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Fall 2021 Chief Editors: Teresa Tan and Jiayi Corinne Li

A New Reality: The Next Generation of Space Travel

By Vinya Kumar and Marjorie Wan, Market Research Analysts

General Overview

The space travel industry is a goods-and-services-based business model with various sectors dedicated to sending consumers to space for leisure and travel. Since the 1960s, government players have dominated the industry [1], but private companies have emerged attempting to tap into space travel. At the present stage, the only sources of space demand are NASA and government consumers [1]. However, private companies are proving that they are becoming more equipped to send regular people into space, which will create more demand for the industry among non-government consumers. In May 2020, SpaceX was the first private company to send humans into space [1]. Boeing, Blue Origin and Virgin Galactic are also making efforts to expand spaceflight [1]. Virgin Galactic and Blue Origin compete for suborbital tourism, which reaches an altitude of about 100 km [3]. SpaceX operates in orbital tourism, which reaches an altitude of 400 km and allows passengers to stay in a space for a significantly longer time [3].

History of the Dry Bulk Shipping Industry

Due to the space travel industry being led by government players, the focus of the industry has inevitably been on activities that serve the public interest, for example, national security, basic science, and national pride [3]. However, private companies have no necessity to justify expenditure on space travel, as it is not funded by government tax money. Therefore, we will see a supply created for space travel for the personal interest of consumers. The demand will mainly come from the wealthy as tickets will have to be pricey to cover the high costs of the service, which result from R&D. George Whitesides, the chief space officer of Virgin Galactic, termed space tourism flights as "out-of-home luxury experience" [3]. The demand is highly price elastic because commercial space travel will be seen as a luxury good and requires a large portion of one's income.

While space travel still has very few players on the demand side, the industry may grow to be large

widely available, and easily accessible. For this to take place, there would need to be significant cost reductions. Space travel has high costs presently due to the high R&D costs and the science behind space travel: most of the components used in the rockets are discarded, and a large amount of propellant is required [4]. Additionally, launch facilities are a sunk cost for these firms. Despite these high costs, the SpaceX website says: "Our performance will increase, and our prices will decline over time, as is the case with every other technology." Thus, through technological advancements, cost cuts may become possible.

Potential Investment Opportunities and Disruptions

With the advancement of the space travel industry, there will be growth potential for firms in complementary industries, such as energy, mining, hospitality, and real estate. At the same time, the airline industry may see a decline if space travel becomes easily accessible.

The energy industry will grow due to the prolific amount of energy required for space inhabitants. If Bezos estimates that there will be millions living and working in space in the coming decades [5] proves true, then a new energy market will emerge. Moreover, the proximity to the sun may cause solar power to become a reliable source of energy, which could be used on Earth.

Future Outlook

The space industry illustrated a record-breaking growth in 2021, with more than \$9 billion invested in private companies. Investors have realized that governments do not monopolize the sector anymore. So, the question is, what does the future of commercial space travelling look like?

We expect growth opportunities in the private sector as technology and cost barriers continue to fall in the near term. Governments have already started to look at the private sector to advance space technology by working with private companies on trillion-dollar projects. Moreover, they are also constructing more complete regulations and licensing requirements for commercial space travel companies [6].

Jeffery Bezos' trip to space, launching inspiration by SpaceX, Boeing to offer commercial flights with its Starliner Capsule, these recent milestones have generated excitement and made headlines, driving even more investment in private space companies. For instance, many special-purpose acquisition companies (SPACs) target space companies based on their projected future revenue, allowing them to go public [7]. Suppose the companies that plan launches in late 2021 and 2022 do meet their timelines. In that case, we can expect an even more significant surge of interest from both investors looking for opportunities and passengers wanting to book future flights.

Analysis of the Stocks in the Industry

Tail Risk

Although most spaceship launches have been great successes so far, loss of space shuttlers such as Challenger and Columbia have shown that accidents are all but inevitable, even when it comes to government programs [6]. Given the limited capacity and number of trips in the current stage, a failed launch will be catastrophic and would negatively influence the company's operation and investors' confidence. A failed launch might also bring more severe regulatory and political risks.

Technology Risk

Compared to most traditional sectors, the space exploration sector bears a higher-than-average beta risk. In extreme market conditions, it's much more volatile than the market portfolio. One primary reason is its heavy dependence on technology. It can be particularly vulnerable to the potential obsolescence of products and services due to exponential technological advancement and competitors' innovation within the industry.

Sample Investment Options

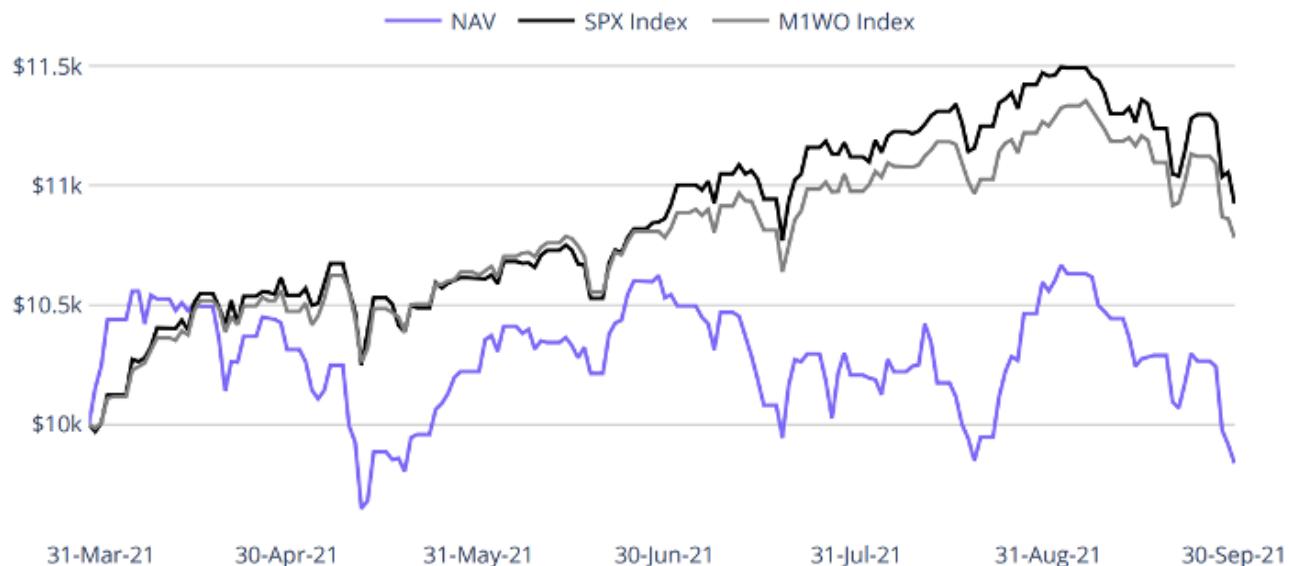
ARKX - Ark Space Exploration and Innovation ETF

ARKX is the newly created ETF under the lead of Cathie Wood that focuses on space exploration. It offers great diversification to a portfolio due to little overlap with traditional indices. Its previous close was at 20.92 dollars. The 52-week range is 19.12 - 21.33 dollars [8].

ARKX invests under normal circumstances, primarily in domestic and foreign equity securities of companies engaged in the Fund's investment theme of Space Exploration and innovation. The adviser defines "Space Exploration" as leading, enabling, or benefitting from technologically enabled products and/or services that occur beyond the surface of the Earth. Technology in the portfolio includes Aerospace Beneficiaries (39.8%), Enabling Technology (28.7%), Orbital Aerospace (23.4%) and Suborbital Aerospace (7.7%). To breakdown by sector, ARKX consists of Industrials (49.9%), Information Technology (26.1%), Communication Services (9.6%) and Consumer Discretionary (3.8%). ARKX invests more than 80% in North American companies [9].

The performance of ARKX did not beat SPX Index from March 2021 to September 2021 and was more volatile than the market portfolio. Some primary reasons include the general public's consensus on economic conditions, the poor performance of tech stocks and how niche the sector is.

GROWTH OF 10,000 USD SINCE INCEPTION



The line graph represents the cumulative performance of a hypothetical \$10,000 investment. The returns are net of the ETF's expenses but do not reflect the payment of any brokerage commissions or brokerage costs incurred as a result of buying or selling fund shares and do not reflect the deduction of taxes to which an investor would be subject as a result of owning or selling shares of the fund. If they did, the returns would be lower than those shown.

Figure 1

SPCE - Virgin Galactic Holdings Inc.

This space travel company builds advanced air and space vehicles and aims to provide private individuals and researchers spaceflight services. At the end of 2019, Virgin Galactic reported more than 600 reservations and \$80 million in deposits from high net-worth individuals, which would translate into \$120 million in revenue once realized. Its previous close was 19.53, with a 52-week high of 62.8 and a low of 14.27 [10].

SPCE's current stock price is well below its 50-day and 200-day keyline. As seen in the graph below, the stock hit a high of approximately 60 dollars in February and a high of roughly 55 dollars when the founder Richard Branson flew to space in early July. The stock declined by about 13% over the last week and remained down by almost 18% over the previous month. This compares to the S&P 500, which was up by nearly 2% over the past week. The declines come as the company pushed back the planned start of its full commercial service to Q4

2022, marking a significant delay from the original early 2022 timeline investors were expecting. The company says that it needs to make specific enhancements to its spaceplanes to make them safer and more robust for the long run [11]. This will delay some critical test flights that are required before commercial operations.



Figure 2

Conclusion

Although space travel is a relatively new industry, there is significant potential for growth. Space travel could become more accessible as a luxury item for even the middle class with technological advancements. The prevalence of private firms in the market will increase efficiency and accelerate the speed at which R&D is conducted, and technology is developed. These firms are incentivized to produce quickly without compromising the safety and security of their passengers. With the success of the space travel industry, there will be growth potential in various sectors like energy. However, the airline industry may lose a large customer base if space travel becomes commonplace enough.

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October 2021

Elon vs Bezos - Fight to Protect Earth or Fight for Money

By Pratham Arya and Akshat Suri, Market Research Analysts

Who is Elon Musk?

Elon Musk is the current CEO of Tesla Inc. and co-founder of PayPal and SpaceX. He was born on June 28, 1971. He studied at Queen's University in Kingston and later finished his degree from University of Pennsylvania for Physic and Economics in 1997. He planned to pursue a graduate degree in Physics at Stanford University but dropped out two days later, because he believed the internet had a better potential than physics. [1]

- 1995: Founded Zip2; provider of maps and business directories to online newspapers
- 1999: Sold Zip2 to Compaq for \$307 million
- 2000: Founded X.com – later renamed to PayPal
- 2002: Sold PayPal to eBay for \$1.5 billion
- 2002: Founded SpaceX; Space exploration company with aims of making it affordable
- 2004: Became an early investor in Tesla Motor – later renamed to Tesla
- 2021: Became the richest man in the world with a net worth of 318.4 billion USD

Who is Jeff Bezos?

Jeff Bezos is the CEO and founder of Amazon.com, also the founder of Blue Origin and owner of The Washington Post. He was born on January 12th, 1964. He graduated from Princeton University with a Degree in Electrical engineering and Computer Science in 1986. In 1990 he joined New York Investment Bank D.E Shaw & Co. and soon became the youngest Senior Vice-President at the firm. He was tasked with the analysis of the interest as an investment opportunity. He soon realized that 2000% a year growth in interest sparked his entrepreneurial imagination as his next venture in life. [2]

- 1994: Quit his position at D.E Shaw & Co and moved to Seattle
- 1994: Began working on a virtual bookstore and the software for the site, Amazon.com
- 1995: Sold its first book in July
- 1998: Began selling CD's and videos
- 1999: Added auctions and invested in other virtual stores

2002: Founded Blue Origin
2005: Realized they need to offer a wide variety of products to sustain its survival
2006: Established Amazon Web Services, Cloud computing services
2007: Launched handheld reading devices; Kindle – to incentive sales for books
2010: Kindle sales surpassed sales of hardcover books
2010: Began developing movies and T.V shows through Amazon Studios
2013: Bought the Washington Post and affiliated posts for \$250 million
2018: Became the world's richest man with net worth of \$112 Billion USD
2021: Stepped down as CEO of Amzon.com but remained as executive chairman
2021: Net worth \$203 Billion USD. – Second richest person alive

TSLA – Company Info

Tesla Inc. is an American electric vehicle and clean energy company based in Palo Alto, California, United States. Tesla designs and manufactures electric cars, battery energy storage from home to grid-scale, solar panels and solar roof tiles, and related products and services. In 2020, Tesla had the most sales of battery electric vehicles and plug-in electric vehicles, capturing 16% of the plug-in market (which includes plug-in hybrids) and 23% of the battery-electric (purely electric) market. Through its subsidiary Tesla Energy, the company develops and is a major installer of photovoltaic systems in the United States. Tesla Energy is also one of the largest global suppliers of battery energy storage systems, with 3 gigawatt-hours (GWh) installed in 2020. [5]

AMZN – Company Info

Amazon.com, Inc. is an American multinational technology company which focuses on e-commerce, cloud computing, digital streaming, and artificial intelligence. It is one of the Big Five companies in the U.S. information technology industry, along with Google (Alphabet), Apple, Facebook (Meta), and Microsoft. The company has been referred to as "one of the most influential economic and cultural forces in the world", as well as the world's most valuable brand. Jeff Bezos founded Amazon from his garage in Bellevue, Washington, on July 5, 1994. It started as an online marketplace for books but expanded to sell electronics, software, video games, apparel, furniture, food, toys, and jewelry. In 2015, Amazon surpassed Walmart as the most valuable retailer in the United States by market capitalization. [6]

Tesla and Amazon Financials

Ticker	<u>NASDAQ:TSLA</u>	<u>NASDAQ:AMZN</u>
Price	\$1222.09	\$3518.99
52 Week Range	\$1243.49-\$393.03	\$3773.08-\$2881
Mkt Cap	1.23T	1.79T
EV	1.22T	1.82T
P/E	347.33	67.96
EV/EBITDA	166.99	28.06
Current Ratio	1.38	1.12

Figure 1

Tesla and Amazon fare similarly when it comes to their financials however we see a stark difference when it comes to their P/E and EV/EBITDA ratios. [3] Both the companies trade at a significant premium when it comes to their P/E ratios and EV/EBITDA. The P/E ratio measures its current share price relative to its earnings per share and the EV/EBITDA is a ratio that compares a company's enterprise value to its earnings before interests, taxes, debts and amortizations. A high P/E can indicate that the stock is overpriced for its current earnings and a high EV/EBITDA can mean that the company's present earnings don't justify its valuation. However, we do have to keep in account investors sentiment for the future outlook of the companies, which do explain the high ratios. Amazon's future ambitious acquisition goals [4] and speculation on Tesla's future industry market share has urged retail investors and the streets to drive the price for each of the companies.

TSLA Latest Deals – Hertz

Hertz Global Holdings Inc. kicked off its ambitious plan to electrify its rental-car fleet by placing an order for 100,000 Tecla's. The cars will be delivered over the next 14 months, and Tesla's Model 3 sedans will be available to rent at Hertz locations in major U.S. markets and parts of Europe starting in early November according to Hertz.

It's the single-largest purchase ever for electric vehicles and represents about \$4.2 billion of revenue for Tesla. After the deal Tesla's shares climbed 13%, the biggest one-day gain since March 9, to a record \$1,024.86, making it one of only five publicly traded U.S. companies with valuations above \$1 trillion. Hertz, which currently trades over the counter ahead of its relisting on the Nasdaq Stock Market, surged 10% to \$27.17. [7]

AMZN Latest Deals – Acquisition of Metro-Goldwyn-Mayer

Amazon acquired the film and TV company MGM for \$8.45 billion in May of 2021. It was a significant acquisition for the e-commerce giant because it now owns a library of content that's reported to consist of around 4,000 films and 17,000 hours of TV. It was the e-commerce giant's biggest entertainment acquisition, yet the acquisition is likely to help Amazon attract even more big-spending Prime subscribers as its Prime Video service competes with the likes of Netflix and Disney Plus. [8]

Race to Commercialize Space: SpaceX vs Blue Origin

In recent years whenever we hear about space, it is always about either SpaceX, Blue Origin, or NASA. The most interesting aspect of it is that SpaceX is owned by Elon Musk and Blue Origin by Jeff Bezos and as of recent both have made major strides in commercializing space. In recent months the race to commercialize space had been heavily linked to the increasing net worth of both founders. Blue Origin, a newer company compared to SpaceX, had its first civilian manned space flight on July 20, 2021. Where founder Jeff Bezos spent 10 minutes beyond the Earth's Ionosphere. SpaceX is currently attempting a return journey for 4 astronauts via its rocket on November 8, 2021. [9]

SpaceX vs Blue Origin Timeline:

2013: SpaceX won the lease for the rocket launch platform LC-39A

2014: SpaceX filed and won the patent right to sea landing of rockets from Blue Origin

2015: Blue origin's rocket New Shepard successfully landed from space

2016: Successfully landed a rocket on the sea, New Glenn directly began competing with

SpaceX's Falcon Heavy and near the Falcon 9 landed from space, prompting Jeff Bezos to tweet out: "Welcome to the club"

2021: SpaceX beat Blue Origin to a \$2.9 B contract to build the lunar lander for NASA [9]

Wealth disparity between Elon Musk vs Jeff Bezos

There is a saying, "The rich get richer, and the poor get poorer" even though it is morally a tough concept to accept it as the truth. Since the pandemic in the US alone the billionaires combined, wealth has risen to \$4 Trillion. While Elon Musk accounts for almost 8% of that amount. The question arises often is why do not the rich help the poor. In reality most billionaires are not against helping, they are not able to. In most cases rich individuals are either running their own company or are earning compensation in a manner which is not liquid. For example, Elon Musk receives his payments as CEO and investor in Tesla with Tesla Stock and options which he later leverages to banks in order to gain more financing. While in a case like Jeff Bezos he started his own company when he began to earn substantial amounts of money, he would either re-invest the amounts into his business or would invest in other companies. In both these cases we are able to see that these individuals do not have cash on hand. Cash is king, and without immediate cash it is near to impossible to shorten wealth disparity. The best way for the government to give back money to those who need it is usually by taxation. Though most of the richest individuals are able to avoid paying a lot of taxes. Through exemptions, delay, or loopholes. Elon Musk has not paid taxes on almost any of his compensation as most of it is tied into stocks, and as it is not cash, he is exempt from paying taxes unless he has a capital gain on the stocks or options which are set to expire in August 2022. Musk and Bezos each have an unfathomable amount of wealth, and they give to charity and different initiatives to support the world, but many think it is not enough. Looking at it from an external perspective, both sides are correct. Firstly, the rich should be obligated to pay more to others and the government as they have built their wealth on the back of the labors. While the second perspective is that even if the rich wanted to take their money today and give it to someone there are not strong systems in place to end the wealth gap or even save earth. These two opinions ask for the same things, one the rich are bound by contracts and commitments that they will give the sufficient funding, and second that institutions and others will work toward building better systems to try and end world hunger, poverty, and save the environment. Both Musk and Bezos are active in space research and developing technology which can support and better the environment. They have said on multiple occasions that they are unhappy with how major institutions are so tied up in the problems of today they are not thinking about how to address the problems of tomorrow as well. This will require a united front from everyone, the rich, the government, and the workers. To address all these issues that they can in our lifetime.

So, to answer the final question: Are Elon Musk and Jeff Bezos fighting to protect Earth or fighting for money?

Based on facts it is easy to say that they are doing this all for money and since they have money, they want more money. While in a qualitative sense we can say the opposite, that yes even with wealth they want to do things for the world however they can. In conjunction to both ideas, they are doing both fighting for more wealth and fighting for the world though the reason we do not see that is because the biggest intermediary between rich and poor is the government which is tied up in so many policies and regulations that they set, that it has become near too impossible to create better change without it at least being 5-10 years.

In the future we can see the rich get richer and poor get poorer or many rich get richer and poor get richer. Any of this is going to happen only when the government and institutions can put into place proper systems to show the world that there is a possibility for change and growth.

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October 2021

Welcome to the Metaverse

By Pia Zhu and Matthew Unrau ,Market Research Analysts

Prepare for plenty of confusion in the coming months because Facebook – whose products are used by more than 3 billion people worldwide – has decided to rebrand itself, and “Metaverse”, a new term in technology, has gradually become a hot topic in the market. Here’s everything you need to know.

What has happened?

On October 28th, Facebook, the company that owns platforms including Facebook, Instagram, and WhatsApp, rebranded as Meta. “The metaverse is the next frontier,” Chief Executive Officer Mark Zuckerberg said in a presentation at Facebook’s Connect conference, held virtually on Thursday. “From now on, we’re going to be metaverse-first, not Facebook-first.”

It is important to note that Facebook, WhatsApp, and Instagram will all be keeping their names. But the company that produces and maintains them will now be called Meta – similar to Google’s 2015 corporate restructuring into a parent company called Alphabet, specifically, repositioning Alphabet from a search-engine company to a holding company for its various businesses such as YouTube, Android, and Google. Facebook (the company) even changed the logo outside its building on October 28th.

For the stock performance, Facebook Inc (NASDAQ: FB) is trading higher Friday after the company announced that it will change its name to Meta. The stock was up 2.39% at \$324.50 Friday afternoon. The company’s stock will start trading under a new ticker, MVRS, on Dec 1st.

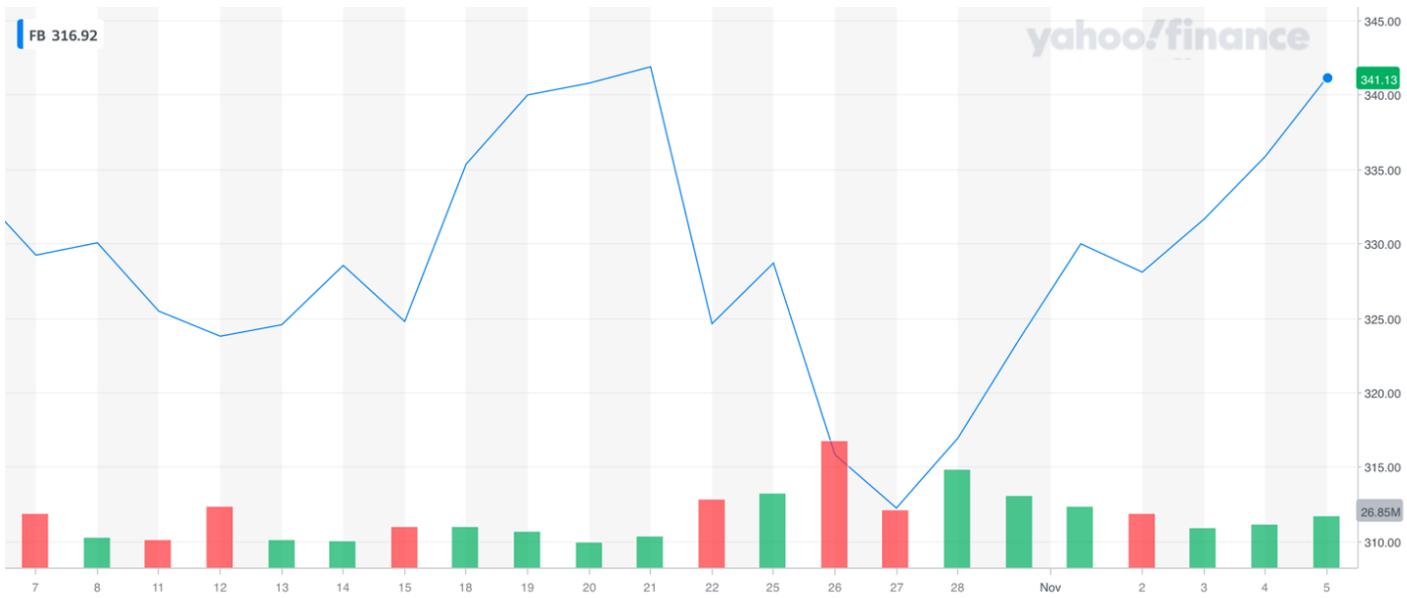


Figure 1: Facebook Inc (NASDAQ: FB) Stock Price for 1 Month [1]

What The Name Change Means for Facebook?

"Right now, our brand is so tightly linked to one product that it can't possibly represent everything that we're doing today, let alone in the future. Over time, I hope that we are seen as a metaverse company, and I want to anchor our work and identity on what we're building toward." Said CEO Mark Zuckerberg at the company's annual Connect conference.

The name change is the most definitive signal so far, signing that the company intends to go deep in the metaverse, a new computing platform. [3]

Also, by changing its name, Facebook hopes to reshape its brand image and create a good impression in society. This is because that the Facebook brand has been overshadowed by one negative news and PR crisis after another in the past few years. In 2019, Facebook has been punished by the US Federal Trade Commission (FTC) with a high price of up to 5 billion U.S. dollars due to scandals of leaking user data. Recently, Facebook has become a splint between the two factions in American society due to content control issues: a recent Facebook internal report exposed by a former employee showed that Zuckerberg and other top executives knew that the Facebook platform and algorithm could incite hatred and bring greater divisions to society. Nowadays, Facebook stock is under intense fire, partly due to Washington politicians who want to break the company up for alleged monopoly practices.

Overall, the name change separates its corporate identity from its eponymous social network; and demonstrates to the community and investors the confidence and determination to shift to an emerging computing platform focused on virtual reality. [3]

Wait, What the Metaverse is?

The term “Metaverse” was mentioned in Neal Stephenson's 1992 science fiction novel Snow Crash, referring to the convergence of physical, augmented, and virtual reality in a shared online space.

Nowadays, we simply see “metaverse” as a shared online 3D virtual universe. It incorporates all aspects of digital technology, including video conferencing, games like Minecraft or Roblox, cryptocurrency, email, virtual reality, social media, and live streaming. It is not a single product, it is not a game, and it is not created by a single company. Instead, it resembles a network of 3D worlds that give participants an immersive experience. [2] Interestingly, several companies are interested in creating “Metaverse” as a sort of future version of the internet, and so does Meta.

“In this future, you will be able to teleport instantly as a hologram to be at the office without a commute, at a concert with friends, or in your parents’ living room to catch up,” said Zuckerberg.

Analysis of Future Trends, Players, Challenges of the Metaverse

The metaverse will have many applications to the upcoming world and is dubbed the next iteration of the Internet of Things. However, the true metaverse is roughly 10-15 years away from us right now [8]. This section will take us through what must happen for the metaverse to become a reality, what are the challenges and who will be building it.

How to build the Metaverse?

Since the creation of AI, Machine learning, mass data transfers requires so much more processing power than we use today, we need to upgrade the foundations of the metaverse before building it fully. The metaverse demands better latency, bandwidth, and reliability concerning internet speed, which has been a problem since the beginning of the Internet of Things. Users will need a “zero lag” experience like real life to capture the true capabilities of AR/VR. It is currently believed that we will need to move from 5G to 6G networks (which are 10-100x better in virtually every way compared to 5G) to be able to accomplish this [4]. Another programming idea involves the use of Content Delivery Networks (CDN’s), which push data close to the user, allowing for less latency and travel distance to the user. Both Netflix and Epic Games currently use this as a “cheat” to prevent latency in their programs [4].

Who can create 6G networks?

Although 6G is very much still in the “vision stage,” the US and Japan are investing 4.5 billion in the race with China for 6G (or Beyond 5G) technologies. Most major companies in the race are not from Japan or the US, but rather China, South Korea, and Europe. The US and Japan already got beat in the race for 5G patents and market share by these companies before, so Japan is pledging \$2 billion (NTT Docomo) research and US is giving \$2.5 billion to fund research of the 6G field (Qualcomm) [5]. 5G and overall communication giants, Samsung, Ericson, Nokia have a joint research development team to create these 6G network technologies that started in 2019 [6]. Chinese companies that are actively researching 6G are Huawei and ZTE. Below is a chart showing how much improved the 6G networks will be than 5G, especially for metaverse applications.

5G vs 6G Comparison Chart

Key Performance Indicator	5G (consistent with 3gpp standards)	6G (consistent with published white papers)
Peak Data rate	20 GBPS	100 GPBS – 1TBPS
Radio Latency	Less than 1 ms	0.1 ms
Density	1 device per m ²	100 devices per m ²
Traffic Increase	1000 x	10000 x
AI / Machine Learning	Probable	Yes (Major Advancement Discussed)
Semantic Communications	No	Yes
Satellite Communications	Limited	Yes (Major Advancement Discussed)
Terahertz Spectrum, RF Device Improvements	No	Yes

Figure 2

What will the first steps of the metaverse look like?

The first applications have already been established with the creation of Cybernetics. This is the integration of human sensory and motor systems into computers. These platforms only have a “feel” of what the metaverse can be like, but they have enough features to get people excited about a virtual 3D world [9]

The first metaverse applications have come from video games, as the video game industry has a connection to metaverse worlds in the past; there have been many popular Mass Online Multiplayer and Free Play Worlds like Minecraft, Skyrim, GTA, and many others. Oculus, which was acquired by Facebook has released a popular VR Gaming headset that was one of the most popular gifts last Christmas. Even though the games on the Oculus are very simplistic and not very functional yet, the immersion into a different world is enough to get

people excited about the metaverse. CEO of Epic Games, Tim Sweeney, has been very outspoken about his thoughts on the metaverse beyond gaming. He wants to be able to get to where you can test drive a new car virtually [8].

In addition, Meta launched a VR meetings app called Workplace and social space called Horizons, which uses virtual avatar systems to hold meetings [8]. This is an available application on the Oculus VR headset that allows for users to communicate in the “same virtual room” while social distancing or not able to physically meet [10]. Although this is a first-of-its-kind application, it requires users to purchase the Oculus headset, which can be expensive, bulky, heavy, and not practical to wear for long periods. Problems like headaches and nausea persist with the headsets and may not be suitable for everyone [11].

In the commerce side of things, NFT's are becoming a great way to reliably track ownership of digital goods p8[. Most files today can be easily duplicated, and it is hard to determine who owns what. Non-fungible tokens (NFT's) cannot be readily exchanged like money. Paintings and houses all have unique non-fungible properties that can't be interchanged and NFT's are these “one-of-a-kind” assets for the digital world [7]. The transactions of NFT's are stored on the ledger known as blockchain – like cryptocurrency. Each file is tokenized thus creating an original that no one can replicate (of course you can still copy and share the picture, but it isn't the original and isn't tokenized). The token makes it like an “autographed picture” instead of just a copy [7].

The world is already starting to see an explosion in NFT popularity this year, and this trend will continue into mass blockchain adoption for the future. The decentralized authority of the blockchain is perfect for navigating the online world, as no one has direct authority and the system governs itself through a public ledger [7].

Market Research

According to Market Research Future, the Global VR/AR market will reach 766 USD billion by 2025, marking a 73.7% CAGR (Compounded Annual Growth Rate) from 2021 [12]. There are many useful applications of this technology like; Industrial automation is expected to enhance connectivity between self-monitoring devices and Machine-to-Machine communications. Healthcare industries plan to use AR/VR to create common spaces for doctors and patients when they are self-isolating, or when a physical connection is not feasible/practical for either party. The challenges that persist are regulation around metaverse standards, cybersecurity, and all-important speed issues [12]. However, the global economy believes that the rewards greatly outweigh the risks of AR/VR as market research from IDC predicts that the global spending on AR and VR is expected to go up sixfold from \$12 billion to \$72 billion by the end of 2024. [13]

Who can create 6G networks?

In addition to Meta, companies like Roblox, Microsoft, Nvidia, Snap, Autodesk, Tencent, Epic Games and Amazon are building out the metaverse [15]. Here is a snapshot of the projects each of these companies has going and how it will affect the metaverse in the future.

Roblox

The company is involved in the virtual video gaming world with its currency (Robux). The platform already has thousands of online multiplayer games, connected to a structured ecosystem [8]. The company aims to expand and create a place where millions of people will come to work, play, and socialize in 3D experiences. One of its main goals is to create an online space where you can conduct business and shop in its virtual currency [15].

Microsoft

The company is developing Microsoft Mesh, which is sort of the rival to Meta's Workplace Horizons initiative [14]. Minecraft may be a key for their expansion as it is already a platform that millions go on with their avatars to create virtual worlds [15].

Meta

Through the acquisition of Oculus, the company has heavily built out their VR/AR environment. In addition, the company has invested 50 million USD into funding non-profit groups to help "build the metaverse responsibly [8]. As aforementioned, the company is building VR meeting places like Workplace Horizons for their employees [15].

Nvidia

The computer chip giant is creating the Omniverse, a platform where you can create 3D worlds of simulations, building, and events. This has major education applications for school trips, as you will be able to go back in time to historical events. This also can allow for real estate simulations, and to realistically simulate training in dangerous situations. This application is said to be the "infrastructure" for metaverses being built [15].

Snap

The Social media giant already has a huge impact on the AR world and is arguably Meta's biggest challenger to create the metaverse. The company's main app, Snap Chat, already uses AR technology in its filters and avatars. The company also invested and revealed its first AR glasses this year [15].

Autodesk

The software firm known for creating programs from architects and engineers wants to start creating a metaverse with 3D worlds for buildings. The company has also wanted to build virtual worlds for entertainment and gaming [15].

Tencent

The company is the largest video game firm by revenue. They have stakes in Epic Games, Activision Blizzard, and other metaverse-related entities, making their next revenue stream dependent on the metaverse [15].

EpicGames

The creators of Fortnite want to turn it into a metaverse. The popular battle royale game already started hosting virtual concerts and parties separate from the main gameplay to help start the metaverse. CEO Peter Sweeney is a huge supporter of the metaverse and wants to use the digital world he has already created to bring it to life [15].

Amazon

The world's largest cloud services provider is bound to have some effect on the metaverse. One indeed was that the company could have stores using AR goggles to browse through the numerous products sold on Amazon [15].

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Where the US Government is on its Road of Tapering

By Nuwair Akram and James Zhang, Market Research Analysts

“History” of Tapering

As an example of definitions that investors constantly refer to as if everyone should know what they mean, “Tapering” is gradually slowing the pace of implementing central bank monetary policies that are known as “Quantitative Easing”. [12] After the great financial crisis in 2008, the Central Bank starts QE (Quantitative Easing) by printing money to buy assets such as government bonds. [11] This decreases the yields on long-term assets and raises the relative attractiveness of equities. [12] One of the aims of QE is to reduce the cost of borrowing across the entire economy and provide liquidity to financial markets. [4] By making it easier for people and companies to borrow, Quantitative Easing can ideally boost economic growth. [10]



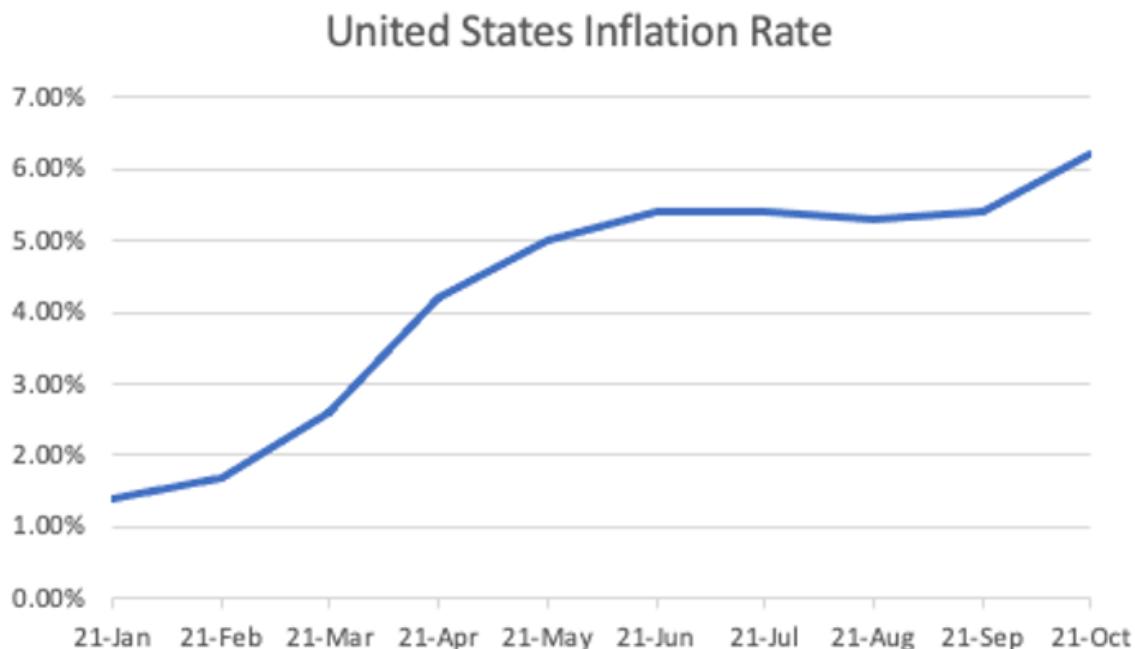
Source: CNBC News, [11]

However, Quantitative Easing can bring a lot of side effects as it lowers the returns. One of the side effects is driving up the prices of assets including bonds, shares, as well as properties. [13] Thus, as the Fed sees the economic conditions normalize, it gradually withdraws QE and tightens monetary policies. The use of the word “Tapering” becomes viral after Fed Chair Ben Bernanke announces in May 2013 that the Central Bank has started to consider reducing the volume of assets it was buying via QE. [10] However, the investor sentiment is opposed to a reduction in QE, fearing that the asset prices will go down consequently. The ensuing turbulent period caused solely by this is called the “Taper Tantrum”. [9]

Recent updates

After years have passed since the Great Recession, the Fed has been applying QE again after the economy has been critically struck by the COVID-19 pandemic. The federal government has been seeking to stimulate the economy while slashing the target for interest rates to near zero and has been buying “at least” 80 billions of treasuries and 40 billion of mortgages every month since July 2020. [9]

As it becomes brighter that the economy will have enough momentum to recover from the short yet severe pandemic recession (signs are there such as the unemployment rate had been back down to around 6 percent while the inflation rate ticked above 2 percent by March 2021), the Fed signals in August that it may start to reduce the QE program. [12]



Source: Trading Economics [14]

On November 3, the Federal Reserve announces that it will begin tapering the pace of its assets purchase later in November, with the Federal Open Market Committee saying that the move came “in light of the substantial further progress the economy has made toward the Committee’s goals since last December.” [9] The plan includes a reduction of 10 billion in purchase of Treasuries and \$5 billion in mortgage-backed securities. On the current schedule, the reduction in bond purchases will conclude around July 2022.[9]

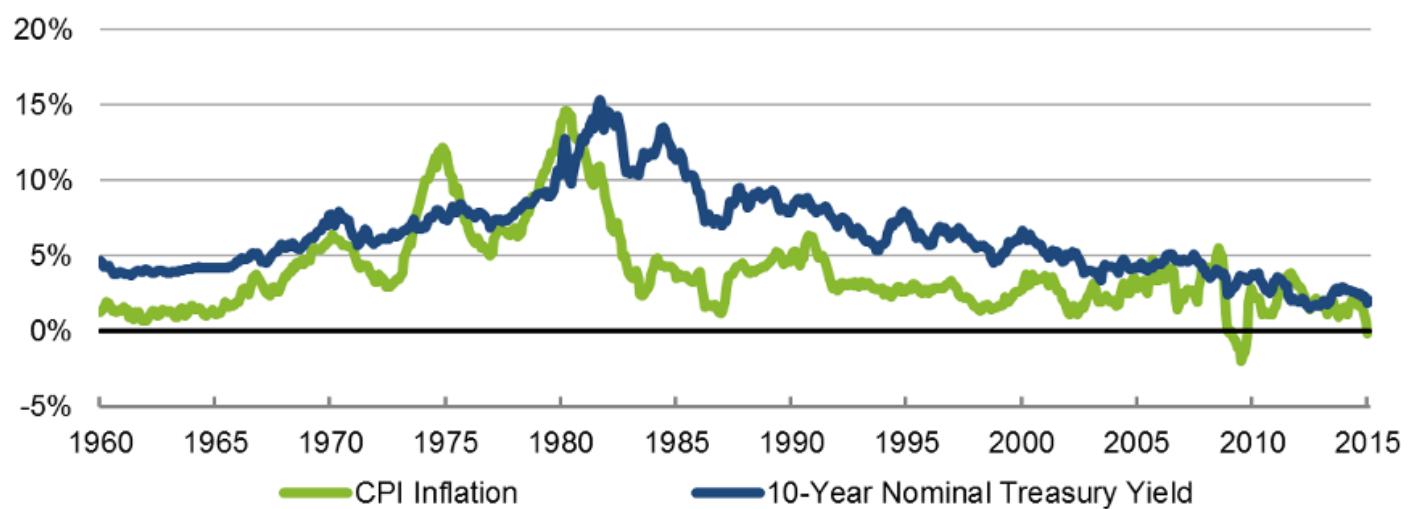
Future Outlook

How does this affect consumers

Tapering quite often means an increase in interest rates, which can have a huge impact on consumers as they have been benefiting from extremely low interest rates recently. Lower

interest rates have made it easier for people to buy cars, houses and in general lower interest rates mean it is simply easier to borrow money [3]. Interest rates were in fact lowered during the pandemic to help sustain the economy. But with the economy now at a much higher level than the low of March 2020, it has become a question of “when” rather than “if” interest rates will rise. In addition, with lower interest rates, the pandemic also sees increased rates of inflation due to stimulus checks and increased spending from the federal reserve to artificially boost the economy [6].

Interest Rates and Inflation



Source: Federal Reserve Board, BLS.

BROOKINGS

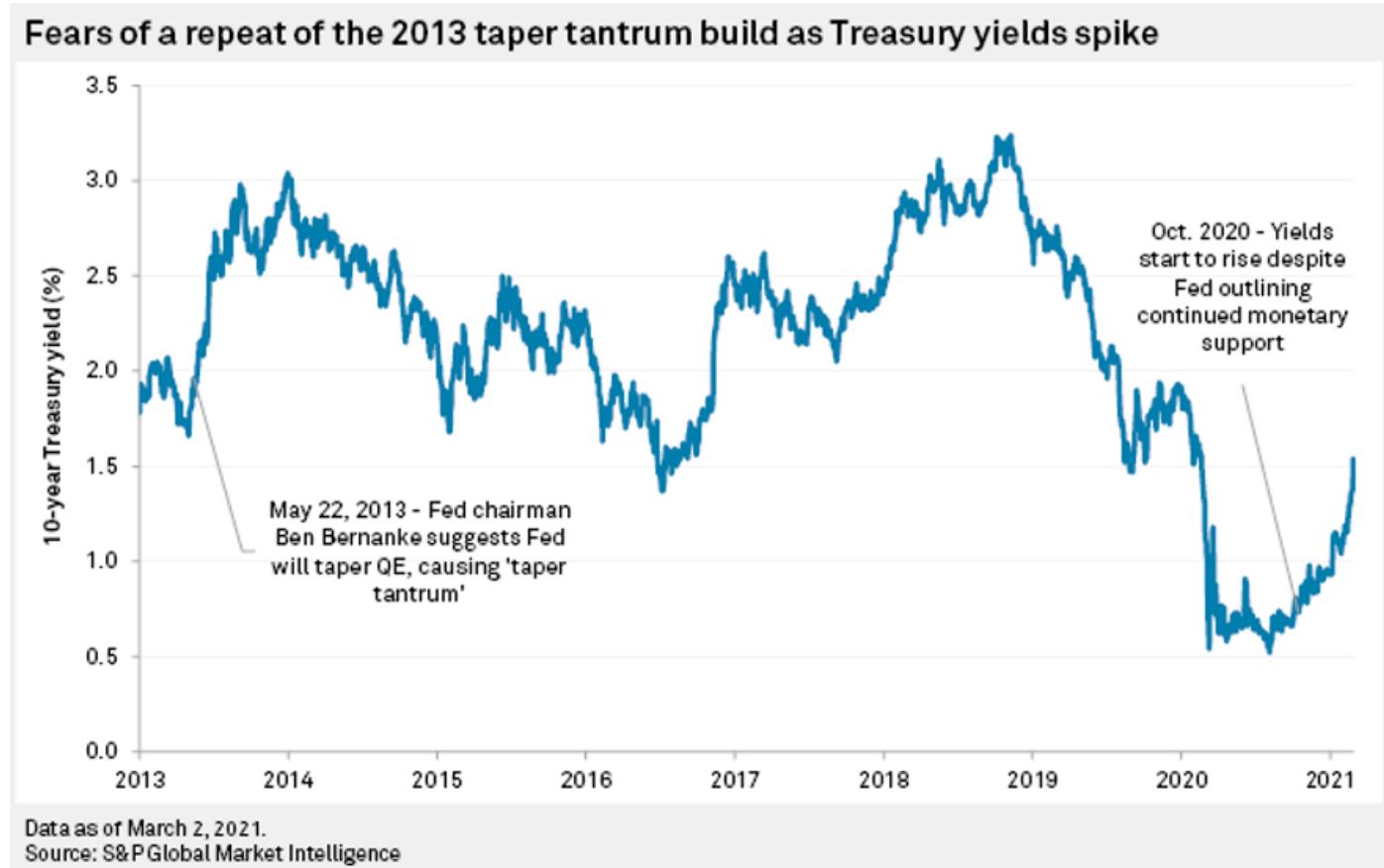
Source: Brookings [8]

Normally, after a certain period of high inflation, the Fed would raise interest rates which is simply not the case during this period of recession due to unprecedented circumstances caused by the pandemic. Now with the Federal Reserve announcing their tapering plan people are expecting interest rates to rise very shortly as well. Higher interest rates, as a result of the Fed's tapering or the market expecting higher rates, would now increase the cost of purchasing cars, houses and starting businesses which in return could slow down economic growth. With higher interest rates consumers will resort to focusing more on saving rather than spending, affecting the spending habits and lifestyle of many. [6]

Taper Tantrum

Big banks on Wall Street have begun to prepare for the Federal Reserve's tapering to ensure they will be able to handle the volatility that will follow. After it is announced that the Fed will begin tapering, the sales and trading teams at many banks are facing concerned clients who are unsure about how it will affect their portfolios and the economy. The head of FICC at one of the large global banks states, “This is the most important issue on their minds. People have to revamp their portfolios and hedge their risk.” Banks are expecting for there to be increased volatility with more people looking to either sell their current holdings or

However, one of the biggest fears is a repeat of 2013 and the “Taper Tantrum.” The “Taper Tantrum” took place after the financial crises in 2009, for which the Federal reserve had started buying more bonds but eventually it was time to slow down the purchases and the market did not react kindly. Treasury Yields rose and the spread between bids and offers made it almost impossible for the market to function. [4]



Source: S&P Global Market Intelligence [1]

In 2013, the rise in 10-year Treasury Yields was caused largely by the unexpected announcement from the federal reserve of a quicker than expected tightening of purchases. This time around, the market is fearing that improving economic growth will cause a rise in inflation. Although the Fed has not reacted or changed its plan as of now, if the rates continue to rise it could be a larger issue. “If market technical push yields higher and central bank comments fail to calm price action, then we could be in for another bumpy March,” said Mark Dowding, chief information officer at BlueBay Asset Management. According to Mark Dowding, a quick rise of rates towards 1.75% could result in a 5% drop in the S&P 500 [1].

Conclusion

The Federal Reserve's announcement of tapering is sure to have an impact on everyone not only in America but the rest of the world as well. The tapering process will involve a \$15 billion monthly reduction in bond purchases which play a part in the monetary policy to hopefully sustain economic growth if everything goes according to plans. Fed Chairman Jerome Powell after the announcement stated, "in light of the progress the economy has made toward our goals decided to begin reducing the pace of asset purchases. With these actions, monetary policy will continue to provide strong support to the economic recovery." [15] However, with the uncertainty and fear of the impact on inflation and when we may see a rise in interest rates, consumers should all ensure that they are prepared and keeping up to date with news for what is expected to happen next and what is next for the economy.

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