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Exploring the Existence of Efficiency in the Financial Markets

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Abstract: Since the market efficiency hypothesis theory was introduced by Fama in 1970, many investors and researchers argued about the efficiency form of the real financial market. In the real financial market, there are solid pieces of evidence that the price of securities could reflect related public information. However, as real human beings, the investors in the financial market are not always rational and act according to the assumptions stated in the market efficiency theory, which results in a reduction in the efficiency of the real financial market. In this paper, our group tends to use two different views (investors and companies) to prove that all of the market efficiency hypothesis theory assumptions are violated in the real financial market, and the current market efficiency is weak. From an investors' view, our group tends to analyze the effect of psychological factors from investors on market efficiency. Furthermore, from the companies' side, our group tends to use case analysis to provide solid evidence for the market efficiency analysis.

Keywords: market efficiency, real financial market, psychological factors

1. Introduction

The efficiency of financial markets has always been a topic worthy of discussion and attention. According to the Efficient Market Hypothesis (EMH), there are three levels of EMH [1]. The most basic one is the weak form, which means that the prices of all current securities have already included all past information about the securities. Any analysis based on past data is not practical, so if the investors apply this analysis to the trading strategy, they cannot get any excess return from these securities. Furthermore, semi-strong is another more vital form than the weak one. With this level of efficiency, the prices of securities have already reflected all related public information so that any technical or fundamental analysis based on general information has no effectiveness. For the last one, the strong form efficiency lets the prices include both public and inside information; even the inside trading strategy cannot bring higher returns.

With the above hypothesis, the investors who believe in EMH and consider the current financial market as a semi-strong or strong form would take passive management for their investment since all the public information is reflected in the price and the inside information is probably impossible to get (under the strong form, even with inside information, the active strategy still is ineffective). Jack Bogle also was known as the father of indexing and a strong supporter of the EMH hypothesis. He considered the current market as at least a semi-strong form and that the performance of passive management could not go beyond the board market average in the long term. According to Morningstar's report, active fund managers outperform only 4.1% of the time compared to passive managers with the management fee deduction for large capitalization securities combinations [2]. In conclusion, there is plenty of sufficient evidence to support that the current market is in at least a semi-strong form

However, EMH is based on the three primary assumptions: All investors are rational, their behaviors are independent across individuals, even the investors are not rational, and there is the unlimited capacity to catch arbitrage opportunities [3]. In the real world, there is other evidence shows that even the "unrelated" factor still could bring a massive influence on market prices, which caused plenty of anomalies and reduced the overall efficiency of the market so that the stock prices could not reflect all public information fairly and show their actual values. Then, through these anomalies, it can be concluded that the market may not be in semi-strong or strong form, and the efficiency is low. In this article, there will be two ways to demonstrate that the efficiency of the market is weak. From investors' view, the causal relationship between investors' psychological factors and stock price fluctuations will be discussed in the following. Then, this relationship's conclusion will show the violation of investor rationality and uncorrelated errors assumptions. Furthermore, from the companies' side, the analysis based on falsifying companies' financial statements will show that companies' unethical behaviors also affect the overall market efficiency. Due to the information asymmetry, the assumption of unlimited capacity is also violated. According to these analyzed situations, it can be concluded that the efficiency of the financial market is low and affected by anomalies in reality.

2. Psychological Factors from Investors

2.1. Seasonal Affective Disorder

Seasonal affective disorder, also known as winter blues or seasonal depression, is a depression disorder that is strongly related to seasonal changes. The primary cause of SAD is straightforward: during fall or winter, the day's duration is shorter, and people are not exposed to enough daylight. Furthermore, reduced daylight exposures hugely influence people's serotonin levels, and the main symptom of SAD includes depression, tiredness, or lethargy [4]. Up to 3% of the overall population suffers the SAD and shows all the main symptoms, and more people are affected by the seasons, with lighter symptoms and slight emotional changes [5].

How does SAD relate to the financial market? The research conducted in Kramer's "Seasonal Variation in Treasury Returns" showed a solid causal relationship between seasonally varying mood and risk aversion. Based on her research result, it can be concluded that when people fall into depression or negative attitudes, they tend to be more risk averse. Therefore, SAD does not just affect people's emotions; it influences the financial market indirectly. When the season goes into fall or winter, SAD will lead people to fall into a negative mood, and investors who got affected do not want to arrange their capital concentrating on risky assets. The research above proved the influence path of SAD: during fall or winter, the price of bonds (including other kinds of safe securities) goes up, the return rate reaches the bottom of the year, and it returns to the peak when spring or summer comes [6].

In addition to the long-term seasonal change of the bond market, the daily weather also impacts the financial market. According to Hirshleifer's research which is conducted through OLS linear regression model based on stock returns and cloud cover percentages, the research result shows that cloud cover percentages and sunshine correlate with stock returns. The regression coefficient of cloud cover percentages for returns is -0.011, which is also significant statistically. Furthermore, based on the regression result, the research examines the expected gap between sunny and cloudy days, which is approximately nine basis points. This research provides strong evidence that the weather effects are statistically significant. From the conclusion of this research, the potential influence path is that when the weather situation is better, people will be in a better psychological state and hold more optimistic opinions about the investment so that they are more willing to make a riskier decision and eventually, the stock prices would be pushed to go up [7].

Overall, there is sufficient evidence to conclude that the weather and seasons could affect the financial market indirectly. Investors' psychological states mainly cause these influences. Moreover, these influences show that investors are not rational, and their behaviors would be affected by common factors (such as SAD and weather), which means two of the three assumptions are violated. The price fluctuations from these situations make the market price could not reflect the actual value of equities and all the related public information, which reduces the overall market efficiency.

2.2. Post-Earnings Announcement Effect

Post-earnings announcement effect describes the situation that after the release of the earnings announcements, the relative stock will experience continuous fluctuations and adjust the price in the short run. This momentum is called a "Post-Earnings-Announcement Drift" (PEAD). According to the research of PEAD, the trend of abnormal return after the announcement shows below [8]. In Figure 1, the vertical axis indicates the abnormal return of the relative securities, and the horizontal axis shows the timeline of the irregular return fluctuations. From the EMH hypothesis, if the current market is in semi-strong form, it should expect that there will be no further price fluctuations due to the information from the announcement, and the price will be adjusted immediately after the release of the announcement. However, the figure shows that the effect of the announcement exists continuously after 13 weeks, and the result is also amplified during the influence period.

The most typical example to examine the PEAD is the price fluctuations of Netflix stocks. Figure 2 shows the trend of the performance of Netflix stock price [9]. As the tendency shows, in April, Netflix announced that there were lost subscribers for the first time in ten years. The result raised the wave that many investors worried about the company and the streaming media industry's potential [10]. Furthermore, after the drop of the Netflix shock, the stock related to other streaming media companies also experienced shocks. The announcement effect lasts for about three months, and the price of Netflix stock is continuously at a low level (see Fig. 2). Therefore, it could be concluded that the abnormal return for Netflix continues to be harmful after the release of the announcement until August 2022.

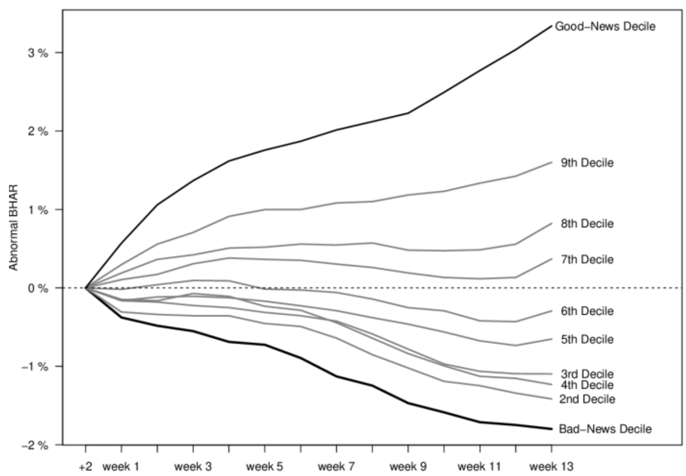

Figure 1: The trend of abnormal returns of securities since the announcement is published [8].

Figure 2: The historical trend of Netflix stock price [9].

The PEAD may be due to the psychological factors of investors. The representativeness bias means that people will overestimate the correlations between similar things. According to the Netflix drop, it could be explained that investors may overestimate the correlation between the announcement and the company and industry potential so that the investors overreact about the company and the stock price eventually shows the investors' overreaction. Comparative research also proved that due to psychological factors, investors affect their rational investment decisions [11]. Moreover, after the initial overreaction, according to the herding situation, which means that individual investors will follow most investors' decisions, more individual investors who hold the Netflix stock will take a short position so that the announcement effect was amplified and extended its existence.

2.3. Market Noise Resulting from Investors' Emotions

In EMH, it was assumed that actions from irrational investors are random and unpredictable, and their activities will be canceled and not cause any systematic bias. In this case, however, the foolish investors put their actions in the same direction, outnumbered the unbiased investors, and made the stock run great in the short term. The power of social media boosts the spread of emotion, and the development of trading platforms and apps increases the number of new investors. Both worked to empower the emotional side to break the balance of it with market efficiency.

One may argue that the effect of emotion might only exist in the short-run market. In the long run, its impact will eventually be written off by the rational investors or the rations arbitragers; the case of GameStop or the existence of 'wall street bets' on Reddit would be a great example showing that the market is not that efficient anymore. The short squeeze of GME (GameStop) is a classic case of a temporary reduction, but it is also not classic due to the types of its participants, the number of its participants, and the time it lasts. The market used to be the battleground among funds, big banks, organizations, and wealth groups. Still, with the development of social media, more individuals join the marketplace with limited financial knowledge. They rely on the behaviors of others, their emotions, and their personal preference rather than a systemic view of the existing data or the fundamental information of a company. During the short squeeze of GME, a few people found the opportunity to invest in GME and started to promote it in an online community on Reddit. GME, a company that provides a physical storefront for people to buy and trade physical copies of games and consoles, was seen as in the sunset industry were believed to be in a downward development trend and became the short target of many funds. The brief activities seem logical, and its stock price initially reflects its expectations from Wall Street. There were too many fast during that time. With the cash on hand, the value of their physical storefront, and the faith in the play and trade business model among gamers, the ordinary online population on Reddit started to unite to buy the stocks of GME [12]. On January 11, GME announced the addition of three new directors to its board of

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directors. That day, GameStop's stock rose less than 13%. Two days later, it was up 57%. Then it was 27%. The following week, it spiked 10 percent twice and 51 percent on another day. This week, it rose another 18%, then 93%, and more than doubled again on January 26 [13].

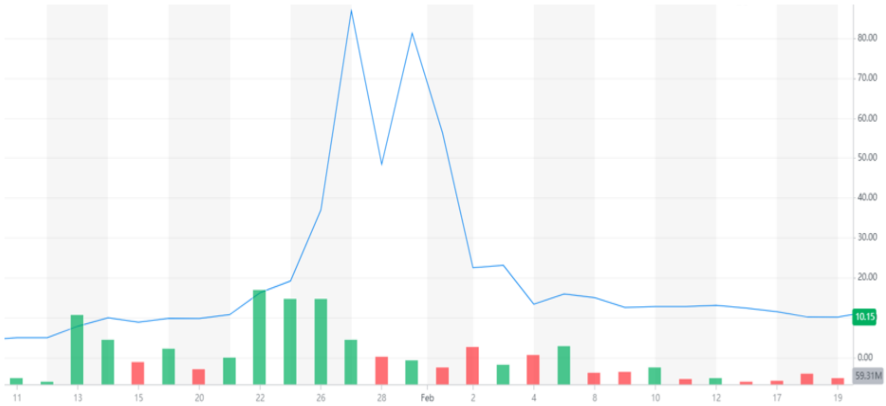

Figure 3: The historical trend of GameStop stock prices [13].

Some even bought options and wanted a gamma squeeze of the funds on Wall Street. At first, the actions from Reddit were viewed as a lifetime opportunity to make money. Still, with the spreading of information and more people joining the online communities, some Reddit users started to package it as an action to fight against Wall Street, fight against the wealthy groups, and fight against the broken and corrupted system. More and more people are deciding to join the game, either to make big bucks from obnoxious Wall Street funds or in the hope of causing damage to the greedy financial industry. Neither reason is a result of their rational thinking or knowledge of Finance. It is very emotional, and the skyrocketing stock price reflects that emotional and irrational investors have vastly outnumbered rational investors.

The market is so inefficient that rules have to be broken, and unethical actions have to be made, shutting down the trade server and forbidding any purchase of the GME stock to stop the short squeeze. Furthermore, the beginning of this short squeeze, which is the over-shorting of GME, also suggests that the market is inefficient. The stock price was way too low compared to the actual value of GME, and with the derivatives, the stock price is no longer a presentation of the underlying business but a presentation of the will from wall street. They've made so much money on shorting the stock in the past years and have no opposites until the Reddit community becomes strong. Unlike the short squeeze of Porches and VW, in which professionals operate with their insider information and financial knowledge and only last for a few days, the temporary reduction of GME is empowered by social media and influencers. Under this circumstance, regular individuals would know that holding a stock long termly is not the optimal strategy anymore since stocks will fall and rise based on popular sentiment. It is a sign of a not efficient market. In the post-GME age of Reddit, its influence on the market became more muscular and even more frequent with the help of its growing population. Once an influencer publishes a solid post on Reddit, some stock will skyrocket in price in the next few days. The popular sentiment drives the stock price high, and the influencer drives the popular belief. The influencers can potentially make an above-average return in the long-term since they have the power to spread emotions favoring them online and make profits from it. The world has seen the power of online communities, and funds have started to improve their investment strategy based on the analytics of the content there. The existence of 'Wall-Streeters' has the power to make a group of people have the ability to beat the market and also change the ideal investing strategy under an efficient market. It is pulling the stock price away from its intrinsic value and making the market inefficient.

According to the above analysis, it could be concluded that most investors are not rational in the financial market. Investors will perform overreaction to companies' announcements, and even the weather and season changes will affect their psychological situation so that they may not be able to be rational the whole time. On the other hand, investors are humans; they may have strong emotions toward common things, and these psychological factors make their investment decisions dependent. Thus, the assumption of uncorrelated errors is violated.

3. Company Behaviors and Financial Market

For several listed companies, the standard methods to defraud investors are falsifying companies' financial statements and hiding damaging information about companies. Also, a fraction of companies are ambitious and prefer bribery to get more priority and resources from the government, which is the best protection for these large companies. They could grow up rapidly, even to a monopoly in the market, which quickly gains people's trust to lead investors to make the wrong decisions on their stock selection, and the stock price will be pushed up temporarily. Once the fraud is exposed or the damaging information is discovered, companies' stock prices will decrease, and massive loss of market value.

Luckin Coffee, a Chinese company listed in the US, The Securities and Exchange Commission reported that Luckin coffee was exposed that its financial statements seriously misrepresented the data of Income, expenditure, and net operating loss. Luckin admits to faking more than $300 million in revenue, more than a quarter of reported sales. Since most orders are from mobile, Luckin coffee through skipping the order number to increase the number of orders recorded in the background, for daily sales of merchandise increased by 69% in the third quarter and 88% in the fourth quarter, and the average price of each good has been overstated by at least 12.3% [14]. Luckin coffee also fixed its cost by 150% by inflating its advertising spending based on its unreal income [15]. Based on Luckin coffee's actions discovered on April 2nd, the stock price dropped from $26.2 to $6.40, and the price range dropped as high as 75.57%. After then, the circuit breaker was triggered [16]. Around five billion USD market value was wiped off from the previous day. Luckin's event shows the existence of information asymmetry in the financial market. The market overestimated Luckin's stock due to falsifying companies' financial data. With the information asymmetry, even though there is the existence of substantial arbitrage, the individual investors still could not catch it. Thus, from Luckin's example, the assumption of EMH is violated, and the unethical behaviors from Luckin also decrease the efficiency of the overall financial market so that the stock price could not reflect all related information fairly.

Not only Luckin coffee revealed the inefficient stock market, but Glencore successfully interpreted the inefficiency. Glencore is one of the largest commodity companies in the world; it mainly focuses on multinational commodity trading and mining. On May 24th, it pleaded guilty to a range of charges, primarily bribery in South America and Africa, agreeing to pay more than $1.1 billion to settle government investigations into violations of the Foreign Corrupt Practices Act (FCPA) and commodity-price-fixing schemes [17][18]. Glencore admitted that it bribed over $28 million to 5 African countries. Attorney General Merrick B. Garland said it was the Justice Department's most excellent final enforcement effort against commodity price manipulation in the oil market. These crimes have caused significant losses worldwide, manipulating oil prices in the two largest fuel markets in the United States U.S. For Glencore, one of the largest oil companies, bribing government departments in Africa for illegally obtaining petroleum business priorities, this action seriously affected the U.S. oil market price. They can be received by oil business priority to control the supply and the cost of oil, the oil market in the United States to monopoly, profound impact on the market effectiveness. Before this information was exposed, retail investors had no way to know the asymmetric information between the average investor and high-ranking company administrator.

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Thus, companies' high-level managers and government officials who had been bribed could hold more inside information to gain revenue from the stock market. However, it was unfair to retail investors that they could only predict the stock price trend through the news or published information from companies because they did not have enough power to oppose capitalism. Some enterprises bribe the government to monopolize a particular town or city and gradually expand. These enterprises usually set unachievable goals for the local government, prioritize obtaining resources through bribes and modify their financial statements. In this case, the government hides its financial statement. The company's outlook is too optimistic about guiding investors to make the right stock-picking decisions.

According to the stock price of Glencore on May 24th, the bribery incident did not cause too much negative impact on the stock price, which is like Luckin Coffee did, even showing an upward trend [19]. This status quo is contrary to the theory of market efficiency, and it cannot be analyzed following the analysis of conventional efficient markets. Even with these events, large companies like Glencore are still too big to fail, but ordinary investors can not realize this. The market is always efficient in their eyes. They prefer that the company that faces a scandal drops its stock price, thus throwing it away—selling stocks to stop losses in time. On the contrary, most investment institutions know they cannot collapse or have other inside information, such as the company may have good development in the future. Thus, they will buy many stocks at a low level to catch the arbitrage.

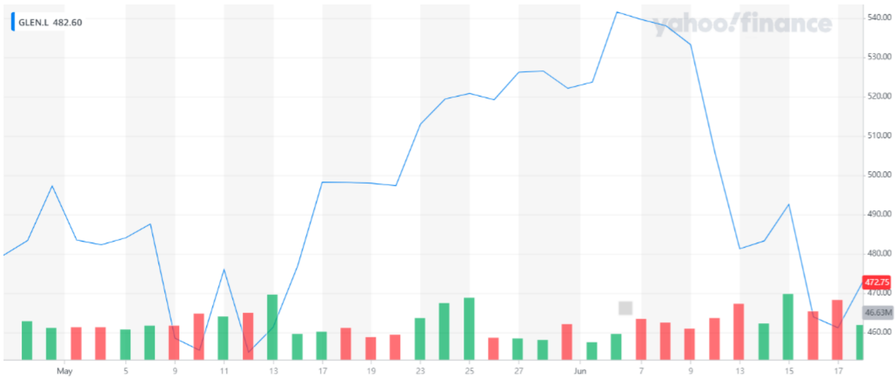

Figure 4: The historical trend of Glencore stock prices [19].

In conclusion, the unethical behaviors of large companies raise the level of information asymmetry. With this feature, many investors could not recognize the stock, which does not reflect all information fairly, so they could not catch the arbitrage opportunity. Furthermore, even if there is no information asymmetry, the price of securities still could not be fair due to factors outside the financial market. Therefore, it could be concluded that the efficiency market is strongly affected by companies' behaviors, and the market efficiency still is at a low level.

4. Conclusion

The assumptions for EMH are based on rational investors, independent investment behaviors, and unlimited capacity to catch the arbitrage. However, in the real financial market, investors are not like machines. Investors' psychological state is always the key to influencing the whole market. Their psychological situation is affected by weather and seasons, so they cannot make rational investment decisions. In another case, investors with common beliefs prefer not to make sensible decisions. Investors who have shared opinions will also act together for a particular investment. The rationality and independence of investors are critical, but they may not always be rational and independent. Furthermore, companies will also act in their interest. Several companies will conduct unethical behaviors. Due to information asymmetry, the stock price will not reflect all information fairly. Even though there is substantial arbitrage, investors still could not catch it with limited capacity. Moreover, even with unethical behavior, due to the factors outside the financial market, the company is too big to fail, so the stock price still could not reflect the information fairly. Overall, it could be concluded that all three assumptions for the market efficiency are violated, and the market efficiency level is weak (the stock price could not reflect public or public and inside information fairly). However, with the increase in machine learning and quantitative trading application, the efficiency of the overall market will continue to increase. After all, people are always more emotional than machines.

References

[1] *Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance (New York), 25(2), 383–. https://doi.org/10.2307/2325486*
[2] *Baldridge, R. (2022, May 11). What Is the Efficient Market Hypothesis? Forbes Advisor. Retrieved October 2, 2022, from https://www.forbes.com/advisor/investing/efficient-market-hypothesis/*
[3] *Market efficiency theoretically rests on three supports, which is investor rationality, uncorrelated errors and unlimited arbitrage - University Business and Administrative studies - Marked by Teachers.com. (n.d.). Retrieved October 2, 2022, from https://www.markedbyteachers.com/university-degree/business-and-administrative-studies/market-efficiency-theoretically-rests-on-three-supports-which-is-investor-rationality-uncorrelated-errors-and-unlimited-arbitrage.html*
[4] *Seasonal affective disorder (SAD) - Symptoms and causes. (2021, December 14). Mayo Clinic. Retrieved October 2, 2022, from https://www.mayoclinic.org/diseases-conditions/seasonal-affective-disorder/symptoms-causes/syc-20364651#:%7E:text=The%20reduced%20level%20of%20sunlight,play%20a%20role%20in%20SAD%20.*
[5] *Seasonal affective disorder: MedlinePlus Genetics. (n.d.). Retrieved October 2, 2022, from https://medlineplus.gov/genetics/condition/seasonal-affective-disorder/*
[6] *Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2015). Seasonal Variation in Treasury Returns. Critical Finance Review, 4(1), 45–115. https://doi.org/10.1561/104.00000021*
[7] *Hirshleifer, D., & Shumway, T. (2003). Good Day Sunshine: Stock Returns and the Weather. The Journal of Finance (New York), 58(3), 1009–1032. https://doi.org/10.1111/1540-6261.00556*
[8] *Katz, J.N., McCubbins, M.D., & McMullin, J.L. (2018). The Post-Earnings Announcement Drift: An Anomalous Anomaly.*
[9] *Netflix Inc (NFLX) Stock Price & News. (n.d.). Google Finance. Retrieved October 2, 2022, from https://www.google.com/finance/quote/NFLX:NASDAQ?sa=X&ved=2ahUKEwjF4qejzcL6AhX7lYkEHWBeCr8Q3ecFegQINBAg&ucbcb=1*
[10] *Bursztynsky, J., & Alessandrini, S. (2022, April 21). Netflix closes down 35% wiping more than $50 billion off market cap. CNBC. Retrieved October 2, 2022, from https://www.cnbc.com/2022/04/20/netflix-plunges-trading-subscriber-loss.html*
[11] *Kaestner, M. (2006). Anomalous Price Behavior Following Earnings Surprises: Does Representativeness Cause Overreaction? Finance (Paris), 27(2), 5–31. https://doi.org/10.3917/fina.272.0005*
[12] *Morrow, A. (2021, January 28). Everything you need to know about how a Reddit group blew up GameStop's stock. CNN. Retrieved October 2, 2022, from https://edition.cnn.com/2021/01/27/investing/gamestop-reddit-stock/index.html*
[13] *GameStop Corp. (GME) Stock Price, News, Quote & History. (n.d.-b). Retrieved October 2, 2022, from https://finance.yahoo.com/quote/GME?p=GME*
[14] *Ghosh, M. G. (2020, April). Luckin Coffee: From Brewing Coffee to Cooking the Books. JUMPSTART. Retrieved October 2, 2022, from https://www.jumpstartmag.com/luckin-coffee-from-brewing-coffee-to-cooking-the-books/*
[15] *Wang, S., & Campbell, M. (2020, July). Luckin Scandal Is Bad Timing for U.S.-Listed Chinese Companies. Bloomberg. Retrieved October 2, 2022, from https://www.bloomberg.com/news/features/2020-07-29/luckin-coffee-fraud-behind-starbucks-competitor-s-scandal?leadSource=uverify%20wall*
[16] *Luckin Coffee Inc. (LKNCY) Stock Price, News, Quote & History. (n.d.-b). Retrieved October 2, 2022, from https://finance.yahoo.com/quote/LKNCY/*
[17] *Glencore Entered Guilty Pleas to Foreign Bribery and Market. (2022, May 25). Retrieved October 2, 2022, from https://www.justice.gov/opa/pr/glencore-entered-guilty-pleas-foreign-bribery-and-market-manipulation-schemes*
[18] *Attorney General Merrick B. Garland Delivers Remarks Announcing. (2022, May 25). Retrieved October 2, 2022, from https://www.justice.gov/opa/speech/attorney-general-merrick-b-garland-delivers-remarks-announcing-glencore-guilty-pleas*
[19] *Glencore plc (GLEN.L) Stock Price, News, Quote & History. (n.d.-b). Retrieved October 2, 2022, from https://finance.yahoo.com/quote/GLEN.L?p=GLEN.L*