Alcoa – a Bellwether for the American Earnings Season?

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Abstract:
Being the first American blue-chip company to file its quarterly earnings and due to aluminium being used in a wide array of industries, Alcoa is often referred to as a bellwether for the American earnings season. This paper aims to provide a possible answer to whether Alcoa, on the one hand, is seen as an earnings season bellwether by the equity market and, on the other hand, if there is reason to believe Alcoa should be seen as a bellwether. By dividing the S&P 500 companies into 51 different industries, we firstly test if Alcoa is seen as a bellwether by performing an event study of abnormal returns around 47 instances of Alcoa earnings announcements between 2001 and 2011. In answering whether there is reason to believe Alcoa is a bellwether we assess inter- and intra-industry relationship by performing both OLS regressions analysing the 51 industries' pro- or contra-cyclicality with Alcoa's operational performance and an industry input analysis. Finally, *ex post* abnormal returns during different time periods are analysed in order to verify our results. Our results suggest that Alcoa neither is nor should be seen as a bellwether for the American earnings season, except for some of its closest related industries.

Keywords: Alcoa, Earnings season, Bellwether, Indicator, Event study, Abnormal returns, Investor attention

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I. INTRODUCTION

Being the first of the blue-chip Dow Jones Industrial Average's (henceforth: DJIA) thirty components and one of the very first of the S&P 500 companies to file quarterly earnings, Alcoa Inc. (henceforth: Alcoa) has commonly been referred to by financial press and analysts as an indicator of the forthcoming American earnings season. To provide some colour to this statement, Authers (2009), investment editor at the Financial Times at the time, went as far as stating that "Four times a year, Alcoa, the aluminium producer, is the most important company on the planet." Similarly, it is common to see the press attributing overall American share price performance on the trading day following the aluminium company's earnings announcement, as exemplified by Torres (2009) at FT.com: "U.S. stocks gained as Alcoa Inc. started the earnings season with an unexpected profit". Apart from being first to report, its bellwether characteristics are also attributed to the fact that aluminium "is seen as an important indicator of industrial and consumer demand" (Weitzman 2010), due to the wide use of aluminium from airplanes to appliances.

Alcoa's habit of reporting first reportedly started with Paul O'Neill, the company's Chairman and Chief Executive Officer 1987 to 1999. He wished to show the prowess of Alcoa's management by publishing the financial statements faster than any other company, a tradition that lived on after he left Alcoa in 1999 to become Secretary of the Treasury. Ever since, Alcoa's earnings release has been seen as the unofficial kick-off for the US earnings season. (Jakab 2012)

Following our introductory discussion, the aim of this thesis is to provide a suggested answer to the question whether Alcoa is and should be seen as a bellwether for the general earnings season, or else for any specific industries. In order arrive at a conclusion we construct three sub-questions: (1) Does the American equity market, and do individual industries, see Alcoa as an earnings season bellwether? (2) Do we have reason to expect Alcoa to be an earnings season bellwether? Our findings to these two questions are then used to answer question number (3) Is there evidence in stock returns post Alcoa earnings releases that Alcoa should or should not be seen as a bellwether for the earnings season?

In order to answer these three sub-questions we have divided our study into three main parts. Firstly, we perform an event study around the day of Alcoa's earnings release. Secondly, we look at operational inter- and intra-industry relationships between Alcoa and the various industries. Finally, we use our results from the first two studies to study *ex post* abnormal returns over the earnings seasons.

Although given much attention in the financial press there has been, as far as we can find using conventional journal databases and search engines, no formal research on the role of Alcoa's earnings announcements as a bellwether for the American earnings season. However, this study relates to the semi-strong form of market efficiency defined by Fama (1970) and more specifically the role of investor attention and rationality in pricing equities. Since Alcoa's role as bellwether has been given much attention by financial press it is of importance for both financial press and investors active on the American equity market to understand the predictive power of Alcoa's financial reports.

Our results suggest that Alcoa is not and should not be seen as a bellwether for the American earnings season in general, but only for a few of the closely related industries – that is chiefly the primary metals and motor vehicles industries. The results also provide some indications that abnormal returns continue over the earnings season post Alcoa's earnings announcements – predominantly for the primary metals industry. These results verify Alcoa's role as a bellwether for primary metals. In an information-efficient market with rational investors, relevant information should immediately be reflected in prices. Therefore, the results might indicate that not enough of the primary metals investors' attention is given to Alcoa's earnings announcements.

Introduction to Alcoa

Alcoa, which is a short for Aluminum Company of America, was incorporated in 1888 following a new innovation, laying the foundations of the aluminium production processes as we know them today, by the then-22-year-old Charles Martin Hall (Alcoa 2012b). Today, the company is one of the world's leading manufacturers of primary aluminium and fabricated aluminium (Alcoa 2011).

Alcoa manages the entire supply chain of aluminium from upstream to downstream – from mining the bauxite (also: aluminium ore) to refining the aluminium ore into alumina (also: aluminium oxide), smelting the alumina into aluminium and all the way to manufacturing finished products (Alcoa 2012f). Depending on degree of product refinement, Alcoa's business is divided into four segments; Alumina, Primary Metals, Flat-Rolled Products and Engineered Products and Solutions (Alcoa 2011). Thus, Alcoa's produce at every stage along the supply chain has a considerably wide range of applications both as inputs in industrial manufacturing and as finished end products. To exemplify Alcoa's end markets, alumina is sold to the chemical industry and other aluminium producers (Alcoa 2012e); primary aluminium products, such as ingots and powder, are widely used as primary inputs[1] in manufacturing industry (Alcoa 2012c); the slightly more refined and alloyed flat-rolled products are bought by the packaging, aerospace, motor vehicles and construction industries (Alcoa 2012d); engineered products

[1] Primary input being defined as a commodity input

and solutions are manufactured products such as wheels, aluminium foil and construction material as well as add-value services to customers across markets including motor vehicles, aerospace, construction and regular consumers (Alcoa 2012a).

Even though Alcoa is an American company, of the almost 25 billion dollars of 2011 revenues only 49% were generated from the United States; the majority of revenues are distributed between Europe (27%), the Pacific (17%) and other American countries (7%). Furthermore, with over half of the company's employees employed outside of the US, Alcoa is a global company indeed. (Alcoa 2011)

II. PRIOR RESEARCH

In a semi-strong efficient market security prices should immediately reflect new public information and according to the EMH's[2] weaker form past prices should not be able to predict future prices (Fama 1970). Since these early "random walk" theories there has been plenty of research questioning market efficiency with evidence of both over- and underreaction of stock returns. One of the more well-known market anomalies (Fama 1998) is the momentum strategy found by Jegadeesh and Titman (1993), using past prices as a predictor for future returns, that is buying past winners and selling past losers. This overreaction behaviour is suggested to be the result of extrapolative expectations and overconfidence (Hou, Xiong and Peng 2009) whereas the flipside of the coin, that is investor underreaction, has been described to be the result of investors paying too little attention to relevant information making share prices adjust slowly to information (Hou et al. 2009). Having reviewed the wide array of research on behavioural finance Fama (1998) claims that researchers should be careful when assuming market efficiency does not hold, at least in the long run. He further states that, taking a holistic view, there is about as much evidence of under- as there is for overreaction coupled with most return anomalies in the long-term most reasonably being attributable to chance, concluding that market efficiency still holds.

Investor Attention and Behavioural Finance

Since we look at earnings information and market assimilation of the same, we want to build further on the initial discussion of this section and understand the general background of research in the area of investor attention and how the equity market reacts to new information. Merton (1987) presented a model accounting for incomplete information, in the sense that investors are suggested to construct portfolios based only on stocks they know of. The findings suggest that expected returns tend to be lower for better-known firms, since the stock price is higher relative to future value for these firms. Relating in part to Merton's (1987) often referred-to investor recognition hypothesis, Hou and Moskowitz (2005) introduced a measure for price delay in response to public information. The results suggested that the most delayed firms were often characterized by being smaller by size, less liquid, more volatile and generally given less attention than their peers rendering a return premium resulting from the delay. As a an empirical illustration of investor attention; a case study of American biotechnology equities showed how an article in New York Times*,* which essentially was old news but was given much more publicity than the same news published several months earlier in a the smaller magazine Nature, resulted in a strong and permanent rise in American biotechnology stocks (Huberman and Regev 2001).

[2] Efficient Market Hypothesis

In a paper criticising the concept underlying the EMH, Hong and Stein (1999) claimed that there are few models jointly explaining underreaction and overreaction in returns and suggested a model dividing the investor pool into newswatchers and momentum traders; newswatchers will in the short run underreact to new information and share prices adjust gradually to information, whereas the momentum traders only look at past prices and buy (sell) a positive (negative) share price trend eventually leading to long-run overreaction in returns. Under the EMH all short- and long-term returns must reflect the asset risk factors. Yet, pro-EMH models, referring to the Fama-French three-factor model (Fama and French 1993), are claimed to fail to incorporate any economically meaningful risks explaining over- and underreaction. They also suggest a departure from a few EMH assumptions, including investor rationality and the unlimited ability of investors to incorporate all information available in pricing assets. Instead, Hong and Stein's (1999) model is based on investor behaviour and interaction between heterogeneous agents, that in reality are only boundedly rational.

The Definition of Unexpected Earnings

In order for us to assess whether certain earnings measures reported in the quarterly earnings announcements studied should be categorised as being ”good” or ”bad” we clearly need to understand what an as accurate-as-possible measure for earnings surprise is. In estimating unexpected earnings Patell and Wolfson (1982) suggested that it is possible to use both exogenous models, where the researcher will need to supply a model, and endogenous models, evaluating data supplied by a market.

Exogenous models used in prior research as proxies for earnings expectations include a seasonally adjusted extrapolation of a time series based on past earnings. Latané and Jones (1977) used a time-series-based measure for EPS[3] performance called unexpected earnings[4], using an extrapolation of the seasonally adjusted trend of actual EPS reported the 20 last quarters as a proxy for estimating EPS expectations for the current quarter. For standardisation purposes unexpected earnings were deflated using the standard error of the estimate for the estimating time series rendering Standardised Unexpected Earnings (henceforth: SUE). Foster, Olsen and Shevlin (1984) used a version of SUE, deflating unexpected earnings by an absolute value of the estimate of earnings expectations. Under the assumption of rational expectations (Muth 1961), actual earnings should be equal to expectations of actual earnings given information available at the time of estimation. Relating to the theory of rationality, Brown and Rozeff (1978) found analyst estimates more accurate than a time-series. More recent research by Keane and Runkle (1998) found evidence that ”strongly supports the view that stock market analysts make rational forecasts of earnings per share” (Keane and Runkle 1998, p. 797) who also

[3] Earnings per Share
[4] Reported EPS – Estimated EPS

claimed that their forecasts were unbiased as opposed to the risk of analysts being biased put forward by Chan, Jegadeesh and Lakonishok (1996).

An alternative approach has been using an endogenous model by employing a market indicator such as share prices to categorise earnings as good or bad. Patell and Wolfson (1982) claimed that using a market indicator avoids estimation errors attributable to misspecification of market earnings expectations, yet using share price reactions risks including reactions to other firm-specific information than earnings difficult to adjust for. Chan et al. (1996) used both SUEs and CARs[5] producing equal outcomes.

Post-Earnings-Announcement Drift

Relating to the research on investor attention and information-efficient markets there is a suggested phenomenon, recognised by Eugene Fama as the "granddaddy of underreaction events" (Fama 1998, p. 286), and which is more commonly referred to as post-earnings-announcement drift, PEAD or earnings momentum. Pioneering research within this area was done by Ball and Brown (1968) who found that the information content given by an annual report already was accounted in market prices to 85% to 90%. Without giving explanation to the remaining 10% to 15%, they instead paved the way for further research on how quickly the market adjusts prices to the suggested residual. In a publication by Rendleman Jr., Jones and Latané (1982) studied abnormal returns over a period of 20 days before to 90 days after earnings announcement suggesting "that the market does not assimilate unexpectedly favourable or unfavourable quarterly earnings information by the day of earnings announcements" (Rendleman Jr. et al. 1982, p. 283). There have been several robustness checks to the idea of earnings momentum with the research paper by Chan et al. (1996) often being referred to. They found significant evidence of abnormal returns for at least six months after earnings announcements when using both SUE and CARs around the earnings announcements as earnings surprise measures. Worth to note is that they did not see any long-run reversal in earnings momentum and also that the drift predominantly was accounted for by smaller firms.

In explaining possible reasons behind a possible earnings momentum market anomaly, Mendenhall (2004) maintains that what seems as an underreaction is due to possible arbitrageurs refraining from limiting the seemingly obvious arbitrage opportunity due to arbitrage risk[6] and transaction costs, whereas Bernard and Thomas (1989) reject risk as an explanation for PEAD and instead claims evidence suggests momentum is due to investors not fully incorporating earnings information in stock prices. Chan et al. (1996)

[5] Cumulative Abnormal Returns

[6] Mendenhall (2004) defines arbitrage risk as the idiosyncratic part of the stock price's volatility, which cannot be offset by holding indices or other positions. If an investor is diversified idiosyncratic risk should not be of importance, however Mandenhall argues that real-world arbitrageurs, such as hedge funds, are relatively more specialised and therefore hold only a few positions at the time

agree with Bernard and Thomas (1989) that the equity market reacts gradually, that is underreacts, to new information. Factors including analyst inertia in revising forecasts are put forward as possible reasons to why investors not immediately adjust equity prices to earnings information. Thus, it is possible to say they argue in line with previously discussed behavioural finance and investor attention theories, since they are not attributing the return drifts to a model of risk.

Reaction of Other Firms' Share Prices to Earnings Announcements

Studying UK[7] companies, Firth (1976) found that when a firm announces earnings, closely competing firms' share prices react in the same direction as the announcing firm at a magnitude amounting to 50% to 80% of the announcing firm's price reaction. Furthermore, reactions of the competitors observed were almost instant and did not indicate any arbitrage opportunity related to the announcing firm's earnings announcement. We have not found any research discussing drifts of stock prices post a related company's earnings announcement.

Event Window Theory

Further building the theoretical foundation to this paper, we need to appreciate the framework applied to studying an event, such as earnings announcements. A common way to study such events has been using share price returns over a short window of a few days. By extending the window to one or a few days post the event date the method accounts for a possible short price reaction lag (Fama 1998) or reactions in after-hours trading on the event (MacKinlay 1997). It may also make sense to include periods before the event since, as for the case of earnings announcements, some information may have leaked to market participants (MacKinlay 1997). Fama (1998) also argued that a shorter event window might be favourable to a longer window since potentially incomplete models of expected returns render values close to zero for daily return, thus having smaller effect on estimating abnormal returns.

[7] United Kingdom

III. ANTICIPATED FINDINGS

For the event study, we expect the share prices of the industries and companies that see Alcoa as a bellwether to significantly react to Alcoa's announcements. We link this to Firth's (1976) publication, which showed how the closest related companies' stock prices react significantly in the direction of the announcing company's share price reaction. The reason for this is believed to be that rational investors reflect relevant information in share prices, relevant information possibly being traced to operational relationships including inter- or intra-industry trade and cyclicality in operational performance. With this in mind, we study Alcoa's operational relationships to various American industries. We anticipate that the same industries that produce event window CARs also are the industries that show the strongest such relationships with Alcoa.

If investors' expectations are strictly rational and the market is strictly information-efficient, relevant information should immediately be reflected in share prices and we should not see an *ex post* drift in returns. Therefore, we do not expect to see any *ex post* abnormal returns for any industries. If they do, however, generate abnormal returns this might indicate that the investors of such industries have paid too much or too little attention to Alcoa's earnings announcement.

In sum, we do not expect Alcoa to be a significant bellwether for the majority of American industries. This is due to the company's operations generating income from majorly outside of the US and also that Alcoa's earnings performance depends on several variables, such as currency fluctuations and the LME[8] aluminium price, that does not necessarily positively correlate to overall American corporate demand (Alcoa 2011). Overproduction of aluminium will from time to time imply that producers dump surplus on the world market, leading to lower prices of aluminium (Alcoa 2011).

[8] London Metal Exchange

IV. DATA

Event Study and *Ex Post* Returns

The dataset consists of observations of 2829 daily stock returns from the first trading day of 2001, January 3rd, to the last trading day of 2011, December 30th, for the 500 constituents of the S&P 500 (also: the equity market, stock market or market). As the companies of the S&P 500 change over time, we use the components as of December 30th 2011. Therefore the dataset is not fully balanced, as some of these companies were listed between 2001 and 2011. Where there are instances of companies which have different classes of shares, the returns of the share class with the greatest turnover in dollars is used.

The companies of the S&P 500 are chosen as they represent most major types of industries, and the companies are subsequently classified in 51 different industries. Since we examine the return of the respective industries against the return of Alcoa, Alcoa is excluded from primary metals, which is the industry it would have belonged to otherwise. The industry classifications is based on industry input-output (henceforth: IO) tables provided by the Bureau of Economic Analysis which in turn are based on the NAICS[9]. The company-specific NAICS codes are gathered from CRSP[10] and the industry classifications from the NAICS website. The full list of industries can be found in the Appendix Table 3.

All stock observations are gathered from CRSP, where the return on a payout-adjusted value-weighted market portfolio[11] for the entire time period also is obtained. This is used throughout the paper as a proxy for the market return. CRSP also provides a daily payout- and stock split-adjusted return measure for each stock in addition to the closing price, and as the former is being used for calculating returns in this paper no further adjustments to the return measure is needed. For the actual event study, the release dates and the exact times of Alcoa's quarterly reports are collected from I/B/E/S[12], which provides actual results and forecast estimates from company filings and security analysts respectively. In cases where the release date is after 16:00 EST[13], the event day will be the day after the release, as this is the first trading day when the new information can be traded upon. For comparability reasons the data used is limited to the companies reporting earnings for the same calendar quarter as Alcoa for every earnings season. In order to adjust for a more obvious source of noise in our dataset, we have deleted observations of returns for those companies, other than Alcoa, that report earnings within the event window.

[9] North American Industry Classification System
[10] The Center for Research in Security Prices
[11] Excluding American Depository Receipts (ADRs)
[12] Institutional Brokers Estimates System
[13] Closing time of the NYSE

During the time span there are a total of 47 earnings releases by Alcoa, the first one being on April 6th 2001 and the last one on October 10th 2011. Alcoa generally release their report the first or second weeks after the end of their fiscal quarters, which have always been the end of March, June, September and December. Provided in Table 1 are timelines of when Alcoa released its report for three different earnings seasons and quarters, in 2001, 2006 and 2011, compared to the other companies on the Dow Jones Industrial Index.

Out of the 47 earnings seasons studied, 27 of Alcoa's reports are below expectations and consequently 20 reports are above market expectations as defined by the cumulative abnormal return of Alcoa around their release dates.

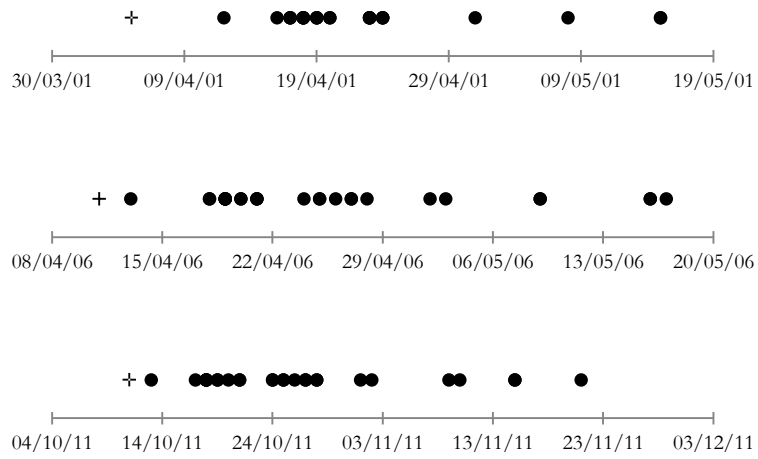

Table 1 Timelines of the release dates of all quartely reports by the DJIA constituents for three different earnings seasons. Alcoa's release is marked with a cross.

Operational Relationships and Cyclicality

The dataset is gathered from Compustat, which provides fundamental financial and market information and is a division of Standard & Poor's. Since the I/B/E/S figures were sparse, the Compustat figures were used for this study. The data consists of operating income before depreciation and amortisation and total assets for the same 500 companies as in the event study during the same time period. Included in the data is the day and exact time of the filing of the quarterly reports. Provided is also information on companies' calendar and fiscal period endings. Again, due to cyclicality and seasonality, for comparison reasons only the companies reporting for the same calendar quarter as Alcoa are included. As data of EBITDA is not always provided in the earlier years of our time span, we limit this part of our study to the first quarter of 2004 to the third quarter

of 2011, or 35 quarters in total. Industries where EBITDA is not a good proxy for corporate performance[14] are omitted from this study.

Finally, IO tables from the latest available year, that is 2010, provided by the Bureau of Economic analysis are used in the study of inter- and intra-industry business relationships.

[14] Insurance carriers and Federal Reserve banks credit intermediation and related activities

V. METHODOLOGY

Event Study

In order to proceed to the event study we need to define what measure to use to categorise Alcoa's earnings announcements as positive or negative surprises. Commonly used in early literature by amongst others Latané and Jones (1977) and Foster et al. (1984), is the method of SUE. The general expression involves a numerator of unexpected earnings standardised by a deflator. As an example, using a combination of theories by Foster et al. (1984) and Brown and Rozeff (1978):

$$SUE_{i,q} = \frac{\text{Actual } EPS_{i,q} - \text{Estimated } EPS_{i,q}}{|\text{Estimated } EPS_{i,q}|}$$

$\text{Actual } EPS_{i,q}$ is the actual reported EPS by company *i* for the quarter *q* and $\text{Estimated } EPS_{i,q}$ is estimated EPS for company *i* for the quarter *q*, divided by the absolute value of Estimated $EPS_{i,q}$. As a proxy for the estimated EPS both extrapolations of time-series models (Latané and Jones 1977; Foster et al. 1984) and analyst consensus (Chan et al. 1996; Brown and Rozeff 1978; Keane and Runkle 1998) have been used in previous research.

In previous literature earnings surprise has mainly been defined in line with the SUE approach above. This might be due to the fact that much research done on earnings surprise is done within the accounting field, thus classifying surprise using an accounting measure. SUE, as mentioned, only takes EPS information into account and the method also requires the researcher to supply a model of estimated EPS, which increases the risk of estimation error attributable to model misspecification (Patell, Wolfson 1982). This highlights the possibly strongest argument in favour of a market method based on CAR; CAR can be seen as a cleaner measure of earnings expectations (Chan et al. 1996). All new information, not only a static measure of performance which EPS is, released in the earnings announcement is available for investors to assimilate. We believe that there is more information than only EPS performance that contributes to investors' assessment of future expected corporate earnings[15]. Share prices may be described as forward-looking discounting machines and earnings are historical, whereby earnings announcements main information value to shareholders arguably is the defining or redefining of the trend in corporate cash flows to equity. In a perfectly efficient market the information should immediately be reflected in the share price, even though there is some research providing

[15] As an example of market reaction to first quarter 2011 earnings announcement: [Alcoa's] "shares slumped 1.07, or 6%, to 16.70, to lead the Dow losers after the aluminum producer late Monday reported earnings that topped expectations but revenue that fell short of forecasts." (Wall Street Journal Online 2011)

evidence on some underreaction to earnings information. An issue with the market return-based model is that there might be noise in terms of for example firm-specific information releases not related to the earnings announcement, which ideally should be adjusted for but are not in a regular market model. In the light of provided arguments and in order to provide consistency to our study we are inclined to favour the, in our view, broader CAR measure.

Applying the market-based model we use CARs around the announcement dates to classify good and bad earnings announcements. We define cumulative return according to a buy-and-hold methodology, which aims to replicate real investment experience compounding daily returns (Roll 1983). A three-day event window around the event day, defined as the first trading day following an earnings announcement, is chosen. This is to compensate for the possibility of information leakage of Alcoa's earnings to the stock market before the announcements, due to some investors in information-advantageous positions[16] possibly having acquired private information. Also, we account for a possible continued share price reaction in after-hours trading as well as allowing for some pricing lag. Therefore, our CAR for company *i* at time *t* is defined as:

$$CAR_{i,t} = \prod_{t=-1}^{1} (1+R_{i,t}) - \prod_{t=-1}^{1} (1+E(R_{i,t}))$$

Where the event day is t = 0, R_{it} is the actual payout-adjusted return of stock *i* at time *t*, and $E(R_{it})$ is normal return estimated by, as also used by Firth (1976), a simple market model:

$$E(R_{i,t}) = \alpha_{i,t-3} + \beta_{i,t-3} * R_{market,t}$$

Where $R_{market,t}$ is given by the payout-adjusted value-weighted American market portfolio gathered from CRSP as mentioned in section IV and $\alpha_{i,\,t-3}$ and $\beta_{i,\,t-3}$ are estimated using a standard OLS[17] regression, performed on a rolling basis going back 100 days instead of using fixed betas for each stock. This way, betas will hopefully incorporate potentially changing relationships between the different securities and the market portfolio. The regression is as follows:

$$R_{i,\,t} = \alpha_{i,t} + \beta_{i,t} * R_{market,t} + \varepsilon_{i,t}$$

[16] These may include employees and other insiders as well as brokers (Niederhoffer and Osborne 1966) and analysts covering Alcoa

[17] Ordinary Least Squares

In the market model used for predicting normal returns, the alphas and the betas have been lagged by three days. This is to ensure that the expected return is unaffected by any noise coming from the event. In other words, if a non-lagged beta is used, an endogeneity problem might arise where the event affects beta which in turn affects the abnormal return we wish to study around the event. The market model could have been replaced by a multifactor model, but considering the purpose of this study is to find abnormal returns and not the exact magnitude of the same, the gains from simplicity using a simple market model are considered greater..

For the actual event study, we differentiate between two types of events, one where the event is a positive Alcoa report and the other is a negative Alcoa report. In reality earnings announcements may also be in line with expectations. Ideally we would therefore have classified announcements as positive, negative or as in line with expectations. However, in order to avoid arbitrarily classifying announcements, which might lead to errors in the event study, we define announcements as either positive or negative based on observed CARs, irrespective of their sizes.

We begin by categorising any positive or negative CAR for Alcoa as a positive or negative earnings announcement calling the variables pos and neg, respectively. Industry CAR at time *t* is, in accordance with Roll's (1983) method of computing mean returns, defined as the mean of the individual firms of every industry:

$$CAR_{industry,t} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,t}$$

Where N is the number of firms in the industry over the event window. For the S&P 500, expected return is given by the average of its return over the last 30 days preceding the event window. We use 30 days, which is a relatively short period of time, in order to account for relatively swift shifts in stock market trends:

$$E(R_{market,t}) = \left(\prod_{u=t-33}^{t-3} R_{market,u}\right)^{1/30} - 1$$

Where $E(R_{market,t})$ is the expected market return for time *t* which is calculated using a geometric mean[18] of the market returns $R_{market,u}$ at times *u*. As with the expected return for the individual stocks, in order for the estimation window not to interfere with the

[18] Since we still define our CAR using a buy-and-hold methodology, calculating compounded returns of normal as well as realised return

event window, our estimation of expected market return for time *t* is lagged three trading days. This gives us our market CAR, $CAR_{market,t}$, for time *t*:

$$CAR_{market,t} = \prod_{t=-1}^{1}(1+R_{market,t}) - \prod_{t=-1}^{1}(1+E(R_{market,t}))$$

Thus, the regressions for testing the reactions of market and industry returns to Alcoa's earnings announcements are constructed as follows:

$$CAR_{industry,\,t} = \beta_0 + \beta_1 * pos_t + \varepsilon_{industry,t}$$
$$CAR_{industry,\,t} = \beta_0 + \beta_1 * neg_t + \varepsilon_{industry,t}$$
$$CAR_{market,\,t} = \beta_0 + \beta_1 * pos_t + \varepsilon_{market,t}$$
$$CAR_{market,\,t} = \beta_0 + \beta_1 * neg_t + \varepsilon_{market,t}$$

The dependent variable $CAR_{industry,\,t}$ is first plotted against independent variable pos_t, which assumes the value 1 every time Alcoa has a positive CAR for the three-day event window and 0 otherwise. β_1 is the coefficient of the linear regression, which is the CAR reaction of the CAR for the respective industries to a positive earnings announcement and β_0 is the intercept. We then plot $CAR_{industry,\,t}$ against neg_t, which is assigned the value 1 if Alcoa's event window CAR is below zero and 0 otherwise. Similarly, the dependent variable $CAR_{market,\,t}$, is tested against both the positive and negative dummies.

Throughout the paper, as we are not looking to answer what drives the abnormal returns of other industries but only what impact Alcoa's earnings have on these, we do not further elaborate on the unobserved factors contained in the error term. Thus, holding ε fixed, the change in the dependent variable will simply be the change in the independent variable multiplied by the coefficient.

Operational Relationships and Cyclicality

In this part of the study, we want to find out whether there is reason to believe Alcoa should be seen as a bellwether for the American earnings season. In doing this we want to find out how significantly related the industries are by firstly looking at industries' pro- and contra-cyclicality with Alcoa's corporate performance as well as industry-specific proportions of total inputs being attributable to primary metals – all-in-all intending to measure inter- and intra-industry relationship.

In defining corporate performance we use an operational measure, which is unaffected by capital structures and financial net income. In macroeconomic analysis one way of

measuring income is GDP[19] is the added value method (Jones 2010) which is calculated as revenues adjusted for costs to generate those revenues. Along these lines a good proxy for added value would be EBIT[20]. Wanting to measure cyclicality and given depreciation and amortisation are generally rather fixed and thus should not be very affected by business cycle swings, we also adjust for this to arrive at EBITDA[21]. To adjust for seasonality, we will hence look at the quarter-on-quarter growth in EBITDA, comparing one quarter with the corresponding quarter a year ago. In cases where a company has acquired or divested a controlled company[22] between one quarter and the other, we would for comparability reasons ideally adjust the EBITDA of these companies on a case-by-case basis. If the EBITDA is left unadjusted there would be non-organic growth which would skew the growth measure. However, for the sake of simplicity and since an acquisition increases assets and divestment decreases assets, we will adjust EBITDA growth for growth in assets on the balance sheet. This is not perfect since it includes assets not used to render operational income[23], but for data availability reasons we assume the change in such assets is negligible compared to the change to assets attributable to an acquisition or divestment of a subsidiary[24]. Thus we arrive at a formula for asset growth-adjusted EBITDA growth, $g_{i,q}$, for company *i* for the quarter *q*,:

$$g_{i,q} = \frac{EBITDA_{i,q}/EBITDA_{i,q-4}}{Assets_{i,q}/Assets_{i,q-4}} - 1$$

$EBITDA_{i,q}$ and $Assets_{i,q}$are the EBITDA and total assets for company *i* at quarter *q* respectively. $EBITDA_{i,q-4}$ and $Assets_{i,q-4}$are, respectively, the quarterly EBITDA and total assets a year ago from *q*.

After having computed $g_{i,q}$ for every company we want to find an average asset growth-adjusted EBITDA growth, $g_{industry,q}$, for every industry:

$$g_{industry,q} = \frac{1}{N}\sum_{i=1}^{N} g_{i,q}$$

[19] Gross Domestic Product
[20] Earnings Before Interest and Taxes
[21] Earnings Before Interest, Taxes, Depreciation and Amortisation
[22] That is a company for which the studied company consolidates the income statement
[23] Such assets include cash not needed to run daily operations and non-controlling shares in other companies as well as other financial assets rendering interest income
[24] Ideally we would compute a book enterprise value = book equity + preferred stock + minority interests + debt – cash and cash equivalents – investments in non-controlled companies

As before, *N* is the number of companies in the industry. We also want to find an average, $g_{market,q}$, for all companies, *M*, that we have data for in a specific quarter, *q*:

$$g_{market,q} = \frac{1}{M}\sum_{i=1}^{M} g_{i,q}$$

Using the computed average growth rates for every quarter we now study if there is any correlation between Alcoa's asset growth-adjusted EBITDA growth rates, $g_{AA,q}$, for every quarter, *q,* studied and the corresponding industry and market average rates:

$$g_{industry,q} = \beta_0 + \beta_{1,\,industry} * g_{AA,q} + \boldsymbol{\beta}_{\mathbf{yrdum}} * \mathbf{yrdum} + \varepsilon_{industry,q}$$

$$g_{market,q} = \beta_0 + \beta_1 * g_{AA,q} + \boldsymbol{\beta}_{\mathbf{yrdum}} * \mathbf{yrdum} + \varepsilon_{market,q}$$

Where **yrdum** is a vector of year dummies being 1 for each of the years 2003 through 2011 and zero otherwise and $\boldsymbol{\beta}_{\mathbf{yrdum}}$ is the coefficient corresponding to each year dummy variable. β_1 indicates how many per cent $g_{industry,q}$ and $g_{market,q}$ will increase for a 1% increase in $g_{AA,q}$. After performing regressions on the industries whose operational performance tend to correlate with Alcoa's, we look closer into inter- and intra-relationships between industries as another, complimentary, study of Alcoa's potential ability as corporate bellwether. This is done using previously mentioned[25] input-output (IO) tables for the latest available calendar year[26] supplied by the Bureau of Economic Analysis, displaying the value of input used by every industry and from which other industries the inputs are supplied. We hence construct tables of the percentages of the purchasing industries' inputs that are attributable to purchases from primary metals. This way we see an indication of how inter-related primary metals are with, on the one hand, other industries and, on the other hand, with other primary metals companies. If we assume that higher (lower) end-demand in purchasing industries also increases (decreases) purchases and thus demand of primary metals, we might trace any relationship in corporate performance between Alcoa and the various industries. Similarly, on the supply-side, increases (decreases) in costs will, *ceteris paribus*, decrease (increase) overall operational performance – here defined as EBITDA. With this in mind, if an industry purchases proportionally more from Alcoa they might be more correlated to each other's corporate performance.

[25] p. 12
[26] 2010

***Ex Post* Returns**

There might be industries that seem to be both significantly inter-related with Alcoa and the primary metals industry, but which do not react in the event study. If *ex post* CARs are observed for such industries we might see indications of investors in these industries paying too little attention to the information content provided by Alcoa's earnings announcements. Conversely, we have the opportunity to test if a reversal of return takes place amongst those industries generating CARs in the event study, which could indicate an overreaction to Alcoa's earnings announcements.

The last step of our analysis is looking at *ex post* stock returns for all industries. This is done by computing the respective CARs for these industries for specified time periods of 10, 20, 30, 40 and 50 trading days from two days post the announcement. This is necessary because of our definition of a positive or negative report based on the cumulative abnormal return around the release. The time periods are chosen to reflect returns over the earnings season following Alcoa's earnings announcement. This way we aim to find out if there are any industries which did not significantly react to Alcoa's earnings release, but that after the indicator study might have been expected to do so, that generate abnormal returns over the forthcoming earnings season instead.

The methodology for calculating the CARs for these periods is done using the same methodology as when performing the event study, the only difference being the larger time spans for which the cumulative abnormal return is calculated. In order to test the measured abnormal returns of the sample, both parametric and non-parametric tests are used. First, one-sample one sided t-tests are carried out, under the assumption of normally distributed abnormal returns. The tests are as follows:

$$t = \frac{ACAR_{industry} - \mu_0}{\frac{s}{\sqrt{n}}}$$

Where $ACAR_{industry}$ is the average 10-, 20-, 30-, 40- or 50-trading day CAR for the respective industries, s is the sample standard deviation and n is the sample size. For all industries, the null hypothesis tested is that the population mean is equal to zero, as would be predicted by the EMH.

$$H_0: ACAR_{portfolio} = 0$$

The null hypothesis is tested against different alternate hypotheses depending on the type of reaction observed. For positive reactions, where a positive abnormal return is expected, the alternate hypothesis will be that the mean cumulative abnormal return is greater than

zero. Conversely, for negative reactions the alternate hypothesis is that the mean cumulative abnormal return is less than zero.

$$H_1^{positive}: ACAR_{portfolio} > 0$$
$$H_1^{negative}: ACAR_{portfolio} < 0$$

T-tests are performed and to evaluate the robustness of these parametric tests, non-parametric tests are carried out as well, relaxing the assumption of normally distributed abnormal returns. As the sample size is only 20 for positive reports and 27 for negative reports, normality is quite a strong assumption, and this would require a normally distributed population, which is plausible due to the long history of the stock market and financial reporting. As a way of testing the robustness of these results, the non-parametric tests will provide more accurate answers in case the population means of abnormal returns are not normally distributed. For this purpose a one sample Wilcoxon signed-rank test is used, which tests the median of the sample. The null and alternate hypotheses are as follows:

$$H_o: MCAR_{portfolio} = 0$$
$$H_1: MCAR_{portfolio} \neq 0$$

As is evident from the alternate hypothesis, the Wilcoxon signed-rank test does not indicate whether or not the median abnormal return is positive or negative, only that it differs from zero. Therefore, the signs of each observation in the sample is provided as an indicator of if the abnormal return is positive or negative, given a rejected null hypothesis.

VI. RESULTS AND IMPLICATIONS

We first present the results of the performed event study and after that the results of the cyclicality and industry relationship study. The findings are then combined in a reconciled analysis. Finally, in light of the results to the first two parts of this paper, we analyse post-Alcoa-earnings-announcement abnormal returns for the various industries.

Event Study

Starting with the outcomes of the event study, selected results can be seen in tables 2.1 and 2.2. For the sake of overview, only a few industries are reported here; the ten companies that have highest purchases of primary metals as a proportion to total purchases (table 4) and other statistically and economically significant industries. The full results for all industries can be seen in the Appendix Table 1.

	S&P 500	Alcoa	Apparel	Construc-tion	Electrical equipment	Fabricated Metal	Food, beverage & tobacco	Furniture	Machinery
pos	0.000	0.040***	0.004	-0.013*	-0.003	0.005	0.000	0.001	0.000
(se)	(0.003)	(0.007)	(0.003)	(0.006)	(0.003)	(0.003)	(0.002)	(0.005)	(0.002)
neg	-0.008	-0.040***	-0.001	-0.003	0.003	-0.006	-0.001	-0.008	0.002
(se)	(0.005)	(0.006)	(0.003)	(0.007)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
N	2829	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05 | ** p<0.01 | *** p<0.001

Table 2.1 shows the results of the event study for how selected industries react to any positive or negative Alcoa report. There are 2829 total observations, where 47 are Alcoa release dates. Out of these there are 27 negative and 20 positive reports in the dataset, as determined by the market using the cumulative abnormal return of Alcoa around its release using a three-day event window. The same window has been used when when obtaining the CARs for the other industries. The S&P 500 abnormal return has been defined as its return on day t compared to the average of its returns from t to t-30.

	S&P 500	Alcoa	Mining (except oil & gas)	Misc. Manufact-uring	Motor Vehicles	Other transportation equipment	Paper Products	Primary Metals	Support activities for mining
pos	0.000	0.040***	-0.002	0.002	0.010**	0.004	0.005	0.009*	-0.007
(se)	(0.003)	(0.007)	(0.004)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.007)
neg	-0.008	-0.040***	-0.003	0.003	-0.007*	0.000	-0.007**	-0.012**	0.010
(se)	(0.005)	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)	(0.007)
N	2829	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05 | ** p<0.01 | *** p<0.001

Table 2.2 shows the results of the event study for how selected industries react to any positive or negative Alcoa report. There are 2829 total observations, where 47 are Alcoa release dates. Out of these there are 27 negative and 20 positive reports in the dataset, as determined by the market using the cumulative abnormal return of Alcoa around its release using a three-day event window. The same window has been used when when obtaining the CARs for the other industries. The S&P 500 abnormal return has been defined as its return on day t compared to the average of its returns from t to t-30.

As is shown, there is no significant reaction on the S&P 500 to either a positive or negative Alcoa report, and thus we can conclude that the market in general does not seem to view the company as a bellwether. There are, however, other industries which react to Alcoa's report. The companies in the primary metals and motor vehicles industries produce CARs in the same direction as Alcoa, that is when Alcoa report positively (negatively) they react positively (negatively). The same holds for other industries including apparel, fabricated metal and furniture, although results for these industries are not as economically and statistically significant. The only industry to significantly move against the direction of the Alcoa report is construction, which in our data sample reacted negatively to a positive Alcoa report. Construction companies on average also react, yet not statistically significant at the 5% level, negatively to a negative Alcoa earnings surprise.

For the industries not included in tables 2.1 and 2.2, there were no further significant results. As for Alcoa itself, a positive report on average generates CARs which are statistically significant, on average 4% on any positive report and -4% on any negative report, which was to be expected given our definition of a positive or negative report.

Operational Relationships and Cyclicality

The results of the OLS regressions, adjusting for heteroskedasticity and incorporating time dummies to adjust for yearly differences in growth, can be seen in tables 3.1 and 3.2 for the same industries as in tables 2.1 and 2.2. A full list for all industries is provided in the Appendix Table 2.

	S&P 500	Apparel	Construc-tion	Electrical equipment	Fabricated Metal	Food, beverage & tobacco	Furniture	Machinery
Alcoa	0.172***	0.117***	-0.462	0.343***	0.021	0.094***	0.605**	0.212***
(se)	(0.03)	(0.02)	(0.59)	(0.08)	(0.04)	(0.02)	(0.17)	(0.03)
r2	0.855	0.593	0.348	0.588	0.604	0.409	0.584	0.875
N	35	35	35	35	35	35	35	35

* p<0.05 | ** p<0.01 | *** p<0.001

Table 3.1 shows OLS regressions of the quarter-on-quarter growth in EBITDA/Assets for the respective industries on the EBITDA/Assets-growth of Aloca from 2011 to 2004, where N is the number of quarters measured. The regressions are adjusted for heteroskedasticity and for yearly differences in growth by incorporating time dummies, one for each year.

	S&P 500	Mining (except oil & gas)	Misc. Manufact-uring	Motor Vehicles	Other transportation equipment	Paper Products	Primary Metals	Support activities for mining
Alcoa	0.172***	0.049	0.096***	0.603***	0.059	-0.046*	0.218	-0.059
(se)	(0.03)	(0.06)	(0.05)	(0.15)	(0.05)	(0.02)	(0.12)	(0.04)
r2	0.855	0.631	0.631	0.797	0.671	0.539	0.516	0.893
N	35	35	35	35	35	35	35	35

* p<0.05 | ** p<0.01 | *** p<0.001

Table 3.2 shows OLS regressions of the quarter-on-quarter growth in EBITDA/Assets for the respective industries on the EBITDA/Assets-growth of Aloca from 2011 to 2004, where N is the number of quarters measured. The regressions are adjusted for heteroskedasticity and for yearly differences in growth by incorporating time dummies, one for each year.

The regressions show that, at the 0.1% significance level, for every per cent of positive Alcoa quarter-on-quarter growth, on average the companies of the S&P 500 will grow 0.17%. The economic significance is not very large, the results only providing some indication of bellwether characteristics of Alcoa for the broader economy. Looking more specifically at the different industries, the strongest correlations are seen for motor vehicles and furniture companies. The statistical significance is high for some other industries in tables 3.1 and 3.1, but the economic significance does not reach the levels of furniture and motor vehicles.

Top 10 Primary Metals-to-Total Purchases Ratios by Industry (2010, Percent of Industry Total)	
Primary metals	44.5%
Fabricated metal products	33.0%
Electrical equipment, appliances, and components	24.6%
Machinery	15.3%
Support activities for mining	11.7%
Miscellaneous manufacturing	10.6%
Motor vehides, bodies and trailers, and parts	9.6%
Furniture and related products	6.7%
Other transportation equipment	5.2%
Mining, except oil and gas	4.3%

Table 4 is based on the 2010 input-output tables supplied the Bureau of Economic Analysis displaying value of uses in American industries. Based on these figures the table shows computations purchases from the primary metal industry as a percentage of total purchases ordered largest to smallest. The top 10 industries out of 51 industries are induded in the table. A full list of industries can be found in the appendix table 3.

If we synthesise the cyclicality regression results and the IO table analysis we can see a fairly high consistency in the industries that correlate more strongly to Alcoa and the industries that buy a high proportion of their inputs from the primary metals industry. We

do not, surprisingly may seem, see a statistically significant correlation between Alcoa and its own industry but Table 4 provides evidence of a strong intra-industry relationship. It is important to note that we see the results of the IO table analysis as an independent and complementary analysis of inter- and intra-industry relationships, and the purpose of it is thus not to provide an explanatory analysis of the operational growth regression. However, we believe that if industries purchase greater (smaller) proportions of their inputs from certain industries there is a greater (smaller) likeliness of them correlating significantly with Alcoa's operational growth as regressed above. A positive correlation in operational growth might be a result of several factors, for example joint pro-cyclical behaviour in response to macroeconomic variables, but it is not the purpose of this thesis to find all such explanatory variables, and we will not analyse this further at this point.

Implications of Event and Corporate Performance Indicator Studies

Now, combining the two first parts of our study, we may answer the questions regarding which industries that see Alcoa as a bellwether and if there is any reason to believe the information content of Alcoa's financial reporting really indicates the direction of performance of other industries.

Starting with Alcoa's closest related companies in the primary metals industry, the findings in the event study point in the direction of Firth's (1976) paper; companies in the primary metals industry render positive (negative) abnormal returns at 22.5%[27] (30.0%[28]) of the magnitude of Alcoa's CAR in case of a positive (negative) earnings surprise by Alcoa. The operational growth regression results indicate that Alcoa could be an indicator for general primary metal performance, although not very significant. Complementing the analysis with Table 4, which clearly indicates a strong intra-industry relationship, we see that 44.5% of all inputs in the primary metals industry are purchased internally. Thus, our second analysis is not completely consistent for primary metals, and we have yet to verify that Alcoa really should be seen as a bellwether for the primary metals industry. This is done in the next part of the analysis, in connection with analysing *ex post* returns.

Building on the findings by Firth (1976) we move one step further and analyse the bellwether characteristics of Alcoa for industries less closely related than in his study. Among these industries motor vehicles is the only industry that reacts with both economic and statistical significance to Alcoa earnings surprises. Furthermore, motor vehicles show both significant results to the regression on operational growth and is one of the top 10 companies in Table 4. Thus, there seems to be reason for Alcoa to be seen as a bellwether for this industry.

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[27] $\frac{0.9\%}{4\%} = 22.5\%$

[28] $\frac{-1.2\%}{-4\%} = 30.0\%$

For a couple of industries the results might seem ambiguous. Construction industry abnormal returns turn negative for both positive and negative Alcoa reports, although not statistically significant for the latter case and at a relatively large standard error. Checking against the operational growth regression there is an arguably economically, yet not fully statistically, significant negative relationship between Alcoa's and the construction companies' operational performance. Due to results being inconsistent, we can only claim there are some indications of Alcoa being seen as and having reasons to be considered a bellwether for a construction earnings season performing negatively when Alcoa releases surprisingly positive results.

Furthermore, there are some industries that, when looking solely at the second study, you might expect should produce CARs in the same direction as Alcoa at a statistically significant level. In our industry inter-relationship study, the furniture industry shows both strong economic significance in the regression and is one of the top 10 purchasers in Table 4. In that case, furniture investors might not pay enough attention to Alcoa's earnings releases, and we would expect *ex post* CARs over the earnings seasons following Alcoa's announcements if the relationship is strong enough. This is studied in the third section of our analysis.

Turning the attention to the market in general, we have seen that there is on average a not very economically significant, yet positive and statistically significant, relationship between operational growth of Alcoa and the market. Thus, the reason why we do not see any indications in the event study of the market in general seeing Alcoa as a bellwether might be traced to the relatively low economic relationship we observe in our regression analysing cyclicality. As previously mentioned, possible factors limiting Alcoa's role as earnings bellwether include the fact that the company only generates 49% of their revenues within the borders of the American economy (Alcoa 2011). Alcoa's performance also largely depends on many moving factors, such as currencies and the crucial LME aluminium price (Alcoa 2011). It is not unusual that prices for aluminium decrease despite strong demand, stemming from overproduction and thus resulting in dumping on the market (Alcoa 2011). With this in mind, it may be easier to understand why Alcoa's performance may be seen as more of a bellwether for in particular the primary metal companies than for the broad economy.

Lastly, we perform robustness tests using winsorising to the 90 % level. For the event study, the results and coefficients are virtually unchanged, implying that the results are robust and not greatly affected by outliers. This is perhaps not surprising, given the large data sample of 2829 stock price observations. Performing the same robustness tests of the corporate performance indicator study renders slightly different results. We see that, while the signs of the coefficients for most industries, and for all industries mentioned in

our analysis remain the same, the economic and statistical significance varies slightly. This is also unsurprising, as a data sample of at most 35 quarter-on-quarter observations is quite susceptible to outliers having a big impact. This could in turn be a possible explanation for the at times inconsistent and unexpected results generated in this section of the study.

Ex Post **Returns**

There are industries – such as furniture – that seem to be both significantly pro-cyclical with Alcoa's operational growth and also inter-related based on primary metals-to-total inputs ratios. Thus, our final analysis seeks to identify any significant *ex post* abnormal returns over the earnings season as an indication of that investors in such industries pay too little attention to Alcoa's earnings announcements. Conversely, we have the opportunity to test if a reversal of return takes place amongst those industries generating CARs in the event study, which could indicate an overreaction to Alcoa's earnings announcements.

First of all, testing Alcoa's cumulative abnormal return following its announcement, it is found that there is no significant abnormal returns for any of the defined time periods on a positive report, and only for the 10-day period on a negative release. Allowing for reduced time periods in order to determine when the effect of the positive release ends, we see that it seems to last up to 5 trading days following the event window (table 5). Thus, even though it does not explicitly answer our research question, it is worth to note for the purpose of linking the results to the suggested phenomenon of PEAD, that post-earnings-announcement drift does not seem to exist for Alcoa more than possibly for a few days. These results are consistent with both Hou and Moskowitz (2005) and Chan et al. (1996) who claimed that lack of investor attention and PEAD is more likely for smaller firms; Alcoa is a very well-known and sizable American company which is given much attention in media which might help to explain the relatively weak evidence of PEAD for Alcoa. When relaxing the assumption of normality of Alcoa's CARs, the non-parametric Wilcoxon signed-rank test verifies the outcome of the t-test (Appendix Table 4).

The primary metals industry shows the strongest indications of abnormal returns drifting over a period up to possibly 20 to 40 days in the direction of Alcoa's earnings surprise. This drift is in part supported by our non-parametric robustness test (Appendix 5 & 6). Thus, once you know if Alcoa has released positive or negative report you may be able to purchase or short a portfolio of primary metal companies and receive a return greater than the risk assumed[29]. In an efficient market, however, this should not be possible.

[29] This is conditional on that there is no unaccounted-for risk factor which motivates the higher return on these stocks. Apart from Mendenhall's (2004) model of real-world risk in terms of arbitrage risk there has been no suggestions of such risk factor. On the contrary risk has often been rejected and a behavioural approach has often been taken (Bernard and Thomas 1989; Hong and Stein 1999)

Thus, our results point in the direction of investors in primary metals paying too little attention to the implications to primary metals performance provided by Alcoa's earnings information. If an investor pays too little attention to public information he is strictly speaking only boundedly rational. This is in line with the behavioural finance theories, including Hong and Stein (1999), stating that investors are likely not to have unlimited time and resources to look for and price all available information. If we can explain these *ex post* abnormal returns using behavioural finance, risk may be an incomplete estimation of returns and EMH assumptions of complete investor rationality may have to be relaxed. However, in order to let our findings be more than indications we arguably would have needed to see even more significant results in our robustness checks.

In addition, we found indications of *ex post* abnormal returns for the motor vehicle industry, although the results were not quite as significant as for the primary metals industry in either of the two statistical tests (tables 6 & 7; Appendix tables 5 & 6). Thus, we can conclude that it does not seem that the two industries that rendered the most significant CARs around the events of earnings announcement – that is primary metals and motor vehicles – overreacted to Alcoa's announcement. There is, on the contrary, some evidence of underreaction, especially for the closest related industry. Thus, relating to the slight inconsistency in the results for primary metals in our corporate relationship study, we also seem to be able to verify Alcoa's role as bellwether for primary metals.

Another result worth to highlight is that the furniture industry showed statistically significant abnormal returns over 10 to 40 days in case Alcoa reports a positive report and negative *ex post* abnormal returns in case of a negative announcement, yet this is not statistically significant. Controlling against the Wilcoxon test verifies the positive drift after a positive earnings surprise, statistically significant over 20 days. In case of a negative earnings surprise, we see no verification of the t-test results. This might indicate that investors in the furniture industry do not see Alcoa as an earnings season bellwether, but our results provide some indication that they should, at least in times of corporate positive growth.

Concluding this part of our study, the lack of reversal in returns provides additional support to suggest Alcoa is a bellwether for primary metals – the industry which Alcoa belongs to. The results might also indicate investor underreaction to relevant information. Other industries which showed some indications of drift, but not as strong as for primary metals, are motor vehicles and furniture – two industries that vary significantly with Alcoa's business cycle as well and are relatively closely related in terms of doing business with each other. For motor vehicles the results, like for primary metals, may be seen as supporting the findings suggesting that Alcoa is and should be seen as a bellwether for the industry and may also point towards underreaction behaviour. For furniture, further studies will be needed to confirm Alcoa's role as bellwether, even though there are some

tendencies of positive abnormal returns following a positive Alcoa earnings announcement.

We have also seen, as an interesting complimentary note, that there is no evidence of prolonged PEAD for Alcoa, indicating the big American aluminium company's earnings announcements are given sufficient attention by its investors. Also, since we based this part of the analysis on the results of the two preceding studies, we decided not to test abnormal returns for the market index. This is due to our preceding studies lending little evidence both to whether Alcoa is or has reason to be seen as a bellwether for the general American earnings season. However perhaps more importantly, estimating normal returns for a market return would most likely be considerably sensitive to noise over such a long period of time.

T-Test			Time Periods					
Report	Industry	Stats	50	40	30	20	10	5
+	Alcoa	t	-0.433	0.963	0.482	0.805	-0.219	1.717
		(sd)	(0.13)	(0.12)	(0.10)	(0.08)	(0.05)	(0.03)
		P	0.665	0.174	0.318	0.215	0.586	0.051
-	Alcoa	t	-0.260	-0.917	0.028	-0.234	-1.713	-3.388
		(sd)	(0.09)	(0.10)	(0.08)	(0.07)	(0.06)	(0.03)
		P	0.399	0.184	0.511	0.409	0.049	0.001

Table 5 Results of the one-sample t-tests of the cumulative abnormal returns of Alcoa for six different time periods, which are defined as trading days commencing two days after a Alcoa release. Report indicates if the report is above or below market expectations. In all cases, the null hypothesis is H0: ACAR=0. If the sign is +, this is tested against H1: ACAR>0. If the sign is -, this is tested against H1: ACAR<0. The P-values provided reflect the different alternate hypotheses, i.e. P is Pr(T>t) for + and Pr(T<t) for -. Any significant abnormal return at the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 20 for + and 27 for -.

T-Test			Time Periods				
+/-	Industry	Stats	50	40	30	20	10
+	Alcoa	t	-0.433	0.963	0.482	0.805	-0.219
		(sd)	(0.13)	(0.12)	(0.10)	(0.08)	(0.05)
		P	0.665	0.174	0.318	0.215	0.586
+	Electrical Equipment	t	-1.793	-0.037	0.355	1.190	0.958
		(sd)	0.045	0.048	0.052	0.050	0.040
		P	0.956	0.515	0.363	0.124	0.175
+	Fabricated Metals	t	0.137	1.284	1.086	1.118	1.239
		(sd)	(0.08)	(0.09)	(0.07)	(0.05)	(0.04)
		P	0.446	0.107	0.146	0.139	0.115
+	Furniture	t	0.187	1.497	1.495	1.900	1.334
		(sd)	0.103	0.096	0.074	0.085	0.075
		P	0.427	0.075	0.076	0.036	0.099
+	Machinery	t	-0.286	0.716	0.678	1.058	0.356
		(sd)	0.051	0.055	0.036	0.026	0.021
		P	0.611	0.241	0.253	0.152	0.363
+	Mining (ex. Oil&Gas)	t	-0.526	0.380	0.253	0.429	-0.384
		(sd)	(0.12)	(0.10)	(0.09)	(0.08)	(0.05)
		P	0.698	0.354	0.402	0.336	0.648
+	Misc. Manufacturing	t	-0.304	0.566	0.235	0.329	-0.907
		(sd)	(0.06)	(0.04)	(0.04)	(0.04)	(0.03)
		P	0.618	0.289	0.408	0.373	0.812
+	Motor Vehicles, Bodies & Parts	t	-1.082	-0.132	-0.008	2.059	1.774
		(sd)	(0.07)	(0.05)	(0.05)	(0.04)	(0.05)
		P	0.854	0.552	0.503	0.027	0.046
+	Other Transportation Equipment	t	-0.515	0.302	0.456	0.825	0.904
		(sd)	(0.06)	(0.06)	(0.04)	(0.04)	(0.03)
		P	0.694	0.383	0.327	0.210	0.189
+	Paper Products	t	0.430	2.056	1.747	1.855	1.298
		(sd)	(0.05)	(0.07)	(0.06)	(0.07)	(0.05)
		P	0.336	0.027	0.048	0.040	0.105
+	Primary Metals	t	1.042	2.326	1.770	2.428	0.749
		(sd)	(0.13)	(0.12)	(0.10)	(0.08)	(0.05)
		P	0.155	0.016	0.046	0.013	0.232
+	Supporting Industries for Mining	t	-0.906	0.166	0.088	0.370	0.889
		(sd)	(0.07)	(0.10)	(0.09)	(0.07)	(0.05)
		P	0.812	0.435	0.465	0.358	0.193
-	Construction	t	0.162	0.493	0.199	1.331	0.935
		(sd)	(0.11)	(0.10)	(0.10)	(0.09)	(0.07)
		P	0.563	0.686	0.578	0.901	0.819

Table 6 Results of the one-sample t-tests of the cumulative abnormal returns for selected industries for the five different time periods, which are defined as trading days commencing two days after a positive Alcoa release. +/- indicates if the industry is expected to generate positive or negative abnormal returns, based on the results from the corporate performance indicator- and event studies. In all cases, the null hypothesis is H0: ACAR=0. If the sign is +, this is tested against H1: ACAR>0. If the sign is -, this is tested against H1: ACAR<0. The P-values provided reflect the different alternate hypotheses, i.e. P is Pr(T>t) for + and Pr(T<t) for -. Any significant abnormal return at the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 20.

T-Test			Time Periods				
+/-	Industry	Stats	50	40	30	20	10
-	Alcoa	t	-0.260	-0.917	0.028	-0.234	-1.713
		(sd)	(0.09)	(0.10)	(0.08)	(0.07)	(0.06)
		P	0.399	0.184	0.511	0.409	0.049
-	Electrical Equipment	t	0.469	0.809	0.341	-0.551	-0.482
		(sd)	(0.09)	(0.12)	(0.11)	(0.06)	(0.04)
		P	0.679	0.787	0.632	0.293	0.317
-	Fabricated Metals	t	-0.185	0.341	0.437	0.597	0.124
		(sd)	(0.06)	(0.05)	(0.06)	(0.05)	(0.04)
		P	0.428	0.632	0.667	0.722	0.549
-	Furniture	t	-0.758	-0.645	-0.436	-0.655	-0.969
		(sd)	(0.06)	(0.06)	(0.08)	(0.08)	(0.05)
		P	0.228	0.262	0.333	0.259	0.171
-	Machinery	t	0.239	0.257	0.585	0.233	-0.102
		(sd)	(0.05)	(0.04)	(0.03)	(0.04)	(0.03)
		P	0.594	0.600	0.718	0.591	0.460
-	Mining (ex. Oil&Gas)	t	-0.782	-1.077	-1.026	-1.602	-1.778
		(sd)	(0.07)	(0.07)	(0.06)	(0.07)	(0.06)
		P	0.221	0.146	0.157	0.061	0.044
-	Misc. Manufacturing	t	-1.496	-1.148	-1.647	0.208	-0.331
		(sd)	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)
		P	0.073	0.131	0.056	0.581	0.372
-	Motor Vehicles, Bodies & Parts	t	-1.359	-1.245	-0.804	-0.232	-0.675
		(sd)	(0.07)	(0.05)	(0.05)	(0.04)	(0.05)
		P	0.093	0.112	0.214	0.409	0.253
-	Other Transportation Equipment	t	-0.860	-0.613	-0.824	-0.432	-1.122
		(sd)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
		P	0.199	0.273	0.209	0.335	0.136
-	Paper Products	t	-0.778	-0.087	-0.796	-1.851	-1.343
		(sd)	(0.08)	(0.08)	(0.06)	(0.05)	(0.03)
		P	0.222	0.466	0.217	0.038	0.096
-	Primary Metals	t	-1.254	-1.267	-1.564	-1.941	-1.637
		(sd)	(0.12)	(0.11)	(0.09)	(0.07)	(0.06)
		P	0.111	0.108	0.065	0.032	0.057
-	Supporting Industries for Mining	t	-0.456	0.013	0.980	0.833	1.610
		(sd)	(0.08)	(0.09)	(0.08)	(0.07)	(0.05)
		P	0.326	0.505	0.832	0.794	0.940
+	Construction	t	-0.575	-0.799	-1.326	-1.110	-1.205
		(sd)	(0.07)	(0.09)	(0.08)	(0.08)	(0.05)
		P	0.285	0.216	0.098	0.139	0.120

Table 7 Results of the one-sample t-tests of the cumulative abnormal returns for selected industries for the five different time periods, which are defined as trading days commencing two days after a negative Alcoa release. +/- indicates if the industry is expected to generate positive or negative abnormal returns, based on the results from the corporate performance indicator- and event studies. In all cases, the null hypothesis is H0: ACAR=0. If the sign is +, this is tested against H1: ACAR>0. If the sign is -, this is tested against H1: ACAR<0. The P-values provided reflect the different alternate hypotheses, i.e. P is Pr(T>t) for + and Pr(T<t) for -. Any significant abnormal return at the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 27.

VII. CONCLUSIONS

We can draw three main conclusions from our results. First and foremost, answering our original question, it seems that Alcoa is not seen as a bellwether by the general US equity market. This implies that the extensive reporting in financial media and the hype surrounding its releases is exaggerated and possibly even unfounded. In fact, Alcoa only significantly seems to be seen as a bellwether for a couple of industries, with our study indicating these to be primary metals and motor vehicles. This is consistent with the findings of Firth (1976), as these industries are closely linked to Alcoa on an operational level, and also consistent with our own expected findings.

We also found that Alcoa's role as an indicator of corporate performance seems to be rather weak for most industries, once again with exception for industries with close links to the company and some other industries. This might be due to factors including the fact that only 49% of Alcoa's 2011 revenues are generated in the US and Alcoa's success depends largely on the LME aluminium price, which not only depends on underlying industrial demand but on overproduction and dumping (Alcoa 2011).

Finally, we found little evidence or consistency in abnormal returns across the majority of all industries for different time periods across the earnings season following an Alcoa quarterly earnings release. If Alcoa would have been seen as a bellwether for certain industries, we would expect those industries to render abnormal returns either surrounding the event window or over the earnings season instead. The closest industry, primary metals, in addition to abnormal event window returns, showed tendencies of *ex post* abnormal returns. Thus, this drift in returns might even indicate an initial underreaction to Alcoa's earnings announcements. This is arguably in line with theories of behavioural finance (Hong and Stein 1999) claiming that such underreaction might be due to lack of investor attention to relevant information. This may in turn question the EMH's assumption of full investor rationality.

Combining these findings, we are thus inclined to conclude that Alcoa primarily is seen as, and also likely should be seen as, a bellwether for the primary metals and motor vehicles industries. Given this conclusion, the question of *why* Alcoa is referred to as a bellwether might arise. We believe this could be the result of several factors, such as the wide variety of Alcoa's end products and its cyclical nature. But perhaps most importantly, it might simply be due to the fact that investors, analysts and financial media like to look for indicators, and as the first company to report, Alcoa fits that bill perfectly.

Limitations

First of all, our event study results build upon the assumption that market returns best describe a positive or negative earnings announcement. The CAR method is widely used

in previous research, so is the SUE method, although chiefly when the concept of post-earnings-announcement drift is assessed in accounting research. It is possible that another definition of earnings surprise would change our results. Furthermore, there is no definite definition to what a positive or negative earnings announcement is. We believe that an earnings announcement is a piece of information providing a holistic picture of ability of future earnings potential. However the SUE method assumes that a positive or negative announcement is exclusively a function of surprise on the bottom line, which also might be correct.

Secondly, in our corporate performance regression we believe that the EBITDA is a satisfactory measure of correlation between the different industries' and Alcoa's corporate performance. We believe that involving financing decisions may distort such a study and not fully reflect the correlation in cyclicality that we want to look at, whereby we do not use net income or EPS. However, in all other studies we look at equity returns. The return to equity depends on the bottom line residual, which is not accounted for here. This might have been a better measure. We also adjust for acquisitions and divestments using a proxy, asset growth, which is not perfect. Ideally we would compute a book enterprise value = book equity + preferred stock + minority interests + debt – cash and cash equivalents – investments in non-controlled companies. However, data was missing whereby we were not able to do this. Even more ideal would have been to adjust EBITDA for every single company in case an acquisition or divestment had been done between two compared quarters.

Thirdly, and this applies to the event study as well, for the ex post returns study we use a simple market model since we primarily want to see the direction of stock returns. We could have used a more sophisticated model, such as the Fama-French three-factor model, and thus produce a more precise estimation of normal returns. Another, longer, estimation period of stock betas could possibly render beta estimation closer to reality. We use a 30-day estimation period for normal S&P 500 returns. Normal returns might change with the trend and momentum of the market, which we hopefully account for using a relatively short window, however it might not be the case. We are further aware of that measuring CARs over longer periods, up to 50 days, as an *ex post* study makes this study sensitive to noise that may affect returns of the studied companies other than market-wide factors (adjusted for by beta) and corporate earnings performance.

Suggestions for Future Research

Firstly, it would be interesting to extend the study over an extended period of time, that is back to when Alcoa first started to kick off the earnings season of the DJIA companies, in order to see if Alcoa's role as a bellwether has changed over time. Secondly, predicting earnings season performance should be of interest for any investor interested in predicting returns. Further research may focus on whether it is possible to generalise

Alcoa's suggested role as bellwether for primarily its own industry and extend the study to companies in other industries. Also, *ex post* drifts are often attributed to the real-world not being rational (Hong and Stein 1999; Bernard and Thomas 1989) thus rejecting market efficiency. However, this is when comparing to conventional models of risk and the consequent expected return from that risk. Future researchers might want to produce more research on developing models connecting real-world risk with return. Mendenhall (2004) explained PEAD by referring to arbitrage risk, that is the idiosyncratic part of a stock's volatility and which in reality is not diversified away, since those interested in arbitrage are believed to be more specialised and hold fewer positions. Thus, just as behavioural finance researchers refer to real-world behaviour, using a real-world theory of risk similar to Mendenhall's (2004) might help explain the general under- and overreaction phenomena, without claiming the stock market to be inefficient.

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APPENDICES

Table 1 - Full results of Event Study

	S&P 500	Accommodation	Admin & support services	Air transportation	Alcoa	Amusements, gambling, & recreation	Apparel & leather	Broadcasting & telecommunications
pos	0.000	-0.004	0.001	0.005	0.040***	0.003	0.004	-0.001
(se)	(0.003)	(0.005)	(0.004)	(0.006)	(0.007)	(0.007)	(0.003)	(0.003)
neg	-0.008	-0.009	0.002	-0.004	-0.040***	-0.012*	-0.001	-0.004
(se)	(0.005)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.003)	(0.003)
N	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

	Chemical products	Computer & electronic products	Computer systems design	Construction	Educational services, health care, & social assistance	Electrical equipment, appliances, & components	Fabricated metal products	Federal Reserve banks & credit intermediation
pos	0.001	-0.003	-0.010	-0.013*	0.002	-0.003	0.005	0.003
(se)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.003)	(0.003)	(0.005)
neg	-0.001	0.009	0.010	-0.003	-0.001	0.003	-0.006	-0.008
(se)	(0.002)	(0.005)	(0.007)	(0.007)	(0.005)	(0.004)	(0.003)	(0.004)
N	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

	Food & beverage & tobacco products	Food services & drinking places	Forestry & fishing	Furniture	Information & data processing	Insurance carriers	Legal services	Machinery
pos	0.000	0.003	0.000	0.001	0.001	0.002	-0.020	0.000
(se)	(0.002)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.016)	(0.002)
neg	-0.001	0.000	-0.006	-0.008	0.008	-0.008**	0.013	0.002
(se)	(0.003)	(0.005)	(0.004)	(0.004)	(0.006)	(0.003)	(0.012)	(0.003)
N	2829	2829	2829	2829	2829	2829	1254	2829

* p<0.05, ** p<0.01, *** p<0.001

	Management of companies & enterprises	Mining (except oil & gas)	Misc. manufacturing	Misc. professional, scientific, & technical services	Motion picture & sound recording	Motor vehicles, bodies & trailers, & parts	Nonmetallic mineral products	Oil & gas extraction
pos	-0.004	-0.002	0.002	-0.002	0.014	0.010**	0.007	-0.005
(se)	(0.004)	(0.004)	(0.002)	(0.004)	(0.009)	(0.003)	(0.017)	(0.005)
neg	-0.007	-0.003	0.003	0.002	0.004	-0.007*	-0.012	0.005
(se)	(0.004)	(0.006)	(0.003)	(0.002)	(0.008)	(0.003)	(0.007)	(0.005)
N	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

	Other transportation & support activities	Other transportation equipment	Paper products	Performing arts, spectator sports & museums	Petroleum & coal products	Pipeline transportation	Plastics & rubber products	Primary metals
pos	-0.001	0.004	0.005	-0.006	-0.004	-0.001	0.002	0.009*
(se)	(0.003)	(0.004)	(0.003)	(0.007)	(0.007)	(0.004)	(0.005)	(0.004)
neg	-0.002	0.000	-0.007**	0.005	0.000	0.007	0.001	-0.012**
(se)	(0.003)	(0.002)	(0.003)	(0.009)	(0.004)	(0.004)	(0.007)	(0.005)
N	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

	Printing & related support activities	Publishing (includes software)	Rail transportation	Real estate	Rental & leasing services	Retail trade	Securities, commodities & investments	Support activities for mining
pos	0.007	-0.002	0.004	-0.000	-0.007	0.001	0.001	-0.007
(se)	(0.004)	(0.004)	(0.005)	(0.003)	(0.012)	(0.004)	(0.005)	(0.007)
neg	-0.004	0.009	0.001	-0.007*	0.006	0.002	-0.003	0.010
(se)	(0.003)	(0.005)	(0.005)	(0.003)	(0.007)	(0.002)	(0.004)	(0.007)
N	2829	2829	2829	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

	Utilities	Waste management	Water transportation	Wholesale trade	Wood products
pos	-0.005	-0.003	-0.008*	0.002	0.001
(se)	(0.004)	(0.004)	(0.004)	(0.002)	(0.006)
neg	-0.003	-0.004	-0.008	-0.002	-0.003
(se)	(0.003)	(0.005)	(0.005)	(0.002)	(0.004)
N	2829	2829	2829	2829	2829

* p<0.05, ** p<0.01, *** p<0.001

Table 1 shows the results of the event study for how all industries react to any postive or negative Alcoa report. There are 2829 total observations of which 47 are Alcoa release dates. Out of these there are 27 negative ar 20 positive reports, as determined by the market using cumulative abnor return. The S&P500 abnormal return has been defined as its return on da compared to the average of its returns from t to t-30.

Table 2 - Full results of corporate performance study

	S&P 500	Accommodation	Admin & support services	Air transportation	Amusements, gambling, & recreation	Apparel & leather	Broadcasting & telecommunications	Chemical products
β	0.172***	0.140	-0.046	0.150	0.186	0.117***	-0.002	0.088***
(se)	(0.03)	(0.09)	(0.07)	(0.08)	(0.10)	(0.02)	(0.03)	(0.02)
r2	0.855	0.548	0.507	0.621	0.462	0.593	0.67	0.539
N	35	35	35	35	35	35	35	35

* p<0.05, ** p<0.01, *** p<0.001

	Computer & electronic products	Computer systems design	Construction	Educational services, health care, & social assistance	Electrical equipment, appliances, & components	Fabricated metal products	Food & beverage & tobacco products	Food services & drinking places
β	0.230**	-0.015	-0.462	-0.036	0.343***	0.021	0.094***	-0.005
(se)	(0.06)	(0.03)	(0.59)	(0.03)	(0.08)	(0.04)	(0.02)	(0.03)
r2	0.684	0.695	0.348	0.618	0.588	0.604	0.409	0.466
N	35	35	35	35	35	35	35	35

* p<0.05, ** p<0.01, *** p<0.001

	Forestry & fishing	Furniture	Information & data processing	Legal services	Machinery	Mining (except oil & gas)	Misc. manufacturing	Misc. professional, scientific, & technical services
β	0.132	0.605**	-0.033	-0.239*	0.212***	0.049	0.096***	0.043
(se)	(0.15)	(0.17)	(0.03)	(0.09)	(0.03)	(0.06)	(0.05)	(0.03)
r2	0.744	0.584	0.501	0.494	0.875	0.631	0.631	0.502
N	33	35	35	18	35	35	35	35

* p<0.05, ** p<0.01, *** p<0.001

	Motion picture & sound recording	Motor vehicles, bodies & trailers, & parts	Nonmetallic mineral products	Oil & gas extraction	Other transportation & support activities	Other transportation equipment	Paper products	Performing arts, spectator sports & museums
β	0.104	0.603***	0.096	0.297*	0.015	0.059	-0.046*	0.213***
(se)	(0.07)	(0.15)	(0.08)	(0.11)	(0.04)	(0.05)	(0.02)	(0.04)
r2	0.771	0.797	0.541	0.512	0.56	0.671	0.539	0.684
N	33	35	27	35	35	35	35	32

* p<0.05, ** p<0.01, *** p<0.001

	Petroleum & coal products	Pipeline transportation	Plastics & rubber products	Primary metals	Printing & related support activities	Publishing (includes software)	Rail transportation	Real estate
β	0.144	0.109	0.416*	0.218	0.077	-0.067**	-0.002	0.170
(se)	(0.14)	(0.18)	(0.17)	(0.12)	(0.07)	(0.02)	(0.01)	(0.10)
r2	0.53	0.117	0.433	0.516	0.329	0.577	0.704	0.740
N	35	35	33	35	31	35	35	30

* p<0.05, ** p<0.01, *** p<0.001

	Rental & leasing services	Retail trade	Support activities for mining	Utilities	Waste management	Wholesale trade
β	-0.039*	0.005	-0.059	0.040	0.282**	0.025
(se)	(0.01)	(0.01)	(0.04)	(0.02)	(0.10)	(0.01)
r2	0.803	0.519	0.893	0.388	0.658	0.49
N	35	35	35	35	35	35

* p<0.05, ** p<0.01, *** p<0.001

Table 2 shows OLS regressions of the quarter-on-quarter growth in EBITDA/Assets for the respective industries on the EBITDA/Assets-growth of Aloca from 2011 to 2004, where N is the number of quarters measured. The regressions are adjusted for heteroskedasticity and for yearly differences in growth by incorporating timedummies, one for each year.

Table 3 - Full list of industries

Accommodation	Motion picture and sound recording industries
Administrative and support services	Motor vehicles, bodies and trailers, and parts
Air transportation	Nonmetallic mineral products
Amusements, gambling, and recreation industries	Oil and gas extraction
Apparel and leather and allied products	Other transportation and support activities
Broadcasting and telecommunications	Other transportation equipment
Chemical products	Paper products
Computer and electronic products	Performing arts, spectator sports, museums, and related activities
Computer systems design and related services	Petroleum and coal products
Construction	Pipeline transportation
Educational services, health care, and social assistance	Plastics and rubber products
Electrical equipment, appliances, and components	Primary metals
Fabricated metal products	Printing and related support activities
Federal Reserve banks, credit intermediation, and related activities	Publishing industries (includes software)
Food and beverage and tobacco products	Rail transportation
Food services and drinking places	Real estate
Forestry, fishing, and related activities	Rental and leasing services and lessors of intangible assets
Furniture and related products	Retail trade
Information and data processing services	Securities, commodity contracts, and investments
Insurance carriers and related activities	Support activities for mining
Legal services	Utilities
Machinery	Waste management and remediation services
Management of companies and enterprises	Water transportation
Mining, except oil and gas	Wholesale trade
Miscellaneous manufacturing	Wood products
Miscellaneous professional, scientific, and technical services	

Table 3 shows a full list of the industries used in this paper, which were obtained using Input-Output tables and the NAICS system, which is a US standard for classifying companies in to various industries.

Wilcoxon Signed-Rank Test			Time Periods					
Report	Industry	Stats	50	40	30	20	10	5
+	Alcoa	Z	-0.672	0.635	0.224	0.299	-0.037	1.717
		P>|Z|	0.502	0.526	0.823	0.765	0.970	0.086
		+/-	8/12	11/9	9/11	8/12	8/12	12/8
-	Alcoa	Z	-0.144	-1.105	-0.096	-0.168	-1.730	-2.835
		P>|Z|	0.885	0.269	0.923	0.866	0.084	0.005
		+/-	14/13	11/16	13/14	13/14	10/17	9/18

Table 4 Results of the one-sample Wilcoxon signed-rank tests of the cumulative abnormal returns of Alcoa for six different time periods, which are defined as trading days commencing two days after a days after a Alcoa release. The null hypothesis for all portfolios is H0: MCAR=0 which is tested against H0: MCAR≠0. Report indicates if the report is above or below market expectations. In the stats column, +/- indicates how many of the abnormal returns in the sample were positive/negative. Any significant abnormal return to the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 20 for + and 27 for -.

Wilcoxon Signed-Rank Test			Time Periods				
+/-	Industry	Stats	50	40	30	20	10
+	Alcoa	Z	-0.672	0.635	0.224	0.299	-0.037
		P>|Z|	0.502	0.526	0.823	0.765	0.970
		+/-	8/12	11/9	9/11	8/12	8/12
+	Electrical Equipment	Z	-1.381	-0.224	0.411	1.232	0.971
		P>|Z|	0.1672	0.8228	0.6813	0.218	0.3317
		+/-	9/11	10/10	9/11	12/8	13/7
+	Fabricated Metals	Z	-0.224	1.232	0.747	0.821	1.045
		P>|Z|	0.823	0.218	0.455	0.412	0.296
		+/-	9/11	13/7	11/9	12/8	12/8
+	Furniture	Z	-0.896	0.859	1.232	1.68	1.12
		P>|Z|	0.3703	0.3905	0.218	0.093	0.2627
		+/-	5/15	10/10	12/8	14/6	12/8
+	Machinery	Z	0.000	0.709	0.448	1.083	0.000
		P>|Z|	1.000	0.4781	0.6542	0.279	1.000
		+/-	10/10	11/9	9/11	11/9	9/11
+	Mining (ex. Oil&Gas)	Z	-0.560	0.597	0.485	0.672	-0.523
		P>|Z|	0.576	0.550	0.627	0.502	0.601
		+/-	9/11	12/8	12/8	11/9	8/12
+	Misc. Manufacturing	Z	0.261	0.411	0.597	0.560	-0.373
		P>|Z|	0.794	0.681	0.550	0.576	0.709
		+/-	11/9	12/8	12/8	12/8	11/9
+	Motor Vehicles, Bodies & Parts	Z	-0.933	0.112	-0.075	1.717	1.605
		P>|Z|	0.351	0.911	0.941	0.086	0.108
		+/-	10/10	11/9	10/10	13/7	13/7
+	Other Transportation Equipment	Z	-1.419	-0.672	-0.299	0.149	0.187
		P>|Z|	0.156	0.502	0.765	0.881	0.852
		+/-	6/14	8/12	8/12	9/11	10/10
+	Paper Products	Z	0.000	1.643	1.344	1.045	0.747
		P>|Z|	1.000	0.101	0.179	0.296	0.455
		+/-	11/9	12/8	11/9	10/10	9/11
+	Primary Metals	Z	0.933	2.128	1.419	1.904	0.635
		P>|Z|	0.351	0.033	0.156	0.057	0.526
		+/-	13/7	14/6	10/10	11/9	10/10
+	Supporting Industries for Mining	Z	-0.933	0.411	0.037	0.261	0.747
		P>|Z|	0.351	0.681	0.970	0.794	0.455
		+/-	8/12	12/8	8/12	10/10	13/7
-	Construction	Z	0.112	0.560	-0.448	1.195	0.373
		P>|Z|	0.911	0.576	0.654	0.232	0.709
		+/-	10/10	11/9	10/10	12/8	9/11

Table 5 Results of the one-sample Wilcoxon signed-rank tests of the cumulative abnormal returns for selected industries for the five different time periods, which are defined as trading days commencing two days after a positive Alcoa release. The null hypothesis for all portfolios is H0: MCAR=0 which is tested against H0: MCAR≠0. +/- indicates if the industry is expected to generate positive or negative abnorma returns, based on the results from the corporate performance indicator - and event studies. In the stats column, +/- indicates how many of the abnormal returns in the sample were positive/negative. Any significant abnormal return to the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 20.

Wilcoxon Signed-Rank Test			Time Periods				
+/-	Industry	Stats	50	40	30	20	10
-	Alcoa	Z	-0.144	-1.105	-0.096	-0.168	-1.730
		P>|Z|	0.885	0.269	0.923	0.866	0.084
		+/-	14/13	11/16	13/14	13/14	10/17
-	Electrical Equipment	Z	-0.216	0.192	-0.673	-0.577	-0.625
		P>|Z|	0.829	0.848	0.501	0.564	0.532
		+/-	12/15	13/14	11/16	13/14	12/15
-	Fabricated Metals	Z	-0.192	0.480	0.601	1.009	0.408
		P>|Z|	0.848	0.631	0.548	0.313	0.683
		+/-	15/12	14/13	15/12	16/11	14/13
-	Furniture	Z	-0.240	-0.456	-0.168	-0.673	-0.432
		P>|Z|	0.810	0.648	0.866	0.501	0.665
		+/-	13/14	12/15	13/14	12/15	14/13
-	Machinery	Z	-0.216	-0.625	0.360	-0.096	0.096
		P>|Z|	0.829	0.532	0.719	0.923	0.923
		+/-	12/15	10/17	14/13	14/13	13/14
-	Mining (ex. Oil&Gas)	Z	-0.649	-1.129	-1.249	-1.369	-1.610
		P>|Z|	0.517	0.259	0.212	0.171	0.108
		+/-	12/15	11/16	10/17	9/18	9/18
-	Misc. Manufacturing	Z	-1.297	-0.961	-1.417	0.961	0.096
		P>|Z|	0.195	0.337	0.156	0.337	0.923
		+/-	11/16	11/16	12/15	18/9	15/12
-	Motor Vehicles, Bodies & Parts	Z	-1.081	-1.441	-0.769	0.048	-0.168
		P>|Z|	0.280	0.149	0.442	0.962	0.866
		+/-	12/15	8/19	13/14	14/13	13/14
-	Other Transportation Equipment	Z	-0.913	0.264	-0.529	-0.505	-1.417
		P>|Z|	0.361	0.792	0.597	0.614	0.156
		+/-	11/16	15/12	12/15	14/13	10/17
-	Paper Products	Z	-0.937	-0.505	-0.360	-1.466	-1.321
		P>|Z|	0.349	0.614	0.719	0.143	0.186
		+/-	14/13	14/13	13/14	11/16	9/18
-	Primary Metals	Z	-1.634	-1.490	-1.610	-1.586	-1.466
		P>|Z|	0.102	0.136	0.108	0.113	0.143
			8/19	9/18	8/19	12/15	10/17
-	Supporting Industries for Mining	Z	-0.577	-0.240	0.480	0.961	1.490
		P>|Z|	0.564	0.810	0.631	0.337	0.136
		+/-	13/14	12/15	14/13	17/10	16/11
+	Construction	Z	-0.913	-0.961	-1.273	-1.369	-0.961
		P>|Z|	0.361	0.337	0.203	0.171	0.337
		+/-	11/16	12/15	12/15	10/17	12/15

Table 6 Results of the one-sample Wilcoxon signed-rank tests of the cumulative abnormal returns for selected industries for the five different time periods, which are defined as trading days commencing two days after a negative Alcoa release. The null hypothesis for all portfolios is H0: MCAR=0 which is tested against H0: MCAR≠0. +/- indicates if the industry is expected to generate positive or negative abnorma returns, based on the results from the corporate performance indicator - and event studies. In the stats column, +/- indicates how many of the abnormal returns in the sample were positive/negative. Any significant abnormal return to the 10 % level has been highlighted by portfolio and time period with striped borders, indicating when the null hypothesis can be rejected. Any significant abnormal return at the 5 % level has been shaded in gray. The sample size is 27.