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Using residual income to refine the relationship between earnings growth and stock returns

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Abstract We use residual income (RI) to decompose earnings growth into growth in RI, growth in invested capital and other components and use this decomposition to explain stock returns. Our approach provides a significant increase in explanatory power vis-à-vis a regression of returns on levels and changes in earnings. While the market values growth in RI more than growth in invested capital, it still undervalues growth in RI and overvalues growth in invested capital. Earnings growth from growth in RI is more persistent, while earnings growth from growth in invested capital is more likely to reverse. Future returns are positively associated with growth in RI and negatively associated with growth in invested capital. A trading rule based on these findings generates significant hedge returns that persist after controlling for known risk factors. Hence, RI, a measure long recommended by accountants, allows investors to differentiate and evaluate different sources of earnings growth.

Keywords Earnings growth · Residual income · Growth in residual income · Growth in invested capital

JEL classification M40 · M41 · M44

1 Introduction

Earnings and earnings growth have long been viewed both theoretically and empirically as fundamental determinants of stock returns (Easton and Harris 1991;

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Ali and Zarowin 1992; Easton et al. 1992; Ohlson and Juettner-Nauroth 2005). In this paper, we use the concept of residual income to decompose earnings growth into growth in residual income, growth in invested capital, and other components. Using this decomposition, we ask the following. First, are we better able to explain cross sectional variation in returns using this decomposition? Second, do growth in residual income and the other components of earnings growth have different associations with returns? Third, does the market fully appreciate the implications of growth in residual income and the other components of earnings growth, or do these components predict future stock returns?

Residual income (RI) seems a natural point of departure to refine the empirical relationship between earnings growth and stock returns. Accounting scholars have long criticized accounting earnings as an incomplete measure of firm profitability from the shareholders' perspective since accounting earnings do not reflect the opportunity cost of the capital employed (Solomons 1965; Dearden 1972; Morse and Zimmerman 1997; Horngren et al. 2006). They present RI as a better proxy for economic profits as it includes a charge for capital employed. Anthony (1973) notes that firms often consider the cost of capital for internal decision making, arguing that "In management accounting it is quite usual to take into account the cost of equity capital; indeed, unless it did so, a company's management would have difficulty in planning effectively and maintaining control." He supports the use of RI to analyze firm profitability by arguing that "the financial community would be better able to judge the company's results if the reports it analyzed recognized these costs."

Subsequent research in both managerial and financial accounting has analyzed the usefulness of RI. Rogerson (1997), Reichelstein (1997), and Dutta and Reichelstein (2002) show theoretically that contracts based on RI with appropriate accrual accounting can achieve goal congruence between owners and managers. Empirically, Wallace (1997) and Balachandran (2006) show that firms' investment decisions are likely to be better aligned with shareholder interests after the implementation of RI-based compensation contracts. Theory work in financial accounting has used residual income to develop structural models to value firms (Ohlson 1995; Feltham and Ohlson 1995). These residual income valuation models have been empirically used to estimate the intrinsic value of the firm (Frankel and Lee 1998) and estimate implied cost of capital (Gebhardt et al. 2001).

Given the vital importance accorded to RI by prior literature, we seek to use it as a basis to refine the relationship between returns and earnings. In our refinement, we decompose earnings growth into growth in RI, growth in invested capital and other components. We incorporate this decomposition of earnings growth into the standard Easton and Harris (1991) specification, which expresses stock returns as a function of the level of earnings and growth in earnings.

We first find that the RI-based decomposition explains more of the cross-sectional variation in stock returns than does the Easton and Harris (1991) specification. Further, while both growth in RI and growth in invested capital are positively associated with returns, the relationship is stronger for growth in residual income. These results highlight the incremental value of using the RI-based decomposition. Moreover, they suggest that the stock market views earnings growth arising from growth in RI as more valuable.

To understand why the market views growth in residual income as more valuable, we analyze the persistence of earnings growth. We find that earnings growth is likely to be more persistent when the proportion of earnings growth coming from growth in residual income is greater and more likely to reverse when the proportion of earnings growth coming from growth in invested capital is greater.

We next analyze the relationship between the components of earnings growth and future returns. We find that growth in RI is positively associated with future returns, while the growth in invested capital is negatively associated with future returns. This suggests that the market does not contemporaneously impound the information in the components of earnings growth appropriately, underreacting to growth in RI and overreacting to growth in invested capital. To analyze the economic significance of our results, we test a trading strategy based on going long in firms with the most growth in residual income and going short in firms with the greatest growth in invested capital. We find that such a strategy generates economically meaningful hedge returns that are consistent across time, robust to controlling for risk factors, and incremental to other documented anomalies.

To summarize, our results validate the RI-based decomposition of earnings growth to refine the relationship between earnings and returns. This has implications for prior research, which finds that RI has only a minimally incremental association with stock returns over and above earnings (Biddle et al. 1997; Chen and Dodd 1997). We show that the utility of RI lies not as a competing metric to earnings, but as an effective conditioning variable that separates out different components of earnings growth.

In a related paper, Balachandran and Mohanram (2010) use the RI-based decomposition of earnings growth developed here to test whether boards consider the differential valuation implications of the components of earnings growth when determining CEO compensation. They find that boards in fact place a greater weight on earnings growth from growth in invested capital as opposed to earnings growth from growth in RI and conclude that the boards are, in a sense, incentivizing CEOs to destroy shareholder value.

The remainder of this paper is organized as follows. Section 2 develops our empirical specification and research design. Section 3 describes our sample selection and provides descriptive statistics. Section 4 presents the results of the paper. Section 5 concludes.

2 Research design

2.1 The relationship between returns and earnings

We start with the specification developed in Easton and Harris (1991), which combines two valuation perspectives that view firm value or stock price as a function of either book value or accounting earnings. Hence, returns (change in price) can be viewed as a function of earnings (change in book value) and change in earnings. This is also the first-differenced form of models in Ohlson (1995) and Feltham and Ohlson (1995), which express price as a function of book value and earnings. Easton and Harris (1991) express the relationship between returns and earnings as:

$$RETM_t = \alpha_0 + \alpha_1 NI_t + \alpha_2 \Delta NI_t + \varepsilon \tag{1}$$

where $RETM_t$ is a measure of market-adjusted returns.

While the Easton and Harris (1991) framework relies on earnings growth, it does not distinguish between the different sources of earning growth. It assumes that all earnings growth is equally valuable to shareholders. However, in reality, earnings growth from certain sources may be more valuable than earnings growth from other sources. In the following sub-section, we argue that decomposing earnings growth using residual income might help in separate out components of earnings growth that differ in their inherent value.

2.2 Why use residual income to refine the relationship between returns and earnings?

Accountants have long cautioned that earnings growth should be interpreted with care because the income statement does not reflect the full cost of capital invested in the firm. This can cause income to grow even for firms that invest in negative NPV projects. For instance, a firm might grow net income by investing in projects that generate enough profits to cover the cost of debt but not the total cost of capital. Similarly, a firm might hoard excess cash on its balance sheet and earn interest from this excess cash, increasing net income, but generating returns lower than the opportunity cost of shareholder funds. The basic model used to analyze the relationship between returns and earnings does not have the ability to distinguish between firms that increase accounting earnings while increasing shareholder value and firms that may be increasing accounting earnings but potentially destroying shareholder value.

Residual income is a natural starting point to refine the relationship between earnings and stock returns. If returns to shareholders are a function of growth in the economic profitability of the firm, then incorporating a superior measure of economic profitability can potentially improve the ability to explain stock returns. Residual income starts with accounting income and incorporates a charge for the opportunity cost of the capital employed, thereby correcting an inherent incompleteness in accounting earnings. Since the 1960s, accounting scholars have viewed residual income as a more appropriate indicator of firm profitability (Solomons 1965; Dearden 1972; Morse and Zimmerman 1997; Horngren et al. 2006). Rogerson (1997) shows theoretically that it is appropriate to "impute interest costs at the firm's cost of capital when using income as a performance measure for management." He concludes that "the current wave of enthusiasm for residual income and EVA measures seems justified."

Rogerson (1997), however, argues that the expenses (depreciation plus interest) associated with the usage of an asset that is equally productive throughout its lifetime ought to be constant across all periods. However, the imputed interest (capital charge in residual income) is higher initially when book values are high, while depreciation is typically either straight line or accelerated. The higher initial capital charge means that residual income is often understated in the early stages of an asset's life. Baldenius et al. (1999), however, show that, while the level of residual income may be biased downwards initially, changes in residual income preserve the valuation relationship between residual income and the net present value of a firm, independent of the depreciation method. This has implications for our RI-based refinement of the Easton and Harris (1991) model as it suggests that we ought to focus on decomposing the change in net income into the change in residual income and other components, rather than decomposing the level of net income into residual income and other components.

2.3 Using residual income to decompose earnings growth

The prior research has typically defined RI as net operating profit after tax (NOPAT) for the period less a charge for invested capital at the beginning of the period, which is typically represented as a weighted average cost of capital (WACC) times the capital invested (IC). As NOPAT is the sum of net income and after-tax interest, we can express residual income (henceforth RI) as:

$$RI_t = NI_t + INT_t * (1 - t) - WACC_t * IC_{t-1}. \quad (2)$$

where NI is GAAP net income for the period, INT_t is interest expense, and t is the tax rate.

Correspondingly RI in the prior period is:

$$RI_{t-1} = NI_{t-1} + INT_{t-1} * (1 - t) - WACC_{t-1} * IC_{t-2}. \quad (3)$$

Combining (2), and (3), we can express change in RI as:

$$\Delta RI_t = \Delta NI_t + \Delta INT_t * (1 - t) - WACC_t * IC_{t-1} + WACC_{t-1} * IC_{t-2}. \quad (4)$$

where Δ refers to the change in a variable.

Add and subtract $WACC_t * IC_{t-2}$ to the above expression to obtain:

$$\begin{aligned} \Delta RI_t = & \Delta NI_t + \Delta INT_t * (1 - t) - WACC_t * IC_{t-1} + WACC_t * IC_{t-2} \\ & - WACC_t * IC_{t-2} + WACC_{t-1} * IC_{t-2}. \end{aligned} \quad (5)$$

Reorganizing the above expression and solving for ΔNI_t we obtain:

$$\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t. \quad (6)$$

This decomposition is potentially helpful because empirically it explicitly considers earning growth in terms of a growth in RI component that incorporates the cost of capital, as well as other components. Consider the terms in Eq. 6.

- ΔRI_t: Earnings growth from growth in RI. It is change in net income that exceeds the incremental cost of capital invested. This growth in the RI component is increasing only when earnings changes are greater than the incremental cost of capital invested. Even if earnings growth is positive, the growth in the residual income component could be negative if the earnings growth does not exceed the incremental capital charge.

- $\Delta IC_{t-1} * WACC_t$: Earnings growth from growth in invested capital. It equals the change in invested capital multiplied by the weighted average cost of capital. It represents earnings growth one would expect if the firm earned the cost of capital on new investment.
- $\Delta INT_t * (1 - t)$: Earnings growth from the change in after-tax interest expense. This could be either because of increased debt or increased cost of debt. As NI is after interest and taxes, an increase in interest expense lowers the growth in NI, all else being equal.
- $IC_{t-2} * \Delta WACC_t$: Earnings growth from the change in cost of capital. Cost of capital could change due to changes in risk, or capital structure among other factors.

The RI-based decomposition above has the advantage of dividing earnings growth into additive components, allowing one to compare the relative coefficients between the different components and make assessments about differential valuation. Harris and Nissim (2006) also analyze the valuation of earnings growth derived from different sources. Their tests do not use a formal decomposition but instead use the change in return on invested capital ($\Delta ROIC_t$) as a proxy for growth from increased profitability and use growth in beginning invested capital (ΔIC_{t-1}) as a proxy for growth from investment.

However, the RI-based decomposition developed above is also subject to the following caveats. In this decomposition, we are estimating ex ante returns to new investments when we parse out the $\Delta IC_{t-1} * WACC_t$ term. In reality, new investments may earn a rate of return that is different from WACC. Further, growth in RI could itself arise either because of the increase in the profitability of existing assets or the high profitability of new investments being made.[1] Because of this, we refrain from attaching any labels to these components of earnings growth, that is, we do not label ΔRI_t as growth from increased profitability or $\Delta IC_{t-1} * WACC_t$ as growth from investment. Instead, we attach descriptive labels, referring to ΔRI_t as earnings growth from growth in residual income and $\Delta IC_{t-1} * WACC_t$ as earnings growth from growth in invested capital.

2.4 Using the decomposition in the returns-earnings specification

We begin with the Easton and Harris (1991) specification, which expresses returns as a function of both the level of profitability (NI) and growth in profitability (ΔNI). As $\Delta NI_t = NI_t - NI_{t-1}$, this equation can be restated as

[1] While decomposing the growth in RI further into a component driven by the increase in profitability of existing assets and a component driven by the high profitability of new investments is likely to be insightful, it is also potentially intractable without making even more ex ante assumptions regarding the profitability of existing assets and new investments. Untabulated results however indicate that growth in RI is positively associated with increase in asset turnover and profit margins and negatively associated with new investment.

$$\mathrm{RETM_t} = \alpha_0 + \beta_1 \mathrm{NI}_{t-1} + \beta_2 \Delta \mathrm{NI_t} + \varepsilon. \quad (7)$$

This allows for easier interpretation of the coefficients, as NI_{t-1} refers to past information and $\Delta\mathrm{NI_t}$ refers to contemporaneous information. We substitute for the components of $\Delta\mathrm{NI_t}$ from Eq. 6 to give the following specification.

$$\begin{aligned}\mathrm{RETM_t} = {} & \alpha_0 + \gamma_1 * \mathrm{NI}_{t-1} + \gamma_2 \Delta \mathrm{RI_t} + \gamma_3 (\Delta \mathrm{IC}_{t-1} * \mathrm{WACC_t}) \\ & + \gamma_4 (\Delta \mathrm{INT_t} * (1 - t)) + \gamma_5 (\mathrm{IC}_{t-2} * \Delta \mathrm{WACC_t}) + \varepsilon. \end{aligned} \quad (8)$$

Consistent with our interpretation of the terms in Eq. 6, we interpret the coefficients from this regression as measures of how the stock market responds to earnings growth from the different components. For our decomposition to add value, it is necessary that the explanatory power of the regression for Eq. 8 exceeds that of the regression for Eq. 7.

3 Sample selection and descriptive statistics

3.1 Sample selection

We conduct our tests using a sample covering the period from 1975 through 2008. We rely entirely on publicly available information from two databases, the Compustat annual file and CRSP monthly returns file.

Table 1 outlines our sample selection procedure. We start from the Compustat annual file, with all firm-years from 1975 through 2008 with valid information needed to compute RI. Specifically, we require net income before extraordinary items (NIB), total assets (AT), stock price at fiscal year-end (PRCC_F), and shares outstanding (CSHO) needed to compute market capitalization, and total invested capital (sum of short term debt {DLC}, long term debt {DLTT}, minority interest {MIB} and total common equity {CEQ}). To compute current and lagged RI, we assure the availability of lagged information for earnings and lagged and twice-lagged information for invested capital. Further, we ensure that both contemporaneous and one-year-ahead information are available, and that we have enough returns (at least 24 prior months) to compute cost of equity and WACC, for all the firms in our sample. Finally, we eliminate financial services firms (2-digit SIC codes between 60 and 69) as the notion of invested capital is very different for these firms. We also eliminate utilities (2-digit SIC code 49) because firms in regulated industries are likely to have guaranteed rates of return on invested capital. Our final sample consists of 105,559 firm-years representing 11,979 distinct firms.

3.2 Computation of RI and returns

We compute RI as follows. NOPAT is income before extraordinary items (NIB) plus interest expense (XINT), adjusted for taxes. The tax rate is set to the prevailing statutory federal tax rate for each year, or zero for firms with net operating loss

Table 1 Sample selection procedure

	Firm-years	Distinct firms
Data on Compustat with information on net income, total assets, price, shares outstanding, common equity, and debt in the 1975–2008 period	238,367	24,822
LESS firms with missing lagged information on net income and missing lagged and twice-lagged information on invested capital	44,002	3,574
Firms with adequate current and lagged financial information	194,365	21,248
LESS firms with deflators that are too small (lagged assets, market capitalization, or invested capital under one million dollars)	20,594	1,518
Firms with adequate current and lagged financial information and reasonable deflators	173,771	19,730
LESS firms with missing current returns on CRSP	33,235	4,324
Firms with adequate current and lagged financial information, reasonable deflators, and current returns	140,536	15,406
LESS firms missing one-year-ahead returns on CRSP	724	70
Firms with adequate current and lagged financial information, reasonable deflators, and current and future returns	139,812	15,336
LESS firms in utilities (2-digit SIC code 49) or financial services (2-digit SIC codes between 60 and 69)	34,253	3,357
Final sample	105,559	11,979

carry-forwards.[2] RI is defined as NOPAT minus the WACC times lagged invested capital (DLC + DLTT + MIB + CEQ).[3]

Contemporaneous annual returns ($RETM_t$) for a given firm are calculated by compounding CRSP monthly returns beginning 4 months after the beginning of the fiscal year and ending 12 months thereafter. We do this to allow enough time to ensure that annual financials are available. One-year-ahead returns ($RETM_{t+1}$) are similarly calculated by starting the compounding period 4 months after the end of the fiscal year. We adjust the returns by subtracting the compounded return on the value-weighted index over the same period.[4]

3.3 Descriptive statistics

Panel A of Table 2 presents descriptive statistics for the sample firms. The large differences between the means and medians of our size variables (sales, assets, total

[2] Our results are not affected if we use the effective tax rate, defined as Income Tax Expense (Compustat TXT) divided by Income before Extraordinary Items and Tax (IB + TXT).

[3] WACC is calculated by (1) estimating a CAPM cost of equity using 60 past monthly returns, (2) inferring after-tax cost of debt from interest expense, total interest bearing debt, and the tax rate, and (3) using market value of equity and book value of total debt for their relative weights. We estimate β using at least 24 months and up to 60 months of lagged returns. β below 0.4 are set to 0.4, while β above 3 are set to 3. If β cannot be estimated, we use the contemporaneous median β for firms with the same 2-digit SIC code.

[4] We rerun all tests using fiscal year returns as well as 16 month returns (from beginning of prior year to 4 months after current fiscal year) to control for the fact that firms often make forecasts and preannouncements in the first quarter. The results are very similar and are not tabulated.

Table 2 Sample descriptive statistics

Panel A: Descriptive statistics for sample firm-years (N = 105,559)

	Mean	SD	Q1	Median	Q3
Sales ($millions)	1,804.9	9,196.5	36.7	144.4	659.4
Assets	2,016.2	12,088.6	35.5	131.1	627.4
Total beginning invested capital	1,258.7	7,686.5	24.8	88.3	411.1
Book value of equity	762.4	4,182.3	16.8	63.5	277.6
Market value of equity	1,607.4	10,247.6	24.0	100.6	510.1
Book-to-market	0.8	0.7	0.3	0.6	1.1
Net income	88.0	787.1	−0.5	3.4	25.6
Net income/lagged assets	1.09%	17.61%	−1.10%	4.40%	9.08%
NOPAT	114.9	868.3	0.3	5.2	34.3
NOPAT/lagged assets	2.75%	17.01%	0.78%	6.18%	10.48%
Cost of debt	7.95%	5.23%	4.67%	6.33%	9.25%
Cost of equity	13.00%	4.59%	9.58%	12.35%	15.60%
WACC	11.72%	4.12%	8.65%	11.07%	13.93%
RI	9.0	711.0	−9.1	−0.8	3.6
RI/lagged assets	−5.60%	17.24%	−8.26%	−1.41%	2.77%

Panel B: Industry distribution

SIC Code	Description	Firm-years	Sample %
36	Electronic and other electric equipment	9,583	9.1
73	Business services	9,407	8.9
35	Industrial machinery and equipment	8,571	8.1
28	Chemicals and allied products	8,532	8.1
38	Instruments and related products	7,745	7.3
13	Oil and gas extraction	4,785	4.5
50	Wholesale trade-durable goods	3,340	3.2
20	Food and kindred products	3,280	3.1
37	Transportation equipment	3,012	2.9
48	Communication	2,875	2.7
34	Fabricated metal products	2,511	2.4
33	Primary metal industries	2,198	2.1
87	Engineering and management services	2,057	1.9
	All other industries	37,663	35.7

Descriptive statistics use information from the Compustat Annual file as follows. Sales (SALE), assets (AT), invested capital (sum of debt in current liabilities (DLC), long-term debt (DLTT), minority interest (MIB) and total common equity (CEQ)), market value of equity (price (PRCC_F) times shares outstanding (CSHO)), and net income before extraordinary items (NIB). NOPAT is net income before extraordinary items plus interest expense (XINT) times (1-tax rate). Cost of debt is estimated as after-tax interest expense deflated by prior year's balance of short-term and long-term debt. Cost of equity is measured using CAPM betas estimated using 60 lagged months of returns (ensuring that at least 24 prior returns are available) and a market premium of 5%. WACC is estimated from cost of equity and cost of debt, using book value of debt and market value of equity for weights. Residual income (RI) is NOPAT minus lagged invested capital * WACC. Panel B provides sample industry distribution invested capital, book and market value of equity) indicate skewness due to the presence of large firms. The considerable variation in the book-to-market ratio suggests the presence of both value (high BM) and growth (low BM) stocks in the sample. Interestingly, although the median net income and NOPAT are positive, the median RI is barely negative, indicating that fewer than half the firms in the sample cover their cost of capital.

Panel B of Table 2 presents the industry distribution. There is little evidence of industry clustering with no industry representing over 10% of the entire sample. In addition, untabulated results indicate that the number of observations per year varies from a low of 2,213 in 1979 to a high of 4,201 in 1998. No single year represents less than 2% or more than 4% of the sample, indicating a lack of time clustering.

Table 3 presents the descriptive statistics and correlations for the variables used in our analysis. The variables of interest are earnings growth (ΔNI) and it components: growth in RI (ΔRI), growth in invested capital ($\Delta IC_{t-1} * WACC_t$), change in after-tax interest expense ($\Delta\ INT_t * (1 - t)$), and change in risk ($IC_{t-2} * \Delta WACC_t$). All these variables are scaled by beginning market value of equity and winsorized at the 1 and 99% level using annual distributions.[5]

Panel A presents the means of all variables. By construction, the mean ΔNI (1.20%) equals ΔRI (0.93%) plus $\Delta IC_{t-1} * WACC_t$ (0.47%), minus $\Delta INT_t * (1 - t)$ (0.21%) plus $IC_{t-2} * \Delta WACC_t$ (0.01%). The means of both contemporaneous and one-year-ahead returns are significantly greater than zero, as these are equally weighted means while the market index is value-weighted. Mean excess returns are close to zero if we use the equally weighted index.

Panel B presents means of annual cross-sectional correlations. Not surprisingly, ΔNI and ΔRI are highly correlated (0.97 Pearson, 0.91 Spearman). Interestingly, the correlation between ΔNI and $\Delta IC_{t-1} * WACC_t$ is negative, indicating that large changes in income are seldom associated with growth because of investment.[6] Both ΔNI and ΔRI show strong positive correlation with current returns ($RETM_t$), with ΔNI showing a marginally stronger correlation. Finally, ΔNI and ΔRI correlate positively, while $\Delta IC_{t-1} * WACC_t$ correlates negatively with future returns ($RETM_{t+1}$).

4 Results

4.1 Components of earnings growth and contemporaneous returns

We begin our analysis by examining the basic Easton and Harris (1991) specification (Eq. 7) by regressing contemporaneous market-adjusted stock returns

[5] Deleting instead of winsorizing outliers yields similar results.

[6] This could either indicate that payoffs to new investments occur with a lag or that capital is being raised without being deployed (i.e. uninvested cash). However, this negative correlation persists even when we net out financial assets in the computation of invested capital, suggesting that the latter explanation is improbable.

Table 3 Descriptive statistics for analysis variables

Panel A: Univariate statistics (n = 105,559 observations)

	Mean (%)	SD (%)	Q1 (%)	Median (%)	Q3 (%)
NI_{t-1}	0.4	22.2	−0.2	4.9	8.9
RI_{t-1}	−10.0	27.0	−10.8	−1.7	2.1
ΔNI_t	1.20	20.18	−3.06	0.77	4.06
ΔRI_t	0.93	21.59	−4.20	0.08	3.67
$\Delta IC_{t-1} * WACC_t$	0.47	4.24	−0.22	0.57	1.71
$\Delta INT_t * (1 - t)$	0.21	2.53	−0.14	0.00	0.46
$IC_{t-1} * \Delta WACC_t$	0.01	5.3	−1.1	0.0	1.0
$RETM_0$	3.1	57.3	−31.5	−5.9	23.6
$RETM_1$	3.8	57.1	−30.4	−4.6	24.4

Panel B: Time-series means of cross-sectional correlation coefficients

	NI_{t-1}	RI_{t-1}	ΔNI_t	ΔRI_t	ΔIC_{t-1} * $WACC_t$	ΔINT_t * $(1 - t)$	IC_{t-2} * $\Delta WACC_t$	$RETM_t$	$RETM_{t+1}$
NI_{t-1}		0.94***	−0.49***	−0.54***	0.53***	0.08***	−0.05**	0.01	0.03*
RI_{t-1}	0.72***		−0.45***	−0.52***	0.57***	0.09***	−0.02	−0.02	0.00
ΔNI_t	−0.20***	−0.18***		0.97***	−0.34***	−0.18***	0.06***	0.24***	0.03***
ΔRI_t	−0.25***	−0.25***	0.91***		−0.43***	−0.16***	−0.09***	0.21***	0.03***
$\Delta IC_{t-1} * WACC_t$	0.32***	0.37***	−0.18***	−0.32***		0.32***	−0.22***	−0.05***	−0.02**
$\Delta INT_t * (1-t)$	0.03***	0.06***	−0.14***	−0.13***	0.33***		0.23***	−0.06***	−0.04***
$IC_{t-2} * \Delta WACC_t$	0.01	0.05*	0.08***	−0.10***	−0.13***	0.12***		0.06***	−0.02**
$RETM_t$	0.13***	0.06***	0.33***	0.28***	−0.04***	−0.09***	0.07***		0.02
$RETM_{t+1}$	0.11***	0.05**	0.04***	0.04***	−0.02**	−0.05***	−0.03***	0.06***	

Figures above (below) diagonal are Pearson (Spearman) correlations

NI_{t-1} is the lagged net income before extraordinary items (NIB). RI_{t-1} is lagged residual income. ΔNI_t and ΔRI_t are the change in net income and residual income respectively. ΔIC_{t-1} is the lagged change in invested capital (#37). $WACC_t$ is the weighted average cost of capital. See header to Table 2 for detailed definitions. $\Delta INT_t * (1 - t)$ is the change in after-tax interest expense (XINT). IC_{t-1} is lagged invested capital. As discussed in Sect. 2.3, we decompose $\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t$ All variables above are scaled by lagged market value of equity (PRCC_F * CSHO). $RETM_t$ and $RETM_{t+1}$ are, respectively, contemporaneous and one-year-ahead annual buy and hold returns, adjusted by subtracting value-weighted market returns compounded over the same time period. Returns are compounded starting 4 months after the prior fiscal year end for $RETM_t$ and starting 4 months after the current fiscal year end for $RETM_{t+1}$. Panel A presents the univariate statistics for the variables. Panel B presents the time series average of annual correlation coefficients among the components of earnings growth and stock returns. Significance levels of correlations are denoted by *** (1%); ** (5%); * (10%)

($RETM_t$) on lagged earnings (NI_{t-1}) and changes in earnings (ΔNI_t). We then analyze the regressions that substitute for ΔNI_t with the components of earnings growth. We conduct statistical tests using pooled regressions, with and without fixed effects, as well as annual regressions. Parameters for the annual regressions are time series averages from annual regressions using the Fama and Macbeth (1973) methodology with *t*-statistics adjusted for auto-correlation among the coefficients as in Bernard (1995). The results are presented in Table 4.

Panel A presents results for the basic Easton and Harris (1991) specification. The results are similar across all three specifications. The coefficient on the change in net

Table 4 Regression of contemporaneous returns with components of income growth

Panel A: Regression of contemporaneous returns on lagged income and income growth (N = 105,559)

Variable	Pooled	Pooled with fixed effects	Annual
Intercept	0.0203		0.0165
	(11.21)		(0.76)
NI_{t-1}	0.3160	0.3178	0.3934
	(22.40)	(35.44)	(8.34)
ΔNI_t	0.8096	0.7725	0.8312
	(56.47)	(81.22)	(24.14)
Adj. R^2	6.08%	18.89%	8.72%

Panel B: Regression of contemporaneous returns on lagged income and components of income growth (N = 105,559)

Variable	Pooled	Pooled with fixed effects	Annual
Intercept	0.0240		0.0147
	(12.83)		(0.70)
NI_{t-1}	0.3619	0.3427	0.4212
	(23.58)	(33.60)	(9.33)
ΔRI_t	0.7815	0.7474	0.7991
	(53.43)	(77.46)	(24.73)
$\Delta IC_{t-1} * WACC_t$	0.3140	0.5007	0.5674
	(4.23)	(9.41)	(2.45)
$\Delta INT_t * (1 - t)$	−1.4257	−1.3667	−1.4007
	(−13.75)	(−18.62)	(−8.49)
$IC_{t-2} * \Delta WACC_t$	0.9874	1.2462	1.4589
	(19.30)	(33.08)	(7.57)
Adj. R^2	6.32%	19.54%	9.49%

Panel C: Regression partitioned by size and profitability (N = 105,559)

Variable	Small firms	Medium firms	Large firms	Low profitability	Medium profitability	High profitability
Intercept	0.0711	0.0047	−0.0225	0.0077	0.0186	−0.0843
	(18.74)	(1.39)	(−6.14)	(1.97)	(1.97)	(−16.16)
NI_{t-1}	0.3186	0.5590	0.6159	0.1901	0.7288	1.5023
	(15.69)	(18.97)	(14.07)	(9.99)	(9.99)	(27.16)
ΔRI_t	0.7227	0.9207	0.9226	0.6032	1.0199	1.3917
	(38.17)	(33.55)	(23.21)	(34.02)	(34.02)	(30.78)
$\Delta IC_{t-1} * WACC_t$	0.3277	0.4687	0.4426	0.2723	0.2973	0.9034
	(2.96)	(3.71)	(3.59)	(2.71)	(2.71)	(5.78)
$\Delta INT_t * (1 - t)$	−1.3492	−1.6348	−1.7274	−1.0413	−2.0416	−2.0643
	(−9.36)	(−9.39)	(−8.93)	(−7.24)	(−7.24)	(−8.36)
$IC_{t-2} * \Delta WACC_t$	0.8797	1.2078	1.1939	0.8769	1.1543	1.1996
	(12.37)	(14.03)	(13.33)	(13.27)	(13.27)	(9.80)
Adj. R^2	7.00%	6.82%	4.93%	5.98%	8.83%	8.82%

Table 4 continued

NI_{t-1} is the lagged net income before extraordinary items (NIB). ΔRI_t is the change in residual income, computed as described in the header to Table 2. ΔIC_{t-1} is the lagged change in invested capital. $WACC_t$ is the weighted average cost of capital, computed as described in Table 2. $\Delta INT_t * (1 - t)$ is the change in after-tax interest expense (XINT). IC_{t-1} is lagged invested capital. As discussed in Sect. 2.3, we decompose $\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t$. All variables are scaled by lagged market value of equity (PRCC_F * CSHO). The dependent variable, $RETM_t$, is the contemporaneous annual buy and hold returns adjusted by subtracting value-weighted market return compounded over the same time period. Returns are compounded starting 4 months after the prior fiscal year end. For Panels A and B, regressions are run in pooled, pooled with fixed-effects and annual specifications. Pooled fixed effects regressions include effects for year and industry (2 digit SIC code). Figures in parentheses are *t*-statistics. *T*-statistics for the pooled regression include Newey and West (1987) corrections for clustering. Parameters for the annual regressions are time series averages of individual annual regressions using the Fama and Macbeth (1973) methodology, with *t*-statistics that control for auto-correlation as in Bernard (1995). The adjusted R^2 for the annual regressions is the time series average of the adjusted R^2 of the individual annual regressions. In Panel A, we regress $RETM_t$ on lagged income (NI_{t-1}) and current change in income (ΔNI_t). In Panel B, we regress $RETM_t$ on lagged income (NI_{t-1}) and components of change in income: ΔRI_t, $\Delta IC_{t-1} * WACC_t$, $\Delta INT_t * (1 - t)$ and $IC_{t-2} * \Delta WACC_t$. In Panel C, we partition the sample into three groups on the basis of size (market capitalization) and profitability (return on invested capital) and rerun the pooled regressions in Panel B

income varies between 0.8096 for the pooled regression without fixed effects to 0.8312 for the annual regression. The adjusted R^2 for the pooled regression without fixed effects is 6.08%, increasing to 18.89% with industry and time fixed effects. The average adjusted R^2 for the annual regressions is 8.72%.

Panel B presents the regressions using our decomposition of earnings growth (Eq. 8). The coefficient γ_2 on ΔRI_t is 0.7815 (0.7474) for the pooled regression without (with) fixed effects, which increases to 0.7991 for the annual regression. The coefficient γ_3 on $\Delta IC_{t-1} * WACC_t$ is also significant in all specifications: 0.3140 (0.5007) for the pooled regressions without (with) fixed effects and 0.5674 for the annual regression. The significantly positive coefficient on $\Delta IC_{t-1} * WACC_t$ is consistent with the market expecting investments to generate a rate of return greater than the ex-ante assumption of investments earning WACC.

Hence, the market also appears to value earnings growth from growth in RI as well as earnings growth from growth in invested capital; however it does not place the same weight on each component. The coefficient on ΔRI_t is significantly greater than that on $\Delta IC_{t-1} * WACC_t$ in all specifications. Further, the coefficient γ_4 on $\Delta INT_t * (1 - t)$ is significantly negative, and the coefficient γ_5 on $IC_{t-2} * \Delta WACC_t$ is significantly positive, consistent with Eq. 6.

The decomposition allows different weights for each component of earnings growth. If these weights had been restricted to be the same for each component, we would essentially be running the original Easton and Harris specification. The value of the RI-based decomposition is seen in the enhanced ability to explain the cross-section of returns. For the pooled regression without fixed effects, the adjusted R^2 increases from 6.08% for the baseline model to 6.32% for the RI-based decomposition. Similar increases are seen for the other specifications as well. The

Vuong (1989) test indicates that the increase in explanatory power between the models is strongly significant.[7] In addition, the decomposition validates the importance of earnings growth from growth in RI, as the coefficient on ΔRI_t is significantly greater than the coefficient on $\Delta IC_{t-1} * WACC_t$ in all specifications.

To better understand where the RI-based decomposition adds value, we rerun the analysis after partitioning our sample. In each year, we partition our sample into terciles on the basis of size (lagged market capitalization) and recent profitability (one period lagged return on invested capital). The results are presented in Panel C of Table 4. The first set of columns presents the regressions for the sample partitioned on the basis of size. In all three terciles, the coefficients on ΔRI_t and $\Delta IC_{t-1} * WACC_t$ continue to be strongly significant. Interestingly, both sets of coefficients are significantly lower for small firms. This suggests that contemporaneously the markets are less optimistic about earnings growth in smaller firms. The second set of columns present the regressions for the sample partitioned on the basis of recent profitability. Firms with high recent profitability have the most positive coefficient on both ΔRI_t and $\Delta IC_{t-1} * WACC_t$. For instance, the coefficient on $\Delta IC_{t-1} * WACC_t$ at 0.9034 is significantly greater than the coefficients for firms with low and medium profitability. This suggests that the market believes that investments made by firms with the greatest recent profitability are more likely to add value.

4.2 Components of earnings growth and future earnings growth

The regression results indicate that the capital market has a more favorable assessment of earnings growth when it is derived from growth in RI. To shed light why the stock market appears to favor growth in RI, we examine the relationship between current earnings growth and future earnings growth. Specifically, we assess whether earnings growth derived primarily from growth in RI is more persistent than earnings growth derived from growth in invested capital.

Dechow et al. (1998) show that earnings changes are negatively serially correlated, suggesting that the earnings growth is mean-reverting. Elgers and Lo (1994), however, show that negative earnings changes tend to reverse more in the next period than positive earnings changes. Ghosh et al. (2005) combine these insights in the following model to analyze the persistence of earnings growth. We use this as our baseline model.

$$\begin{aligned}\Delta NI_{t+1} = \alpha_0 + \alpha_1 * NEG + \alpha_2 * POS + \beta_1 * \Delta NI_t * NEG \\ + \beta_2 * \Delta NI_t * POS + \varepsilon,\end{aligned} \tag{9}$$

where ΔNI is change in earnings in the subscripted period, NEG is an indicator variable that takes the value 1 when current earnings growth is negative, and 0 otherwise, and POS takes value 1 when current earnings growth is positive and 0 otherwise.

[7] The p value for the Vuong (1989) test for the difference in adjusted R^2 is 0.0000 for the pooled regressions, both with and without fixed effects. For the annual regressions, the p value is less than 0.10 in 29 out of 34 years.

Next we expand Eq. 9 as follows: We define a variable called ΔRI_PROP, which equals the ratio of growth in RI to growth in NI (i.e. $\Delta RI_t/\Delta NI_t$). Similarly, we define INV_PROP as the ratio of earnings growth from growth in invested capital (i.e. $\Delta IC_{t-1} * WACC_t/\Delta NI_t$). ΔRI_PROP and INV_PROP are set to zero for firms with negative earnings growth. We interact ΔRI_PROP and INV_PROP with ΔNI_t * POS to test whether the persistence of positive earnings growth differs based on the source of earnings growth. The model we use is

$$\begin{aligned}\Delta NI_{t+1} = {} & \alpha_0 + \alpha_1 * NEG + \alpha_2 * POS + \beta_1 * \Delta NI_t * NEG + \beta_2 * \Delta NI_t * POS \\ & + \beta_3 * \Delta RI\_PROP + \beta_4 * INV\_PROP + \beta_5 * \Delta NI_t * POS * \Delta RI\_PROP \\ & + \beta_6 * \Delta NI_t * POS * INV\_PROP + \varepsilon. \end{aligned} \tag{10}$$

In the above models, β_1 and β_2 represent the persistence of negative and positive earnings growth, respectively. Prior research suggests that β_1 should be strongly negative as negative earnings growth is strongly mean reverting. Further, β_2 then should either be less negative than β_1 or even be positive, (i.e. positive earnings growth is more likely to persist than negative earnings growth). Finally, if future earnings are consistent with the contemporaneous market reaction to the components of earnings growth, we would expect β_5 to be positive and β_6 to be negative, i.e. positive earnings growth is more persistent when derived primarily from growth in RI and less persistent when derived primarily from growth in invested capital. The above regressions are run using the same specifications as earlier-pooled, pooled with fixed effects for time and industry, and annual.

The results are presented in Table 5. The first three columns present regressions for the baseline model. Consistent with prior research, the coefficient on ΔNI_t * NEG is strongly negative in all specifications, indicating that negative earnings growth is strongly mean reverting. Further, the coefficient on ΔNI_t * POS is significantly positive in all specifications, indicating that positive earnings growth does, on average, persist. The final three columns include the interactions for ΔRI_PROP and INV_PROP. As expected, the coefficient on the interaction of ΔNI_t * POS with ΔRI_PROP is strongly significant and positive in all three specifications. This lends support for the conjecture that earnings growth derived primarily from growth in RI is more likely to be persistent. Further, the coefficient on the interaction of ΔNI_t * POS with INV_PROP is strongly significant and negative in all three specifications, suggesting that earnings growth derived from growth in invested capital tends to reverse. Interestingly, in the last 3 columns of Table 5, the coefficient on ΔNI_t * POS, which was formerly significantly positive (in the first 3 columns), is now significantly negative. This indicates that earnings growth, bereft of growth in RI, does not persist but reverses.

The analysis of earnings persistence is consistent with the contemporaneous return results discussed earlier. It suggests that growth in residual income is significantly associated with future earnings growth, which is valuable to shareholders. On the other hand, earnings growth derived from growth in investment does not persist and reverses in the future. These results lend support for the use of growth in RI as an appropriate measure of growth in profitability, as it accounts for the opportunity cost of funds. This is consistent with arguments made by accounting scholars such as Anthony (1973) enumerating the shortcomings of

Table 5 Relation between persistence of earnings growth and components of earnings growth

Variable	Pooled	Pooled with fixed effects	Annual	Pooled	Pooled with fixed effects	Annual
Intercept	−0.0460		−0.0237	−0.0460		−0.0194
	(−1.26)		(−1.42)	(−1.26)		(−1.15)
NEG	0.0070	0.0095	−0.0149	0.0070	0.0090	−0.0191
	(0.19)	(0.26)	(−0.88)	(0.19)	(0.25)	(−1.12)
POS	0.0404	0.0407	0.0200	0.0480	0.0472	0.0232
	(1.10)	(1.11)	(1.23)	(1.31)	(1.30)	(1.41)
ΔNI_t * NEG	−0.8635	−0.8594	−0.8480	−0.8635	−0.8592	−0.8480
	(−129.13)	(−127.76)	(−24.80)	(−129.52)	(−128.07)	(−24.8)
ΔNI_t * POS	0.0310	0.0166	0.0181	−0.1742	−0.1754	−0.2123
	(7.58)	(4.01)	(1.74)	(−9.40)	(−9.19)	(−5.64)
ΔRI_PROP				−0.0006	−0.0010	−0.0008
				(−1.39)	(−2.17)	(−1.76)
INV_PROP				−0.0006	−0.0003	−0.0008
				(−1.24)	(−0.65)	(−1.59)
ΔNI_t * POS * ΔRI_PROP				0.1415	0.1309	0.1449
				(7.98)	(7.16)	(3.53)
ΔNI_t * POS * INV_PROP				−0.3996	−0.3997	−0.4289
				(−16.48)	(−16.26)	(−6.03)
Adj. R^2	15.8%	18.4%	16.0%	16.3%	18.5%	18.9%

The dependent variable is the future change in earnings (ΔNI_{t+1}) while the main independent variable is the current change in earnings (ΔNI_t), computed from net income before extraordinary items (NIB) and scaled by the corresponding beginning market value of equity (PRCC_F * CSHO). NEG is an indicator variable that equals 1 if $\Delta NI_t < 0$ and 0 otherwise. POS is an indicator variable that equals 1 if $\Delta NI_t > 0$ and 0 otherwise. ΔRI_PROP is defined as the ratio of ΔRI_t to ΔNI_t. INV_PROP is defined as the ratio of ΔIC_{t-1} * $WACC_t$ to ΔNI_t. See header to Table 2 for computations of ΔRI_t and ΔIC_{t-1} * $WACC_t$. ΔRI_PROP and INV_PROP are only computed when $\Delta NI_t > 0$ and is set to zero for all other observations. Regressions are run in pooled specifications, with and without fixed effects, as well as annually. Pooled fixed-effects regressions include effects for year and industry (2-digit SIC code). Figures in parentheses are *t*-statistics. *T*-statistics for the pooled regression include Newey and West (1987) corrections for clustering. Parameters for the annual regressions are time-series averages of individual annual regressions using the Fama and Macbeth (1973) methodology, with *t*-statistics that control for auto-correlation as in Bernard (1995). The adjusted R^2 for the annual regressions is the time-series average of the adjusted R^2 of the individual annual regressions. The number of observations for all regressions is 97,039 across all years

earnings-based measures of profitability and advocating the use of residual income as an alternative measure of profitability.

4.3 Components of earnings growth and future returns

The results thus far indicate that both ΔRI_t and ΔIC_{t-1} * $WACC_t$ are positively associated with contemporaneous returns. However, the analysis of the persistence of earnings growth suggests that the growth associated with ΔRI_t persists while the growth associated with ΔIC_{t-1} * $WACC_t$ reverses. Prior research has shown that markets' contemporaneous reaction is often incorrect, as markets underreact to certain information (e.g., the post-earnings announcement drift demonstrated in Bernard and Thomas 1989) or overreact to other information (e.g. naive extrapolation of accruals as shown in Sloan 1996). To examine this issue further, we study the relationship between the components of earnings growth and future returns.

We modify the Easton and Harris (1991) specification by using one-year-ahead returns as the dependent variable. We regress one-year-ahead market-adjusted stock returns ($RETM_{t+1}$) on lagged earnings (NI_{t-1}) and changes in earnings (ΔNI_t) using the following specification:

$$RETM_{t+1} = \alpha_0 + \beta_1 NI_{t-1} + \beta_2 \Delta NI_t + \varepsilon. \quad (11)$$

We also examine the relationship between the components of change in net income and future returns using the specification:

$$RETM_{t+1} = \alpha_0 + \delta_1 * NI_{t-1} + \delta_2 \Delta RI_t + \delta_3(\Delta IC_{t-1} * WACC_t) + \delta_4(\Delta INT_t * (1 - t)) + \delta_5(IC_{t-2} * \Delta WACC_t) + \varepsilon. \quad (12)$$

We interpret the coefficients from this regression as measures of how the stock market reinterprets its initial reaction to the components of earnings growth. For example, if any of the coefficients are positive, it implies that the market underreacted contemporaneously, leading to a drift in the future. However, if the coefficients are negative, it implies that the market overreacted contemporaneously, leading to a future reversal.

The results are presented in Table 6. Panel A presents the parameter estimates of Eq. 11 above. Consistent with the well-documented earnings drift literature, the coefficient on change in earnings (ΔNI_t) is significantly positive. Panel B of Table 6 presents the parameter estimates of Eq. 12 above. The future return results corroborate the results related to the persistence of earnings growth. The coefficient δ_2 on ΔRI is significant and positive in all specifications. This indicates that the market only partially impounds the increased persistence of earnings growth from growth in RI, (i.e., there is a drift with respect to change in RI). In contrast, the coefficient δ_3 on $\Delta IC_{t-1} * WACC_t$ is significant and negative in all specifications. This is consistent with the market reversing its initial favorable assessment of earnings growth from growth in invested capital as it realizes that such earnings growth does not persist and instead reverses.

The positive relationship between future returns and earnings growth from growth in RI provides additional support for the contention in Anthony (1973) that growth in RI is a crucial metric of financial performance. The negative relationship between future returns and earnings growth from growth in invested capital, on the other hand, corroborates prior research that documents negative returns in the aftermath of investments such as mergers and acquisitions (Roll 1986; Harding and Yale 2002; Bower 2001) and capital expenditure (Titman et al. 2004). Finally, the adjusted R^2 for all the regressions using the decomposition are significantly greater than the corresponding regression using only the change in earnings.[8] Thus, the RI-based decomposition of earnings growth explains a larger cross section of current as well as future returns.

[8] The p value for the Vuong (1989) test for difference in adjusted R^2 is 0.0000 for pooled regression both with and without fixed effects. For annual regressions, the p value is <0.10 in 27 out of 34 years.

Table 6 Regression of one-year-ahead returns with components of income growth

Panel A: Regression of one-year-ahead returns on lagged income and income growth (N = 105,559)

Variable	Pooled	Pooled with fixed effects	Annual
Intercept	0.0362		0.0323
	(19.34)		(1.34)
NI_{t-1}	0.0877	0.0706	0.1076
	(7.15)	(7.63)	(1.96)
ΔNI_t	0.1300	0.1040	0.1302
	(9.93)	(10.59)	(2.94)
Adj. R^2	0.17%	13.02%	1.49%

Panel B: Regression of one-year-ahead returns on lagged income and components of income growth (N = 105,559)

Variable	Pooled	Pooled with fixed effects	Annual
Intercept	0.0394		0.0299
	(20.46)		(1.25)
NI_{t-1}	0.1214	0.1040	0.1349
	(8.81)	(9.87)	(2.16)
ΔRI_t	0.1066	0.0876	0.1128
	(7.95)	(8.79)	(2.46)
$\Delta IC_{t-1} * WACC_t$	−0.2309	−0.2766	−0.2190
	(−3.43)	(−5.03)	(−2.09)
$\Delta INT_t * (1 - t)$	−0.8061	−0.5728	−0.5324
	(−8.73)	(−7.55)	(−2.74)
$IC_{t-2} * \Delta WACC_t$	0.1587	−0.1017	−0.1262
	(3.59)	(−2.61)	(−0.99)
Adj. R^2	0.34%	13.38%	1.90%

Panel C: Regression partitioned by size and profitability (N = 105,559)

Variable	Small firms	Medium firms	Large firms	Low profitability	Medium profitability	High profitability
Intercept	0.0610	0.0338	0.0207	0.0362	0.0383	−0.0196
	(15.91)	(9.56)	(6.17)	(8.95)	(7.18)	(−3.87)
NI_{t-1}	0.1491	0.1361	0.1333	0.0827	0.2823	0.6625
	(8.39)	(4.65)	(3.79)	(4.77)	(5.16)	(13.2)
ΔRI_t	0.1297	0.0798	0.0654	0.1043	0.0563	0.1943
	(7.73)	(2.92)	(1.88)	(6.34)	(1.93)	(4.97)
$\Delta IC_{t-1} * WACC_t$	−0.2746	−0.1848	−0.1110	−0.1272	−0.2256	−0.3122
	(−2.84)	(−1.48)	(−0.92)	(−1.42)	(−1.77)	(−2.40)
$\Delta INT_t * (1 - t)$	−0.9049	−0.6271	−0.7059	−0.7373	−0.8791	−0.9686
	(−7.25)	(−3.68)	(−3.62)	(−5.99)	(−5.10)	(−3.94)
$IC_{t-2} * \Delta WACC_t$	0.1970	0.1471	−0.0223	0.1906	0.0497	0.2374
	(3.28)	(1.74)	(−0.25)	(3.35)	(0.56)	(2.08)
Adj. R^2	0.59%	0.18%	0.13%	0.33%	0.41%	0.84%

Table 6 continued

NI_{t-1} is the lagged net income before extraordinary items (NIB). ΔRI_t is the change in residual income, computed as described in the header to Table 2. ΔIC_{t-1} is the lagged change in invested capital. $WACC_t$ is the weighted average cost of capital, computed as described in Table 2. $\Delta INT_t * (1 - t)$ is the change in after-tax interest expense (XINT). IC_{t-1} is lagged invested capital. As discussed in Sect. 2.3, we decompose $\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t$. All variables are scaled by lagged market value of equity (PRCC_F * CSHO). The dependent variable, $RETM_{t+1}$, is the one-year-ahead annual buy and hold returns adjusted by subtracting value-weighted market return compounded over the same time period. Returns are compounded starting 4 months after the current fiscal year-end. For Panels A and B, regressions are run in pooled, pooled with fixed-effects and annual specifications. Pooled fixed-effects regressions include effects for year and industry (2-digit SIC code). Figures in parentheses are *t*-statistics. *T*-statistics for the pooled regression include Newey and West (1987) corrections for clustering. Parameters for the annual regressions are time-series averages of individual annual regressions using the Fama and Macbeth (1973) methodology, with *t*-statistics that control for auto-correlation as in Bernard (1995). The adjusted R^2 for the annual regressions is the time series average of the adjusted R^2 of the individual annual regressions. In Panel A, we regress $RETM_t$ on lagged income (NI_{t-1}) and current change in income (ΔNI_t). In Panel B, we regress $RETM_{t+1}$ on lagged income (NI_{t-1}) and components of change in income: ΔRI_t, $\Delta IC_{t-1} * WACC_t$, $\Delta INT_t * (1 - t)$ and $IC_{t-2} * \Delta WACC_t$. In Panel C, we partition the sample into three groups on the basis of size (market capitalization) and profitability (return on invested capital) and rerun the pooled regressions in Panel B

Panel C of Table 6 reruns the specification of Panel B for subsamples partitioned on the basis of size and recent profitability. The first set of columns presents the regressions for the firms partitioned on the basis of size. The results are strongest in the tercile of small firms, with the greatest positive coefficient on ΔRI_t and the most negative coefficient on $\Delta IC_{t-1} * WACC_t$. This is consistent with the market being especially susceptible to mispricing the components of earnings growth for small firms. The coefficient on ΔRI_t is 0.1297 for small firms, as against 0.0798 for medium firms and 0.0654 for large firms. Similarly, the coefficient on $\Delta IC_{t-1} * WACC_t$ is −0.2746 for small firms, as against −0.1848 for medium firms and −0.1110 for large firms. These results suggest a behavioral explanation for our results—if small firms are less likely to be scrutinized by sophisticated investors then the value of their earnings growth is more likely to be misconstrued.[9]

We also partition our sample on the basis of recent profitability. Interestingly, we find that the negative relationship between $\Delta IC_{t-1} * WACC_t$ and future returns is strongest for the tercile with the greatest profitability. This provides an interesting contrast to the earlier result that the strongest positive relationship between $\Delta IC_{t-1} * WACC_t$ and contemporaneous returns is prevalent in firms with the highest recent profitability. One interpretation of these results is that the market believes that investments made by firms with high recent profitability are likely to add value. However, such investments do not generate as much value as the market thinks they will, which results in future reversals.

4.4 Trading strategy based on the decomposition of earnings growth

The results thus far suggest that the market does not contemporaneously understand the implications of earnings growth arising from different components. We now

[9] In untabulated analyses, we find similar patterns when we partition the sample on the basis of the extent of analyst following or institutional investment, consistent with such a behavioral explanation.

document the economic magnitude of our results by analyzing whether one can combine the market's underreaction to ΔRI_t and overreaction to $\Delta IC_{t-1} * WACC_t$ to create a trading rule that generates significant hedge returns. We measure one-year-ahead returns for firms in the same manner as for our regression analysis as buy-and-hold returns for a 1 year period starting 4 months after fiscal year end. We divide firms into annual deciles on the basis of either earnings growth (ΔNI_t) or the two main components of earnings growth we have focused on, ΔRI_t and $\Delta IC_{t-1} * WACC_t$. We then examine the patterns in returns for each of these deciles. The results are presented in Panel A of Table 7.

As a reference, we first create a hedge strategy based on ΔNI_t. A strategy that takes a long position in the decile with the greatest increase in net income and a short position in the decile with the greatest decline in net income generates an average annual excess return of 5.0%. Further, in 25 out of the 34 years, the strategy produces positive excess returns. Next, we implement a hedge strategy long on firms with the largest ΔRI_t and short on the firms with lowest ΔRI_t and find higher average hedge returns of 5.5%, also positive in 25 out of the 34 years. Finally, we implement a hedge strategy that goes *short* in firms with the greatest $\Delta IC_{t-1} * WACC_t$ and long in firms with the lowest $\Delta IC_{t-1} * WACC_t$ and document average hedge returns of 5.3%, positive in 21 out of 34 years.

Given the strong inverse correlation between ΔRI_t and $\Delta IC_{t-1} * WACC_t$, it is unclear whether the hedge returns based ΔRI_t are subsumed by the hedge returns based on $\Delta IC_{t-1} * WACC_t$. To test this, we create a composite variable combining both these components. We convert both ΔRI_t and $\Delta IC_{t-1} * WACC_t$ into ranks annually, with ranks for $\Delta IC_{t-1} * WACC_t$ in inverse order. We add these ranks to create a composite measure, RI_GROW. RI_GROW combines a preference for earnings growth from growth in RI with the avoidance of earnings growth from growth in invested capital. A hedge strategy based on RI_GROW generates average annual excess returns of 8.8%, with positive returns in 29 out of 34 years. This represents a significant improvement over the 5.5% generated based on ΔRI_t as well as the 5.3% generated based on $\Delta IC_{t-1} * WACC_t$. We interpret the success of this strategy as reflecting the market's eventual realization that it had undervalued ΔRI_t and overvalued $\Delta IC_{t-1} * WACC_t$. This also validates the earnings persistence results by showing that separating out earnings growth into a component likely to persist (ΔRI_t) and a component likely to reverse ($\Delta IC_{t-1} * WACC_t$) generates economically meaningful returns.

To ensure our results are not driven by omitted risk, we control for risk factors using the Fama and French (1993) three-factor and four-factor models. We create calendar-time portfolios of firms based on the decile of RI_GROW and regress the twelve monthly returns to these portfolios in the year after portfolio formation on the market factor ($R_m - R_f$), size factor (SMB), book-to-market factor (HML), and, for the four-factor model, momentum (UMD).[10] The regression is run in time series

[10] Although there is debate about whether momentum is, indeed, a risk factor, we include it in our tests to ensure that the results are incremental to a momentum effect. This can also be viewed as a control for the post-earnings-announcement drift, which as Chordia and Shivakumar (2006) show, is strongly related to price momentum.

by pooling the twelve future months for the 34 years. The intercept (alpha) represents the future monthly excess return for each decile.

The results are presented in Panel B of Table 7. The first set of columns present the results from the three-factor model regression. Firms in the lowest RI_GROW

Table 7 Returns to hedge strategies based on components of earnings growth

Panel A: Hedge returns based on deciles of components of earnings growth

Year	Decile size	ΔNI_t deciles	ΔRI_t deciles	ΔIC_{t-1} * $WACC_t$ deciles	RI_GROW deciles
1975	248	0.5%	−1.7%	−1.2%	1.9%
1976	247	5.7%	5.3%	−0.3%	3.8%
1977	237	11.1%	12.4%	2.9%	6.9%
1978	229	10.9%	11.7%	2.0%	7.1%
1979	221	16.1%	12.9%	7.1%	1.0%
1980	226	10.9%	10.2%	9.7%	11.8%
1981	236	19.5%	21.4%	7.4%	−5.2%
1982	244	−1.1%	4.6%	4.6%	18.9%
1983	264	13.4%	14.9%	7.1%	17.3%
1984	258	9.5%	8.7%	−5.3%	−2.8%
1985	273	2.9%	3.6%	14.3%	9.8%
1986	272	−3.4%	−0.6%	−2.5%	11.5%
1987	271	5.3%	7.8%	−8.5%	8.3%
1988	279	15.3%	12.6%	9.8%	8.4%
1989	290	9.8%	11.3%	15.1%	25.5%
1990	285	6.7%	6.7%	−5.6%	4.3%
1991	287	1.2%	−1.6%	−0.6%	12.8%
1992	295	4.5%	8.5%	10.4%	8.9%
1993	315	−3.4%	−2.6%	8.6%	9.8%
1994	341	10.1%	12.3%	17.7%	22.0%
1995	371	7.1%	5.7%	−0.7%	−5.7%
1996	395	7.0%	8.8%	4.9%	14.2%
1997	408	−2.2%	−1.4%	12.4%	13.3%
1998	420	−3.7%	−7.1%	24.1%	17.5%
1999	405	13.5%	12.0%	−9.2%	7.4%
2000	384	−9.3%	−4.8%	−6.1%	−0.7%
2001	383	7.2%	6.7%	13.0%	17.7%
2002	384	−3.2%	1.8%	38.1%	16.9%
2003	370	−6.8%	−7.1%	−12.7%	1.2%
2004	359	19.6%	19.9%	7.8%	15.6%
2005	348	2.0%	2.8%	−0.2%	−1.6%
2006	341	11.1%	8.5%	−10.1%	5.0%
2007	332	9.0%	7.2%	3.9%	11.1%
2008	326	−26.7%	−23.7%	21.4%	5.3%
Avg.	310	5.0%	5.5%	5.3%	8.8%
		(3.15)	(3.70)	(2.86)	(5.64)
Positive		25/34	25/34	21/34	29/34

Table 7 continued

Panel B: Fama–French regressions for portfolios of a composite measure (RI_GROW)

Decile	3-Factor model					4-Factor model					
	α (%)	$R_m - R_f$	SMB	HML	Adj. R^2 (%)	α (%)	$R_m - R_f$	SMB	HML	UMD	Adj. R^2 (%)
1	−0.36	1.12	1.01	0.31	80.0	−0.12	1.07	1.02	0.21	−0.24	82.3
			(19.12)	(5.52)		(−0.78)	(29.98)	(20.69)	(3.95)	(−7.5)	
2	−0.21	1.11	0.9	0.27	85.4	0.03	1.05	0.92	0.17	−0.26	88.5
	(−1.66)	(37.37)	(21.4)	(5.9)		(0.29)	(39.25)	(24.66)	(4.06)	(−10.64)	
3	−0.05	1.05	0.88	0.15	87.3	0.19	0.99	0.90	0.06	−0.26	90.6
	(−0.45)	(39.41)	(23.34)	(3.83)		(1.94)	(42.62)	(27.78)	(1.56)	(−12.14)	
4	0.01	1.06	0.81	0.18	90.0	0.20	1.01	0.82	0.1	−0.2	92.2
	(0.08)	(46.59)	(25.06)	(5.11)		(2.33)	(49.66)	(28.95)	(3.11)	(−10.91)	
5	0.20	1.01	0.79	0.13	88.6	0.38	0.97	0.8	0.06	−0.19	90.7
	(1.94)	(42.77)	(23.46)	(3.68)		(4.1)	(44.42)	(26.36)	(1.71)	(−9.59)	
6	0.25	1.01	0.78	0.21	90.0	0.37	0.98	0.79	0.16	−0.13	91.0
	(2.66)	(46.8)	(25.46)	(6.49)		(4.13)	(46.92)	(27.11)	(5.08)	(−6.82)	
7	0.30	0.99	0.82	0.16	90.2	0.44	0.96	0.83	0.1	−0.15	91.6
	(3.28)	(46.21)	(26.75)	(4.92)		(5.02)	(47.18)	(29.2)	(3.36)	(−8.1)	
8	0.30	0.99	0.82	0.15	90.4	0.44	0.96	0.83	0.09	−0.15	91.6
	(3.24)	(46.39)	(27.07)	(4.61)		(5.03)	(47.18)	(29.39)	(2.97)	(−7.98)	
9	0.45	0.99	0.92	0.18	84.4	0.60	0.96	0.93	0.12	−0.15	85.5
	(3.63)	(34.07)	(22.45)	(4.15)		(4.89)	(33.47)	(23.54)	(2.84)	(−5.81)	
10	0.54	1.01	1.04	0.27	80.4	0.74	0.97	1.06	0.19	−0.2	82.1
	(3.65)	(29.09)	(21.12)	(5.18)		(5.11)	(28.55)	(22.39)	(3.75)	(−6.46)	
(10 − 1)	0.90					0.86					
	(4.15)					(4.1)					

As discussed in Sect. 2.3, we decompose $\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t$. See header to Tables 2 and 4 for detailed definitions. We combine ΔRI_t and $\Delta IC_{t-1} * WACC_t$ into a composite measure, RI_GROW, that incorporates a preference for earnings growth from growth in RI with an avoidance of earnings growth from growth in invested capital, as described in Sect. 4.4. In each year, we form equally weighted deciles on the basis of ΔNI_t, ΔRI_t, $\Delta IC_{t-1} * WACC_t$ and RI_GROW. The table below presents the annual hedge returns ($HRET_{t+1}$) for a strategy of going long in firms in the highest deciles of ΔNI_t, ΔRI_t, and RI_GROW (lowest decile of $\Delta IC_{t-1} * WACC_t$) and going short in firms in the lowest deciles of ΔNI_t, ΔRI_t, and RI_GROW (highest decile of $\Delta IC_{t-1} * WACC_t$). Figures in parentheses are *t*-statistics, calculated from the distribution of annual hedge returns. Panel B presents results of calendar time-series regressions with the monthly return for deciles based on RI_GROW as the dependent variable, and the Fama and French (1993) risk factors as independent variables. The three-factor model uses the market factor ($R_m - R_f$), size factor (SMB), book-to-market factor (HML). The 4-factor model also includes momentum (UMD). The regressions pool 34 years of monthly returns for each portfolio, with 404 observations for each regression (2008 has only 8 observations as return compounding starts in May 2009 and data is available only until Dec 2009). The intercepts (alpha) to these portfolios represent the monthly excess returns earned in the year following portfolio formation

decile earn a significant negative return of −0.36%, while firms in the highest RI_GROW decile earn a significant positive return of 0.54%. The alphas increase monotonically from the lowest to the highest decile. The difference between the alphas of the extreme RI_GROW portfolios is 0.9%, equivalent to an annualized difference of 11.3%. The next set of columns present the results of the four-factor model. Although the lowest decile firms no longer show a significantly negative alpha, the difference in alphas between extreme portfolios is still significant at 0.86%, equivalent to an annualized difference of 10.8%.

To put our results in perspective, Titman et al. (2004) report spreads of 0.20–0.28% between extreme quintiles of firms based on capital expenditures. Correspondingly, if we run our tests using quintiles (alphas to deciles 9 and 10 minus alphas to deciles 1 and 2), we find alpha spreads of 0.65–0.75%. Hence, our composite measure derived from the RI-based decomposition generates excess returns that are three times as large as those from a capital expenditure based strategy.

4.5 Sensitivity analysis

To ensure that our results are not driven by our research design choices, we run the following sensitivity tests. First, we replicate the regressions for contemporaneous and future returns by controlling for the effects of conservatism and growth, which can distort the growth in residual income. Second, we use alternate definitions of residual income for the regressions, focusing mainly on the measurement of cost of capital. Third, we modify our decomposition by relaxing the assumption that new investments earn the cost of capital. Fourth, we run additional tests to ensure that our hedge return results are incremental to other documented anomalies.

4.5.1 The confounding effect of conservatism and growth

Rajan et al. (2007) show that the growth in RI can be overstated for slow-growing conservative firms and understated for fast-growing conservative firms. This can cloud any interpretation that one attaches to growth in RI as generating value for shareholders. As a sensitivity test, we rerun the regressions for both current as well as future returns with controls for the interplay of accounting conservatism and growth.

We measure conservatism using the C-SCORE measure of Penman and Zhang (2002), who define C-SCORE as the sum of capitalized research and development, capitalized advertising expense, and the LIFO reserve scaled by net operating assets.[11] We define a dummy variable CONS, which equals 1 if a firm's C-SCORE is greater than the contemporaneous industry median (on the basis of two-digit SIC

[11] Consistent with Penman and Zhang (2002), we capitalize research and development (XRD) over a five-year amortization period and advertising expense (XAD) over a two-year amortization period, using the sum-of-years-digits method. If the data for R&D or advertising are missing, we set them to zero. Instead of net operating assets, we use total assets (AT) as our deflator, as the information to calculate net operating assets is either unavailable or net operating assets are negative for over 10% of all firms.

[12] The growth rate in invested capital is measured over a five-year horizon. If 5 years of data are not available, a firm is classified as neither fast or slow (i.e. both FAST and SLOW are set to zero).

codes) and 0 otherwise. We also define a dummy variable called SLOW (FAST), which equals 1 if the firm's recent annualized growth rate in invested capital is less (greater) than its WACC, and 0 otherwise.[12] In our analysis, we interact ΔRI_t with CONS*FAST and CONS*SLOW to control for the interplay of growth and conservatism.

Panel A of Table 8 presents the results for the model with the above interactions. The first set of columns present the regression for contemporaneous returns. Our basic result with respect to contemporaneous returns is unaltered as the coefficients on both ΔRI_t and ΔIC_{t-1} * $WACC_t$ are significant and positive. The coefficient on ΔRI_t*CONS*FAST is a highly significant 0.3018, consistent with the markets capitalizing growth in RI at a higher rate for fast growing conservative firms, where such growth is likely understated. The incremental coefficient on ΔRI_t*CONS*-SLOW is however insignificant. The next set of columns presents the regression for one-year-ahead returns. Controlling for conservatism does not impact our basic result as we continue to observe a positive drift with respect to ΔRI_t and a reversal with respect to ΔIC_{t-1} * $WACC_t$. The incremental coefficients on the interactions with respect to conservatism and growth are however insignificant. To summarize, the relationship between components of income growth and both contemporaneous and future returns is unlikely to be driven by errors in the estimation of growth in residual income caused by the interplay of conservatism and growth.

4.5.2 Alternate specifications for RI

The computation of RI, the focal point of our decomposition, is crucial to our analysis. In practice, RI is measured using a variety of different methodologies. While analyzing financial statements, one can net out financial assets from debt in the computation of invested capital. In addition, there is considerable variation in how cost of capital is measured. Different measures of cost of capital will lead to different estimates for RI. Also, RI can be estimated as a levered measure ($NI_t - r_e * BV_{t-1}$) instead of an unlevered measure ($NOPAT_t - WACC*IC_{t-1}$).

We rerun the analyses in Tables 4 and 5 with the following alternate estimations of residual income. First, we use a net operating assets approach by netting out financial assets against debt while computing invested capital and correspondingly netting out interest income against interest expense while computing NOPAT. Second, we use a constant WACC of 12% for all firm-years, which implies that the term pertaining to change in WACC drops out of the decomposition. Third, we use a WACC that is constant across all firms at a given point in time but varies across time as the risk-free rate plus 6%. Fourth, we compute the cost of equity for each firm using a factor model, controlling for the Fama and French (1993) factors for size (SMB) and book-to-market (HML) in addition to the market factor.[13] Finally, we use a levered definition of residual income based on NI and BV, which implies

[13] We run multi-factor estimation regressions to estimate firm specific factor loadings with respect to the Market Risk ($R_m - R_f$), Size (SMB) and Book-to-Market (HML). To estimate the cost of equity, we assume the following risk premium for each of these factors based on historical realized premium: $R_m - R_f$ (6%), SMB (2%), HML (4%).

Table 8 Sensitivity analysis

Panel A: Controlling for the effect of conservatism and growth

Variable	Regression for contemporaneous returns ($RETM_0$)	Regression for future returns ($RETM_1$)
Intercept	0.0209	0.0321
	(9.03)	(13.37)
CONS * SLOW	0.0014	0.0206
	(0.35)	(4.92)
CONS * FAST	0.0189	0.0090
	(3.74)	(1.77)
NI_{t-1}	0.3612	0.1234
	(23.54)	(9.02)
ΔRI_t	0.7458	0.1158
	(42.78)	(7.13)
ΔRI_t * CONS * SLOW	0.0284	−0.0163
	(1.11)	(−0.70)
ΔRI_t * CONS * FAST	0.3018	−0.0219
	(6.21)	(−0.57)
ΔIC_{t-1} * $WACC_t$	0.3100	−0.2159
	(4.16)	(−3.21)
ΔINT_t * (1 − t)	−1.4241	−0.7988
	(−13.77)	(−8.66)
IC_{t-2} * $\Delta WACC_t$	0.9816	0.1591
	(19.19)	(3.62)
Adj. R^2	6.42%	0.36%

Table 8 continued

Panel B: Alternate specifications for residual income

Variable	Regression for contemporaneous returns ($RETM_0$)					Regression for future returns ($RETM_1$)				
	NOA and net interest	Constant WACC	Time varying WACC	Factor model WACC	RI based on NI	NOA and net interest	Constant WACC	Time varying WACC	Factor model WACC	RI based on NI
Intercept	0.0203	0.0243	0.0219	0.0228	0.0198	0.0396	0.0394	0.0401	0.0388	0.0367
	(11.03)	(13.25)	(11.94)	(12.49)	(10.96)	(20.70)	(20.96)	(21.07)	(20.67)	(19.61)
NI_{t-1}	0.3621	0.3374	0.3574	0.342	0.4274	0.1093	0.1175	0.1095	0.1109	0.1727
	(23.60)	(22.50)	(23.77)	(22.53)	(22.84)	(8.09)	(8.83)	(8.16)	(8.16)	(9.94)
ΔRI_t	0.8086	0.763	0.7986	0.7727	0.818	0.1077	0.1055	0.1058	0.1055	0.1091
	(54.80)	(52.75)	(54.85)	(53.4)	(55.84)	(7.85)	(8.06)	(7.95)	(7.90)	(7.98)
$\Delta IC_{t-1} * WACC_t$	0.5725	0.3956	0.4613	0.5193	−0.0261	−0.2359	−0.1982	−0.1419	−0.1151	−0.6939
	(7.85)	(6.10)	(7.48)	(7.84)	(−0.22)	(−3.54)	(−3.36)	(−2.41)	(−1.90)	(−6.37)
$\Delta INT_t * (1 - t)$	−1.4376	−1.3883	−1.2326	−1.6118		−0.6270	−0.7798	−0.8518	−0.8699	
	(−14.73)	(−14.81)	(−13.26)	(−16.31)		(−6.92)	(−8.94)	(−9.71)	(−9.61)	
$IC_{t-2} * \Delta WACC_t$	0.9641		0.3064	1.2384	−0.0946	0.1288		0.3431	0.2198	0.0392
	(18.07)		(8.68)	(27.86)	(−2.08)	(2.71)		(8.91)	(5.83)	(0.88)
Adj. R^2	6.75%	6.06%	6.52%	6.48%	6.65%	0.30%	0.33%	0.38%	0.33%	0.21%

NI_{t-1} is the lagged net income before extraordinary items (NIB). ΔRI_t is the change in residual income, computed as described in the header to Table 2. ΔIC_{t-1} is the lagged change in invested capital. $WACC_t$ is the weighted average cost of capital, computed as described in Table 2. $\Delta INT_t * (1 - t)$ is the change in after-tax interest expense (XINT). IC_{t-1} is lagged invested capital. As discussed in Sect. 2.3, we decompose $\Delta NI_t = \Delta RI_t + \Delta IC_{t-1} * WACC_t - \Delta INT_t * (1 - t) + IC_{t-2} * \Delta WACC_t$. All variables are scaled by lagged market value of equity (PRCC_F * CSHO). The dependent variable is either $RETM_t$ for contemporaneous returns or $RETM_{t+1}$ for one-year-ahead returns. Returns are annual buy and hold returns adjusted by subtracting value-weighted market return compounded over the same time period. Returns are compounded starting 4 months after prior or current fiscal year-end. All regressions are pooled regression with *t*-statistics that control for clustering. Figures in parentheses are *t*-statistics. The number of observations is 52,190. For Panel A, CONS is a dummy variable that equals 1 if a firm's C-SCORE is greater than the contemporaneous median across all other firms in the same industry (on the basis of two-digit SIC code). SLOW is a dummy variable which equals 1 if the firm's recent annualized growth rate in invested capital is less than its WACC and 0 otherwise. FAST is a dummy variable which equals 1 if the firm's recent annualized growth rate in invested capital is greater than its WACC and 0 otherwise. For Panel B, we use alternative methods to compute residual income that the term pertaining to change in interest expense (ΔINT_t * $(1 - t)$) is now a part of ΔRI_t.

The results are presented in Panel B of Table 8. The first set of columns presents the regressions for contemporaneous results ($RETM_t$). Using a net operating assets definition of RI increases explanatory power as the adjusted R^2 increases to 6.75%. Both ΔRI_t and ΔIC_{t-1} * $WACC_t$ continue to be significant and positive. When we use a constant WACC, the expression related to the change in WACC (IC_{t-2} * $\Delta WACC_t$) drops out of the regression, but both ΔRI_t and ΔIC_{t-1} * $WACC_t$ continue to be significant and positive. The regression results are also robust when we use a WACC that is cross-sectionally constant but varies in time series, as well as the factor-model based WACC. Finally, when we use the levered definition of residual income based on net income, the coefficient on ΔRI_t continues to be significant but the coefficient on ΔIC_{t-1} * $WACC_t$ is insignificant.[14] The next set of columns presents the results for one-year-ahead returns ($RETM_{t+1}$). Across all five specifications, we continue to find strong evidence of drift with respect to ΔRI_t and reversal with respect to ΔIC_{t-1} * $WACC_t$.

Given the vital importance of the computation of the cost of capital in the estimation of residual income, the stability of the results across the different methods might seem surprising. We surmise that two factors contribute to the robustness of the results. First, the impact of errors in the estimation of the cost of capital is likely mitigated in our analysis, as our decomposition focuses on the change in residual income and not the level of residual income. Second, the correlations increase further when we scale all values by size (lagged market capitalization). To illustrate, the Pearson (Spearman rank-order) correlation between the unscaled levels of RI computed as described in the paper using a CAPM approach and the RI computed using a constant WACC is only 0.72 (0.67). However, the correlation between the changes in these unscaled measures is 0.93 (0.81). The correlation increases to 0.98 (0.91) for the scaled values used in our analyses.

4.5.3 Alternative multipliers for the RI-based decomposition

Our approach towards using RI to refine the returns-earnings relationship makes certain assumptions, which may or may not be empirically valid. For instance, we label ΔIC_{t-1} * $WACC_t$ as earnings growth from growth in invested capital. This represents earnings growth one would expect if the firm earned the cost of capital on new investment. If, in reality, incremental investment generates returns differing from cost of capital, then this component will be measured with error. Further, any measurement error in this component, will also affect other components in the decomposition, as the total of all components equals actual

[14] The insignificance of ΔIC_{t-1} * $WACC_t$ is likely driven by multicollinearity. For the RI based on NI, the change in invested capital ΔIC_{t-1} equals change in book value, which is highly correlated with NI_{t-1}. Indeed, when we either drop NI_{t-1} or replace it with NI_t, the coefficient on ΔIC_{t-1} * $WACC_t$ is significant and positive.

earnings growth. We use two approaches to examine the empirical effect of such error.

First we examine an alternate specification in which we multiply change in invested capital by the firm's lagged return on invested capital instead of WACC. Our expression for earnings growth from growth in invested capital is redefined as ($ROIC_{t-1}$ * ΔIC_{t-1}).[15] This assumes that the new investments will earn what the firm's existing assets have most recently earned. To ensure the consistency of the decomposition, we redefine the ΔRI term (i.e., we subtract ΔIC_{t-1} * $ROIC_{t-1}$ and add ΔIC_{t-1} * $WACC_t$ to ΔRI_t). Untabulated results for both contemporaneous returns as well as one-year-ahead returns are very similar to the presented results and suggest that the assumption that incremental investment earns the cost of capital is not critical.

Second, we use a specification with no multipliers with the following variables: NI_{t-1}, ΔRI_t, ΔIC_{t-1}, ΔINT_t and $\Delta WACC_t$. This specification no longer makes any assumption about the rate of return that investments earn but also does not preserve the additive decomposition of earnings growth. For contemporaneous returns, this regression has an adjusted R^2 of 5.93%, which is significantly lower than the 6.32% reported in Table 4, Panel B. This indicates that the structure imposed by our breakdown of earning growth is valuable, distinguishing our approach from that used in Harris and Nissim (2006). The coefficient on ΔRI_t continues to stay significant; however the coefficient on ΔIC_{t-1} is insignificant.[16] For one-year-ahead returns, we continue to find a significant positive coefficient on ΔRI_t and a significant negative coefficient on ΔIC_{t-1}. Hence, the result that the market underreacts to earnings growth from growth in RI and overreacts to earnings growth from growth in invested capital is unaltered.

4.5.4 Robustness of hedge returns results

We rerun the hedge returns tests in Table 7 using the alternate definitions of residual income described earlier. The results are very similar and not tabulated. In addition, we test if the hedge returns results are incremental to previously documented anomalies. Zhang (2007) shows that many accounting anomalies are related to the market's misperception about the implications of current growth for future growth. We control for three well-documented anomalies: accruals (Sloan 1996), capital expenditures (Titman et al. 2004) and external financing (Richardson and Sloan 2003). For brevity, the results are not tabulated but described below.

We first find that RI_GROW generates the second strongest return separation across quintiles (8.1%), stronger than accruals and capital expenditures, but weaker than external financing (12.9%). We then partition our sample into quintiles on the basis of the other anomaly variables, further partition on the basis of RI_GROW within each quintile, and test to see if the returns to the RI_GROW strategy persist

[15] If lagged ROIC is negative, we continue to use WACC as the multiplier.

[16] The insignificance of ΔIC_{t-1} is also likely driven by multicollinearity. The correlation of ΔIC_{t-1} with NI_{t-1} (0.60 Pearson, 0.38 Spearman) is greater than the correlation between ΔIC_{t-1} * $WACC_t$ and NI_{t-1} (0.53 Pearson, 0.31 Spearman). When we either drop NI_{t-1} or replace it with NI_t, the coefficient on ΔIC_{t-1} is significant and positive.

within each quintile of the other variables. We find that the RI_GROW strategy is effective within all accrual quintiles, with the greatest return difference in firms with extreme accruals. The strategy is also effective within all capital expenditure quintiles and external financing quintiles with the greatest effectiveness for firms with highest capital expenditure and most external financing. This provides additional insight to the negative relationship between external financing and future returns demonstrated by Richardson and Sloan (2003), who interpret their finding as related to over-investment due to empire building. Our decomposition helps isolate firms least likely to waste the proceeds from external financing (highest RI_GROW) from firms most likely to do so (lowest RI_GROW).

5 Conclusion

Earnings and growth in earnings have been considered fundamental determinants of stock returns. However, accounting earnings has been criticized as an incomplete measure of firm profitability as it does not recognize the opportunity cost of the capital employed. Accounting scholars have long recommended the use of residual income (RI) as a proxy for economic profits, as it incorporates a charge for capital employed. In this paper, we decompose earnings growth into growth in RI, growth in invested capital, and other components. We use this RI-based decomposition to refine the empirical specification of the relationship between earnings and returns (Easton and Harris 1991).

We first find that the RI-based decomposition explains more of the cross-sectional variation in stock returns than the traditional earnings and earnings changes specification. Further, while growth in both RI and invested capital have a positive association with returns, the coefficient on growth in RI is significantly greater. This suggests that the market contemporaneously considers the growth in RI component to be more valuable than the growth in invested capital component. Consistent with this, we find that the persistence of future earnings is increasing in the proportion of earnings growth due to growth in RI and decreasing in the proportion of earnings growth due to invested capital.

When we examine the relationship between the components of earnings growth and future returns, we find that, while the growth in RI component is positively associated with future returns, the growth in invested capital component is negatively associated with future returns. This suggests that markets contemporaneously underreact to growth in RI and overreact to growth in invested capital. A trading strategy based on a preference for earnings growth derived from growth in RI and an avoidance of earnings growth derived from growth in invested capital generates significant abnormal returns after controlling for known risk factors.

The positive relationship between growth in RI and stock returns is consistent with the contention in Anthony (1973) that RI is an informative metric of economic performance for shareholders. The negative relationship between growth from investment and future returns is consistent with prior research documenting negative returns after large investments in mergers and acquisitions (Roll 1986; Harding and Yale 2002; Bower 2001) and capital expenditures (Titman et al. 2004).

Our paper contributes to the literature on the usefulness of RI vis-à-vis earnings by showing that, in contrast to prior research (Biddle et al. 1997; Chen and Dodd 1997), these two measures of performance need not be viewed as competing measures. The value of RI lies as an effective conditioning variable that helps us better understand the sources of earnings growth.

The results of this paper have interesting implications for future research. In a follow-up paper, Balachandran and Mohanram (2010) examine the association between CEO compensation and the RI-based decomposition of earnings growth developed in this paper. They find a greater association between CEO compensation and the invested capital component than the RI component, indicating that compensation committees place greater weight on earnings growth due to invested capital when determining CEO compensation. They conclude that the corporate boards of directors are, in a sense, incentivizing CEOs to destroy shareholder value.

While our paper highlights the importance of growth in RI, it does not identify the source of this growth. RI could increase either because existing assets are more profitable or because new investments generate additional profits. Separating out these two sources of RI growth is a potentially fruitful avenue for future research. Such identification is more likely in specific industries such as retail with extensive disclosure about same-store sales and profitability.

The results of the present paper apply to shareholders in the aggregate. An interesting extension would be to consider the implications of investor sophistication. For instance, does the presence of institutional shareholders reduce the drift with respect to growth in RI and also reduce the reversal with respect to growth in invested capital? Answers to such questions can help us build on the principal finding of this paper, that RI is an informative measure for shareholders.

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