Economic Analysis (BEA) industry specific capitalization rates. Ranging from 10% to 40%, average at ca. 15%.

This leads to the intangible-adjusted B/M ratio whose main idea it is to create a superior proxy for stock price returns compared to Fama-French's traditional model. In a similar vein, Peters & Taylor (2017) created a superior version of Tobin's q for the US market by capitalizing previously expensed R&D and SG&A investments. To our knowledge, Arnott et al. (2021) were the first to use the approach to capitalizing intangible investments from Peters & Taylor (2017) and apply it to the Fama-French model. They observed US public firms from 1963 to 2020 and replicated Fama-French's study by using the 70^{th} and 30^{th} percentile of iB/M ratios to create intangible adjusted HML (iHML) portfolios while using the NYSE median market cap as a breakpoint for size in creating SMB portfolios. They found the iHML portfolio to outperform the B/M effect in traditional HML portfolios by 1.3 percentage points annually since 1963. Moreover, they found an even stronger outperformance of 2.2 percentage points annually from 2007 to 2020.

In the following year Eisfeldt et al. (2022) and Li (2022) published a replication of this study. They used the same breakpoints and slightly different capitalization assumptions for the creation of portfolios. Also, their data samples were slightly different but kept focused on the US market. Ultimately, both studies found similar results as their predecessor. Like Fama & French's studied in 2012 it is noteworthy that Li (2022) used the most extensive geographical data sample by observing firms across several developed markets. However, European firms in her sample are distinguished into continental European and UK firms and her observations start in 1950. Although extensive, they indicate no observation of the European market as a whole and no isolated view on the post-IFRS period.

2.7.Hypotheses motivation & formulation

After careful consideration of existing literature and identification of research gaps, we test three broadly connected hypotheses which we chose based on the following motivation:

(1) Fama & French's (1992) original discovery of the book-to-market ratio as a predictor of stock price performance demonstrated robustness across various time periods but has recently exhibited signs of deterioration (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021). Consequently, several researchers, including Li (2022) and Eisfeldt et al. (2022) introduced an intangible-adjusted B/M ratio to represent value-creating resources more accurately in the classification of value and growth stocks. Notably, these studies primarily focus on US companies reporting under US GAAP. European companies are rarely discussed and if so, only subdivided into continental Europe and the UK and without an isolated view on the post-IFRS period (Li, 2022). Considering this, our objective is to investigate the performance of a HML portfolio based on intangible-adjusted B/M ratios across all European countries, commencing from the first year of IFRS adoption.

(2) Regarding accounting's value relevance, a noteworthy trend was discovered in the recent decade by Barth, Li, & McClure (2023). Contrary to the common claim of declining value relevance, they observed that the relevance of accounting information has progressively evolved, with a heightened level of intricacy, especially for firms belonging to the New Economy. Notably, items related to intangible assets and growth

opportunities, particularly R&D expenses, are more relevant than before. We aim to test whether incorporating R&D expenses into the iB/M ratio enhances its effectiveness and performance especially in New Economy firms.

(3) Companies seeking to enhance their performance through innovation have two primary avenues: investing in R&D or acquiring innovative firms. Notably, it's only the latter that results in Goodwill being recorded on financial statements. Previous research has established a connection between low R&D expenditures and heightened acquisition activity (Bena & Li, 2014). Moreover, studies have indicated that the book-to-market effect becomes less prominent as the level of acquired Goodwill increases (Park, 2019). Therefore, our aim is to investigate the potential for outperformance by using the iB/M ratio within specific niches by categorizing firms based on their acquisition activity and goodwill intensity.

The stated motivations lead us to testing the following hypotheses:

H1: An intangible-adjusted value investing strategy yields stronger returns in Europe than the traditional B/M HML strategy.

H2a: An intangible-adjusted value investing strategy yields superior returns in New Economy compared to Old Economy firms.

H2b: An intangible-adjusted value investing strategy yields weaker returns for firms with high levels of acquired goodwill and a high number of acquisitions as a buyer.

3. Methodology

The methodology section describes our research design, including all steps performed and criteria used to create subsamples and portfolios. It is connected to the literature review by referring to previous studies and research approaches to justify and motivate choices and assumptions made in our study, for example with respect to capitalization and depreciation rates.[6]

3.1. Research design

To fill the existing research gap, we perform a quantitative study on European public (i.e., IFRS reporting) firms aimed at finding a niche in which a value investing strategy adjusted for intangible investments generates lasting superior returns. In the following sections, we describe our approach to creating said strategy and connect it to the methodology used in prior studies as laid out in the literature review. The focus of our research is on finding niches in which the value premium performs especially well. Thus, we consider the implications of the size premium only briefly and prioritize the construction of a value premium.

[6] The abbreviations used for the respective portfolios and subsamples in the following sections are defined in Appendix A.

Initially, we choose a capitalization rate for intangible capital, meaning reported R&D and SG&A expenses, and decide on a depreciation pattern to use for their subsequent treatment. This results in "new" book values of equity adjusted for intangible investments. Based on the adjusted book values, we create adjusted book-to-market ratios (i.e., iB/M) for each year in our sample. After accounting for outliers, we form portfolios based on the iB/M ratios and set a constant rebalancing schedule for the subsequent periods and compute the annual portfolio returns. The portfolios are later slightly refined for the respective niches we focus our hypotheses on.

The respective portfolio returns observed are compared to the returns of the market (i.e., the full sample return), the CAPM (Sharpe, 1964), the Fama-French three factor model and the Fama-French four factor model generated or predicted respectively. We ultimately test three distinct hypotheses for statistical significance using t-tests and regression analyses. Lastly, we check for the robustness of our results across sub-periods within our sample and discuss the returns' practicability.

3.2. Capitalization and depreciation of intangible capital

The first step to create iHML portfolios is capitalizing R&D and SG&A expenses and adding them to the book-to-market ratio as illustrated in section 2.5.1 and section 2.5.2. We follow Li's (2022) approach to capitalize 100% of R&D expenses. Accordingly, we assume them to fully benefit the creation of an intangible asset. To avoid accounting for unrelated expenses or including too much noise, we follow Peters & Taylor (2017) in capitalizing 30% of SG&A expenses. Hence, we also assume the remaining 70% to be operating costs for the year (Peters & Taylor, 2017). For all capitalized expenses, we use a perpetual inventory method and a unified straight-line depreciation over a finite life of five years, i.e., 20% annually. Furthermore, we assume no capital stock at the beginning of our observation period.

3.3. Subsample classification

For the hypotheses (2a) and (2b), the value investing strategy is used in subdivided samples based on the firms' acquisition intensity and classification as an Old or New Economy firm. For acquisition intensity, we look at the total number of mergers and acquisitions a firm was involved in as a buyer since 2005. To classify New Economy firms, we follow Barth et al. (2023) and include firms which belong to the *Information Technology* sector and reported negative earnings in their IPO year. We consider the offer date to be indicative of the IPO date and year and define the Old Economy to include all firms which are not classified as New Economy firms. For all the above information, namely the number of acquisitions, industry classification, IPO year and reported earnings, we use Capital IQ data.

3.4. Portfolio creation

Our goal is to create a superior trading strategy based on the underlying idea of the HML factor to create portfolios. This is different from Fama and French's approach to find expected returns by expanding on the CAPM. With the goal of maximizing portfolio returns and creating a

stronger effect than B/M, we choose more extreme breakpoints than previous studies. Overall, the portfolios are created as follows.

Book-to-market and intangible-book-to-market – Hypothesis 1

Grouping all sample firms into deciles based on their B/M and iB/M ratio respectively, we sort them in ascending order and choose the highest and lowest decile to include in the HML or iHML portfolio. Thus, the value premium portfolios are created with breakpoints at the 90th and 10th percentile.

Old/New Economy and intangible-book-to-market – Hypothesis 2a

All firms in the sample are allocated to either the Old or New Economy based on the criteria described in section 3.3. Thereafter, quintiles based on the iB/M ratio are created within each of the subsamples and sorted in ascending order. Again, the highest and lowest groupings are chosen to include in the iHML portfolio, equaling breakpoints at the 80th and 20th percentile. The breakpoints allow for a more pronounced effect than the 70th and 30th percentile approach while ensuring a higher number of firms per portfolio compared to using deciles. The latter is necessary to accommodate for statistical significance given the smaller size of the subsample.

Acquisition activity and intangible-book-to-market – Hypothesis 2b

Regarding acquisition activity, firms which did not show any acquisition activity throughout the sample period are grouped as *No acquisition* firms. The remaining are divided into high and low acquisition firms based on breakpoints at the 70th and 30th percentile, respectively. The creation of iHML portfolios in each of the groups follows the quintile approach described and motivated above. As an extension to the approach outlined above, we create another portfolio based on a firm's level of goodwill instead of acquisitions.

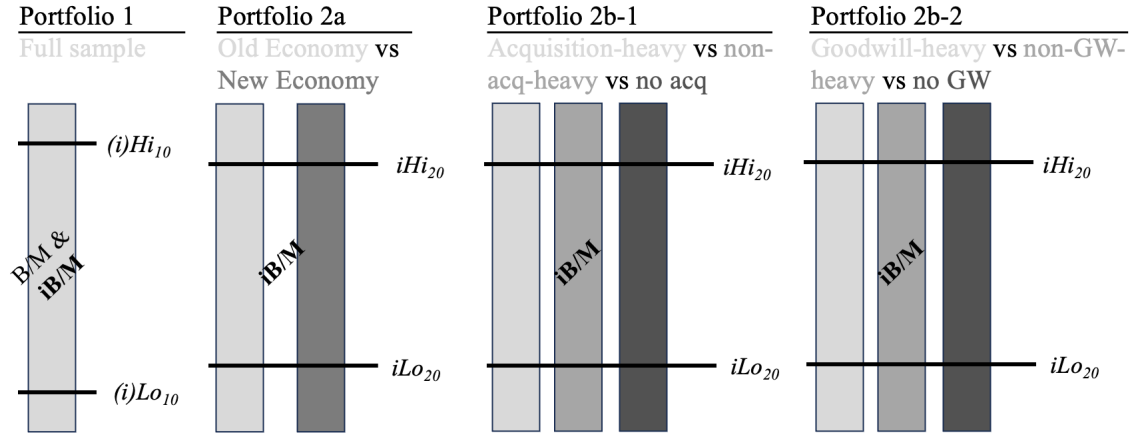

Figure 1. Portfolio creation methodology

The following steps were taken for all portfolios, regardless of size. To avoid outlier values and one-off effects impacting the results, firms whose value factors put them above the 99th or below the 1st percentile are excluded. We purposely trim rather than winsorize our results because the values are used exclusively to create portfolios. Winsorizing would include the outliers in the portfolio later and therefore make the outlier adjustment redundant.

The portfolios are rebalanced once a year based on the latest annual report data. To avoid a look-ahead bias in the historical data, rebalancing occurs at the end of March. The IFRS conceptual framework does not dictate an exact date for the publication of annual reports but requires it to be in a timely manner – in practice, companies are required to follow their countries' respective local law (IASB, International Accounting Standards Board, 2018). We chose the end of March for rebalancing based on the legal requirement for public firms in Germany to publish their financial statements within three months of year end and Germany being well represented in our sample. Whereas most studies decide to rebalance mid-year in June, our trading strategy acts immediately when newest information is available in an effort to maximize returns. To illustrate the process, financial statements data from the end of December 2005 is used to create the first portfolios held from April 2006. By the end of March 2007, the portfolios are rebalanced using financial data from the end of December 2006. This process is repeated annually ending with the last observation in March 2023.

Like previous studies, we measure the value-weighted instead of equal-weighted return of our portfolios. This is a more realistic proxy for investment opportunities as value weighted components better capture the different return behaviors of high- and low-B/M stocks (Fama & French, 1993). Moreover, we use the average annual return of all firms in our final sample as an estimate for the market return. This yields a market return of 7.0%.

4. Data

4.1. Sample selection

Our sample begins with financial statements data for the financial year 2005 and ends with market value observations at the end of March 2023. 2005 was chosen as the first year because it is the first year in which IFRS standards were widely adopted by European public firms. The initial dataset comprises a total of 4,407 publicly traded European companies. These companies were selected based on two criteria: (1) a market capitalization exceeding 25 mEUR as of September 2023, and (2) a minimum reported revenue of 10 mEUR for the fiscal year 2022. These parameters ensure a sample of firms that maintain a certain scale and maturity and operational significance within the market.

4.2. Sample modifications

We exclude firms from the financial services sector because of the difference in the structure of financial statements. Additionally, Capital IQ does not disclose R&D expenses for international financials which is why they are excluded from previous studies as well (Li, 2022). The modification results in a final sample of 3,788 firms for which we collect monthly stock prices, bringing the total number of monthly market value observations to 570,612.

Table 2. Sample modifications

Initial sample	4,407
Financial institutions	619
Final sample	3,788

4.3. Sample descriptions

This section provides a general overview of the characteristics and composition of the data sample used. Besides general sample descriptions, it is broken down into the relevant samples later used in each of the tests.

Table 3. Sample - Industry overview

Sample specification	Count (%)[7]	Median Market Cap mEUR[7]	Avg. B/M[8]	Avg. iB/M[8]	Chg (%)
Total sample	3,788	754	0.96	1.23	28%
Industrials	928 (24)	708	0.91	1.23	35%
Consumer Discretionary	559 (15)	836	1.16	1.49	29%
Information Technology	493 (13)	350	0.65	0.96	47%
Materials	338 (9)	1,384	1.14	1.42	24%
Health Care	334 (9)	967	0.50	0.73	44%
Real Estate	330 (9)	882	1.25	1.30	4%
Consumer Staples	297 (8)	737	1.13	1.49	31%
Communication Services	252 (7)	649	0.78	1.04	32%
Utilities	139 (4)	3,006	1.08	1.16	8%
Energy	119 (3)	1,416	1.19	1.34	13%

The *Industrials* sector is best represented at 24% of the total sample. On the opposite side of the spectrum, the *Utilities* and *Energy* sectors are least represented, each constituting less than 5%. The median market capitalization of the entire sample is 754 mEUR, with the highest median market capitalization found in the *Utilities* sector at 3,006 mEUR, indicating many large-scale firms. In contrast, the *Information Technology* sector has a notably low median market capitalization at 350 mEUR, suggesting the presence of small-cap, and potentially young tech firms, or start-ups. The traditional book-to-market and the iB/M ratio provide different valuation perspectives. For instance, the *Real Estate* sector has a B/M ratio of 1.25, which increases only to 1.30 when adjusting for intangible capital. This implies that R&D and SG&A expenses have a low impact on valuations in this sector. In contrast, sectors like *Information Technology* and *Health Care* show a notable spread between the B/M and iB/M (+44% and +47%, respectively), suggesting that intangible investments would significantly alter book values in these sectors.

[7] As of September 2023
[8] Average across all sample periods

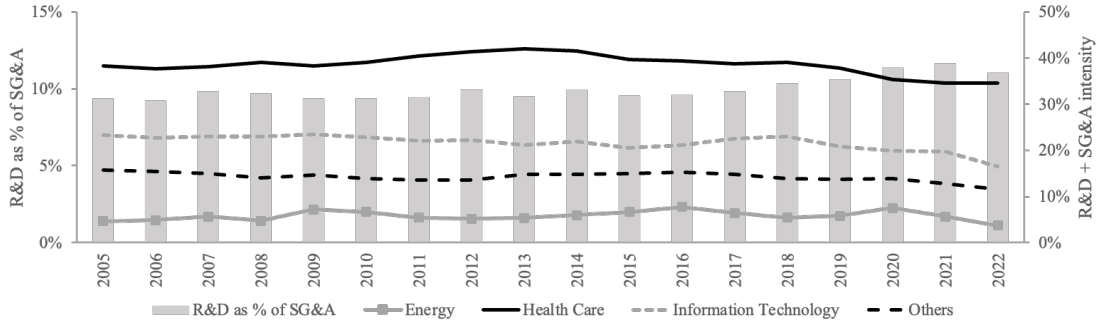

Figure 2. R&D and SG&A intensity

Overall SG&A and R&D intensity[9] have remained relatively stable throughout our sample period. The *Health Care* and *Information Technology* sectors stand out with an average of 39% and 21%, respectively. On the lower end, the *Energy* sector reaches an average of barely 6%. All other industries illustrate an approximately equal level circling around 14%. Most of the intensity stems from SG&A, R&D adds up to barely 10% of SG&A, albeit with a slightly increasing trend and both negative (0% in both *Real Estate* and *Utilities*) and positive spikes per industry (66% in *Information Technology* and 36% in *Health Care*). Singling out the components, SG&A intensity stands at circa 12% and R&D intensity at 1.2% respectively. In comparison, the EU27 average R&D intensity according to the OECD stands at approximately 2% (OECD, 2023).[10]

Table 4. Sample - Country overview

Sample specification	Count (%)[7]	Median Market Cap mEUR[7]	Avg. B/M[8]	Avg. iB/M[8]
Total sample	3,788	754	0.96	1.23
United Kingdom	588 (16)	795	0.72	0.97
Sweden	373 (10)	903	0.61	0.85
Germany	369 (10)	422	0.73	1.02
France	346 (9)	349	0.89	1.27
Turkey	331 (9)	835	0.96	1.13
Italy	235 (6)	69	1.07	1.37
Poland	181 (5)	459	0.98	1.20
Other	1,365 (36)	813	1.20	1.47

The United Kingdom is the most represented country in our sample, accounting for 16% of all firms. However, a significant proportion (36%) is clustered as *Other*, which illustrates sample's regional diversity, with many countries amounting to less than 5% of the total sample. The book-to-market measure and its change when adjusted for intangible capital varies across countries. Overall, countries with strong economies (e.g., UK, Sweden, Germany) show a lower B/M and iB/M ratio than less robust economies (e.g., Italy & most countries in Other).

[9] Calculated as the sum of R&D and SG&A expenses divided by sales.
[10] Note: The slight difference in R&D intensity most likely stems from two sources: (1) Deficiencies in the R&D reporting figures in Capital IQ, and (2) our sample including public firms only.

Table 5. Sample - Old and New Economy overview

Sample specification	Count (%)[7]	Median Market Cap mEUR[7]	Avg. B/M[8]	Avg. iB/M[8]	(%Chg.)
Total sample	3,788	754	0.96	1.23	28%
New Economy	138 (4)	250	0.58	0.85	47%
Old Economy	3,650 (96)	779	0.97	1.24	28%

Unsurprisingly, New Economy firms being a subset of all *Information Technology* companies, they display a comparably low median market capitalization at 250 mEUR. They constitute 4% of the overall sample, meaning that 28% of *Information Technology* firms belong to the New Economy. The average B/M ratios suggest Old Economy companies have a relatively cheaper valuation than New Economy companies. This observation remains stable with the iB/M ratio.

Table 6. Sample - Acquisition activity overview

Sample specification	Count (%)[7]	Median Market Cap mEUR[7]	Avg. B/M[8]	Avg. iB/M[8]	Median Deal count
Total sample	3,788	754	0.96	1.23	4
High acq. activity (>70th pct)	901 (24)	2,942	0.78	1.00	23
Medium acq. activity (mid 40%)	1,203 (32)	561	0.90	1.23	7
Low acq. activity (<30th pct)	901 (24)	441	1.08	1.37	2
No acquisitions	783 (20)	489	1.22	1.45	0

A total of 3,705 companies in the sample acted as buyers in M&A transactions at least once since 2005.[11] A clear trend between high acquisition activity and median market capitalization is observable, albeit becoming less pronounced with fewer acquisition activity. Acquisition active companies further display on average low B/M and iB/M ratios at 0.78 and 1.00 respectively. Both figures grow as acquisition activity decreases and reaches 1.22 and 1.45 respectively for firms with no acquisition activity.

5. Results

The following section describes the results of the previously introduced portfolios applied to the respective subsamples. After starting out with a general results overview, t-tests and (multiple) regressions are used to illustrate which portfolios yield statistically significant returns in excess of other strategies and the market. Ultimately, the results lead to a rejection or acceptance of the hypotheses stated.

[11] The number of acquisitions is based on disclosed data from the databases Capital IQ and Mergermarket. The figures reflect the total number of acquisitions a firm has been involved in as a buyer during the sample period, 2005-2023. Acquisitions of minority shares are excluded from the sample.

5.1. Results overview

Table 7. Overview of observed results based on section 3.4

Portfolio Return	Monthly n=204		Annualized n=204	
Portfolio specification	μ	σ	μ	σ
Total sample	0.6%	0.04	7.2%	0.14
Hi_{10}	1.9%	0.08	22.8%	0.29
Lo_{10}	0.7%	0.04	8.4%	0.14
HML	1.2%	0.08	14.4%	0.28
iHi_{10}	2.2%	0.09	26.4%	0.31
iLo_{10}	0.8%	0.04	9.6%	0.14
iHML	1.4%	0.09	16.8%	0.30

To begin with, we turn our attention to the traditional B/M approach (Table 7). Strategically investing in the top and bottom deciles proves to be beneficial. Our results highlight an average annual return (calculated based on monthly returns) of 14.9% to the HML strategy.[12] Investing into the top B/M decile only even yields an average return of 22.8%. This result stands out especially considering the average market return being 7.0% per annum. Thus, we cannot confirm Arnott et al.'s (2021) observation of a severe drawdown of the B/M effect. This is likely due to slightly different trends in European firms, our longer observation period and the more extreme portfolio breakpoints chosen.

Moving on to the iB/M portfolio, its return exceeds that of the traditional B/M Hi_{10} portfolio (Table 7). The iHML strategy generates an average return of 16.8% annually. When compared year-on-year, it exceeds the returns of the HML portfolio by 2.4%. Looking deeper into the portfolio components, the highest decile stands out by delivering an average return of 26.4%. This figure not only outperforms the market portfolio's returns but also the iHML strategy's performance, underscoring its potential as a lucrative investment avenue.

Table 8. Old & New Economy - observed results

Portfolio Return	Monthly n=204		Annualized n=204	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
New Economy	2.4%	1.5%	28.8%	18.0%
Old Economy	1.7%	0.6%	20.4%	7.2%

Applying the investment strategy in niche segments, we turn our attention to Old and New Economy firms as described in section 3.4. For New Economy firms, the portfolio based on firms in the top iB/M quintile achieved an annual return of 28.8%. However, even the firms that ranked in the bottom 20% showed strong returns of 18.0%. To put this into perspective, these results indicate an outperformance of the market by 21.8% and 11.0% respectively. For

[12] If not otherwise stated, we use the "average annual return" derived from monthly returns and "return" interchangeably.

the Old Economy, the stocks included in the top quintile yield a return of 20.4% whereas those in the bottom quintile showcase a return of 7.2%. These findings underscore the differential investment potential inherent to both Old and New Economy firms when these strategies are applied (Table 8).

Table 9. Acquisition activity - observed results

Portfolio Return	Monthly n=204		Annualized n=204	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High acquisition activity	0.5%	0.4%	6.0%	4.8%
Low acquisition activity	1.7%	0.6%	20.4%	7.2%
No acquisition activity	2.3%	0.8%	27.6%	9.6%

When shedding light onto companies with frequent M&A involvement as a buyer, the outcomes are not as clear. The subsample of highly acquisition active firms yielded a return of 6.0% and 4.8% in the top and bottom quintile of iB/M ratios, respectively. This indicates a performance lower than the market return in both cases. In contrast, the return metrics shift for companies with low to no involvement in M&A transactions as buyers. Low acquisition-active firms generated a return of 20.4% and 7.2%, again for the top and bottom quintile of iB/M ratios, respectively. The effects are even clearer for firms with no acquisition activity at all by yielding returns of 27.6% in the top iB/M quintile 9.6% in the bottom iB/M quintile (Table 9).

Table 10. Goodwill intensity - observed results

Portfolio Return	Monthly n=204		Annualized n=204	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High Goodwill intensity	0.9%	0.7%	10.8%	8.4%
Low Goodwill intensity	1.2%	0.5%	14.4%	6.0%
No Goodwill	2.8%	1.1%	33.6%	13.2%

Finally, looking into the goodwill intensity factor, we can see that the *iHi_{20} (iLo_{20})* portfolio applied to firms with a high goodwill intensity reports annual returns of 10.8% (8.4%). Firms with a low goodwill intensity generated slightly higher returns in the top quintile at 14.4% but lower performance in the bottom quintile at 6.0%. In contrast, companies without any goodwill showed superior performance by achieving annual returns of 33.6% and 13.2% for those in the top and bottom iB/M quintile, respectively. These variances, especially when compared with the overall sample return of 7.0%, highlight the complex connection between M&A activity, goodwill intensity, and their implications for stock price returns (Table 10).

5.2. Tests of statistical significance

The following two subsections employ statistical methods to test the significance level at which the defined portfolios per sample and subsample outperform one another. Section 5.2.1 describes and interprets the results of statistical t-tests comparing the returns of respective

portfolios and subsamples to one another. Section 5.2.2 employs multiple regression analyses to regress portfolio returns against common measurements of risk and expected return. Ultimately, the tests lay the foundation to a rejection or confirmation of the hypotheses formulated in section 2.7.

5.2.1. T-test results for (sub-) sample portfolios

For the full sample, both the Hi_{10} and iHi_{10} portfolio generate returns that surpass the market at a very strong level of statistical significance[13]. The significant outperformance against the market fades when employing a normal HML_{10} strategy. In contrast, when employing an $iHML_{10}$ strategy the significant outperformance of the market persists, albeit with a weak level of statistical significance. Bolstering this observation is that for both, B/M and iB/M, the top decile distinctly outshone the bottom decile (not depicted in table) with a strong level of significance. Finally, the $iHML_{10}$ portfolio outperforms the HML_{10} portfolio by 3.32% annually at a weak level of significance.

As a result, we confirm hypothesis 1. The iHML premium, on a monthly return basis, outpaces the conventional value premium. Equally, an intangible-adjusted long-only strategy outperforms its tangible counterpart. The currently level of significance is likely to increase when repeating the study with more observation years in the future. Additionally, our results echo the sentiment of subdued effects relative to US markets which will be further discussed in section 6.1.

Moving on to Old and New Economy entities, we test whether intangible-adjusted value investing yields significant superior returns for New Economy firms. A portfolio of New Economy firms in the highest value quintile outperforms the same portfolio consisting of Old Economy firms. However, this seems to be the case not because of the iB/M ratio being a superior proxy for this segment but because New Economy firms create generally higher returns. When comparing the returns of the top and bottom iB/M quintile within New Economy firms, there is no observable significant outperformance of either side. Consequently, the t-test provides no support for H2a, meaning there is no indication for value investing strategies to perform significantly better in New Economy firms. However, some nuances of this observation need deeper understanding - for example with regards to why the rather high yearly outperformance has a high standard error. Beyond the complexities tied to R&D accounting, another plausible factor influencing this outcome could be the portfolio's limited scale. Especially the New Economy sample is small at 138 firms, and the according portfolios encompass a comparably low number of firms, which harms their coverage of market dynamics and consequently their statistical significance.

[13] Written, we use following phrasings for statistical significance interchangeably to the p-values: *weak statistical significance, **strong statistical significance, *** very strong statistical significance.

Table 11. Overview of T-Test results.

This table illustrates the performance of portfolios relative to each other for the full sample period, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi10* portfolio exceeded the performance of the full market portfolio by 16.10%. The symbols denote statistical significance at the *10%, **5%, and *** 1% level, respectively. The colors are added as an immediate illustration of the significance level, with red and green symbolizing under- and overperformance respectively at the 5% or 1% level.

Annualized Monthly Returns

Outperformance	Market	B/M Hi_{10}	B/M HML_{10}	iB/M Hi_{10}	iB/M HML_{10}	Old Hi_{20}	Old Lo_{20}	New Hi_{20}	New Lo_{20}
Market	-								
B/M Hi_{10}	16.10%***	-							
B/M HML_{10}	7.87%	-8.26%***	-						
iB/M Hi_{10}	19.68%***	3.59%*	11.85%***	-					
iB/M HML_{10}	11.15%*	-4.94%	3.32%*	-8.53%***	-				
Old Hi_{20}	7.22%**	-8.88%**	-0.62%	-12.46%***	-3.93%	-			
Old Lo_{20}	-0.36%	-16.45%***	-8.19%	-20.04%***	-11.51%*	-7.57%**	-		
New Hi_{20}	22.37%***	6.27%*	14.53%	2.69%	11.22%	15.15%***	22.72%***	-	
New Lo_{20}	10.42%	-5.68%	2.58%	-9.26%	-0.73%	3.20%	10.77%	-11.95%	-

Outperformance	Market	B/M Hi_{10}	iB/M Hi_{10}	High M&A Hi_{20}	High M&A Lo_{20}	Low M&A Hi_{20}	Low M&A Lo_{20}	High GW Hi_{20}	Low GW Lo_{20}
Market	-								
B/M Hi_{10}	16.10%***	-							
iB/M Hi_{10}	19.68%***	3.59%	-						
High M&A Hi_{20}	-1.34%	-17.44%***	-21.44%***	-					
High M&A Lo_{20}	-1.76%	-17.85%***	-21.85%***	-0.41%	-				
Low M&A Hi_{20}	13.41%**	-2.69%	-6.27%	14.75%**	15.17%**	-			
Low M&A Lo_{20}	0.65%	-15.45%**	-19.04%***	1.99%	2.40%	-12.69%**	-		
High GW Hi_{20}	4.04%	-12.05%**	-15.64%***	5.39%*	5.80%*	-9.37%**	3.40%	-	
Low GW Lo_{20}	6.99%*	-9.10%*	-12.69%**	8.33%**	8.75%**	-6.42%	0.66%	-2.95%	-

Table 12. Hypothesis results

Hypothesis 1 *(iHML > HML)*	**Supported**
Hypothesis 2a *(New Ec. > Old Ec.)*	**Rejected**
Hypothesis 2b *(High GW & acq, < Low GW & acq.)*	**Supported**

Looking at the subsample consisting of low M&A acquisition-activity, the iHi_{20} portfolio generates superior returns with a strong level of statistical significance. The trend persists for firms that have not engaged in any documented M&A transactions. However, in this case the outperformance is only significant at a low level. The low level of significance can potentially be attributed to the Capital IQ data not differentiating between zero reported acquisitions and undisclosed activities. We expect the number of those cases to be low but cannot securely detect and exclude them. Regardless, comparing the respective portfolios with the market return supports our findings since only the iHi_{20} portfolios for companies with no and low acquisition activity were able to outperform the market significantly.

Conversely, the iHi_{20} portfolio fails to generate any superior return for frequently acquiring firms – which supports H2b. This observation underscores that the iB/M strategy finds its most fertile ground amongst companies characterized by limited M&A transactions, indicating that higher levels of acquired goodwill and acquisition activity may indeed weaken the returns of the intangible adjusted strategy and potentially value investing strategies in general.

Further supporting our findings is our investigation into firms categorized by their goodwill intensity —a metric intrinsically tied to M&A transactions which result in goodwill. We were able to find similar results by using a goodwill intensity metric.

5.2.2. Regression analysis

The purpose of the following linear and multiple regression analysis is to observe the abnormal returns of our designed portfolios when testing for the influence of generally accepted measurements of expected return.

To test the resilience of our findings in the face of standard risk metrics, we employed both one factor and multifactorial regression analyses. Our approach was inspired by the Fama-French three-factor model (1993), targeting both the SMB effect and the book-to-market dynamics (HML). Furthermore, to test for a broader range of influences, we incorporated momentum as an additional fourth factor as suggested by Carhart (1997).

$$R_i(t) = a_i + R_f(t) + \beta_i \left(R_m(t) - R_f(t)\right) + c_i SMB(t) + d_i HML(t) + f_i * (WML) + e_i(t) \qquad (1)$$

The equation (1) is based on Fama and French (2012). Here, $R_i(t)$ represents the expected return for any given asset *i* in period *t*. $R_f(t)$ is the risk-free rate, and $R_m(t)$ is the market return. $SMB(t)$ captures the size- and $HML(t)$ the value premium. Lastly, $WML(t)$ represents the momentum

factor (Winners-Minus-Losers), highlighting the differential in monthly yields between the preceding year's losers and winners.

Table 13. Overview of (multiple) regression results

	Annualized Monthly Abnormal Returns			
	Market	CAPM	Fama French 3 Factors	Fama French 4 Factors
B/M Hi_{10}	17.26%***	11.84%**	11.93%**	11.95%**
B/M HML_{10}	15.05%**	13.72%*	13.74%**	13.76%**
iB/M Hi_{10}	21.00%***	18.11%**	18.43%***	18.43%***
iB/M HML_{10}	18.97%**	15.82%**	16.23%**	16.22%**
Old Hi_{20}	6.40%*	0.82%	1.77%	1.80%
Old Lo_{20}	0.08%	-3.97%**	-4.01%**	-4.02%**
New Hi_{20}	21.02%***	15.06%*	17.87***	17.88%***
New Lo_{20}	10.12%	4.81%	4.80%	4.81%
High M&A Hi_{20}	-3.35%	-8.87%**	-7.76%***	-7.74%***
High M&A Lo_{20}	-1.66%	-5.77%***	-6.03%***	-6.04%***
Low M&A Hi_{20}	12.61%**	7.50%	9.13%	9.19%
Low M&A Lo_{20}	0.16%	-4.68%	-4.34%	-4.36%
High GW Hi_{20}	3.11%	-2.22%	-0.89%	-0.85%
Low GW Lo_{20}	3.98%	-1.60%	-0.36%	-0.32%

Portfolio returns are linearly regressed against the market return and CAPM (using a stock's 1-year weekly beta). A multiple regression was used for the Fama-French 3 (CAPM, HML, SMB) and 4 (+MOM) factor models. The symbols denote statistical significance at the *10%, **5%, and ***1% level, respectively.

Owing to the majority of European countries being EU members or at least largely engaging in the EU's market, the ECB deposit rate was employed as an estimation for the risk-free rate (ECB, 2023), in line with Fama & French's (2012) methodology. Equally, size and value premiums were replicated using the same methodology as Fama and French in terms of breakpoints and unadjusted B/M ratios. In this delineation, firms exceeding the 90th percentile of the sample's market capitalization as of March 31st, 2023, were categorized as 'big stocks' and those under the 10th percentile were categorized as 'small stocks'. It is noteworthy that our analyses didn't reveal a significant yield differential between these portfolios. A plausible explanation might be our exclusive focus on firms with a market capitalization of at least 25 mEUR as of September 2023.

For the value premium, the breakpoints were chosen based on the traditional B/M ratio's 70th and 30th percentile, respectively. Again, the determination of the B/M ratios relied on available market data as of March 31st annually (Fama & French, 2012). The book values were always sourced from the previous calendar year's annual report. A noteworthy observation here is the consistent outperformance of the Hi_{30} portfolio over the Lo_{30} counterpart, averaging a monthly margin of 0.6%.

In framing the momentum strategy, we structured portfolios based on their 12-month returns, always gauging from the first day of April. Deviating slightly from Fama and French's (2012) approach, our portfolio rebalancing occurred annually, mirroring the once-a-year adjustment frequency of our strategic portfolio (iHML). However, the momentum effect did not display a

significant effect on the stock price return in our sample. This phenomenon can likely be attributed to momentum strategies having encountered two major crashes over the study period, namely the financial crisis from 2007-08 and the Covid-19 crisis in 2020-21 (Barroso & Santa-Clara, 2015).

To begin our analysis, we undertook a standard HML portfolio examination, focusing on the top 10%, counterbalanced by the bottom 10%, using the market return as our primary independent variable, evaluated on a monthly cycle. Since we are mainly interested in finding a superior trading strategy, we will also look at the long-only portfolio which seems to yield higher return as we pointed out in section 5.1. Nevertheless, any finding in the HML analysis bolsters our results when investment is concentrated solely in the high portfolio.

From this analysis we can see that the HML_{10} portfolio generated an annual outperformance of over 11% per year at a strong to very strong level of significance, regardless of the risk measurement. The HML_{10} portfolio exceeded the risk adjusted returns and generated a significant annual outperformance of circa 15%.

Transitioning to our $iHML_{10}$ trading approach, a more pronounced abnormal return was discerned with 18% abnormal return per year at a strong to very strong level of significance. In this case also we were able to see that the abnormal returns of the $iHML_{10}$ portfolio are still higher than the traditional one but, in this case, lower than those generated by a long-only portfolio. This result indicates that the iB/M is more effective in predicting stocks that outperform but maybe less effective in predicting stocks that underperform.

Our analysis, centered around the CAPM anticipated return for the companies included in the portfolio. Here, the conventional HML_{10} portfolio managed to surpass the anticipated return, with a strong level of significance. Also, the $iHML_{10}$ approach generated a notable outperformance of 18.1% per year, by a high significance level after we controlled for CAPM risks.

We also subjected the $iHML_{10}$ approach to the standards of the Fama-French-3-Factor-Model (1993). Notably, we incorporated the SMB factor — even in the absence of overt significance — theorizing that its inclusion might enhance the depth and relevance of our findings, particularly if effects with other factors were in play. Even after weaving in these control variables, an outperformance rate of 18.4% per year surfaced, buttressed by a strong level of significance.

In a further stage of our analysis, we also included the momentum factor, WLM, as an additional control variable. Although it does not showcase a significant impact in our sample, the factor was included due to major research attributing a potential effect to it (Bernard & Thomas, 1989; Liu & Zhang, 2014). Intriguingly, in this scenario, we match the abnormal return in comparison with the 3-Factor-Model, recording an outperformance of 18.4% per year, accompanied by a very strong significance level.

From our regression analysis, we garnered supporting evidence to accept our hypothesis H1. This suggests that when adjusted for intangible assets, the B/M ratio yields enhanced returns, even when considering specific risk metrics.

When examining H2a, we find support for our hypothesis from the regression analysis. While the risk adjusted abnormal return for the portfolio of Old Economy firms is not significant the Hi_{20} portfolio of New Economy firms outperformed the risk adjusted portfolios at a very strong level of significance. What is interesting to mention is that the underperformance of companies in the Lo_{20} portfolio of the Old Economy subsample is significant. Nevertheless, we cannot confirm whether this development is based on the iB/M ratio or on a general underperformance of Old Economy stocks.

Turning our attention to hypothesis H2b, we cannot conclusively accept the hypothesis that firms with low acquisition activities consistently generate abnormal returns when applying an intangible book-to-market metric. Nevertheless, the analysis spotlights a tendency for corporations engaged in many acquisition or M&A activities to lag behind the anticipated return at a high level of significance — a trend that remains consistent across CAPM, 3-factor, and 4-factor models, and is underscored by strong levels of significance. Furthermore, it seems that goodwill intensity is not correlated with abnormal returns in any way, which is interesting since deal count is highly correlated with goodwill intensity, but it seems to have different effects.

In summary, the regression analysis supports H2b in the sense that companies with low M&A activities outperform those with high M&A activities and we are able to generate abnormal returns with the iB/M strategy especially in companies with low M&A activities.

5.3. Robustness across time

In our assessment, we examined the annualized returns of various investment portfolios, with details provided in Appendix C. Our evaluation is structured into three distinct intervals: 2006-2011, 2011-2017, and 2017-2023. It is noteworthy that across all periods, portfolios built based on the intangible adjusted book-to-market ratio consistently outperform those based on the traditional book-to-market ratio. An additional observation is the low efficacy of both strategies when applied during the latest time frame from 2017-2023.

Turning our attention to the performance relationship between firms classified under the New and Old Economy sectors, we see that post-2017, the iB/M approach has not yielded favorable results for Old Economy firms. This observation presents a stark deviation from previous trends. Furthermore, in exploring the dynamics of mergers and acquisitions activity and the role of goodwill intensity, our data reinforces the initial results that the iB/M strategy tends to thrive in a context of low or no acquisition activity. The empirical evidence is compelling, showing that scenarios with no acquisitions and low or lower goodwill intensity consistently produce favorable outcomes across all investigated time frames.

Our examination of the robustness shows that the t-tests, indicates that there is no statistically significant evidence to suggest that the Hi_{10} and strategy iHi_{10} consistently underperformed the market across various time frames. Moreover, while the iHi_{10} strategy demonstrates a tendency to outperform the Hi_{10} in every time interval considered. Likely, it is merely the small sample size that hinders the results from being statistically significant.

Delving into the specific differences between Old and New Economy firms reveals a more complex scenario. Particularly in the New Economy sector, it is evident that the effectiveness of the strategy varies across different periods, aligning with our preliminary notion that the iHi_{20} strategy does not universally apply to firms in this sector. As for entities engaging in high volumes of mergers and acquisitions, companies with higher iB/M ratios modestly outperformed those with lower ratios, albeit at a comparably low margin as opposed to entities with less M&A activity. Additionally, M&A activity apparently offers a more conducive setting for illustrating the comparative advantage of the iB/M strategy as opposed to goodwill intensity. This is supported because goodwill intensity, in shorter time spans, does not yield statistically significant results, thereby underscoring our initial observation that the iB/M strategy's efficacy is more pronounced in certain contexts.

In the regression analysis to identify abnormal returns, our results are clearer in the initial two intervals studied. During these phases, the Hi_{10} portfolio demonstrates a marginal and statistically significant ability to outstrip the market, though it fell short when it came to surpassing risk-adjusted expected returns. In contrast, the iHi_{10} portfolio exhibited robust abnormal returns that were both higher and more significant across all time frames analyzed.

Parallel to the findings from t-test assessments, the regression analyses also intimate that the pursuit of abnormal returns among New Economy firms via the iHi_{20} portfolio is not consistently reliable across shorter temporal spans. We are also able to see that the iHi_{20} portfolio does not seem to hold within a sample of companies characterized by a high volume of acquisition activity.

5.4. Long-term returns and compound effects

Albert Einstein is often claimed to have labeled compound interest as the eighth wonder of the world. It is not officially confirmed whether he said this, but we take the fact that it is even debated as an indication for its relevance. Because indeed, compound interest becomes increasingly more powerful, the longer the investment horizon. It makes seemingly small differences in annual returns multiply and increase in spread. To evaluate our strategy's long-term compounded performance, a retrospective analysis was conducted to compare the performance of our iHi_{10} against the traditional Hi_{10} portfolio and the market return over our full sample period.

The analysis from 2006 to 2023 reveals a robust pattern of outperformance by both the Hi_{10} and iHi_{10} portfolios relative to the market. The resilience and superior performance of these portfolios became particularly evident during the financial crisis around 2008, a period during which the broader market struggled to recuperate. Even when isolating the data from 2012 to 2023, thus excluding the volatile years of 2006 to 2011, the high iHi_{10} portfolio maintained a lead over its counterparts, albeit to a somewhat lower extent. This consistent outperformance across varied market conditions, underscores the potential efficacy of the high iB/M strategy for those seeking long-term investment opportunities.

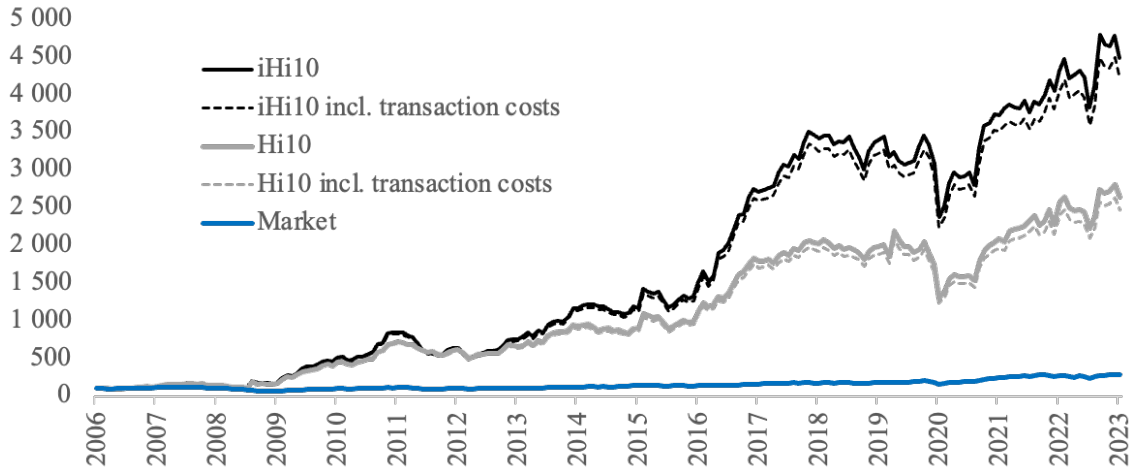

Figure 3. Compound results of investment over full sample period

To show the strategy's ability to generate superior returns in a real-world setting, we extended our initial tests by adding transaction costs for our analysis of the Hi_{10} and iHi_{10} portfolio. The initial iHi_{10} portfolio in 2006 consists of 155 firms and has consistently grown to include 333 entities in April 2023. This expansion is due to a singular company screening in 2023 – only firms publicly traded then are included in the sample at all, meaning all companies which were included in the sample in 2006 are still included 17 years later. On average, the iHi_{10} portfolio experienced an annual influx of 93 stocks and the exit of 75. Over the entire sample period, this equates to an average rebalancing quota of 35%, meaning 35% of portfolio companies are traded annually. This implies a considerable degree of stability with the majority of assets consistently retained year over year. In line with prior research, we opted for annual truncation costs of 0.5% per trade, meaning each sale and purchase (Beraldi, Violi, Ferrara, Ciancio, & Pansera, 2021). The average transaction costs over the entire portfolio are usually lower given that more than 50% of portfolio stocks are rarely exchanged in any given sample year. We neglect any possible transaction costs incurred when investing in the market.

6. Discussion

The following sections discuss the results of our study attempting to create a superior value investing strategy and contextualize them by integrating prior research. We start with a short recap of the study's goals, including underlying assumptions and approaches to the creation of iB/M ratios and the associated portfolios. Thereafter sections 6.1, 6.1.1. and 6.1.2. discuss our results from various angles before the practical usefulness of these value investing strategies is discussed for different kinds of investors in section 6.2. Finally, section 6.3. contributes to the literature on accounting standard setting by discussing the implications of our results in the context of IFRS accounting for intangible asset investments.

Following a drawdown in the performance of Fama and French's value premium built on the classification of firms as *value* or *growth* stocks, various research has attempted to reverse the development by adjusting the B/M ratio for intangible assets. In doing so, the iB/M ratio was illustrated to be a better predictor for expected returns than the traditional metric. However, previous research has exclusively focused on the cross-section of expected returns – in other

words: previous research has replicated Fama and French's original study, used more recent data samples, and adjusted the HML premium for intangible assets. In contrast to previous studies aimed at deriving expected returns, our approach focuses primarily on using the iB/M ratio to generate maximum returns in excess of the market.

In this vein, our research creates an intangible book-to-market ratio which augments the conventional B/M by fully capitalizing R&D expenditures and partially (30%) capitalizing SG&A expenses. Our results suggest that it is possible to create a superior value investing strategy using an intangible-adjusted B/M ratio to form iHML portfolios with more extreme breakpoints than the traditional Fama-French model. At the same time, the return of the iHML portfolio's long side contributes more positively to the overall return than the short side. This is a universal observation valid across all subsamples and over the entire sample period from 2005 to 2023. Hence, we suggest a long-only strategy over the use of the HML factor with extreme breakpoints. This posits an advantage of the strategy for investors with limited resources, operating with a long-only constraint (Li, 2022). The effect is more pronounced in certain segments which is why we suggest applying the strategy in the following niches: *No and low Goodwill firms and no and low number of acquisitions firms.*

6.1. Performance of the iB/M ratio in Europe

Before jumping into the discussion of our results, we compare them to the most extensive study that has been conducted on the iHML premium's performance. As described in section 3.2, Li (2022) adjusted the B/M ratio for intangible assets in a similar manner to us and then replicated Fama and French's study of the HML portfolio returns by using the same breakpoints. She was the first to also include European firms, subdivided into Continental Europe and the UK, in her sample and therefore closest to our study. In applying the same breakpoints to our study and comparing the results, we get meaningful insights as illustrated in table 7. For the two decades leading up to 2020, Li (2022) found an average annual outperformance of 0.84% of the iHML over the HML portfolio, the majority of which was achieved from 2010 onwards. Observing the latter period for Continental Europe exclusively, she found an overall negative performance of both (HML & iHML) portfolios but a reinforced superior return of the intangible-adjusted version.

Regarding the iHi_{30} portfolio, we find a substantially lower average return than Li found for the US since 2000 (7.90% vs. 11.04% / 12.00%). The more pronounced effect in the US aligns with our expectations for two reasons – firstly, US Gaap's full expensing of all R&D costs and secondly, Li's (2022) sample ending in 2019 just before returns were negatively impacted by the Covid-19 crisis. The same theme can be observed for her findings on the European market, albeit to a less extreme extent. We consider this to be due to her sample ranging from 2010 to 2019, and thereby a long-standing bull market which cuts out the financial crisis in the beginning (2008) and the Covid-19 crisis in the end (2020). Ultimately, we believe that the observed returns being higher in the US – arguably due to the difference in accounting regulation – provides two insights. First, our data sample generates returns in line with expectations and at a slightly lower level than the US. And secondly, we believe it is an

indication that an investing strategy using more extreme breakpoints would work even better in firms reporting under US Gaap.

Table 14. Comparison of value premium returns in the US and Europe

Portfolio returns with breakpoints at the 70th and 30th percentile.									
	iHML based on R&D + Organizational Capital								
	iHML	**HML**	**iHML-HML**	**iHi_{30}**	**Hi_{30}**	**iHi-Hi**	**iLo_{30}**	**Lo_{30}**	**iLo-Lo**
US firms (2000 - 2019) – (Li, 2022)									
Average return (%)	3.48	2.64	0.84	11.04	10.32	0.72	7.44	7.68	-0.24
US firms (2010 - 2019) – (Li, 2022)									
Average return (%)	-2.16	-3.36	1.20	12.0	10.92	1.08	14.04	14.28	-0.24
Continental Europe (2010 - 2019) – (Li, 2022)									
Average return (%)	-0.36	-3.12	2.76	8.64	6.84	1.80	9.00	9.96	-0.96
Europe (2006 - 2023) – (Grawe & Thomsen, 2023)									
Average return (%)	1.98	1.58	0.40	7.90	7.53	0.37	5.93	5.95	-0.02

After this initial comparison, the following discussion focuses exclusively on our results. Juxtaposing the iHML strategy and the iHi_{10} portfolio against their unadjusted counterparts, both demonstrate a positive edge at a weak level of significance. This subtle outperformance is sufficient to confirm our first hypothesis (H1). But it contrasts with findings from other research, notably Li (2022) where an intangible adjusted book-to-market approach manifested a more significant market outperformance. Two plausible explanations emerge for the apparent deviation. Firstly, as we highlighted in section 4.2, our analysis faced the constraint of an incomplete view of R&D expenditure; a substantial portion of companies in our sample chose not to disclose them. Secondly, the accounting norms differ markedly when one compares Europe with the US, particularly under US GAAP, which mandates the full expensing of R&D, a practice not universally mirrored in Europe. Drawing from this rationale, one could infer that in the European context, capitalized R&D expenditures are held in esteem by investors and possibly factor into their valuation models which is not the case in the US (Franzen & Radhakrishnan, 2009). Furthermore, our sample is limited to the period of 2006-2023 since IFRS as a standard for European firms was adopted from 2005.

In the real world, fund managers could use the iB/M ratio as a useful tool in constructing and rebalancing investment portfolios. It offers a lens through which to find the hidden value of firms' intangible assets, potentially enabling a more profitable allocation of funds that aligns with long-term value creation. For investor relations the intangible assets and their role in value creation can be a key differentiator in a crowded market. By articulating how intangible assets contribute to a firm's competitive edge and financial prospects, investor relations professionals can foster a more nuanced understanding of firm value among investors and analysts.

6.1.1. Performance in the Old and New Economy niches

The exploration into our strategy's performance for Old and New Economy companies yields very interesting insights. When looking at Old Economy firms, the iHi_{20} strategy's efficacy

appears limited. Instead, the iHi_{20} approach demonstrates its strength among New Economy firms, particularly when comparing its returns to risk-adjusted measures derived via the CAPM and the FF3F-Model. A portfolio composing the top iB/M quintile of New Economy companies stands out by outperforming both the market and its Old Economy counterpart at a very strong level of statistical significance. However, as described in section 5.2, the outperformance stems primarily from New Economy firm's higher general returns irrespective of which iB/M quintiles are considered. This leads us to a nuanced stance regarding Hypothesis 2a. The evidence does not lend support to a clear-cut confirmation or rejection of the hypothesis. On the one hand, we observe an absence of significant outperformance across parts of the strategy not adjusted for a niche (i.e., normal iHi_{10}); on the other, it's evident that the occurrence of abnormal returns emerges primarily within the New Economy subset.

The implication here is profound: a better and more granular understanding of accounting practices within New Economy firms may be the keystone for an augmented trading strategy. Our study posits that refining the metrics that differentiate the prospects of success and failure within this sector could revolutionize investment methodologies.

However, there are limitations to the implications drawn for the strategy in Old and New Economy firms. Admittedly, the analysis is limited to entities that are publicly listed as of September 2023. This inadvertently excludes all firms that filed for bankruptcy since 2005, despite them having been publicly listed at some point during the sample period and probably also classified as New Economy. Especially those firms, defined as reporting negative earnings in their IPO year, this potentially excludes entities with recurring negative and below-average returns, ultimately inflating the observed returns. Upon acknowledging this limitation, we find fertile ground for further inquiry. Two research avenues appear particularly promising to adjust for the survivorship bias. First, utilizing a more detailed dataset including firms which filed for bankruptcy at some point during the observation period – thereby adjusting for survivorship bias. Secondly, exploring the adaptability of the iB/M strategy to incorporate factors related to the probability of a firm's survival or failure.

Moreover, New Economy firms as such are characterized by growth and constant investments. Evidently, they are a subset of the *Information Technology* sector and have an average growth from B/M to iB/M ratio of 33% (compared to 26% in Old Economy). Logically, one would assume all New Economy firms are growth stocks, and the application of a value investing strategy might be the wrong overall approach. This limitation is further illustrated when considering the findings on value relevance in New Economy firms as discussed by Barth et al. (2023). The most value relevant accounting items for today's New Economy firms are cash flow and earnings, but although they both impact the iB/M ratio, neither of them is directly reflected in it. Further research on superior investing strategies could therefore focus on other metrics which directly employ cash and earnings to value firms of the New Economy.

Another issue to consider when discussing the iB/M ratio is the sample's division into growth and value stocks. The classification is based on the B/M ratio and R&D and SG&A expenses, but no further variables. Consequently, the classification may be false for companies with specific characteristics. For example, following this methodology one might classify a typical cash cow firm to fall into the growth bucket given they have little to no R&D and SG&A

expenses (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021). Additionally, this risk can motivate the development of an entirely new alternative measure instead book-to-market related indicators. For example, research & development's potential conversion to revenue as indicated by addressable and obtainable market sizes. This approach could potentially unravel new dimensions of market outperformance and refine our understanding of market dynamics in an era increasingly dominated by intangible assets and information technology.

6.1.2. Performance in the acquisitions and goodwill niches

In prior research, the idea of employing an investing strategy based on the HML value premium in certain niches of firms is arguably underdeveloped. Our investigation delves into the implications of inorganic corporate growth activities for the B/M effect. As unpacked in chapter 2.4., the prevailing IFRS framework exhibits a predilection for acquired over organic growth. It mandates the expensing of internally generated intangibles while allowing for the amortization or impairment of acquired intangibles—a treatment contingent upon their lifespans. This bifurcation in accounting treatment may skew firms towards inorganic expansion, particularly when investor judgments are swayed by earnings metrics adjusted for goodwill impairment, namely EBITA or Adjusted EBITA (Hellman, 2022).

Following this reasoning, firms with high levels of goodwill should generate superior returns compared to those with low or no levels of goodwill, assuming the latter pursue organic growth. Within this paradigm, our data offers a counter-narrative. Firms devoid of M&A activity exhibit superior returns. This phenomenon may indeed resonate with the inherent market preference for companies poised for organic expansion, a predilection that seemingly contradicts Hellman's (2022) assertion. Contrary to the expected advantages of acquired growth under IFRS, our results intimate that high levels of goodwill do not necessarily herald strong returns, challenging the implicit assumption that investor reliance on EBITA or adjusted EBITA shields impairments of intangibles from impacting investor key performance indicators (KPIs). Rather, our results underpin that accounting treatment has no impact on economic value added and consequently on return (Penman, 2013).

However, the outperformance of no and low goodwill over high goodwill firms is unlikely to result primarily from different accounting treatment. Further research could focus on which portion, if any, of the outperformance is attributable to the difference in accounting treatments and to which extent investors see through accounting effects. In essence, there likely are several other reasons. To make an empirically justified claim about whether investors see through the currently preferred accounting scheme for inorganic growth, standards would need to be amended and compared accordingly.

Apart from the negative relation of goodwill and returns, there is a similarly negative relation between the number of acquisitions and return. It is a well-studied phenomenon that 70 to 90 percent of M&A transactions fail, meaning they do not meet expectations (Christensen, Alton, Rising, & Waldeck, 2011). This raises questions about the inefficiencies of M&A transactions with regards to subsequent integration challenges. These include a general dissonance between anticipated and realized synergies and performance. Our findings support the observation that acquisitions, on average, do not meet expectations. More accurately, acquisition active firms

display a lower average B/M and iB/M ratio which indicates a relatively high market valuation, potentially reflecting positive expectations. Equally, the average returns are significantly lower than those for non-acquiring firms. This corresponds to Haugen's (1995) claim that investors fail to adjust expectations for mean reversion – in this case, acquisition-activity instead of earnings growth is the variable in question. Overall, our results support the notion that M&A transactions, on average, fail to meet expectations. Further research could focus on whether the sheer scale of the companies or the strategic nature of the acquisitions injects complexity that dilutes the benefits of inorganic growth.

Notably, we expanded the relative portfolio size for M&A activity by choosing the firms in the top quintile instead of decile in terms of iB/M ratio. In doing so, we ensure greater statistical significance and ultimately more meaningful insights. And indeed, the top quintile of firms with low M&A activity outperforms the top quintile of firms with high M&A activity by 14.75% at a strong level of significance. The outperformance is even stronger for firms which have no reported M&A activity at all. This strengthens our belief in the potential applicability of the *iHi* strategy in niches, namely in firms with low M&A activity. Simultaneously it suggests the strategy's refinement via further research. As stated before, we cannot distinguish firms with no M&A activity and firms whose acquisition activity is not disclosed on Capital IQ. Consequently, we suggest further research to differentiate between the two cases in detail and confirm, reject, or even reinforce our results.

Next, we discuss potential reasons for the significant outperformance of our strategy in firms with fewer acquisitions. Foremost is the clearness and straightforward nature of their business models. Entities with fewer acquisitions have less noise and consequently cleaner financial statements, allowing both investors and analysts to gauge their true value with more ease. Their strategic focus is unshattered and focused, dedicated focus on expanding their core operations without the distraction of integrating new ventures. This focus negates the need to allocate given resources to the complexities of post-merger integration. Secondly, integration risk, which stands for a large part in the aftermath of M&A transactions, is significantly diminished. The attendant challenges of combining different corporate cultures, aligning operational systems, and realizing the projected synergies are notably absent, or at least greatly reduced. The absence of these insecurities translates to a more stable and predictable investment landscape, offering an easier environment to the long-term investor. Thirdly, low acquisition M&A activity could well signify a disciplined strategy in capital allocation. In the investors' eyes, such restraint is often synonymous with a heightened degree of financial prudence and a safeguarding of shareholder value, which might be prized among value investors.

To further illustrate the impact of differences in accounting treatment for intangibles, we provide a simplified numerical example neglecting taxes and other distorting factors. Assume a firm with a book value of 500 at the end of the year t-1 makes an investment into research & development on the first day of year t. The investment amount is 200 units, and it will generate 50 units annually for the next five years. The B/M ratio is 1.00 in the beginning and the market value subsequently grows by 7.0% annually. Figure 4 illustrates the different accounting impact dependent on whether the asset is internally generated and expensed or acquired and capitalized. In the latter case, there is no immediate impact on book value, but Net Income is

lowered by a depreciation amount of 40 units in each subsequent period. An accounting-based valuation such as the Residual Income Valuation model of the two cases will always yield the same result. This is in line with the value conservation principle stating that accounting-induced profitability does not generate actual economic value (Penman, 2013).

	Generate	BV	NI	ROE	B/M	Acquire	BV	NI	ROE	B/M	MV
t-1		500			1.00		500			1.00	500
t		350	-150	-30%	0.65		510	10	2.0%	0.95	535
t+1		400	50	14%	0.70		520	10	2.0%	0.91	572
t+2		450	50	13%	0.73		530	10	1.9%	0.87	613
t+3		500	50	11%	0.76		540	10	1.9%	0.82	655
t+4		550	50	10%	0.78		550	10	1.9%	0.78	701

Figure 4. Simplified numerical example

Focusing on the book value, it is initially lowered in the expensing and unaffected in the capitalization case. In the subsequent five periods, both cases revert to the same level by retaining earnings and depreciating capitalized assets if applicable. Since market value is unaffected by accounting treatment, this directly affects the B/M ratio. Integrating the example with our study, the problem becomes clearer. Acquiring firms should be much more likely to be considered a value stock based on the B/M ratio and therefore included in high value portfolios despite not actually offering superior value. But as our sample date has shown, that is not the case. Rather, it is non-acquiring firms which posit on average greater B/M ratios (see table 7). Reverting to our numerical example, potential reasons could be acquiring firms not retaining as much of their earnings, for example by paying dividends or performing further acquisitions. Alternatively, it is an indication that investors expect more positive future returns from acquired intangibles than they expect from internally generated intangibles and therefore driving one's market value up.

Moving on, we discuss implications of our results for finance professionals depending on their company's acquisition strategy. The investor relations function plays a key role to capitalize on the finding of overly pessimistic valuation in non- and rarely acquiring companies. Strategically communicating this undervaluation to the market can serve as a potent tool to unlock shareholder value. On the side of frequently acquiring firms, our results suggest a pivot towards more judicious selection of acquisitions. Rather than pursuing a volume-centric approach, there seems to be merit in targeting fewer, more strategically aligned acquisitions that promise seamless integration and clear value addition. This would not only enhance the quality of integration but also mitigate the integration risks that come with higher volumes of M&A transactions. In some sense, one could state that less becomes more when converting the number of acquisitions to their valuation impact.

In light of the insights drawn from our initial research, we suggest several dimensions for further academic studies. Delving into the connection between varied M&A strategies and their correlation with a B/M-based investment strategy stands out as particularly promising. This exploration could unravel the nuances of how different acquisition approaches—be it

aggressive expansion or selective growth—impact the robustness of the B/M metric as a reliable indicator for investment opportunities. A sectorial analysis is equally important, given that industry-specific factors can significantly influence the success of both M&A activities and investment strategies. Each industry brings a unique set of variables—regulatory environment, growth patterns, competitive dynamics—that could skew or reinforce the applicability of B/M measures. Assessing these factors will provide a more granular understanding of where and how B/M ratios can be best applied.

Goodwill impairments offer another ground for further investigation. An examination of the circumstances leading to impairments and their consequences could be one valid reason for the statistically weaker predictive power of goodwill intensity compared to acquisition activity. Moreover, the development of a nuanced iB/M metric—perhaps integrating elements that reflect the strategic outcomes of high-volume M&A activities—could yield a more nuanced tool for investors interested in companies with robust acquisition portfolios. Such a refined metric would ideally differentiate between acquisitions that add sustainable value versus those that do not meet strategic or financial objectives.

In summary, the frontier for research in this domain is varied and wide. Each suggested topic not only holds the potential to expand academic knowledge but also to provide tangible, actionable insights for the investment community. By charting these unexplored territories, future research can contribute significantly to the efficacy of investment strategies in the dynamic landscape of corporate M&A.

6.2. Practical usefulness of the iHi as an investing strategy

The practical usefulness of an empirically superior investing strategy depends on its robustness in a real-world setting. In the case of our niche investing strategy, the practicality depends on several factors. These include (1) whether the strong performance will persist over time, (2) if the returns might be offset due to expensive implementation and rebalancing costs, and (3) whether the strategy is easy to implement for any investor, e.g., by the information needed being readily available. The degree to which these factors harm the practical usefulness of the strategy are different for retail and institutional investors.

Regarding persistency, we expect our results to be stable in the long-term for two main reasons. Firstly, the robustness test (section 5.3) has illustrated that the outperformance of the general iHi_{10} over Hi_{10} portfolio persist over our full sample period. Secondly, Fama and French illustrated that the normal HML premium's performance was robust across several decades and geographies (Fama & French, 2012). Their value premium follows the same logic as ours and can therefore be seen as its predecessor. We infer that our results will similarly persist over the coming decades. This is, of course, assuming no changes in accounting standards.

Another angle to take on this issue is Haugen's (1995) underlying reasoning for retail investors' Golden Opportunity described in section 2.2. He claims that the long-term outperformance of value stocks persists because institutional investors drive market developments by investing in growth stocks which lay the foundation for the indexes they are benchmarked against. Among others, he uses a firm's earnings growth as a criterion to identify growth stocks. Their

underperformance stems from not meeting expectations caused by earnings growth' mean reversion in the long-term. One could argue against the temporal robustness of our strategy by stating that intangible investments are means to increase the growth in earnings which ultimately will not persist at the same growth level. In other words, using the iB/M ratio we classify firms as value stocks which would be considered growth stocks when using growth in earnings as a criterion.

While the temporal robustness is a uniform consideration all long-term investors must account for equally, the remaining factors carry different degrees of importance for individual and institutional investors.

Regarding costs, previous studies have shown that although transaction costs impact the performance of investment factors, implementing value factors associated with the Fama-French model is not liquidity demanding, meaning costs do not significantly alter their returns (Detzel, Novy-Marx, & Velikov, 2023) (Beck, Hsu, Kalesnik, & Kostka, 2016). Following this logic and considering our strategy uses more extreme breakpoints and consequently smaller portfolios, the rebalancing costs will be even lower, ensuring the robustness of our strategy for implementation costs. However, despite these positions taken in prior research, we independently tested the impact of transaction costs resulting from rebalancing in a numeric example using the top decile of firms selected on the iB/M ratio as illustrated in section5.5. The results after accounting for transaction costs convey a similar image and underscore the strategy's applicability for private as well as institutional investors from a transaction costs perspective. In addition, our calculations assume average transaction costs of 0.5% per trade which is a cheap rate in historical comparison of brokerage prices. Nowadays, one can arguably trade with even cheaper transaction fees when using digital offers such as Avanza or Nordnet in the Nordics region.

Lastly, the strategy's practicality hinges on the ease of its implementation. It passes the first hurdle by relying entirely on publicly available information. That is, all companies included in the sample are publicly listed and the portfolio creation occurs in April using publicly available data from annual reports and observable market values. Similarly, classifying firms based on the New or Old Economy or based on their acquisition activity and level of goodwill, all uses public information. Thus, anyone could theoretically replicate it. However, there are three practical difficulties. One being the complexity of capitalizing and depreciating assets needing some degree of financial knowledge – especially when professional judgement is needed to account for one-off effects. The second difficulty is the final data sample encompassing close to 4,000 firms. Replicating the trading strategy manually, without the use of an extensive database such as Capital IQ, would be extremely time consuming and substantially impact the time needed from reports publication to portfolio creation. Overcoming this would be associated with additional costs for the access to a database which posits a disadvantage for retail investors whose overall investment volume is likely lower. And thirdly, although the rebalancing can be largely neglected from a cost-perspective, the time invest of setting up orders to buy and sell an average of 35% of portfolio companies each year can be burdensome for investors constrained on available time, these are most likely individual investors.

6.3. Implications for accounting

Finally, we circle back to the initial definition of an accounting item's value relevance as its ability to explain changes in the market price of owner's equity (Barth, Li, & McClure, 2023). Applying this definition to financial ratios, the normal B/M ratio was repeatedly shown to be value relevant in previous literature given its correlation with stock price performance (e.g., (Fama & French, 1993) (Daniel & Titman, 1997)). Our study suggests that the relevance of the B/M ratio increases further as it is adjusted for intangible capital, and even more so in specified niche segments. This indicates how investors consider artificially capitalized items, namely the entirety of R&D expenses and parts (30%) of SG&A expenses, as proxies for value creating assets. These capitalization rates correspond to the approaches to *full asset recognition* and *asset recognition dependent on an uncertainty threshold* as outlined by Barker et al. (2022) (see section 2.4.3). Assuming the full amount of R&D expenses to certainly constitute a value creating resource arguably is an overly optimistic approach – equally, 30% of SG&A is arguably too pessimistic (Rajgopal, Iqbal, Srivastava, & Zhao, 2023).

While normative accounting research is considered underdeveloped, empirical research relies on accounting practice (Hellman, 2022) (Barker, Lennard, Penman, & Teixeira, 2022). Our empirical results are based on the IFRS accounting practice and therefore limited to entities applying these. In comparison to prior US Gaap studies, the excess returns an iHML portfolio generates over a HML portfolio are less pronounced for European public firms (see section 6.1). These results indicate that investors consider the capitalized portion of R&D an asset and IFRS accounting standards therefore convey a seemingly better impression of value as defined by the book-to-market ratio. Notably, the results disregard considerations such as disclosure quality adopted by firms.

Furthermore, our results contribute to the discussion on the treatment of acquired intangibles and goodwill in business combinations. Neither the HML nor the iHML portfolios generate significant abnormal returns in firms with high goodwill intensity and the return spread between the top and bottom quintile is lowest in this segment. Hence, the excessively optimistic accounting for goodwill arguably leads to a distortion in the classification of firms as value or growth stocks. This supports various researchers' calls to improve the accounting for goodwill and the design of the impairment test (e.g., (Hellman & Hjelström, 2023)).

As previously described, Lev (2018) discusses common objections to intangibles capitalization and explains why they are misconceptions. Among these misconceptions are that capturing intangible components such as R&D expenses in the income statement was sufficient and that the uncertainty of intangibles was leaving no other option than to expense. We cannot contribute to the discussion revolving normative accounting research, but our results address both issues empirically. Firstly, a differentiation of capturing intangibles in the income statement or balance sheet is crucial for value investing (when identifying value stocks via the B/M ratio). Intangible investment expenses negatively impact the earnings for that year and have no immediate accounting impact in subsequent periods. Applying our methodology, capitalized intangible investments increase the book value for the first year and continuingly remain part of the book value in the subsequent periods until they are fully depreciated. In

doing so, immediate expensing tends to classify firms as growth stocks (especially) in the first year while capitalization tends to classify it as a value stock. Secondly, we show that investors consider R&D investment components that exceed the currently capitalized portion to be assets in contrast to their accounting treatment. Assuming rational and risk-averse investor behavior, they identify a larger share of the intangible component to be a certain source of future value creating than IAS 38.

Both arguments are mostly relevant to value investors and must be weighed against other stakeholder considerations and use cases of financial information. However, if empirical and normative research paints a similar picture, Lev (2018) suggests the implementation of new standards in a subsample to see real world implications compared to an unchanged control group. Based on our results, we suggest testing the implementation of a conditional capitalization model in the *Health Care* and *Information Technology* segments or subsets of these. Our reasoning is that these sectors show the greatest relative change from B/M to iB/M ratio in our sample at 44% and 47% respectively. Due to the special importance of product development and brand value for investor decisions in these two industries, we consider an openness to change on the practitioner side. Prescribing the capitalization of more intangible investments may also lead to more information on the type of investment being disclosed, ultimately increasing accounting quality. Moreover, given that R&D- and SG&A-related activities are so central to the business model of either of the industries selected, we suggest applying a portfolio instead of a single project view (current practice) to the conditional capitalization approach. This further contributes to overcoming uncertainty-related problems because experience from both industries shows that the entirety of investments usually has a positive expected value (Hellman, 2022).

To summarize, our results suggest a more optimistic approach to intangible asset recognition in the balance sheet as opposed to the current conservatism adopted by standard setters. The adopted capitalization rates of (1) 100% and (2) 30% correspond to the (1) full capitalization and (2) conditional capitalization or threshold-dependent capitalization presented by Barker et al. (2022). Their practical feasibility in combination with a portfolio view on investments should be tested in sub segments, e.g., the *Information Technology* and *Health Care* sector in line with Lev (2018) and Hellman (2022). Further research could attempt to merge our study on value premiums with Rajgopal et al.'s (2023) approach to find the most appropriate capitalization and depreciation rates with a regression-based model – ultimately aiming at informing more concrete standard setting with empirical research.

7. Conclusion and limitations

The book-to-market ratio has long been a staple in financial theory, serving as a cornerstone in identifying value and growth stocks and deriving expected asset returns (Fama & French, 1992). However, its relevance has diminished in the face of evolving economic and societal circumstances making intangible assets increasingly more important, but not reflecting them accordingly in the ratio (Arnott, Harvey, Kalesnik, & Linnainmaa, 2021). This evolution has prompted scholars into revisiting traditional valuation metrics and seeking out amendments to better align the respective figures with contemporary financial realities (Peters & Taylor, 2017).

In this vein, this thesis uses the intangible book-to-market ratio as an enhanced metric by augmenting the conventional B/M with capitalized R&D expenditures and 30% of SG&A expenses. Capitalized expenses are amortized at the comparably conservative annual rate of 20%, assuming an average useful life of 5 years. This novel approach aims to provide a more realistic classification of a firm being a value or growth stock with the goal of crafting a robust and effective investment strategy. Our analysis is built on financial statements data from 2005 to 2023 and focuses on European firms—a previously underexplored geography in the literature.

Our empirical exploration yields evidence that the iB/M ratio is a potent tool in identifying stocks which consistently outperform the market at a greater margin than the traditional B/M ratio. This outperformance is significant, underscoring the potency of the iB/M ratio as a superior measure for identifying undervalued stocks. Further, the predictive power of the iB/M ratio is especially pronounced in certain segments. Namely in firms which posit no to low buying involvement in acquisitions or no to low levels of goodwill on the balance sheet. In deriving a superior trading strategy from this finding, we suggest creating a long-only portfolio based on the top quintile of firms (iHi_{20}) in the niches mentioned while rebalancing annually. It can best be implemented by institutional investors or individuals preferably with access to a database such as Capital IQ and a minimum degree of financial proficiency.

Moreover, the thesis contributes to the discussion on accounting for intangible assets by illustrating the relevance intangible investments have in identifying value and growth stocks beyond capitalized book values. It supports the call for action made in prior research to rethink the capitalization regime of internally generated intangible assets. Our findings suggest that book values could better reflect investors' perception of intangible investments as assets generating future revenues by prescribing less conservatism in the capitalization criteria of R&D and SG&A expenses, aided by the adoption of a portfolio instead of single-project view.

But our study is also subject to some limitations which must be addressed. It largely neglects the cost impact of transactions and taxes. Although we show that transaction costs alone have a merely small impact on average returns, the taxes could substantially erode our reported outperformance when realized gains are taxed in every rebalancing cycle. Further, the dataset retrieved from Capital IQ carries a potential for survivorship bias. Any firm in the dataset was publicly traded at a market capitalization >25 mEUR as of September 2023. Consequently, firms which met the criteria thresholds during the sample period but went bankrupt or were taken private before September 2023 are excluded which potentially overstates overall returns. Other specifications of the dataset demonstrate further limitations, for example uncertainties regarding the disclosure completeness of transaction-activity and R&D expenses. In acknowledging these limitations, we do not diminish the relevance of our findings but rather underline the necessity for critical judgement when applying the iB/M ratio. The recognition of these constraints serves as a call for future research to continuously refine the metric and ensure that it remains resilient and relevant.

Going forward, we see several possible areas to explore in future research. Regarding the defined niches, further research could focus on the disclosure quality of the purchase price allocation and goodwill and its impact on the applicability of the iB/M ratio. This may provide

additional insights for value investing in that niche compared to those portrayed in this thesis. But we deem the overall continuation and detailed development of our study most important. This thesis shows that the iB/M metric is a potent tool to identify opportunities for superior returns when using “extreme” breakpoints. However, we used a simplified approach with breakpoints at the decile or quintile level, making them more extreme than Fama-French’s initial study. It is unlikely that the breakpoints we chose are those which ultimately maximize returns. A further study could therefore explore based on which criteria and at which level breakpoints should be chosen in each niche to find the equilibrium breakpoint that maximizes average return while compensating for risk. Similarly, further studies could define other niches, potentially based on industry, R&D intensity or other figures impacting the applicability of the iB/M ratio.

Bibliography

Arnott, R., Harvey, C., Kalesnik, V., & Linnainmaa, J. (2021). Reports of Value's Death May Be Greatly Exaggerated. *Financial Analyst Journal* , (77) 44-67. doi:10.1080/0015198X.2020.1842704

Asness, C., & Frazzini, A. (2013). The devil in HML's details. *Journal of Portfolio Management, 39*(4), 49–68. doi: 10.3905/jpm.2013.39.4.049

Bagna, E., Ramusino, E., & Ogliari, M. (2023). The impact of different goodwill accounting methods on stock prices: A comparison of amortization and impairment-only methodologies. *International Review of Financial Analysis, 85*. doi:10.1016/j.irfa.2022.102432

Balachandran, S., & Mohandram, P. (2011). Is the decline in the value relevance of accounting driven by increased conservatism? *Review of Accounting Studies, 16*(2), 272–301. doi:10.1007/s11142-010-9137-0

Banker, R. D., Huang, R., Natarajan, R., & Zhao, S. (2019). Market valuation of intangible asset: Evidence on SG&A expenditure. *The Accounting Review, 94*(6), 61-90. doi:10.2308/accr-52468

Barker, R., Lennard, A., Penman, S., & Teixeira, A. (2022). Accounting for intangible assets: suggested solutions. *Accounting and Business Research, 52*(6), 601-630. doi:10.1080/00014788.2021.1938963

Barker, R., Penman, S., Linsmeier, T., & Cooper, S. (2020). Moving the Conceptual Framework Forward: Accounting for Uncertainty. *Contemporary Accounting Research, 37*(1), 322–357. doi:10.1111/1911-3846.12585

Barroso, P., & Santa-Clara, P. (2015). Momentum has its moments. *Journal of financial economics*, 116 (1), p.111-120. doi:10.1016/j.jfineco.2014.11.010

Barth, M. E., & Clinch, G. (1998). Revalued Financial, Tangible, and Intangible Assets: Associations with Share Prices and Non-Market-Based Value Estimates. *Journal of Accounting Research, 36*, 199–233. doi:10.2307/2491314

Barth, M., Li, K., & McClure, C. (2023). Evolution in Value Relevance of Accounting Information. *The Accounting Review, 98* (1), 1–28. doi:10.2308/TAR-2019-0521

Basu, S. (1977). Investment Performance of Common Stocks in Relation to their Price-Earnings ratios: a test of the Efficient Market Hypothesis. *Journal of Finance, 32*(3), 663–682. doi:10.1111/j.1540-6261.1977.tb01979.x

Beck, N., Hsu, J., Kalesnik, V., & Kostka, H. (2016). Will your factor deliver? An examination of factor robustness and implementation costs. *Financial Analysts Journal, 72*(5), 58–82. doi:10.2469/faj.v72.n5.6

Bena, J., & Li, K. (2014). Corporate Innovations and Mergers and Acquisitions. *The Journal of Finance, 69*(5), 1923–1960. doi:10.1111/jofi.12059

Beraldi, P., Violi, A., Ferrara, M., Ciancio, C., & Pansera, B. A. (2021). Dealing with complex transaction costs in portfolio management. *Annals of operations research*, 299 (1-2), p.7-22. doi:10.1007/s10479-019-03210-5

Bernard, V., & Thomas, J. (1989). Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium? *Journal of accounting research*, 27 (2), 1-36. doi:10.2307/2491062

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance, 52*(1), 57-82. doi:10.1111/j.1540-6261.1997.tb03808.x

Christensen, C., Alton, R., Rising, C., & Waldeck, A. (2011). The big idea: The new M&A playbook. *Harvard business review, 83*(3).

Daniel, K., & Titman, S. (1997). Evidence on the Characteristics of Cross Sectional Variation in Stock Returns. *The Journal of Finance, 52*(1), 1–33. doi:10.1111/j.1540-6261.1997.tb03806.x

Detzel, A., Novy-Marx, R., & Velikov, M. (2023). Model Comparison with Transaction Costs. *The Journal of Finance, 78*(3), 1743–1775.

Dichev, I., & Tang, V. W. (2008). Matching and the Changing Properties of Accounting Earnings over the Last 40 Years. *The Accounting Review, 83*(6), 1425–1460. doi:10.2308/accr.2008.83.6.1425

Dinh, T., Kang, H., & Schultze, W. (2016). Capitalizing research & development: signaling or earnings management? *European Accounting Review, 25*(2), 373–401. doi:10.1080/09638180.2015.1031149

ECB. (2023, 10 25). *ecb.europe.eu*. retrieved from ecb.europe.eu: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

Eisfeldt, A., & Papanikolaou, D. (2013). Organization Capital and the Cross-Section of Expected Returns. *Journal of Finance, 68*(4), 1365–1406. doi:10.1111/jofi.12034

Eisfeldt, A., & Papanikolaou, D. (2014). The Value and Ownership of Intangible Capital. *The American economic review*, (104 5) 189-194. doi: 10.1257/aer.104.5.189

Eisfeldt, A., Kim, E., & Papanikolaou, D. (2022). Intangible value. *Critical finance review, 11*(2), 299-332.

Falato, A., Kadyrzhanova, D., Sim, J., & Steri, R. (2022). Rising Intangible Capital, Shrinking Debt Capacity, and the U.S. Corporate Savings Glut. *Journal of Finance, 77*(5), 2799–2852. doi:10.1111/jofi.13174

Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance, 25*(2), 383–417. doi:10.1111/j.1540-6261.1970.tb00518.x

Fama, E., & French, K. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance, 47*(2), 427–465. doi:10.1111/j.1540-6261.1992.tb04398.x

Fama, E., & French, K. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3–56. doi:10.1016/0304-405X(93)90023-5

Fama, E., & French, K. (2012). Size, value, and momentum in international stock returns. *Journal of financial economics*, (105 3) 457-472. doi:10.1016/j.jfineco.2012.05.011

Franzen, L., & Radhakrishnan, S. (2009). The value relevance of R&D across profit and loss firms. *Journal of accounting and public policy*, 28 (1) 16-32. doi:10.1016/j.jaccpubpol.2008.11.006

Graham. (1949). *The Intelligent Investor.* Harper & Brothers.

Graham, J., Harvey, C., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting & Economics, 40* (1), 3–73. doi: 10.1016/j.jacceco.2005.01.002

Hall, B., & Li, W. (2016). *Depreciation of Business R&D Capital.* Cambridge, Mass.: National Bureau of Economic Research. doi:10.1111/roiw.12380

Harvey, C., Liu, Y., & Zhu, H. (2016). ...and the Cross-Section of Expected Returns. *The Review of Financial Studies, 29*(1), 5–68. doi:10.1093/rfs/hhv059

Haugen, R. (1995). *The new finance : the case against efficient markets.* Englewood Cliffs, N.J.: Prentice Hall.

Haugen, R., & Baker, N. (1996). Commonality in the determinants of expected stock returns. *Journal of financial economics*, 41(3), 401-439. doi:10.1016/0304-405X(95)00868-F

Hellman, N. (2022). Discussion of 'Accounting for intangible assets: suggested solutions'. *Accounting and Business Research, 52*(6), 631-640. doi:10.1080/00014788.2021.1984906

Hellman, N., & Hjelström, T. (2023). The goodwill impairment test under IFRS: Objective, effectiveness and alternative approaches. *Journal of International Accounting, Auditing & Taxation, 52*. doi:10.1016/j.intaccaudtax.2023.100558

Hoogervorst, H. (2012). Chairman. *Speech: the imprecise world of accounting.* International Accounting Standards Board, Amsterdam.

International Accounting Standards Board (IASB). (2018). The Conceptual Framework for Financial Reporting. London: IFRS Foundation.

International Accounting Standards Board (IASB). (2001a). *IAS 38 - Intangible Assets.* London: IFRS Foundation.

International Accounting Standards Board (IASB). (2001b). *IAS 16 - Tangible Assets.* London: IFRS Foundation.

International Accounting Standards Board (IASB). (2001c). *IAS 36 - Impairment of Assets.* London: IFRS Foundation.

International Accounting Standards Board (IASB). (2004). *IFRS 3 - Business Combinations.* London: IFRS Foundation.

Khan, U., Li, B., Rajgopal, S., & Venkatchalam, M. (2018). Do the FASB's standards add shareholder value? *The Accounting Review, 93*(2), 209–247. doi: 10.2308/accr-51840

Lakonishok, J., Shleifer, A., & Vishny, R. (1994). Contrarian Investment, Exploration, and Risk. *Journal of Finance*, 49, 1541-1578. doi:10.1111/j.1540-6261.1994.tb04772.x

Lev, B. (2018). The deteriorating usefulness of financial report information and how to reverse it. *Accounting and Business Research, 48*(5), 465-493. doi:10.1080/00014788.2018.1470138

Lev, B. (2019). Ending the Accounting-for-Intangibles Status Quo. *The European Accounting Review, 28*(4), 713–736. doi:10.1080/09638180.2018.1521614

Lev, B., & Gu, F. (2016). *The End of Accounting and the Path Forward for Investors and Managers* (Vol. 1). Hoboken: John Wiley & Sons, Incorporated. doi:10.1002/9781119270041

Lev, B., & Thiagarajan, R. (1993). Fundamental Information Analysis. *Journal of accounting research*, 31(2), 190-215. doi:10.2307/2491270

Li, F. (2022). Intangibles: The Missing Ingredient in Book Value. *Journal of Portfolio Management,* 48(3), 164–184. doi:10.3905/JPM.2021.1.322

Liu, L. X., & Zhang, L. (2014). A neoclassical interpretation of momentum. *Journal of monetary economics*, 67, p.109-128. doi:10.1016/j.jmoneco.2014.07.003

OECD. (2023, September). *OECD Main Science and Technology Indicators*. Retrieved in November 2023 from OECD Main Science and Technology Indicators Database: https://www.oecd.org/sti/msti.htm

Park, H. (2019). Intangible assets and the book-to-market effect. *European Financial Management : the Journal of the European Financial Management Association, 25*(1), 207–236. doi:10.1111/eufm.12148

Penman, S. (2013). *Financial Statement Analysis & Security Valuation* (Vol. 5). New York City: McGraw-Hill.

Peters, R., & Taylor, L. (2017). Intangible capital and the investment-q relation. *Journal of financial economics*, (123 2) 251-272. doi:10.1016/j.jfineco.2016.03.011

Rajgopal, S., Iqbal, A., Srivastava, A., & Zhao, R. (2023). Value of Internally Generated Intangible Capital. *Management Science*, Forthcoming.

Shalev, R., Zhang, I., & Zhang, Y. (2013). CEO Compensation and Fair Value Accounting: Evidence from Purchase Price Allocation. *Journal of Accounting Research, 51*(4), 851-854. doi:10.1111/1475-679X.12015

Sharpe, W. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance*, 425-442. doi:10.2307/2977928

Appendix

Appendix A. Definitions

Subsamples:

High M&A - Top 30% of firms in the sample based on #acquisitions (excl. 0 acquisitions).

Low M&A - Bottom 30% of firms in the sample based on #acquisitions (excl. 0 acquisitions).

No M&A - All firms in the sample reporting exactly 0 acquisitions.

High GW - Top 30% of firms in the sample based on reported goodwill. (excl. no GW reporting firms)

Low GW - Bottom 30% of firms in the sample based on reported goodwill. (excl. no GW reporting firms)

No GW - All firms in the sample reporting no goodwill.

New (Economy) - All firms in the Information Technology sector and with negative Earnings in their IPO year.

Old (Economy) - All firms not considered New Economy firms.

Portfolios:

(i)$Hi_{[BP]}$[14]: A portfolio based on a given sample's highest [BP]% firms based on the (i)B/M ratio.

(i)$Lo_{[BP]}$[13]: A portfolio based on a given sample's lowest [BP]% firms based on the (i)B/M ratio.

(i)$HML_{[BP]}$[13]: A HML portfolio going long on the highest [BP]% and short on the lowest [BP]% of firms based on the (i)B/M ratio.

[14] BP stands for breakpoint. In the thesis, it is usually set at 10, 20 or 30, respectively.

Appendix B. Sample overview

Table 15. Overview of R&D intensity (R&D expenses / Revenue) per industry

R&D intensity	Mean	Median	Max	Min
Total sample	7.5%	2.1%	6471.7%	0.0%
Industrials	3.1%	1.1%	6471.7%	0.0%
Consumer Discretionary	3.3%	0.9%	12.8%	0.0%
Information Technology	13.4%	7.1%	563.9%	0.0%
Health Care	14.4%	9.9%	3643.2%	0.1%
Materials	2.8%	0.4%	31.1%	0.0%
Energy	1.5%	0.7%	2.4%	0.0%
Consumer Staples	1.5%	0.3%	14.1%	0.0%
Utilities	0.6%	0.0%	2.1%	0.0%
Communication Services	12.4%	3.5%	29.1%	0.0%
Real Estate	-	-	-	-

Table 16. Overview of SG&A intensity (SG&A expenses / Revenue) per industry

SG&A intensity	Mean	Median	Max	Min
Total sample	21.4%	13.8%	14930.5%	0.0%
Industrials	20.8%	14.3%	6897.7%	0.0%
Consumer Discretionary	24.7%	14.8%	364.7%	0.0%
Information Technology	25.2%	15.6%	2926.7%	0.0%
Health Care	31.5%	28.8%	7973.0%	0.3%
Materials	16.0%	11.9%	14930.5%	0.0%
Energy	13.9%	9.1%	1803.7%	0.4%
Consumer Staples	20.9%	15.5%	228.9%	0.3%
Utilities	11.6%	275.3%	7.6%	0.3%
Communication Services	23.7%	13.8%	9143.7%	0.2%
Real Estate	14.9%	9.2%	3384.1%	0.4%

Appendix C. Robustness

Appendix C.1 Results 2006-2011

Table 17. Y06-11: Basic portfolio results

Portfolio Return	Monthly n=60		Annualized n=60	
Portfolio specification	μ	σ	μ	σ
Total sample	0.3%	0.04	3.6%	0.15
Hi_{10}	3.9%	0.12	46.8%	0.42
Lo_{10}	0.5%	0.04	6.0%	0.15
iHi_{10}	4.3%	0.13	51.8%	0.46
iLo_{10}	0.4%	0.05	4.8%	0.16

Table 18. Y06-11: Old & New Economy - portfolio results

Portfolio Return	Monthly n=60		Annualized n=60	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
New Economy	2.8%	-0.8%	33.6%	-9.6%
Old Economy	2.2%	0.1%	24.4%	1.2%

Table 19. Y06-11: Acquisition activity - portfolio results

Portfolio Return	Monthly n=60		Annualized n=60	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High M&A as buyer	1.2%	-0.2%	14.4%	-2.4%
Low M&A as buyer	3.4%	-0.4%	40.8%	-4.8%
No M&A as buyer	4.6%	0.6%	55.2%	7.2%

Table 20. Y06-11: Goodwill intensity - portfolio results

Portfolio Return	Monthly n=60		Annualized n=60	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High Goodwill intensity	1.7%	0.3%	20.4%	3.6%
Low Goodwill intensity	1.1%	0.1%	13.2%	1.2%
No Goodwill	6.6%	1.0%	79.2%	12.0%

Table 21. Y06-11: Results overview - t-tests (1/2)

Annualized Monthly Returns 06-11									
Outperformance	Market	B/M Hi_{10}	B/M HML_{10}	iB/M Hi_{10}	iB/M HML_{10}	Old Hi_{20}	Old Lo_{20}	New Hi_{20}	New Lo_{20}
Market	-								
B/M Hi_{10}	43.45%**	-							
B/M HML_{10}	36.97%**	-6.47%	-						
iB/M Hi_{10}	48.18%**	4.73%	11.20%*	-					
iB/M HML_{10}	43.78%**	0.34%	6.81%*	-4.39%	-				
Old Hi_{20}	22.77%***	-20.67%**	-14.20%	-25.40%**	-21.01%	-			
Old Lo_{20}	-2.60%	-46.04%**	-39.57%**	-50.77%**	-46.38%**	-25.37%***	-		
New Hi_{20}	29.96%*	-13.48%	-7.01%	-18.21%	-13.82%	7.19%	32.56%**	-	
New Lo_{20}	-12.95%**	-56.40%***	-49.93%**	-61.13%***	-56.74%***	-35.73%***	-10.36%*	-42.92%**	-

This table illustrates the performance of portfolios relative to each other from 2006-2011, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* exceeded the performance of the full market portfolio by 43.45%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 22. Y06-11: Results overview - t-tests (2/2)

Annualized Monthly Returns 06-11									
Outperformance	Market	B/M Hi_{10}	iB/M Hi_{10}	High M&A Hi_{20}	High M&A Lo_{20}	Low M&A Hi_{20}	Low M&A Lo_{20}	High GW Hi_{20}	Low GW Lo_{20}
Market	-								
B/M Hi_{10}	43.45%**	-							
iB/M Hi_{10}	48.18%**	4.73%	-						
High M&A Hi_{20}	10.72%*	-32.72%*	-37.45%**	-					
High M&A Lo_{20}	-5.65%*	-49.09%***	-53.82%***	-16.37%**	-				
Low M&A Hi_{20}	36.78%**	-6.67%	-11.40%	26.05%	42.43%	-			
Low M&A Lo_{20}	-8.23%**	-51.67%***	-56.40%***	-18.95%**	-2.58%	-45.01%**	-		
High GW Hi_{20}	16.95%**	-26.50%*	-31.23%**	6.22%	22.60%*	-19.83%*	25.17%**	-	
Low GW Lo_{20}	9.74%	-33.71%**	-38.44%**	-0.99%	15.39%	-27.04%*	17.96%**	-7.21%	-

This table illustrates the performance of portfolios relative to each other from 2006-2011, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* exceeded the performance of the full market portfolio by 43.45%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 23. Y06-11: Overview of (multiple) regression results

Annualized Monthly Abnormal Returns 06-11				
	Market	CAPM	Fama French 3 Factors	Fama French 4 Factors
B/M Hi_{10}	44.80%**	36.03%	13.96%	13.97%
B/M HML_{10}	41.31%**	56.83%**	33.69%*	33.70%*
iB/M Hi_{10}	49.73%**	43.21%*	19.51%	19.47%
iB/M HML_{10}	48.61%**	69.52%***	44.37%**	44.28%**
Old Hi_{20}	22.29%**	-4.92%	-16.38%*	-16.57%*
Old Lo_{20}	-2.35%	-29.18%***	-28.53%***	-28.26%***
New Hi_{20}	29.20%	1.00%	2.59%	2.58%
New Lo_{20}	-12.30%	-32.98%**	-37.39%***	-38.16%***
High M&A Hi_{20}	8.80%	-32.20%***	-39.94%***	-40.18%***
High M&A Lo_{20}	-5.57%	-34.08%***	-33.04%***	-32.92%***
Low M&A Hi_{20}	35.33%*	10.43%	10.02%	8.65%
Low M&A Lo_{20}	-8.30%*	-39.43%***	-39.30%***	-39.26%***
High GW Hi_{20}	16.34%	-9.13%	-15.91%	-16.29%
Low GW Lo_{20}	6.91%	-41.22%**	-49.57%***	-50.75%***

This table illustrates the results of regression analyses where the respective annualized returns are tested against different risk measurements for the period 2006-2011. The CAPM is return is based on the 1-year weekly beta of a stock. The 3 and 4 factor models are enhanced by the SMB and the traditional HML factors, and the momentum (WML) factor in case of the 4 Factor Model. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Appendix C.2 Results 2011-2017

Table 24. Y11-17: Basic portfolio results Y11-17

Portfolio Return	Monthly n=72		Annualized n=72	
Portfolio specification	μ	σ	μ	σ
Total sample	0.5%	0.03	6.0%	0.11
Hi_{10}	1.5%	0.06	18.0%	0.20
Lo_{10}	0.5%	0.03	6.0%	0.11
iHi_{10}	1.8%	0.07	21.6%	0.23
iLo_{10}	0.5%	0.03	6.0%	0.11

Table 25. Y11-17: Old & New Economy - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
New Economy	2.5%	5.0%	30.0%	60.0%
Old Economy	1.1%	0.6%	13.2%	7.2%

Table 26. Y11-17: Acquisition activity - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High M&A as buyer	-0.1%	0.6%	-1.2%	7.2%
Low M&A as buyer	0.8%	1.4%	9.6%	16.8%
No M&A as buyer	1.1%	0.5%	13.2%	6.0%

Table 27. Y11-17: Goodwill intensity - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High Goodwill intensity	1.0%	0.7%	12.0%	8.4%
Low Goodwill intensity	1.3%	0.3%	15.6%	3.6%
No Goodwill	1.4%	0.3%	16.8%	3.6%

Table 28. Y11-17: Results overview - t-tests (1/2)

Annualized Monthly Returns 11-17									
Outperformance	Market	B/M Hi_{10}	B/M HML_{10}	iB/M Hi_{10}	iB/M HML_{10}	Old Hi_{20}	Old Lo_{20}	New Hi_{20}	New Lo_{20}
Market	-								
B/M Hi_{10}	11.04%**	-							
B/M HML_{10}	5.31%	-5.73%	-						
iB/M Hi_{10}	15.76%**	4.73%	10.46%*	-					
iB/M HML_{10}	9.32%	-1.71%	4.02%	-6.44%*	-				
Old Hi_{20}	12.42%*	-4.53%	1.20%	-9.26%**	-2.82%	-			
Old Lo_{20}	0.43%	-10.61%*	-4.88%	-15.34%**	-8.90%	-6.08%	-		
New Hi_{20}	23.09%**	12.06%	17.78%*	7.33%	13.77%	16.59%**	22.67%**	-	
New Lo_{20}	53.83%**	42.80%**	48.52%**	38.07%*	44.51%**	47.33%**	53.41%**	30.74%	-

This table illustrates the performance of portfolios relative to each other from 2011-2017, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* exceeded the performance of the full market portfolio by 11.04%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 29. Y11-17: Results overview - t-tests (2/2)

Annualized Monthly Returns 11-17									
Outperformance	Market	B/M Hi_{10}	iB/M Hi_{10}	High M&A Hi_{20}	High M&A Lo_{20}	Low M&A Hi_{20}	Low M&A Lo_{20}	High GW Hi_{20}	Low GW Lo_{20}
Market	-								
B/M Hi_{10}	11.04%**	-							
iB/M Hi_{10}	15.76%**	4.73%	-						
High M&A Hi_{20}	-8.07%**	-19.11%***	-23.84%***	-					
High M&A Lo_{20}	1.10%	-9.93%*	-14.66%**	9.17%**	-				
Low M&A Hi_{20}	2.98%	-8.05%	-12.78%*	11.06%*	1.88%	-			
Low M&A Lo_{20}	9.85%***	-1.18%	-5.91%	17.93%***	8.75%**	6.87%	-		
High GW Hi_{20}	5.64%	-5.39%	-10.12%*	13.72%**	4.54%	2.66%	-4.21%	-	
Low GW Lo_{20}	9.07%	-1.96%	-6.69%	17.15%*	7.97%	6.09%	-0.78%	3.43%	-

This table illustrates the performance of portfolios relative to each other from 2011-2017, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* exceeded the performance of the full market portfolio by 11.04%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 30. Y11-17: Overview of (multiple) regression results

Annualized Monthly Abnormal Returns 11-17				
	Market	CAPM	Fama French 3 Factors	Fama French 4 Factors
B/M Hi_{10}	10.18%	12.45%*	19.37%***	18.07%***
B/M HML_{10}	10.15%	10.88%	19.25%***	17.97%***
iB/M Hi_{10}	13.57%*	16.39%**	24.22%***	23.38%***
iB/M HML_{10}	18.97%**	14.27%*	23.42%***	22.55%***
Old Hi_{20}	5.45%	7.71%	12.19%***	11.39%***
Old Lo_{20}	0.94%	2.54%	1.44%	1.52%
New Hi_{20}	20.81%*	23.67%**	17.87***	29.25%***
New Lo_{20}	54.71%**	55.98%**	52.62%**	53.40%**
High M&A Hi_{20}	-8.44%**	-6.54%**	-1.52%	-1.02%
High M&A Lo_{20}	1.45%	3.10%	2.10%	2.11%
Low M&A Hi_{20}	3.50%	4.99%	9.00%	7.93%
Low M&A Lo_{20}	10.29%***	12.11%***	11.30%***	11.96%***
High GW Hi_{20}	5.59%	7.42%	9.68%**	8.81%*
Low GW Lo_{20}	6.55%	9.37%	15.49%**	15.09%**

This table illustrates the results of regression analyses where the respective annualized returns are tested against different risk measurements for the period 2011-2017. The CAPM is return is based on the 1-year weekly beta of a stock. The 3 and 4 factor models are enhanced by the SMB and the traditional HML factors, and the momentum (WML) factor in case of the 4 Factor Model. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Appendix C.3 Results 2017-2023

Table 31. Y17-23: Basic portfolio returns

Portfolio Return	Monthly n=72		Annualized n=72	
Portfolio specification	μ	σ	μ	σ
Total sample	0.9%	0.04	10.8%	0.15
Book to market high 10%	0.7%	0.06	8.4%	0.22
Book to market low 10%	1.0%	0.04	12.0%	0.14
iB/M high 10%	0.9%	0.06	10.8%	0.20
iB/M low 10%	1.2%	0.04	14.4%	0.15

Table 32. Y17-23: Old & New Economy - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
New Economy	2.2%	-0.3%	26.4%	-3.6%
Old Economy	0.5%	0.9%	6.0%	10.8%

Table 33. Y17-23: Acquisition activity - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High M&A as buyer	0.5%	0.8%	6.0%	9.6%
Low M&A as buyer	1.7%	0.6%	19.4%	7.7%
No M&A as buyer	1.5%	1.3%	18.0%	15.6%

Table 34. Y17-23: Goodwill intensity - portfolio results

Portfolio Return	Monthly n=72		Annualized n=72	
iB/M	iHi_{20}	iLo_{20}	iHi_{20}	iLo_{20}
High Goodwill intensity	0.2%	1.0%	2.4%	12.0%
Low Goodwill intensity	1.1%	0.9%	13.2%	10.8%
No Goodwill	1.1%	2.1%	13.2%	25.2%

Table 35. Y17-23: Results overview - t-tests (1/2)

Annualized Monthly Returns 17-23

Outperformance	Market	B/M Hi_{10}	B/M HML_{10}	iB/M Hi_{10}	iB/M HML_{10}	Old Hi_{20}	Old Lo_{20}	New Hi_{20}	New Lo_{20}
Market	-								
B/M Hi_{10}	-1.63%	-							
B/M HML_{10}	-13.91%**	-12.28%**	-						
iB/M Hi_{10}	-0.14%	1.49%	13.77%**	-					
iB/M HML_{10}	-14.21%**	-12.58%*	-0.30%	-14.07%	-				
Old Hi_{20}	-5.03%	-3.39%	8.89%	-4.88%	9.19%	-			
Old Lo_{20}	0.73%	2.36%	14.64%*	0.87%	14.94%	5.76%	-		
New Hi_{20}	15.32%**	16.95%*	29.63%**	15.36%*	29.53%*	20.35%**	14.59%**	-	
New Lo_{20}	-13.51%*	-11.88%	0.40%	-13.37%	0.70%	-8.49%	-14.24%	-28.83%**	-

This table illustrates the performance of portfolios relative to each other from 2017-2023, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* fell short of the performance of the full market portfolio by 1.63%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 36. Y17-23: Results overview - t-tests (2/2)

Annualized Monthly Returns 17-23

Outperformance	Market	B/M Hi_{10}	iB/M Hi_{10}	High M&A Hi_{20}	High M&A Lo_{20}	Low M&A Hi_{20}	Low M&A Lo_{20}	High GW Hi_{20}	Low GW Lo_{20}
Market	-								
B/M Hi_{10}	-1.63%	-							
iB/M Hi_{10}	-0.14%	1.49%	-						
High M&A Hi_{20}	-4.67%	-3.03%	-4.53%	-					
High M&A Lo_{20}	-1.37%	0.27%	-1.22%	3.30%	-				
Low M&A Hi_{20}	4.36%	6.00%	4.50%*	9.03%*	5.73%	-			
Low M&A Lo_{20}	-1.17%	0.46%	-1.03%	3.50%	0.20%	-5.53%	-		
High GW Hi_{20}	-8.31%**	-6.67%*	-8.16%*	-3.64%	-6.94%	-12.67%***	-7.14%	-	
Low GW Lo_{20}	2.62%	4.26%	2.76%	7.29%*	3.99%	-1.74%	3.79%	10.93%*	-

This table illustrates the performance of portfolios relative to each other from 2017-2023, illustrated in a matrix structure. To exemplify the logic, the *B/M Hi_{10} portfolio* fell short of the performance of the full market portfolio by 1.63%. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.

Table 37. Y17-23: Overview of (multiple) regression results

Annualized Monthly Abnormal Returns 17-23

	Market	CAPM	Fama French 3 Factors	Fama French 4 Factors
B/M Hi_{10}	-3.08%	-1.23%	1.45%	3.50%
B/M HML_{10}	-5.84%	-5.81%	-1.42%	0.80%
iB/M Hi_{10}	-0.82%	0.93%	3.12%	2.94%
iB/M HML_{10}	-4.80%	-4.97%	-1.44%	-1.48%
Old Hi_{20}	6.40%	-5.16%	-1.82%	0.24%
Old Lo_{20}	1.25%	3.15%	1.45%	1.14%
New Hi_{20}	11.25%	14.01%*	13.29%*	12.99%*
New Lo_{20}	-18.76%*	-16.29%	-17.14%*	-18.04%*
High M&A Hi_{20}	-6.45%	-4.46%	-0.61%	1.21%
High M&A Lo_{20}	-1.26%	0.75%	0.62%	0.77%
Low M&A Hi_{20}	2.50%	4.57%	5.98%	6.66%
Low M&A Lo_{20}	-3.14%	-4.68%	-2.94%	-3.75%
High GW Hi_{20}	-10.94%**	-8.89%*	-6.60%	-5.43%
Low GW Lo_{20}	0.53%	2.58%	6.49%	7.04%

This table illustrates the results of regression analyses where the respective annualized returns are tested against different risk measurements for the period 2017-2023. The CAPM is return is based on the 1-year weekly beta of a stock. The 3 and 4 factor models are enhanced by the SMB and the traditional HML factors, and the momentum factor (WML) in case of the 4 Factor Model. The symbols represent statistical significance at the *10%, **5%, and ***1% level, respectively.