A REEXAMINATION OF BALL AND BROWN

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Abstract

In 1968, Ball and Brown produced a ground-breaking study that illustrated that there is valuable information content in financial statements. This paper reexamines the influential work of Ball and Brown, discusses the research developments that made the work of Ball and Brown (1968) such an impactful step in accounting, finance, and capital markets research, and examines studies since Ball and Brown (1968) that have attempted to provide further insight into the key findings of that study. This paper then proposes a methodology that could be used to test the findings of Ball and Brown (1968) in today's market environment; lastly, this paper reports the results of a study using that methodology.

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Keywords: Ball and Brown, Information Content, Earnings Surprise, Efficient Markets

The research study by Ball and Brown in 1968 changed the field of accounting and changed the nature of capital markets research (Kothari, 2001). It changed the field of accounting because before the work of Ball and Brown, investors felt that accounting statements had minimal value (Ball and Brown, 1968). Financial statements were thought to constructed based on normative, subjective preferences of the preparers of financial statements (Kothari, 2001). Additionally, investors had access to other, more timely sources of information, and the access to those sources of information made financial statement announcements largely irrelevant to company valuation. But the work of Ball and Brown (1968) changed this sentiment. Ball and Brown showed that company earnings announcements had a significant effect on company price; additionally, Ball and Brown showed that when the effect was diminished, it was generally due to the fact that the information contained in the financial statements had already been released by other sources, and it was not due to the fact that the information was not valuable.

The work of Ball and Brown (1968) was an important foundation of modern capital markets research because it affirmed the value of financial statements as a research tool (Kothari, 2001). Combined with other concurrent developments, Ball and Brown (1968) gave researchers the tools to assess the true impact of company and market events. The other concurrent developments were Positive Accounting Theory developed in the late 1970s by Watts and Zimmerman, the Efficient Market Hypothesis pioneered by Fama in 1965, the Capital Asset Pricing Model developed by Sharpe (1964) and Lintner (1965), and an event study by Fama, Fisher, Jensen, &

Roll (1969) (Kothari, 2001). Positive Accounting Theory showed that financial statements could be used to analyze issues related to the principal agent problem and in that process, users of financial statements began to see the objectives of accounting as more standardized; this development combined with the work of Ball and Brown (1968) showed that financial statements were valuable and based on standardized objectives (Kothari, 2001). Additionally, the Efficient Market Hypothesis and the Capital Asset Pricing Model provided more reliable methods for assessing company value, and the first event study in financial economics by Fama et al. in 1969 set the standard for researching the effect of changes in company value based on specific events (Kothari, 2001).

The research in this paper attempts to replicate the findings of Ball and Brown (1968) in the current market environment. As will be discussed in the Literature Review section, the research in market efficiency has produced divergent opinions, and there has been an increasing amount of literature that shows market inefficiency (Kothari, 2001). Given the debate about market efficiency, a review of the work of Ball and Brown is useful and timely. This study takes a sample of 30 companies and compares the magnitude of the surprise earnings of those companies to the price reaction before and after the announcement.

The initial test in this analysis does not show a statistically significant relationship between surprise earnings and a change in security price. So a second test is conducted which covers a different time period and allows for more time

before the company announcement to monitor the change in price. The second test also does not show a statistically significant correlation between surprise earnings and security prices. Thus, the analysis in this paper reviews the literature on constructing the proper methodology to test the findings of Ball and Brown as well as the literature discussing the changing relationship between surprise earnings and security prices. The value of the analysis in this paper becomes a discussion of methodology and opaque correlation. The key findings of Ball and Brown (1968) are never in doubt, but the difficulty in illustrating those findings is discussed in detail.

Literature Review

The State of Accounting Research before Ball and Brown

Before the ground-breaking study of Ball and Brown in 1968, market investors did not necessarily believe that a company's financial statements had any value (Ball and Brown, 1968). Kothari (2001) explains that accounting research was not empirical; in other words, accounting research did not scientifically address the capital market effect of financial statements; instead, accounting research was a normative discussion about what accounting objectives should be. Kothari (2001) explains that the lack of consensus on what accounting objectives should be added to the sentiment that financial statements were not useful to market investors because it was assumed that accountants would choose accounting methods based on their chosen objectives. The research by Ball and Brown in 1968 was one of four developments that would change this sentiment and be the foundation of modern

capital market research in accounting (Kothari, 2001). Kothari (2001) explains that the other three foundational developments were the development of Positive Accounting Theory (PAT) by Watts and Zimmerman in the 1970s, the Efficient Market Hypothesis (EMH) pioneered by Fama in 1965 in conjunction with developments in the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965), and an event study by Fama, Fisher, Jensen, & Roll (1969). The literature review in this paper will discuss the seminal work by Ball and Brown, Positive Accounting Theory, the Efficient Market Hypothesis, and the 1969 event study by Fama et al. Additionally, this literature review will discuss studies that have attempted to replicate the 1969 work of Ball and Brown.

Ball and Brown

As explained by Kothari (2001) above, Ball and Brown (1968) suggest that because there is not an "all-embracing theoretical framework" (p. 160) for reporting and accounting practices, a company's net income is not "homogeneous" (p. 160) with other companies; thus, market participants are inclined to feel that reported net income is a "'meaningless' figure" (p. 160). Research by George Benston in 1967 supported the assertion that accounting metrics could be meaningless (Benston, 1967). Benston (1967) found no relationship between company earnings and stock price, and he suggested that this could be due to the lack of consensus in accounting objectives. Ball and Brown tested the assertion that financial documents contain no valuable information content, and they found that these assertions were untrue. In

fact, in 1968, Ball and Brown found that accounting numbers had a significant relationship with security prices. The study compared a company's stock price with changes in accounting reports that were unexpected.

Ball and Brown (1968) examined the relationship between earnings residuals and price residuals. Positive earnings residuals are unexpected earnings over and above earnings based on previous reports and expected market increases. Positive price residuals are security returns above expected market increases. Ball and Brown found a significant positive relationship between price residuals and earnings residuals. So unexpected earnings are correlated with price increases.

The work of Ball and Brown was both an event study and an association study (Kothari, 2001). An event study is analysis of the effect of an event over a specified period of time; the work of Ball and Brown was an event study in that it examined the market effect of earnings announcements (the event). The association study seeks to find a positive relationship between stock returns and accounting performance measures; and an association study is not dependent on the timing of a particular event (Kothari, 2001). Ball and Brown found it necessary to conduct an association study. Because investors have access to multiple sources of information about companies, the actual event of the company announcement may not be strongly correlated with market returns; however, the information contained within those announcements could be very strongly correlated with market returns. Thus, Ball and Brown also conducted an association study to find the correlation between

earnings announcements and market returns that was not dependent on a narrow window of time around a specific event.

The event study conducted by Ball and Brown was important in demonstrating the relationship between announced company earnings residuals and price residuals, and the association study was important in determining the timeliness of the company announcements. Ball and Brown found that most (90%) of the price residual occurred in the year before the earnings announcements. The association study showed that the content in the earnings announcements was relevant; however, investors were able to discover that information before the actual announcement.

Efficient Markets and the Capital Asset Pricing Model

The work of Ball and Brown in 1968 has important implications for market efficiency. On the one hand, the work of Ball and Brown proves some level of market efficiency in that it demonstrates that financial markets react to new information. But it was the widespread acceptance of market efficiency theories that solidified the importance of the work of Ball and Brown (Kothari, 2001), and the acceptance of market efficiency was due mostly to the pioneering work of Eugene Fama in 1965 (Kothari, 2001). The assumption that markets are efficient is necessary to assert that new information in financial statements is linked to changes in security prices. Ball and Brown (1968) state that "Recent developments in capital theory provide

justification for selecting the behavior of security prices as an operational test of usefulness" (p. 160).

In addition to the assumption of market efficiency, the work of Ball and Brown required a model for determining the market-specific component of a security's returns. In order to determine the price residual, Ball and Brown did not use the Capital Asset Pricing Model (CAPM), but they were aware it, and they used a similarly specified model to account for market-specific return (Ball and Brown, 1968); more will be discussed on this issue in the section below, "Replicating Ball and Brown." The important historical research issue is that both market efficiency and the acceptance of a model that quantifies market-specific return was a necessary condition for the impact of the findings by Ball and Brown.

Kothari (2001) explains the important role that Eugene Fama's work in market efficiency had in capital market research. A perfectly efficient market would be defined by Fama as one that fully reflects all of the available market information. Because perfect efficiency is largely theoretical, Fama's contribution was framing research and discussion into varying levels of market efficiency, commonly known as weak-form, semi-strong form, and strong form efficiency (Fama, 1970). This outline allows researchers and investors to quantify the level of market efficiency and support those assertions with research findings.

One of the enduring challenges to drawing conclusions about efficient markets is the Joint Hypothesis Problem (Fama, 1970). This problem is relevant in

the work of Ball and Brown (1968), it is relevant in the reexamination of Ball and Brown in this paper, and it is often an issue in any research in capital markets. As posed by Fama in 1970, in order to understand the level of market efficiency, a researcher must have a properly specified model that separates the market-specific return from the company-specific return. If the model is not correctly specified, then the results could be compromised. Furthermore, if the market is not efficient, then that could cast doubt on a correctly specified model. It is thus difficult to determine which conclusion is relevant in which case. To make matters even more complicated, a conclusion of significant results that would indicate a meaningful correlation, an efficient market, and a correct market model could also be compromised due to the possibility of some combination of inefficient markets and an improper model.

Despite the challenges of the Joint Hypothesis Problem, the Capital Asset Pricing Model (CAPM) has become commonly accepted as a reasonable and reliable way to price securities and conduct research (Kothari, 2001). The CAPM was not only an efficient way to value securities, but it also addresses the problem of separating a security's company-specific return from its market specific return. Before the widespread acceptance of the CAPM, capital market research was hindered by the confusing challenge of separating company and market return (Kothari, 2001). While Ball & Brown (1968) do not use the CAPM specifically, they use a similar model; thus, the prevalent acceptance of the CAPM added to the acceptance of the work of Ball & Brown (1968).

Fama-French three factor model.

In 1993, Eugene Fama developed a model with Kenneth French that enhanced the Capital Asset Pricing model and became known as the Fama-French three-factor model. This model expanded on the Capital Asset Pricing Model with the implication that a firm's level of market risk alone was not enough to quantify stock returns (Fama & French, 1993). Instead, a firm's size and a firm's book value to market value ratio would need to be considered. In regard to the firm's size, the model finds that smaller companies tend to outperform bigger companies (Fama & French, 1993). The implication is that larger companies are more heavily covered by financial analysts and other market observers; as a result, the smaller companies are less efficient and abnormal returns are more commonly found. In regard to book value to market value ratio, Fama and French (1993) found that firms with higher book to market ratios outperformed firms with lower book to market ratios. The intuition of this logic can be supported with ratio analysis; firms with low book to market ratios by definition have high stock values as a multiple of their book value; sometimes this higher ratio is justified, but Fama and French find that on average the higher multiple is not justified; thus, higher book to market companies tend to outperform (Fama and French, 1993).

The findings of the Fama-French three-factor model could be important considerations in the analysis conducted in this paper. A possible reason that the research findings of this paper do not support the conclusions of Ball and Brown in

1968 could be that the sample in this study consists of large, heavily traded companies. The Fama-French model predicts that these large companies will be more efficiently priced and thus more likely to already contain any valuable information content that is announced regarding the financial statements. As a result, the surprise earnings might not significantly correlate with abnormal company return.

Evidence of market inefficiency.

The level of market efficiency is debated among researchers, market analysts, and investors. There is the most agreement that the market is weak-form efficient, less agreement that the market is semi-strong form efficient, and very little agreement that the market is strong-form efficient (Hetherington, 2018). Kothari (2001) states that recent capital market research indicates lower levels of market efficiency than previously thought. This recent research could have a number of implications; one implication could be that capital market research should rely less on the financial market as a reliable dependent variable. Kothari (2001) explains that another implication of recent evidence of market inefficiency is an increase in the number of long-horizon event studies. This long-horizon is in contrast many short-horizon event studies that were common in the 1970s and 1980s (Kothari, 2001). Kothari (2001) cites research by Frankel and Lee in 1998 that indicates that price converges to value over a slower time period than previously thought.

The increasing evidence of market inefficiency (Kothari, 2001) may be relevant to the study in this paper. The statistically insignificant results in this research could be due to market inefficiency, but another implication is that a longer-horizon study would have been necessary due to a decreased level of market efficiency. The earnings surprise information could have taken longer to be absorb into stock prices, and the relatively short horizon used in this study could have been insufficient to show the correlation.

Event Study by Fama in 1969

Kothari (2001) credits Fama, Fisher, Jensen, and Roll (1969) with ushering in the modern model of event studies by conducting the first event study in financial economics. The methods and analysis used by Fama et al. (1969) were key in future developments in both short-term and long-term event studies. Additionally, the fact that that the seminal study by Fama et al. in 1969 was published at the time of the groundbreaking work of Ball and Brown (1968) strengthened and enhanced the impact of the event study conducted by Ball and Brown (1968).

The research by Fama et al. in 1969 uses the event study framework to test the speed of adjustment of new information to security prices; specifically, the researchers test how and when information that might be contained in stock splits is incorporated into security prices (Fama et al., 1969). Fama et al. propose a methodology in their event study that can be used generally to measure the effect of events on stock prices (Fama, et al., 1969).

Positive Accounting Theory

The transition of accounting to an objective and empirically useful method of asserting value was a key development in capital market research, and it was a key factor in illustrating the importance of the work of Ball and Brown in 1968 (Kothari, 2001). In 1953, Milton Friedman advocated for an objective approach to studying economics, and in the 1970s, Watts and Zimmerman built on this initial step and popularized Positive Accounting Theory (Kothari, 2001). Watts and Zimmerman in the 1970s made accounting objective rather than normative. Before the work of Watts and Zimmerman, there was no consensus on the objectives of accounting, and it was believed that accountants would merely choose accounting methods based their subjective uses or their subjective opinion of how the users of their financial statements would use the documents (Kothari, 2001).

Watts and Zimmerman saw the field of accounting as a way to address the principle agent problem that was introduced by Jensen and Meckling (1976) and Ross (1977). Watts and Zimmerman saw accounting metrics as a way to monitor the interaction between principal and agent, and they used the principal agent problem to explain variation in a firm's accounting actions and to explain that accounting standards matter (Kothari, 2001). Watts and Zimmerman were even able to demonstrate that the principal agent problem can explain accounting variations and prove that accounting statements have value even if the financial markets are not efficient (Kothari, 2001).

Replicating Ball and Brown

Methodology used in Ball and Brown.

Ball and Brown (1968) compared earnings residuals with price residuals. Earnings residuals were defined as unexpected company earnings, and price residuals were defined as company-specific price changes. Ball and Brown defined earnings residuals as the difference between expected company earnings based on a normal market growth and the earnings that were announced on the announcement date. Ball and Brown used regression analysis to separate the company specific return from the market-specific price return; their regression analysis determined overall market price movements, which provided the estimate for overall market movements. Ball and Brown acknowledged that this method of analysis does not account for industry-specific variations in price, but this issue seems to be of minimal concern as long as there is reasonable distribution of different industries being tested. Ball and Brown were aware of the CAPM based on the work of William Sharpe in 1964, but ultimately Ball and Brown used their own similar method of regression analysis to determine the market-specific component of stock returns. Ball and Brown cite Sharpe (1964) and suggest that the CAPM could have been used; additionally, Ball and Brown undoubtedly benefited from the discussion in William Sharpe's work about regression analysis of individual securities and the overall market. But at the time of Ball and Brown's work (1968), the CAPM was likely not

well developed enough to be definitively more reliable than Ball and Brown's own regression analysis.

Ball and Brown (1968) collected data on companies that made earnings announcements based on a fiscal year ending December 31st. The time period of analysis was 1957-1965. During that period, the price movement information for these companies was examined in the period one year prior to the earnings announcement through six months post the earnings announcement. Using the method described above, Ball and Brown determined the company-specific return for each security and termed securities with positive company-specific return as having positive price residual. Conversely, companies with negative company-specific return were termed as having negative price residual. Ball and Brown than tested for a relationship between companies with positive earnings residuals and positive price residuals, and they did the same with companies that had negative earnings and price residuals. As discussed earlier, Ball and Brown found a significant correlation between the positive earnings residuals and positive price residuals.

Studies continuing Ball and Brown.

There are many studies that have attempted to replicate, enhance, or extend the work of Ball and Brown in 1968, and a small number of those studies will be discussed here. A recent study by Chen and Huang (2014) is a successful replication of Ball and Brown (1968); two earlier studies by Bamber (1986) and Lev (1989)

discuss methodological challenges to replicating Ball and Brown. The discussion of these challenges is key to interpreting results to tests of valuable information content.

A study in 2014 by Chen and Huang replicates the work by Ball and Brown using both the US market and the Chinese market. These researchers examine the time period from 1971-2011, which represents much of the time period since the original work by Ball and Brown in 1968. Chen and Huang (2014) find that a significant correlation remains between surprise earnings and stock returns in the US market over the studied time period. Chen and Huang (2014) find differences in the magnitude of reactions to earnings information in the Chinese market compared to the US market, which leads them to conclude that non-earnings factors are less important in the US market compared to China, and that conclusion strengthens the assertion that earnings information is valuable is determining stock prices in the US.

A study in 1986 by Linda Bamber focuses on the correlation between earnings announcements and trading volume and price reactions. Bamber (1986) draws most of her comparisons with the work of William Beaver in 1968; however, her research is relevant to the work of Ball and Brown (1968) because William Beaver (1968) and Ball and Brown (1968) conducted similar analysis. Bamber (1986) explains that the reactions to earnings announcements could very likely change over time, and she tests the propensity of trading volume and price reaction to be stable dependent variables; additionally, Bamber (1986) tests the ability to

generalize results using earnings as independent variables and trading volume and price as dependent variables. Bamber (1986) finds that results found in one time period and based on earnings reports at a certain time of year can not necessarily be generalized to earnings reports that are based on a different time period and/or released at a different time of year. This is important insight because future studies need to understand the possible shift and lack of stability in the relationship between earnings and the various dependent variables; additionally, researchers need to use caution when generalizing results from any particular time period.

Research by Lev in 1989 affirms that financial accounting earnings information is considered to be useful by investors; however, Lev explains why this information can be limited in its usefulness. Lev finds the contribution of surprise earnings to the ability to predict stock prices is modest and this contribution is unstable. In the contemporary stock environment, this modest, unstable correlation is easily obscured by weak methodology. Additionally, the correlation of earnings and stock prices can easily be obscured by investor irrationality (Lev, 1989). Lev (1989) focuses research on actual accounting methods that in fact decrease information content in accounting statements such as biases in valuation and measure or manipulation by management. This is important insight for any researchers who wishes to replicate the result found in the 1968 study by Ball and Brown because these pitfalls must be carefully navigated either in constructing the methodology or interpreting the conclusions or both. Lev (1989) describes possible

pitfalls of poor methodology and failing to realize the modest amount of valuable information content.

Methodology

Summary

The methodology in this study involves comparing excess company-specific return (alpha) with surprise earnings announcements. The first time period of study compares the alpha generated over 2018 with the surprise earnings of the third quarter of 2018. Many of the Q3 2018 earnings were announced in October 2018, and the data for calculating return and alpha was pulled on November 23rd, 2018. So this timeframe would account for information that was incorporated into stock price from other sources for approximately 10 months prior to the announcement, and this timeframe would incorporate roughly one and a half months of time after the announcement for surprise earnings to be reflected and for post-announcement drift to have delayed effects on stock price. The results of the analysis in Time Period 1 did not support a statistically significant relationship between surprise earnings and alpha.

Because the results from Time Period 1 were not statistically significant, a second test was conducted using Time Period 2. In Time Period 2, the alpha generated over 2017 was compared to the surprise earnings announced in the fourth quarter of 2017. The rationale for selecting Time Period 2 was that efficient

markets might incorporate all of the valuable information content into the stock price before the actual earnings announcement. If this were the case, then time periods after the earnings announcement would not show statistical significance. Therefore, the longer time period before the announcement was tested for correlation between surprise earnings and company alpha.

Data

The data are provided by Yahoo Finance. Yahoo Finance provides stock price information that is retroactively adjusted for stock splits. While these numbers do not always represent the actual historical number of the past stock price, this provides a comparable basis for stock price appreciation over time. Yahoo Finance also provides earnings announcement data included forecasted earnings and actual earnings announced.

Dow Jones Industrial Average

The 30 companies used as a sample are the companies in the Dow Jones Industrial Average (DJIA), and the companies are listed in Table 1 and Table 2. These 30 companies are considered by market analysts to be a fair representation of the U.S. stock market (Hom, 2012); as such, the DJIA companies will be considered to be an approximation for a simple random sample. The data used in this analysis are meant to represent a sample of 30 publicly traded companies, and a statistical

analysis of these 30 companies will allow for the results to be inferred on all public companies.

After time period 1 in this study failed to yield statistically significant results, the second test in the methodology of this study was conducted. The results in Time Period 1 may have been insignificant because the companies were large, well-covered companies. So the second test attempted to determine if much of the accounting information was incorporated before the earnings announcements.

Earnings Surprise

The earnings surprise is the difference between the company forecasted earnings per share and the company's actual earnings per share. The earnings forecasted is compared with the actual company earnings, and the percentage difference is entered into the regression analysis.

Time period

Time Period 1 – earnings surprise third quarter 2018 and security price year to date 2018.

Time Period 1 compares surprise earnings from the third quarter of 2018 with price movements from January 1st, 2018 until November 23rd, 2018. This time period is similar to the research by Ball and Brown (1968) in that it captures price movements for a significant time period prior to the company announcement, and it

captures price movements for enough time after the announcement to capture market reactions. Many of the 2018 Q3 earnings were reported to the public in October 2018, so there was approximately one month after the earnings announcement for the market to fully incorporate the surprise earnings.

Time Period 2 – earnings surprise fourth quarter 2017 and security return of 2017.

Time Period 2 used in this analysis compares surprise earnings from the fourth quarter of 2017 with the price movements during 2017. This analysis allows price movements before the announcement to be assessed. This analysis is expected to be useful because a key finding of Ball and Brown (1968) was that the information content in earnings announcement was not timely because investors had access to other sources of information that allowed them to act on that information before the earnings announcements were made.

Company-Specific Security Return

The company-specific return for each security is estimated using the Capital Asset Pricing Model (CAPM). This model was mentioned as a possible method of valuation in the Ball and Brown study in 1968, but those researchers choose to use a similar but different method of regression analysis. It may be that Ball and Brown choose not to use the CAPM because at that time the model was only recently developed. Since the CAPM was pioneered by Sharpe (1964) and Linter (1965), it

has become a widely used tool in measuring the expected market-related return of a security (Kothari, 2001). The CAPM isolates a company's market-specific return based on its sensitivity to the overall market. The use of the CAPM in this study seems to be comparable to the regression analysis performed by Ball & Brown (1968). Ball and Brown noted that their regression analysis was not able to account for industry specific difference. Similarly, the CAPM would not account for isolated industry variations.

The CAPM was specified using the 10-year Treasury rate as a proxy for the risk-free rate; this data was gather from CNBC on November 22nd, 2018. The market return for the CAPM was based on the S&P 500 return over the price alpha time period; for Time Period 1, this was the return from the beginning of 2018 until November 23rd, 2108; for Time Period 2, this was the return over the course of 2017.

Regression Analysis

The earnings surprise and the alpha for each respective time period were compared with regression analysis. A standard least squares analysis was conducted, and a Pearson's correlation coefficient was calculated using standard statistical theory (Freed, Jones, & Bergquist 2013). The r-square was used as the key performance measure, and the f-significance and the p-value of the slope coefficient of the regression equation are used as the key inferential statistics. The significance level of 5% is the threshold for establishing statistical significance.

Results

Time Period 1

The results from Time Period 1 are shown on Table 3. The finding is that there is no statistically significant correlation between earnings surprise and company alpha. The r-squared measure is 0.18%, which means that the surprise in company earnings over the time period explains 0.18% of the variation in earnings over the time period. This is the key performance measure of the model, and it shows that the model does not perform well in describing the variation within the sample data. The low r-squared value indicates that earnings surprise has no usefulness in explaining alpha generated for individual companies.

The key inferential statistics are f significance and the p-value of the slope of the regression equation. These results are indicated in Table 3. These results also indicate that there is no statistical correlation between earnings surprise and company alpha. The f significance is 82.19%, which is much higher than any statistically significant results would be. The p-value of the slope of the regression line 79.04%, which means that the chance of the regression line being random is 82.19%. This is a high likelihood, and it does not even come close to the significant level threshold of 5%. In short, there is no evidence that surprise earnings is correlated with company alpha.

Time Period 2

The results from Time Period 2 are shown on Table 3. The finding is that there is no statistically significant correlation between earnings surprise and company alpha. The r-squared measure is 1.67%, which means that the surprise in company earnings over the time period explains 1.67% of the variation in earnings over the time period. This is the key performance measure of the model, and it shows that the model does not perform well in describing the variation within the sample data. The low r-squared value indicates that earnings surprise has no usefulness in explaining alpha generated for individual companies.

The key inferential statistics are f significance and the p-value of the slope of the regression equation. These results are indicated in Table 3. These results also indicate that there is no statistical correlation between earnings surprise and company alpha. The f significance is 49.62%, which is much higher than any statistically significant results would be. The p-value of the slope of the regression line is also 49.62%, which means that the chance of the regression line being random is 49.62%. This is a high likelihood, and it does not even come close to the significant level threshold of 5%. In short, there is no evidence that surprise earnings is correlated with company alpha.

Conclusions

The finding of no statistical significance could mean a number of things, and further, more robust research is necessary. The finding could of course mean that there is no valuable information content in earnings announcements, but that is

unlikely given the well-established strength of the relationship discussed in the literature review. It is far more likely that the lack of statistical significance stems from problems with the construction of the methodology or the changing correlation of information content with company alpha.

Methodological Problems

High coverage of DJIA companies.

The high amount of analyst coverage of the DJIA companies could have resulted in the lack of statistical significance between surprise earnings and price alpha; the fact that DJIA companies are commonly followed could mean that the original company forecast was not weighed heavily into the security price or that the surprise earnings was a very small percentage of information. The DJIA companies are highly traded securities that many analysts cover; these financial analysts pay close attention to the value of these companies and issue regular reports with buy, sell, or hold recommendations. Thus, the original company forecasts for third quarter 2018 and for fourth quarter 2017 may not have been significant factors in the price of the securities because these forecasts were a small portion of the available company research; therefore, there was not necessarily a market reaction when the surprise was announced. In essence, even though the DJIA represents a reasonable cross section of the American economy, it may not have represented a reasonable approximation of a simple random sample for this research; thus, the methodology may have been flawed.

Time period selection.

The time period selection is a very sensitive issue in this analysis, and the level of market efficiency is a critical issue in deciding the proper time period. If the market is highly efficient than a narrow time period would be necessary to find a statistically significant relationship. A high level of efficiency would imply that there is quick incorporation of earnings surprises into company stock price; in that case, a long period would capture other confounding variables that might obscure the results. If on the other hand the market is inefficient, then the time period would need to be longer in order to observe the correlation between earnings surprise and company alpha. In that case, there might be a significant earnings drift that could well take longer than the one month in Time Period 1.

While market efficiency was developed by Sharpe (1964) and Lintner (1965) many years ago, the question of market efficiency is far from settled (Kothari, 2001). Kothari notes recent studies that have shown an increasing level of inefficiency in the financial markets. As a result of these findings, event studies have shifted from short-horizon to long-horizon (Kothari, 2001). It is perfectly plausible that the duration of the time period in this analysis was improperly chosen, and that may have resulted in the insignificant findings.

Changing Correlation

Unstable variables.

The issues raised by Linda Bamber in her 1986 work could be relevant to the findings in this study. Bamber (1986) explains that the relationship between earnings announcements, security prices, and trading volume can change over time. Thus, the price reaction to valuable information content could be less significant in today's market as compared to the market in 1968. Bamber also warns of the danger of generalizing results based on reporting time periods; for example, the results of Ball and Brown (1968) were based on reporting dates that were based on a fiscal year ending December 31st. So results of reporting dates that are not based on a fiscal year ending December 31st might not have the same relationship. This very well could be an issue in this analysis because all of the companies in Time Period 1 are based on the same reporting date of Q3 2018, and all of the companies in Time Period 2 are based on the same reporting date of Q4 2017; in other words, since all of the reporting dates are the same, there could very well be a bias based on those particular time frames.

Modest correlation.

The issues raised by Lev in 1989 could be used to explain the lack of statistical correlation found in this analysis. Like Bamber (1986), Lev (1989) describes the correlation between earnings surprises and security prices to be unstable; furthermore, Lev (1989) describes the correlation as modest. Thus, it could be relatively easy for the correlation to be obscured if there were even slight issues with the time period selection or slight effects from confounding variables.

Lev (1989) goes on to illustrate that there is sometimes evidence of lack of value in information content because of actual accounting measures or even because of management manipulation. These are of course issues that could have been factors in the results of this analysis.

Regime change.

In both time periods of this study, the earnings surprise time period was based on a different span of time than the price alpha time period. Therefore, there could have been different underlying company and market dynamics that affected the results. For example, the overall stock market was especially volatile in 2018. The S&P 500 Index reached a high of 2,929 on September 17th, 2018 and quickly fell to a low of 2,632 on November 19th, 2018. Both the surprise earnings of 2018 Q3 and the price alpha time period of most of 2018 could have been affected by this volatility, and this effect could have corrupted the results. In other words, the CAPM may have produced faulty results because it was applied to data in a regime than was different from the regime the model was based on.

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Table 1

Time Period 1 Sample Company Earnings Surprise and Calculated Alpha

Company	Surprise Earnings % 2018 Q3	Company Beta	2018 Share Increase	Market-Specific Return	Alpha
Microsoft	18.80%	1.09	16.87%	-4.11%	20.98%
Pfizer Inc.	4.00%	0.73	17.04%	-1.74%	18.78%
Procter & Gamble	2.80%	-0.08	0.33%	3.59%	-3.26%
Merck & Co., Inc.	4.40%	0.6	31.02%	-0.88%	31.91%
Johnson & Johnson	1.00%	0.31	0.37%	1.02%	-0.66%
The Home Depot, Inc.	11.10%	1.51	-12.29%	-6.88%	-5.41%
UnitedHealth Group	3.60%	0.88	-14.38%	-2.73%	-11.65%
McDonald's	5.50%	0.19	-4.53%	1.81%	-6.34%
The Coca-Cola	5.50%	0.28	6.40%	1.22%	5.18%
American Express	6.20%	1.31	4.61%	-5.56%	10.17%
Cisco Systems, Inc.	4.20%	1.12	12.67%	-4.31%	16.98%
The Walt Disney	10.40%	0.81	0.41%	-2.27%	2.68%
Verizon	2.50%	0.25	7.93%	1.42%	6.51%
Travelers Companies	12.40%	1.11	-4.21%	-4.24%	0.03%
JPMorgan Chase	4.00%	1.12	-1.56%	-4.31%	2.75%
DowDuPont Inc.	4.20%	1.62	-25.18%	-7.60%	-17.58%
3M Company	-4.40%	1.19	-18.19%	-4.77%	-13.43%
Walmart Inc.	6.90%	0.47	-5.02%	-0.03%	-4.99%
Intel Corporation	21.70%	0.8	4.02%	-2.20%	6.22%
Visa Inc.	0.80%	0.99	11.79%	-3.45%	15.24%
IBM	0.60%	1.84	-27.88%	-9.05%	-18.83%
NIKE, Inc.	6.30%	0.96	11.74%	-3.25%	14.99%
Caterpillar Inc.	0.40%	1.83	-24.48%	-8.98%	-15.49%
Walgreens Boots	2.10%	0.39	10.82%	0.50%	10.32%
Boeing	15.14%	1.59	1.13%	-7.40%	8.53%
Goldman Sachs	16.70%	1.08	-25.99%	-4.04%	-21.95%
Apple Inc.	19.70%	0.62	-24.12%	-1.02%	-23.11%
United Technologies	6.00%	1.12	-1.65%	-4.31%	2.66%
Exxon Mobil	18.70%	0.69	-12.98%	-1.48%	-11.50%
Chevron Corporation	2.40%	0.91	-11.18%	-2.93%	-8.26%

Table 2
Time Period 2 Sample Company Earnings Surprise and Calculated Alpha

Company	Surprise Earnings % 2017 Q4	Company Beta	2017 Share Increase	Market-Specific Return	Alpha
Microsoft	10.30%	1.09	46.96%	17.47%	29.49%
Pfizer Inc.	10.70%	0.73	18.07%	12.71%	5.36%
Procter & Gamble	4.40%	-0.08	-1.73%	2.01%	-3.74%
Merck & Co., Inc.	4.30%	0.6	-4.42%	11.00%	-15.42%
Johnson & Johnson	1.20%	0.31	-18.05%	7.16%	-25.21%
Home Depot	5.00%	1.51	46.02%	23.02%	23.00%
UnitedHealth Group	2.80%	0.88	46.07%	14.70%	31.37%
McDonald's	7.50%	0.19	39.63%	5.58%	34.05%
The Coca-Cola	0.00%	0.28	14.48%	6.77%	7.72%
American Express	2.60%	1.31	30.14%	20.38%	9.76%
Cisco Systems, Inc.	6.80%	1.12	43.07%	17.87%	25.20%
The Walt Disney	17.40%	0.81	-1.79%	13.77%	-15.56%
Verizon	-2.30%	0.25	10.32%	6.37%	3.96%
Travelers	51.00%	1.11	27.30%	17.74%	9.56%
JPMorgan Chase	4.10%	1.12	36.68%	17.87%	18.81%
DowDuPont Inc.	20.90%	1.62	26.75%	24.48%	2.27%
3M Company	4.50%	1.19	43.29%	18.79%	24.50%
Walmart Inc.	-2.90%	0.47	59.72%	9.28%	50.45%
Intel Corporation	24.10%	0.8	30.74%	13.64%	17.11%
Visa Inc.	9.10%	0.99	50.20%	16.15%	34.05%
IBM	-0.60%	1.84	-6.20%	27.39%	-33.59%
NIKE, Inc.	15.00%	0.96	28.96%	15.75%	13.21%
Caterpillar Inc.	20.00%	1.83	70.17%	27.25%	42.91%
Walgreens Boots	1.60%	0.39	-8.15%	8.22%	-16.37%
Boeing	5.90%	1.59	116.85%	24.08%	92.77%
Goldman Sachs	15.40%	1.08	16.82%	17.34%	-0.52%
Apple Inc.	0.80%	0.62	37.97%	11.26%	26.71%

United Technologies	2.60%	1.12	25.84%	17.87%	7.97%
Exxon Mobil	-15.40%	0.69	4.06%	12.19%	-8.12%
Chevron	-41.00%	0.91	12.57%	15.09%	-2.52%

Table 3

Regression Results for Time Period 1 & 2

Metric	Time Period 1	Time Period 2
R Square	0.18%	1.67%
Significance F	82.19%	49.62%
P-value of Slope	79.04%	49.62%