**Project Analysis Report**

**Analysis of Apple and Samsung Stock Performance During the COVID-19 Pandemic:**

For our first group project of Data Science Bootcamp, we chose to analyze Apple and Samsung stock performance during Covid !9 pandemic and its comparison with other tech companies. This analysis is important as it helps to:

* Understand market resilience under stress
* Identify how these companies adjusted to challenges such as supply chain disruptions, lockdowns and consumer behaviour.
* reveal how investor sentiment evolved with changes in economic conditions, public health measures, and financial stimulus.
* Provide insights into their business models.
* Understand the recovery strategies.

To conduct this analysis, we collected data mainly from Yahoo Finance because it is free and easy to access and provides a wide range of financial data.

We analyzed following trends in our project:

**1.Stock Price Trends:**

***Before Covid***

**Apple**: The price stayed within a linear price range, an uptrend for all of 2017 and most of 2018. Closer to the end of 2018, the price experienced a reversal, causing a downtrend for the rest of 2018. This downtrend was caused by Apple estimating their growth for the first quarter of 2019 to be only about 1-5%, which is low for the company. Many investors inferred that the company's small, expected growth means a slowdown in the company, which in turn indicates that they should sell their stocks. Not only did Apple project small growth for the first quarter of 2019, but it also announced that it would no longer provide unit-sale data for iPads, iPhones, and MacBooks. Investors were suspicious if Apple was trying to hide something, and if so, what? At the beginning of 2019, another reversal was back into an uptrend. With small retracements, prices continue to trend upward for the rest of 2019. Investing in Apple before COVID-19 would help investors as the price was tending upward most of the time. With the significant reversal, investors pulled out due to predicated small growth. But after that downtrend, Price continued to move upward.

**Samsung:** At the beginning of 2017, the stock price of Samsung started strong but met a significant slowdown and then reversed into a downtrend by year’s end. The downtrend continued until 2019. In 2019, The stock experienced a sharp increase at the beginning of the year, suggesting a positive turnaround after years of a downtrend. However, this was followed by a period of consolidation, where the price fluctuated within a defined range (between 35,000 KRD to 60,000 KRW), indicating indecision among investors. Toward the end of the year, there was a slight uptrend, bringing prices to the highs of 2017. This is the price staying within the defined range. Investors find interest in these areas of highs and lows when the price is consolidating, as they help tell them when and where to buy stocks. Investing in Samsung before COVID-19 could’ve been beneficial, even though the price was moving between a range if an investor could buy/sell at highs and lows of the defined range.

In summary, while both stocks have the potential for gains, Apple's stability may appeal to those who prefer a lower-risk approach. At the same time, Samsung might attract investors who are willing to navigate more volatility. Investing in Apple has generally been safer than investing in Samsung. Even if investors buy Apple stock later in its upward trend, they are likely still to see profits by the end of the year, thanks to its consistent price movement. In contrast, while it’s possible to profit from Samsung stock before COVID-19, it requires more active management. Investors need to analyze charts to identify prices, buying low and selling high.

***During covid***

**Apple:** Following a brief retracement, the stock price rapidly surged during an uptrend, maintaining this momentum until late 2021 and early 2022, when it began to consolidate. The price showed significant volatility throughout this period, rising from approximately $60 to $175 by the end of 2022. Investors are often drawn to stocks with such volatility, making this an ideal time to enter the market, as returns could reach around 191% in just two years.

**Samsung:** Like Apple, after a retracement, the price surged into an uptrend due to considerable volatility, rising from just over 40,000 KRW to over 90,000 KRW. However, when the price peaked in 2021, it reversed and entered a downtrend, continuing to decline throughout 2022. Like Apple, the price remained quite volatile during this period, allowing investors to capitalize on a 125% price change.

Both stocks saw a sharp uptrend during the pandemic due to significant price volatility that attracted investors. Apple delivered an impressive 191% return over two years, while Samsung achieved a 125% return in just one year. However, Samsung's prices didn’t resume their upward trajectory until nearly a year after COVID-19, whereas Apple continued to climb even after the pandemic. This sustained momentum makes Apple a more favorable investment choice.

***After covid***

**Apple:** After COVID-19, Apple’s stocks consolidated between $125 and $175 for 2022. At the beginning of 2023, we saw a sharp increase from $125 to $150 within the first few months. This uptrend continued, bringing the price to almost $200 by the end of 2023. At the beginning of 2024, the price experienced a retracement only to explode from about $170 to over $200, a new high since 2017, before COVID-19.

**Samsung:** Samsung stock started 2022 with a notable downtrend but reversed course before the end of the year. From late 2022 into the early months of 2024, the stock entered an uptrend, remaining within a linear range. Over two years, this trend elevated the price from around 5,000 KRW to 8,500 KRW.

While both stocks trended upward for most of the time after COVID-19, Apple's stock experienced fewer consolidation periods and more price volatility.

The best period to trade each stock would be during COVID-19, as the price was extremely volatile and moved sharply in an uptrend. Overall, from 2017 to 2024, Apple’s stock was in an uptrend. Between these years, Samsung's stock trended upward with one significant reversal.

**2. Trading Volume:**

The analysis aims to look at how the COVID-19 pandemic affected the trading volume of Apple and Samsung. By examining the trading volumes pre-pandemic and during the pandemic for both companies, it helps determine whether the investor activity in these stocks increased or decreased and helps provide insights into investor behavior in response to market shifts caused by the global pandemic. The stock price data for Apple and Samsung was sourced from Yahoo Finance API because of its frequency of updates, ensuring accurate and current data. The datasets were merged to show the historical stock prices ranging from January 2020 to December 2021.

We were able to calculate the total trading volume of Apple and Samsung by grouping them with a ticker which helps differentiate between the two currencies USD (US Dollars) for Apple and KRW (Korean Won) for Samsung, allowing us to see the total trading activity for each company in their respective

The utilization of bar charts allowed for easy comparisons of the total trading volume allowing us to get insights on how the pandemic affected investor activity.

During the pandemic, Apple and Samsung saw a constant change in trading volume. Apple experienced a surge in trading volume in early 2020 and managed to sustain its levels of trading through mid-2020. Samsung’s trading volume also showed growth during the pandemic. However, by the end of 2021, there was a slight decline due to the global semiconductor shortage that took place. Overall, Apple outperformed Samsung in trading activities, resulting in higher investor confidence in the tech sector during the pandemic.

**3. Recovery to Pre-Pandemic Levels:**

The recovery timeline of Apple and Samsung to their pre-pandemic stock price levels offers valuable insight into their resilience, strategic decisions, and investor confidence during and after the COVID-19 pandemic. Here’s a breakdown of how long it took for each company to recover, along with an analysis of the factors that contributed to their recovery:

***Apple’s Recovery Timeline and Analysis:***

**Pre-pandemic levels:**

In January 2020, Apple’s stock was trading around $75–$80 per share (adjusted for the stock split that occurred in August 2020).

**Pandemic low:**

In March 2020, as global markets plunged due to the uncertainty surrounding the COVID-19 pandemic, Apple’s stock dropped to approximately $55–$60 per share**.**

**Recovery to pre-pandemic levels:**

By June 2020, Apple’s stock price had recovered to its pre-pandemic levels, reaching around $80 per share, just a few months after the March lows.

**Factors Behind Apple’s Quick Recovery:**

1. Robust Business Model: Apple’s diversified business, particularly its growing services division (which includes the App Store, iCloud, and Apple Music), helped maintain steady revenue. The services segment is less vulnerable to supply chain disruptions compared to hardware.

2. Work-from-Home Demand: The surge in demand for laptops, tablets, and other devices due to remote work and online learning boosted sales of Apple’s MacBook and iPad products.

3. Strong Brand Loyalty: Apple has a loyal customer base that continued to buy its products, even during the economic uncertainty of the pandemic. This brand loyalty helped Apple recover more quickly than other companies.

***Samsung’s Recovery Timeline and Analysis:***

**Pre-pandemic levels:**

In January 2020, Samsung’s stock was trading around KRW 55,000 (South Korean won) on the Korea Exchange.

**Pandemic low:**

Samsung’s stock price dropped to around KRW 47,000 in March 2020, as the global economic outlook became uncertain.

**Recovery to pre-pandemic levels:**

Samsung took slightly longer than Apple to recover, reaching its pre-pandemic stock price of KRW 55,000 by around August 2020.

**Factors Behind Samsung’s Recovery:**

1. Semiconductor Demand: One key advantage for Samsung during the pandemic was its semiconductor business. Samsung is one of the largest manufacturers of memory chips, and the pandemic led to a surge in demand for semiconductors due to increased data center usage, remote work, and online services.

2. Diversified Business: Unlike Apple, Samsung is heavily involved in various sectors, including smartphones, consumer electronics, and semiconductors. This diversification helped cushion the impact of the pandemic, particularly as the semiconductor sector saw growing demand.

3.Resilience in Smartphone Sales: Samsung’s smartphone sales were impacted by the pandemic, but it benefitted from its diversified product range, which includes both premium devices like the Galaxy S series and budget-friendly options in the mid-range segment, allowing it to appeal to a wide range of consumers.

4. Supply Chain Management: Samsung’s strong global supply chain management allowed it to mitigate the effects of supply chain disruptions better than some competitors. Its geographical diversification in manufacturing (including plants outside of China) helped Samsung maintain product availability.

It took Apple and Samsung approximately 6 months to surpass their pre-pandemic stock price levels. By late 2020, both companies were performing exceptionally well due to increased demand for tech products, especially smartphones and services.

**4. Comparison with the Technology Sector:**

The Nasdaq 100 Index is a collection of the 100 largest, most actively traded companies listed on the Nasdaq stock exchange. The index includes companies from diverse industries like manufacturing, technology, healthcare, and others.

Apple experienced the highest growth among the three, significantly outperforming both Samsung and the NASDAQ-100 Tech Index.

Samsung has had the most stable growth, indicating a steadier stock price with fewer large variations.

The NASDAQ-100 Tech Index has grown steadily, reflecting the performance of the overall tech sector, though not as sharply as Apple. During this time, both tech stocks and markets in general experienced increased uncertainty.

After the pandemic peak, volatility for all three starts to normalize, but Apple and the NASDAQ-100 Tech Index show periodic spikes, especially during 2021-2023. Samsung remains relatively stable, with fewer drastic changes in volatility.

Both companies outperformed the broader technology sector during the pandemic. The tech sector in general experienced a boom as remote work, digital services, and consumer electronics saw a surge. Apple and Samsung, being industry leaders, were among the primary beneficiaries, although Apple’s performance was especially remarkable, driven by iPhone sales and its services.

**5. Stock Price Volatility:**

Volatility is a statistical measure of how much a stock's price fluctuates over time. It's often measured using the standard deviation of returns, which is the difference between a stock's individual returns and its average return over a given period.

Volatility is a key factor in determining the risk of an investment. Stocks with higher volatility are generally considered riskier because their prices are less predictable.

**1. Volatility (Pre-Covid vs. Covid):**

Apple and Samsung’s pre-Covid and Covid volatilities are direct measures of how much the daily returns fluctuated over time in those periods.

If the Covid volatility is higher than the pre-Covid volatility, it indicates that the stock became more volatile (i.e., the prices fluctuated more) during the pandemic period. A higher volatility generally means that the stock was subject to larger price swings.

**2. Comparing Volatility between Companies:**

If Apple’s volatility increased more during the pandemic compared to Samsung, it could imply that Apple’s stock was more sensitive to the market conditions induced by the pandemic.

if Samsung’s volatility increased more, it could indicate greater uncertainty or risks perceived by investors in Samsung compared to Apple during that period.

**3. Economic Interpretation:**

- Stock price volatility is often driven by uncertainty in the markets. During the pandemic, numerous factors (lockdowns, supply chain disruptions, changes in consumer behavior, etc.) may have contributed to increased volatility.

**4. Impact on Investors:**

- Higher volatility often indicates higher risk. Investors might avoid such stocks during volatile periods.

- A steady decline in volatility toward pre-Covid levels could signal a return to normalcy, suggesting that the market has absorbed the pandemic's impact and stabilized.

Thus, this analysis helps to highlight the risk or instability of these stocks over time. Apple’s higher volatility indicates it has experienced more price swings, while Samsung’s more stable line suggests less price movement and potentially lower risk.

During the pandemic, volatility for both Apple and Samsung increased sharply, mirroring the broader market trend. The initial market crash in March 2020 and subsequent recovery period saw significant swings in their stock prices. However, once recovery was underway, volatility levels began to stabilize as both companies reported better-than-expected earnings driven by pandemic-induced demand for tech.

**6.Performance Comparison of Apple, Samsung, Motorola, and LG Before, During, and After the COVID-19 Pandemic**

**Before the Pandemic:**

Apple and Samsung were already dominant players with strong stock performance. Apple had a solid upward trend driven by iPhone sales and services, while Samsung's semiconductor business was booming. LG and Motorola lagged behind, with Motorola focusing on budget phones and LG struggling with its mobile division.

**During the Pandemic:**

Apple emerged as the top performer, with its stock surging due to increased demand for devices and services for remote work and learning. By late 2020, Apple had almost doubled its pre-pandemic stock value.

Samsung recovered quickly as well, benefiting from strong demand for its Galaxy series and semiconductor components. Its profits rose significantly in the latter half of 2020, though it did not match Apple's growth in percentage terms.

Motorola and LG struggled during the pandemic. LG’s mobile division continued to underperform, leading to the eventual decision to exit the smartphone market in 2021. Motorola maintained a market presence but failed to capture major market share**.**

**Post-Pandemic:**

Apple has remained the strongest performer, driven by continuous innovation and product diversification. Its ecosystem and services keep boosting long-term value.

Samsung continues to perform well, especially with its leadership in foldable phones and semiconductor technology, but it remains more volatile due to the cyclical nature of the semiconductor business.

LG exited the smartphone market in 2021, while Motorola remains a smaller player focused on budget-conscious consumers.

**Conclusion:**

While both Apple and Samsung navigated the pandemic effectively, Apple’s stock growth was more pronounced, especially due to its service-based revenues, whereas Samsung benefited from its semiconductor and electronics businesses. Both companies outpaced the overall tech sector during the pandemic, although volatility was notably higher during the crisis. Apple emerged as the best-performing phone company in terms of stock appreciation both during and after the pandemic**.**