A Quantitative Analysis of the Impact of COVID-19 on the Video Gaming Industry

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Abstract

Impact of the COVID-19 pandemic has been growing at a tremendous speed all over the world since its outbreak in 2020, which results in massive uncertainty and disorder in many fields including economy, society, politics and culture. It is reported that the gaming usage has been increasing during the pandemic. In this research, we analyze the impact of COVID-19 on the video gaming industry in the United States. A quantitative analysis which focuses on the behavior of major gaming companies' stock prices and the video gaming user data before and during COVID-19 pandemic is performed. It shows that daily player counts and average concurrent players increased dramatically with the advent of COVID-19. However, there is only a weak correlation between the concurrent COVID-19 cases and the change in daily players, which suggests that the pandemic introduced many people to video games as a more permanent new hobby instead of as a temporary alternative to entertainment and social interaction. Other important results include that the stock prices of major gaming companies did not alter significantly due to COVID-19. With exception to a few drops, their stock prices during COVID-19 have continued to grow and recover from drops in similar manner to that before the pandemic.

Keywords: Covid-19, Pandemic, Video Game, Player

1 Introduction

Covid-19 has had a major impact on the world since it was announced as a global pandemic in March 2020. In the US, this impact translated to massive quarantine efforts. Schools and

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workplaces initially shut down, and gradually began shifting towards virtual rather than in person. With quarantines in affect, people started losing their jobs, parents had to stay home to watch their children, and social interaction decreased dramatically. With this sudden shift, many people began looking towards video games as an outlet for their missing entertainment and social needs. People could interact with each other online while playing, and so this outlet quickly gained popularity.

In this paper, we examine the impact that the advent of Covid-19 had on the video game industry. In particular, we examine the daily number of players 18 months prior to and 18 months following the advent of Covid, which we chose as March 1st, 2020. This date was chosen to coincide with the increase in cases at that time, and fits with the CDC announcing the pandemic. We also examine stock prices of several major game industries within the same time frame.

2 Methodology and Data

2.1 Data Sources

In order to analyze and model the effect of Covid-19 on the video game industry, we gathered daily data for the number of Covid cases in the US, the number of players in the US, and the stock price of several major gaming companies. We used the CDC's reports to gather the daily data, as their reporting should be the most accurate. To gather data on players we utilized Steam DB, a 3rd party software that tracks user data for the popular game engine Steam. Steam is currently the most used gaming platform, having more users than both Sony and Microsoft. Being the most popular, it serves as a good representative of the larger gaming community. We acquired the stock value for our chosen companies through Yahoo Finance, and use the opening price for each day. The companies we chose to represent the industry are Microsoft, Sony, Activision, Nintendo, and Ea.

2.2 Statistical Analysis

For our analysis we split each data set into two groups, with exception to the CDC daily Covid data. Using March 1st, 2020 as our dividing point, both the stock data and the player data was

split into a before Covid and after Covid group. R was used for all tests and models, and the data is stored in excel files.

2.2.1 Hypothesis Test 1:

The number of people who play video games has increased since the pandemic began.
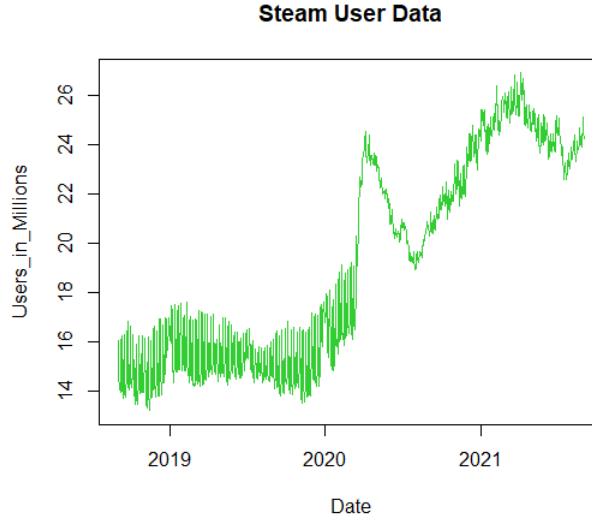
$$H_0 : \mu_0 = \mu_1$$

$$H_A : \mu_0 < \mu_1$$

H_0 represents our null hypothesis, H_A our alternative hypothesis, and μ_0 and μ_1 representing our player data before Covid and after Covid, respectively. Since both data sets have a few hundred data points, we apply the Central Limit Theorem and use a T-test to compare the two sets. We accept the null hypothesis if our p-value $p > 0.05$ Otherwise we reject it and accept our alternate hypothesis.

μ_0	15296300
μ_1	22918550
t	-73.632
df	850.6
p-value	< 2.2e-16

Figure 1: T-test results for player data

Since our p-value $p < 0.05$, we reject our null hypothesis. It is worth noting that 2.2e-16 is the minimum value that R can calculate for p-values.

Steam User Data

2.2.2 Hypothesis Test 2:

The growth rate of stocks has increased since Covid began.

$$H_0 : \mu_0 = \mu_1$$

$$H_A : \mu_0 < \mu_1$$

H_0 represents our null hypothesis, H_A our alternative hypothesis, and μ_0 and μ_1 representing our stock data growth rate before Covid and after Covid, respectively. Since both data sets have a few hundred data points, we apply the Central Limit Theorem and use a T-test to compare the two sets. We accept the null hypothesis if our p-value $p > 0.05$ Otherwise we reject it and accept our alternate hypothesis.

t	-0.96509
df	726.31
p-value	0.1674

Figure 2: T-test results for stock data

Since our p-value $p > 0.05$, we accept our null hypothesis.

Stock Sum
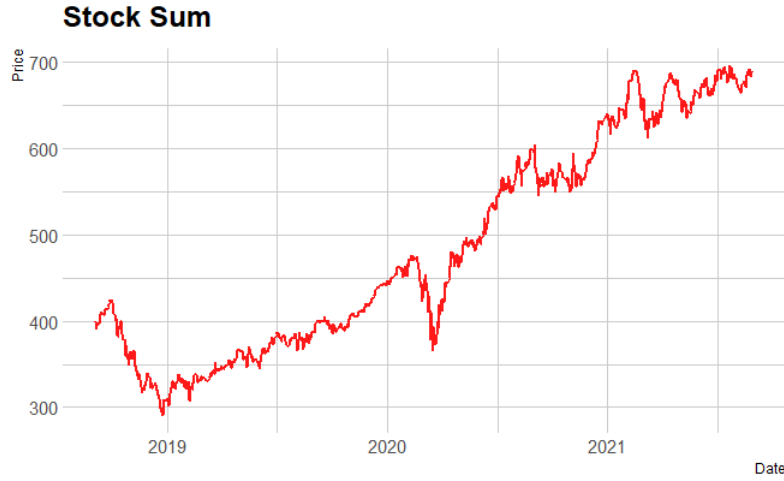
2.2.3 Hypothesis Test 3:

The growth rate varies more after Covid.

$$H_0 : \sigma_0^2 = \sigma_1^2$$
$$H_A : \sigma_0^2 < \sigma_1^2$$

H_0 represents our null hypothesis, H_A our alternative hypothesis, and σ_0^2 and σ_1^2 representing the variance in our stock data growth before Covid and after Covid, respectively. Since both data sets have a few hundred data points, we apply the Central Limit Theorem and use a T-test to compare the two sets. We accept the null hypothesis if our p-value $p > 0.05$ Otherwise we reject it and accept our alternate hypothesis.

F	0.66299
num df	371
denom df	371
p-value	4.046e-5

Figure 3: F-test results for stock data

Since our p-value $p < 0.05$, we reject our null hypothesis.

2.3 Hypothesis Test 4:

There is a positive correlation between daily changes in Covid cases and daily changes in the number of players.

$$H_0 : \rho = 0$$

$$H_A : \rho > 0$$

H_0 represents our null hypothesis, H_A our alternative hypothesis, and ρ is our correlation coefficient between the change in daily Coivd cases and the change in daily players. We accept the null hypothesis if our p-value $p > 0.05$ Otherwise we reject it and accept our alternate hypothesis.

t	8.8114
df	546
p-value	< 2.2e-16
ρ confidence interval	$0.2772763 < \rho < 0.4240670$

Figure 4: Correlation test results for stock data

Since our p-value $p < 0.05$, we reject our null hypothesis. It is worth noting again that 2.2e-16 is the minimum value that R can calculate for p-values.

2.4 Statistical Interpretation

A few conclusions can be gleaned from this data. First, there is undeniably a significant increase in the number of Steam users following the pandemic. As our representative for players in the industry, it suggests that video gaming as a whole has increased dramatically. This is in line with our initial reasoning that more people turned to video games as a means of entertainment and/or social interaction during the pandemic.

Our comparison showed us that gaming increased since Covid began, but how is Covid continuing to related to players during the pandemic? We find there is a weak positive correlation between the change in Covid cases and the change in player numbers on a daily basis. This follows from video games serving as an alternative when people quarantine while having Covid. Being a weak correlation, it also suggests that people continue to play after they begin, rather than using it as a temporary alternative.

This increase is not reflected in the stock price of major gaming companies. The average rate of growth remains largely the same, with a linear upwards trend similar to before Covid. One possible interpretation of this is that player usage does not significantly affect stock prices. This seems unlikely, as a market is typically affected by its consumer interaction. Also, since we follow this trend for 18 months before and after March 1st, 2020, it is unlikely that the effect of increased players has yet to propagate into a change in stock prices.

Another more likely interpretation is that the significance of other negative events directly or indirectly linked to the pandemic - such as the ongoing microchip shortage - has countered the positive effects from the increase in the player base. We would likely see this result in volatile growth, which our data suggests. The increased fluctuation in prices during Covid can be explained by the positive effects on the player increase countered by negative events related to Covid.

3   Conclusion and Discussion

Steam is currently the most used platform for playing video games in the world, surpassing even Playstation and Xbox. For this reason it was chosen as the source for our player data. However, Steam users only represent part of the gaming community, and results would be more accurate with player data from other major platforms.

While stock value does not appear to differ significantly from precovid projections, our analysis of Steam player data showed more promising results. As expected, there has been a significant increase in both the number of players and the number of concurrent players since the advent of Covid-19. Furthermore, there is a weak correlation between the number of current Covid cases and the number of current players.

These results suggest two things. First, the introduction of Covid led to a massive spike in people playing video games. This is in line with our initial reasoning, namely that quarantine and social distancing led to many new players searching for entertainment and social interaction. Second, having Covid and being quarantined might lead individuals to temporarily play video games. The weak correlation suggests that the majority of people who now play daily do so on a more permanent basis.

This is significant because it indicates an increased interest and larger interaction with the

video game industry. Game developers who are aware of this trend would likely benefit from releasing new product or advertising prior products.

Covid has had other affects on the industry. Further research will help determine the change in demographics among game users, such as gender and race distribution. Furthermore, what game genres are gaining popularity during the pandemic is another point of interest. Following these trends will help developers decided what audiences to target and help them determine what kind of game they want to build.

References

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