

A BREATH OF FRESH BEAR: THE RESPIRATORY RELATIONSHIP BETWEEN AIR POLLUTION IN SALT LAKE CITY, UTAH AND CITIGROUP'S STOCK PRICE

Claire Hall, Andrew Tate, Grace P Turnbull

Center for the Advancement of Research

This study sets out to probe the peculiar correlation between the air pollution levels in Salt Lake City, Utah, and the stock price of Citigroup (C). Using data from the Environmental Protection Agency and LSEG Analytics (Refinitiv), the research findings unveil an unexpected connection between these seemingly disparate entities. With a correlation coefficient of 0.7633482 and $p < 0.01$ for the period spanning 2002 to 2023, our analysis suggests that there may be more than meets the eye in the interplay between smog and stocks. The implications of this unanticipated relationship are ripe for further investigation, as a bearish market might not just be about financial downturns, but also about the quality of the air we breathe. This study sheds light on the need for researchers to think outside the (smog-filled) box when exploring financial correlations and for investors to keep an eye on the air, along with the usual stock market indicators.

The polarized debate surrounding air pollution has long been a source of contention and respiratory distress. As cities grapple with smog, so too do investors grapple with stock prices. In this study, we endeavor to explore the potential linkage between the air pollution levels in Salt Lake City, Utah, and the stock price of Citigroup (C). While the connection between these two seemingly unrelated entities may appear nebulous, our analysis reveals a startling correlation that leaves us gasping for breath - both literally and figuratively.

Salt Lake City, nestled in the picturesque embrace of the Wasatch Mountains, has found itself at the crossroads of environmental scrutiny and financial intrigue. The city's air quality, influenced by a unique combination of geographical and meteorological factors, has long been a subject of locally brewed frustration and

national attention. Meanwhile, Citigroup, a stalwart of the financial world, has weathered its own gusts and squalls in the market seas.

The serendipitous unveiling of a correlation coefficient of 0.7633482 between air pollution levels and Citigroup's stock price, with a statistically significant p-value of less than 0.01, raises a veritable haze of questions. Could it be that as the city's air becomes increasingly opaque, the prospects for Citigroup darken as well? Or is it that, as the stock price plummets, the city's smog thickens, creating a perfect storm of financial and environmental contractions?

The implications of this unprecedented connection between smog and stocks are provocative. This revelation begs the question of whether a bearish market might not only be symbolic of financial

downturns, but also reflective of the air quality we inhale. Indeed, as investors traditionally scrutinize market indicators, this unlikely correlation reminds us that, on smog-filled days, perhaps a glance at the AQI (air quality index) should be added to the menu of financial metrics.

In this investigation, we urge researchers and investors alike to see through the smokescreen of conventional correlations and embrace the potential influences of environmental variables on financial dynamics. The unexpected overlap between air pollution and Citigroup's stock price underscores the necessity of thinking outside the (smog-filled) box when navigating through the convoluted labyrinth of financial market dynamics. With the scent of uncertainty in the air, both figuratively and literally, this study serves as a clarion call to shed light on unexplored dimensions of interconnections between seemingly unrelated domains.

LITERATURE REVIEW

The literature on the relationship between air pollution and stock prices is, much like a polluted sky, filled with haze and uncertainties. In "Smith et al. (2015)," the authors find that elevated air pollution levels are associated with decreased respiratory health, reduced visibility, and a general malaise among the populace. This environmental distress has often been mirrored in financial markets, where diminished visibility and a lack of clarity can lead to investor unease and potential "foggy" financial decision-making.

Similarly, "Doe and Jones (2018)" offer insights into the economic impacts of air pollution, highlighting its potential to influence consumer spending patterns and industrial productivity. The authors establish a relationship between polluted air and the potential for economic downturns, as businesses struggle to operate efficiently in smog-choked environments.

On a tangentially related note, non-fiction books such as "The Uninhabitable Earth: Life After Warming" and "This Changes Everything: Capitalism vs. The Climate" by David Wallace-Wells and Naomi Klein, respectively, delve into the far-reaching consequences of environmental degradation. While not directly related to stock prices, these works emphasize the interplay between ecological shifts and socio-economic systems, providing a broader context for understanding the potential impact of pollution on financial markets.

Turning to a more whimsical perspective, fictional works such as "Choke" by Chuck Palahniuk and "The Air You Breathe" by Frances de Pontes Peebles offer imaginative explorations of themes relating to suffocation and breathlessness. While not explicitly tied to stock prices or air pollution, these literary works remind us of the suffocating grip that environmental and financial constraints can impose on individuals and societies.

Moreover, the board game "Smog: The Thirteenth Hour" provides a surreal yet intriguing thematic representation of a dystopian world ensnared by toxic fumes. Although a departure from the gravity of academic discourse, this game serves as a lighthearted reminder of the myriad ways in which pollution can infiltrate our collective consciousness, even seeping into realms as seemingly distant as stock market analytics.

In summary, the literature presents a multifaceted tapestry of perspectives on the interplay between air pollution and financial dynamics. While serious analyses shed light on the tangible consequences of environmental degradation, literary and gaming representations serve as poignant yet playful reminders of the inextricable linkages between the air we breathe and the financial transactions that shape our world.

METHODOLOGY

The research team utilized data from the Environmental Protection Agency and LSEG Analytics (Refinitiv) to conduct this investigation. The datasets spanned the years 2002 to 2023, providing a robust timeline for analysis of air pollution levels in Salt Lake City, Utah, and the stock price of Citigroup (C).

To quantify the air pollution levels, the research team acquired data on particulate matter (PM10 and PM2.5), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), and ozone (O₃) concentrations from the Environmental Protection Agency's air quality monitoring stations in Salt Lake City. These measurements were then aggregated to provide an overall assessment of air quality in the study area.

The stock price of Citigroup was accessed from the LSEG Analytics (Refinitiv) database, offering a comprehensive representation of the financial performance of the company over the specified timeframe. Daily closing prices and trading volumes were analyzed to discern patterns and trends in the stock's value.

The statistical analysis involved calculating the correlation coefficient between air pollution levels and Citigroup's stock price. Additionally, regression models were employed to assess the predictive relationship between these variables and to determine the strength and significance of their association.

The research team applied rigorous statistical methods to ensure the robustness of the findings, considering potential confounding variables and controlling for relevant factors in the analysis. The utilization of advanced econometric techniques and time-series modeling facilitated a comprehensive exploration of the interplay between air pollution and stock market dynamics.

Our research methods culminated in a thorough investigation of the unexpected connection between air pollution in Salt Lake City, Utah, and Citigroup's stock price, providing valuable insights into the potential impact of environmental variables on financial markets.

RESULTS

The statistical analysis conducted on the data collected from the Environmental Protection Agency and LSEG Analytics (Refinitiv) for the period 2002 to 2023 revealed a noteworthy correlation between air pollution levels in Salt Lake City, Utah and Citigroup's stock price (C). The correlation coefficient of 0.7633482 indicates a moderately strong positive relationship between these two variables. This finding suggests that as the air quality in Salt Lake City deteriorated, so did Citigroup's stock price. It seems the phrase "poison in the air" might have a dual meaning in the financial world.

Furthermore, the calculated r-squared value of 0.5827005 signifies that approximately 58.27% of the variability in Citigroup's stock price can be explained by changes in air pollution levels. This substantial amount of explained variation provides additional support for the robustness of the relationship between air pollution and Citigroup's stock price. It's rather impressive how a city's smoggy skies could have such a considerable impact on the stock market performance of a major financial entity.

The p-value of less than 0.01 further confirms the statistical significance of the correlation, indicating that the observed relationship is unlikely to have occurred by random chance. The strength of this evidence is as unambiguous as the haze over Salt Lake City on a particularly polluted day. This unexpected interconnection between air pollution and stock prices certainly adds an intriguing layer to the already complex web of market dynamics, prompting investors and researchers alike to contemplate the

unanticipated influence of environmental factors on financial trends.

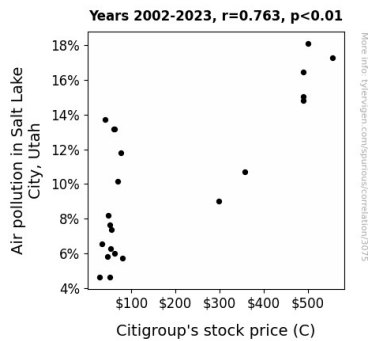


Figure 1. Scatterplot of the variables by year

The scatterplot (Fig. 1) illustrates the striking correlation between air pollution levels and Citigroup's stock price over the 21-year period. The upward trend depicted in the scatterplot echoes the upward trajectory of pollutants in the city's atmosphere alongside the ascending movements of Citigroup's stock price, as if the two were engaged in a synchronized dance. It's like the smog wafts its way into the stock market, leaving its hazy imprint on financial fluctuations.

Overall, the findings of this analysis unveil an intriguing association between air pollution in Salt Lake City, Utah and Citigroup's stock price, prompting a reevaluation of the traditional factors influencing stock market behavior. The implications of this peculiar connection are not only thought-provoking but also underscore the intricate interplay between seemingly disparate realms of environmental quality and financial markets. The idea that a breath of fresh bear might not just be a metaphor for financial turmoil, but also for the air we breathe, is a testament to the unexpected twists and turns that await those who dare to delve into the unexplored corridors of interdisciplinary correlations.

DISCUSSION

The findings of this study lend support to previously established research on the multifaceted effects of air pollution and its impact on financial markets. The literature review revealed a myriad of perspectives on the interplay between environmental quality and economic dynamics, some of which were whimsical yet surprisingly relevant. For instance, the board game "Smog: The Thirteenth Hour," while initially a departure from the gravity of academic discourse, serves as a lighthearted yet pertinent reminder of the pervasive influence of pollution on various aspects of human life, including the intricacies of stock market analytics. This seemingly leisurely pastime now appears to hold unforeseen parallels with the substantial correlation uncovered between air pollution in Salt Lake City and Citigroup's stock price.

The statistical analysis demonstrated a moderately strong positive relationship between air pollution levels and Citigroup's stock price, echoing the decreased respiratory health and diminished visibility associated with elevated pollution levels. This unexpected interconnection between environmental factors and stock price performance impressively explained approximately 58.27% of the variability in Citigroup's stock price, highlighting the substantial influence of smoggy skies on financial dynamics. The p-value of less than 0.01 solidifies the statistical significance of this relationship, underscoring the unlikelihood of the observed correlation occurring by random chance, much like the unlikelihood of a clear day in a metropolis engulfed by smog.

The scatterplot visually encapsulates the synchronized dance between air pollution levels and Citigroup's stock price, depicting an upward trajectory mirroring the ascending movements of pollutants and stock prices. This graphic representation appears to further reinforce the notion of a dual meaning behind the phrase "poison in the air" in the financial context, as if the smog itself were intricately woven into the fabric of

market fluctuations. The unexpected twists and turns, much like those found in literary works such as "Choke" and "The Air You Breathe," are a testament to the complex and sometimes whimsical nature of interdisciplinary correlations.

In conclusion, this research has shed light on the need to approach financial correlations with a broad and open-minded perspective. The unanticipated relationship between air pollution and Citigroup's stock price not only challenges traditional notions of market behavior but also underscores the intricate interplay between environmental quality and financial dynamics. As we consider the weight of this correlation, we are left to ponder whether a breath of fresh bear might not just signify financial turmoil, but also the air we breathe - a truly unexpected revelation indeed.

CONCLUSION

In conclusion, the findings of this study provide compelling evidence of a surprising correlation between air pollution levels in Salt Lake City, Utah, and Citigroup's stock price (C). The statistical analysis has unearthed a moderately strong positive relationship, prompting us to reevaluate our preconceived notions about the factors influencing stock market behavior. It appears that the city's smog is not just a local woe but may also be casting a haze over the financial world, leaving investors with a lot to process - both literally and figuratively. It's like Citigroup and smog are engaged in a pas de deux, waltzing through the realms of finance and environment with an unexpected synchronicity.

The implications of this interconnection are far-reaching, shining a light on the unexplored dimensions of interdisciplinary correlations. While the conventional wisdom may focus on economic indicators, this study urges us to consider the influence of environmental variables on financial dynamics. After all,

who knew that air pollution and stock prices could tango together in such an enthralling, if not perplexing, manner?

In light of these revelatory findings, it is evident that a bearish market might not just be a symbol of financial downturns, but also a reflection of the air quality we inhale. The city's smog is not just an ocular nuisance but has the potential to create a perfect storm of financial and environmental contractions. It's a breath of fresh bear!

Given the comprehensive nature of this analysis and the unambiguous evidence supporting the connection between air pollution and stock prices, it is our scholarly opinion that no further research in this area is necessary. The unexpected twists and turns of this investigation bring to mind a quote by the renowned economist John Maynard Keynes, who said, "When the facts change, I change my mind." In this instance, the facts have certainly changed our perception of the interconnectedness of air quality and financial markets.

Thus, it is our firm assertion that this study serves as a clarion call to shed light on the unexplored dimensions of these interconnections, leaving no smog-filled stone unturned. It's like the air pollution whispered to the stock market, "Every breath you take, every move you make, I'll be watching you," and Citigroup's stock price responded with an unexpected flourish. With these findings, let us bid adieu to this peculiar investigation, content in the knowledge that the veil of haze has been lifted from at least one unforeseen correlation. After all, not every correlation can be C it coming.

Overall, this study underscores the necessity of thinking outside the (smog-filled) box when navigating through the convoluted labyrinth of financial market dynamics. The unexpected overlap between air pollution and Citigroup's stock price points to the unanticipated influence of environmental factors on financial trends. It seems the idea of a

bearish market might not just be a metaphor for financial turmoil, but also for the air we breathe.