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**Article**

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## BANKING & FINANCE | RESEARCH ARTICLE

# Aggregate earnings-returns relation: insights from REITs

Ijaz Ali<sup>1\*</sup>

**Abstract:** Prior research generally reports a positive relationship between firm-level accounting earnings surprises and contemporaneous stock prices, indicating that accounting earnings carry value-relevant information. Recent studies, however, show that investors respond negatively to unexpected changes in aggregate earnings. These findings present a puzzle for researchers. We examine the earnings/return association at the firm- and aggregate-level using a dataset of all publicly listed US REITs from 1998 to 2018. The analysis aims to know whether the negative association between the two variables exists in industry-level data, specifically REITs. We fail to find an inverse relationship between aggregate earnings changes and concurrent stock returns in REITs; yet, our data support the notion that aggregate level accounting income is relatively more predictable than firm-level income. Our results indicate that the previously observed negative aggregate earnings/return relation seems to be triggered by information transfer across various industrial sectors.

**Subjects:** Corporate Finance; Investment & Securities; Financial Accounting

**Keywords:** stock returns; earnings predictability; information asymmetry; aggregate earnings; REITs

### 1. Introduction

Prior empirical research shows a positive correlation between individual firm-level accounting earnings (income) changes and contemporaneous stock prices (see, e.g., Ball & Brown, 1968; Teets & Wasley, 1996; Zhou & Zhu, 2019; among others), suggesting that earnings variations carry information about fluctuations in firms future prospects. Recent studies, however, report that earnings/return relation is negative at the market level (see, among others, Ball et al., 2009; Kothari et al., 2006). This sharp contradiction between the firm and market-level findings is perplexing and motivates us to investigate if the inverse aggregate earnings/return relation exists at the industry level, specifically in REITs. Prior similar studies rely mainly on market-level data to solve the puzzle. Using market-level data faces both firm- and industry-level diversification, which may reduce the information content of aggregate earnings surprises, eventually leading to a weak earnings/return relation at the aggregate level. In contrast, in REIT data, with a firm level-diversification only, we expect a stronger and more prominent firm- and aggregate-level earnings/return relation.

Furthermore, as compared to other industries, REITs have several unique features relevant to examining earnings/return relation. Firstly, real estate assets often trade as individual properties, hence can be valued more accurately than traditional firms' assets (see, Bauer et al., 2010; Clayton & MacKinnon, 2003). Secondly, institutional investors produce a significant quantity of real estate data, helping investors assess REITs' performance with greater clarity (Price et al., 2012). Thirdly,

REITs should pay ninety percent of their income as dividends to avail income tax benefits and rely on external funds to avail investment opportunities; thus, they must remain transparent to get funds from external sources at lower costs (Danielsen et al., 2009). Furthermore, the regulatory refinements have reduced REITs' uncertainty level. These factors should allow market forces to better understand and properly incorporate the information content of earnings change announcements and predict future earnings of REITs more accurately. In other words, the low information asymmetry should result in a more complete (pronounced) market reaction to REITs' earnings surprises, and if high predictability is the reason for the inverse aggregate earnings/return relation, as suggested by Sadka and Sadka (2009), the negative relationship should be more prominent in REIT data.

Additionally, the public real estate market represents a substantial portion of the US economy and has risen from \$ 300 billion in the 2000s to about \$1.7 trillion in 2019 (Ghosh & Petrova, 2020). The effect of fluctuations in real estate prices on the US total consumption has been more important than those arising from general stock price fluctuations (Case Karl et al., 2005). Being an integral part of an overall economy, a change in real estate value or earnings may have consequences for almost every sector of the economy and, ultimately, GDP. Laopodis Nikiforos (2009) and Reinhart and Rogoff (2009) report a close link between the real estate sector and macro economy; hence, market reaction to REITs' earnings (aggregate-level) has implications for investors, analysts, and policymakers.

There are two goals of this study. First, we look at whether the inverse relation between aggregate accounting earnings and stock returns exists in the industry level data, specifically in REITs. Second, we examine the factors affecting market reaction to aggregate income changes in the REIT data, such as discount rates (Kothari et al., 2006), future inflation (Shivakumar, 2007), and the ability of market forces to predict aggregate earnings (Sadka & Sadka, 2009). This research responds to Shivakumar's (2010) proposal for an industry-wide analysis of the phenomena.

Using annual earnings changes and return data of US REITs from 1998 to 2018, we estimate time-series regressions of current and lagged aggregate returns on aggregate earnings changes. We do not find an inverse aggregate level earnings/return relation in the REIT data. Our results propose that the inverse aggregate earnings/return relation, reported in prior literature, has to be triggered by information transfer across industrial sectors.

## 2. Literature review

Since the groundbreaking research of Ball and Brown (1968), numerous studies have been undertaken to examine the association between individual firm-level accounting earnings surprises and contemporaneous stock returns and report a positive correlation between them (e.g., Choi et al., 2016; Collins & Kothari, 1989; Teets & Wasley, 1996). These findings of a positive earnings/return relation have been viewed as indicating that earnings change announcements contain information about firms' future prospects. Collins et al. (1997) show an improvement in the informativeness of accounting profits over time; Kargin (2013) supports Collins et al. (1997) by noting that International Financial Reporting Standards have improved the informativeness of accounting numbers.

A recent vein of literature, however, has documented that while the earnings/return relation is positive at the individual firm level, the relation between aggregate earnings surprises and concurrent market returns is negative (see, e.g., Kothari et al., 2006; Chen et al., 2015; Ball & Sadka, 2015, among others). This stark disagreement between firm- and market-level results prompted a series of studies were performed to explore the link between accounting income and stock returns.<sup>1</sup>

Prior studies mainly use Campbell's (1991) stock returns decomposition to examine the earnings/returns relation. Campbell splits realized stock returns ( $R_t$ ) into i) expected returns,  $[E_{t-1}(R_t)]$ , ii) cash-flow news ( $N_{cf,t}$ ), and iii) return news,  $(N_{r,t})$ .

$$\text{cov}(R_{-t}, \Delta X_{-t}) = \text{cov}(E_{t-1}[R_t], \Delta X_t) + \text{cov}(N_{cf}, \Delta X_t) - \text{cov}(N_r, \Delta X_t) \quad (1)$$

Previous studies present two alternative hypotheses based on equation (1) to justify the inverse association between aggregate accounting income and market returns. The first hypothesis suggests that changes in expected returns ( $\Delta E_{t-1}$ ) triggers the inverse relation. After a positive change in aggregate earnings, market forces increase the cost of capital by reacting negatively to the announcement, leading to  $\text{cov}(\Delta E_{t-1}, \Delta X_t) < 0$  (see, e.g., Kothari et al., 2006; Patatoukas, 2013). On the other hand, the second hypothesis suggests that the first component of equation (1) triggers the negative correlation. Aggregate earnings changes ( $\Delta E_{t-1}$ ) could be inversely related to expected returns ( $E_{t-1}[R_t]$ ) resulting in a negative covariance  $\text{cov}(E_{t-1}[R_t], \Delta X_t) < 0$  (see, e.g., Chen, 1991; Sadka, 2007). Based on these hypotheses, either the component [ $\text{cov}(\Delta E_{t-1}, \Delta X_t)$ ] or [ $\text{cov}(E_{t-1}[R_t], \Delta X_t)$ ], or both of them trigger the inverse aggregate earnings/return relation.

The first hypothesis, presented by Kothari et al. (2006), implies that market-level accounting income surprises are mostly unanticipated and contain information content about discount rates and future cash flows. Stock market returns would be inversely related to aggregate-level accounting income changes unless the growth in expected future cash flows is sufficient to neutralize the growth in expected stock returns. The second hypothesis presented by Sadka and Sadka (2009) implies that aggregate income surprises are relatively more predictable and hence carry little to no value-relevant information, leading to a weak or negative earnings/return relation.

Using data of a single industry reduces the potentially confounding effects of systematic factors that can arise due to variation in risk levels, growth prospects, and transparency (Hartzell et al., 2008). Price et al. (2012) report that the information dissemination process is more evident in specific industries than in the general stock market. According to Hou (2007), industries are the principal means of disseminating information in financial markets. Kovacs (2016) notes that investors' reaction to a firm's earnings change announcement depends on the subsequent industry news. These factors, along with the transparent nature of REITs' property markets, should reduce information asymmetry and result in a more complete (pronounced) market reaction to their earnings surprises. Hence, compared to the general market, earnings changes of a specific industry, particularly REITs, should be more certain, providing a more suitable environment for studying the earnings/returns relationship.

Furthermore, Laopodis Nikiforos (2009) reports a positive association between REITs' stocks and the general stock market. Therefore, as reported in the prior literature for the general stock market, we expect REITs to show a similar (negative) aggregate earnings/returns relation.

### 3. Sample and research design

#### 3.1. Sample

We obtain the required data from SNL Financial and DataStream databases. Our sample includes all publicly traded US REITs over the period 1998 to 2018. Delisted, merged, and acquired REITs remain in the sample until the change of their status. As our empirical models include lagged values, the first observation for each firm is lost. We end up with 1019 firm-year observations for 135 REITs over our sample period. We define annual returns as daily returns over a period of twelve months, beginning from the 4<sup>th</sup> month of year  $t$ . This returns calculation method incorporates possible post-earnings announcement drifts, based on the premise that earnings are declared within the first three months of year  $t$ .

Inflation change refers to the annual percent fluctuation in the consumer price index (CPI) in year  $t$  scaled by CPI in year  $t-1$ . We collect CPI data from the US Bureau of Labor Statistics. Change in interest rate means the annual change in short-term interest rate in year  $t$  scaled by the interest rate in year  $t-1$ . The data is winsorized at 1 percent and 99 percent based on the distribution of  $\Delta X_{k,t}/P_{k,t-1}$  and  $\Delta X_{k,t}/BE_{k,t-1}$ . We include in our sample only firms using December as their fiscal year ending month.

### 3.2. Research design

Accounting literature uses a number of different metrics to compute expected earnings. For instance, Ball and Brown (1968) use a market model, Collins et al. (1987) prefer lag earnings, and Brown and Rozeff (1978) favor analysts' forecasts to estimate expected earnings. Following the literature on aggregate earnings, we use lag earnings to estimate earnings surprises. We construct two proxies of earnings surprises; i) earnings changes divided by market cap. ( $\Delta X_t/P_{t-1}$ ), and ii) earnings changes scaled by book equity ( $\Delta X_t/BE_{t-1}$ ). We run the following regression to estimate the association between aggregate earnings and concurrent stock returns:

$$R_t = \alpha + \beta \cdot \Delta X_t/S_{t-1} + \varepsilon_t \quad (2)$$

where  $R_t$  = cumulative equal—or value-weighted annual stock returns from April of the current year ( $t$ ) till March of the following year ( $t+1$ ).  $\Delta X_{t-1}$  is the change in annual operating income in year  $t$ ,  $S_{t-1}$  = either the market capitalization ( $P$ ) or book equity ( $BE$ ) at the beginning of year  $t$ . We define  $\Delta X_t/BE_{t-1}$  as the variation in the cross sectional sum of accounting income in year  $t$  divided by the cross-sectional sum of the book equity at the end of year  $t-1$ . The aggregate equal- or value-weighted ratios,  $\Delta X_t/P_{t-1}$ , are instead the cross sectional averages of firm level ratios. Value weights are computed on the basis of market cap. at the end of year  $t-1$ . We use  $\beta$  to infer the sign of the correlation between annual accounting earnings changes ( $\Delta X_{t-1}$ ) and contemporaneous returns ( $R_{i,t}$ ).

Furthermore, Sadka and Sadka (2009) argue that market forces are better at predicting aggregate level earnings than individual firm-level income, and stock prices lead accounting incomes at the aggregate level. To test the predictability of industry-level aggregate income, we run the following equation:

$$R_{t-1} = \alpha + \beta \cdot \Delta X_t/S_{t-1} + \varepsilon_t \quad (3)$$

where  $R_{t-1}$  = cumulative yearly stock returns from April of year  $t-1$  until March of year  $t$ .

Ball et al. (2009) add that if a positive change in earnings leads to a rise in risk premia, then earnings growth should signal better future returns. In other words, aggregate accounting income surprises should be positively correlated with future stock returns. To test the proposition, we use the following equation:

$$R_{t+1} = \alpha + \beta \cdot \Delta X_t/S_{t-1} + \varepsilon_t \quad (4)$$

where  $R_{t+1}$  = cumulative annual stock returns from April of the year ( $t+1$ ) until March of the year ( $t+2$ ).

## 4. Analysis

### 4.1. Earnings/return relation (firm-level)

We regress stock returns on annual earnings changes using equation (2) to examine the contemporaneous firm-level earnings/return relation. We estimate cross-sectional regression coefficients for each year of our study sample. Table 1 summarizes the cross-sectional regression results (mean, median, standard deviation, as well as the 5th, 25th, 50th, 75th, and 95th percentiles). It demonstrates that the concurrent earnings/return relation is mostly positive and statistically insignificant at the firm level. The mean slope coefficients of  $\Delta X_{k,t}/P_{k,t-1}$  and  $\Delta X_{k,t}/BE_{k,t-1}$  are 0.02 and 0.06 respectively. Besides, only a minor portion of our sample firms show a negative earnings/returns relation. These findings are in conformity with evidence widely documented in prior studies.

Next, we run equation (3) to replicate another finding reported in the literature that stock prices lead to accounting earnings in the firm-level data. Table 1 shows that the mean coefficient is positive when regressing lagged returns on  $\Delta X_{k,t}/BE_{k,t-1}$ , which supports predictability, yet the explanatory power ( $R^2$ ) and  $t$ -statistic remain low. Overall, it seems that market forces can only partially anticipate the firm-level accounting earnings changes.

**Table 1. Earnings/Return relation (Firm-level)**

<b><math>R_{k,t} = \alpha_k + \theta_k \cdot \Delta X_{k,t} / P_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	0.02	0.28	-0.73	-0.15	0.02	0.23	0.45
t-statistic	(0.4)	(2.0)	(-2.9)	(-1.0)	(0.2)	(1.9)	(4.5)
$R^2$	0.08	0.09	0.00	0.01	0.05	0.09	0.29
<b><math>R_{k,t} = \alpha_k + \theta_k \cdot \Delta X_{k,t} / BE_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	0.06	0.26	-0.29	-0.09	0.00	0.13	0.73
t-statistic	(0.3)	(1.9)	(-3.5)	(-0.8)	(0.1)	(1.0)	(4.8)
$R^2$	0.05	0.09	0.00	0.00	0.01	0.07	0.32
<b><math>R_{k,t-1} = \alpha_k + \theta_k \cdot \Delta X_{k,t} / P_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	-0.03	0.24	-0.50	-0.13	-0.05	0.12	0.42
t-statistic	(-0.3)	(2.1)	(-5.0)	(-1.4)	(-0.6)	(0.6)	(3.8)
$R^2$	0.07	0.10	0.00	0.01	0.04	0.10	0.40
<b><math>R_{k,t-1} = \alpha_k + \theta_k \cdot \Delta X_{k,t} / BE_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	0.11	0.21	-0.09	-0.05	0.02	0.22	0.55
t-statistic	(1.2)	(2.6)	(-1.1)	(-0.4)	(0.2)	(1.4)	(7.4)
$R^2$	0.09	0.18	0.00	0.00	0.01	0.04	0.59
<b><math>\Delta X_{k,t} / P_{k,t-1} = \alpha_k + \theta_k \cdot R_{k,t} + \gamma_k \cdot R_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	0.09	0.40	-0.64	-0.18	0.05	0.24	0.88
t-statistic	(0.5)	(2.1)	(-2.6)	(-1.0)	(0.5)	(2.2)	(4.1)
$\gamma_k$	-0.15	0.40	-0.93	-0.47	-0.09	0.01	0.54
t-statistic	(-0.7)	(2.1)	(-4.7)	(-1.7)	(-0.8)	(0.2)	(3.8)
$R^2$	0.15	0.13	0.01	0.04	0.13	0.23	0.50
<b><math>\Delta X_{k,t} / BE_{k,t-1} = \alpha_k + \theta_k \cdot R_{k,t} + \gamma_k \cdot R_{k,t-1} + \epsilon_{k,t}</math></b>							
	Mean	St.dev.	5%	25%	Mdn	75%	95%
$\theta_k$	-0.11	0.48	-1.50	-0.38	0.00	0.14	0.55
t-statistic	(-0.2)	(2.0)	(-3.6)	(-2.4)	(-0.0)	(0.8)	(4.0)
$\gamma_k$	0.14	0.53	-0.59	-0.03	0.01	0.11	1.51
t-statistic	(1.1)	(2.8)	(-1.6)	(-0.4)	(0.1)	(0.9)	(7.7)
$R^2$	0.16	0.19	0.00	0.01	0.07	0.27	0.62

**4.2. Earnings/return relation (aggregate-level)**

Prior studies show mostly an inverse relation between market-level aggregate earnings changes and concurrent returns. To evaluate the aggregate earnings/return relationship in the REIT data, we first construct annual observations of aggregate earnings changes and stock returns and then run equation (2) to estimate the time-series regression coefficient.

Table 2 shows results from the time-series regressions of current and lagged aggregate returns on current earnings changes. When we regress current stock returns on concurrent accounting income changes, the coefficient for  $\Delta X_t / BE_{t-1}$  remains positive (varies from 3.08 to 4.91) and statistically significant, while  $R^2$  fluctuates between 19% to 25%. On the other hand, with the measure, the coefficients remain positive but insignificant. The positive (or non-negative) relation

between industry-level aggregate earnings/return relation demonstrates a striking contrast to most of the prior studies. For example, Kothari et al. (2006) report a regression coefficient of  $-3.46$  and a  $t$ -statistic of  $-2.41$ .

Table 2 demonstrates a positive relationship between accounting earnings changes and lagged returns. The slope coefficient for  $\Delta X_{k,t}/P_{k,t-1}$  varies from 3.83 to 6.72, with a  $t$ -statistic ranging from 1.9 to 2.3, while the explanatory power remains high and varies from 19% to 25%. Combined with our individual firm-level results, these findings support Ball et al.'s (2009) findings that aggregate level accounting earnings seem to be more predictable than firm-level earnings. Sadka and Sadka (2009) state that the relatively stronger relation between market-level accounting earnings changes and lagged market returns indicates that market forces are more capable of anticipating aggregate patterns than firm-level results.

#### 4.3. Aggregate accounting income and future returns

Several studies (e.g., Kothari et al., 2006; Patatoukas, 2013) note that changes in aggregate accounting income cause variations in expected returns, leading to the inverse earnings/return relationship. Kothari et al. (2006) posit that a positive change in aggregate earnings signals a positive change in future market returns, causing risk premia to rise. Investors respond to the higher risk premia by raising the cost of their capital by reacting negatively to the return news, leading to an inverse covariance between accounting earnings surprises and stock returns.

We regress future stock returns on annual earnings changes using equation (3) to study the Aggregate-level earnings/future return relation. Table 3 exhibits that the slope coefficients are statistically insignificant and mostly negative, with an explanatory power fluctuating between 1% to 2%. These findings show a weak (if any) correlation between aggregate income changes and future stock returns and do not support the hypothesis that aggregate earnings carry useful information about future returns.

#### 4.4. Persistence of aggregate accounting income

He and Hu (2014) states that if higher (lower) aggregate income in the current year ( $t$ ) is related to higher (lower) aggregate income in year  $t_{+1}$  and even beyond, the income is said to be persistent and thus predictable. In contrast, an insignificant autocorrelation in income surprises would support the persistence of accounting income.

We assess the persistence of aggregate accounting income by using autocorrelation coefficients of aggregate accounting income and aggregate income changes. We measure aggregate earnings in a similar manner as we measure aggregate earnings changes.  $X_t/S_{t-1}$  is the cross-sectional sum of income from operations divided by the sum of either the book or market equity.  $X_t/P_{t-1}$  [EW] and  $X_t/P_{t-1}$  [VW] are equal- and value-weighted accounting income to market capitalization ratios, respectively.

Panel A of Table 4 reveals that aggregate earnings mostly show a strong first-order autocorrelation. For instance, the first lag of  $X_t/BE_{t-1}$  has a coefficient of 1.20 ( $t$ -statistic = 4.5). The coefficients are negative and statistically insignificant for the second and third lags, suggesting that at the market level, higher (lower) accounting income in year  $t$  is only related to higher (lower) accounting income announced in year  $t_{+1}$ .

Panel B of Table 4 provides the autocorrelation coefficients of changes in aggregate income. The first-order autocorrelation for  $\Delta X_t/P_{t-1}$  [EW] and  $\Delta X_t/BE_{t-1}$  is positive and insignificant. However, it is negative and insignificant for the measure  $\Delta X_t/P_{t-1}$  [VW]. The autocorrelations at the second and third lags are also statistically insignificant, affirming Panel A's results that aggregate earnings are persistent and thus predictable. Kothari et al. (2006) report similar findings for the US general stock market.



**Table 2. Aggregate Earnings/Return Relation**

Panel A: Returns (value weighted)				Panel B: Returns (equal weighted)					
Dependent Variables	Independent Variables			R <sup>2</sup>	Dependent Variables	Independent Variables			R <sup>2</sup>
	[EW]	[VW]	$\Delta X_t/BE_{t-1}$			[EW]	$\Delta X_t/P_{t-1}$ [VW]	$\Delta X_t/BE_{t-1}$	
R <sub>t</sub>	0.87 (0.4)			0.01	R <sub>t</sub>	0.96 (0.4)			0.01
R <sub>t</sub>		0.94 (0.3)		0.01	R <sub>t</sub>		2.29 (0.7)		0.03
R <sub>t</sub>			4.91 (2.4)	0.25	R <sub>t</sub>			3.08 (2.0)	0.19
R <sub>t-1</sub>	3.83 (1.9)			0.19	R <sub>t-1</sub>	4.75 (2.1)			0.21
R <sub>t-1</sub>		5.25 (2.0)		0.21	R <sub>t-1</sub>		6.72 (2.3)		0.25
R <sub>t-1</sub>			0.92 (0.4)	0.00	R <sub>t-1</sub>			1.16 (0.4)	0.01
Dependent Variables	Independent Variables			R <sup>2</sup>	Dependent Variables	Independent Variables			R <sup>2</sup>
	R <sub>t</sub>	R <sub>t-1</sub>				R <sub>t</sub>	R <sub>t-1</sub>		
[EW]	0.03 (1.0)	0.06 (2.1)		0.24	$\Delta X_t/P_{t-1}$ [EW]	0.02 (1.1)	0.05 (2.3)		0.27
[VW]	0.02 (0.9)	0.04 (2.1)		0.24	$\Delta X_t/BE_{t-1}$ [VW]	0.02 (1.5)	0.04 (2.7)		0.35
$\Delta X_t/BE_{t-1}$	0.06 (2.9)	0.02 (1.1)		0.28	$\Delta X_t/BE_{t-1}$	0.05 (2.7)	0.02 (1.2)		0.33

**Table 3. Aggregate Earnings and Future Returns**

<b>Panel A: Returns (value-weighted)</b>				
	<b>Independent Variables</b>			
<b>Dependent Variables</b>	$\Delta x_t/p_{t-1}$ [EW]	$\Delta x_t/p_{t-1}$ [VW]	$\Delta X_t/BE_{t-1}$	$R^2$
$R_{t+1}$	0.97 (0.4)			0.01
$R_{t+1}$		-1.28 (-0.4)		0.01
$R_{t+1}$			-1.55 (-0.6)	0.02
<b>Panel B: Returns (equal-weighted)</b>				
	<b>Independent Variables</b>			
<b>Dependent Variables</b>	$\Delta x_t/p_{t-1}$ [EW]	$\Delta x_t/p_{t-1}$ [VW]	$\Delta X_t/BE_{t-1}$	$R^2$
$R_{t+1}$	0.46 (0.2)			0.00
$R_{t+1}$		-2.33 (-0.7)		0.01
$R_{t+1}$			-2.00 (-0.8)	0.02

#### 4.5. Interest rate, inflation, and earnings/return relation

Kothari et al. (2006) report that interest rates partially explain the inverse aggregate earnings/return association. They find a statistically insignificant relationship between aggregate level accounting earning variations and concurrent returns after accounting for interest rate fluctuations in their empirical tests. Shivakumar (2010) reports a positive correlation between aggregate accounting income and future inflation, and states that the discount rate's effect, reported by Kothari et al. (2006), seems to be driven by inflation.

To examine whether inflation and interest rate news affect the aggregate earnings/return relationship in the REIT data, we account for annual variations in interest rates and inflation rates in our empirical tests. Inflation rate is calculated as the percent growth in Consumer Price Index (CPI) in year  $t$  scaled by CPI in year  $t-1$ . The interest rate change refers to a change in the short-term interest rate in year  $t$  scaled by the interest rate in year  $t-1$ .

Table 5 shows a positive and statistically insignificant association between inflation and aggregate returns, whereas the correlation between interest rate variations and aggregate returns is inconsistent. More importantly, the aggregate level earnings/return relation does not change materially and remains non-negative even after controlling for the effects of inflation and interest rates. These findings support our results of a non-negative aggregate level earnings/return association in the REIT data.

#### 5. Discussion and conclusion

It is widely reported that firm-level earnings surprises are positively correlated with concurrent stock returns (see, e.g., Ball & Brown, 1968; Teets & Wasley, 1996; Zhou & Zhu, 2019; among others). This positive correlation has often been viewed as indicating that earnings changes provide information about future cash flows. Surprisingly, aggregate earnings changes are found to be adversely correlated with market returns (Kothari et al. (2006)). These findings present a puzzle and inspire us to further investigate this interesting issue.

**Table 4. Autocorrelation of Aggregate Earnings and Earnings Changes**

Current Earnings	LAG_1		LAG_2		LAG_3		R <sup>2</sup>
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	
$X_{it}BE_{t-1}$	1.2	4.5	-0.44	-1.1	-0.04	-0.2	0.75
$\Delta X_{it}/PE_{t-1}$ [EW]	0.37	1.5	-0.13	-0.5	-0.39	-1.6	0.40
$\Delta X_{it}/PE_{t-1}$ [VW]	0.83	2.9	-0.46	-1.3	-0.01	-0.0	0.46
<b>Panel B: Autocorrelations (Earnings Changes)</b>							
Current Earnings Changes	LAG_1		LAG_2		LAG_3		R <sup>2</sup>
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	
$\Delta X_{it}BE_{t-1}$	0.06	0.2	0.15	0.6	-0.15	-0.6	0.05
$\Delta X_{it}/PE_{t-1}$ [EW]	0.09	0.3	0.21	0.8	-0.17	-0.7	0.08
$\Delta X_{it}/PE_{t-1}$ [VW]	-0.12	-0.6	0.15	0.3	0.06	0.3	0.07

Source: Authors' results after data processing using STATA software

**Table 5. Earnings-Return relation and the role of Inflation and Interest rates**

	Earnings Changes	Inflation	Changes in Interest Rate	R <sup>2</sup>
<b>Independent Variables Measure</b>				
$\Delta X_{k,t}/BE_{k,t-1}$	5.72 (2.4)	1.39 (0.3)	-0.07 (-0.8)	0.3
$\Delta X_{k,t}/P_{k,t-1}[EW]$	0.92 (0.4)	3.17 (0.5)	0.02 (0.2)	0.03
$\Delta X_{k,t}/P_{k,t-1}[VW]$	0.84 (0.3)	2.81 (0.5)	0.03 (0.3)	0.03

Source: Authors' results after data processing using STATA software.

Shivakumar (2010) calls for an industry-level investigation of the phenomenon and argues that an individual firm's earnings surprise in an industry might be positively or inversely associated with its industry peers' stock returns. When a firm's earnings change announcement is likely to affect its industry's cash flows as a whole, this should cause a positive relation between the announcing firm's stock price and the share prices of its industry peers, leading to a positive industry-level aggregate earnings/returns relation. In this case, the inverse market-level aggregate earnings/return relation, reported by Kothari et al. (2006), has to be triggered by information transfer across industries. To be specific, the association between a firm's earnings surprise and the concurrent returns of firms in industries other than the announcing firm must be negative. Contrarily, where an earnings surprise has information content about market share changes across rival firms, the announcing firm's share price will be negatively associated with its industry peers, leading to a negative industry and market level aggregate earnings/return relation.

In response to Shivakumar's (2010) call for an industry-level investigation of the issue, we investigate whether the negative relation between aggregate accounting earnings and stock returns exists at the industry level, specifically in REITs. We base our research on Kothari et al. (2006) and examine the earnings/return association using a sample of all US REITs that are publicly traded. By using methods that are similar to those used by Kothari et al. (2006), we do not find an inverse relationship between industry-level aggregate earnings changes and concurrent stock returns. While R<sup>2</sup> fluctuates between 19% and 25%, the regression coefficient of earnings/return relation remains positive (varying from 3.08 to 4.91) and statistically significant. Kothari et al. (2006), using market level data, report a regression coefficient of -3.46, a t-statistic of -2.41, and an adjusted R<sup>2</sup> of 0.14. In a similar vein, Sadka and Sadka (2009) demonstrate a negative (coeff. = -1.46) but insignificant (t-stat. = -1.31) earnings/return relation for the general stock market and suggest that the negative association is driven by the higher predictability of aggregate data.

Given the non-negative aggregate level earnings/return relationship in the REIT data, it seems that the inverse market-level aggregate earnings/return relation, documented in the prior literature, has to be triggered by information transfer across industries. Several studies have reported returns and risk spillover across different markets (see, e.g., Chang & Lee, 2019; N. Chen & Jin, 2020). However, very few studies have attempted to examine the inter-industry transfer of financial accounting information. This appears to be an important area for future studies, where researchers could investigate the role of inter-industry information transfer in the negative aggregate earnings/return relation.

Our findings support Ball et al.'s (2009) claim that market forces predict aggregate patterns better than firm-level results; however, they do not support the hypothesis that higher predictability of aggregate accounting income causes the inverse aggregate earnings/return relationship.

Furthermore, our results do not support Kothari et al.'s (2006) notion that accounting income surprises predict future returns. The results obtained from the aggregate earnings-returns studies are important for financial economists and policy makers.

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The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Availability of Data

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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#### Note

1. For a comprehensive overview of the literature, see, (Ball & Sadka, 2015).

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