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The Evolution of Capital Market Research over the Past 50 Years*

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As Published: 10.1111/1475-679X.12287

Publisher: Wiley

Persistent URL: <https://hdl.handle.net/1721.1/136485>

Version: Author's final manuscript: final author's manuscript post peer review, without publisher's formatting or copy editing

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**Commemorating the Fifty-Year Anniversary of Ball and Brown (1968):
The Evolution of Capital Market Research over the Past Fifty Years**

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July 2019

ABSTRACT

We commemorate the 50th anniversary of Ball and Brown [1968] by chronicling its impact on capital market research in accounting. We trace the evolution of various research paths that post-Ball and Brown [1968] researchers took as they sought to build on the foundation laid by Ball and Brown [1968] to create a body of research on the usefulness, timeliness, and other properties of accounting numbers. We discuss how those paths often link back to the groundwork laid and questions originally posed in Ball and Brown [1968].

JEL: M41; G10; G14

Keywords: Ball and Brown; earnings; earnings-return relation; earnings usefulness; earnings timeliness; asymmetric timeliness; conservatism; association study; event study; information content; value relevance, positive economics; efficient markets hypothesis; market efficiency; post-earnings-announcement drift

The Securities and Exchange Commission disclaims responsibility for any private publication or statement of any SEC employee or Commissioner. This paper expresses the authors' views and does not necessarily reflect those of the Commission, the Commissioners or other members of the staff.

We acknowledge the comments and suggestions of Ray Ball, Sudipta Basu, Phil Brown, Dan Collins, Christian Leuz, Bryce Schonberger, Doug Skinner (Editor), Joe Weber, Jerry Zimmerman, Luo Zuo and an anonymous referee. John Yang and especially Ray Gao and Yifei Lu provided research assistance.

1. Introduction

This paper commemorates the 50th anniversary of Ball and Brown [1968] (hereafter, BB68). Accounting researchers readily acknowledge the seminal impact BB68 has had and continues to have on capital market research in accounting (CMRA).^{1,2} We assess BB68's impact by analyzing how it has affected the evolution of CMRA over the past fifty years. We do so by identifying the various research paths that post-BB68 researchers pursued as they sought to build on the foundation laid by BB68 to create a body of research on the usefulness, timeliness, and other properties of accounting numbers. We discuss how various branches of research and underlying papers often have intellectual roots in BB68. This is not to imply that post-BB68 researchers did not come up with new and innovative questions of their own (they did!). Our approach is simply a way to organize how post-BB68 research built on the foundation of BB68 in creating a new body of accounting research. We illustrate the intellectual roots by quoting from various articles when researchers state the pivotal role of BB68 in motivating their studies or when they describe how BB68 otherwise influenced their research.

Our paper is not designed to offer a detailed review of the past fifty years of CMRA. Rather, we seek to identify the various research avenues that originated from BB68. We use a two-pronged approach to analyze BB68's impact on CMRA. We begin with BB68's Web of Science and Google Scholar citations, which we then use to identify the research paths that unfolded after BB68's publication.³ These paths are defined based on the research questions motivating each cluster of

¹For example, **Ohlson [1991, p.1]** writes: "Without exaggeration, it can be said that the Ball-Brown [1968] paper has had an enormous influence on modern empirical accounting research." In addition, in 1986, BB68 was the first paper awarded the American Accounting Association's Seminal Contributions to Accounting Literature Award.

² Although not as widely cited as BB68, **Beaver [1968]** shares some of the same qualities. As discussed in **Ball and Brown [2019]** (hereafter **BB2019**), while BB68 and **Beaver [1968]** have a 1968 publication date, publication of BB68 actually preceded **Beaver [1968]**. A contemporary of BB68 and **Beaver [1968]** was Benston [1967]. As discussed in BB2019 (p.426) "The impact of Benston's paper was adversely affected by limitations of the research design, the small sample and the non-result for earnings."

³ We distinguish articles citing BB68 from those that do not by placing the former (latter) in bold (normal) font.

papers. However, since citations alone will invariably understate BB68's broader impact, we add papers that do not cite BB68, but which fall in a given research path, and arguably have intellectual roots in BB68 (e.g., they build on a paper that cited BB68). Our approach provides evidence of BB68's impact across the entire spectrum of CMRA over the past fifty years. For example, it identifies the research areas and topics that were most influenced by BB68; it identifies major innovations in the literature with roots in BB68; and it uncovers trends in CMRA over time, for example, where various literatures have been and where they may be heading. An added benefit is that papers building on BB68 often turn out to be highly cited themselves, and identifying them helps us fulfill our objective of documenting BB68's overall impact.⁴

Our paper is organized as follows. Section 2 briefly discusses the genesis of BB68.⁵ Section 3 describes our approach to assessing the past and on-going impact of BB68. The heart of our paper is section 4 where we identify research paths and underlying research streams to describe how CMRA evolved subsequent to BB68. Section 5 contains our concluding remarks.

2. A Brief History

2.1 WHY DID BALL AND BROWN [1968] ARISE WHEN IT DID?

To provide the necessary backdrop for our commentary, the natural starting point is: Why did BB68 emerge when it did? The answer is that the prevailing view in the accounting profession at the time BB68 was written was that accounting numbers were meaningless, that is, they did not possess useful information (BB68; **Ball and Brown [2014]** (hereafter **BB2014**); **BB2019** and **Watts and Zimmerman [1986]**). The debate's normative tone meant it lacked evidence about the

⁴ Other studies of BB68's contributions include **Fargher and Wee [2019]** and **Clinch, Lyon and Pinnuck [2019]**. The former uses secondary level citation analysis while the latter focuses solely on BB68's impact on research in the Asia-Pacific Basin. Updated evidence on some of BB68's results can be found in **BB2019** and **Nichols and Wahlen [2004]** and **Nichols and Wahlen [2018]**.

⁵ While a first-hand account of this appears in **Ball and Brown [2014]** (hereafter **BB2014**) and **BB2019**, we briefly discuss this and related issues to provide the necessary backdrop for our commentary.

factors or forces rendering accounting numbers meaningless or those that might in fact make them useful. Fortunately, BB68 changed all of that by providing evidence on a controversial issue at the time, namely “are accounting earnings useful?” BB68 did so by introducing a positive economics approach to accounting research (Friedman [1953]); by exploiting the economic underpinnings of the “efficient market hypothesis (EMH)” (Fama [1965]; Samuelson [1969]; Mandelbrot [1966]) to use security prices as a measure of the economic effects of accounting numbers; and by introducing the association-study and event-study methodologies (Fama, Fisher, Jensen and Roll [1969]; Benston [1967]; **Beaver [1968]**) as empirical tools to study accounting phenomenon.⁶ BB68 also took advantage of monthly stock return data becoming available in machine-readable form following the creation of the Center for Research in Security Prices at the University of Chicago (**BB, 2014, p.7**), which, alongside accounting data on COMPUSTAT, made BB68’s empirical work possible.

BB68’s foresight in harnessing innovations from other disciplines was important to motivating and designing their analysis, and to this day is a hallmark of BB68’s legacy. The common thread of drawing on Friedman [1953]; Fama [1965] and Fama, Fisher, Jensen and Roll [1969] reveals that BB68 is not only a cornerstone of CMRA and part of the *Journal of Accounting Research’s* heritage, but also a part of the University of Chicago’s research heritage as all of the above had roots and/or were nurtured there. These innovations have had a profound and lasting impact as evidenced by the prominent, often implicit, role they continue to play in CMRA today.

2.2. BALL AND BROWN [1968]’S OBJECTIVES AND THEIR IMPORTANCE AT THE TIME

The questions BB68 investigated stayed true to the three pillars guiding their analysis. BB68’s tests were rooted in the “positive economics” approach to scientific research; exploited

⁶ A key difference between BB68 and Fama, Fisher, Jensen and Roll [1969] is the former conducted statistical tests while the latter used figures with no corresponding statistical tests.

the “association and event-study methodology” to assess the usefulness of earnings; and drew on the “efficient markets hypothesis.” BB68’s foremost objective was to empirically test whether the process underlying the measurement of accounting earnings is meaningful. This is the now classic association (long-window) study aspect of BB68 which they used to investigate whether the information conveyed by the change in annual earnings is concordant with the information being incorporated into stock prices during the year in which the earnings were earned. As illustrated in BB68’s classic Figure 1 (see BB68, p. 169), the average price performance for firms split into those that would eventually report earnings increases and decreases diverged sharply, vindicating the hypothesis that earnings capture economically meaningful information, or simply, that earnings are useful.⁷

A second objective of BB68 was to ask “does the announcement of earnings convey new information to the market?” This is the now classic event-study aspect of BB68, which tested whether the arrival of earnings information, on average, causes a price change. Specifically, BB68 test whether the price change in the earnings announcement month was positive (negative) for the earnings increase (decrease) group. BB68’s month-zero chi-square tests were resoundingly supportive (see, BB68, Table 5). A third question was “how do annual accounting earnings rate as a timely source of information?” On this question, BB68 conclude that annual earnings are not particularly timely.

BB68 also provide early evidence on whether the market reacts quickly and in an unbiased fashion to earnings, thereby touching on the question of market efficiency with respect to earnings information. While BB68 did not study the drivers of post-earnings announcement drift (PEAD) in detail, they clearly noted the drift in returns after the earnings announcement month and its

⁷ Ohlson [1991] provides theoretical support and intuition for BB68.

inconsistency with market efficiency. Finally, BB68 (pp. 172-173) also provide early evidence on the information content of cash flow (measured as operating income) which foreshadowed a vast literature on the information content and pricing of accruals and cash flow that would later emerge.

While BB68 drew a watershed conclusion that earnings are useful and meaningful, the paper had its fair share of critics. **Chambers [1974]** noted that BB68 could not discriminate between market efficiency and market fixation when interpreting the association between security prices and earnings. History demonstrates that Chambers' concern has been largely unwarranted. More generally, BB68 sparked research that explicitly sought to ascertain whether accounting adjustments devoid of cash flow effects affected prices, thus testing market efficiency rather than using efficiency as a maintained hypothesis as in BB68.

3. Ball and Brown [1968]'s Google Scholar and Web of Science Citations

Even though citations alone will understate BB68's broader impact, as a starting point, we assess BB68's impact by documenting its Google Scholar and Web of Science citations as of June 30, 2019 (2019 citation counts are lower since they are not for a full year).⁸

While citations allow us to trace BB68's impact over time, such analysis is akin to an "association-type" study in that we cannot (and do not) conclude that BB68 "caused" papers citing it to be written. Rather, BB68 is "associated" with these papers because they extended BB68 in some way or otherwise had intellectual roots in BB68. This "association" characterization is especially true for papers that do not cite BB68, but which we include as part of our discussion because such papers are nonetheless "fruit of the BB68 tree." With this caveat in mind, our

⁸ To ensure we have all published papers citing BB68, we used Google Scholar to identify the top 1,000 papers (based on their own citations) that cite BB68. We compared that list with Web of Science, updating the latter when necessary. The difference between Google Scholar and Web of Science is the latter only includes papers in a specified set of journals while the former includes published as well as unpublished papers along with other mentions of BB68.

approach is simply a way to organize the research questions subsequent researchers addressed as they built on the foundation laid by BB68 to create a body of capital market research in accounting.

The time-series of BB68's annual Google Scholar citations in Figure 1 attests to its lasting impact and relevance. As of June 30, 2019, BB68 has 8,394 Google Scholar citations, and based on the plot, it appears those citations show no sign of abating. Further evidence of BB68's impact is evident from its Web of Science citations in Figure 2. Unlike Google Scholar, Web of Science citations are from published articles only. As of June 30, 2019, BB68 has 1,393 Web of Science citations. As in Figure 1, in Figure 2, BB68's citations also show little sign of abating.^{9, 10}

4. Ball and Brown [1968]'s Impact on Capital Market Research in Accounting

4.1. OVERVIEW

To identify the main research paths and related underlying research streams that unfolded after BB68's publication, we begin by using keywords from the Web of Science articles citing BB68 (when keywords are unavailable we use our judgment). However, since citations alone understate BB68's broader impact, we use our judgment to augment each path with papers that do not cite BB68, but nonetheless have intellectual roots in BB68. As noted above, we distinguish articles citing BB68 from those that do not by placing the former (latter) in bold (normal) font.

Figure 3 depicts the five main research paths we identify: the information content/ usefulness of earnings and other accounting numbers; the timeliness of earnings and other

⁹ An added measure of BB68's overall relevance and impact is that it is cited in virtually all accounting review papers (**Gonedes and Dopuch [1974]; Ball and Foster [1982]; Lev and Ohlson [1982]; Dyckman and Zeff [1984]; Lev [1989]; Bernard [1989]; Kothari [2001]; Fields, Lys and Vincent [2001]; Dechow, Ge and Schrand [2010]; Kothari, Ramana and Skinner [2010]; Dechow, Sloan and Zha [2014]; and Ball and Sadka [2015]**). BB68 is also cited in commentaries by **Beaver [1981]** and **Beaver [2002]**, and in finance reviews papers by **Fama [1970]; Fama [1991]; Fama [1998]** and **MacKinlay [1997]**. BB68 is also cited in a review in the forecasting literature (**Brown, [1993]**).

¹⁰ For comparison, as of June 30, 2019, **Beaver [1968]** has 3,524 (495) Google Scholar (Web of Science) citations; Watts and Zimmerman [1978] 3,673 (585); Watts and Zimmerman [1986] 8,150 (N/A: Web of Science does not track citations for books); Skinner [1994] 2,513 (584); Dechow, Sloan and Sweeney [1995] 8,436 (1,521); **Sloan [1996]** 4,980 (1,078); **Basu [1997]** 4,554 (886); **Kothari [2001]** 3,165 (587); and Kothari, Leone and Wasley [2005] 5,181 (1,323).

accounting numbers; market efficiency with respect to accounting numbers; accounting numbers and the information environment; and properties of annual and quarterly earnings and forecasting earnings. In the sections below, we break each path down into its underlying research streams. Doing so enables us to map out BB68's impact across the spectrum of CMRA. As part of describing the evolution of research over time, we link papers back to BB68 where appropriate. We develop that linkage by quoting from various articles when they state how BB68 helped motivate their research or when they describe how BB68 otherwise influenced their research.

4.2. THE INFORMATION CONTENT/USEFULNESS OF EARNINGS AND OTHER ACCOUNTING NUMBERS

4.2.1. Overview

Figure 4 portrays the underlying research streams making up this path which are “the earnings-return relation;” “earnings announcement-type studies;” “accounting methods;” “the magnitude of unexpected earnings and earnings response coefficients;” “the information content/usefulness of earnings components;” and “other information content/usefulness studies.” The broad research issue addressed in this area is “are accounting numbers useful,” an issue that has been investigated from numerous perspectives. For example, “are accounting numbers value relevant?;” “are accounting numbers informative?;” “which accounting numbers are more informative about firms’ fundamentals?;” “how does varying the measurement period affect the return-earnings association?;” “the return-earnings association in international settings;” “has the information content or usefulness of earnings information changed over time?;” “how do accounting methods impact the usefulness of accounting numbers?;” and “how does the earnings-return association vary with firm characteristics?” In sum, many studies in this area replicate and extend BB68's original findings to a wide variety of settings such as different countries, stock exchanges, and time periods.

4.2.2. Earnings-Return Relation Related

BB68's publication triggered a flurry of research extending BB68 to interim earnings; accounting numbers beyond earnings; the effect of firm characteristics on the underlying relations; the return measurement interval; and others. The sheer volume of research makes it impossible to do justice to this literature. Instead, we briefly describe the evolution of research in this area post-BB68.

In the 1970s, a number of studies on the earnings-return relation extended BB68's analysis to special accounting items, extraordinary accounting items, and dividends (**Watts [1973]; Gonedes [1974]¹¹; Gonedes [1975]; Eskew and Wright [1976]; and Gonedes [1978]**). When citing BB68, **Watts [1973, p. 203]** draws a parallel between his results on the information content of dividends and BB68's on the information content of earnings. Specifically:

“Ball and Brown found the relationship between earnings and stock prices to be positive. The preceding results suggest that the relationship between unexpected dividend changes and future earnings is positive as implied by the information hypothesis. Therefore, one would expect, on the average, an unexpected dividend change of a particular sign to be accompanied by a price change of the same sign.”

In the 1980s, the FASB's concern with inflation accounting led many researchers to investigate the information content of replacement cost accounting numbers (e.g., **Beaver, Griffin, and Landsman [1982]** and **Lustgarten [1982]**). Other studies in the 1980s continued to build on BB68's legacy by studying other properties of the earnings-return relation such as **Lipe [1986]** on the information contained in the components of earnings and **Stober [1986]** on the incremental information-content of LIFO inventory liquidations. To motivate his study of the information content of LIFO liquidations, **Stober [1986, p. 138]** writes:

“Evidence exists indicating that annual earnings numbers convey information to investors that is relevant to the pricing of common stocks for publicly- traded companies (e.g., Ball

¹¹ **Gonedes [1974, p. 33]** actually notes that “The collection of firms used in this study is a subset of the 261 firms used by Ball and Brown [1968] in an examination of annual accounting income numbers.”

and Brown [1968] and Beaver, Clarke and Wright [1979]). However, comparatively little is known about the information content of the more comprehensive disclosures regarding earnings and earnings components that are provided in the complete text of a firm's financial statements and the accompanying footnotes."

Other studies of the earnings-return relation in the 1980s include **Tse [1986]** on intra-year trends in the relation between accounting numbers and security prices and **Freeman and Tse [1989]** on the multi-period information content of earnings. In a widely-cited paper, **Freeman [1987]** compares the earnings-return relation of large versus small firms. At the very outset of his paper, **Freeman [1987, p.195]** links his paper to BB68 by stating:

"This paper investigates the timing and magnitude of the relation between security returns and accounting earnings for large versus small NYSE firms. The tendency for abnormal returns to lead accounting earnings was documented by Ball and Brown (1968) and extended by Beaver, Lambert and Morse (1980)."

The 1990s produced a number of papers on the earnings-return relation that would turn out to be very influential (i.e., highly cited). These include, **Easton and Harris [1991]** on earnings as an explanatory variable for returns and **Easton, Harris and Ohlson [1992]** who showed that aggregating firm earnings and returns temporally dramatically increases the strength of the earnings-return relation because the alignment of information underlying prices and earnings increases as earnings and returns are aggregated over longer intervals (see, also Fama [1990]). Also in the 1990s, **Lipe [1990]** examined the earnings-return relation in the presence of alternative information while **Anthony and Ramesh [1992]** documented that the earnings-return association varies as a function of the firm's life cycle. In another highly-cited paper, Hayn [1995] uses shareholders' abandonment option to motivate tests of a differential relation between profits and losses, and returns. In both long and short-windows, Hayn [1995] finds that the information content of earnings is concentrated in profits. Another widely cited paper from the 1990s is **Collins, Kothari, Shanken and Sloan [1994]**, which is motivated in part by **Lev [1989]**'s observation of the low explanatory power (R^2) of return-earnings regressions. **Collins et al. [1994]** investigate

earnings lack of timeliness vs. noise in earnings as explanations for the low annual earnings-return association, coming down in favor of the lack of timeliness explanation.

4.2.2.1 Value Relevance

In essence, BB68 was the first value-relevance study in the accounting literature. That said, BB68 is rarely cited in a literature that would later become known as “the value-relevance literature.” We briefly discuss the value relevance literature because of the prominence of research in this area over time (see **Barth, Beaver and Landsman [2001]**; Holthausen and Watts [2001]; and Barth, Li and McClure [2018] for reviews). As stated in **Barth, Beaver and Landsman [2001, p.78]** “... value relevance studies are designed to assess whether particular accounting amounts reflect information that is used by investors in valuing firms’ equity.” This broad goal can be linked back to BB68’s primary research question. Consistent with this, value relevance studies often use equity value (e.g., price) as the dependent variable with independent variables such as earnings and book values along with other financial statement items or disclosures. The empirical model in most value relevance studies is rooted in the Ohlson [1995] model. To provide just a few examples, research in this area has studied the value relevance of asset fair values (Barth [1994] and Barth Beaver and Landsman [1996] and numerous others); and whether the relevance of financial statement numbers has changed over time (Collins, Maydew and Weiss [1997] and **Francis and Schipper [1999]**).

4.2.3. Earnings Announcement Related

Publication of BB68 and **Beaver [1968]** triggered accounting researchers to study the announcement of interim earnings; other accounting numbers; and the effect of firm characteristics on return behavior at the time of the release of accounting information.¹² The most highly-cited

¹² While many of the earnings announcement-type studies discussed in this section cite BB68, such studies may in fact have more in common with **Beaver [1968]**.

paper is BB68's contemporary, **Beaver [1968]** on the information content of annual earnings announcements.¹³ **Beaver [1968, p. 85]** links his study to BB68 by noting:

"The Ball and Brown findings and the findings presented here are mutually supportive with respect to the information content of earnings reports and also are uniformly consistent with the findings of previous studies in the behavior of security prices."

An early study in this area is **Foster [1975]** who studied the relation between the earnings and stock prices of insurance companies. However, by far, the most active stream was research on interim/quarterly earnings. Interim/quarterly earnings were the focus of research in the 1970s by **May [1971]** and **Brown and Kennelly [1972]**, where, for example, the latter study is comparable to BB68 in many respects except that it focused on quarterly earnings rather than annual earnings in BB68. A focus on interim/quarterly earnings continued on into the 1980s, 1990s and 2000s in, for example, **Bamber [1987]** on the explanatory power of unexpected earnings and firm size at earnings announcement dates; **Shores [1990]** on the information content of OTC firms' earnings announcements, and **Landsman and Maydew [2002]** who replicate and update various aspects of **Beaver's [1968]**'s original results. Collectively, these studies consistently find that quarterly earnings and earnings announcements have information content based on their effect on signed returns, variance of returns or trading volume.

Another topic of interest has been the timing of earnings news release. For example, **Patell and Wolfson [1982]** and **Lee [1992]** investigate questions related to the intra-day-timing of news release, the former (latter) in the context of good-news and bad news (small traders). In their study of the intra-day timing of news, **Patell and Wolfson [1982, p. 517]** acknowledge BB68 by stating:

"Explicit recognition of the idea that news is good or bad only in relation to prior expectations first appeared in the seminal study of earnings announcements by Ball and Brown [1968], who introduced the use of empirical models of investor expectations."

¹³ As discussed in BB (2019), while BB68 and **Beaver [1968]** have a 1968 publication date, publication of BB68 actually preceded publication of **Beaver [1968]**.

Other studies on earnings announcement timing include **Chambers and Penman [1984]** who find that, relative to expected earnings announcement dates, good (bad) news earnings tend to be accelerated (delayed). Skinner and Sloan [2002] find that earnings surprises, especially negative surprises for technology firms, can have a large (“earnings torpedo”) effect on prices; while Francis, Schipper and Vincent [2002a] and [2002b] explored the relation between earnings announcements and competing information and how expanded disclosures affect the usefulness of earnings announcements.

Based on the number of papers published in the past ten years (i.e., 2008-2018), earnings announcement-type studies continue to be an active area of research. To provide some breadth of the topics investigated (in chronological order), studies in this area focus on the effect of after-hours earnings announcements (Berkman and Troung [2009]); Google information search around earnings announcements (Drake, Roulstone and Thornock [2012]); the information content of annual earnings announcements and mandatory IFRS adoptions (**Landsman, Maydew and Thornock [2012]**); volatility risk and risk premiums at earnings announcements (**Barth and So [2014]**); news-driven return reversals and liquidity provision preceding earnings announcements (**So and Wang [2014]**); the market pricing and the strategic scheduling and timing of earnings announcements (deHaan, Shevlin and Thornock [2015]); how weather-induced moods affect the processing of earnings news (deHaan, Madsen and Piotroski [2017]); which announcements investors process first (**Frederickson and Zolotoy [2016]**); the strategic timing of earnings news (Michaely, Rubin and Vadrashko [2016a]; Michaely, Rubin and Vadrashko [2016b]); earnings announcements and systematic risk (**Savor and Wilson [2016]**); asymmetric trading costs prior to earnings announcements (Johnson and So [2018]); the effect of earnings announcements promoted on Yahoo Finance (Lawrence, Ryans, Sun, and Laptev [2018]); the rise of concurrently

released earnings announcements and 10-Ks (Arif, Marshall, Schroeder, and Yohn [2018]); and the relation between actively managed funds and earnings news (**Lee and Zhu [2018]**).

Studies taking a broad perspective on earnings announcement-related research include **Ball and Shivakumar [2008]** who ask the question “how much new information is there in earnings” and **Basu, Duong, Markov and Tan [2013]** who study “how important are earnings announcements as an information source?” **Ball and Shivakumar [2008, p. 975]** find that “the average quarterly announcement is associated with approximately 1% to 2% of total annual information, thus providing a modest, but not overwhelming amount of incremental information to the market,” which leads them to conclude that “the primary economic role of reported earnings is not to provide timely new information to the share market.” In contrast, **Basu, Duong, Markov and Tan (2013)** conclude that “earnings announcements are a dominant source of new information in the equity market.” Finally, in a study providing updated cross-sectional and time-series evidence on stock return behavior at earnings announcement dates, **Beaver, McNichols and Wang (2018, p. 95)** conclude: “... there is a dramatic increase in information content at earnings dates from 2001 onward.”¹⁴ ... “the market reaction to loss firms is substantially less than that for profitable firms.” ... “there is a significantly greater reaction to larger firms.” ... and “reaction at earnings dates is significantly increasing in analyst coverage, and once analyst coverage is controlled, the association with size becomes less significant.”

4.2.3.1. Non-GAAP Earnings Reporting

When citing BB68, **Bradshaw and Sloan [2002, p.42]** state:

“Since the seminal work of Ball and Brown [1968], it has been well documented that stock prices are closely related to earnings performance. Earnings performance has been traditionally measured using the net income and earnings per share (EPS) figures produced according to “generally accepted accounting principles” (GAAP). However, recent years

¹⁴ Evidence of increased information during earnings-announcement windows in recent years was reported earlier by **Ball and Shivakumar [2008]**.

have witnessed an increasing focus on "Street" earnings numbers, which are the numbers announced by corporations in their press releases and tracked by analyst estimate clearinghouse services, such as I/B/E/S, Zacks, and First Call."

Bradshaw and Sloan [2002] used this observation to motivate their comparison of the stock price effects of "street" vs. GAAP earnings. Since then, research on non-GAAP (or pro forma) earnings reporting has been an active area of research. The issues investigated include (but are not limited to): the informativeness of non-GAAP earnings (Bhattacharya, Black, Christensen and Larson [2003]; Lougee and Marquardt [2004]; Bowen, Davis and Matsumoto [2005]); investor sentiment and pro forma earnings disclosures (Brown, Christensen, Elliott and Mergenthaler [2012]); whether managers use non-GAAP earnings to meet or beat analyst forecasts (Doyle, Jennings and Soliman [2013]); who trades on pro forma earnings information (Bhattacharya, Black, Christensen, and Mergenthaler [2007]); whether pro forma earnings attract short-sellers (Christensen, Drake, and Thornock [2014]); managers' and analysts' use of non-GAAP numbers (Bentley, Christensen, Gee, and Whipple [2018]); and non-GAAP earnings disclosure in loss firms (Leung and Veenman [2018]). A recent study discussing the implications of analysts' non-GAAP earnings forecasts for accounting research is Bradshaw, Christensen, Gee and Whipple [2018].

4.2.4. Accounting Methods

To motivate studying the effects of accounting methods, **Ball [1972, p.26]** draws a connection to BB68 by noting that BB68 found that:

*"...if actual income differs from expected income, the market typically has reacted in the same direction..." **Ball (1972, p.26)** goes on to state "If the market reacts in the same direction to a typical income change, does it react in a similar fashion to an income change which is induced by a change in accounting technique?"*

Thus, BB68 opened the door for using stock prices to evaluate the consequences of accounting changes. In the 1970s, such studies included (among others) **Kaplan and Roll [1972]**, Archibald [1972], **Sunder [1973]**, **Harrison [1977]** and **Hong, Kaplan, and Mandelker**

[1978]. These studies gave way to a stream of research on LIFO adoptions, which have a direct cash flow effect. LIFO studies span a couple of decades and include Ricks [1982]; **Biddle and Lindahl [1982]**; Hand [1993]; Hand [1995]; and Pincus and Wasley [1996].

Research on accounting changes took a major turn in the late 1970s with the introduction of Watts and Zimmerman's positive accounting theory (PAT) (Watts and Zimmerman [1978]; Watts and Zimmerman [1979]; Watts and Zimmerman [1983]; and especially Watts and Zimmerman [1986]). PAT laid out the intuition for why accounting changes devoid of a direct cash flow effect via taxes, can still affect stock prices. Specifically, accounting changes (mandatory or voluntary) can affect a firm's debt contracts and executive compensation contracts triggering wealth transfers to or from shareholders. PAT led to a torrent of research on why managers choose the accounting methods they do; why they periodically change accounting methods; why they lobby for certain accounting policies; and why they make the accounting policy (e.g., discretionary accrual) choices they do. Early tests of the PAT include **Hagerman and Zmijewski [1979]**, **Holthausen [1981]** and Leftwich [1981]. A detailed discussion of the PAT literature is outside the scope of our paper (for reviews see Holthausen and Leftwich [1983]; **Watts and Zimmerman [1986]**; **Fields, Lys and Vincent [2001]**; and **Kothari, Ramanna and Skinner [2010]**).¹⁵ In sum, we do want to mention that the topic, discretionary accrual choices, led to vast literatures on "earnings management" and "earnings quality."

4.2.5. The Magnitude of Unexpected Earnings and Earnings Response Coefficients

In their "Concluding Remarks" BB68 (p.177) state:

"...The relationship between the magnitude (and not merely the sign) of the unexpected income change and the associated stock price adjustment could also be investigated."

This prophecy came true (*eleven years later*) when **Beaver, Clarke and Wright [1979]**

¹⁵ BB68 is extensively discussed in chapter 3 of Watts and Zimmerman [1986].

studied the relation between the *magnitude* of unexpected returns and the *magnitude* of unexpected earnings (UE). When citing BB68, **Beaver et al. [1979, p. 316]** note that BB68's:

“ability to reject the null hypothesis by considering only the sign of the forecast error leads us to expect that incorporating the magnitude would tend to strengthen their findings.”

In this important extension of BB68, **Beaver et al. [1979]** document a positive relation between the magnitude of unexpected returns and the magnitude of UE. The positive magnitude relation was later confirmed at the quarterly level in a short-window setting by **Hagerman, Zmijewski and Shah [1984]** (and in other studies too numerous to mention).

Research on the magnitude of unexpected earnings led to a vast literature on the economic determinants of earnings response coefficients (ERCs). In light of the quote above (BB68, p.177) about a magnitude relation, BB68 deserve some credit for the birth of the ERC literature. Major contributions to the ERC literature were made by **Kormendi and Lipe [1987]**; **Easton and Zmijewski [1989]**; and **Collins and Kothari [1989]** who document that ERCs vary as a function of earnings persistence, growth, beta and firm size.

As the ERC literature evolved, subsequent studies examined (among numerous other factors) the implications for ERCs of prices leading earnings (**Kothari and Sloan [1992]** and **Kothari [1992]**) as well as numerous determinants of time-series and cross-sectional-variation in ERCs such as (to name just a few) proxy contests (Collins and DeAngelo [1990]); the time series process of earnings (Lang [1991]); audit qualifications (Choi and Jeter [1992]); the default risk of debt (Dhaliwal and Reynolds [1994]); dividend payout ratios (Kallapur [1994]); and the permanent vs. transitory components in earnings (**Ali and Zarowin [1992]**). Other research focused on properties of ERCs, such as the magnitude of ERCs estimated from firm-specific time-series models when compared to pooled cross-sectional regression estimation (Teets and Wasley [1996]; Lipe, Bryant and Widener [1998]). While no longer an active area of research, two recent ERC

studies examine how macro-uncertainty (VIX) impacts ERCs (**Williams [2015]**) and Ferri, Zheng, and Zou [2018] who study how uncertainty about managers' reporting objectives affects the market response to earnings reports.

4.2.5.1 Non-linearity in the Earnings—Return Relation

Another nugget left by BB68 is their last footnote foreshadowed a non-linear magnitude relation:

“The functional form need not necessarily be linear, if only because income numbers convey information about the covariability of the income process.”

This observation presaged research on non-linearity in the earnings-return relation (Freeman and Tse [1992]; **Cheng, Hopwood and McKeown [1992]**; Das and Lev [1994]; Hayn [1995]; **Basu [1997]**).

4.2.6. Information Content/Usefulness of Earnings Components -- Cash Flows and Accruals

BB68's early evidence on the informativeness of cash flow (which BB68 measured as operating income) foreshadowed a literature that would subsequently emerge on the information content and pricing of accruals and cash flow. Studies examining the information content of earnings, accruals and cash flow include **Rayburn [1986]**; **Wilson [1986]**, **Wilson [1987]**; **Bowen, Burgstahler and Daley [1987]**; and Bernard and Stober [1989]. With the exception of the latter, most studies conclude that both accruals and cash flow have incremental information content. In a widely cited paper, **Dechow [1994]** sharpened the focus on the information content of accruals (earnings) versus cash flow by investigating whether earnings or cash flow better explains variation in contemporaneous returns. **Dechow [1994]** found that the answer was earnings, which is an important finding because it gave empirical support to the accrual accounting process underlying earnings. While the studies above used stock returns as a benchmark, other

studies examined the ability of accruals to predict future cash flows (Dechow, Kothari and Watts [1998]; **Barth, Cram and Nelson [2001]; Barth, Clinch and Israeli [2016]**).

In sum, the studies discussed in this sub-section were designed to provide evidence on the informativeness of earnings (via accruals) beyond operating cash flow as a summary measure of firm performance when benchmarked against stock returns or future cash flows. The issue of whether earnings or cash flow is a better summary measure of firm performance was and continues to be an issue of obvious interest and importance to the accounting profession. That said, research on the information content of accruals largely gave way to a literature on the mis-pricing of accruals and accrual components.

4.2.7. Other Information Content/Usefulness Studies

4.2.7.1 Commonalities in Earnings and Earnings Changes and Information Transfer

To measure the firm-specific component of a firm's change in earnings (i.e., unexpected earnings), BB68 used a market-wide earnings index model to filter out the systematic portion of the earnings change. The rationale is that firms' earnings (hence earnings changes) move together due to macroeconomic and/or industry factors. Pre-BB68 evidence of a relation between "the earnings of a firm and its industry and the economy" appears in Brown and Ball [1967], hereafter BB67). BB67's and BB68's modelling of (expected) earnings changes led subsequent researchers to further investigate market-wide and industry-wide commonalities in earnings (**Magee [1974]; Ayers and Freeman [1997]**).

Evidence of commonalities in earnings provided motivation to investigate whether information transfers occurred between firms in the same industry or between customers and suppliers at the time of information releases such as earnings or management forecasts. Studies of information transfer include **Foster [1981]; Pownall and Waymire [1989]; Han and Wild**

[1990]; Ramnath [2002]; Thomas and Zhang [2008]; and Pandit, Wasley and Zach [2011]. An early study in this area by **Foster [1981, p. 222]** links his study and results to BB68 when he states:

“The competing information sources notion plays an important role in discussions of the results of capital market research. For instance, Ball and Brown (1968, p. 176) conclude that ‘the annual income report does not rate highly as a timely medium’. ... The results in section 4 document that for an identifiable subset of cases, the earnings releases of other firms in the same industry are also part of the information set that the capital market uses in its continual process of share price revaluation.”

While information transfer research waned in the 1990s and 2000s, it has seen renewed interest recently (**Hann, Kim and Zheng [2018]**).

4.2.7.2. Option and Bond Markets

While most CMRA focuses on equity markets (i.e., common stock prices), researchers also investigated the impact of earnings in the options and debt markets. Early examples in the option market include **Patell and Wolfson [1979]** on “the anticipated information releases reflected in call option prices” and **Patell and Wolfson [1981]** on “the ex-ante and ex-post price effects of quarterly earnings announcements reflected in option and stock prices.” Later studies include Skinner [1990]; Jin, Livnat and Zhang [2012]; **Billings and Jennings [2011]** and **Truong and Corrado [2014]** all of which examine topics such as “the option market’s anticipation of information content in earnings announcements” and “options trading volume and stock price response to earnings announcements.”

In the bond market, **Easton, Monahan and Vasvari [2009]** conduct long and short-window tests of earnings’ information content and **Defond and Zhang [2014]** who study the timeliness of bad news earnings. To motivate their study, **Easton, Monahan and Vasvari [2009, p. 721-22]** draw on BB68 (and **Beaver [1968]**) by stating:

“The extant literature beginning with Ball and Brown [1968] and Beaver [1968] concerning the role of accounting earnings in equity markets is vast...little is known about the role of earnings in bond markets.”

Other studies with a debt or credit market focus include **Callen, Livnat, and Segal [2009]** on the effect of earnings on the price of credit default swaps and the relation between earnings announcements and the timing of debt offerings (**Kerr and Ozel [2015]**).

4.2.7.3. Earnings-Return Relation and Earnings Announcement Studies in International Settings

Beyond U.S. markets, researchers also studied the role of earnings in international settings. In some cases, the motivation was to investigate how different institutional arrangements in other countries affected the earnings-return relation and/or the market reaction to earnings. That is, how different institutional features affected the pricing of accounting information vis-à-vis that in the U.S. **Ball [2016]** discusses the rationale for international accounting research. An early study by **Alford, Jones, Leftwich and Zmijewski [1993]** replicates BB68 internationally by focusing on the “relative informativeness of accounting disclosures in different countries.”

Other studies with an international setting include **Ball, Kothari and Robin [2000]** who develop and test hypotheses about “the effect of international institutional factors on properties of accounting earnings;” **Ball, Robin and Wu [2003]** who study the effect of “incentives versus standards on the properties of accounting income in four East Asian countries;” **DeFond, Hung and Trezevant [2007]** who study “investor protection and the information content of annual earnings announcements;” and **Landsman, Maydew and Thornock [2012]** who investigate the effect of mandatory IFRS adoption on the information content of annual earnings announcements.

4.2.7.4. Aggregate Earnings

While CMRA’s primary focus is on firm-level relations, in the mid-2000s a literature emerged on aggregate earnings where aggregate earnings are calculated as the cross-sectional sum of earnings or earnings changes in a given year or quarter.¹⁶ We organize research on aggregate

¹⁶ **Ball and Sadka [2015]** discuss why research on aggregate earnings is of interest to the accounting profession and researchers.

earnings into two broad, but related strands: studies related to various aspects of the aggregate earnings-aggregate return relation and studies of aggregate earnings' relation with macroeconomic variables such as GDP. Some of the studies examining the aggregate earnings-aggregate return relation are: Penman [1987] who documents “coincidental” seasonalities in aggregate corporate earnings news and stock returns; **Kothari, Lewellen and Warner [2006]** who study the aggregate earnings-aggregate return relation using annual and quarterly data and show that the post-earnings announcement drift phenomenon documented at the firm level does not aggregate up to the economy level, and **Cready and Gurun [2010]** who study the relation in a short-window setting. Both **Kothari, Lewellen and Warner [2006]** and **Cready and Gurun [2010]** document a negative relation between aggregate earnings and aggregate returns.

Other studies at the aggregate level include **Ball, Sadka and Sadka [2009, p. 1099]** who report that “accounting earnings has substantial undiversifiable variation, that systematic earnings risk is correlated with return risk, and that systematic earnings risk is priced”; Hirshleifer, Hou, and Teoh [2009] who study the relation between accruals, cash flows and aggregate returns; Kang, Liu and Qi [2010] who study predicting stock market returns with aggregate discretionary accruals; Jorgensen, Li and Sadka [2012], on earnings dispersion and aggregate stock returns; Gallo, Hann and Li [2016] who study aggregate earnings surprises, monetary policy and stock returns; Gkougkousi [2014] who studies the role of aggregate earnings in the corporate bond market; **Shivakumar and Urcan [2017]** who study how aggregate earnings growth reflects information about future inflation; and He and Hu [2014] and Gallo, Hann, Li, and Zotova [2018], both of which examine the aggregate earnings-return relation in an international setting. The recent publication dates of these papers suggests that research on the properties and pricing of aggregate earnings is an active area of research.

4.3. THE TIMELINESS OF EARNINGS AND OTHER ACCOUNTING NUMBERS

4.3.1. Overview

BB68 provided evidence on the question “how do annual accounting earnings rate as a timely source of information?” BB68 conclude that annual earnings are not a particularly timely source of information in that more than 80% of the information in earnings is already incorporated into price by the time of the earnings announcement. BB68 conjecture this could be due to the release of interim reports. As shown in Figure 5, the research streams making up this path are: competing/other information releases and the timeliness of earnings; the information content of security prices; and the asymmetric timeliness of earnings. Broadly speaking, the main research question addressed in this area is “what determines the timeliness of accounting numbers?” Studies approached this question in a variety of ways including: why are earnings asymmetrically timely?; how does earnings timeliness affect the short- and long-window earnings-return association?; are accruals asymmetrically timely?; and is earnings timeliness evident in international settings?

4.3.2. *Competing/Other Information Releases and the Timeliness of Earnings*

BB68 (p. 176) state “the annual income report does not rate highly as a timely medium, since most of its content (about 85 to 90 percent) is captured by more prompt media which perhaps include interim reports.” While BB68 do not mention management forecasts (MFs) as an example of “more prompt media,” MFs turned out to be a widely studied information release likely to preempt annual or quarterly earnings. While MF studies typically do not motivate their analysis by stating they view MFs as an example of a way to investigate what BB68 meant by “more prompt media,” because BB68 is cited in this literature we briefly discuss its evolution over time.¹⁷

¹⁷ For reviews of the voluntary disclosure literature including research on MFs, see Healy and Palepu [2001]; Hirst, Koonce and Venkataraman [2008]; and Beyer, Cohen, Lys, and Walther [2010].

MF studies in the 1970s and 1980s includes **Patell [1976]; Gonedes, Dopuch and Penman [1976]; Penman [1980]; Waymire [1984]; Pownall and Waymire [1989]** and **Lev and Penman [1990]**. On balance, these studies report that MFs have information content in that they affect stock prices. A major innovation in the MF literature in the 1990s is a widely-cited paper by Skinner [1994] who developed the rationale for why litigation risk may induce managers to voluntarily disclose bad news sooner rather than later (see also Kothari, Shu and Wysocki [2009]).

Given the vastness of the MF literature, we briefly summarize MF research from 2000 and beyond. Select examples include, Anilowski, Feng and Skinner [2007] who study whether earnings guidance affects market returns; Rogers and Van Buskirk [2009] who examine how shareholder litigation affects subsequent disclosure behavior; Rogers, Skinner and Van Buskirk [2009] who study earnings guidance and uncertainty in the options market; Rogers, Van Buskirk, and Zechman [2011] on the relation between disclosure tone and litigation; and Bonsall, Bozanic, and Fischer [2013] who examine whether MFs convey information about the macroeconomy. An important empirical fact that has emerged in the MF literature is that since roughly 2000 (and the implementation of Reg FD), earnings guidance (i.e., MFs) is now routinely “bundled” with earnings news on earnings announcement dates (see, Rogers and Van Buskirk [2013]).

4.3.3. The Information Content of Security Prices

A common interpretation of BB68’s results on earnings’ lack of timeliness is that prices impound a significant portion of the information contained in earnings prior to the release of earnings. This intuition motivated **Beaver, Lambert and Morse [1980]** to use price to measure the information available to investors prior to the release of earnings, and whether the information in price could be used to develop more accurate forecasts of annual earnings when compared to a random walk (or random walk with a drift). **Beaver et al. [1980]** find that using the information in price leads to improved earnings forecasts, although the margin of improvement is modest. A

subsequent study by **Collins, Kothari and Rayburn [1987]** investigated whether the information content of prices is greater for large firms than for small firms, which they find is the case. **Ou and Penman [1989b, p.112]** “...compare the ability of prices and appropriate financial statement variables to predict future earnings” ... and ... “find that the price *changes* that Beaver, Lambert and Ryan (1987) and Collins, Kothari and Rayburn (1987) indicate lead earnings are poor earnings predictors relative to predictors based on financial statement information.” Other papers in this area include **Beaver, Lambert, and Ryan [1987]** and **Beaver, McNally and Stinson [1997]**.

4.3.4. Asymmetric Timeliness of Earnings

Researchers have studied the timeliness property of accounting numbers such as earnings from a number of perspectives. The common thread linking these studies is that they focus on the economic forces shaping accounting standards, hence accounting numbers, and the resulting impact on the timeliness of accounting numbers such as their timeliness in incorporating good vs. bad news. Major innovations came in widely-cited papers by **Basu [1997]** on the asymmetric nature of earnings in reflecting good versus bad news and **Ball et al. [2000]** who study international determinants of the timeliness property. **Basu [1997]** is a natural descendant of BB68 in that both papers investigate properties of accounting earnings using returns as a benchmark. Moreover, BB68 use stock returns as a benchmark to evaluate the information content and timeliness (within a year) of earnings while **Basu [1997]** uses stock returns as a benchmark to evaluate the asymmetric timeliness (across years) of earnings. Viewed this way, **Basu [1997]** was following the spirit of BB68.

Other research on timeliness includes **Ball et al. [2003]**, another international study (see also Pope and Walker, [1999]); **Ball and Shivakumar [2005]**; and **Ball and Shivakumar [2006]** on the role of accruals in asymmetric gain and loss recognition. More recent research in this area

focuses on the timeliness of financial institutions' accounting numbers during the U.S. financial crisis (**Vyas [2011]**) and the timeliness of accounting numbers during the Asian financial crises (**Vichitsarawong, Eng and Meek [2010]**).

Discussion of asymmetric timeliness would be incomplete without mention of the Conservatism literature (see, Watts [2003a] and Watts [2003b]). BB68 is often cited in the Conservatism literature because researchers often use the "Basu coefficient" as a measure of conservatism, and as noted above, **Basu [1997]** is a descendent of BB68. Examples of papers in this area that cite BB68 include studies on the economic and statistical properties of the "Basu coefficient" (see, e.g., **Dietrich, Muller and Riedl [2007]** and **Ball, Kothari and Nikolaev [2013a]** and **Ball, Kothari and Nikolaev [2013b]**).

4.4. MARKET EFFICIENCY WITH RESPECT TO ACCOUNTING NUMBERS¹⁸

4.4.1. Overview

BB68's Figure 1 (see BB68, p. 169) constituted the first evidence of post-earnings-announcement drift (PEAD). While BB68 did not perform detailed tests of PEAD, they were the first to uncover the PEAD phenomenon. Moreover, the drift in the *API* (abnormal performance index) in BB68's Figure 1 after the earnings announcement month was a springboard for a vast body of research on whether security prices are efficient with respect to earnings and other accounting numbers, and if strategies designed to exploit any mis-pricing could be used to generate abnormal returns. While extensive reviews on market efficiency exist (**Fama [1970]**; **Fama [1991]**; **Fama [1998]**; **Ball [1978]**), we discuss market efficiency because BB68 heralded research on market efficiency with respect to accounting numbers, in particular, PEAD. As shown in Figure 6, the research streams making up this path are PEAD; (mis)pricing of accruals and other

¹⁸ While accounting researchers have investigated whether the market mis-prices a variety of accounting numbers, we focus on PEAD; accruals; and fundamental analysis.

accounting numbers; and fundamental analysis. Studies in these streams have investigated questions such as “what are the causes of PEAD?”; “what factors explain the magnitude of PEAD?”; “do accruals and earnings exhibit differential persistence?”; and “are accruals mispriced?”

4.4.2. *Post-Earnings Announcement Drift (PEAD)*

The first PEAD papers that surfaced after BB68 generally focused on documenting properties of the drift (Jones and Litzenberger [1970]; **Joy, Litzenberger and McEnally [1977]; Watts [1978];** and Foster, Olsen and Shevlin [1984]). One of the most widely-cited papers in the PEAD literature, **Bernard and Thomas [1989, p. 1]** directly acknowledges BB68 by stating:

“Ball and Brown [1968] were the first to note that even after earnings are announced, estimated cumulative “abnormal” returns continue to drift up for “good news” firms and down for “bad news” firms.”

Over time, studies tested explanations for PEAD such as risk shifts and the market’s failure to appreciate the time-series properties of quarterly standardized unexpected earnings. Such studies include (among others) **Bernard and Thomas [1989]; Bernard and Thomas [1990]; Bartov [1992]; Bhushan [1994]; Ball and Bartov [1996]; Mendenhall [2002]; Chordia and Shivakumar [2005]; Sadka [2006]; Livnat and Mendenhall [2006]; Ng, Rusticus and Verdi [2008]; Zhang [2008]; and Basu, Markov and Shivakumar [2010].**

4.4.3. *(Mis)Pricing of Accruals and other Accounting Numbers*

While a number of studies examined and compared the information content of earnings, accruals and cash flow by focusing on their contemporaneous relation with security returns, other studies went down a different path, namely, whether the market mis-priced accruals. By far, the most widely cited study of accrual mis-pricing is **Sloan [1996]. Sloan [1996, p. 291]** writes:

“Following Ball and Brown (1968), many studies have documented a positive contemporaneous association between earnings and stock returns, which is generally attributed to earnings’ ability to summarize value relevant information.” Sloan (1996, p.

291) goes on to state “...*However, a number of recent studies present evidence that investors do not correctly use available information in forecasting future earnings performance...*”

To motivate his study, **Sloan [1996, p. 291]** goes on to note that, “This evidence raises the possibility that the well documented association between earnings and stock returns may, in part, reflect investors' naïve fixation on reported earnings, rather than earnings' ability to summarize value relevant information.” **Sloan [1996]** concludes that the market mis-prices accruals because it does not recognize accruals' lack of persistence, and as a result, a long (short) position in firms with extreme negative (positive) total accruals yields abnormal returns.

Numerous studies have extended **Sloan's [1996]** findings (see Richardson, Tuna and Wysocki [2010] for a review of accounting anomalies). For example, some studies focused on the pricing of accrual components (Xie [2001]; Hirshleifer, Hou, Teoh and Zhang [2004]; Richardson, Sloan, Soliman and Tuna [2005]; Battalio, Lerman, Livnat, and Mendenhall [2012]; Allen, Larson, and Sloan [2013]; others compare the pricing of accruals with that of cash flow or other profitability measures (Desai, Rajgopal, and Venkatachalam [2004]; **Ball, Gerakos, Linnainmaa and Nikolaev [2016]**); while others explored explanations for the accrual anomaly (Khan [2008]; Kraft, Leone and Wasley [2006]; Kraft, Leone and Wasley [2007]) or provided international evidence on accrual mis-pricing (Pincus, Rajgopal and Venkatachalam [2007]).

4.4.4. Fundamental Analysis

We classify a final area of accounting research on market efficiency with respect to accounting numbers as “fundamental analysis.” Studies with a focus on the market-pricing of “fundamentals” exists as far back 1977 (**Basu [1977]** on P/E ratios; **Basu [1978]** on earnings yield (E/P); and Basu [1983] on earnings yield and firm size; see **Ball [1992]** for a review/commentary on the earnings/price anomaly).

The papers that perhaps best illustrate a focus on fundamental accounting information are **Ou and Penman [1989a]** and Ou [1990], both of which use financial statement numbers to predict earnings changes and eventually future returns. For example, **Ou and Penman [1989a]** use a large array of accounting variables to predict year-ahead earnings changes which they then use to form long and short portfolio positions which they argue generates future abnormal returns. To help motivate their focus of using fundamental analysis to predict earning changes, **Ou and Penman [1989a, p. 298]** state:

“We are impressed, however, by one of the most robust results in empirical research in accounting, namely the Ball and Brown (1968) finding that accounting earnings are valued positively by investors. Higher (lower) earnings imply higher (lower) values... Thus we identify future earnings as a value-relevant attribute of interest.”

Ou [1990] augments the information set to include non-financial information to form predictions of future earnings changes beyond what is conveyed by the information in current earnings. Other studies with a fundamental analysis focus include Abarbanell and Bushee [1997]; **Abarbanell and Bushee [1998]**.

4.5 ACCOUNTING NUMBERS AND THE INFORMATION ENVIRONMENT

4.5.1. Pre-disclosure Information Environment

With regard to the research path “accounting numbers and the information environment,” as shown in Figure 7, the primary research stream is the “pre-disclosure information environment.” The broad research question studied here is “how do information environment characteristics affect the pricing of accounting numbers?”

As stated above, a common interpretation of BB68’s results on earnings’ lack of timeliness is that a significant portion of the information contained in annual earnings is incorporated into stock prices prior to the earnings release date. This observation motivated a number of studies to investigate whether the stock price reaction to earnings announcements varied with proxies for

firms' pre-disclosure information environment. The proxies studied include exchange listing by **Grant [1980]** who finds the stock price reaction to OTC firms' earnings announcements to be greater than that for exchange listed firms and **Atiase [1985]** on firm size who finds the stock price reaction to small firms' earnings announcements to be greater than that for large firms. To motivate his study of pre-disclosure information environment characteristics **Atiase [1985, p.21]** states:

“Several studies on the relationship between earnings reports and security price behavior provide evidence suggesting that a significant portion of the information revealed through earnings reports is reflected in security prices prior to the report month (e.g., Ball and Brown [1968] and Brown and Kennelly [1972]). This has been attributed (at least partly) to the existence of other more timely sources of information which allow market agents to forecast earnings prior to their release.”

Other studies in this area include **Atiase [1987]** on both firm size and exchange, finding that the price reaction to earnings announcements is related to both size and exchange listing. Examples of other studies on information environment characteristics include **Heflin, Subramanyam and Zhang [2003]** on Regulation FD's impact on the financial information environment and **Drake, Roulstone and Thornock [2015]** on the determinants and consequences of information acquisition via EDGAR.

4.6. PROPERTIES OF EARNINGS AND FORECASTING EARNINGS

4.6.1. Overview

BB68 constructed measures of unexpected earnings (UE) based on the expected change in annual earnings estimated from a market-wide earnings index model and using a naïve change in earnings per share (EPS) (random walk) model. These features of BB68 created a cottage industry on forecasting earnings to obtain more accurate measures of *UE*. As shown in Figure 8, the research streams here are “time-series models” and “analysts' forecasts.” Research in these areas began with using time-series models to forecast annual and quarterly earnings, which naturally grew into research comparing the properties (e.g., bias and accuracy) of time-series models with those of

consensus analysts' earnings forecasts. Research in this area naturally evolved toward understanding analysts' behavior such as coverage decisions and their incentives to issue biased (optimistic or pessimistic) earnings forecasts.

4.6.2. Time-Series Models of Annual and Quarterly Earnings

One of BB68's earnings change variables was based on a random walk for annual EPS. Subsequent studies (**Ball and Watts [1972]**; Brooks and Buckmaster [1976]; Watts and Leftwich [1977]) studied the time-series properties of annual earnings and earnings changes to determine whether a random walk was descriptive of the underlying earnings process. As quarterly data became available, the focus shifted to the time-series properties of quarterly earnings. The seasonality in quarterly earnings led researchers to investigate univariate Box-Jenkins models. Brown and Rozeff [1979]; Griffin [1977]; Watts [1973] and **Foster [1977]** all proposed models to forecast quarterly earnings. When describing his stock price tests, **Foster [1977, p. 14]** notes he is "Using the basic approach adopted in Ball and Brown [1968]..." Other studies of the time-series properties of quarterly earnings include **Lorek and McKeown [1978]**, **Bathke and Lorek [1984]**, and Collins, Hopwood and McKeown [1984]. Until analyst earnings forecasts became widely available, these models were used to measure unexpected earnings in studies of the earnings-return relation.

4.6.3. Properties of Analysts' Forecasts

With the availability of analyst earnings forecasts from The Value Line Investment Survey, and later for a broader sample of firms from I/B/E/S, research on time-series models gave way to research on the properties of analyst forecasts. Studies investigating whether analyst forecasts were superior to those of time-series models include **Fried and Givoly [1982]**; Brown, Griffin, Hagerman and Zmijewski [1987a]; Brown, Griffin, Hagerman and Zmijewski [1987b]; and

O'Brien [1988]. When describing features of their study, **Fried and Givoly [1982, p. 86]** draw from BB68 when they state:

“The tests of the association between the API and the prediction errors, to be described later, follow those employed by Ball and Brown (1968) and Beaver et al. (1979) and rely on the correlation between API and forecasts made about a year before the release of the earnings report.”

The takeaway from these studies is that analysts' forecasts are typically a better proxy for market expectations when compared to those from time-series models. As a result, research on time-series models has all but ceased. Recent evidence on the superiority of analysts' forecasts of annual earnings versus time-series models is provided by **Bradshaw, Drake, Myers and Myers [2012]**. The superiority of (consensus) analysts' forecasts over time-series models such as a random walk (seasonal random walk) for annual (quarterly) earnings stems from the updating of analysts' forecasts during the fiscal period which leads them to beat the by-then stale forecasts from a random walk model. On the other hand, the superiority of analysts' forecasts measured as of the beginning of the year (as opposed to right before the earnings announcement date) is less clear-cut.

Having generally documented the superiority of analysts' forecasts over those from time-series models, research on analysts' forecasts turned to other aspects of and properties of analysts' forecasts. Among other features, the issues examined included whether analysts' forecast revisions have information content (**Brown, Foster and Noreen [1985]; Lys and Sohn [1990]; Frankel, Kothari and Weber [2006]; Gleason and Lee [2003]**); whether analysts' earnings forecasts incorporated information in prior stock price changes (Abarbanell [1991]); analysts' coverage decisions (McNichols and O'Brien, [1997]); the informativeness of analysts' stock recommendations and earnings forecast revisions (Francis and Soffer [1997]); how analysts use earnings forecasts in generate stock recommendations (Bradshaw [2004]); and incentives for

analysts' to issue biased forecasts (**Basu and Markov [2004]** and Markov and Tamayo [2006]). While the bulk of the analyst literature focuses on equity analysts, some studies investigate the information content and other properties of debt analysts' reports (De Franco, Vasvari and Wittenberg-Moerman [2009]; Johnston, Markov and Ramnath [2009]).

4.7. BB68'S IMPACT ON OTHER LITERATURES¹⁹

As testament that BB68's relevance and impact have permeated beyond the accounting literature to other business fields, BB68 has a substantial number of citations in such other literatures. In this section, we briefly discuss the focus of articles in other business research literatures that cite BB68. To save space, we focus only on papers that are highly cited themselves.

4.7.1. *BB68's Impact on the Finance Literature*

As of June 30, 2019, BB68 has 258 Web of Science citations from articles published in Finance journals. Additional evidence of BB68's impact on research in Finance is that Ball and Brown are receiving The 2019 Wharton-Jacobs Levy Prize for Quantitative Financial Innovation "*for their influential work linking stock prices to accounting data outlined in their paper "An Empirical Evaluation of Accounting Income Numbers" (Journal of Accounting Research, 1968)*" (see, <https://jacobslevy.wharton.upenn.edu/2019-prize/>).

Since it is infeasible to discuss the topic addressed by each Finance article citing BB68, we provide select examples to simply provide a flavor for BB68's relevance to research in Finance. To focus on important topics, we require a Finance article citing BB68 to have a minimum of 100 Web of Science citations of its own. Since a threshold of 100 tilts articles to those published longer ago, we also include examples of articles published from 2010-2018 where we use a citation count of ten.

¹⁹ Since, by definition, all of the papers in this section cite BB68, we omit placing them in bold type as we previously did to signify papers citing BB68.

BB68 is cited in Fama's [1970]; [1991]; [1998] review papers and in methodology papers on measuring abnormal returns (Brown and Warner [1980]; Brown and Warner [1985]). BB68 is also cited in papers on the relation between price-to-earnings ratios and subsequent returns (Basu [1977]); the information content of analyst recommendations (Womack [1996]); proxy contests (Dodd and Warner [1983]); and quantifying language to measure firm's fundamentals (Tetlock. Saar-Tsechansky and Macskassy [2008]).

Turning to articles published from 2010 to 2018, BB68 is cited by papers on topics such as earnings announcements (Kaniel, Liu, Saar and Titman [2012]; Diavatopoulos, Doran, Fodor and Peterson [2012]); earnings conference calls (Price, Doran, Peterson and Bliss [2012]; Doran, Peterson and McKay [2012]); beta movements with news (Paton and Verardo [2012]); short-selling and price discovery (Boehmer and Wu [2012]); and asset pricing anomalies (Hou, Xu and Zhang [2015]; Ball, Gerakos, Linnainmaa and Nicholaev [2015]). In sum, BB68's Finance citations span a long period of time and a wide variety of topics.

4.7.2. BB68's Impact on the Other Business Research Literatures

BB68 is cited in the Marketing, Management, and Strategy literatures (sixteen different journals in total). The literature with a highly-cited paper citing BB68 most often is Marketing. To provide a flavor for BB68's relevance to research in these literatures, we briefly highlight select articles. To focus on important topics, a paper must at least 50 Web of Science citations of its own. While limiting our coverage of articles in these other literatures to those with at least 50 citations of their own saves space, doing so biases our discussion toward articles published further back in time, which will have the effect of understating BB68's impact on more recent research in these other literatures.

Over time, papers in these other literatures have addressed topics such as the effect of strategic planning on stock returns (Kudla [1980]); the effect of executive deaths on investor

wealth (Worrell, Davidson, Chandy and Garrison [1986]); the financial performance of multi-business firms (Robins and Wiersema [1995]); the value of human resource reputation (Hannon and Milkovich [1996]); the financial consequences of employment change decisions (Cascio, Young and Morris [1997]); the valuation effect of newly created chief information officer positions (Chatterjee, Richardson and Zmud [2001]); the value relevance of brand attitude in high-technology markets (Aaker and Jacobson [2001]); the announcement of new products, sales promotions and firm value in the auto industry (Pauwels, Silva-Risso, Srinivasan and Hanssens [2004]); the value of quality (Tellis and Johnson [2007]); the value of brand attributes (Mizik and Jacobson [2008]); movie advertising and stock market valuation (Joshi and Hanssens [2009]); product innovations, advertising and stock returns (Srinivasan, Pauwels, Silva-Risso and Hanssens [2009]); and myopic management (Mizik [2010]). The variety of topics addressed by articles in these other business research literatures speaks to BB68's relevance to research on business topics in general.

4.8 CURRENT UNPUBLISHED RESEARCH THAT CITES BALL AND BROWN (1968)

To provide some evidence on how BB68 is influencing current CMRA we identify papers posted to SSRN with an initial posted date from September 1, 2015 – September 1, 2018 that cite BB68. Our search yielded 138 papers. After we drop 39 papers that were later published, 99 remain, of which 24 were first posted during the September 1, 2015 to August 31, 2016 period; 29 from September 1, 2016 to August 31, 2017; and 46 from September 1, 2017 to September 1, 2018. The number of papers naturally increases over time because papers posted earlier generally get published sooner than those posted later. In the interest of brevity, we simply note that many of these papers focus on earnings announcements; others focus on earnings or other accounting numbers and returns; and others focus on market efficiency (some things never change!).

5. *Concluding Remarks*

BB68 served as the impetus for considerable subsequent research that now constitutes much of the accumulated knowledge in the capital market literature in accounting. We charted the paths that post-BB68 researchers took over the past fifty years; the advances they made along the way; and the link between their research and BB68. Research paths with intellectual roots in BB68 include the information content/usefulness of earnings and other accounting numbers; the timeliness of earnings and other accounting numbers; market efficiency with respect to accounting numbers; accounting numbers and the information environment; and properties of annual and quarterly earnings and forecasting earnings expectations.

Before concluding, it is worth noting that BB68 was conducted in a time with no internet, no desktop computers, no word-processing capabilities (manuscripts were typed directly onto paper with limited opportunities for revisions), no canned statistical software packages and batch processing of computer programs from punched cards (so no instantaneous rerunning of regressions). All of these are a far cry from where we are now, fifty years after publication of BB68, where computation speeds are astronomically greater.²⁰

In conclusion, countless (tenured) researchers are indebted to Ray Ball and Phil Brown for charting such a remarkable path that has served all of us so well for fifty years and counting. Lest we forget, a fascinating aspect of BB68 is that it was written by 23- and 27 year-old graduate students!

²⁰ We thank the referee for this observation.

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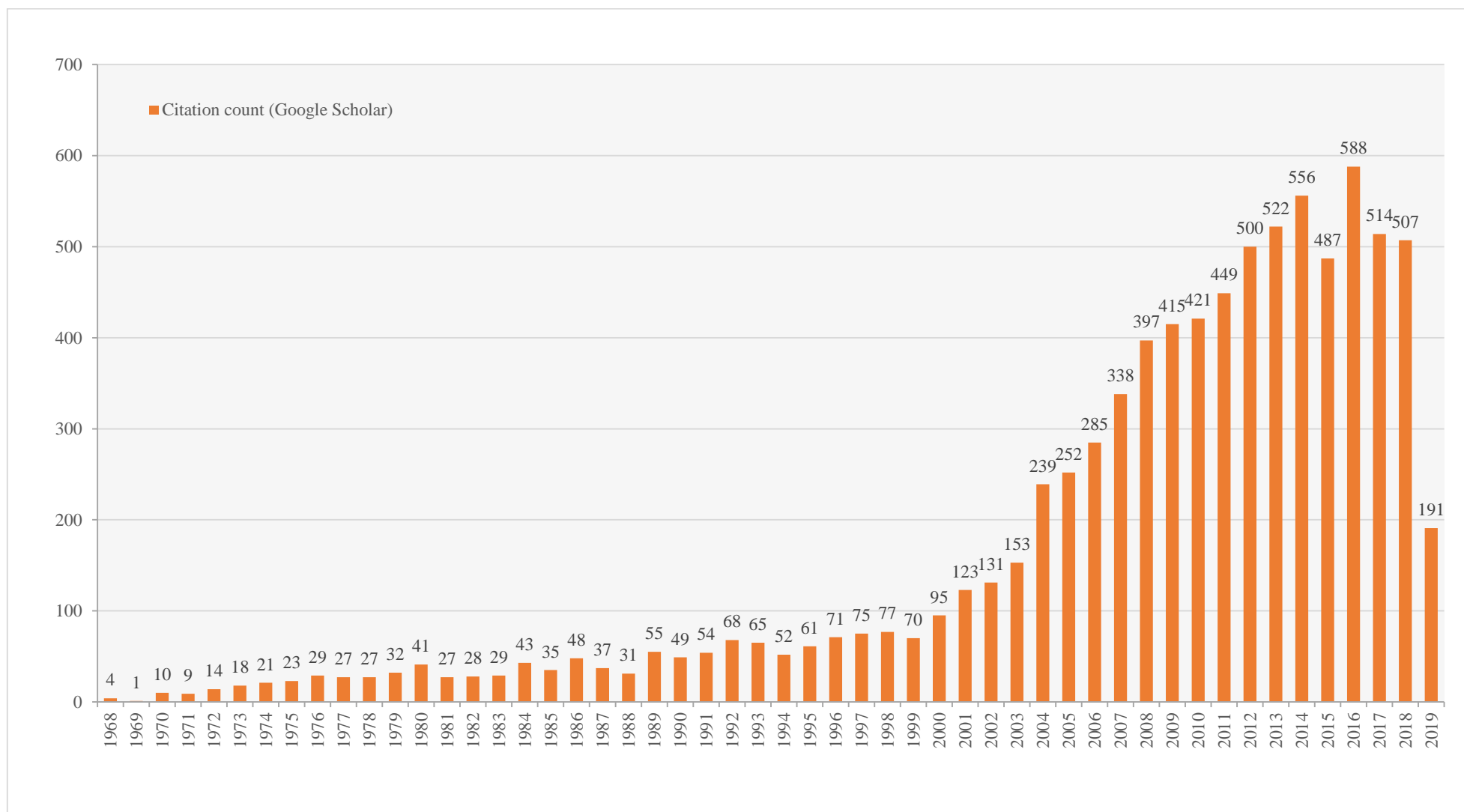


FIG. 1. -- The Impact of Ball and Brown (1968) over the Period 1968-2019. Total Google Scholar Citations as of June 30, 2019 are 8,394. The 2019 citation count is lower because it is not for a full year.

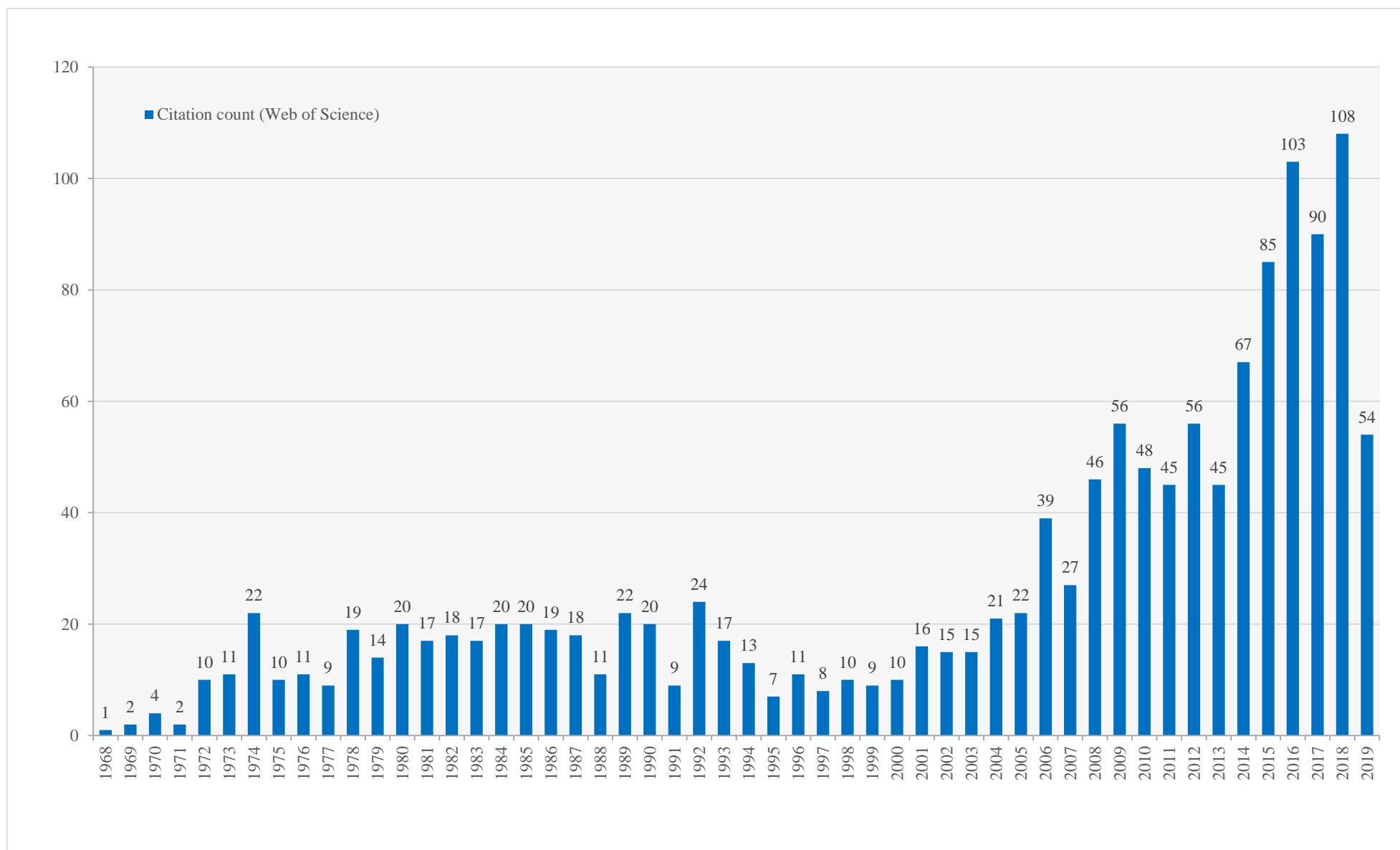


FIG. 2. -- The Impact of Ball and Brown (1968) over the Period 1968-2019. Total Web of Science Citations as of June 30, 2019 are 1,393. The 2019 citation count is lower because it is not for a full year.



FIG. 3. -- Ball and Brown (1968)'s Impact on the Evolution of Capital Market Research in Accounting.

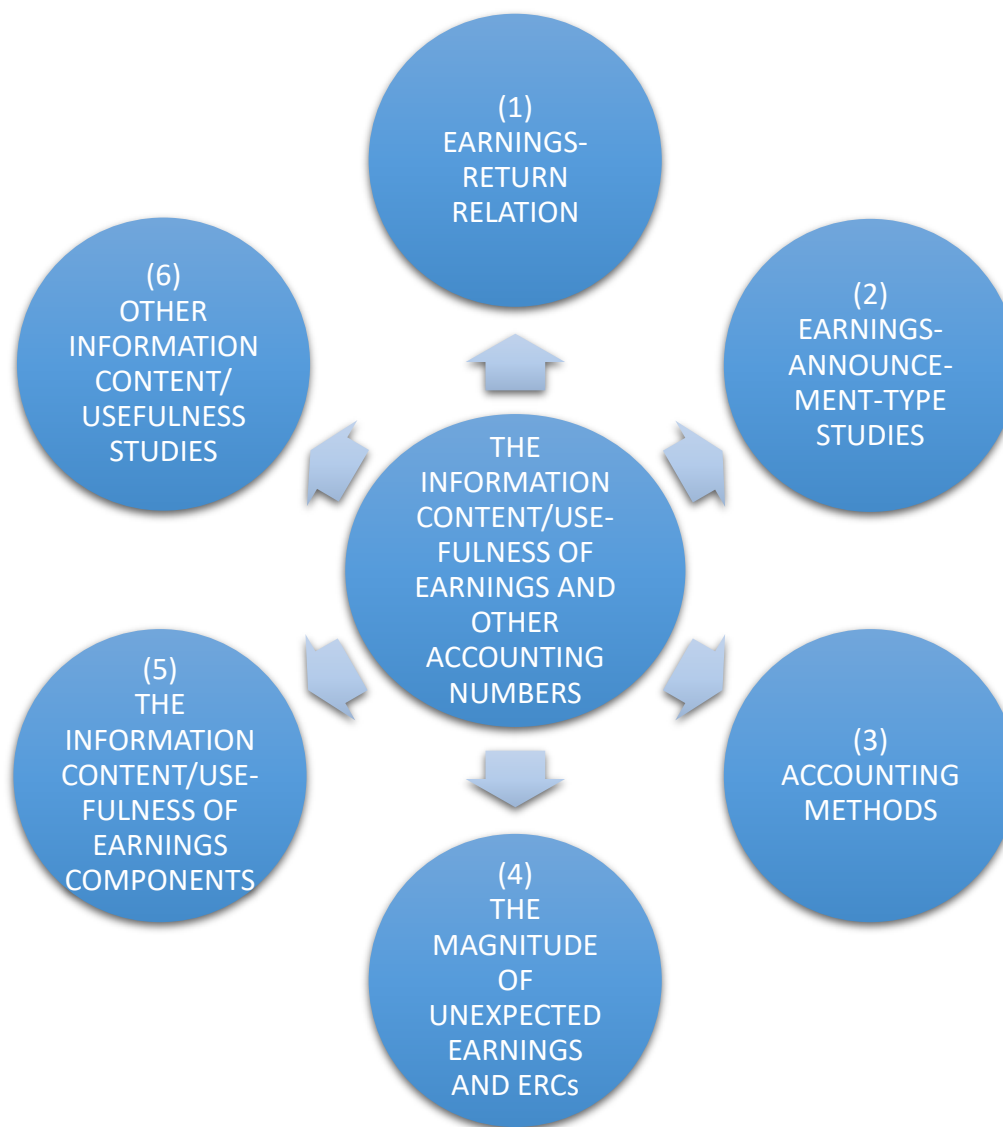


FIG. 4. -- The Information Content/Usefulness of Earnings and Other Accounting Numbers: Underlying Research Streams.



FIG. 5. -- The Timeliness of Earnings and Other Accounting Numbers: Underlying Research Streams.

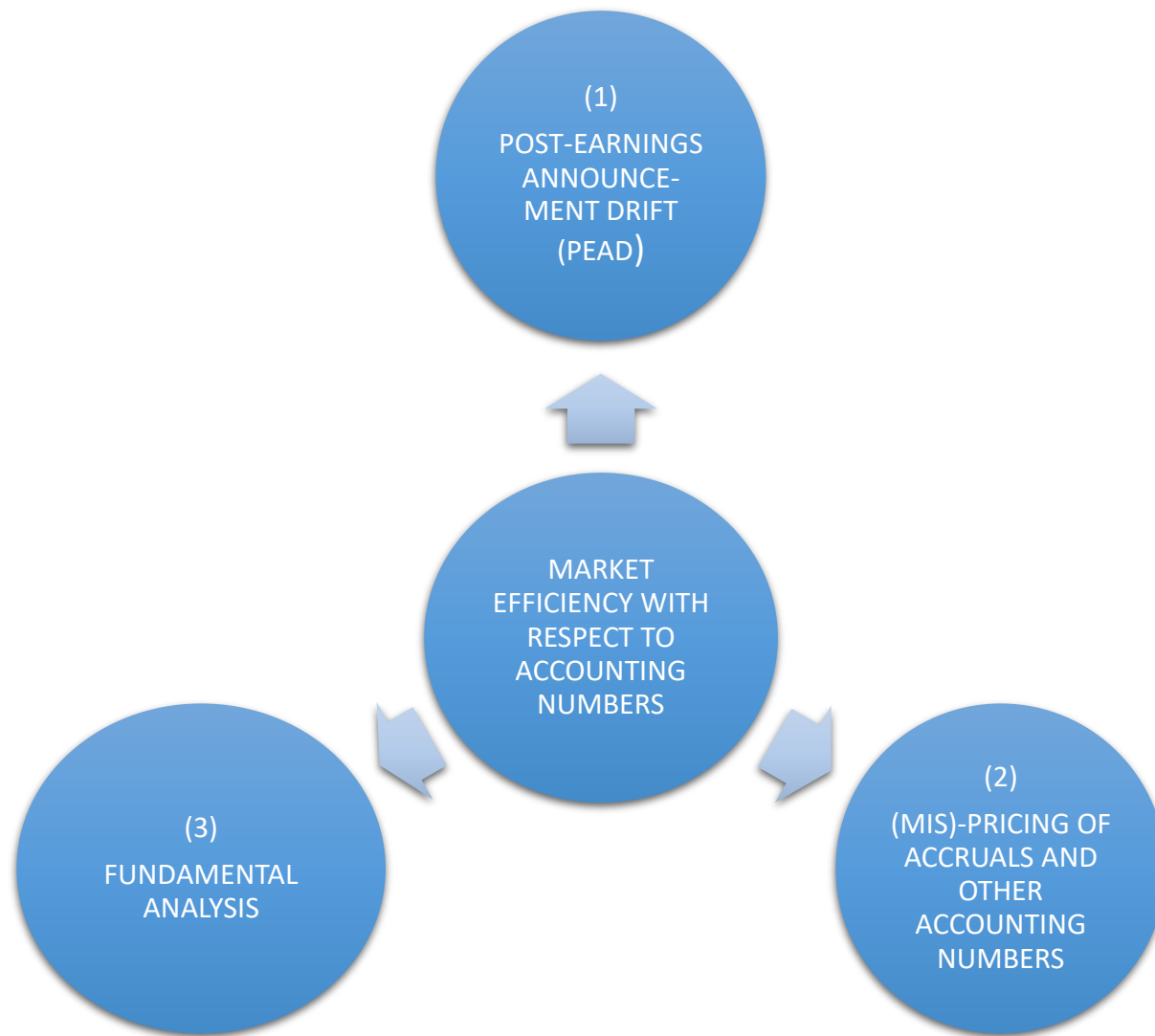


FIG. 6. -- Market Efficiency with Respect to Accounting Numbers: Underlying Research Streams.

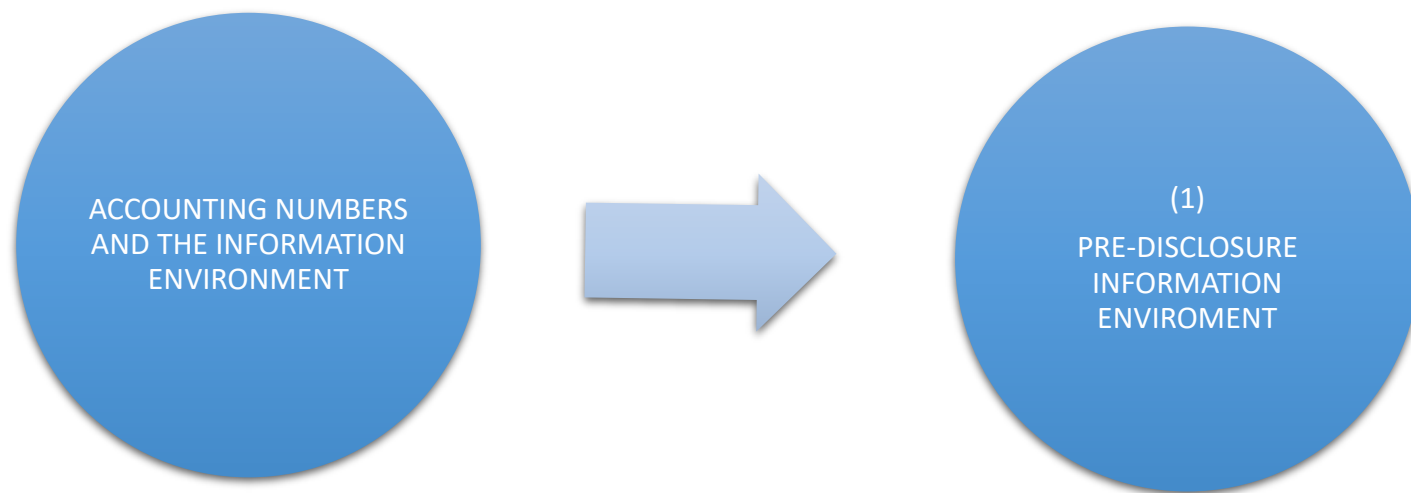


FIG. 7. -- Accounting Numbers and the Information Environment: Underlying Research Stream.



FIG. 8. -- Properties of Annual and Quarterly Earnings and Forecasting Earnings Expectations: Underlying Research Streams.