

# The Impact of COVID-19 on Vaccine Producers and ESG Performance

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# INTRODUCTION

The pharma-biotechnology sector has been historically scrutinized by the global community. Their core business gives rise to an eternal ethical dilemma that supersedes most other sectors. Their products and innovations aim to safeguard human health and to save lives. However, their need to maximize profits often stains their social standing.

The sector has faced strong public criticism on a range of topics. For example, how pharmaceutical companies price products to maximize shareholders' wealth at the cost of the masses' inability to pay for them; how products are designed to increase users' addiction rates to materialize scaling and recurring revenues; or how clinical trials on animals are unethical.

Select pharmaceutical companies are now also challenged by COVID-19. Globally, society continues to be vigilant in taking a stand on fair and adequate vaccine supply, the commercialization of vaccines, marginalized populations, and vaccine side effects. As companies' self-disclosed press releases, traditional media updates, and government statements are published, communities around the world react to them and share their personal experiences in relation to the situations they endure in their communities. For instance, they express frustration when there is a vaccine shortage, serious side effects, or simply share their general distrust in vaccines. Simultaneously, a percentage of society is also grateful for efforts made by pharmaceuticals to combat COVID-19 spread and to bring the world back to pre-pandemic course.

Examining and understanding the convoluted situation COVID-19 brought upon key vaccine providers is a challenging task, primarily when analyzing the impact, the pandemic had on a company's ESG (Environmental, Social and Governance) practices throughout several phases of the pandemic. Having a thorough understanding of how communities report on a company's ESG actions was crucial to reaching a level of data sophistication that allows the public, such as asset managers, to make informed investment decisions. The importance of this historical event and the dynamic variables it has on the day to day of such companies requires high frequency and relevant ESG data that can fulfill this need.

Orenda Software Solutions, a SIX company, solves this problem by analyzing millions of online conversations, via AI (artificial intelligence) and NLP (natural language processing), and computing accurate ESG performance scores from the perspective of the global community in real time. For this exercise, we have employed Orenda's ESG and TRUST scores to decode the performance of four major vaccine providers (AstraZeneca (ticker: AZN), Pfizer (ticker: PFE), Moderna (ticker: MRNA) and Johnson & Johnson (J&J) (ticker: JNJ)) both prior to and during the COVID-19 era.

The ESG scores presented in this short paper are based on a total of ~10.6M data points for all 4 companies. AstraZeneca carried the largest quantity of content covering 5.5M datapoints, followed by J&J, Pfizer and Moderna with ~3.3M, ~1.4M, and ~350,000, respectively. The total period covered dates from December 2018 through May 2021. However, we segmented the analysis between a pre-COVID-19 period of December 2018 through December 2019 and the COVID-19 era of January 2020 through May 2021. The COVID-19 era was subsequently divided into 3 periods from January 2020 through June 2020, July 2020 through December 2020, and January 2021 through May 2021.

# PRE-COVID-19 ANALYSIS

We first analyzed the year leading up to the first reported COVID-19 outbreak in Wuhan, China, on December 31st, 2019 (<https://www.who.int/news/item/27-04-2020-who-timeline---covid-19>). The data encompasses each pharmaceutical company's monthly overall ESG scores from December 2018 through December 2019. We focused on this general metric to maintain a concise exercise and provide an indication of the general impact on each company's ESG score. Figure 1 captures the monthly average ESG scores for each of the 4 companies. Moderna consistently led the remaining three entities in ESG performance for the 13-month pre-COVID-19 period, and its score averaged ~12% over the second-best performing company. AstraZeneca maintained the second-best score for 11 out of 13 months, while Pfizer held a steady 3rd position, leaving J&J as the primary lagger for the pre-COVID-19 period.

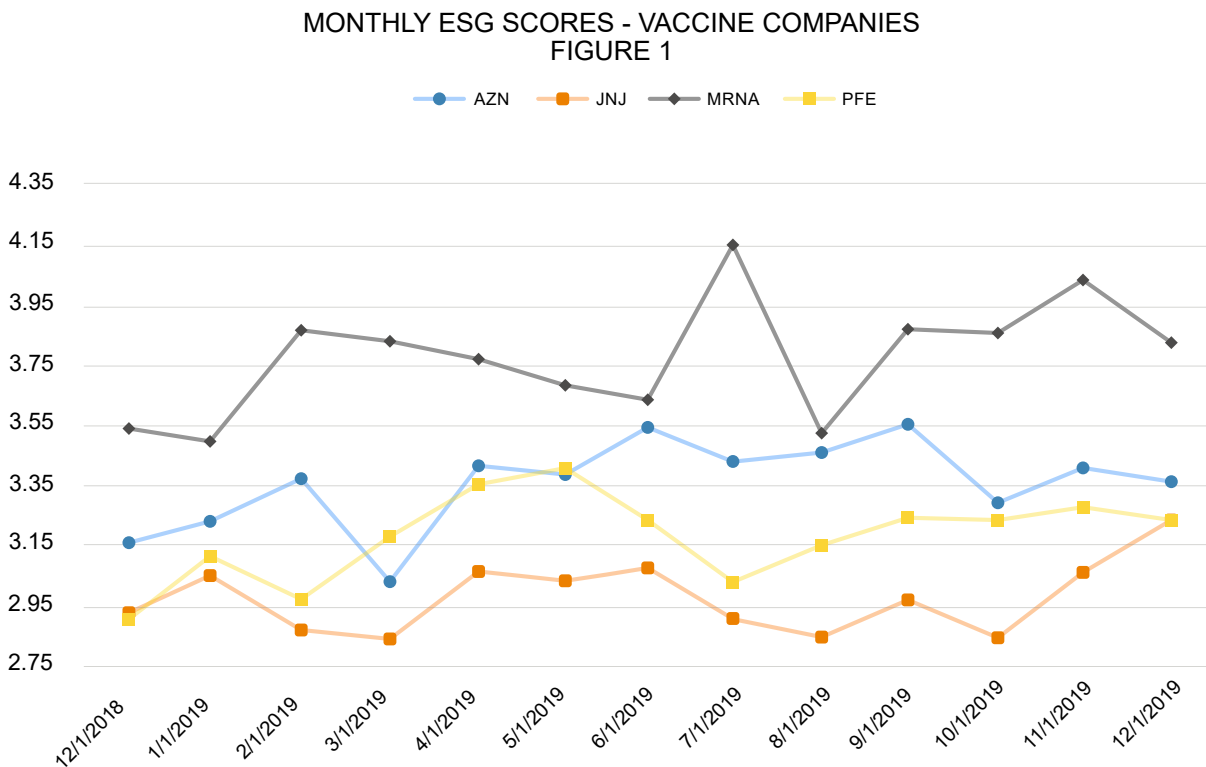
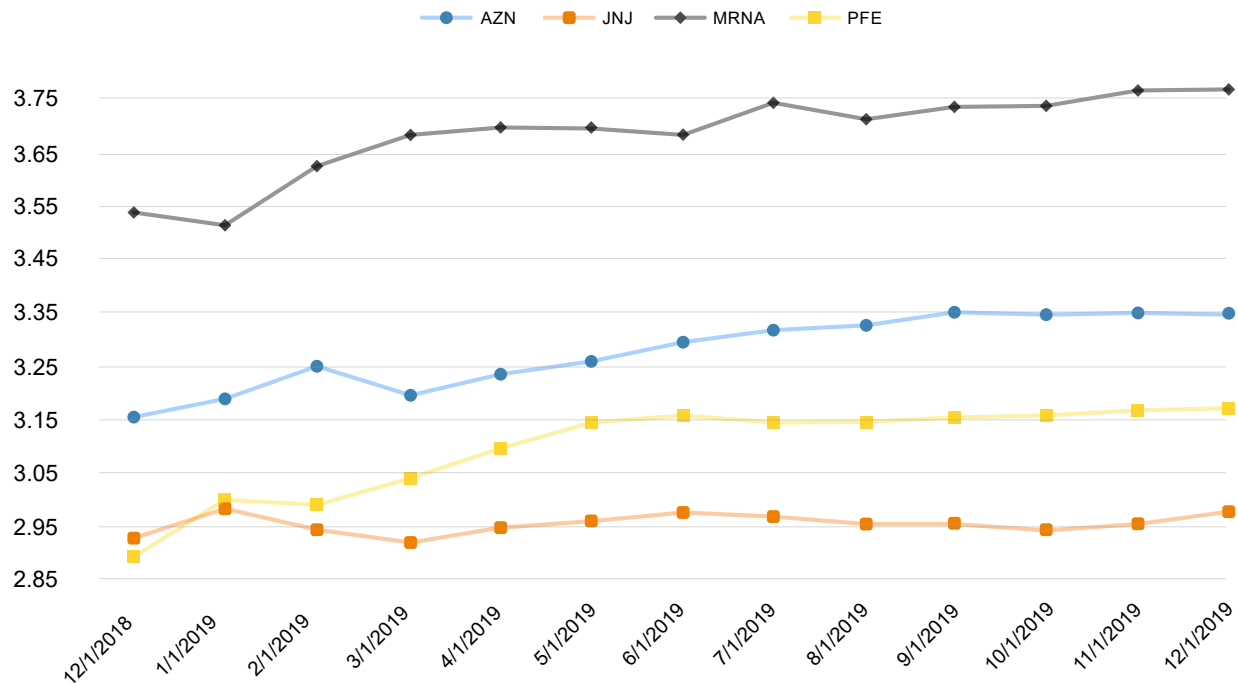


Figure 2 captures the monthly rolling average ESG scores for the 4 companies, providing additional clarity to our previous findings. A rolling monthly average score visibly depicts Moderna as the leader in the group, followed by AstraZeneca, Pfizer, and J&J.

ROLLING AVERAGE MONTHLY ESG SCORES - VACCINE COMPANIES  
FIGURE 2



Moderna has historically been publicly lauded for its engagement with the community, its efforts to address rare diseases within its R&D initiatives, and company-wide volunteering. Prior to COVID-19, its mRNA vaccine has been categorized as a promising technology to prevent infectious diseases outbreaks. The company specializes in vaccine technologies based on messenger RNA (mRNA). This mRNA reprograms human cells to prompt immune responses to viruses such as the novel coronavirus. Although its COVID-19 vaccine is its only commercial product, its scientific achievements have maintained and supported its elevated social positioning within communities across the globe. Public opinions often reflect the following sample of online conversations:

## Moderna

Cambridge biotech @moderna\_tx announces plans to test three new drugs, including its first rare disease treatment \$MRNA [01/08/2019](#)



Congrats to the @moderna\_tx for another peer-reviewed scientific paper. This one is about #mRNA for #Fabry disease. There are more than 20 peer-reviewed papers available at [modernatx.com](#) [03/18/2019](#)



Good news on mRNA therapeutics! @moderna\_tx published results of study showing an mRNA-encoded antibody against #chikungunya virus, delivered in a lipid nanoparticle, is well tolerated & provides 100% protection against infection of animals @VUMC\_Vaccines [05/19/2019](#)



Second to Moderna's high ESG score is AstraZeneca, a UK based pharmaceutical and biotechnology company with leading products in oncology and cardiovascular diseases. The company was awarded the 2019 Dive Award recognizing industry's top innovators and disruptors, which aligns with communities' views about the company (<https://www.industrydive.com/news/post/the-dive-awards-for-2019/>). Although communal voices have, in general, reported strong ESG practices such as generous sponsorships, unique trials for rare-cancer patients, and commitment to the environment, there has

also been adverse ESG reporting affecting its score throughout the period analyzed. Online conversations include reported delays in cancer drug supplies that left some patients waiting for prolonged periods of time, as well as public complaints about medical providers aggressively prescribing AstraZeneca drugs. Sample conversations are captured below.

## Astrazeneca

Thanks to the generous sponsorship @AstraZeneca we have a limited number of funded places for oncology trainees to attend the #ACCM2019. Please spread the word. Great opportunity for clinician-scientist #radonc #medonc and #haemonc <https://t.co/PgXfNvaXWi> 04/16/2019



'Cancer patients left waiting as drig delayed by red tape' via @theTimes @delythjmorgan: "The delay in olaparib's appraisal for use on the NHS is extremely concerning and we urge Nice and AstraZeneca to make clear why this happened" <https://t.co/UxskRvrfZN> 04/16/2019



Right on! The drug company @AstraZeneca has a program for patients who are denied because of rare cancer - called off-label. My friend @ [redacted] needs Drug Company to approve his application to this program ASAP <https://t.co/7DfYDF38> 07/11/2019



AstraZeneca commits to converting fleet to all -electric vehicles <https://t.co/GjeBZINI9v> 07/11/2019



Pfizer maintained a steady third place for the year leading up to COVID-19. Executing a similar business model and product offering to that of AstraZeneca, Pfizer has been viewed less favorably on social media than AstraZeneca in terms of ESG performance. Although the company has been portrayed as ethnically diverse, inclusive, and actively associated with UN Sustainable Development Goals (SDGs), society has voiced its negative reaction to the company's high price tag. The company has also experienced allegations of possible deaths related to their products. Although Pfizer has successful offerings within its portfolio of products and carries the second largest market capitalization out of the four companies analyzed, a large portion of society reported unfavorable ESG practices, leading Pfizer to be a lagger within the group.

## Pfizer

Today in SPain, Pfizer packaged our millionth meal for @Rise2030 to help #endhunger. We're proud to support their goal of eradicating hunger by 2030! #2030ispossible #PFizerVolunteers #PfizerProud #orgullotrabajaren 12/17/2019



@pfizer CEO says it'll be "business as normal" for price increases to start 2020. That means charging as much as he feels he can get away with. Any moderation in pricing by drug corps we see is temporary due to pressure of legislation like HR3 and PDPRA. <https://t.co/ZZChA9ftpx> 11/14/2019



Of course. My husband was killed by a Pfizer drug and, like the vast majority of big pharmaceutical's victims, we were unable to successfully sue them. I almost lost my home. I hope Gottlieb always remembers to take an Amiodarone a day - & twice on Sundays. 11/14/2019



Pfizer Pride, Pfizer Proud: Our colleagues get personal on what it meand being able to bring your authentic self to work every day #Pride #PrideMonth <https://t.co/IXs3zWID6g> 07/11/2019



Lastly, J&J, one of the world's most well-known companies specializing in pharmaceuticals, medical devices, and consumer packaged products such as Band-Aid®, was the weakest ESG performing entity out of the four companies for the 13-month period leading to COVID-19. Society has repeatedly registered negative ESG deficiencies in the company's practices. For instance, communal voices have reported that the company knew its baby powder products contained asbestos for decades, or that the company had downplayed the dangers of opioids and oversold its benefits. The company has consistently faced reports of hiding the truth, deceiving consumers, and commercializing products that led to fatalities. Although the company ran multiple campaigns to overturn its negative ESG communal perception, such as running partnerships with African hospitals to treat patients, its scores lagged throughout the pre-COVID-19 period. Sample conversations are presented below.

## Johnson & Johnson

"By 2013, J&J a \$4 billion settlement to cover the claims raised by 12,000 patients in the U.S." Read more on what @Vidhi\_India's Senior Resident Fellow, Prashant Reddy T. says in @the\_hindu: [buff.ly/2KXo1oY](https://buff.ly/2KXo1oY) 06/26/2019



Johnson & Johnson and Bayer agree to a \$775 million settle over the blood thinner Xarelto, which plaintiffs claimed caused excessive bleeding and deaths. 03/25/2019



Exclusive: Lawsuit says Johnson & Johnson was opioid "kingpin" J&J PRODUCED RAW NARCOTICS IN TASMANIAN POPPY FIELDS, CREATED OTHE OPIOD INGREDIENTS, SUPPLIED THE PRODUCTS TO PURDUE PHARMA AND OTHERS. <https://www.axios.com/>



Meet Gamai, a @MercyShips patient who recieved a complex - and free - operation to severe burns aboard the Africa Mercy ship. On #HumanRightsDay, learn how #JNJ partnership with the floating hospital is helping patients like Gamai who need it the most: <https://t.co/QmMG0..>



J&J knew there was asbestos in its baby powder for decades and concealed the fact, documents discovered through litigation show. [reuters.com/investigates/s...](https://reuters.com/investigates/s...) 12/14/2018



Johnson & Johnson still tests on animals! Tell them to be a true industry-leader and go completely cruelty free, Read and sign here: [soon.nr/5Hs8](https://soon.nr/5Hs8) #crueltyfree #noanimaltesting 03/25/2019



# COVID-19 ERA

As the world started to follow the COVID-19 outbreak in China and cases diagnosed locally, the global community shifted its attention to the pandemic and how corporations were dealing with it. While society continued to report on traditional ESG practices for the four vaccine providers, an elevated amount of content was directly related to COVID-19 and how these corporations performed during the race to arrive at an effective vaccine and the subsequent distribution of those vaccines.

The COVID-19 era covered the dates of January 2020 to May 2021, and throughout this period we witnessed significant shifts in overall ESG communal reporting for the four companies analyzed. As time progressed and COVID-19 spread around the globe, Moderna's definite ESG performance dominance faced challenges as communities expressed contradictory reports for all four vaccine manufacturers.

We segmented the COVID-19 era analysis into three main periods: January-June 2020, July-December 2020, and January-May 2021 with the objective of unveiling critical results in the race, commercialization, and distribution of the vaccine.

## January 2020 - June 2020

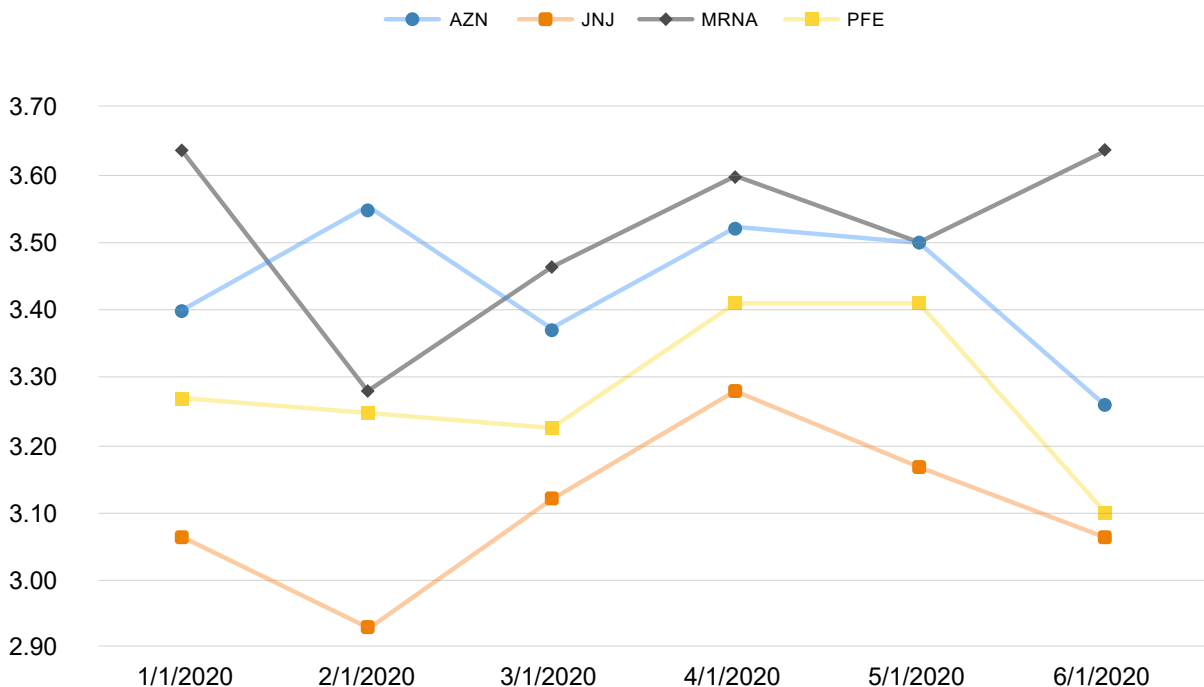
For the initial 6 months of the pandemic, the ESG performance previously described held for the four companies. Since the beginning, Moderna has been publicly referred to as a trustworthy vaccine developer and was expected to be one of the leaders in both quality and speed of production. The company was then followed by AstraZeneca, which collaborated with Oxford University to develop its COVID-19 vaccine. AstraZeneca was initially portrayed as one of the most trusted companies to make an effective vaccine and was also anticipated to be one of the fastest to market. Both companies experienced similar communal reports despite their differences in size, technology, and business models.

Pfizer and J&J continued to lag for the initial 6 months. Communal reports surrounding Pfizer, specifically related to COVID-19 and vaccine development, were more positive than J&J. Social media conversations showed that Pfizer was perceived to be a more trusted organization with more experience in the field of vaccine development.

For this initial 6-month period, a common online voice expressed concerns regarding the safety of a potential J&J vaccine. While this was an area of concern for the remaining three companies, it was more relevant for J&J, and mostly tied to the company's history of reportedly selling products that were later recalled due to health and safety issues. Figure 3 captures the initial six months discussed.



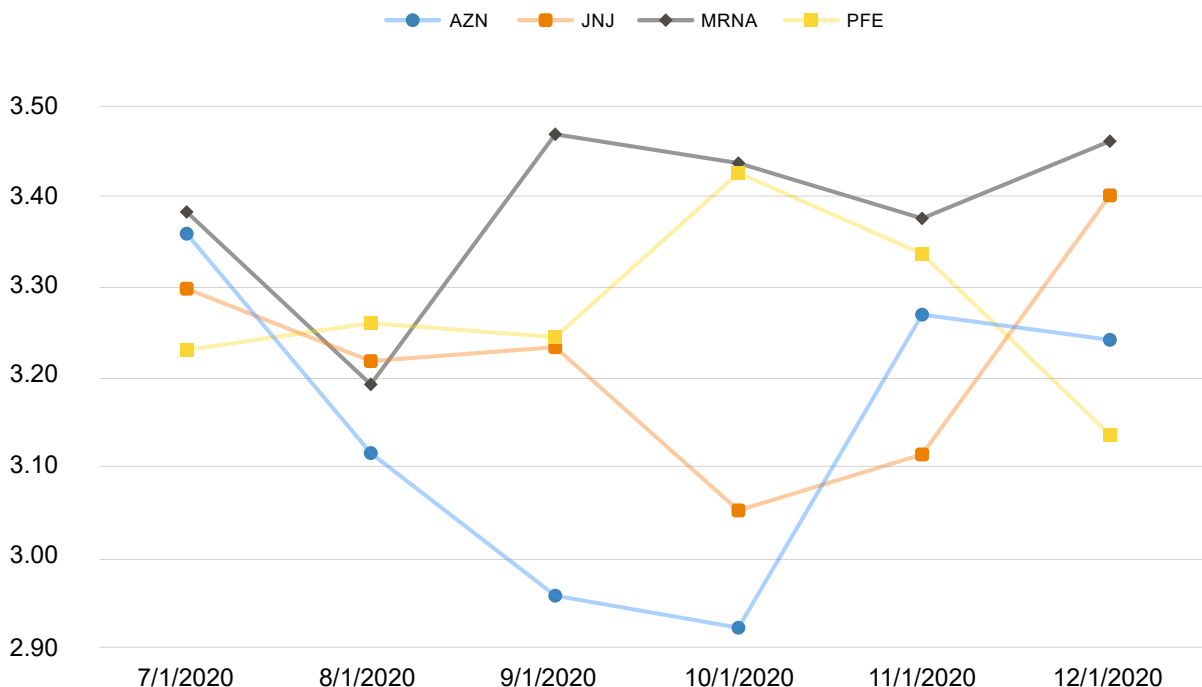
MONTHLY ESG SCORES - VACCINE COMPANIES  
FIGURE 3



## July 2020 - December 2020

The six months from July to December of 2020 were filled with speculation and feedback from society on the results of vaccine trials and other company related actions. Although Moderna continued to lead the group in high ESG performance, AstraZeneca, a close follower, saw its score erode for 3 consecutive months (July 2020 – October 2020), only to recover in Q4 2020. J&J experienced a similar performance to that of AstraZeneca, while Pfizer’s score increased from July through September and retracted in Q4. Figure 4 depicts the performance for the period discussed.

MONTHLY ESG SCORES - VACCINE COMPANIES  
FIGURE 4



Several events impacted AstraZeneca’s overall ESG score. In August of 2020, the Australian government announced a deal with the company. However, AstraZeneca denied striking a deal with the Australian government. This generated a high level of confusion and frustration locally, especially when the global community repeated the Australian stakeholders' claims. This was perceived online as negative corporate governance and generated fear that the company might retract from other deals. During early September of 2020, multiple participants of the AstraZeneca vaccine trials reportedly developed neurological illnesses. The trials were briefly paused while these illnesses were investigated, but promptly continued with little explanation to the public. In some locations, such as India, trials were never halted. As can be expected, this generated material concerns among communities around the globe. During October of 2020, the concern increased when a volunteer in Brazil's AstraZeneca experimental vaccine trial had reportedly died. However, trials continued. The company’s official statement was that the participant did not take the vaccine, but a placebo. That statement was often called into question during online conversations.

In July 2020, AstraZeneca announced that it would not profit from its vaccine sales during the pandemic. However, the series of events that transpired before that statement overshadowed the advances in social good, with the quality of the vaccine and related information continuously questioned throughout the period. AstraZeneca experienced a robust recovery during November of 2020, once the global community received, analyzed, and reported the positive results the company released about controlled age group immune response. Society’s response to AstraZeneca’s series of events clearly demonstrates that its priority was centered around the release of a safe and effective vaccine, with clear information being disseminated to the public.

JULY 2020	AUGUST 2020	SEPTEMBER 2020	OCTOBER 2020	NOVEMBER 2020
AZN ANNOUNCED NOT FOR PROFIT PRICING STRATEGY - SCORE 3.6	AZN AZN DENIED AUSTRALIAN DEAL - SCORE 3.12	NEUROLOGICAL ILLNESS REPORTED - SCORE 2.96	TRIAL PARTICIPANT DIED IN BRAZIL - SCORE 2.26	POSITIVE TRIAL RESULTS REPORTED - SCORE 3.27

J&J experienced a similar ESG performance pattern where its score eroded from July through October of 2020, as a collective online voice expressed a general mistrust for the safety of the vaccine. This was primarily due to the company's history of selling products that were later recalled due to health and safety issues. However, as J&J trials led to successful results and deals were struck with countries around the globe, safety concerns began to fade. This, coupled with the company's funding programs for healthcare workers and selling vaccines at a not-for-profit pricing strategy during the pandemic, initiated a shift in the general reporting of J&J's ESG practice and its score improved from October through December of 2020. Throughout this period, the company was authorized to conduct trials in several countries around the globe and Americans also voiced their optimism for having local trials.

## Johnson & Johnson

This month #JNJ fulfilled its \$50 million commitment to help support healthcare workers worldwide & organizations like @MaskedHeroesSA. Meet health worker who benefitted from this campaign as he reflects on the critical support that helped change his life. [12/31/2020](https://t.co/umSY68miff)



Columbia reaches deal with J&J for 9 million doses #SmartNews <https://t.co/umSY68miff> [12/30/2020](https://t.co/umSY68miff)



I enrolled in J&J's vaccine trial because I believe it's my civic duty to encourage others to join vaccine trials across the nation & to help give folks confidence in the safety & efficacy of the upcoming vaccines. <https://t.com/dh0AdaAleS> [11/18/2020](https://t.com/dh0AdaAleS)



Drive to get people to participate in Johnson & Johnson coronavirus vaccine trial kicks off at N.J hospital <https://t.co/BhWpCgUS1c> [12/30/2020](https://t.co/BhWpCgUS1c)



Pfizer maintained a second-best performance from July through November of 2020 with a material correction in December. Although the company confirmed it would sell the vaccine at a profit, Pfizer's decision not to take taxpayer dollars was well-received by society. This was seen as an integral decision that strengthened Pfizer's corporate governance. During this period, the company also gained global confidence in its mRNA vaccine as Pfizer positioned itself as a clear COVID-19 vaccine leader. In December of 2020, the company experienced a drop in its score as people around the world reported negative reactions to the vaccine. Additionally, concerns related to Pfizer's ability to supply vaccines and government officials voicing frustration for it, led to communal doubts about the company's general claims on issues related to the vaccines.

## Pfizer

@Pfizer CEO Albert Bourla say he wanted to keep his company "out of politics" by not taking tax-payer money in #COVID19 #vaccine development: "It's only money. It will not break our company although its going to be painful.. I wanted to liberate our scientists from bureaucracy" <https://t.co/IJ7QVQkkAp> [10/02/2020](https://t.co/IJ7QVQkkAp)



"The amplified political rhetoric around vaccine development, timing and political credit is undercutting public confidence." Extraordinary that @Pfizer's CEO would have to write this. Politicians must stop applying pressure and manipulating science. <https://t.co/e1VSIzscyW> [10/02/2020](https://t.co/e1VSIzscyW)



Pharmaceutical giant Pfizer is preparing to ship over a billion doses of Covid-19 vaccines, using frozen boxes, cargo planes and trucks, in a mega logistics operation <https://t.co/QA2SMWh7kT> [10/02/2020](https://t.co/QA2SMWh7kT)



GREAT NEWS!! Congratulations to my @Pfizer colleagues on today's authorization of a #COVID19 vaccine! While our work is not done yet, we are #PfizerProud #ScienceWillWin #PFEColleague [12/02/2020](https://t.co/umSY68miff)



## January 2021 - May 2021

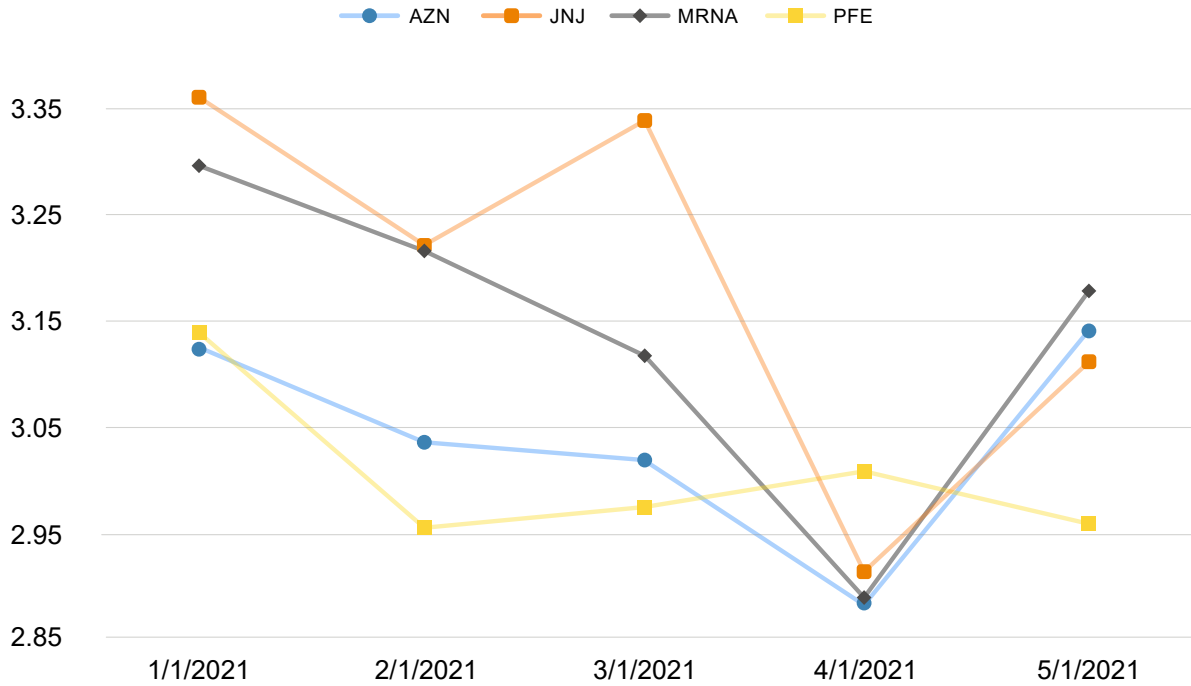
The beginning of 2021 was filled with high anticipation for a vaccine rollout, as communities were expecting to flip the page on COVID-19. Increased optimism and a recovery forward-looking approach became apparent, especially in those who trusted the vaccines. However, subsequent events impeded the positive transition to favorable ESG reporting. From January through April of 2021, all 4 companies experienced eroding scores as communal reports exposed ESG issues.

For example, in January 2021, J&J announced that its single dose vaccine was 66% effective, significantly lower than Moderna, Pfizer and AstraZeneca. Many expressed their disappointment with these results, stating that a vaccine which is 66% effective against a virus with a high recovery rate was not worth the risk, especially with J&J's negative track record. As time progressed and numerous vaccines were approved for use, comparative conversations started to take place. For instance, Moderna was established to be more effective than J&J, but requiring multiple doses was viewed as a negative. Additionally, fatal cases were publicly reported online following a Moderna jab, including the death of a mother with no underlying health conditions, triggering investigations into a possible link between the dose and her death. While these claims lacked evidence, online conversations continued to suggest that the vaccine caused deaths.

AstraZeneca was also affected as the EU collided with the company once it revised its supply forecast for the region. Stakeholders expressed growing frustration, and it impacted the company's ESG performance, similarly to the Australian event in August of 2020. Once again, this suggested negative governance and created doubts about the company within the international community. AstraZeneca's ESG score continued to erode as the administration of the vaccine was suspended in South Africa, Germany, and Switzerland due to an increase of blood clot cases tied to the vaccine. Safety concerns overshadowed the benefits of the vaccine and people voiced their fears online. In April 2021, several countries around the globe reported deaths related to the vaccine and fear of blood clots became a major issue, triggering further vaccine suspensions. Countries switched to other vaccine suppliers as a result.

Figure 5 below depicts this discussion.

MONTHLY ESG SCORES - VACCINE COMPANIES  
FIGURE 5

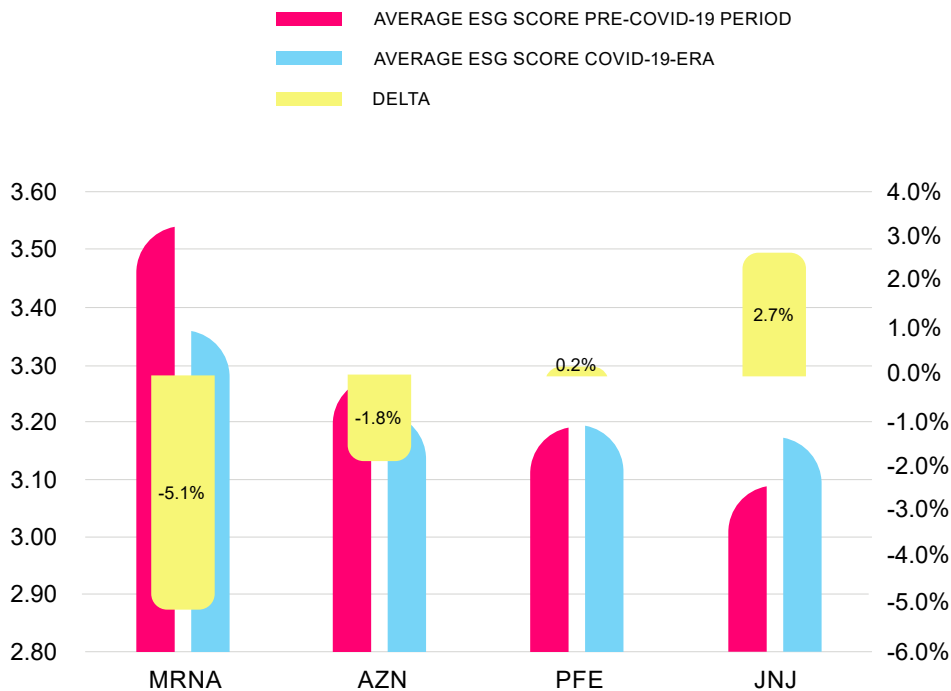


As you can see, during this time Pfizer's ESG score underperformed when compared to its peers. Although the remaining 3 companies suffered robust ESG erosions, Pfizer maintained a low score throughout without further negative impacts.

# COVID-19, TRUST, & MARKET IMPACT

The COVID-19 pandemic created global turmoil as several countries invoked prolonged community lockdowns and quarantines, causing companies to shut down, leaving many jobless. Communities suffered the loss of countless loved ones, and many families were separated for lengthy periods of time. The level of disconcert communities experienced was visible online, as conversations often targeted those responsible for managing the pandemic, and that included COVID-19 vaccine providers. By computing the ESG average of the pre-COVID-19 and COVID-19 era, we observed that the two leading ESG companies, Moderna and AstraZeneca, experienced significant drops in their average scores of 5.1% and 1.8%, respectively. However, the group’s laggards, Pfizer and J&J, improved by 0.2% and 2.7%. This led to a convergence of scores, as the level of communal despair and global uncertainty led to closer ESG performance scores and a less pronounced dominance as shown on figure 6.

PRE-COVID-19 VS COVID-19 ERA AVERAGE ESG SCORES  
FIGURE 6



Furthermore, when we look at the monthly average ESG scores vs. the monthly average return for all four companies in both periods, we determined that the top performing ESG companies, Moderna and AstraZeneca, produced the highest average monthly returns (see figure 7).

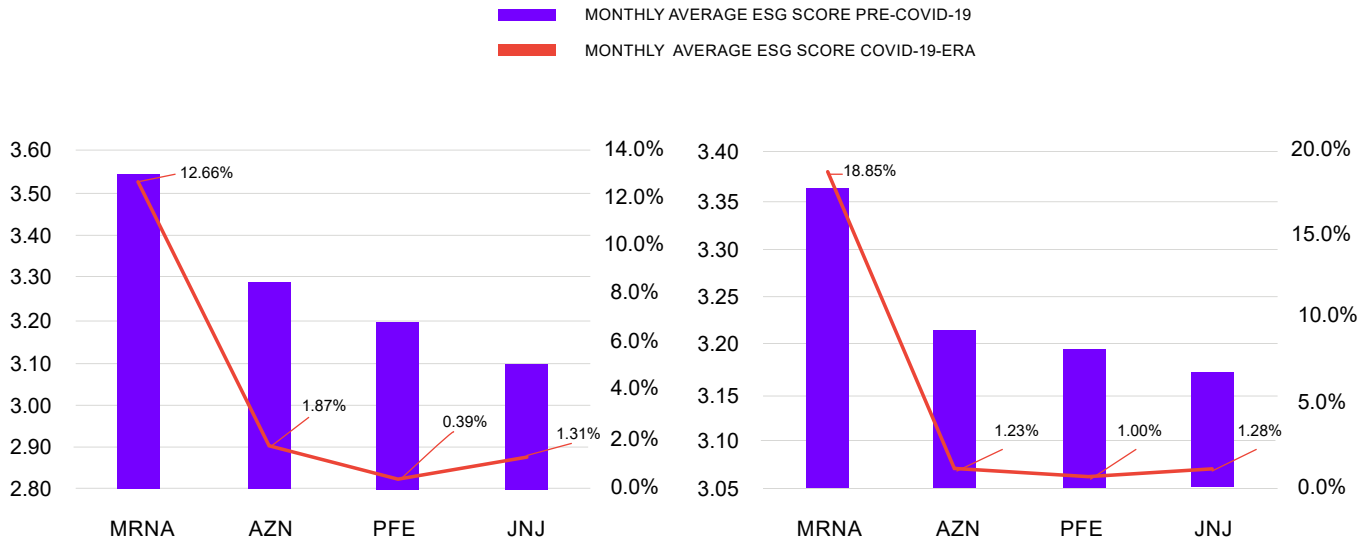
We can also observe a robust increase in average monthly returns for both mRNA vaccine providers as Pfizer’s monthly average returns increased from 0.39, pre-COVID-19 to 1.0% during the COVID-19-era while Moderna increased from 12.66 to 18.85%.

AstraZeneca and J&J posted lower returns when compared to the pre-COVID-19 period discussed, signaling market support for the mRNA vaccine producers.

MONTHLY AVERAGE - ESG SCORE VS STOCK RETURN - PRE COVID-19

FIGURE 7

MONTHLY AVERAGE - ESG SCORE VS STOCK RETURN - COVID-19 ERA

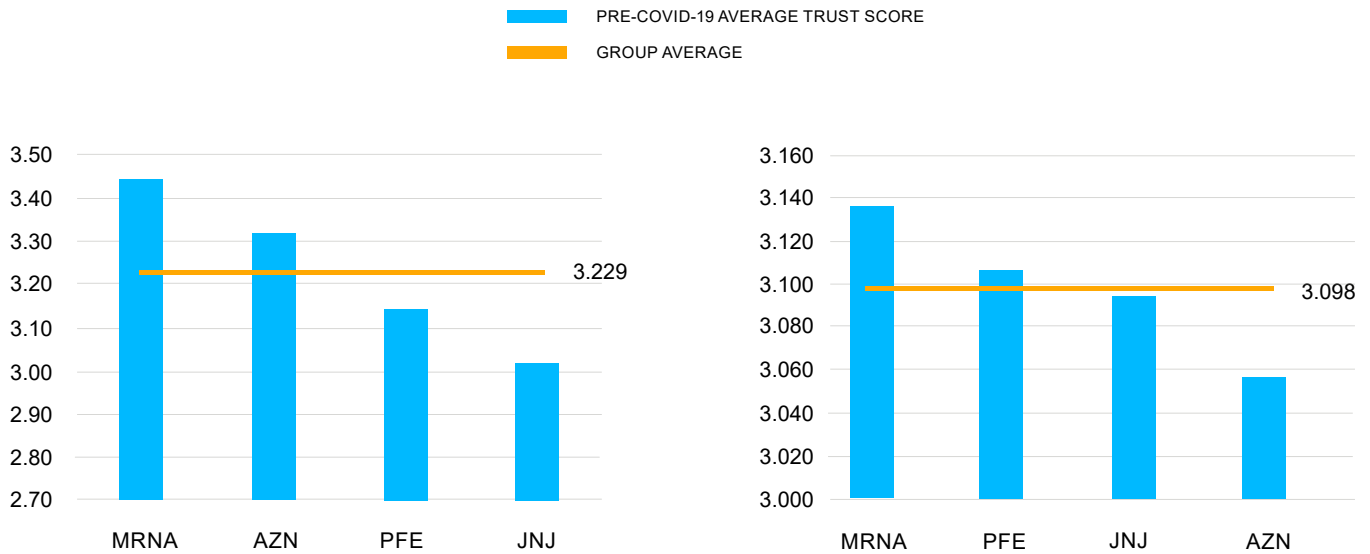


COVID-19 has impacted Orenda’s ESG performance scores for all four companies. They have experienced volatility, and at times, group leaders suffered erosions in their scores while laggards slightly increased ESG performance. We have also established that by analyzing the pre-COVID-19 and post-COVID-19 periods as aggregate averages, the four vaccine providers maintained their ranking when both periods were compared as previously shown on Figure 7.

However, this relationship has not held for Orenda’s TRUST scores. Figure 8 depicts the pre-COVID-19 TRUST scores, which followed the same ranking we observed for Orenda’s ESG analysis. Nevertheless, the COVID-19 era, segmented from July 2020 through May 2021, unveiled a difference in results. Although Moderna continued to lead the group, AstraZeneca became the group’s lagger. Pfizer secured the second most trusted position while J&J was the only company able to increase its TRUST scores during the pandemic.

The average TRUST score for all four companies eroded during the COVID-19 period, signaling the difficulties vaccine providers experienced and continue to do so in the public eye. Orenda’s TRUST ranking for the COVID-19-era follows the ranking in monthly average return increases we covered previously. For example, Moderna experienced the highest increase in monthly average return, and it led the group with the highest TRUST score. Pfizer posted the second largest increase in monthly average return while carrying the second highest TRUST score. J&J experienced a mild decrease while AstraZeneca posted the largest drop in monthly average returns, coinciding with the 3rd and 4th positions in our TRUST ranking. This could serve as the basis for the association between higher trust in vaccines and corresponding stock returns. It is common knowledge that the mRNA vaccines, commercialized by Moderna and Pfizer, enjoy greater popularity and are preferred by the general public when compared to J&J and AstraZeneca.

FIGURE 8



Trust is the cornerstone and most fundamental factor of any relationship. Without it, all other factors become irrelevant. Companies have worked extensively to build trust in their brands to establish themselves as market leaders and have seen their efforts evaporate online instantaneously. AstraZeneca is a vivid example of this. The global community came together to provide determined feedback about their trust in the vaccine and the company. Even though this is only one of several products AstraZeneca commercializes, the vaccine's side effects, and life-threatening consequences came at a time when the global community was in need to trust the companies that were providing the solution to the pandemic. As expected, the outcome of AstraZeneca's trust level was negatively impacted.



# COVID-19, ESG, & INVESTING

After analyzing the complexity of COVID-19’s impact on the four major vaccine suppliers, investors face the inevitable question of how to employ such data and which stock(s) to include in their portfolios. Different investment mandates will lead to different conclusions, but for the purpose of this short paper, we entertained a handful of investing strategies and contrasted their financial performance as well as compared them to a few non-ESG possibilities, including the iShares Biotechnology ETF (IBB).

Since our analysis includes four companies, our first approach was to test an arbitrary weight allocation of 40, 30, 20, and 10% to stocks ranking from top to bottom. For example, if Moderna leads the group with the highest ESG monthly average score, then received a 40% weight allocation, while the second-best performing stock obtained 30%. We called this strategy Orenda’s Discretionary. We then proceeded to generate two additional strategies comprised of holding the highest two ESG performers with a 50 / 50% allocation, and a final approach holding a single pick with the highest ESG monthly average score. We titled those two strategies Orenda’s Top Picks and Orenda’ Single Pick, respectively. For Orenda’ strategies, we rebalanced the portfolios at month-end based on the monthly overall ESG average score.

We have also modelled an equally weighted and a price weighted strategy for the four companies analyzed and computed the performance of iShares Biotechnology ETF (ticker: IBB) which seeks to track the investment results of the ICE Biotechnology Index, composed of U.S.-listed equities in the biotechnology sector. Although IBB did not represent a suitable benchmark for our strategies, it did provide an indication of the sector’s performance. It is important to highlight that all three portfolios lacked any ESG tilt or allocation. This allows us to compare the financial performance of our previously described ESG strategies vs non-ESG portfolios.

Following our previous analysis, we tested the \$1 performance of the stipulated Orenda’ strategies and diverse non-ESG strategies for the pre-COVID-19 period dating from December 2018 through December 2019. Figure 9 captures Orenda’s Top Picks strategy posting the best performance with an ending value of \$1.37, followed by Orenda’s Discretionary and Orenda’ Single pick with \$1.29 and \$1.28, respectively. All non-ESG strategies lagged with a final dollar performance of \$1.25, \$1.23, and \$1.16 for IBB, Equally Weighted and Price weighted, correspondingly.

\$1 PERFORMANCE - ORENDA STRATEGIES VS NON-ESG STRATEGIES  
FIGURE 9

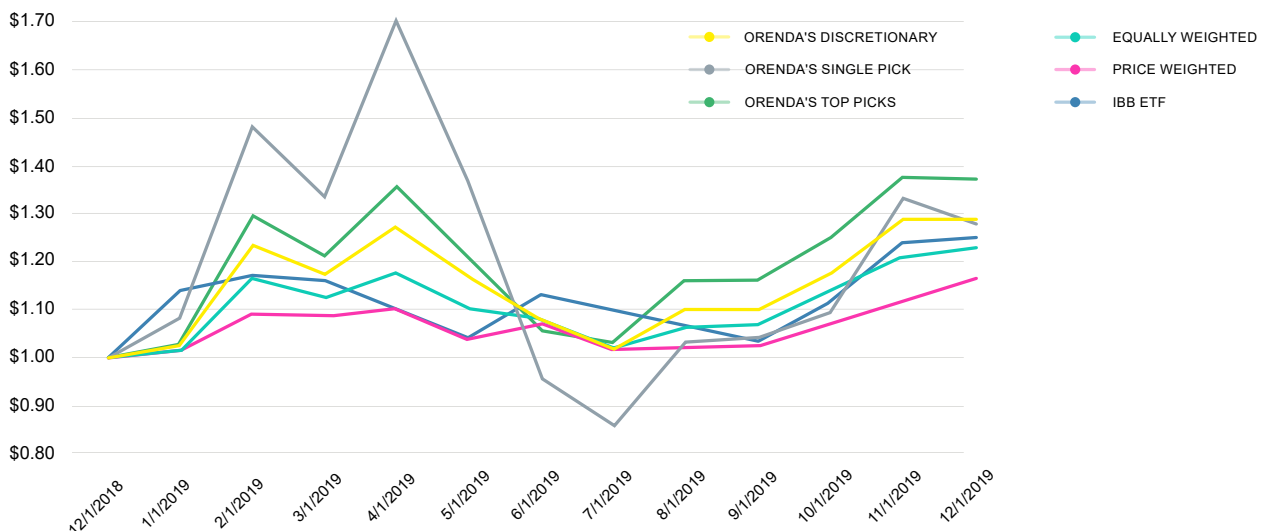


Figure 10 captures the COVID-19 era ranging from January 2020 through May of 2021. For this period, a \$1 invested in Orenda’ Single Pick ended at \$7.07, followed by Orenda’s Top Picks and Discretionary strategies with \$3.82 and \$3.07, respectively. For the non-ESG strategies, the Equally Weighted reached \$2.28, while the Price Weighted and IBB ETF concluded \$1.86 and \$1.58 on May 31st, 2021.

\$1 PERFORMANCE - ORENDA STRATEGIES VS NON-ESG STRATEGIES  
FIGURE 10

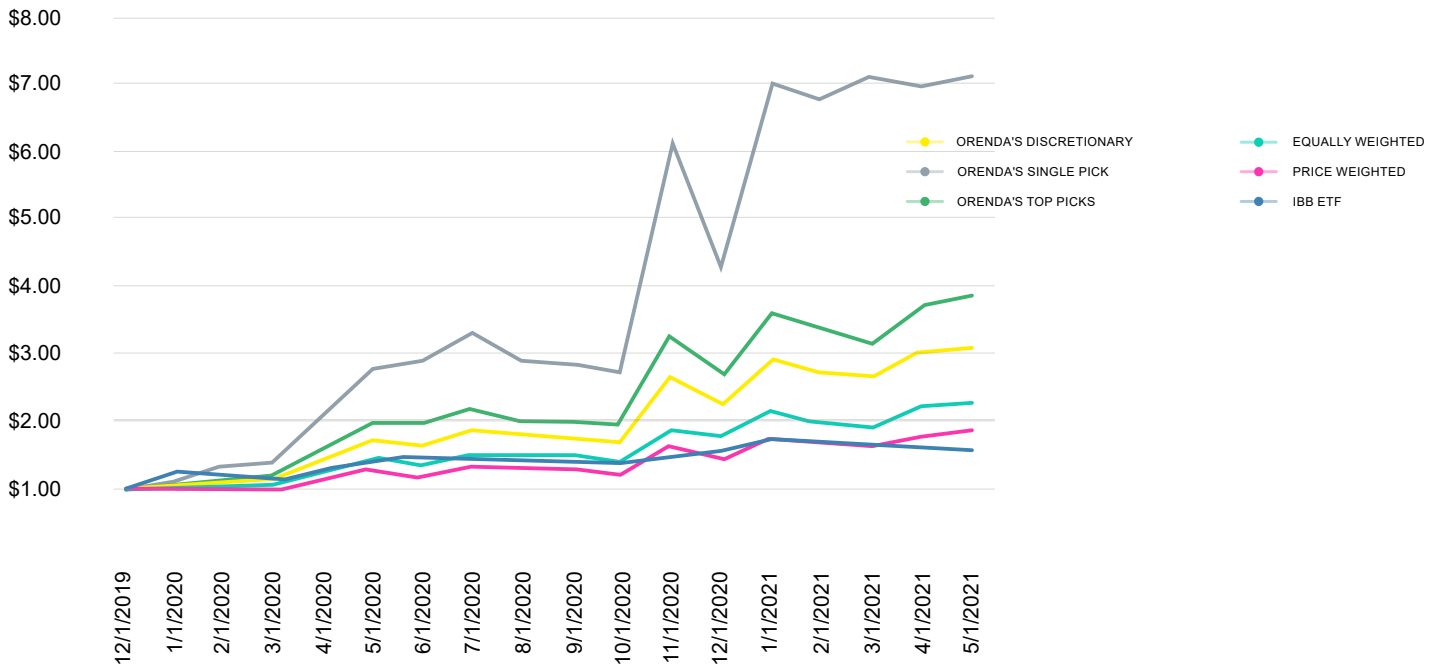


Table 1 captures the Sharpe ratio for the converged periods which measures the risk adjusted return per strategy. Orenda’s Top Picks leads the covered strategies with a Sharpe ratio of 1.41. The non-ESG equally weighted and Orenda’s Discretionary share the second position with a Sharpe ratio \$1.40 while Orenda Single Pick secured the third spot with 1.28. The Price Weighted and IBB were last with a Sharpe ratio of 1.12 and 1.02, respectively.

TABLE 1

STRATEGY	SHARPE RATIO
ORENDA'S TOP PICKS	1.41
EQUALLY WEIGHTED	1.40
ORENDA'S DISCRETIONARY	1.40
ORENDA'S SINGLE PICK	1.28
PRICE WEIGHTED	1.12
IBB ETF	1.02

The strategies presented do not necessarily conform to a buy and hold or long-term holding strategy. However, they aim to capture the financial performance of holding securities or tilting portfolios towards an ESG communal approach. It also intends to establish the importance of high frequency ESG data to accomplish ESG or alpha generating investment mandates.

# FINAL THOUGHTS

COVID-19 is a historical event that has challenged our conventional ways of living, thinking, and prioritizing what is paramount in life. Since December 2019, communities around the globe have endured the impact of COVID-19 and became actively engaged in the outcome. We have witnessed groups denouncing governments, companies, and international entities for profiteering from this pandemic while many were thankful for actions taken to contain COVID-19 and keep society safe. Concurrently, this pandemic has brought a sense of despair to the global community that has been clearly voiced by those affected as well as hope for a better future as people understood we can do things better and differently with our lives, society, and the environment.

Companies were also challenged to do better by not only shareholders, but stakeholders as well. COVID-19 has tested new ways for companies to engage with clients, suppliers, employees, and the environment. Many were proactive and quickly adjusted to the constraints COVID-19 brought on business and rapidly addressed employee and customer safety concerns, or adapted business models to continue to serve. Such companies were lauded for their actions and are expected to come out of this pandemic stronger and more agile.

We have seen how society's ESG reporting has shifted for the four major pharma-biotech companies developing and commercializing COVID-19 vaccines. The constant feedback from communities on COVID-19 related events have impacted their ESG scores and the group leaders faced challenges to constantly lead in ESG practices from a communal perspective. Their management of trial information, speed to a safe and effective vaccine, as well as adequate supply have been the major drivers for the volatility experienced in the COVID-19-era ESG outcomes, where traditional ESG topics were previously the basis for their respective ESG scores.

A drop in TRUST scores was also determinantal for Moderna and Pfizer to maintain their position as vaccine leaders around the globe. However, their mRNA technology has become the most popular and preferred vaccine while J&J and AstraZeneca have lagged significantly due to health concerns. This has reshuffled the TRUST ranking since Pfizer replaced AstraZeneca as a strong second position, and the latter descending to the 4th place, behind J&J.

We have also observed how the monthly average returns significantly improved for both Moderna and Pfizer, while J&J and AstraZeneca experienced a decrease during the COVID-19 period, aligning with the presented TRUST ranking.

The constant feed of information and events taking place across the globe created a level of complexity that led to tough ESG investment decisions for many. When we include the voice of many, investment decisions become easier. We live in a digitally empowered world where society reports on events such as the pandemic and related corporate ESG actions in real time. When the voice of many is quantified into easily downloadable data points, incorporating the outcomes into investment strategies upholds a portfolio that reflects a comprehensive ESG investment mandate aimed at generating alpha.

While we have only presented the results of our ESG and TRUST scores, we invite you to explore our extended line of ESG and Social positioning products. We also invite you to provide feedback on the presented results and suggest ideas for future publishing by contacting [eze@orendasolutions.com](mailto:eze@orendasolutions.com).

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