American Effect on Chinese Control of African Cobalt: An Event Study of U.S. - African Leaders' Summit Effect on Chinese owned Cobalt Securities

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ABSTRACT

Cobalt is becoming the most important metal in the world due to its use in electric vehicles, phones and computers. This creates large competition between the United States and China for cobalt. China has dominated this commodity due to infrastructure policies in African countries; America's political strategy to regain momentum has focused on hosting the U.S./African Leaders' Summit. This study uses an event study methodology to analyze the U.S./African Leaders' Summit and its effects on CMOC Group Limited and Zhejiang Huayou Cobalt on the Shanghai Stock Exchange, Nanjing Hanrui Cobalt and Guangdong Dowstone Tech on the Shenzhen Stock Exchange, and Jinchuan Group and China Railway Group Limited on the Hong Kong Stock Exchange. The summit was found to have a minimal effect on these stocks at the 95% confidence level, but not enough to imply cause.

Introduction

Cobalt is one of the most important metals in the world today. The emerging clean energy market along with phones and computers has created a massive demand for this metal. High demand leaves developed countries scrambling to obtain this mineral which is found almost exclusively in the Democratic Republic of the Congo (DRC) (Gulley, 2022). However, China has already dominated the cobalt competition due to its economic focus on Africa. This does not mean developed countries are out of the race. America, along with other developed countries, are now trying to access cobalt stores in Africa. America even created its own cobalt plant in Idaho state so they would not have to rely on Chinese cobalt, but it is not enough (Siegler & Whitney,2022).

Cobalt use shows no sign of slowing down, which is a good sign for investors looking to make money off the competition. However, as competition grows the companies that dominate now could lose much of their profit or control, often resulting in a loss on investment. Competing countries, mainly the United States of America (U.S.) are utilizing political strategies such as political summits to build partnerships with African countries including the DRC to possibly move them away from partnering with China. Understanding the effect that political summits used by the U.S. to gain control in the DRC cobalt mining industry have on Chinese-owned cobalt companies is extremely valuable for investors both cooperate and personal.

Literature Review

Global Demand for Cobalt

Cobalt has become an imperative material for development within the modern world. A largely unused metal commonly utilized as a dye in premodern societies, it is now a key component in the world of electronics and Chinese

exports. Simple cobalt demand increased 200% between 2005 and 2013 (Zeng & Liu, 2015). A 200% increase in demand in only eight years is evidence of a massively growing cobalt market. One example of its use is in the cobalt-containing iPhone that was announced in 2007 and uses cobalt from Chinese refineries. Refined cobalt is the most important form of cobalt because of its use in technology such as the previously mentioned iPhone along with electric car batteries, semiconductors, and many more useful commodities. China's refined cobalt production in 2016 was thirty-four times that of 2000 levels (Gulley et al, 2019). China massively dominates the cobalt refining industry. The drastic increase of refining further makes clear the importance China has placed on cobalt to manufacture their largest exports which are Computers ($192B), Integrated Circuits ($158B), and Telephones ($53.9B) (OEC,2021).The three largest exports in China's economy utilize cobalt with these systems being a part of a 403.9 billion dollar business for China and an even larger business for the large multinational corporations who utilize these Chinese exports such as Apple, Dell, and Microsoft among more equal and smaller sized businesses. The emergence of electric vehicles also brings yet another emerging industry that requires cobalt produced in China. A report by Prachi Patel estimates that ten million electric vehicle sales in 2025 means the demand for cobalt that year could reach 330,000 metric tons (Patel, 2017). Electric vehicles add a third dimension to the world of cobalt. Zheng observed a 200% increase in demand between 2005 and 2013 in an environmental climate that hadn't yet developed such a high demand for electric vehicles.

Infrastructure Policies and American Response

The dire need China has for cobalt requires a lucrative strategy to source the coveted metal. China has found such a method by strategically providing infrastructure and foreign direct investment into African countries in exchange for mining rights and materials. The most well-known example of Chinese infrastructure policies is the Belt and Road Initiative (BRI). Announced in 2013, the Belt and Road Initiative is inspired by and mirrors the ancient silk road trading route which connected Europe, Asia, and Africa. This initiative builds railroads, ports, roadways, energy pipelines, and electricity among other key aspects of infrastructure that allow countries to better participate in global trade and commerce at large. Another important infrastructure deal that specifically relates to cobalt is a 2009 deal between the Congolese government and China Railway Engineering Corporation (CREC) where CREC would provide the DRC with China Export-Import (EXIM) Bank financed infrastructure (road, railway, and mining infrastructure) valued at 9 billion U.S. Dollars in exchange for mining rights in the Katanga province(Malm,2014). The Democratic Republic of the Congo is home to the largest cobalt mines in the world and 70% of the world's cobalt mining production (Gulley,2022) with the Katanga province being a large mining area within the DRC. This makes clear that natural resources are a large component of Chinese infrastructure policies. However, China has yet to explicitly state its interest in foreign natural resources. A paper by Michael Dunford and Weidong Liu compiled documents and interviews with Chairman Xi Jin Ping and other spokesmen of China to establish the Chinese perspective of the initiative. They found when it comes to public words China presents its infrastructure policies as a unanimously symbiotic policy(Dunford & Liu,2019). However, many American experts have their criticisms, such as Dan Blumenthal who explains that "The Chinese Communist Party's long-term strategic objective is to displace the United States as the world's most powerful country and create a new world order favorable to China's authoritarian brand of politics, or its "socialist market economy.".".(Stein & Udhammar,2021). Blumenthal's view of the matter, albeit extreme, is an accurate representation of America's perception of Chinese foreign infrastructure policies. At a hearing before the United States Senate Subcommittee on African Affairs of the Committee of Foreign Relations Thomas J. Christensen, and his colleague, Jim Swan, gave testimony on Chinese engagement in Africa. The overall objectives they identified were to secure natural resources to support their economy, and to increase global power (Christensen et al,2008). Although Christensen's testimony is without the threat of a total communist takeover, he and Blumenthal both come to the consensus that America should be concerned with Chinese activity due to foreseen attempts of obtaining increased global power and control of natural resources. America has made various attempts to stray away from Chinese cobalt dependence and encourage African countries to partner with them as opposed to China. America recently built

its cobalt mine in Idaho in 2022 but it is not expected to provide enough supply to meet the requirements of American companies (Siegler & Whitney,2022). It is, however, seen as a valuable step away from China. America also hosted the African Leaders Summit, a three-day summit centered around building relationships and trade deals with African countries. The DRC and cobalt were of particular interest within the summit due to Joe Biden's push for electric vehicles (Wong & Crowley,2022). Therefore, as America pushes against Chinese cobalt, it is extremely valuable to research how this affects Chinese owed cobalt companies.

Political Summits and Stock Markets

Numerous studies have analyzed the effect political summits have on stock markets. Analysis of the North-Korea and U.S. Summits effect on the South Korean stock market. It was found that South Korean sectors were substantially affected by summit talks. The summit was called off then called back on with both events causing significant volatility across the South Korean market. This is believed to be due to the possible threat of military conflict which would involve South Korea. (Pham et al, 2019) This study demonstrates that stock markets of a country can be affected even when they are not directly a part of the summit. However not all summits impact the market directly. An event study analyzing the COP15 summit which aimed to mitigate climate change through political policy and its effect on Chinese and American coal and solar stocks. In the study it was found that the summit had no discernable effect on Chinese or American coal and solar securities. (Dahlstrom & Winstedt, 2017) Although Phams study and Dahlstroms study both analyze distinct types of summits, they demonstrate that political summits can have significant and insignificant affects on the stock markets. Another event study analyzed the 2021 Leaders' Climate Summit and its effect on the S&P 500 Kensho Electric Vehicles Index and the S&P 500 Kensho Clean Power Index. In this study it was found that there was an effect on these two indices during this event at a 95% confidence level, however it was not enough to imply cause and needed further research (Zhao et al, 2022) Overall, political summits can have mixed effects on stock markets and minimal effects on natural resource stocks.

Gap

Although surrounding literature suggests that political summits do not have a discernible effect on stock markets, Chinese cobalt companies are anticipated to be different. The unique situation of cobalt where it is largely concentrated in the DRC with control by China is different from the situation of coal, solar, electric vehicles, and clean power analyzed in other scholarly works. This situation could mean any attempt at challenging China's control has major potential to affect these cobalt companies which makes it valuable to research and understand the affects summits have on the cobalt landscape. For this reason, it is hypothesized that the U.S. African Leaders Summit will negatively affect Chinese owned cobalt stocks. Finally, after reviewing surrounding literature and establishing a gap within it, a research question is reached which is how did the deals and policies reached in the U.S. African Leaders Summit affect Chinese owned cobalt stocks across the Shanghai, Shenzhen, and Honk Kong Stock Exchanges?

Methodology

Dates and Organization

In this study an event study approach was utilized. Event studies are a tool used to measure stock reactions to a certain event and is based on the efficient market hypothesis which theorizes that stock prices reflect all publicly available information (NASDAQ). All event studies require timelines including a pre-event period, event period, and post event period (Armitage, 1995). The pre-event period for this study is ten trading days before December 13th. A trading day is Monday-Friday because stock exchanges do not trade on weekends. The event period is December 13th – 15th which

are the three days the summit takes place. The post-event period is ten trading days after December 15th. Pre and post event period timelines are utilized to calculate alpha and beta values within the equations that will be mentioned later however are not significant values in terms of results. Since this study is considered a short horizon study, risk nor natural volatility of stock prices need to be accounted for on the account that the event period is so short that deviations due to natural volatility are not applicable (Khotari & Warner,2006). The study is organized and conducted in Microsoft Excel. Historical stock prices are sourced from Yahoo Finance because it is free and equivalent to databases such as the Center for Research in Security Prices (CRSP).

Securities and indices

China has three main stock exchange, the Shanghai, Shenzhen, and Hong Kong Stock Exchanges. The criteria for stocks to be analyzed is, be Chinese owned, traded on one of the three Chinese stock exchanges and be involved with the cobalt mining industry within the Democratic Republic of the Congo. After applying these criteria six stocks across the three exchanges met the criteria. The stocks analyzed on the Shanghai Stock Exchange will be CMOC Group Limited and Zhejiang Huayou with the SSE Composite Index as the market proxy. Indices are useful for equations and an index is a compilation of stocks in a given market. Nanjing Hanrui Cobalt and Guangdong Dowstone Tech will be analyzed on the Shenzhen Exchange with the SZSE Component B Index as the market proxy. Finally, China Railway Group Limited and Jinchuan Group will be analyzed on the Hong Kong Exchange with the Hang Seng Index as the market proxy.

Equations

Daily returns, which are often expressed as percentages, measure how much a stock gained or lost across a specific period. The study measures daily returns using the equation $\ln(\frac{P_2}{P_1})$. where P_2 is the adjusted close price of the stock on a given day. Adjusted close is used instead of the actual close, because adjusted close considers after-market trading, providing a more accurate close than the hard close. P_1 represents the open price of the stock on a given day. Expected returns are the mathematical expectation of what a stock will return. For the expected and abnormal returns the market model is utilized which is advertised as the most widely used method to measure expected and abnormal returns. The equation used to calculate the expected returns for the stocks analyzed and the indices within the study will be calculated with the formula $R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$ (Armitage,1995). Where R_{it} is the expected return of the security, α_i and β_i are the respective intercept and slope of a security against the market proxy. R_{mt} is the return of the market proxy on a given day. e_{it} is the error term which has an expected value of zero therefore is irrelevant in terms of this study (Corrado,2011). Abnormal returns are the difference between the expected and realized returns (daily returns). The formula used to calculate abnormal returns is $AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$. All variables in the expected returns equation have the same definition in the abnormal returns equation. For this information to be rationalized it must pass through a statistical significance test which is calculated by dividing the abnormal return value by the standard error. If the quotient is higher than an absolute value of 1.96 then the results are statistically significant at the 5% level. Meaning the abnormality of the stock has a 5% chance of being caused by random chance or natural volatility (Van Dalsem,2015).

Shanghai Stock Exchange
CMOC Group Limited

Date	Return	AR-Value	CAR-Value	α-Value	β-Value	Significance Test	R-Square
11/29/2022	3.68	0.32					
11/30/2022	-1.07	-1.82					
12/1/2022	0.21	1.37					
12/2/2022	-1.49	-1.39					
12/5/2022	2.52	0.62					
12/6/2022	0.62	-0.25					
12/7/2022	-0.21	-0.06					
12/8/2022	0.21	-0.03					
12/9/2022	4.70	3.97					
12/12/2022	-1.62	-0.80					
12/13/2022	1.22	1.24	1.24			0.96775	
12/14/2022	-1.22	-1.26	-0.02	0.162041	1.857492	0.98667	0.528242
12/15/2022	-0.82	-0.49	-0.51			0.37972	
12/16/2022	0.42	-0.43					
12/19/2022	-2.95	0.33					
12/20/2022	-0.43	0.92					
12/21/2022	-1.08	-0.64					
12/22/2022	-2.40	-0.66					
12/23/2022	0.88	0.29					
12/26/2022	-0.44	-1.66					
12/27/2022	1.31	0.07					
12/28/2022	1.30	1.21					
12/29/2022	-0.87	-0.85					

Findings

As seen in Table 1, an initial R-Square test which tests for correlation between the index and the individual security yielded a value of 0.528, which is moderate correlation. The R-Square essentially demonstrates low connection between the event and stock market changes. CMOC at face value was a moderately volatile stock with daily returns often ending up over 1% in both positives and negatives. A beta(β) value of 1.857 would prove a moderate to high level of volatility when compared to the beta value of the SSE Index which was 0.284. However, the alpha(α) value of 0.162 indicates that CMOC is in line with and even a bit better than the index in terms of performance. This means that although volatility is much higher than the index, when it comes to daily returns and performance, they are similar. The Cumulative Abnormal Return (CAR) value of -0.51 during the event period shows little difference between expected returns and realized returns during the summit. This has multiple meanings. One is that the volatility of CMOC was not unexpected therefore before further testing there was a low chance of significance. However, it is not a determining factor of significance, it is simply an indicator. Another is that expected returns were more optimistic than realized returns. This is in line with the hypothesis that returns would fall due to the summit, but the difference was not large enough. Finally, the significance test quotients did not come close to the desired |1.96| therefore no statistical significance at the 5% level across the entire event period for CMOC Group Limited is evident.

An initial R-Square yielded a value of 0.000981, an extremely low correlation between Zhejiang Huayou Cobalt and the SSE Index. A low R-Square value such as this means any results are heavily questioned due to the low correlation. A beta value of 0.079 indicates very low volatility as compared with the index. An α value of -0.435 demonstrates that Zhejiang is mostly in line but lags a slight amount behind the index in terms of daily returns and performance. The CAR value of 0.98 demonstrates a larger but still very small difference between the expected and realized returns, indicating low probability of significance. This value differs from CMOC because it is positive, positive values were unexpected due to Chinese companies seemingly being in no position to benefit from this summit however Zhejiang's stock was able to benefit. The significance test values did not reach the desired value of |1.96| therefore no statistical significance at the 5% level is evident across the event period for Zhejiang Huayou Cobalt. However, on the final day of the summit on December 15th, the test value was 1.40 which was the highest value by far of the three days of the event meaning as the event went on the stock was affected more and more.

Zhejiang Huayou Cobalt

Date	Return	AR Value	CAR Value	α-Value	β-Value	Significance Test	R-Square
11/29/2022	0.03	0.33					
11/30/2022	0.02	0.43					
12/1/2022	2.47	2.96					
12/2/2022	-3.14	-2.70					
12/5/2022	-1.27	-0.90					
12/6/2022	0.13	0.53					
12/7/2022	3.67	4.12					
12/8/2022	0.29	0.72					
12/9/2022	0.55	0.96					
12/12/2022	-1.96	-1.48					
12/13/2022	-1.56	-1.11	-1.11			-0.60	
12/14/2022	-0.92	-0.48	-1.60	0.43552	0.079192	-0.26	0.000981
12/15/2022	2.12	2.58	0.98			1.40	
12/16/2022	-3.26	-2.85					
12/19/2022	0.41	0.99					
12/20/2022	-2.91	-2.41					
12/21/2022	-1.41	-0.95					
12/22/2022	-1.52	-1.00					
12/23/2022	-0.54	-0.12					
12/26/2022	1.88	2.27					
12/27/2022	-0.31	0.08					
12/28/2022	-2.22	-1.78					
12/29/2022	-0.62	-0.18					

Shenzhen Stock Exchange

Nanjing Hanrui Cobalt

Date	Return	AR-Value	CAR-Value	α-Value
11/29/2022	1.98	0.33		
11/30/2022	-0.28	-1.73		
12/1/2022	-0.25	-1.42		
12/2/2022	-0.18	-0.51		
12/5/2022	1.78	1.78		
12/6/2022	0.25	0.25		
12/7/2022	0.87	0.87		
12/8/2022	-0.81	-0.81		
12/9/2022	1.52	1.52		
12/12/2022	-3.47	-3.47		
12/13/2022	0.99	0.99	0.99	
12/14/2022	-0.39	-0.39	0.60	0.24308
12/15/2022	1.41	1.41	2.01	
12/16/2022	-2.95	-2.95		
12/19/2022	-1.41	-1.41		
12/20/2022	-0.24	-0.24		
12/21/2022	-0.94	-0.94		
12/22/2022	-2.47	-2.47		
12/23/2022	1.10	1.10		
12/26/2022	1.02	1.02		
12/27/2022	-0.34	-0.34		
12/28/2022	-0.44	-0.44		
12/29/2022	-0.71	-0.71		

The r-square value of 0.275 shows low correlation. A beta value of 1.049 shows a stock that is mostly in line but slightly more volatile than the SZSE Component B Index. An alpha value of -0.243 shows the stock underperforms

the index. The CAR value for Nanjing is 2.01 which is a moderate difference between the expected and realized returns. However, this value does not align with the original hypothesis given the positive value. Finally, the significance test values found insignificance across the entire event period for Nanjing Hanrui Cobalt.

Guangdong Dowstone Tech

Date	Return	AR-Value	CAR-Value	α-Value	β-Value	Significance test	R-Square
11/29/2022	-0.80	-3.19					
11/30/2022	0.43	-0.44					
12/1/2022	1.26	-0.45					
12/2/2022	0.54	0.27					
12/5/2022	-1.69	-1.69					
12/6/2022	1.70	1.70					
12/7/2022	1.74	1.74					
12/8/2022	0.24	0.24					
12/9/2022	-0.78	-0.78					
12/12/2022	-1.29	-1.29					
12/13/2022	-1.76	-1.76	-1.76			-0.98	
12/14/2022	0.00	0.00	-1.76	0.31048	1.364856	0.00	0.274526
12/15/2022	5.59	5.59	3.84			3.13	
12/16/2022	-0.97	-0.97					
12/19/2022	-3.37	-3.37					
12/20/2022	-0.57	-0.57					
12/21/2022	-2.45	-2.45					
12/22/2022	-4.04	-4.04					
12/23/2022	0.34	0.34					
12/26/2022	2.73	2.73					
12/27/2022	-0.20	-0.20					
12/28/2022	-1.67	-1.67					
12/29/2022	0	0					

An initial R-square value of 0.274 shows low correlation between Guangdong Dowstone Tech and the SZSE Component B Index. A beta value of 1.364 means the stock is more volatile than its benchmark index. An alpha value of 0.310 indicates the stock slightly overperforms its index. A CAR value of 3.84 shows a large difference between expected and realized returns but this value is due mainly to the last day which saw a daily return of 5.59% on December 15th which skewed the cumulative data. The significance results follow the same pattern as China Railway with the first two days being insignificant but the final day being significant with a value of 3.13, the largest significance value of the entire study. As with China Railway the significance of this company is not believed to be correlated with the summit because Nanjing Hanrui Cobalt was found to be mainly unaffected which again leads to the conclusion that an exclusively Nanjing Hanrui Cobalt event affected the stock price. However, no such event was able to be located. Another reason is that the value is positive whereas the value of Guangdong was negative which was in line with the hypothesis, but a positive value contradicts both the significance of China Railway and the hypothesis.

The Hong Kong Stock Exchange

Jinchuan Group

Date	Return	AR-Value	CAR-Value	α-Value	β-Value	Significance Test	R-Square
11/29/2022	5.41	1.38					
11/30/2022	3.45	0.84					
12/1/2022	1.65	4.31					
12/2/2022	-1.65	-0.40					
12/5/2022	1.63	0.22					
12/6/2022	1.60	0.62					
12/7/2022	-6.56	-2.32					
12/8/2022	1.65	-1.01					
12/9/2022	3.23	1.08					
12/12/2022	0.00	1.36					
12/13/2022	-1.63	-2.00	-2.00	0.51494		-0.86	
12/14/2022	0.00	-0.05	-2.05		1.257512	-0.02	0.464004
12/15/2022	0.00	-1.81	-3.86			-0.77	
12/16/2022	4.88	4.70					
12/19/2022	-1.60	-0.31					
12/20/2022	-4.96	-4.04					
12/21/2022	0.00	0.71					
12/22/2022	-1.68	-2.07					
12/23/2022	-1.71	-2.55					
12/28/2022	0.00	-0.19					
12/29/2022	-3.51	-3.59					

An initial R-Square yielded a result of 0.423, a moderate to average correlation level between Jinchuan and the Hang Seng Index. A beta value of 1.257 means the stock is more volatile than the index. An alpha value of 0.514 means the stock outperformed the index by a slight amount in terms of performance and daily returns. The CAR value for the

event period of -3.86 shows a substantial difference between estimated returns and realized returns meaning there was an unforeseen factor that caused volatility of the stock. This is also in line with the hypothesis due to the CAR value being negative showing a negative affect on the stock during the event. However, the significance test found no significance at the 5% level during the entire event for Jinchuan Group with none of the days getting close to the |1.96| value that is needed.

China Railway Group Limited

Date	Return	AR-Value	CAR-Value	α-Value	β-Value	Significance Test	R-Square
11/29/2022	1.40	-1.98					
11/30/2022	2.30	0.26					
12/1/2022	-4.36	-1.46					
12/2/2022	-1.42	0.17					
12/5/2022	7.04	6.12					
12/6/2022	0.66	0.15					
12/7/2022	-4.47	-0.07					
12/8/2022	0.90	-1.20					
12/9/2022	0.67	-0.95					
12/12/2022	-0.67	1.01					
12/13/2022	-3.18	-3.13	-3.13			-1.55	
12/14/2022	-2.28	-2.42	-5.55	0.8897	1.182678	-1.20	0.464004
12/15/2022	-2.54	-3.98	-9.53			-1.97	
12/16/2022	2.56	2.80					
12/19/2022	-4.22	-2.60					
12/20/2022	-0.48	0.79					
12/21/2022	0.72	1.80					
12/22/2022	-0.96	-0.93					
12/23/2022	-0.24	-0.63					
12/28/2022	0.48	0.71					
12/29/2022	-0.24	0.09					

The r-Square value of 0.464 implies a moderate correlation between China Railway and the Hang Seng Index. A beta value of 1.182 means China Railway is more volatile than its benchmark index. An alpha value of -0.889 means China Railway slightly underperforms its index. The CAR value of -9.53 illustrates a very large difference between expected and realized returns. This CAR value is the largest throughout the entire study, a substantial indictor of significance. Also, the value being negative aligns with the hypothesis of stocks suffering during event. Finally, the significance test yielded the values of -1.55, -1.20 and -1.97 on the first second and third day respectively of the event which shows insignificance at the 5% level on the the first and second day but shows significance on December 15th which is the final day of the event. Although the test showed significance, it is doubtful that it was caused by the event. This is due in part because China Railway is an outlier in terms of AR and CAR values when compared to Jinchuan Group, the other stock on the Hong Kong Exchange. If the event truly caused this volatility, it in theory should have also affected Jinchuan. However, Jinchuan recorded very low significance test results which would make it odd that the event affected one stock without affecting the other. Which means something had to have affected the China Railway stock to cause this large change. However, all that could be accessed was a report published on December 15th, 2022, by the Board of Directors which detailed various wins in auctions for land and other assets totaling RMB 58,927,820,000 approximately 8,575,812,786.86 United States Dollars (Yun,2022) which has little chance of negatively affecting the stock price.

Discussion

Overall

Overall, the results of this study show there was no uniform effect on the markets. The Shenzhen Stock Exchange yielded positive returns, the Hong Kong Exchange was largely negative, and the Shanghai Exchange yielded mixed returns. This leads to the conclusion that there was not enough significance to imply cause. The cause of this trend would be relevant for further research.

Implications

This study implies two similar yet different things. One is that U.S. ventures into the Chinese dominated African cobalt industry do not affect the stock prices of those Chinese cobalt stocks. This is contrary to the preliminary hypothesis. The final implication is that political summits do not affect natural resource stocks. As mentioned previously in the literature review, cobalt was anticipated to be massively different from other natural resources due to its unique situation. However, after conducting this study that notion is shown to be untrue.

Limitations

Aside from statistical significance there were limitations in this study worth mentioning. The largest issue was the limited number of Chinese cobalt companies and even fewer being publicly traded on the stock market. Although six total companies is a moderate amount of stocks to analyze for a topic as niche as Chinese cobalt stocks there were other companies I would have liked to analyze such as Wanboa Mining Limited but was unable to because it is not publicly traded. If I were able to analyze other companies, a more complete picture of the affect the summit had on Chinese cobalt companies could be assessed. Another limitation is the recency of the event. The deals and policies that were reached during the summit will not be set into action until a considerable amount of time from the post event period. These deals have the potential to affect companies further down the line. Drawbacks to a longer post event window would be that it is even more difficult to assume cause. Although there are drawbacks it is still relevant and valuable to analyze this topic with a longer timeline.

Conclusion

In conclusion, this study provides insight to how the U.S. African Leaders' Summit affects Chinese owned cobalt stocks. This information is valuable to the scholarly body of knowledge because it addresses the gap within the body of knowledge of the affect political summits have on the Chinese cobalt landscape. Although there was significance within the study, it was not enough to assume the event caused the stock abnormality. However, further research is needed to answer this question for certain. Future research would address and improve upon the limitations of my study. First, I would analyze the entire metals and mining sector through the creation of a portfolio. The summit did not deal exclusively with cobalt because Africa is not exclusively valuable for cobalt. Africa has thousands of materials that are important to the rest of the world and were mentioned in the summit such as lithium, copper, and iron to name a few. Therefore, analysis of the entire metals and mining sector of China would provide a much clearer picture of the affect the summit had. Another change that would be implemented in future research is a long horizon study to analyze the summits full effects as opposed to a short horizon study such as this one. The deals and policies reached in the U.S. African Leaders Summit were not immediately implemented and it is a long political process to do so. Therefore, a long horizon study that could analyze months to years after a specific event would analyze the full effect of these policies and deals.

References

Armitage, S. (1995). Event Study Methods and Evidence on their Performance . Wiley Online Library. Retrieved April 26, 2023, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-6419.1995.tb00109.x

Christensen , T., Biden, J., Dodd, C., Kerry, J., Feingold, R., Boxer, B., Nelson, B., Obama , B., Menendez, R., Cardin, B., Casey, R., Webb, J., Lugar, R., Hagel, C., Coleman, N., Corker, B., Voinovich, G., Murkowski, L., DeMint, J., … myers, K. (2008). CHINA IN AFRICA: IMPLICATIONS FOR U.S. POLICY. - china in Africa: Implications for U.S. policy. Retrieved January 29, 2023, from https://www.govinfo.gov/content/pkg/CHRG-110shrg45811/html/CHRG-110shrg45811.htm

Corrado, C. J. (2011). Event studies: A methodology review . Wiley Online Library. RetrievedMay 1, 2023, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-629X.2010.00375.x

Dahlström, A., & Winstedt, J. (2017, June 28). Measuring the impact of the 2009 COP15 Copenhagen Summit - an event study of coal and solar portfolios in the United States of America and China. Gothenburg University Library. Retrieved April 27, 2023, from https://gupea.ub.gu.se/handle/2077/52751

Dunford, M., & Liu, W. (2019). Chinese perspectives on the Belt and Road Initiative. Academic.oup.com. Retrieved May 1, 2023, from https://academic.oup.com/cjres/article/12/1/145/5288447

Gulley, A. L. (2022, October 3). One hundred years of cobalt production in the Democratic Republic of the Congo. Resources Policy. Retrieved May 1, 2023, from https://www.sciencedirect.com/science/article/pii/S0301420722004500?via%3Dihub

Gulley, A. L., McCullough, E. A., & Shedd, K. B. (2019, April 28). China's domestic and foreign influence in the Global Cobalt Supply Chain. Resources Policy. Retrieved May 1, 2023, from https://www.sciencedirect.com/science/article/pii/S0301420718303490

Khotari, S. P., & Warner, J. B. (2006). Econometrics of event studies. Boston University . Retrieved May 1, 2023, from https://www.bu.edu/econ/files/2011/01/KothariWarner2.pdf

Malm, J. (2014, May 22). Patterns of Chinese investment, aid and trade in Central Africa (Cameroon, the DRC and Gabon). Centre for Chinese Studies. Retrieved April 26, 2023, from https://www.academia.edu/1576609/Patterns_of_Chinese_Investment_Aid_and_Trade_in_Central_Africa_Cameroon_the_DRC_and_Gabon_?scrlybrkr=93260ffb

NASDAQ. (2023). Efficient market hypothesis definition. Nasdaq. Retrieved April 27, 2023, from
https://www.nasdaq.com/glossary/e/efficient-market-hypothesis

Patel, P. (2017). Cobalt blues. Scientific American. Retrieved May 1, 2023, from
https://pubmed.ncbi.nlm.nih.gov/29257829/

Pham, H., Al-Hares, O., Ramiah, V., Moosa, N., & Francisco Veron, J. (2019). Measuring the effect of the North
Korea-U.S. summit on the South Korean Stock Market. Taylor & Francis. Retrieved May 1, 2023, from
https://www.tandfonline.com/doi/full/10.1080/23322039.2019.1690212

Siegler, K., & Whitney, E. (2022, October 8). In Idaho, America's first, and only, cobalt mine in decades is opening.
NPR. Retrieved May 1, 2023, from https://www.npr.org/2022/10/08/1127310649/in-idaho-americas-first-and-
only-cobalt-mine-in-decades-is-opening

Stein, P., & Udhammar, E. (2021, December 29). China in Africa: The role of Trade, investments, and loans amidst
shifting geopolitical ambitions. ORF. Retrieved May 1, 2023, from https://www.orfonline.org/research/china-
in-africa/

The Observatory of Economic Complexity. (2021). China. OEC-World.
https://oec.world/en/profile/country/chn#:~:text=Yearly%20Trade,-
%23permalink%20to%20section&text=During%20the%20last%20five%20reported,and%20Telephones%20(%
2453.9B).

Van Dalsem, S. (2015, May 6). Event studies part 1. YouTube. Retrieved May 1, 2023, from
https://www.youtube.com/watch?v=D-qDASZuLbE

Wong, E., & Crowley, M. (2022, December 13). Biden hosts African leaders for talks on security, trade and Outer
Space. The New York Times. Retrieved May 1, 2023, from
https://www.nytimes.com/2022/12/13/us/politics/africa-summit-biden.html

Zhao, Y., Wang, S., Zhang, X., & Yang, Z. (2022, October 1). Event studies: The effect of leaders' summit on
electric vehicle and Clean Power Market: Proceedings of the 2022 6th international conference on E-business
and internet. ACM Other conferences. Retrieved April 27, 2023, from
https://dl.acm.org/doi/fullHtml/10.1145/3572647.3572685