The Measurement of Speculative Investing Activities and Aggregate Stock Returns†

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ABSTRACT: We examine whether the incorporation of speculative investments onto the balance sheet explains the negative association between aggregate investment and future market returns. Speculative investments that are incorporated onto the balance sheet often arise as intangibles recorded at acquisition. We find that the previously documented negative association between aggregate investment and future market returns is concentrated in more speculative periods, and is mostly driven by goodwill. Our findings highlight the usefulness of differences in accounting measurement in the prediction of aggregate economic outcomes. Specifically, measurement differences enable decompositions of investment into inherently speculative assets based on beliefs about the future, and assets based on market prices. Our findings also provide evidence of use in assessing the useful characteristics of assets.

Keywords: *Aggregate Investment; Fundamental Analysis; Market Returns; Speculation.*

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Data Available: *All data are available from the sources described in the text.*

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1. Introduction

We examine whether the incorporation of speculative investing activities onto the balance sheet explains the negative association between aggregate investment and future market returns. We extend Arif and Lee (2014), who find evidence of a negative association between future market returns and that total aggregate investment, by decomposing total aggregate investment into more versus less speculative investment. We base our decomposition on differences due to accounting measurement and define more speculative investments as those that are measured by capitalizing the difference between price and book values onto the balance sheet (e.g. goodwill and other acquired intangibles) and less speculative investments as those investments that are not measured explicitly on the difference between price and book values (e.g., capital expenditures). In terms of accounting measurement, we consider speculation arising from the capitalization of future beliefs into asset values.[1] We find evidence that the negative association between aggregate investment and future market returns is concentrated in more speculative investments.

The accounting measurement of investment activities is primarily based on the purchase price of the investment; the accounting for different investment activities, however, creates differences in the types of assets recorded on the balance sheet. For example, the cost of acquiring tangible assets is typically capitalized into the asset value, whereas acquiring a company often results in the allocation of costs between tangible assets and intangible assets. Whether or not the purchase price is appropriate in all cases, however, is controversial. On the one hand, if market prices are efficient, then purchase price is a measure of the exchange (or exit) value of an asset. On the other hand, if market prices contain a speculative component, then the purchase price is a mixture of the "permanent" exchange (or exit) value plus a "temporary" speculative component.[2] M&As activities are important events that plausibly lead to the incorporation of speculation onto the balance sheet, thus we consider how the purchase price approach plausibly leads to speculation being incorporated differently for acquisition accounting

[1] Our relative definition here does make the implicit assumption that the product market is more efficient than the merger and acquisition market. Theory asserts either efficiency across all markets, or relative inefficiency of the merger and acquisition market (Shleifer and Vishny 2003). We discuss the theoretical predictions below in more detail.

[2] A more technical definition of speculation is the component of prices that does not co-move with fundamentals (Harrison and Kreps 1978). An amount that can be positive or negative, but is temporary, such that asset prices will revert towards their permanent levels. Identification of speculation empirically is an elusive concept (e.g., Penman 2011). One benefit of our acquisition setting, however, is that goodwill can only measure the positive speculation, whereas tangible asset acquisitions can include both positive and negative speculation.

relative to other asset purchase[3]. We use this distinction to motivate the open question of whether or not the inclusion of speculation into the measurement of accounting assets explains the negative association between aggregate investment and future market returns.

Economic theory provides conflicting predictions for our question. Specifically, the theory relating to the reasons for undertaking an acquisition can be broadly classified into those based on efficient markets and those based on behavioral theories. For example, Jovanovic and Rousseau (2002) argue that mergers are more valuable when prices are high, as it efficiently reallocates capital to the highest-value users. Such acquisitions will lead to the recognition of assets at an efficient value, including goodwill, which will recognize the intangible value from synergies. In contrast, the behavioral view argues that managers can time their acquisitions to take advantage of periods when stock prices are temporarily higher than their fundamental values (Lamont and Stein 2006; Shleifer and Vishny 2003). In these cases, the acquired assets will be recorded at a premium to their efficient value, with much of that premium, or speculative component of prices, being recorded in goodwill.

In addition, empirical findings highlight that there are points in time with a larger clustering of merger and acquisition activity, often termed merger waves. Again theory predicts two alternative reasons for merger waves, in both cases, however, aggregate goodwill is expected to increase during merger waves. An efficient market explanation is provided by Jovanovic and Rousseau (2002) as rational responses to industry and regulatory shocks. In contrast, Shleifer and Vishny (2003) argue that acquisitions are more likely to be made with stock over cash when aggregate valuations are high. Both approaches, however, suggest that merger waves will provide time-series variation in aggregate goodwill which allows us to perform our aggregate level tests.[4]

We provide empirical evidence on our question by reexamining the growing evidence of a negative association between aggregate investment and future market returns (Cochrane 1991;

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[3] At firm level, Oh (2016) shows that alternative goodwill that captures a speculative component in M&A prices is negatively related to acquirer's future returns.

[4] In our empirical analysis, we control for the change in number of M&As undertaken each year as a proxy for the effect of merger waves, however, our construct of interest is aggregate speculation, not economic activity. Harford (2005) provides evidence that merger waves are associated with technological and regulatory change, which suggests that the change in number of M&As reflects economic activity. In addition, aggregate goodwill includes time-series variation due to impairments (Li and Sloan 2015; Gu and Lev 2011; Hayn and Hughes 2006).

Arif and Lee 2014; Lamont 2000). We focus our reexamination on the two mechanisms that are jointly required in order to facilitate the incorporation of speculation in the measurement of assets. First, we examine expected differences between investments made during a period when market prices appear more speculative. Second, we examine the expected differences between investments based on accounting measurement.

We first document that aggregate total investments, calculated empirically as the annual change in net operating assets plus the change in the estimated capitalization of R&D, are negatively related to future aggregate market returns. Consistent with Arif and Lee (2014) for our long time-series that spans 1962-2013, we find stronger results for one-year lagged aggregate total investments. We then examine whether in more recent periods, the negative association between aggregate total investment and future market returns is stronger by testing for a structural break around 1993. We choose 1993 following Curtis (2012) who documents a structural break in the comovement between aggregate market prices and aggregate accounting measures of fundamental value, consistent with an increase in the aggregate level of speculation in market prices. We find strong evidence of a negative association for the post 1993 period which is in direct contrast to the earlier period where the evidence is not significant at conventional levels.[5]

We next examine a disaggregation of total investment into changes in tangible and intangible assets. As predicted, we find that in recent periods, the change in intangible assets is negatively associated with future market returns. In contrast, we find that the change in tangible assets does not exhibit a structural change, and is inconsistent across specifications. These results suggest that the primary driver of the negative association between investments and future returns are found in assets that are measured in a way that allows for the incorporation of speculation. We then examine this in more detail by further decomposing intangible assets into changes in goodwill, R&D and other intangibles. We find that the primary driver of the negative association between total aggregate investments ad future market returns is the change in aggregate goodwill.

[5] We investigate alternative periods in our analysis, including the estimation of rolling regressions and find results consistent with the negative association being concentrated in more recent years of the sample.

Our paper shares some similarities with recent work in both finance and accounting but is distinct in terms of focus and contribution. First, our evidence contributes towards understanding the links between the level of aggregate investment and the fluctuations in the business cycle. Specifically, we provide additional evidence on the role of the more speculative investment activities within aggregate total investment that are identified by acquisition accounting. Our evidence extends Arif and Lee (2014) who investigate aggregate total investment. Consistent with their conclusion that the aggregate actions of managers may be linked to fluctuations in the business cycle, we find that aggregate goodwill – the aggregate price paid for companies acquired above the fair value of identifiable assets acquired – provides evidence of a link between speculative investments and aggregate economic outcomes.

Second, our paper also shares some similarities with recent accounting research that examines the effects of accounting measurement and aggregate, or macroeconomic fluctuations. For example, Konchitchki (2011) and Curtis et al. (2015) examine how inflation affects the interpretation of accounting information and Konchitchki et al. (2016) examine how the pricing of earnings relates to macroeconomic risk. We focus on how the increase in aggregate R&D expenditures affects the future profitability of a firm's R&D expenditures. We focus on how accounting measurement can identify speculative investment and how the aggregate of goodwill can aid in the understanding of aggregate economic outcomes.

Finally, our results have implications for the broad accounting debate on whether or not incorporating prices into accounting is "good" or "bad" especially for the measurement for intangibles.[6] On the one hand, empirical evidence is generally consistent with acquired intangible assets being value relevant (e.g., Kallapur and Kwan 2004). On the other hand, including prices in accounting could potentially lower accounting quality, as "Quality accounting recognizes that market prices are inherently speculative, for they are based on beliefs about the future" (Penman 2003, 88). Our results are consistent with the incorporation of speculation onto the balance sheet

[6] Clearly the phrases 'good' and 'bad' are loaded terms. A key feature in this debate is whether or not accounting measurement of transaction costs is adequate for users' needs. The theoretical literature on transaction cost economies suggests that firms exist to minimize transactions costs through organizing as a firm (Coase 1937), suggesting an important role for accounting could be the measurement and disclosure of these costs. In such a setting, 'bad' accounting for acquiring assets includes the measurement and disclosure of assets that are transaction costs, and should be expensed. If goodwill is considered in part as a transaction cost of maintaining or gaining market share or synergies (see the example in Appendix C), then theoretically it appears closer to a transaction cost associated with the reorganization of the firm, than an asset.

via acquisition accounting, suggesting that this approach is associated with lower accounting quality.

2. Motivation and hypothesis development

2.1. The link between aggregate investment and future returns

Prior literature examines the association between aggregate investment and future aggregate stock returns. Using a production-based asset pricing model, Cochrane (1991) finds the negative association between aggregate investment and future stock returns. Lamont (2000) examines how lags in investment are related to the association between aggregate investments and stock returns. He finds the planned investments have different implications on stock returns from unplanned investments. Investments are negatively related to contemporaneous stock returns, but investments do not predict future returns. When he decomposes investments into planned and unplanned components, he finds planned investments are negatively related to future stock returns. More recently, Arif and Lee (2014) document that aggregate investments, measured by the change in aggregate net operating assets, are high in the same periods with investor sentiment and followed by low stock return periods. One possible explanation for this result discussed by Arif and Lee (2014) is that managers get 'caught up' in investor sentiment. We provide further evidence on this possibility by examining whether the association between aggregate investments and aggregate future returns is driven by the incorporation of speculation onto the balance sheet.

We focus our examination on the two mechanisms that are jointly required in order to facilitate the incorporation of speculation onto the balance sheet. First, market prices are required to include significant speculative components at the aggregate level. Second, accounting techniques that capitalize market prices without distinction between the efficient price and any speculative components must be in broad usage. Without these two mechanisms operating together, the amount of aggregate speculation incorporated onto the balance sheet is unlikely to have any meaningful effect on the measurement of aggregate investment.

To identify the role of the first mechanism, the amount of aggregate speculation in price, we examine time-series variation in the association between aggregate investments and future returns. We base our time-series tests on the evidence that the aggregate level of speculation in prices relative to accounting based measures of fundamental value is higher in periods after 1994 (Curtis 2012). Intuitively, the effects of the market bubble in the late 1990s and the subsequent market volatility in the 2000s suggest that this is a period of much higher speculation in prices than in earlier periods.

To identify the role of the second mechanism we examine acquired intangible assets arising from M&A activities. Accounting for M&A activities is an important accounting technique that plausibly leads to the incorporation of speculation onto the balance sheet. Following the purchase method, of accounting for acquisitions, acquirers estimate fair values of tangible and identifiable intangible assets, with difference between the purchase price and the sum of fair values of all identifiable assets less liabilities is recorded as goodwill.[7] In aggregate, the intangible assets, especially goodwill, are the most likely to capitalize speculative activities onto the balance sheet.

2.2. Speculation in market prices

We consider the possibility that the aggregate level of speculation in market price varies over time, the maintained assumption that prices measure intrinsic value with a time-varying error (Lee et al. 1999; Curtis 2012). For example, market prices include many speculations during bubble periods than other periods. In the late 1990s, technology and internet stocks experienced high prices that appeared to be independent to the fundamentals of business. The resulting stock market bubble that was likely driven by this higher level of aggregate speculation burst, resulting in sharp price declines. Based on tests of cointegration between market prices and accounting based measures of fundamental value, Curtis (2012) finds that during that period price movements include more speculative components than in historical years, based on tests of cointegration. When aggregate market prices include more speculation, aggregate assets recognized on the balance sheet based on market prices are expected to include greater levels of

[7] Prior to SFAS 141, companies in business combinations chose between the pooling of interests and purchase (when accompanied by an exchange of stock) methods. Under the pooling of interests method, two companies' assets and liabilities are simply combined, and goodwill is not recognized under pooling method. This means that M&A activities recorded under pooling method do not incorporate speculation onto the balance sheet as clearly as the purchase method. Therefore, the bulk of our results likely stem from the M&A activities that are recorded under the purchase method.

speculation. In addition, Moeller et al. (2005) document that M&A deals made between 1998 and 2001 are much more value destructive than M&A deals made in 1980s. This evidence suggests that investments in recent sample periods incorporate more speculation than investments in earlier sample periods.

Based on this argument, we hypothesize:

> H_1: The negative association between aggregate investment and future market returns is concentrated in recent years.

To test H_1 we examine regressions of future returns on our variables of interest. We measure returns, Ret_{t+1}^{M}, over the 12 month period beginning from July in year *t*+1 until June in year *t*+2, using the CRSP value-weighted index adjusted for inflation. Following Arif and Lee (2014) we include firms with December fiscal year-ends and use two lags of investment, and consider the base time-series regression model as:

$$Ret_{t+1}^{M} = \beta_0 + \beta_1 INVEST_t + controls_t + e_t \tag{1}$$

where, $INVEST_t$ is a measure of total investments based on the change in net operating assets.[8] Based on Arif and Lee (2014) our priors for β_1 are negative in the range -4.28 to -2.09, statistically below zero. Our hypotheses relate to the estimates of β_1 for different time-periods and for the disaggregation of $INVEST_t$ into tangible and intangible assets.

Our first prediction, which we summarize in Hypothesis 1, is that the coefficient on β_1 is lower in more recent periods, the periods coinciding with the speculative periods identified in Curtis (2012). There are multiple ways to test this prediction, consider splitting the base regression into two sub-periods, the first T observations and the remaining, then Equation (2) can be written as:

$$Ret_{t+1}^{M} = \begin{cases} \beta_0 + \beta_1 INVEST_t, t = 1, \ldots, T. \\ \beta_0^T + \beta_1^T INVEST_t, t = T+1, \ldots, T+m., \end{cases} \tag{2}$$

As we expect that the more recent period includes more speculative periods, we can write our prediction based on H_1 as:

[8] We describe the measurement of *INVEST* and controls in the following section and in Appendix A. Arif and Lee (2014) report models measuring *INVEST* at time t, at time t-1, and the simple average of the prior two years of aggregate total investments We report *INVEST* at time t, at time t-1 in our main analysis, and the average in Appendix D.

$$H_1: \beta_1^T < \beta_1$$

Empirically, we can identify differences between two-time periods by incorporating a time-series indicator variable to distinguish the two different time-periods. For example:

$$Ret_{t+1}^M = \beta_0 + \beta_1 INVEST_t + \delta \mathbf{1}_{t>T} + \beta_2(\mathbf{1}_{t>T} INVEST_t) + controls_t + e_t \tag{3}$$

where, $\mathbf{1}_{t>T}$ is an indicator variable equal to 1 if $t > T$ and zero otherwise. In this case, $\beta_1^T = \beta_1 + \beta_2$. Our empirical strategy for testing H_1 is now based on finding appropriate splits of the time-series into two periods; one where the period is considered as less speculative and a second period considered more speculative ex-ante. We provide our initial tests based on the evidence in (Curtis 2012) that in the period after 1993, prices included more speculative components. We also consider other ex-ante candidates for the split including (i) an equal time period split to maintain equal power of the test across sub-periods (1989), and (ii) post SFAS 141 to test for a regime shift (2002).[9] In these cases where a structural change in the parameter is predicted ex-ante, the Chow Statistic is an appropriate test statistic for tests of H_1.[10]

2.3. Incorporating speculation on the balance sheet with goodwill accounting

We consider next consider the possibility that aggregate total investment can be decomposed into components based on the level of speculation recognized in the various investments' values. We consider the difference between tangible and intangible assets as a starting point. Intangible assets are typically recognized due to the accounting treatment of merger and acquisitions. Specifically, when an acquirer recognizes an acquisition on its balance sheet, it allocates the purchase price into fair value of identifiable net assets, both tangible and intangible, and goodwill.[11] In the case where the purchase price is lower than the fair value of identifiable net assets, the assets are recorded at the allocation of the price paid. As such, goodwill can only take a positive value, arising only when the price paid exceeds the fair value of identifiable net assets. Identifiable intangible assets, such as customer lists, trade names and

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[9] The changes to the measurement of acquired intangible assets following the enactment of SFAS 141 mandates the capitalization of acquired goodwill as opposed to a choice, requires impairment testing as opposed to amortization, and provided additional guidance on the capitalization of intangible assets.

[10] We consider alternative tests for parameter stability that are based on assumptions relating to the stationarity of the parameter in Appendix D.

[11] In 2007, SFAS 141R included some changes relating to how the allocation of the acquisition price to various assets and expenses occurred. In particular, the guidelines surrounding in process R&D were clarified. The anticipated effect on the recognition of goodwill, however, was minimal.

technology (including in-process R&D) are recognized based on the estimated fair value of the assets, and are often based on estimates of the present value of future cash-flows. Again, the residual purchase price is allocated to goodwill and includes speculation implied in the market value of a target relative to the fair value of identifiable net assets. Thus in general, acquisition accounting leads to the explicit incorporation of speculative values onto the balance sheet as they incorporate expectations of the future.

Based on this argument, we hypothesize:

> H_2: Aggregate intangibles, primarily goodwill, drive the negative relationship between aggregate investment and returns.

We test H_2 by noting that $INVEST_t$ can be decomposed into tangible, ΔAT_t^T, and intangible, ΔAT_t^I, assets, as $INVEST_t \equiv \Delta AT_t^T + \Delta AT_t^I$. Based on H_2 we expect that the negative association between future returns and total investments is concentrated in intangible investments that are typically recorded on recognition. Disaggregating and writing Equation (2) as:

$$Ret_{t+1}^M = \theta_0 + \theta_1 \Delta AT_t^T + \theta_2 \Delta AT_t^I + controls_t + e_t \qquad (4)$$

Using this specification, H_2 predicts:

$$H_2: \theta_2 < \theta_1$$

Tests of H_2 are based on the standard F-test of the difference between θ_1 and θ_2. The predictions of H_1 and H_2 are not mutually exclusive. Combining the predictions from H_1 and H_2 yields the prediction that changes in intangible assets will have a significantly greater negative association in the recent more speculative periods. This prediction is tested based on a differences-in-differences estimator which is the combination of Equation (5) with time-indicator variables for speculative periods in Equation (4).

We further note that ΔAT_t^I in Equation (5) can be decomposed into goodwill, other intangibles and changes in capitalized R&D using the identity that $\Delta AT_t^I \equiv \Delta GW_t + \Delta OIA_t + \Delta RDC_t$.[12] Using this identity to decompose intangible assets allows the estimation of the

[12] According to our disaggregation above an important control variable in Equation **Error! Reference source not found.** is the aggregate of R&D expenditures. Note that Curtis et al. (2016) find that the association between aggregate R&D

association between each of the components of intangible investment with future returns individually:

$$Ret_{t+1}^{M} = \theta_0 + \theta_1 \Delta AT_t^T + \theta_2 \Delta GW_t + \theta_3 \Delta OIA_t + \theta_4 \Delta RDC_t + controls_t + e_t \qquad (5)$$

In this decomposed specification, H_2 predicts:

$$H_2 \colon \theta_2 < \theta_1, \theta_3, \theta_4$$

For these tests, we are only able to examine the period after 1989, as goodwill is not available on Compustat prior to this point in time. This prediction can also be estimated using standard *F*-tests.[13]

3. Measurement of variables

3.1. Aggregation procedure

We aggregate variables taking the value-weighted mean of each variable using in the equations below, using market capitalization as the weights. For each variable the aggregate time-series is the weighted sum of all firms with available data in time t, such that $var_t = \sum_i \omega_{it} var_{it}$, with weights $\omega_{it} = \frac{mve_{it}}{\sum_i mve_{it}}$. Note that the weights, ω_{it}, sum to one, and are based on market value of equity, mve_{it}, at the end of the June. The purpose of the weights is to make our aggregate measures reflect aggregate changes in wealth that are predicted by speculative investment. All variables are aggregated in this fashion.[14]

3.2. Decomposing total investments

Following Arif and Lee (2014) we measure aggregate investment ($INVEST_t$) as the value-weighted aggregate of the change in net operating assets adjusted for research and development expenses divided by average assets adjusted for prior R&D. That is:

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expenditures and profitability are declining over our sample period. In order to assess whether our effect is distinct from R&D expenditures we perform our analysis including and excluding capitalized R&D in aggregate total assets.

[13] With only a short time-series we will be unable to undertake more sophisticated time-series econometrics as the power of these tests are significantly reduced for sample sizes under 100 time-series observations. As such we are unlikely to be able to reliably measure more dynamic models. For example, a more complex model could consider using SFAS 141 to identify the incremental effect of mandating the purchase method. In our set-up, this is a test of a second order effect and may not yield coefficients that can be disentangled from time-series variation in the level of speculation in market prices.

[14] We also consider alternatives such as dollar weighting which is equivalent to the sum of each variable: $var_t = \sum_i var_{it}$ with similar results.

$$INVEST_t = \frac{\Delta NOA_t + XRD_t}{AvgAssets_t}, \qquad (6)$$

where ΔNOA_t is the change in net operating assets measured as the change in non-cash assets (*Compustat*:AT – *Compustat*:CHE) minus the change in non-debt liabilities (*Compustat*:LT + *Compustat*:MIB – *Compustat*:DLTT – *Compustat*:DLC), XRD_t is research and development expenses (*Compustat*: XRD), $AvgAssets_t = 1/2(AT_{t-1} + RDC_{t-1} + AT_t + RDC_t)$ where AT_t is total assets (AT) and RDC_t is capitalized research and development expenses using the weights in Lev and Sougiannis (1996).

We decompose $INVEST_t$ in two steps to examine the incorporation of speculations on the aggregate investment. First, we decompose $INVEST_t$ into the change in tangible assets ($\Delta \mathrm{A}T_t^T$) and the change in intangible assets ($\Delta \mathrm{A}T_t^I$) using the following identity: $\Delta INVEST_t \equiv \Delta \mathrm{A}T_t^T + \Delta \mathrm{A}T_t^I$. We measure the change in intangibles by summing the annual change aggregate total intangibles (*Compustat*: INTAN) and capitalized R&D expenses (XRD_t) as above, and for both comparability with Arif and Lee (2014) and internal consistency we solve the identity to calculate the change in tangible assets (i.e. $\Delta \mathrm{A}T_t^T \equiv INVEST_t - \Delta \mathrm{A}T_t^I$). Second, we then decompose the change in intangible assets ($\Delta \mathrm{A}T_t^I$) into the change in goodwill (*Compustat*: GDWL), the change in intangibles other than goodwill, and capitalized R&D expenditures (*Compustat*: XRD_t). Therefore, the sum of the change in goodwill, the change in other intangibles, and the capitalized R&D expenses is equal to the change in intangible assets (i.e. $\Delta \mathrm{A}T_t^I \equiv \Delta GDWL_t + \Delta OtherINTAN_t + XRD_t$). We provide an illustration of the two-step decomposition process in Appendix B.

4. Empirical analyses

4.1. Sample selection

We collect annual accounting data from the *COMPUSTAT* database over the sample period for December year-end firms beginning in 1962 and ending in 2012. We begin our analysis with data from 1962 year-ends as it is the earliest year with available data to calculate our measure of aggregate investment, and end in 2012 as we require future returns ending 18 months after this date (i.e., July 2014). We exclude firms in the financial industry (SIC codes between 6000 and 6999). We also restrict our sample to firms with the fiscal year ending in December in order to properly match accounting information with related aggregate annual returns real GDP growth rates. Following Arif and Lee (2014), we exclude observations if total assets (AT), cash and short-term investments (CHE), long-term debt (DLTT), sales (SALE), or total liabilities (LT) are missing. We replace other investment and advances (IVAO) and debt in current liabilities (DLC) with zero if they are missing. Ratios and changes are winsorized at 1 percent level every year prior to aggregation. For our 51 year sample period, these screens result in 84,538 firm-year observations that are used in the aggregate measures.[15]

The annual real return for year *t* is compounded CRSP value-weighted returns for Q3 and Q4 in year t and Q1 and Q2 in year *t*+1. To find real returns for year *t*, we adjust annual value-weighted returns with the consumer price index (CPI). Real GDP is obtained from Federal Reserve Bank of Philadelphia web site. All variables are aggregated as described above (value-weighted means).

4.2. Descriptive statistics

We report descriptive statistics in Table 2. In Panel A of Table 2 we report descriptive statistics for the full period. We find that the mean annual market return ($RET_{y,t}$) is 7.3% with standard deviation of 0.176, in our sample period. Similar to Arif and Lee (2014) we find that the mean aggregate investment (*INVEST)* is 0.066. When decomposing *INVEST* into tangible and intangible components, we find that *INVEST* is mostly due to the increase in tangible assets (ΔTAN = 0.058) with the mean of the change in aggregate intangible assets ($\Delta INTAN$) being 0.019. For the full sample, the mean change in aggregate goodwill ($\Delta GDWL$) is 0.003, however, this number is low due to the frequency of zeros prior to 1989 (post 1989, when goodwill data is populated in *COMPUSTAT* the mean $\Delta GDWL$ is 0.06).

In Panel B, we report descriptive statistics for the early (1962-1993) and the late (1994-2012) sample periods independently along with tests of difference between the sample periods. The mean aggregate return for the early period (7.0%) is not statistically different from the later period (8.0%), with similar results for tests of the median return (early period median = 7.3%; late period median = 15.3%). These apparent differences are not statistically different due to

[15] As expected, early years in the sample have fewer observations. The minimum number included in the aggregate is in 1962 (192 firms) and the maximum is in 1999 (2,777 firms). We report the number of firm-years included in the sample by year in Appendix Table D.1.

large variation in aggregate returns during the sample period. Aggregate total investment is not significantly different between the early and late periods, both periods having a mean *INVEST* = 0.66, with the early median *INVEST* = 0.66 and late period median *INVEST* = 0.65. Not surprisingly, these differences are not statistically significant. The decomposition of *INVEST*, however, highlights that proportion of investment in intangible assets has increased relative to the proportion of tangible assets. Specifically, the early mean of *ΔTAN* = 0.063 declined by 0.014 to 0.049 a statistically significant decline at the 5% level of confidence. In contrast, the early mean *ΔINTAN* = 0.063 which increased by 0.013 to 0.027 a statistically significant increase at the 5% level of confidence.

We also find evidence that a larger proportion of *INVEST* is stemming from M&A activities, which includes the acquisition of both tangible and intangible investments, especially goodwill. That is, we find that there is a statistically significant increase in the number of acquisitions made by the firms in our aggregate, with the early mean of 50.5 M&A transactions per year increasing to 416.3 M&A transactions per year. This increased M&A activity is the obvious cause of the increases in the change in aggregate goodwill and other intangibles in the late period. In summary, these statistics are consistent with our conjectures that more speculative investments are incorporated into the balance sheet in more recent periods.

In Figure 1 we plot the time series of annual aggregate investment relative to the changes in tangible assets. By definition, the difference between the two is the change in intangible assets. Consistent with the tests reported in Table 1, comparing the early part of the time-series with the late part of the time-series highlights the lower weight of tangible investments relative to intangible investments in aggregate investment over time. An important trend appears in the 1994-2000 period, or bubble period, with intangible investments appearing to be of much greater importance. In Figure 2 we plot the time series of annual aggregate changes in goodwill relative to the changes in intangible assets. The changes in goodwill appear to co-move with the changes in intangible assets suggesting that the variation *ΔGDWL* is likely well-proxied for by *ΔINTAN*.[16]

[16] Confirming this we find that $\Delta INTAN_t$ and $\Delta GDWL_t$ are highly correlated, with a Pearson correlation of 0.816. This is consistent with goodwill being a major component of intangible assets and variation in $\Delta GDWL_t$ providing significant variation in $\Delta INTAN_t$. We tabulate this correlation along with correlations between other selected variables in Appendix D.

4.3. Tests of Hypothesis 1

In this section we discuss our empirical tests of Hypothesis 1, which predicts that the negative association between aggregate investments and future market returns is concentrated in recent years. As discussed above, this implies a difference in the association between earlier and later periods which can be accomplished by testing for a structural break in the time-series association between aggregate total investments and future returns. Following Arif and Lee (2014) we consider the effects of aggregate investment on future economic outcomes over the subsequent two years by examining the association between Ret_{t+1}^{M} with both $INVEST_t$ and $INVEST_{t-1}$. In our setting this allows us to identify a slower market response to speculative investments.

We report estimates of the association between total aggregate investments and future returns for the period 1962-2012 in Table 2. Similar to Arif and Lee (2014) we find evidence of a negative association on total aggregate investments, which is much stronger for lagged total investments. In Column (1) the coefficient estimate for $INVEST_{t-1} = -2.036$, which is statistically significant at the 5% level of confidence. In contrast, the coefficient estimate for $INVEST_t = -1.422$ but is not statistically significant at conventional levels. These results confirm that the future economic outcomes associated with increased investment tend to take time to be resolved.

In Columns (3) and (4) of Table 2, we report tests of difference between the earlier and later period. Specifically, we include an indicator variable for all years greater than or equal to 1994 (*Post 1994*) and also include the interaction of the indicator with total investments. Our prediction, based on H_1, is that the interaction term will be significantly negatively associated with future returns. We find evidence consistent with H_1, for both $INVEST_t$ and $INVEST_{t-1}$. For example, in Column (3) the coefficient of $Post\ 1994 * INVEST_{t-1} = -2.810$, statistically significant at the 10% level of confidence. Note that the coefficient estimate of the main effect of total investments, $INVEST_{t-1} = -1.338$, is negative but not statistically significant at conventional levels. The interaction effect is even stronger in Colum (4) with the coefficient estimate of $Post\ 1994 * INVEST_t = -5.045$, statistically significant at the 1% level of confidence. These results provide preliminary evidence in support of H_1.[17]

To further examine H_1 we estimate rolling regressions using 20 time-series observation, beginning with the window from 1962-1981, and sequentially adding a recent year of data and dropping the earliest year of data, until the final window that is based on the period 1991-2012. The rolling window estimates allow for additional tests of structural change in the coefficient linking aggregate investment and future returns. We plot the coefficients in Figure 3. Specifically, we plot in blue the rolling window estimate of β_1 from the regression $Ret_{t+1}^M = \beta_0 + \beta_1 INVEST_t + e_t$. Visually, the results indicate that the coefficient is positive prior to the window ending in 1998, the coefficient is then below zero in the period ending in 1999 and declines relatively consistently from that point onwards. In contrast, we plot in red the rolling window estimate of β_1 from the regression $Ret_{t+1}^M = \beta_0 + \beta_1 INVEST_{t-1} + e_t$, the estimates generally all lie below zero. The sharp downward shift in the plot is also around the 1998-1999 period, around the end of the bubble. These figures shed light on the estimates presented in Table 2, which suggest that the association between future returns and aggregate investment is significantly lower on average in recent periods, with the shift in the association being more prominent for total investments in year *t*.[18]

Taken together, our results are consistent with the prediction in H_1 that the negative association between aggregate total investment and future returns is concentrated in recent years. These tests confirm at least that there is a role for time-variation in the level of speculative investment, but they do not yet provide any direct evidence of a role for accounting measurement. It is possible that these results are consistent with overinvestment during these periods of high investor sentiment. We examine the extent to which the results are due to incorporating speculation onto the balance sheet in our tests of Hypothesis 2.

[17] We also considered alternative break points for the association between total investments, including splitting the sample into equal time-periods to control for any differences in the power of the test. As expected, the results are using an equal sample period provide evidence of a structural break. We do not, however, find evidence of a structural break around the implementation of SFAS 141, but this is potentially due to the small number of observations (5) in our sample since 2007. We tabulate these results in Appendix D.

[18] We also examine how the slopes from the rolling window estimates might be non-stationary by estimating Phillips-Perron tests with and without trends. We find that in all cases, the slopes plotted in Figure 3 are nonstationary. The prominent downward trend in both Panels is highly significant in these regressions, however, we do not find that the coefficients are stationary around these trends. We tabulate these results and provide further discussion in Appendix D.

4.4. Tests of Hypothesis 2

In this section we discuss our empirical tests of Hypothesis 2, which predicts that the negative association between aggregate investments and future market returns is concentrated in aggregate changes in intangible assets, especially goodwill. As discussed above, this implies a difference in the association between the components of total investment that include less speculation (changes in tangible assets) and more speculation (changes in intangible assets). This calls for tests of the association of future returns with a decomposition of aggregate total investment into the changes in tangible and intangible assets.

We report estimates of the associations between future aggregate returns and the decomposition of total investments into changes in tangible assets and changes in intangible assets in Table 3. In Column (1), we find evidence of negative coefficients on both lagged tangible and lagged intangible investments with the coefficient on $\Delta TAN_{t-1} = -1.776$ being significantly less than zero and the coefficient on $\Delta INTAN_{t-1} = -3.396$, which is not statistically different from zero at conventional levels. In Column (2), whereas both coefficients are again negative, we do not find evidence of a statistically significant association between future aggregate returns and either component of total investment. These results are inconsistent with H_2, where we predicted that the coefficient on intangibles would be statistically more negative than that on tangible assets due to these investments being more speculative. There are a number of reasons, however, why we may not find evidence in the full time-series. First, the hypothesis is contingent on aggregate intangible investments containing sufficient levels of speculation, which requires that aggregate market price has a significant amount of speculation. As such, we may fail to find evidence of an effect for early part of our sample. Second, as seen in Figure 1, changes in tangible assets make up almost all of the aggregate total investments until the recent period.

To address these concerns, we examine the effect of including an indicator variable for recent periods and an interaction between the indicator and the components of total investments. That is, an approach that tests H_2 conditional on H_1. We report the results in for the decomposition of total investment and the lag in Columns (3) and (4). In these specifications, the evidence is much more consistent with the predictions in H_2. Specifically, we find that the coefficient $Post\ 1994 * \Delta INTAN_{t-1} = -20.586$, which is statistically significant at the 1% level of confidence. The aggregate change in tangible assets, however, is not statistically different from zero at conventional levels. We find similar results for the decomposition of total investments in year *t*, and report these in Column (4).

Taken together, our results are consistent with the prediction in H_2 that the negative association between aggregate total investment and future returns is concentrated in more speculative investments. These results, however, are only found in the recent sample period, consistent with the evidence we presented for tests of H_1. One interpretation of these results, along with those for H_1 is that both the existence of speculation in price and the capitalization of this speculation on the balance sheet via intangible assets acquired are required for the underperformance of investment activities. We examine this further in our tests below, by examining a further decomposition of intangible assets into goodwill, R&D, and other intangibles.

4.5. Tests of the role of Goodwill

Our analysis above suggests that at least in recent periods, where the negative association between future returns and aggregate investments are statistically strongest, are driven by investments in intangibles. In this section, we provide further evidence as to the mechanism that links aggregate investing activities to negative future aggregate returns. In Hypothesis 2, due to the residual nature of goodwill (being the plug number after recognizing all other identifiable assets) we consider it to be the asset which incorporates the highest relative amount of speculation onto the balance sheet. As such, we examine tests of the association between future aggregate returns and intangible assets decomposed into three components: the change in goodwill, the change in non-goodwill intangibles, and the change in capitalized R&D.

For this decomposition, we anticipate that aggregate changes in goodwill have the most negative association with future returns relative to other components of aggregate total assets. We report estimates of these associations in Table 4. In Column (1) we find that the coefficient on $\Delta GDWL_{t-1} = -13.44$, which is statistically significant at the 5% level of confidence. In Column (2) we find that the coefficient on $\Delta GDWL_t = -10.05$, however, the coefficient is not statistically different from zero at conventional levels. In both Column (1) and Column (2) the coefficients on the other components of total investments are all insignificantly different to zero. These results are consistent with our prediction in Hypothesis 2 that changes in goodwill are the primary driver of the negative association between future returns and aggregate total investments. As such, our results are consistent with the most speculative investments on the balance sheet being the driver of the poor stock market performance associated with aggregate investments.

4.6. Further analysis

We undertake additional analysis to consider the robustness of our main results to changes in key variables and assumptions. As aggregate goodwill could proxy for changes in macroeconomic conditions, and investor sentiment, we examine whether the negative association between the change in goodwill and the future market holds after controlling for other variables that are expected to be related to the future market returns, including investor sentiment variables examined by Arif and Lee (2014).[19] As controls for macroeconomic conditions, we include the term structure of interest rates, the default spread and the interest rate on the US Government Treasury Bill as controls. To control for growth in working capital, we include aggregate working capital accruals, and finally to control for sentiment, we include consumer confidence, equity market inflow and the Baker-Wurgler sentiment index. We report the estimates in Table 5. Columns (1) – (4) report estimates including each sentiment variable individually due to multicollinearity concerns. In each case, including these additional controls does not appear to subsume the predictive power of $\Delta GDWL_t$ with significant coefficient estimates in all cases ranging from -29.172 to -24.863 across various specifications.

In addition to the aggregate change in goodwill being robust to the inclusion of controls, the coefficient on the aggregate changes in other intangible assets is also significantly negative in three of the four specifications. The results are marginal, with two of the three being significant at the 10% level and one at the 5% level. Nonetheless, as many of these intangible assets are acquired on acquisition and are based on uncertain estimates of future cash flows within the constraints of the allocation of the price paid, these assets are also likely to be relatively

[19] Due to our shorter sample period in these tests, we choose to include a subset of the controls to avoid micronumerosity concerns. We did not include eshares as it is highly correlated with changes in goodwill, and we did not include valuation multiples due to high multicollinearity concerns according to the VIF statistic.

speculative. The control variable for aggregate working capital accruals is positive and significant in three of the four specifications. Despite this being in contrast with the results in Sloan (1996), who along with subsequent researchers document a strong negative association between working capital accruals and future returns, our results are consistent with the positive association between working capital accruals and future returns documented in Hirshleifer et al. (2009).

We next consider the alternative measures of future economic outcomes by examining GDP growth as a dependent variable. We examine both the change in GDP and the change in the non-residential investment component of GDP both over the subsequent 12-month period. GDP growth includes residential spending, or real estate purchases, whereas this is excluded from the non-residential component of GDP. As we anticipate that speculative investments will lead to lower corporate performance, we conjecture that the non-residential component of GDP will be more affect than the residential component. We report estimates of these regressions in Table 6. We find some evidence of a negative association between GDP growth and changes in aggregate goodwill, but the estimates are marginally significant at best. In contrast, we find robust negative associations between both the change and the lagged change in aggregate goodwill with changes in non-residential GDP growth.

Finally, we provide additional evidence on the role of the number of M&A transactions in Table 7. Harford (2005) finds that M&A waves are associated with economic activity, such as changes in regulation that affects competition. As goodwill is recorded on acquisition, aggregate M&A activity is expected to be mechanically related to goodwill. In Panel A of Table 7, we include the annual change in the number of M&A transactions as a control variable when examining the association between future returns and aggregate changes in goodwill. Comparing these estimates with the estimates we report in Table 4, we note that the inclusion of M&A activity lowers the magnitude of the coefficient on goodwill to -10.22 (from -13.44 in Column 1 of Table 4), but the statistical significance remains at a qualitative similar level. In Panel B of Table 7, we report the association between future GDP and aggregate changes in goodwill, controlling for the number of M&A transactions. The evidence here is fairly inconsistent, with some limited evidence that aggregate changes in lagged GDP is significant when including the number of M&A transactions, but changes in aggregate GDP are not (the opposite from Table 6).

Taken together, the results in this section provide additional evidence on the usefulness of aggregate changes in goodwill to predict negative future aggregate returns and the non-residential component of GDP growth. The evidence, however, is weaker and inconsistent for GDP growth.

5. Conclusion

We examine whether the incorporation of speculative investments onto the balance sheet explains the negative association between aggregate investment and future market returns. Speculative investments that are incorporated onto the balance sheet often arise as intangibles recorded at acquisition. Our decomposition of total investments is based on differences in the accounting measurement of assets acquired through merger and acquisition activities. Specifically, we define more speculative investments as those that are measured by capitalizing the difference between price and book values onto the balance sheet (e.g. goodwill and other acquired intangibles) and less speculative investments as those investments that are not measured explicitly on the difference between price and book values (e.g., capital expenditures).

We find that the previously documented negative association between aggregate investment and future market returns is concentrated in more speculative periods, and is mostly driven by goodwill, the most speculative acquired asset. Our findings extend Arif and Lee (2014), by highlighting the usefulness of differences in accounting measurement in the prediction of aggregate economic outcomes. Specifically, measurement differences enable decompositions of investment into inherently speculative assets based on beliefs about the future, and assets based on market prices. Our findings also provide evidence of use in assessing the useful characteristics of assets, suggesting that the capitalization of speculation is associated with lower quality asset measurement.

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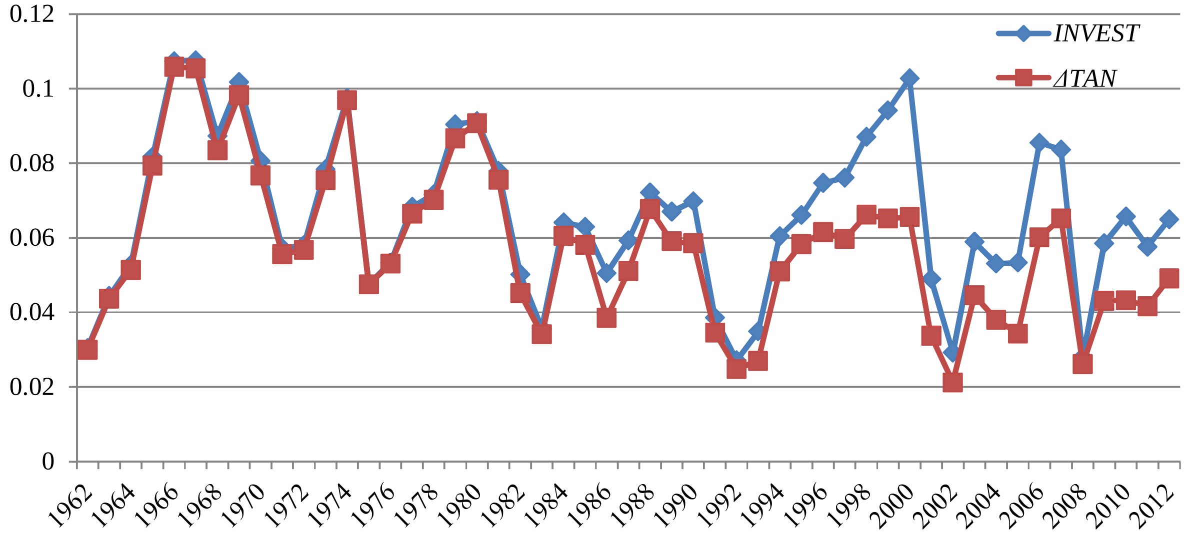
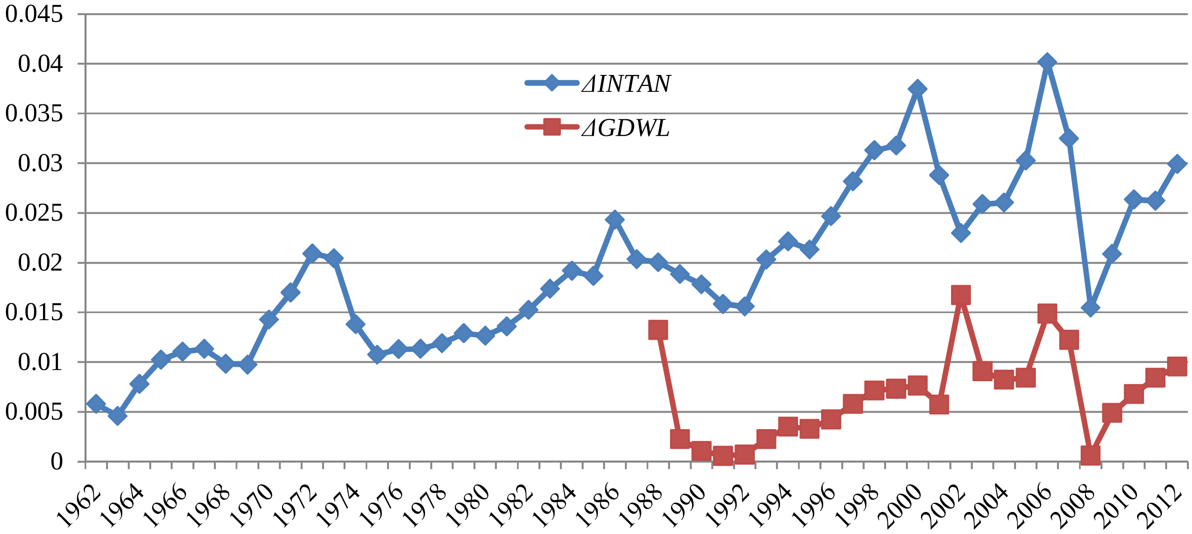
Figure 1
The time series behavior of aggregate total investment relative to changes in tangible assets



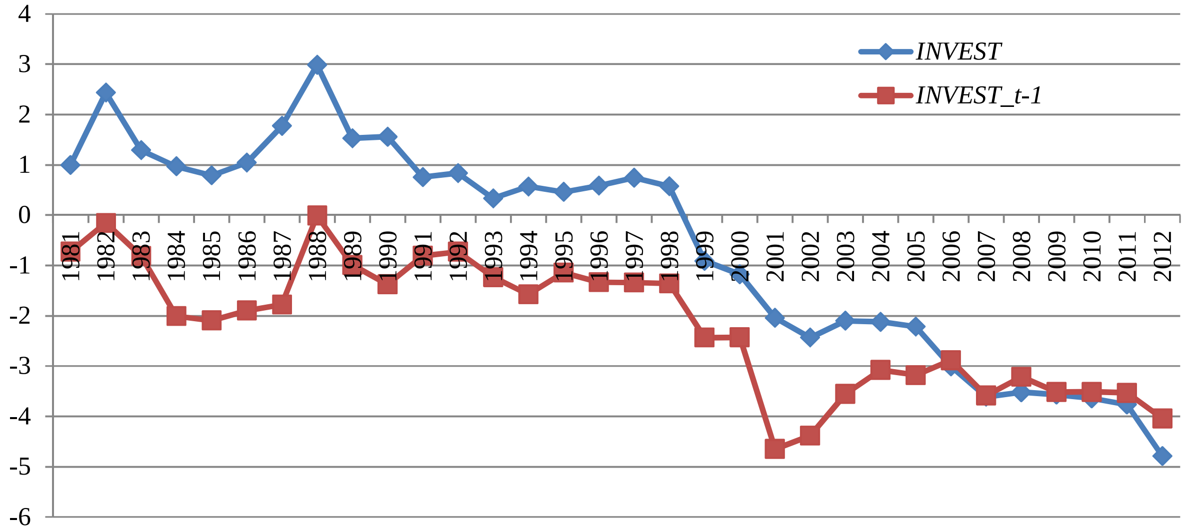
Notes: We include all firms with available data in the aggregate measures of total investment (*INVEST*) and the change in tangible assets (*ΔTAN*). The aggregates plotted in the figure reflect the weighted mean investment and change in tangible assets, with the weights based on market capitalization.

Figure 2
The time series behavior of aggregate changes in goodwill to changes in intangible assets



Notes: We include all firms with available data in the aggregate measures of changes in goodwill (*ΔGDWL*) and the change in intangible assets (*ΔINTAN*). The aggregates plotted in the figure reflect the weighted mean change in goodwill and change in intangible assets, with the weights based on market capitalization. The apparent spike in 1988 is driven by the collection of goodwill in *COMPUSTAT* in 1988 and is excluded from our analysis.

Figure 3
Rolling regression estimates of the association between investments and future returns
Rolling regression estimate for $Ret_{t+1}^{M} = \beta_0 + \beta_1 INVEST_t + e_t$ *and* $Ret_{t+1}^{M} = \beta_0 + \beta_1 INVEST_{t-1} + e_t$



Notes: We include 20 observations in each of the rolling regressions, the date in the X-axis relates to the final year of data included in the regression.

Table 1
Descriptive Statistics

Panel A: Full sample (1962-2012)

Variable	N	Mean	Std Dev	10st Pctl	25th Pctl	Median	75th Pctl	90th Pctl
$RET_{y,t}$	51	0.073	0.176	-0.176	-0.022	0.076	0.179	0.261
INVEST	51	0.066	0.021	0.036	0.053	0.065	0.082	0.094
ΔTAN	51	0.058	0.021	0.034	0.043	0.058	0.068	0.087
ΔINTAN	51	0.019	0.008	0.010	0.013	0.019	0.026	0.030
ΔGDWL	51	0.003	0.005	0.000	0.000	0.000	0.007	0.009
ΔOtherINTAN	51	0.002	0.003	0.000	0.001	0.002	0.004	0.006
R&D	51	0.013	0.003	0.009	0.012	0.014	0.016	0.017
$GDPGR_{y,t}$	51	0.030	0.021	0.005	0.015	0.032	0.044	0.053
$GDPINVGR_{y,t}$	51	0.047	0.062	-0.035	0.014	0.050	0.097	0.119
M&A	51	186.784	191.480	0.000	0.000	110.000	393.000	470.000

Panel B: Comparison of early (1962-1993) and late (1994-2012) sample period

	Early (1962-1993)		Late (1994-2012)		Tests of difference Late-Early	
	Mean	Median	Mean	Median	Mean	Median
$RET_{y,t}$	0.070	0.073	0.080	0.153	0.010	0.080
INVEST	0.066	0.066	0.066	0.065	0.000	-0.001
ΔTAN	0.063	0.059	0.049	0.049	-0.014**	-0.010**
ΔINTAN	0.015	0.014	0.027	0.026	0.013***	0.012***
ΔGDWL	0.001	0.000	0.008	0.007	0.007***	0.007***
ΔOtherINTAN	0.001	0.001	0.004	0.004	0.003***	0.003***
R&D	0.012	0.013	0.015	0.015	0.003***	0.002***
$GDPGR_{y,t}$	0.034	0.038	0.024	0.023	-0.010*	-0.015
$GDPINVGR_{y,t}$	0.051	0.048	0.041	0.053	-0.010	0.004
M&A	50.500	1.500	416.316	412.000	365.816***	410.500***

Notes: This table reports descriptive statistics for the aggregate time-series of investment and the decomposition of investment into tangible and intangible. In Panel A we report the full time-series (1962-2012) and in Panel B we compare the early (1962-1993) and late (1994-2012) time-periods.

Table 2
Tests of H1: Regressions of future aggregate returns on aggregate investments

	(1)	(2)	(3)	(4)
$INVEST_{t-1}$	-2.036**		-1.338	
	(-2.66)		(-1.68)	
$INVEST_t$		-1.422		0.163
		(-1.47)		(0.17)
Post 1994			0.194**	0.345***
			(2.06)	(3.35)
*Post 1994*$INVEST_{t-1}$*			-2.810*	
			(-1.95)	
*Post 1994*$INVEST_t$*				-5.045***
				(-3.17)
Intercept	0.203***	0.166***	0.153***	0.056
	(4.06)	(2.76)	(3.00)	(0.82)
N	51	51	51	51
Adj R^2	0.07	0.01	0.06	0.06

Notes: In this table we report regressions of future aggregate returns on aggregate total investment. The dependent variable is the future market-wide return over the following 12 months, beginning in Q3 of the following calendar year. The total aggregate investments variable, INVEST, is measured in the December of year *t*. Post1994 is an indicator variable that takes the value of 1 for all years in the sample after 1994 and 0 in all years in the sample prior to 1994. *p<0.1, **p<0.05, ***p<0.001.

Table 3
Tests of H2: Regressions of future aggregate returns on decomposed aggregate investments

	(1)	(2)	(3)	(4)
ΔTAN_{t-1}	-1.776**		-1.382	
	(-2.03)		(-1.51)	
ΔTAN_{t}		-1.221		0.079
		(-1.44)		(0.09)
$\Delta INTAN_{t-1}$	-3.396		0.141	
	(-1.23)		(0.04)	
$\Delta INTAN_{t}$		-4.149		-0.736
		(-1.35)		(-0.15)
Post 1994			0.445***	0.571***
			(3.76)	(4.68)
*Post 1994** ΔTAN_{t-1}			2.172	
			(0.80)	
*Post 1994** ΔTAN_{t}				-0.251
				(-0.10)
*Post 1994** $\Delta INTAN_{t-1}$			-20.586***	
			(-2.93)	
*Post 1994** $\Delta INTAN_{t}$				-19.437***
				(-2.71)
Intercept	0.235***	0.223**	0.149***	0.073
	(3.19)	(2.52)	(3.63)	(1.02)
N	51	51	51	51
Adj R^2	0.05	0.01	0.11	0.08

Notes: In this table we report regressions of future aggregate returns on decomposed aggregate total investment. The dependent variable is the future market-wide return over the following 12 months, beginning in Q3 of the following calendar year. The change in intangible assets is the value-weighted sum of change in intangible assets (INTAN) and capitalized R&D expenses (XRD) for year *t*, the change in tangible assets is measured as total investments minus the change in intangible assets. Both variables are measured at December of year *t*. Post1994 is an indicator variable that takes the value of 1 for all years in the sample after 1994 and 0 in all years in the sample prior to 1994. *p<0.1, **p<0.05, ***p<0.001.

Table 4
Regressions of future aggregate returns on changes in tangible and decomposed intangible assets

	(1)	(2)	(3)	(4)
ΔTAN_{t-1}	-0.791		-0.507	
	(-0.39)		(-0.23)	
ΔTAN_t		-1.595		-2.085
		(-0.58)		(-0.83)
$\Delta GDWL_{t-1}$	-13.44**		-11.88**	
	(-2.16)		(-2.20)	
$\Delta GDWL_t$		-10.05		-9.132
		(-1.42)		(-1.22)
$\Delta OtherINTAN_{t-1}$	-5.909			
	(-1.13)			
$\Delta OtherINTAN_t$		-15.87		
		(-1.68)		
$R\&D_{t-1}$	-26.68		-37.39	
	(-0.91)		(-1.26)	
$R\&D_t$		-2.691		-21.78
		(-0.09)		(-0.74)
Intercept	0.624	0.319	0.742*	0.563
	(1.62)	(0.80)	(1.94)	(1.48)
N	24	24	24	24
Adj R^2	0.20	0.15	0.21	0.12

Notes: In this table we report regressions of future aggregate returns on decomposed aggregate total investment. The dependent variable is the future market-wide return over the following 12 months, beginning in beginning in Q3 of the following calendar year. The change in intangible assets is decomposed into the value-weighted sum of change goodwill ($\Delta GDWL_t$) and value-weighted estimate of capitalized R&D expenses ($R\&D_t$) for year *t*, the change in tangible assets is measured as total investments minus the change in intangible assets. Both variables are measured at December of year *t*. Due to *COMPUSTAT* data constraints for goodwill, our estimates are based on the sample period of 1989-2012. *p<0.1, **p<0.05, ***p<0.001.

Table 5
Regressions of future aggregate returns on changes in decomposed intangible assets with controls for sentiment

	(1)	(2)	(3)	(4)
ΔTAN$_{t-1}$	2.657	2.628	2.153	2.724
	(0.74)	(0.76)	(0.54)	(0.76)
ΔGDWL$_{t-1}$	-24.863***	-29.172***	-25.610***	-25.396***
	(-4.01)	(-3.76)	(-3.70)	(-3.80)
ΔOtherINTAN$_{t-1}$	-16.828*	-19.594**	-17.242*	-20.435
	(-2.12)	(-2.23)	(-2.03)	(-1.53)
R&D$_{t-1}$	-9.704	-16.757	-8.021	-7.970
	(-0.36)	(-0.61)	(-0.33)	(-0.26)
Term	0.606	0.951	0.050	0.623
	(0.24)	(0.42)	(0.02)	(0.24)
Def	0.327	5.799	4.145	0.711
	(0.04)	(0.50)	(0.26)	(0.07)
Tbill	-10.794	-12.874	-7.210	-15.300
	(-0.33)	(-0.41)	(-0.20)	(-0.43)
OpAcc	4.504*	5.247**	4.289	4.499*
	(2.04)	(2.45)	(1.66)	(1.98)
ConsConf		0.004		
		(0.97)		
Inflow			0.048	
			(0.10)	
SentIndex				0.034
				(0.54)
Intercept	0.680	0.825*	0.624	0.667
	(1.62)	(1.90)	(1.44)	(1.54)
N	24	24	23	24
Adj R^2	0.31	0.29	0.24	0.28

Notes: In this table we report regressions of future aggregate returns on changes in tangible investments and decomposed intangible investment controlling for sentiment and other macroeconomic control variables. The dependent variable is the future market-wide return over the following 12 months, beginning in beginning in Q3 of the following calendar year. The change in intangible assets is decomposed into the value-weighted sum of change goodwill (*ΔGDWL*$_t$) and value-weighted estimate of capitalized R&D expenses (*R&D*$_t$) for year *t*, the change in tangible assets is measured as total investments minus the change in intangible assets. Both variables are measured at December of year *t*. Due to *COMPUSTAT* data constraints for goodwill, our estimates are based on the sample period of 1989-2012. We describe the measurement of sentiment and macroeconomic control variables in Appendix A. *p<0.1, **p<0.05, ***p<0.001.

Table 6
Regressions of future changes in GDP on changes in decomposed intangible assets

	$GDPGR_{y,t+1}$		$GDPINVGR_{y,t+1}$	
	(1)	(2)	(3)	(4)
ΔTAN_{t-1}	0.390		0.340	
	(1.15)		(0.32)	
ΔTAN_{t}		-0.145		-1.348
		(-0.52)		(-1.16)
$\Delta GDWL_{t-1}$	-1.525		-6.410**	
	(-1.70)		(-2.55)	
$\Delta GDWL_{t}$		-1.978*		-6.704**
		(-2.01)		(-2.54)
$\Delta OtherINTAN_{t-1}$	-0.354		-1.487	
	(-0.40)		(-0.55)	
$\Delta OtherINTAN_{t}$		-1.687		-6.351*
		(-1.40)		(-2.09)
$R\&D_{t-1}$	-3.732		-18.85	
	(-1.31)		(-1.72)	
$R\&D_{t}$		2.600		4.919
		(0.76)		(0.31)
Intercept	0.0732**	0.0119	0.356**	0.100
	(2.10)	(0.27)	(2.67)	(0.52)
N	24	24	24	24
Adj R^2	0.09	0.21	0.32	0.37

Notes: In this table we report regressions of future GDP growth on changes in tangible investments and decomposed intangible investment. The dependent variable in Columns (1) and (2) is the future GDP growth over the following 12 months, beginning in beginning in Q3 of the following calendar year and in Column (3) and (4) the change in non-residential investment component of GDP, over the following 12 months, beginning in beginning in Q3 of the following calendar year. The change in intangible assets is decomposed into the value-weighted sum of change goodwill ($\Delta GDWL_t$) and value-weighted estimate of capitalized R&D expenses ($R\&D_t$) for year *t*, the change in tangible assets is measured as total investments minus the change in intangible assets. Both variables are measured at December of year *t*. Due to *COMPUSTAT* data constraints for goodwill, our estimates are based on the sample period of 1989-2012. *p<0.1, **p<0.05, ***p<0.001.

Table 7
Regressions of future economic outcomes on changes in decomposed intangible assets controlling for number of M&As

	(1)	(2)	(3)	(4)
Panel A: Future returns				
$\Delta M\&A_{t-1}$	-9.488		-13.35**	
	(-1.50)		(-2.27)	
$\Delta M\&A_{t}$		-0.117**		-0.134**
		(-2.15)		(-2.27)
$\Delta GDWL_{t-1}$	-10.22**			
	(-2.30)			
$\Delta GDWL_{t}$		-7.935		
		(-0.85)		
Intercept	0.141***	0.124*	0.0724**	0.0724**
	(2.88)	(1.94)	(2.40)	(2.40)
N	24	24	24	24
Adj R^2	0.21	0.18	0.17	0.17
Panel B: Future GDP growth ($GDPGR_{y,t+1}$)				
	(1)	(2)	(3)	(4)
$\Delta M\&A_{t-1}$	-1.152**		-1.498***	
	(-2.45)		(-2.92)	
$\Delta M\&A_{t}$		-0.0117***		-0.0150***
		(-3.10)		(-2.92)
$\Delta GDWL_{t-1}$	-0.914**			
	(-2.11)			
$\Delta GDWL_{t}$		-1.574		
		(-1.39)		
Intercept	0.0303***	0.0343***	0.0241***	0.0241***
	(8.52)	(6.64)	(6.68)	(6.68)
N	24	24	24	24
Adj R^2	0.21	0.33	0.19	0.19

Notes: In this table we report regressions of future aggregate returns on changes in goodwill controlling for merger and acquisition activity. In Panel A the dependent variable is the future market-wide return over the following 12 months, beginning in beginning in Q3 of the following calendar year, in Panel B, is the future GDP growth over the following 12 months, beginning in beginning in Q3 of the following calendar year. The independent variable of interest is the value-weighted sum of change goodwill ($\Delta GDWL_t$) controlling for the effect of the number of M&A transactions ($\Delta M\&A_t$). Both variables are measured at December of year *t*. Due to *COMPUSTAT* data constraints for goodwill, our estimates are based on the sample period of 1989-2012. *p<0.1, **p<0.05, ***p<0.001.

Supplement to "The Measurement of Speculative Investing Activities and Aggregate Stock Returns": Appendices

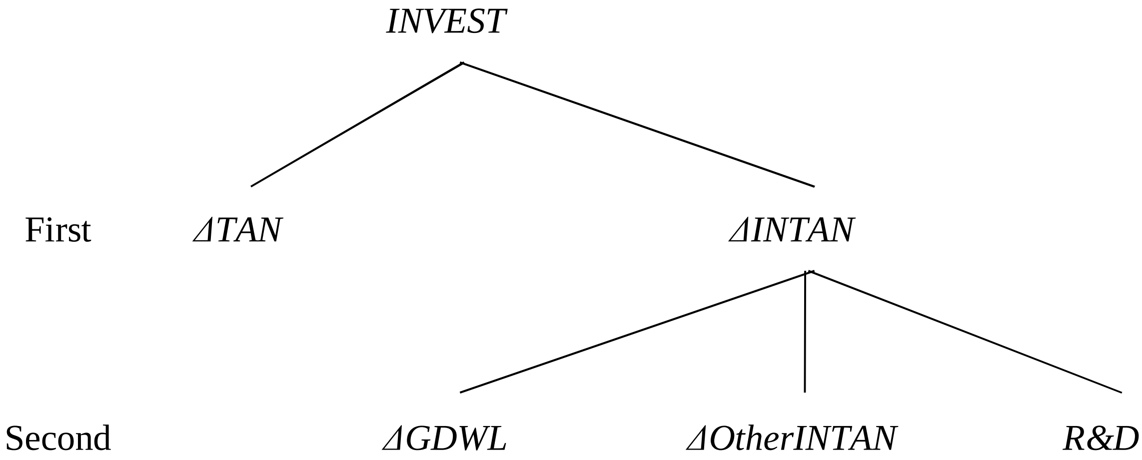
In this supplement we discuss additional information in the form of appendices. In Appendix A we provide a summary of the definitions of variables used in the study. In Appendix B we provide further discussion of the decomposition of investments into tangible and intangible. In Appendix C we provide an example of the intangible assets recognized at acquisition, and in Appendix D we provide further analysis to supplement the analysis in the paper.

Appendix A: Summary of variable definitions

Variable	**Definition**
$RET_{y,t}$	$RET_{y,t}$ is value-weighted aggregate annual real returns for a year *t*. Real returns indicated that returns that are adjusted with consumer price index.
INVEST	*INVEST* is the value-weighted sum of change in investment, which is measured by aggregate net operating assets (NOA) scaled by average total assets (AT). NOA is (AT-CHE) minus non-debt liabilities (LT+MIB-DLTT-DLC). In addition, *INVEST* is adjusted for research and development expenses (XRD) and capitalization of research and development expenses following Lev and Sougiannis (1996).
ΔTAN	*ΔTAN* is the value-weighted sum of change in aggregate tangible assets for year *t*. *INVEST* minus *ΔINTAN* and *R&D.*
ΔINTAN	*ΔINTAN* is the value-weighted sum of change in intangible assets (INTAN) and capitalized R&D expenses (XRD) for year *t*.
ΔGDWL	*ΔGDWL* is the value-weighted sum of change in goodwill (GDWL) for year *t*.
ΔOtherINTAN	*ΔOtherINTAN* is non goodwill intangible assets, which is the difference between *ΔINTAN* and *ΔGDWL.*
R&D	*R&D* is a research and development expenses (XRD) for year *t*.
$GDPGR_{y,t}$	$GDPGR_{y,t}$ is GDP (ROUTPUT) growth rate for year *t*. Real GDP is obtained from Federal Reserve Bank of Philadelphia Real-time data set for macroeconomist. (https://www.philadelphiafed.org/research-and-data/real-time-center/real-time-data/data-files)
$GDPINVGR_{y,t}$	$GDPINVGR_{y,t}$ is growth in real gross private domestic nonresidential investment (RINVBF), which is a component of GDP for year *t*. RINVBF is obtained from Federal Reserve Bank of Philadelphia.
M&A	*M&A* is the number of mergers and acquisitions in year *t*. *M&A* is obtained from SDC Platinum.

Appendix B: Further discussion of the decomposition of aggregate investments

Figure B.1
Decomposition of aggregate investments



Notes: This diagram provides a decomposition of investment into tangible and intangible investments. In the first stage we combine all intangibles into a single variable, and in the second stage we decompose these variables into goodwill, other intangibles and R&D.

Appendix C: Example transaction

Figure C.1
Example disclosure of intangibles recorded at acquisition

	WhatsApp		
		(in millions)	Useful lives (in years)
Finite-lived intangible assets:			
Acquired users	$	2,026	7
Trade names		448	5
Acquired technology		288	5
Other		21	2
IPR&D		—	
(Liabilities assumed) assets acquired		(33)	
Deferred tax liabilities		(899)	
Net assets acquired	$	1,851	
Goodwill		15,342	
Total fair value consideration	$	17,193	

Goodwill generated from the WhatsApp acquisition is primarily attributable to expected synergies from future growth, from potential monetization opportunities, from strategic advantages provided in the mobile ecosystem, and from expansion of our mobile messaging offerings. Goodwill generated from all other business acquisitions completed during the year ended December 31, 2014 is primarily attributable to expected synergies from future growth, from potential monetization opportunities and, also for Oculus, as a potential to expand our platform. All goodwill generated during this period is not deductible for tax purposes.

Notes: These note disclosures are extracted from Note 2 of Facebook's 10-K in 2014 that describes the acquisition of WhatsApp. It is an example of an acquisition with a substantial proportion of intangible assets being recognized on acquisition, under ASC805, which is based on SFAS 141R and SFAS 141R-1.

Appendix D: Further analysis

D.1. Further notes about the sample composition of the aggregate measure

We present the number of firm-years included in each of the aggregates based on *COMPUSTAT* inputs by year in Table D.1. For our sample period of 51 years between 1962 and 2012, we have a total of 84,538 firm-year observations included in the aggregates.

D.2. Correlations between variables

We present the correlations between the aggregate variables used in our main analysis in Table D.2.

D.3. Robustness to average INVEST

We present the regressions of future returns on average INVEST and averages of the decompositions in Table D.3. As anticipated, the results are consistent with those reported in the text.

D.4. Chow tests using alternative break-points

We present robustness to the choice of the break point in the time-series in Table D.4. Ex-ante candidates for the break point include (i) an equal time period split to maintain equal power of the test across sub-periods (*Break Year* = 1988), and (ii) post SFAS 141 to test for a regime shift (*Break Year* = 2002). In Columns (1) and (2) we report the estimates for INVEST, and in Columns (3) and (4) for the decomposition with *Break Year* = 1988. We find similar results for $Break\ year * INVEST_t$, but the statistical significance declines for $Break\ year * INVEST_{t-1}$ to the point that it is not statistically different to zero at conventional levels. In Columns (3) and (4) we find inconsistent results for the effect of a possible break in the association between changes in intangible assets and future returns. Overall, these results suggest that the break point is likely later than 1988, consistent with the visual inference drawn from the plots of the rolling regressions. We report the estimates using *Break Year* = 2002 in Columns (5) – (8). Again the coefficient on $Break\ year * INVEST_t$ continues to be negative and statistically significant, however, the remaining estimates are not significant at conventional levels. Taken together these results suggest that the most appropriate break point is around the bubble period, and not the mandating of the purchase price approach, as many firms were already using the purchase price technique prior to SFAS 141.

D.5. Alternative tests for parameter stability

The rolling window tests presented in the main analyses provide visual evidence of a break structural change in the time-series relation between future returns and total investment. In this section we consider alternatives based on the stationarity of the parameter. Intuitively an estimate of $\beta_t = \beta_{t-1} + \epsilon_t$ provides a test for a constant parameter based on observing a constant residual variance over time.

Econometrically, regressions such as these often suffer from severe short-comings, especially as there are many alternative approaches to determining the functional form and resulting test statistics in these cases. In Table D.5 we explore intuitive stationarity based tests of the association between future returns and total investment. For example, testing for stationarity can be considered as a test of H_1 based on the following approach:

$$\Delta\beta_t = a_0 + (\rho - 1)\beta_{t-1} + \epsilon_t \tag{D.1}$$

$$\Delta\beta_t = a_0 + \delta t + (\rho - 1)\beta_{t-1} + \epsilon_t \tag{D.2}$$

where Equation (D.1) includes a constant and Equation (D.2) includes both a constant and a time-trend. The null in both regressions is that the variable ϵ_t has a unit root (i.e., it is nonstationary) when $\rho = 1$. Alternatively, $\rho < 1$, would indicate evidence of stationarity in β_t where lower values of ρ imply less persistent, or faster decaying, errors.

We find little evidence of stationarity in the rolling coefficient estimates, inconsistent with no difference in the slopes over time.

Table D.1
Number of observations per year

Year	Firm-observations	Year	Firm-observations
1962	192	1988	1,624
1963	200	1989	1,706
1964	312	1990	1,716
1965	345	1991	1,769
1966	551	1992	1,774
1967	595	1993	1,930
1968	719	1994	2,051
1969	759	1995	2,299
1970	816	1996	2,474
1971	876	1997	2,602
1972	914	1998	2,800
1973	942	1999	2,777
1974	1,385	2000	2,700
1975	1,469	2001	2,639
1976	1,465	2002	2,697
1977	1,427	2003	2,597
1978	1,417	2004	2,537
1979	1,405	2005	2,396
1980	1,337	2006	2,395
1981	1,361	2007	2,324
1982	1,405	2008	2,311
1983	1,500	2009	2,328
1984	1,448	2010	2,237
1985	1,549	2011	2,159
1986	1,564	2012	2,156
1987	1,587		

Total firm-year observations for full sample (1962-2012)	84,538
Total firm-year observations for pre sample (1962-1994)	38,059
Total firm-year observations for post sample (1994-2012)	46,479

Notes: We include December year-end firms with available information on COMPUSTAT to calculate total investments as described in the text and Appendix A.

Table D.2
Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	1.00	0.52	-0.07	-0.09	0.00	0.03	-0.01	0.01	0.05	-0.23	0.01	-0.01	0.00	0.12	-0.04	-0.18	0.06	-0.06	0.14	-0.01
(2)	0.52	1.00	-0.31	-0.20	-0.29	-0.25	-0.27	-0.26	0.05	-0.36	-0.02	-0.04	-0.04	0.11	0.14	0.10	-0.21	0.04	0.08	-0.11
(3)	-0.07	-0.31	1.00	0.92	0.15	0.01	-0.01	-0.08	-0.49	0.00	0.25	0.05	0.03	-0.12	0.24	-0.01	0.05	0.32	-0.22	-0.03
(4)	-0.09	-0.20	0.92	1.00	-0.23	-0.27	-0.19	-0.42	-0.57	0.06	0.38	0.29	0.23	0.15	0.46	0.19	-0.24	0.15	-0.34	-0.16
(5)	0.00	-0.29	0.15	-0.23	1.00	0.82	0.42	0.88	0.20	-0.12	-0.41	-0.61	-0.52	-0.71	-0.44	-0.59	0.76	0.35	0.24	0.34
(6)	0.03	-0.25	0.01	-0.27	0.82	1.00	0.36	0.79	0.22	-0.06	-0.44	-0.49	-0.42	-0.59	-0.28	-0.59	0.91	0.20	0.13	0.16
(7)	-0.01	-0.27	-0.01	-0.19	0.42	0.36	1.00	0.50	0.12	0.21	0.09	-0.09	0.11	-0.26	-0.40	-0.02	0.38	0.15	0.22	0.14
(8)	0.01	-0.26	-0.08	-0.42	0.88	0.79	0.50	1.00	0.37	-0.06	-0.47	-0.61	-0.51	-0.72	-0.51	-0.57	0.79	0.28	0.36	0.31
(9)	0.05	0.05	-0.49	-0.57	0.20	0.22	0.12	0.37	1.00	0.26	-0.19	-0.10	0.04	0.01	-0.40	-0.26	0.26	-0.22	0.19	0.21
(10)	-0.23	-0.36	0.00	0.06	-0.12	-0.06	0.21	-0.06	0.26	1.00	0.43	0.59	0.64	0.46	0.10	0.37	-0.10	-0.26	-0.17	0.08
(11)	0.01	-0.02	0.25	0.38	-0.41	-0.44	0.09	-0.47	-0.19	0.43	1.00	0.65	0.65	0.62	0.00	0.54	-0.47	0.14	-0.03	0.11
(12)	-0.01	-0.04	0.05	0.29	-0.61	-0.49	-0.09	-0.61	-0.10	0.59	0.65	1.00	0.91	0.86	0.29	0.47	-0.51	-0.35	-0.30	-0.33
(13)	0.00	-0.04	0.03	0.23	-0.52	-0.42	0.11	-0.51	0.04	0.64	0.65	0.91	1.00	0.79	0.21	0.51	-0.43	-0.39	-0.29	-0.26
(14)	0.12	0.11	-0.12	0.15	-0.71	-0.59	-0.26	-0.72	0.01	0.46	0.62	0.86	0.79	1.00	0.15	0.48	-0.60	-0.41	-0.21	-0.13
(15)	-0.04	0.14	0.24	0.46	-0.44	-0.28	-0.40	-0.51	-0.40	0.10	0.00	0.29	0.21	0.15	1.00	0.35	-0.37	-0.34	-0.61	-0.46
(16)	-0.18	0.10	-0.01	0.19	-0.59	-0.59	-0.02	-0.57	-0.26	0.37	0.54	0.47	0.51	0.48	0.35	1.00	-0.50	-0.28	-0.18	-0.05
(17)	0.06	-0.21	0.05	-0.24	0.76	0.91	0.38	0.79	0.26	-0.10	-0.47	-0.51	-0.43	-0.60	-0.37	-0.50	1.00	0.18	0.25	0.16
(18)	-0.06	0.04	0.32	0.15	0.35	0.20	0.15	0.28	-0.22	-0.26	0.14	-0.35	-0.39	-0.41	-0.34	-0.28	0.18	1.00	0.29	0.27
(19)	0.14	0.08	-0.22	-0.34	0.24	0.13	0.22	0.36	0.19	-0.17	-0.03	-0.30	-0.29	-0.21	-0.61	-0.18	0.25	0.29	1.00	0.23
(20)	-0.01	-0.11	-0.03	-0.16	0.34	0.16	0.14	0.31	0.21	0.08	0.11	-0.33	-0.26	-0.13	-0.46	-0.05	0.16	0.27	0.23	1.00

Notes: Correlations above are for the full sample period (1962-2012), giving of 51 annual observations. The variables are indexed as follows: (1) future returns, (2) GDP growth, (3) total investments, (4) tangible investments, (5) intangible investments, (6) changes in goodwill, (7) R&D, (8) the number of M&As, (9) the term structure of interest rates, (10) the defult spread, (11) the Tbill rate, (12) the aggregate E/P ratio, (13) the aggregate B/P ratio, (14) the aggregate D/P ratio, (15) operating accruals, (16) Eshares, (17) the interaction between eshares and goodwill, (18) Michigan Consumer confidence index, (19) equity market inflows, (20) the Baker-Wurgler sentiment index. All variables are defined in Appendix A. Selected cells are shaded to ease the exposition in Appendix D.2.

Table D.3
Robustness of regressions of future aggregate returns on average aggregate investments

	(1)	(2)	(3)	(4)	(5)
$INVEST_{(t\text{-}1,t)}$	-2.060**	-1.226			
	(-2.51)	(-1.51)			
$\Delta TAN_{(t\text{-}1,t)}$			-1.845**	-1.267	-0.414
			(-2.08)	(-1.56)	(-0.23)
$\Delta INTAN_{(t\text{-}1,t)}$			-3.711	0.334	
			(-1.43)	(0.13)	
$\Delta GDWL_{(t\text{-}1,t)}$					-12.569*
					(-1.94)
$\Delta OtherINTAN_{(t\text{-}1,t)}$					-4.538
					(-0.85)
$R\&D_{(t\text{-}1,t)}$					-38.061
					(-1.56)
Post 1994		0.238**		0.509***	
		(2.26)		(3.95)	
*Post 1994** $INVEST_{(t\text{-}1,t)}$		-3.571**			
		(-2.35)			
*Post 1994** $\Delta TAN_{(t\text{-}1,t)}$				1.510	
				(0.66)	
*Post 1994** $\Delta INTAN_{(t\text{-}1,t)}$				-22.013***	
				(-3.74)	
Intercept	0.204***	0.148***	0.245***	0.142***	0.763**
	(3.78)	(2.71)	(2.93)	(3.07)	(2.37)
N	50	50	50	50	23
Adj R^2	0.11	0.14	0.09	0.26	0.32

Notes: In this table we report regressions of future aggregate returns on aggregate total investment. The dependent variable is the future market-wide return over the following 12 months, beginning in Q3 of the following calendar year. The total aggregate investments variable, INVEST, the change in intangible assets is the value-weighted sum of change in intangible assets (INTAN) and capitalized R&D expenses (XRD) for year *t*, the change in tangible assets is measured as total investments minus the change in intangible assets. The change in intangible assets is decomposed into the value-weighted sum of change goodwill ($\Delta GDWL_t$) and value-weighted estimate of capitalized R&D expenses ($R\&D_t$) for year *t*,all financial variables are measured in the December of year *t*. Post1994 is an indicator variable that takes the value of 1 for all years in the sample after 1994 and 0 in all years in the sample prior to 1994. *p<0.1, **p<0.05, ***p<0.001.

Table D.4
Tests of different breakpoints in the regressions of future aggregate returns on aggregate investments

	Break Year=1988				*Break Year=2002*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$INVEST_{t-1}$	-1.331				-1.850**			
	(-1.56)				(-2.24)			
$INVEST_t$		0.464				-0.587		
		(0.37)				(-0.56)		
ΔTAN_{t-1}			-1.355				-1.646*	
			(-1.31)				(-1.70)	
ΔTAN_t				0.394				-0.236
				(0.36)				(-0.27)
$\Delta INTAN_{t-1}$			0.019				-2.203	
			(0.00)				(-0.64)	
$\Delta INTAN_t$				-2.129				-2.892
				(-0.36)				(-0.71)
Break Year	0.150*	0.274**	0.278**	0.352**	0.103	0.327***	0.306*	0.392***
	(1.70)	(2.13)	(2.64)	(2.39)	(0.96)	(2.74)	(1.84)	(3.24)
Break Year$INVEST_{t-1}$*	-2.187				-1.890			
	(-1.58)				(-0.96)			
Break Year$INVEST_t$*		-4.034**				-5.497**		
		(-2.08)				(-2.62)		
Break YearΔTAN_{t-1}*			0.057				4.997	
			(0.03)				(1.19)	
Break YearΔTAN_t*				-1.827				-6.533
				(-0.81)				(-1.58)
Break Year$\Delta INTAN_{t-1}$*			-11.374*				-18.817	
			(-1.71)				(-1.56)	
Break Year$\Delta INTAN_t$*				-8.441				-2.845
				(-1.14)				(-0.44)
Intercept	0.151**	0.030	0.149***	0.066	0.192***	0.109	0.205***	0.134
	(2.56)	(0.31)	(3.51)	(0.85)	(3.36)	(1.53)	(2.87)	(1.57)
N	51	51	51	51	51	51	51	51
Adj R^2	0.05	0.03	0.05	0.01	0.04	0.03	0.04	0.00

Notes: In this table we report regressions of future aggregate returns on aggregate total investment. The dependent variable is the future market-wide return over the following 12 months, beginning in Q3 of the following calendar year. The total aggregate investments variable, INVEST, is measured in the December of year *t*. Break year is an indicator variable that takes the value of 1 for all years in the sample after the break year and 0 in all years in the sample prior. *p<0.1, **p<0.05, ***p<0.001.

Table D.5
Stationarity tests of the rolling regressions of future aggregate returns on aggregate investments

	No trend		Trend	
	$INVEST_{t-1}$	*$INVEST_t$*	*$INVEST_{t-1}$*	*$INVEST_t$*
	(1)	(2)	(3)	(4)
Slope	0.854	1.010	0.582	0.616
	(8.37)	(16.91)	(3.80)	(4.64)
Intercept	-4.14	-0.182	-0.221	1.187
	(-1.66)	(-1.47)	(-0.89)	(2.72)
Trend			-0.478	-0.097
			(-2.26)	(-3.23)
Z_ρ	-4.00	0.605	-13.83	-12.607
Z_τ	-1.337	0.365	-2.80	-2.942
Approx. p-value	0.612	0.980	0.197	0.149
N	31	31	31	31

Notes: In this table we report stationarity tests of the rolling regression estimates plotted in Figure 3. We use the Phillips-Perron test statistics and report estimates for the rolling regression estimates between future returns and $INVEST_{t-1}$, and $INVEST_t$ both with an without a trend term. *p<0.1, **p<0.05, ***p<0.001.