



**ATILIM
ÜNİVERSİTESİ**

**EFFECT OF COVID-19 VIRUS ON THE GAMING
INDUSTRY**

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EFFECT OF CORONAVIRUS TO GAMING INDUSTRY

ABSTRACT

Because of the coronavirus people are forced to stay at home. Due to human nature, a human has to do something in order to avoid feeling bored. In the century we are living in, most people have access to electronic devices that can be used as an instrument to spend time on them. In this study we will examine if the rate of the confirmed Covid-19 virus patients made people replace their hobbies with video games or because of the confirmed Covid-19 patients people started to play video games. The relationship between confirmed Covid-19 patients and stay at home is that because of the confirmed patient number, people felt safer in home, also governments forced people to stay at home because of the increasing confirmed patient numbers. This study examines the dates between 01/01/2020 - 31/05/2020 by daily charts. ARDL, Enders (2002) model has been used for this work. In order to eliminate the unit root problem, we used the ADF test. Also, we used OMAX (2015), SOR (2015) & OY (2018) models to visualize.

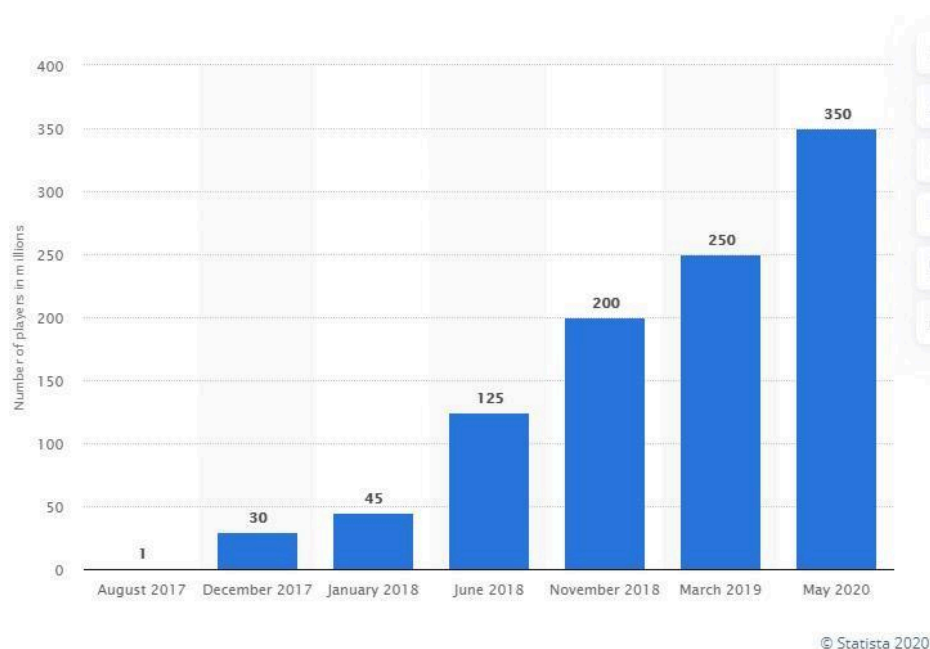
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1.1 INTRODUCTION:

Because of the Covid-19 virus people had to stay at home. Since this virus is very contagious, many people believe staying home is much safer which is true. Based on the research done by Hua QIAN, Te MIAO², Li LIU, Xiaohong ZHENG, Danting LUO, and Yuguo Li² in Hong Kong, the Covid-19 virus was spreading at the highest rate in houses. This study indicates that the most outbreaks are caused by the same home environment. If everybody stayed at home, spreading this Covid-19 virus would significantly decrease. As the number of confirmed Covid-19 patients increased, governments forced people to stay in quarantine at their homes. In this time of period did people (in self-quarantined) find a new way to waste time?

Every human being on this earth have hobbies. This can be from fishing to working out or partying. Due to Covid-19 Virus people now had to replace their hobbies with something they can do at home. We will see if people fill this emptiness with playing video games. Video games can be played either online or alone, the only requirement is a device where video games can be played (PlayStation, Xbox, cell phone, Nintendo, computer) and an internet connection. Based on statista.com, the number of registered users of Fortnite (Video Games) worldwide in May 2020 was 350 million. Same game in March 2019 had 250 million users. In one-year Fortnite has gained 100 million players.



Graph 1: Number of registered users of Fortnite worldwide from August 2017 to May 2020

Based on Granic, Lobel, & Engels, (2014) playing video games makes people happier and elicit positive emotions. Same article also states that ‘ ‘ Increasingly, players are gaming online, with friends, family, and complete strangers, crossing vast geographical distances and blurring not only cultural boundaries but also age and generation gaps, socioeconomic

differences, and language barriers”. It is clear that playing games destroys social barriers. While people were in self-quarantine, video games clearly helped to destroy this self-quarantine and helped people to reach beyond their house radius.

This study examines the dates between 01/01/2020 and 31/05/2020 Covid-19 virus impact on video game playing.

1.2 EMPIRICAL TEST:

We will examine the Covid-19 effects on the gaming industry starting from 01/01/2020 to 31/05/2020 date. Daily Covid-19 data were taken from European Center for Disease Prevention and Control and active players and number of players data were taken from Steam Database.

We need to take a look at the steady state. For this purpose, we need to use the ADF Test.

1.1.1 ECONOMETRIC MODEL:

In this study we are using the ARDL model. (Enders, 2002)

$$y_t = \beta_1 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{i=1}^q \beta_i x_{t-i} + \varepsilon_t$$

Model 1

In this ARDL model (**MODEL 1**) y_t represents daily number of players and x_t gives us the daily confirmed Covid-19 virus cases. This way we will be able to examine the correlation between number of cases and video games

$$y_t = \beta_1 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{i=1}^q \beta_i x_{t-i} + DUMMY + \varepsilon_t$$

Model 2

Then we added the DUMMY model into this ARDL model in order to find out before the outbreak and after the outbreak. y_t represents daily number of players and x_t gives us the daily confirmed Covid-19 virus cases, DUMMY represent before and after the outbreak.

1.3 METHODS AND FINDINGS

TABLE 1: UNIT ROOT TESTS: ADF TEST

Series	Interception	Interception Trend
y_t	-1.776	2.974
Δy_t	-10.898*	-0.137
X_t	0.137	2.647
ΔX_t	-12.775*	1.189

Note: *, **, * gives us in order of %1, %5, %10 levels**

When we examine the data, we encountered with that it, interception was not in stationary position y_t and interception trend was at 2.974. In order to make it in stationary position Y_t we applied ADF test and made it in stationary position Δy_t . When we applied the ADF test now instead of dealing with the number of players (NoP), we are dealing with the active number of users playing video games. Δy_t intercepting at -10.898 and trending at -0.137. After the ADF test we did not find any evidence of a unit root problem so we continued.

TABLE 1: UNIT ROOT TESTS: BREAKING POINTS

Series	Break	Break Trend
Dummy Y_t	3.854*	8.437
Omay (2015) y_t	-1.363***	-1.993***
Sor (2018) y_t	-3.199** Model A	-3.938* Model C
OY(2014) y_t	-5.492 Model A	-5.858 * Model C

Note: *, **, * gives us in order of %1, %5, %10 levels**

FOR Omay, Sor, OY tests, ln (Number of Users) were taken, due to numbers being too high to calculate for tests.

When we use a dummy model in order to analyze the correlation between NoU and confirmed Covid-19 patients. For the dummy model we separated groups into two, **before outbreak (0)** and **after outbreak (1)**. After the outbreak our dummy model (1) and NoU goes along, as we can see on

Figure 1.

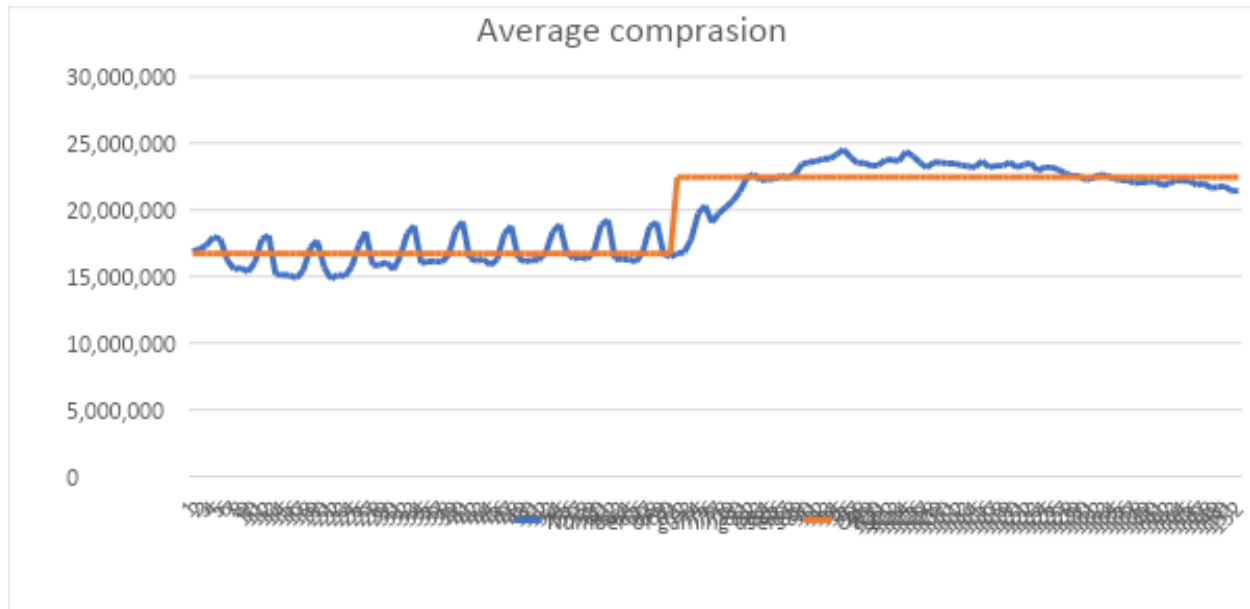


FIGURE1: NUMBER OF PLAYERS NONLINEAR MODEL

In order to make this new trend line smoother and go along with the model I applied for the Omay test. Breaking point when we applied the Omay test is at -1.863 on T-Stat and trend breaking point is at -1.933 on T-Stat. We can see how it graphed by looking at **FIGURE 2**.

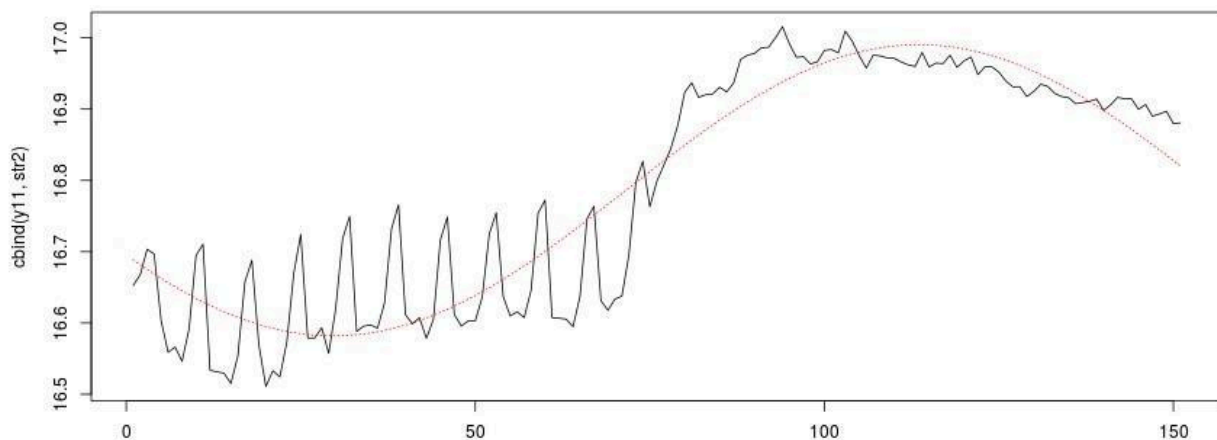


FIGURE 2: NUMBER OF PLAYERS Omay TEST

When we used SOR Test Model C we graphed and saw that line got closer to the NoU line. When we applied the Omay test we couldn't catch the fluctuation that was happening before the outbreak (0) but in the SOR Model I was able to capture fluctuation **FIGURE 3**. Breaking trend

was happening at -3.938. I used model C to support my hypothesis because on model A, I was not able to capture neither fluctuations nor line goes along with the NoU line.

SOR Test Model_C and Original Series

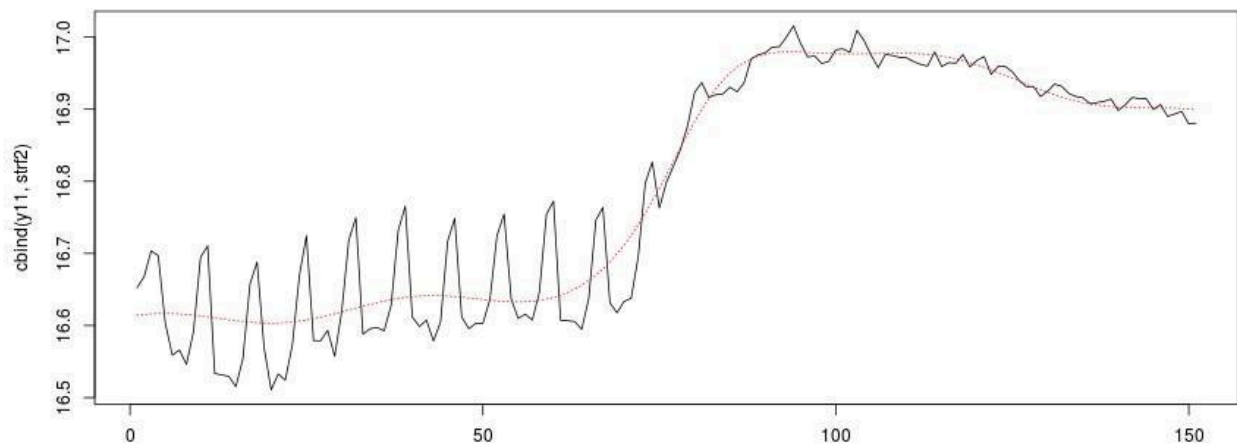


FIGURE3: SOR TEST NUMBER OF PLAYERS

When we used OY Test Model C we graphed and saw, our new line moved very close to NoU after the outbreak **(1)**. This line was closer than what we saw on Omay and SOY tests. Unfortunately, fluctuation was not captured before the outbreak **(0)** as we captured on the SOY test. Nevertheless, we will use the OY test for study because it captures very close to NoU after the outbreak **(1)** line. We can see the results at **FIGURE 4**.

Logistic Smooth Transition Trend Model_C and Original Series

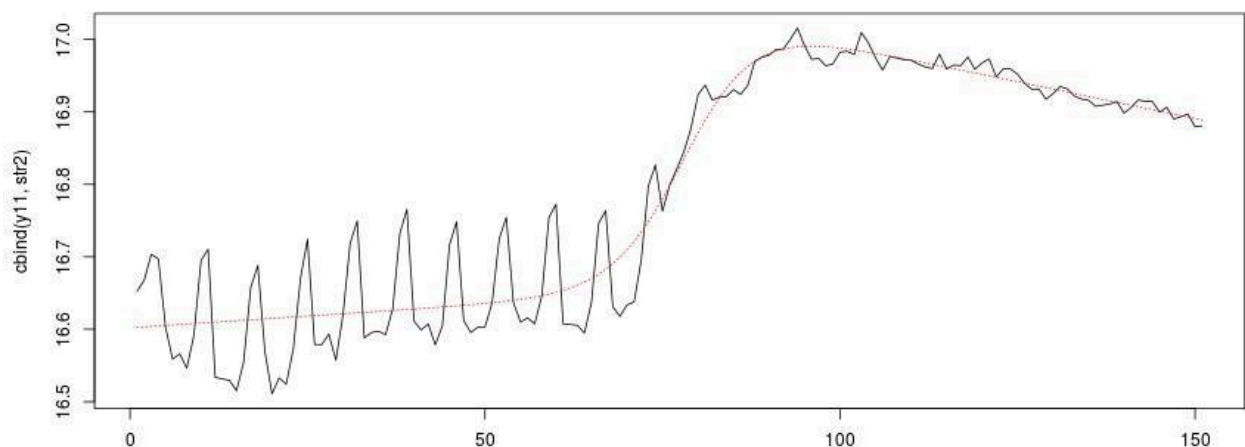


FIGURE4: OY TEST NUMBER OF PLAYERS

When we look at graph of confirmed Covid-19 patients **FIGURE 5**, the NoU movement followed the trend. As the number of patients increased, the number of users also increased.

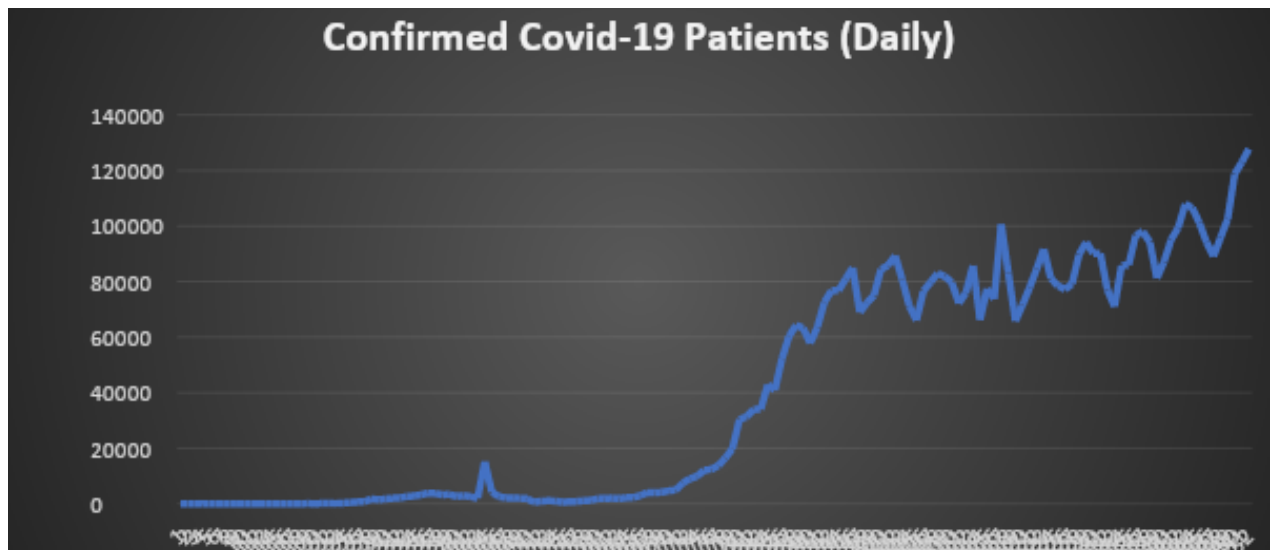


FIGURE5: DAILY CONFIRMED COVID-19 PATIENTS

As we saw how NoU moved along with the different tests. We used three different ARDL models for this study, which are presented at the below **TABLE 1,2**. In **TABLE1,2** we found that each model has its own values on the ARDL model. Among Model 1, 2, 3 & 4. I chose Model 3 for this study. R^2 for Model 2, Model 3 and was the same but Model 3 was more attractive than model 2. It is because of AIC and SIC numbers. When we applied these tests to both models, model 3 has much lower AIC and SIC numbers. We need to choose between which number of AIC. Because the model which has lower AIC value than the other is better than the other in the sense that it is less complex but still a good fit for the data. In this case our best option is model 3.

TABLE 3: Estimation of Results of ARDL Model

	Model 1	Model 2
Intercept	4183239(4.683)	6821401.036(6.179)
Number of Players $T - 1$	0.749	0.586 (8.775)
Number of Players $T - 2$	-	-
COR $T - 1$	-3.838	63.976(4.019)
COR $T - 2$	8.866	-0.000(-3.830)
DUMMY	1136790.85 (3.854)	704739.024 (2.343139)
Diagnostic Check Misspecification Test		
R^2	0.935	0.941
DW	2.51706E+14	2.27306E+14
AIC	27.24913883	27.15123844
SIC	27.32942244	27.23116638

TABLE4: Estimation of Results of ARDL Model

	Model 3	Model 4
Intercept	5402875(5.87)	9322085(50.168)
Number of Users $T - 1$	0.928(11.688)	-0.011(-0.822)
Number of User t^2	-	2.71E-08(72.078)
Number of Users $T - 2$	-0.252(-3.205)	-
COR $T - 1$	7.363 (1.971)	-19.916(-6.921)
COV t^2	-	0.000(6.798)
COR $T - 2$	-	-
DUMMY	1384245(4.635)	190731.2(3.796)
Diagnostic Check Misspecification Test		
R^2	0.941	0.998
F-Test	575.164	18178.99

DW	2.58037E+14	3.60755E+12
AIC	8.615	18.581
SIC	8.695	18.6814

NoU=Number of Users

$$y_t = \beta_1 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{i=1}^q \beta_i x_{t-i} + DUMMY + \varepsilon_t$$

$$Y_t = 5402875_{(5.87)} + 0.928NoU_{t-1(11.688)} + 0.252NoU_{t-2(-3.205)} + 7.363COR_{x_{t-1}(1.971)} + \varepsilon_t$$

$R^2=0.941$, F-Test=575.164(7.59633E-88), DW=2.58037E+14, AIC=8.615, SIC=8.695 Tests

1,5

1.4 CONCLUSION

At the beginning our model was not at the stationary position. We had to use the ADF (**TABLE 1**) test in order to make it in a stationary position. Then we used Omay, SOR and OY test in order to analyze the NoU increase at the stationary position (**FIGURE 1, FIGURE 2, FIGURE 3, FIGURE 4**). Overall the best model that supports our hypostases is the OY test.

We analyzed if there is a correlation between confirmed Covid—19 patients and game users. As a result, we observed that as the confirmed-19 patients increased, the number of users increased as well. Staying at home pushed people to find new hobbies, such as playing video games. As we graphed both numbers, we can see that there is a positive relation **FIGURE 6**.

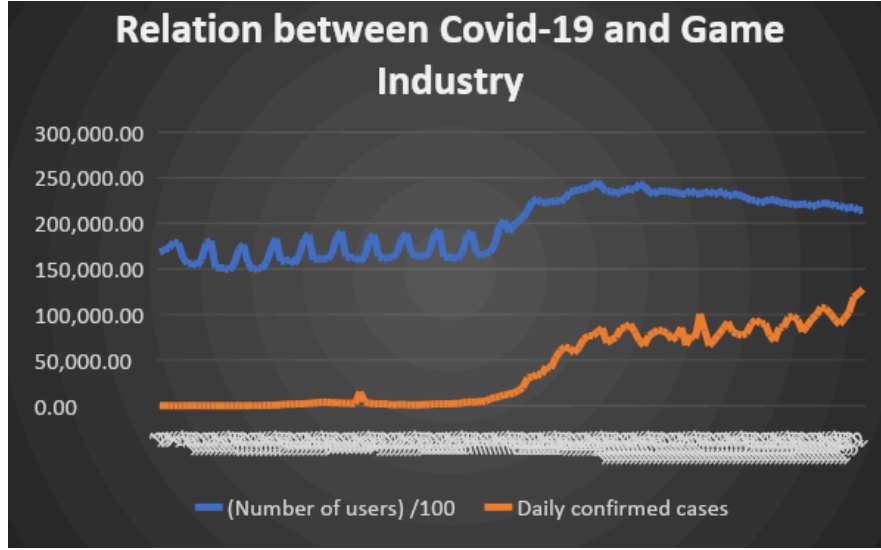


FIGURE 6

When we analyze Model 3 (TABLE 4) we receive the result that first delay of NoU_{t-1} is 0.928. Which we can interrupt as confirmed Covid-19 patients increases. NoU increased 0.928 as compared to COV. Although we did not observe any positive relation at NoU_{t-2} with -0.252. At the second delay there was a negative relation. When we look at the COV_{t-1} We saw 7.363 increase. We can conclude that as confirmed patients increased the number of players increased as well.

I personally hesitated to use Model 4(TABLE 4) with the **highest** R^2 as our main model because of the lower AIC and SIC values.

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