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MUDDY WATERS RESEARCH AND THE U.S. STOCK MARKET REACTION

Abstract

In this study, we investigate whether investors react to nonconventional research reports instead of traditional audit reports in the United States. Prior studies have explored market responses to various audit-related factors, such as qualified audit reports, reportable events disclosure, going concern audit reports, adoption of new IFRS Standards, and analyst coverage and recommendations. For this study, nonconventional reports refer to independent investigative reports issued by third-party research firms. Specifically, the analysis focuses on Muddy Waters Research Company, a specific third-party research firm. The data used in the study are obtained from the Securities and Exchange Commission, CRSP, Compustat, and Muddy Waters Research Company. We employ a market model event study to examine investor reactions. The results indicate a significant negative market response to the independent investigative reports issued by Muddy Waters Research Company similar to the response to conventional reports.

Key words: Investigative reports, market reaction, abnormal returns

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I. Introduction

Publicly traded companies must present financial statements to the general public typically on an annualized basis. Financial statements are prepared by firm management under the oversight of internal auditors and audited by external auditors according to Sarbanes Oxley Act 2002, (SOX 404). Audited financial statements provide material information to the public. Investors are interested in the material information provided from financial statements to make informed investment decisions.

The purpose of this study is to examine whether investors respond to nonconventional research reports in lieu of audit reports. This research examines the effect of the Muddy Waters Research issued investigative reports on shareholder wealth. Muddy Waters Research is an American privately held due diligence based investment research firm that was founded in 2010. Muddy Waters Research conducts investigative research on public companies to determine their true worth. They also evaluate the opacity and/or hype that firms' management attempts to create. Muddy Waters Research provides due diligence and creates public investigative reports. They focus on three main categories (1) business fraud (2) accounting fraud and (3) fundamental problems within the organization, (muddywatersresearch.com/about, en.wikipedia.org/wiki/muddy_waters_research). To date, 116 public reports on corporations have been issued for the period ranging from 2010 to 2022. These reports represent 52 distinct firms.

It is questionable whether stock market participants react to information contained in independent investigative reports in lieu of audited financial reports. In particular, would investors take advantage of third-party free sources when making investment decisions? The prior literature indicates that market participants are affected by analysts' forecast Derrien and Kecskes (2013). In addition, auditors consider analysts' forecasts when they evaluate their clients' risk Newton (2019). Therefore, it is questionable whether there are any additional informational sources that investors and auditors consider when evaluating firm risk.

Investor awareness of such reports (events) can be measured by examining market returns three days prior (-3) and three days following (+3) the report issuance (the event). This process is similar to that of A. Ziobrowski, Cheng, Boyd, and B. Ziobrowski (2004). However, they utilized a total duration of 255 prior (-255) to the event and 255 (+255) after the event to examine returns. We expect to find a negative abnormal return associated with each of the Muddy Waters investigative reports due to the nature and content of the reports. Therefore, the purpose of this research is to examine how Muddy Waters Research Company reports affect investor reactions in the U.S. It is important to note that Muddy Waters Research Company examines companies in all developed countries and even some emerging markets. However, based on the reports issued, it appears that they focus on the following countries: U.S., European countries and China.

There are many anomalies that generate signals to stock market participants. Previous literature has examined a portion of these anomalies. For example, many publicly traded companies meet or beat analyst forecasts consistently. While this approach is useful for individual companies, it may provide a signal for investigation. For example, Cheng and

Warfield (2005) noted that CEOs and firms' top management may have equity incentives that are based on how well the firm performs compared with analysts' expectations. Consequently, the firm's management will want to sell their equity shares in the future at a higher price. This may provide opportunities for firm management to manage earnings according to analysts' expectations, Cheng and Warfield (2005). Additionally, Bergstresser and Philippon (2005) provide information on how a firm's management manages earnings through the use of discretionary accounting. As a result, the purpose of Muddy Waters Research is to investigate companies that may have provided a signal of such events.

The concern here is that owners and investors alike fund these companies with the expectation of earning positive returns. Owners and investors trust management to pursue firm operations in the most efficient manner, hence optimal performance while mitigating risk simultaneously. The main purpose of firm management is to operate the firm to generate sufficient earnings for owners and investors alike. This also occurs when firm performance meets or beats analyst expectations without putting the firm at risk. As a result, there is a fiduciary relationship between the firm's management and the firm's owners and investors. This also corresponds with agency theory which basically states that in an agency relationship, one party acts on behalf of another, Shapiro, S. P. (2005).

Muddy Waters Research is a company that provides due diligence into firm fundamentals with the purpose of disclosing fraud (business and/or accounting) and fundamental problems. In addition, the purpose of their research is to disclose risky firm behavior to market participants, auditors, owners, investors, lenders, creditors, and stakeholders. As mentioned earlier, this research examines the reactions of stock market participants to the investigates reports issued by the Muddy Waters Research Company. Therefore, we extend the previous literature by providing further insight into reactions of stock market participants to a new variable. The new variable is investigative reports issued by third-party research that are separate from firm management reports, market analyst reports, and audit reports. This research pursues the investigative research reports provided by the Muddy Waters Research Company that discloses agency cost.

The remainder of the research paper is organized as follows. Section two consists of the literature review, research questions and hypothesis development. Section three consists of information in reference to the data. Section four consists of the methodology, analysis, and empirical results. Finally, section five consists of our interpretations of the results, conclusions, and implications of future research opportunities.

II. Literature Review and Research Questions

There is widespread literature on abnormal returns for various reasons. A significant portion of the prior research on abnormal returns indicates the cause is from information asymmetry. Most of this research indicates that there is asymmetric information between firm management and investors Cheng and Warfield (2005), Bergstresser and Philippon (2005), and Brochet (2013). For example, Brochet et al. (2013) measure abnormal returns based on the adoption of the International Financial Reporting Standards (IFRS). They empirically document that the adoption of the IFRS reduces information asymmetry between firm management and

investors by making financial statements more comparable. As a result, stock market returns from insiders' decrease based on the adoption of the IFRS.

In addition, Crawford, Roulstone and So (2012) examine the relationship of analyst coverage to firms and firm return synchronicity with the stock market. They empirically indicate that as analysts begin to initiate coverage on a particular firm, that firm's return may or may not be in sync with the stock market. However, they provide sufficient evidence that indicates that if the firm has no prior analyst coverage, then that firm's return will typically be in sync with the stock market. More importantly, they provide significant evidence that as more analysts join in on the coverage on the same firm, the firm's return synchronicity with the stock market will decrease. They interpret that the initial analyst obtains less costly information in reference to the firm. Consequently, the initial analyst depends on industry and market data which causes the firm to provide returns that are in synchrony with the stock market; Crawford et al. (2012). However, when additional analysts provide coverage, they compete with each other which causes the information to become more firm specific, therefore causing the firm's return synchronicity with the market to decrease; Crawford et al. (2012).

Abnormal returns from common stock investments of the U.S. Senate are examined by A. Ziobrowski, Cheng, Boyd, and B. Ziobowski (2004). They indicate that the actions of the federal government can have a profound impact on financial markets. U.S. Senators are prominent participants in the government decision making process Ziobrowski et al. (2004). As a result, they are likely to have knowledge of forthcoming government actions before the information becomes public. This could provide them with an informational advantage over other investors Ziobowski et al. (2004).

The market reaction is initially documented based on literature provided by Ball and Brown (1968). They associated the relationship between net income and stock returns. However, Vukovic et al. (2020) examine analysts' recommendation value and determine which market analysts have more predictive power. They define predictive power as the extent to which a stock price reacts to a particular recommendation that leads to abnormal returns. They found that analysts can outperform both American and European Union markets, but it is impossible to highlight any of the markets as they behave almost identically around positive, neutral and negative recommendations.

Welagedara et al. (2016) provide evidence that investors underreact after analysts' recommendation upgrades; however, price reactions are faster after downgrades. They measure individual investors' attention using Google's search volume index. Their findings indicate that, after upgrades, stocks that enjoy greater individual investors' attention underreact significantly more than stocks that receive high level of attention from institutional investors. On the other hand, after recommendation downgrades, stocks with higher levels of prior attention from individual investors overreact and show a significantly greater price reversal than stocks that receive a high level of attention from institutional investors. Their results suggest that attentive individual investors may not be rational.

The analysis in this research attempts to document a possible association between stock returns and Muddy Waters research reports, which differs from predictive power. The analysis investigates whether a minority third-party research company has a significant impact on stock prices. Consistent with Bernard and Thomas (1989), we apply the abnormal return following the event window as a proxy for measuring the market reaction.

Similar to Crawford et al. (2012) and Brochet et al. (2013), this research attempts to examine the effects of information asymmetry disclosed by Muddy Waters Research. It appears that most of the fraud that occurs is due to management taking advantage of the asymmetric information, hence creating agency costs. As noted earlier, Muddy Waters Research examines firms' business and accounting behavior in an attempt to detect fraud and/or fundamental problems.

This research will examine the stock market's reaction of each firm in our sample that has an investigative report issued by Muddy Waters Research. This research will also compare the returns of each U.S. listed firm that is domiciled in the U.S. and investigated by Muddy Waters Research with U.S. listed firms that are not domiciled in the U.S. The analysis will cover three days prior (t -3), and three days after (t +3) the issuance of the investigative report. Several tests will examine the returns to determine whether the returns of the individual firms are abnormal and significant. In addition, holding period returns will be employed for the analysis. To determine the difference between the two independent variables, a market model similar to that in Ziobowski et al. (2004) research. Their model is displayed below.

$$\overline{AR} = \sum_{i=1}^{N} w_i (R_{it} - R_{mt}),$$

The main contribution is to find abnormal returns with the stocks of the firms that are investigated by the Muddy Waters Research Company.

Research Questions and Hypothesis Development

As mentioned earlier, this research attempts to document a possible association between stock returns and Muddy Waters investigative research reports. Consistent with Bernard and Thomas (1989), we apply the abnormal return following the event window as a proxy for measuring the market reaction. Therefore, this research hypothesizes that there is a negative association between stock market returns and the reports issued by Muddy Waters Research.

The key research questions are as follows:

1. Does the market react to the investigative research reports provided by Muddy Waters Research?
2. If so, is the reaction significant?

The key hypotheses are listed below.

H1: The U.S. stock market significantly reacts to investigative due diligent reports issued by the Muddy Waters Research Company.

H2: This analysis predicts that the economic impact of the market's reaction is negative for each individual firm that is analyzed by Muddy Waters Research.

III. Data

The sample of this study includes publicly traded companies listed on any of the U.S. stock market exchanges for which investigative reports were issued from Muddy Waters Research. The data are publicly available; however, this research is limited by the number of reports issued by Muddy Waters Research. A sample size was generated by utilizing the following criteria.

1. The firms must have publicly available stock price data at least three days prior (-3) to the Muddy Waters Research report.
2. The firms must have stock price data available up to three days after (+3) the issuance of the Muddy Waters Research report.
3. All companies that were investigated by Muddy Water Research and are not listed and traded on the U.S. stock exchanges were removed.

The original sample consisted of fifty-two firms that had investigative reports issued against them from the Muddy Waters Research Company. After analyzing the sample to ensure that the information complied with the criteria listed in steps one through three above, the sample size was reduced to thirty firms.

The firm and stock-specific data are collected from the Securities and Exchange Commission, the Center for Research and Security Prices (CRSP), and Compustat. The investigative reports were obtained from the Muddy Waters Research Company. This research utilized the Central Index Key (CIK), Standard Industrial Classification (SIC), and PERMNO for each company to identify and ensure that the correct companies were included in the sample.

The CIK number is a number that is assigned to an individual, company, filing agent or foreign government by the U.S. Securities and Exchange Commission. This is analogous to a U.S. citizen's social security number. A company can change its name; however, the CIK number will remain the same. Consequently, the CIK number is used on the SEC's computer system to identify individual people, corporations, and organizations who have filed disclosures with the SEC, (sec.gov).

The SIC number indicates the type of business the company operates. The SIC is divided by business sector. For example, a company whose operation is metal mining will have a SIC number between 1000 and 1039, (sec.gov). A PERMNO is a unique permanent identification number that is assigned by the Center for Research in Security Prices (CRSP) to all companies listed in the CRSP dataset. The PERMNO serves a similar purpose as the CIK number with the SEC. Table 1 consists of the data sample that meets all the criteria noted in this research.

Table 1 – Data Sample from Muddy Waters Research Reports

#	CIK Number	Company Name	PERMNO	SIC	Ticker	Event Date
1	0001053507	American Tower Corporation	86111	6798	AMT	7/17/2013
2	0001377757	Asanko Gold now Galiono Gold	92536	1400	GAU	5/31/2017
3	0001687542	China Internet Financial Services now Hudson Capital	16877	8742	HUSN	12/20/2017
4	0001399067	China Media Express Holdings	92422	7310	CCME	2/3/2011
5	0001465317	Duoyuan Global Water Inc.	92947	3550	DGW	4/4/2011
6	0001333493	EHealth Inc	91498	6411	EHTH	4/8/2020
7	0001330017	Focus Media Holding LTD	90810	7311	FMCN	11/21/2011
8	0001330017	Focus Media Holding LTD	90810	7311	FMCN	1/24/2013
9	0000710846	Fushi Copperweld	79519	3357	MM	4/3/2012
10	0001768259	GSX Techedu Inc	18743	8200	GSX	5/18/2020
11	0001294133	Inogen Inc	14459	3842	INGN	2/8/2019
12	0001530238	Joyy Inc	13701	7374	YY	11/18/2020
13	0001086888	Manulife Financial Group	87212	6311	MFC	10/4/2018
14	0001372920	New Oriental Ed and Tech	91457	8200	EDU	7/18/2012
15	0001158967	Nidec Corporation	89156	3621	NJDCY	12/13/2016
16	0001509986	NQ Mobile now Link Motion Inc	12746	7372	LKM	10/24/2013
17	0001358190	Orient paper Inc now IT Tech Packaging	93177	2670	ITP	6/28/2010
18	0001039065	OSI Systems Inc	85488	3674	OSIS	12/6/2017
19	0001559053	Prothena Corporation	13706	2834	PRTA	6/29/2017
20	0001394220	Rino International Corporation	79365	3569	RINO	11/10/2010
21	0001287950	Spreadtrum Communications	92103	3674	SPRD	6/28/2011
22	0000203077	St. Jude Medical Inc.	68591	3845	STJ	8/25/2016
23	0001499620	TAL Education Group	90940	8200	TAL	6/18/2018
24	0001169870	TeliaSonera AB	89621	4813	TLSNY	10/15/2015
25	0001691421	Lemonade, Inc.	19497	6331	LMND	5/13/2021
26	0001779020	Danimer Scientific, Inc.	19388	2821	DNMR	9/15/2021
27	0001469367	Sunrun, Inc.	15643	3690	RUN	7/28/2022
28	0001469367	Sunrun, Inc.	15643	3690	RUN	8/3/2022
29	0001333493	EHealth Inc	91498	6411	EHTH	6/2/2020
30	0001294133	Inogen Inc	14459	3842	INGN	2/25/2019

Data source: Created by the authors and derived from the Muddy Waters Research Company and the Securities and Exchange Commission. Table 1 discloses the sample of corporations that were investigated by the Muddy Waters Research Company and traded on one of the U.S. Stock Exchanges. The data were created in MS Excel to include the CIK number, company name, PERMNO, SIC number, stock symbol, and date that the investigative report was issued.

The data were processed utilizing Eventus software to obtain descriptive statistics. The data and descriptive statistics for the market returns are shown in Table 2 and Table 3, respectively. Unfortunately, the Eventus software located twenty-four of the thirty PERMNOS in our population sample. Eventus located that two data sources were not available because the database ended prior to their event dates. Also, three additional data sources ended their data

contribution prior to their event dates. Finally, one data source had its event date issued when the market was closed as it took place on a Saturday. The final results and interpretations include the data that Eventus located and processed.

Table 2 - Muddy Waters Research Data Sample from Eventus

PERMNO	Name on Event Date	Event Date	Estimation Period Returns <=255	Event Period Returns <=7	Reason if No Useable Returns
86111	AMERICAN TOWER CORP NEW A	Wednesday, July 17, 2013	255	7	
16877	CHINA INTERNET NATIONWIDE FIN S	Wednesday, December 20, 2017	48	7	
92422	CHINA MEDIAEXPRESS HLDGS INC	Thursday, February 3, 2011	255	7	
19388	DANIMER SCIENTIFIC INC A	Wednesday, September 15, 2021	255	7	
92947	DUOYUAN GLOBAL WATER INC	Monday, April 4, 2011	255	7	
91498	EHEALTH INC	Wednesday, April 8, 2020	255	7	
91498	EHEALTH INC	Tuesday, June 2, 2020	255	7	
90810	FOCUS MEDIA HOLDING LTD	Monday, November 21, 2011	255	7	
90810	FOCUS MEDIA HOLDING LTD	Thursday, January 24, 2013	255	7	
79519	FUSHI COPPERWELD INC	Tuesday, April 3, 2012	255	7	
18743	G S X TECHEDU INC	Monday, May 18, 2020	193	7	
14459	INOGEN INC	Friday, February 8, 2019	255	7	
14459	INOGEN INC	Monday, February 25, 2019	255	7	
13701	JOYY INC	Wednesday, November 18, 2020	255	7	
19497	LEMONADE INC	Thursday, May 13, 2021	171	7	
87212	MANULIFE FINANCIAL CORP	Thursday, October 4, 2018	255	7	
12746	N Q MOBILE INC A	Thursday, October 24, 2013	255	7	
91457	NEW ORIENTAL EDUC & TECH GP INC	Wednesday, July 18, 2012	255	7	
89156	NIDEC CORP	Tuesday, December 13, 2016	*	*	89156's data end before 20161213
15643	Not checked or unavailable.	Thursday, July 28, 2022	*	*	Database ends on 20211231.
15643	Not checked or unavailable.	Wednesday, August 3, 2022	*	*	Database ends on 20211231.
92536	Asanko Gold now Galiono Gold	Saturday, May 13, 2017	*	*	Market closed on 20170513.
85488	O S I SYSTEMS INC	Wednesday, December 6, 2017	255	7	
93177	ORIENT PAPER INC	Monday, June 28, 2010	85	7	
13706	PROTHENA CORP PLC	Thursday, June 29, 2017	255	7	
79365	RINO INTERNATIONAL CORP	Wednesday, November 10, 2010	255	7	
92103	SPREADTRUM COMMUNICATIONS INC	Tuesday, June 28, 2011	255	7	
68591	ST JUDE MEDICAL INC	Thursday, August 25, 2016	255	7	
90940	TAL INTERNATIONAL GROUP INC	Monday, June 18, 2018	*	*	90940's data end before 20180618
89621	TELIASONERA A B	Thursday, October 15, 2015	*	*	89621's data end before 20151015

Table 2 discloses the sample of corporations that were investigated by the Muddy Waters Research Company and traded on one of the U.S. Stock Exchanges. The data were processed in Eventus to include a description if the event date was unavailable. Source: Created by the authors and derived from the Eventus database (Cowan Research LLC, 2022).

Table 3 – Descriptive Statistics of Data Sample

PERMNO	Event Date	Mean Total Return	% of Raw Returns > 0	Alpha	Beta	Market Model Residuals	Total Return Variance	Residual Standard Deviation	Autocorrelation
86111	17-Jul-13	0.0010	52.94%	0.0005	0.69	50.20%	0.0001	0.0103	-0.0801
16877	20-Dec-17	0.0138	55.27%	0.0113	1.85	31.25%	0.0015	0.0383	0.0579
92422	3-Feb-11	0.0023	48.06%	0.0010	1.36	41.96%	0.0019	0.0410	0.0610
92947	4-Apr-11	-0.0029	44.89%	-0.0039	0.99	50.59%	0.0018	0.0408	-0.0387
91498	8-Apr-20	0.0034	53.90%	0.0026	1.93	49.80%	0.0018	0.0409	0.0411
90810	21-Nov-11	0.0018	53.54%	0.0013	1.28	52.55%	0.0007	0.0221	-0.0328
90810	24-Jan-13	0.0011	51.58%	0.0003	2.02	49.80%	0.0017	0.0381	-0.0907
79519	3-Apr-12	0.0003	46.48%	0.0002	0.96	46.67%	0.0016	0.0372	0.0646
18743	18-May-20	0.0076	57.24%	0.0085	0.76	46.11%	0.0021	0.0445	0.0548
14459	8-Feb-19	0.0011	57.48%	0.0010	1.39	51.76%	0.0009	0.0280	-0.0708
13701	18-Nov-20	0.0021	50.42%	0.0015	0.88	43.92%	0.0016	0.0362	-0.0720
87212	4-Oct-18	-0.0002	50.79%	-0.0007	0.9	49.02%	0.0001	0.0092	-0.1320
91457	18-Jul-12	0.0003	48.83%	0.0003	1.36	54.12%	0.0011	0.0281	-0.0206
12746	24-Oct-13	0.0046	48.82%	0.0032	1.66	45.10%	0.0016	0.0384	0.0772
93177	28-Jun-10	0.0018	53.52%	-0.0036	2.33	47.06%	0.0023	0.0459	-0.0011
85488	6-Dec-17	0.0015	52.76%	0.0007	1.16	47.84%	0.0002	0.0143	-0.0784
13706	29-Jun-17	0.0015	51.58%	-0.0009	3.18	47.84%	0.0015	0.0350	0.0211
79365	10-Nov-10	0.0019	46.48%	0.0001	2.14	44.71%	0.0025	0.0455	0.0446
92103	28-Jun-11	0.0055	53.12%	0.0045	1.5	47.06%	0.0014	0.0341	-0.0661
68591	25-Aug-16	0.0004	51.58%	0.0006	0.9	47.45%	0.0005	0.0201	0.0055
19497	13-May-21	0.0039	47.67%	-0.0016	2.03	47.37%	0.0044	0.0634	0.0426
19388	15-Sep-21	0.0049	51.95%	0.0015	1.71	44.31%	0.0025	0.0477	0.1392
91498	2-Jun-20	0.0042	54.32%	0.0051	1.27	47.45%	0.0023	0.0424	0.0130
14459	25-Feb-19	0.0007	57.08%	0.0011	1.42	51.76%	0.0009	0.0279	-0.0773
Mean		0.0026	0.5168	0.0014	1.4863	0.4732	0.0015	0.0346	-0.0058
Median		0.0018	0.5177	0.0008	1.3750	0.4745	0.0016	0.0377	0.0022

Table 3 shows the descriptive statistics sample of corporations that were investigated by the Muddy Waters Research Company and traded on one of the U.S. Stock Exchanges. Source: Created by the authors derived utilizing the Eventus database (Cowan Research LLC, 2022).

Companies were originally matched based on their CIK according to the Securities and Exchange Commission's (SEC) website (sec.gov). The CIK is a 10-digit number used in the SEC's systems to identify corporations and individuals who have filed disclosures with the SEC (sec.gov). Once, the CIK codes were searched on the SEC website, then the SIC code was obtained. SIC codes are four-digit numerical codes that categorize the industries in which companies belong based on the nature of their business. A firm's PERMNO is a unique permanent identifier for the firm's securities. It is commonly used in the CRSP database to identify stocks.

When gathering and organizing our data, an interesting event took place with some of the firms in the data sample. It appears that some of the companies changed their name throughout the process. However, it is not clear if the investigation from the Muddy Waters Research report is the cause of the name change. An example based on a screenshot from the SEC's Electronic Data Gathering Electronic Retrieval system (EDGAR) is shown in Figure 1. EDGAR is the primary system for companies and others for submitting documents to the SEC under the Securities Act of 1933, the Securities Exchange Act of 1934, the Trust Indenture Act of 1939, and the Investment Company Act of 1940 (sec.gov).

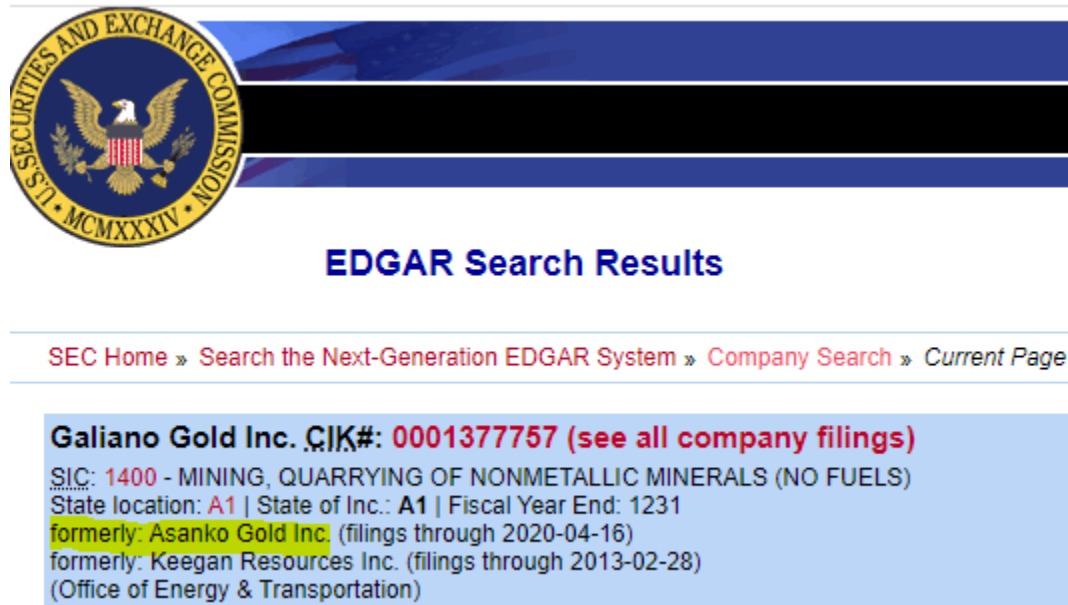**Figure 1 – Disclosure of Company Name Change**

Figure 1 discloses an example of a company name change that is included in the sample. This disclosure conveys that a company can change its name; however, its CIK number will remain the same. The example in Figure 1 discloses that Galiano Gold Inc. had two prior names. Data source: Securities and Exchange Commission

The example in Figure 1 discloses that one of our sample companies, Asanko Gold Incorporated, changed its name to Galiano Gold Incorporated. These companies are located based on their CIK and SIC codes. This is to ensure that the correct companies are included in our sample. This could also explain why our sample size was reduced from thirty to twenty-four observations.

Once the CIK and the SIC codes were verified and confirmed, the PERMNOs were utilized to pursue the event study. Eventus is the source for analyzing the event study.

IV. Methodology, Analysis and Results

Methodology

The data were analyzed in a variety of steps. Excel, WRDS, CRSP and Eventus were employed to analyze the data. The sample data were imported into Excel for cleaning and organizing. We subsequently entered the cleaned data into WRDS and CRSP to obtain the PERMNOs. Finally, the coded and cleaned data were uploaded into Eventus to process the data

through the model indicated in Equation 1 to generate the empirical results. The results include both the descriptive statistics and regression results for the event study.

The average abnormal return is calculated utilizing Equation 1 below.

Equation (1) $\quad AAR_{j,t} = \dfrac{\Sigma j,t\; [Rj,t - (\alpha j + \beta j Rmt + \varepsilon j,t)]}{n}$

where: $R_{j,t} = \alpha_j\; + \beta_j R_{mt} + \varepsilon_{j,t}$

therefore, $\varepsilon_{j,t} = R_{j,t} - (\alpha_j + \beta_j R_{mt}\,)$

AAR_{jt} = Average Abnormal return for firm j, day t
R_{jt} = Raw return for firm j, day t
R_{mt} = Equally weighted mean return for day t on the U.S. stock exchange index firm decile that firm j is a member.
α = Y-intercept
β = Regression coefficient
ε = Excess returns (error term)
n = Number of firms in the sample

The results should address the research questions and hypotheses. The following tests are used to examine the abnormal return data in the sample.

1. Portfolio Time-Series (CDA) t – statistic Test
2. Uncorrected Patell Z Test
3. Rank Test (RANKTEST)
4. Jack Knife (JACKNIFE)

In addition, both the mean abnormal and the mean compound abnormal returns will be calculated and included in this research. They are categorized in the following manner.

1. Market Adjusted Returns – Equally Weighted Index
2. Market Model Abnormal Returns – Equally Weighted Index

Finally, parametric statistics are repeated with the bootstrap p-values for the two return categories listed above. The results are displayed below.

Analysis and Results

Panel A of Table 4 discloses the mean abnormal return for the market adjusted returns, equally weighted index. The results in Table 4 indicate that when utilizing the Portfolio Time-Series t-statistic test and the uncorrected Patell Z test, we find that the three days leading up to the event (-3, -2, -1), are all negative and significant. Additionally, the day of the event (day 0); indicates a significant negative return that is greater in magnitude. The results convey that the stock market reacted negatively up to three days prior to the investigative report issued by Muddy Waters. However, on the day that the investigative report was issued, the market's

negative response increased in magnitude and significance. However, an interesting find is that the day after the report, (+1), the returns the Portfolio Time-Series test is significant and insignificant for the Patell Z.

Table 4 – Market Adjusted Returns and Market Model Mean Abnormal Returns, Equally Weighted Index

Day	N	Mean Abnormal Return	Positive: Negative	Portfolio Time-Series (CDA) t	P-value	Uncorrected Patell Z	P-value
Panel A							
-3	24	-2.30% ***	6:18<	-3.04	0.0024	-2.81	0.005
-2	24	-1.53% **	7:17<	-2.029	0.0425	-2.469	0.0136
-1	24	-3.88% ***	8:16(	-5.131	<.0001	-5.187	<.0001
0	24	-12.6% ***	3:21<<<	-16.675	<.0001	-21.167	<.0001
1	24	2.21% ***	15:09	2.92	0.0035	4.055	<.0001
2	24	-1.59% **	12:12	-2.11	0.0349	-1.322	0.1861
3	24	-0.78%	12:12	-1.03	0.3032	-0.757	0.4491
Panel B							
-3	24	-2.39% ***	5:19<<	-3.173	0.0015	-2.974	0.0029
-2	24	-1.82%	8:16	-2.425	0.0153	-2.802	0.0051
-1	24	-4.03%	7:17(	-5.358	<.0001	-5.448	<.0001
0	24	-12.88%	5:19<<	-17.123	<.0001	-21.498	<.0001
1	24	1.95%	14:10	2.593	0.0095	3.741	0.0002
2	24	-1.68%	11:13	-2.227	0.0259	-1.442	0.1493
3	24	-0.92%	12:12	-1.225	0.2207	-0.937	0.3488

Table 4 shows the mean abnormal market adjusted returns and mean abnormal market model returns are both equally weighted beginning three days prior to the event and ending 3 days after the event. The symbols (, <, <<, <<<, or), >, >>, >>> show the direction and significance of a generic one-tail generalized sign test at the 0.10, .005, 0.01, and 0.001 levels, respectively. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Source: Created by the authors using the Eventus database (Cowan Research LLC, 2022).

Panel B of Table 4 discloses the mean abnormal return for the market model abnormal returns, equally weighted index. Table 4 also indicates that when utilizing the Portfolio Time-Series t-statistic test and the uncorrected Patell Z test, the results reveal that the three days leading up to the event (-3, -2, -1), are all negative and significant at least at the five percent level. Additionally, the day of the event (day 0), indicates a significant negative return that has a largest magnitude of the three prior days. The day after the report, (+1), the return is significant; but positive. This is interpreted as the market recovering after the cumulated significant loss on the four prior days. However, the recovery's magnitude is not as large as the day of the event.

Panel A of Table 5 discloses the mean compound abnormal return for the market adjusted returns, equally weighted index. The results in Panel A of Table 5 are similar to those shown in Table 4. Table 5 shows that when utilizing the Portfolio Time-Series t-statistic test, three days leading up to the event (-3, -2, -1) and including the event (0), the results are negative and

significant. However, an interesting find is that the three days after the report, (+1, +2, +3), the returns are insignificant.

Table 5 – Market Adjusted and Market Model Mean Compounded Abnormal Return, Equally Weighted

Days	N	Mean Abnormal Compound Return	Precision Weighted CAAR	Positive: Negative	Portfolio Time-Series (CDA) t	P-value
Panel A						
(-3,0)	24	-18.92%	-16.79%	2:22<<<	-12.519	<.0001
(+1,+3)	24	0.29%	1.42%	13:11	0.218	0.8271
Panel B						
(-3,0)	24	-19.75%	-17.42%	2:22<<<	-13.126	<.0001
(+1,+3)	24	-0.21%	1.07%	12:12	-0.158	0.8746

Table 5 discloses the mean compound abnormal market adjusted Market Model returns, both are equally weighted beginning on three days prior to the event and ending 3 days after the event. The symbols (, <, <<, <<<, or), >, >>, >>> show the direction and significance of a generic one-tail generalized sign test at the 0.10, .005, 0.01, and 0.001 levels, respectively. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Source: Created by the authors utilizing the Eventus database (Cowan Research LLC, 2022).

Panel B of Table 5 discloses the mean compound abnormal return for the market model abnormal returns, equally weighted index. The results in the bottom half of Table 5 are similar to those indicated in the top half of Table 5. As with the market adjusted abnormal returns, the market model abnormal returns also indicate that when utilizing the Portfolio Time-Series t-statistic test, it is found that the three days leading up to the event are all negative and significant. This includes the day of the event (day 0), which indicates a significant negative return. Similar to Panel A, the three days after the report is issued, (+1, +2, +3), the returns are insignificant.

Finally, Table 6 discloses the market model cumulative abnormal returns for the equally weighted index. The pattern remains similar, as the results in Table 9 are similar to those indicated in table 5. When utilizing the Uncorrected Patell Z test, Rank Test and the Jackknife Test, the results convey that the three days leading up to the event and including the event (-3, -2, -1, 0) are all negative and at the one percent level. In addition, and consistent with Table 5, for the three days after the event (+1, +2, +3), the returns are insignificant.

Table 6 – Market Model Cumulative Abnormal Returns, Equally Weighted Index

Days	Uncorrected Patell Z	p-value	Rank Test Z	p-value	Jackknife Z	p-value
(-3,0)	-16.371***	<.0001	-5.813	<.0001	-3.516	0.0004
(+1,+3)	0.796	0.4261	0.477	0.6337	0.181	0.8565

Table 6 discloses the mean cumulative abnormal market model returns and is equally weighted beginning on three days prior to the event and ending 3 days after the event. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Source: Created by the authors using the Eventus database (Cowan Research LLC, 2022).

To present further insight into the abnormal returns, a comparison was made with U.S. firms and non-U.S. firms. The purpose of this approach is to determine the effects of each factor separately to determine magnitude and significance. Table 7 shows the results for both U.S. firms and non-U.S. firms utilizing the Portfolio Time-Series t-statistic test and the uncorrected Patell Z test. The results show that two days leading up to the event (-2, -1) are negative and significant for U.S. firms. Additionally, the day of the event (day 0), indicates a strong significant negative return relative to the previous two days. Significant returns continue two days after the event. However, on the first day after the event, (+1), the return is positive, and on the following day, (+2) is negative.

The results for the non-U.S. firms listed in Table 7 convey a greater magnitude. The results show that three days leading up to the event (-3, -2, -1) are all negative and significant for non-U.S. firms. Additionally, the day of the event (day 0); indicates a strong significant negative return relative to the previous three days. Significant returns continue one day after the event. However, on the first day after the event, (+1), the return is positive, and on the following two days (+2, +3), the returns are insignificant.

Table 7 – Market Adjusted Returns, Equally Weighted Index – U.S. Firms and Non-U.S. Firms

United States Firms

Day	N	Mean Abnormal Return	Postive: Negative	Portfolio Time-Series (CDA) t	p-value	Uncorrected Patell Z	p-value
-3	12	-1.01%	4:08	-1.01	0.3124	-1.004	0.3156
-2	12	-1.69%	4:08	-1.689	0.0911	-2.254	0.0242
-1	12	-2.40%	4:08	-2.404	0.0162	-1.972	0.0486
0	12	-4.00%	3:09	-4.000	<.0001	-7.954	<.0001
1	12	1.87%	9:3)	1.865	0.0621	2.364	0.0181
2	12	-3.06%	5:07	-3.055	0.0023	-2.587	0.0097
3	12	-0.87%	6:06	-0.868	0.3854	-1.518	0.129

Non United States Firms

Day	N	Mean Abnormal Return	Postive: Negative	Portfolio Time-Series (CDA) t	p-value	Uncorrected Patell Z	p-value
-3	14	-2.70%	3:11<	-2.648	0.0081	-2.486	0.0129
-2	14	-2.35%	3:11<	-2.302	0.0213	-2.172	0.0298
-1	14	-4.28%	6:08	-4.193	<.0001	-4.786	<.0001
0	14	-16.98%	1:13<<	-16.622	<.0001	-19.32	<.0001
1	14	2.13%	8:06	2.088	0.0368	3.094	0.002
2	14	-0.56%	8:06	-0.546	0.5853	0.245	0.8067
3	14	-0.59%	8:06	-0.58	0.562	0.388	0.6977

Table 7 discloses the mean abnormal market adjusted returns for U.S. and non-U.S. firms on an equally weighted index separately beginning three days prior to the event and ending 3 days after the event, respectfully. The symbols (, <, <<, <<<, or), >, >>, >>> show the direction and significance of a generic one-tail generalized sign test at the

0.10, .005, 0.01, and 0.001 levels, respectively. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Source: Created by the authors using the Eventus database (Cowan Research LLC, 2022).

Table 7 discloses that the impact of non-U.S. firms is greater in magnitude up to three days prior to the event and the magnitude is greatest on the actual event day relative to U.S. firms.

As a robustness check, a 30-day study was performed. The 30-day study includes analyzing stock returns fifteen days prior (-15) to the event, the day of the event (0), and fifteen days after the event (+15). The results are disclosed in Table 8 which utilizes the Portfolio Time-Series t-statistic test and the uncorrected Patell Z test.

Table 8 - Market Adjusted Returns, Equally Weighted Index - U.S. Firms and Non U.S. Firms

Day	N	Mean Abnormal Return	Positive: Negative	Portfolio Time-Series (CDA) t	p-value	Uncorrected Patell Z	p-value
-15	26	1.36%	17:09	1.778	0.0753	1.916	0.0554
-14	26	0.80%	14:12	1.052	0.2926	0.779	0.4361
-13	26	-0.69%	12:14	-0.899	0.3684	-0.913	0.3613
-12	26	-0.31%	12:14	-0.411	0.6808	-1.008	0.3133
-11	26	0.22%	13:13	0.282	0.7778	0.645	0.5192
-10	26	0.00%	10:16	0.002	0.9985	-0.11	0.9127
-9	26	-0.24%	12:14	-0.318	0.7507	-0.597	0.5503
-8	26	-1.04%	9:17	-1.362	0.1733	-1.748	0.0805
-7	26	-0.59%	8:18(	-0.777	0.4374	-0.997	0.3186
-6	26	-1.87%	10:16	-2.45	0.0143	-2.279	0.0226
-5	26	1.00%	12:14	1.315	0.1884	1.697	0.0896
-4	26	0.55%	10:16	0.716	0.4742	0.848	0.3966
-3	26	-1.98%	7:19<	-2.596	0.0094	-2.532	0.0114
-2	26	-1.87%	7:19<	-2.448	0.0144	-2.905	0.0037
-1	26	-3.29%	10:16	-4.314	<.0001	-4.640	<.0001
0	26	-10.63%	4:22<<<	-13.941	<.0001	-19.158	<.0001
+1	26	2.35%	17:09	3.088	0.002	4.27	<.0001
+2	26	-1.61%	13:13	-2.115	0.0344	-1.435	0.1513
+3	26	-0.54%	14:12	-0.705	0.481	-0.514	0.6074
+4	26	1.28%	15:11	1.684	0.0922	0.846	0.3978
+5	26	0.20%	13:13	0.269	0.7881	-0.253	0.8003
+6	26	-0.55%	10:15	-0.728	0.4669	-1.134	0.2568
+7	26	0.65%	17:8)	0.849	0.3957	0.641	0.5213
+8	26	-0.48%	13:12	-0.632	0.5274	-0.795	0.4268
+9	26	1.26%	14:11	1.657	0.0976	2.046	0.0408
+10	26	0.36%	10:15	0.473	0.6361	-0.223	0.8239

+11	26	0.61%	15:10	0.799	0.4245	1.413	0.1575
+12	26	-0.89%	13:11	-1.164	0.2443	-1.53	0.126
+13	26	0.14%	15:09	0.187	0.8518	0.382	0.7026
+14	26	-1.56%	6:18<	-2.051	0.0403	-2.411	0.0159
+15	26	-0.71%	7:17<	-0.932	0.3514	-1.314	0.1889

Table 8 discloses the mean abnormal market adjusted returns for U.S. and non-U.S. firms on an equally weighted index beginning three days prior to the event and ending 3 days after the event. The symbols (, <, <<, <<<, or), >, >>, >>> show the direction and significance of a generic one-tail generalized sign test at the 0.10, .005, 0.01, and 0.001 levels, respectively. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Source: Created by the authors using the Eventus database (Cowan Research LLC, 2022).

Table 8 shows significant abnormal returns for the Portfolio Time-Series and Patell Z tests fifteen (-15) and six days (-6) prior to the event date. However, fifteen days (-15) prior to the event date, the impact is positive. In addition, six days (-6) before the event date, the impact is negative. It remains that on the actual event day; (day 0), the abnormal return is significant and has the strongest magnitude. As a result, our results convey that the investigative reports issued by the Muddy Waters Research Company have a significant impact on stock returns.

To further disclose the impact of the results, a buy and hold strategy is illustrated for the returns of four companies that are included in the sample. The four companies are China Internet Nationwide Financial Services, China Media Express Holdings, Duoyuan Global Water, and Focus Media Group. The results are presented in the Appendix.

V. Conclusion

Interpretations and Conclusions

In summary, our study reveals that the U.S. stock market responds unfavorably to investigative research reports released by the Muddy Waters Research Company. Notably, the market appears to anticipate these reports, showing significant negative returns up to three days before the report is issued. The day following the report, the mean abnormal return tends to be positive, though with a much smaller absolute magnitude relative to the preceding negative mean abnormal returns. Based on our evidence, we cannot reject hypotheses one and two, and we conclude that the market indeed reacts to independent investigative research reports, with a consistent negative impact.

Future Research

The limited number of available reports has constrained the sample size in existing research. Additional research could explore the impact of future reports disseminated by the Muddy Waters Research Company. Furthermore, investigating the effects of these research reports in other countries is an avenue for future study. Currently, the research is restricted to companies listed and traded on at least one of the U.S. stock exchanges. Notably, there are investigative reports on European companies traded on European exchanges, as well as Chinese companies traded on Chinese exchanges. Future research could compare the effects across these

country-specific exchanges with results from U.S. exchanges, aiming to identify any potential differences.

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Appendix

In reference to China Internet Nationwide Financial Services, Muddy Waters Research investigative report disclosed that the company overstated their revenue by at least five times their actual amount and the report states that the company does not have the number of customers that it initially claims. The results of the buy and hold strategy that includes the event is conveyed in Table 10.

Table 10 – China Internet Nationwide Financial Services

PERMNO	=	16877	
Event Date	=	Wednesday, December 20, 2017	
		Uncorrected	
Day	Abnormal Return	Patell Z	p-value
-3	-10.92%***	-2.822	0.007
-2	-3.35%	-0.866	0.3907
-1	-8.21%**	-2.121	0.0393
0	8.95%**	2.314	0.0252
1	1.02%	0.263	0.7937
2	0.55%	0.143	0.8869
3	-0.13%	-0.033	0.9736

Table 10 discloses the mean compound abnormal market adjusted returns for China Internet Nationwide Financial Services beginning three days prior to the event and ending 3 days after the event. *, **, *** indicates significance at the 10%, 5%, 1% levels, respectively. Source: Created by authors derived from the Eventus database (Cowan Research LLC, 2022).

According to Muddy Waters Research, there was a pump and dump scheme on China Media Express Holdings' stock. The results of the buy and hold strategy that includes the event is conveyed in Table 11.

Table 11 – China Media Express Holdings

Day	PERMNO	=	92422	
	Event Date	=	Thursday, February 3, 2011	
			Uncorrected	
	Abnormal		Patell	
Day	Return		Z	p-value
-3	-15.00% ***		-3.654	0.0003
-2	-8.09% **		-1.971	0.0498
-1	-0.24%		-0.06	0.9525
0	-33.43% ***		-8.144	<.0001
1	25.12% ***		6.119	<.0001
2	-6.07%		-1.478	0.1406
3	3.86%		0.942	0.3473

Table 11 discloses the mean compound abnormal market adjusted returns for China Media Express Holdings beginning three days prior to the event and ending 3 days after the event. *, **, *** indicates significance at the 10%, 5%, 1% levels, respectively. Source: Created by authors derived from the Eventus database (Cowan Research LLC, 2022).

Muddy Waters Research disclosed an overstatement of revenues in Duoyuan Global Water's financial statements. The results of the buy and hold strategy that includes the event is conveyed in Table 12.

Table 12 – Duoyuan Global Water Incorporated

Day	PERMNO	=	92947	
	Event Date	=	Monday, April 4, 2011	
			Uncorrected	
	Abnormal		Patell	
Day	Return		Z	p-value
-3	-3.87%		-0.947	0.3448
-2	-4.37%		-1.07	0.2858
-1	-9.31% **		-2.276	0.0237
0	-27.42% ***		-6.705	<.0001
1	-19.74% ***		-4.828	<.0001
2	0.98%		0.24	0.8104
3	8.87% **		2.168	0.0311

Table 12 discloses the mean compound abnormal market adjusted returns for Duoyuan Global Water Incorporated beginning three days prior to the event and ending 3 days after the event. *, **, *** indicates significance at the 10%, 5%, 1% levels, respectively. Source: Created by authors derived from the Eventus database (Cowan Research LLC, 2022).

Most severely, Muddy Waters stated Focus Media Holding had significant overstatement of the number of screens in its LCD network and it has Olympus-style acquisition overpayments. Muddy Waters also claims that insiders have used Focus Media as their counterparty in trading

in and out of Focus Media's subsidiary, a company entitled Allyes. The report mentions that this caused several insider individuals to earn at least $70.1 million, while shareholders lost $159.6 million. Consequently, the results of the buy and hold strategy that includes the event is conveyed in Table 13.

Table 13 – Focus Media Holding

PERMNO	=	90810
Event Date	=	Monday, November 21, 2011

Day	Abnormal Return	Uncorrected Patell Z	p-value
-3	-2.03%	-0.918	0.3594
-2	0.22%	0.099	0.9215
-1	0.77%	0.35	0.7266
0	-37.58%***	-16.99	<.0001
1	15.20%***	6.871	<.0001
2	1.75%	0.791	0.4297
3	1.00%	0.453	0.6509

Table 13 discloses the mean compound abnormal market adjusted returns for Focus Media Holding beginning three days prior to the event and ending 3 days after the event. *, **, *** indicates significance at the 10%, 5%, 1% levels, respectively. Source: Created by authors derived from the Eventus database (Cowan Research LLC, 2022).