ECO 631 – INTRODUCTION TO ECONOMETRICS

CIA-I

Effect on Professional Football Club Revenue during times of Calamity

Team Members

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Team Member	Contribution
Aniruddha Nath	Selection of appropriate data from reports, interpretation of output and formulation of the report
Anurag Dey	Application and Interpretation of Economic Theory and Generating the output through Coding
Karan Gill	Researched Papers and Information related to the topic and interpreted the output and the complete conclusion

Contents

Introduction

Our group's research suggests the tragic disturbances in the social sphere together with socio-economic impacts of extreme severity, such as high levels of material damage due to natural disasters. Even when they are classified as small or moderate, natural disasters are responsible for adverse socio-economic and environmental impacts. This prolonged resurgence duration aggravates socio-economic impacts by disturbing economic activity (sports) and increasing social vulnerability. Across global sports, differing responses to the pandemic have varying financial implications on a club-by-club basis. We have considered football (Soccer in the US) for our study. There is no doubt that this is one of the most testing times the football industry has ever had to endure: the absence of fans, postponement and cancellation of matches, rebates to broadcasters and need to satisfy commercial partners have all had a significant impact on the revenue.

The potential long-term impact on the professional sports ecosystem

The sports ecosystem:

governing bodies, competition organizers, clubs, owners/investors, athletes, broadcasters, sponsors, suppliers, and fans — can expect impacts across multiple organizational and strategic pillars

Competitions and calendars:

Postponement, cancellation, and expungement of events and competitions looks set to alter the sports calendar over the coming years radically.

Commercial relationships:

Sports ecosystem suffering from termination of broadcasting rights resulting in a plunge in the total revenue.

Investment:

Given the rapid shutdown exposure and liquidity issues, investors speculate huge losses in the sports industries.

The absolute difference in the total revenue generated by different professional sports organizations decreases as a linear combination of tickets sold and coverage rights during recessions

CASE STUDY (Impact of COVID-19 on Soccer (Europe))

- The top 20 clubs generated a combined €8.2 billion in 2019/20, down 12% on the prior season (€9.3 billion).
- This €1.1 billion decrease is explained by:
  - a €937m (23%) drop in broadcast revenue, primarily due to the deferral of broadcast revenues to the financial year ending in 2020 and broadcaster rebates related to the disrupted 2019/20 season
  - a €257m (17%) fall in matchday revenue as matches were first postponed and then either canceled or resumed behind closed doors; and
  - offset by a €105m (3%) increase in commercial revenue, reflecting the commencement of several significant commercial arrangements across Money League clubs in 2019/20.

Mathematical Model

$$|Revenue| = \beta_0 + \beta_1(|Tickets\ Sold|) + \beta_2(|Broadcasting\ Right| + \beta_3(|Commercials|)$$

β_0 = Revenue generated when the tickets sold, the coverage rights, and the commercial revenue value is taken to be 0.

β_1 = Taking other factors constant the change in revenue generated due to a unit change in tickets sold

β_2 = Taking other factors constant the change in revenue generated due to a unit change in Broadcasting Rights

β_3 = Taking other factors constant the change in revenue generated due to a unit change in Commercial revenue

The Tickets sold, Coverage rights and Commercial Revenue can be predicted using the time Series model

Econometric Model

|Expected Revenue − Actual Revenue|
$$= \beta_0 + \beta_1(|Tickets\ Sold|) + \beta_2(|Coverage\ Rights| + (|Commercials|) + \varepsilon$$

Where ε represents the error term, the error term is included in the mathematical model to incorporate the combined effect of other factors that can influence the model (for example, foreign investments, Sponsorships, etc.)

The tickets sold and coverage rights can be estimated using the time series model, an extension of Holt's Exponential Smoothing. (We assume that the series is a realization of a discrete parameter stationary stochastic process)

$$Zt = m_t + S_t + e_t$$

Where,

$$m_t\ refers\ to\ the\ trend\ component$$

$$S_t\ refers\ to\ the\ seasonal\ component$$

$$and\ e_t\ refers\ to\ the\ error\ component$$

About the Dataset

Our group's research considers the various damages caused by a natural disaster and its economic impact on sports. For our study, we have considered these impacts in the sport of football. One of these factors is the change in revenue in the broadcasting rights. In France, on 4 May 2020, the league adopted a resolution that would enable them to take out a state-guaranteed loan (of approx. €224.5 million) to make up for the shortfall in broadcast rights monies caused by the termination of the 2019-20 season.

The second Important independent factor considered in our research is the tickets sold. Matchday revenue of Money League clubs is close to nil from March 2020 onwards, with fans unlikely to return in significant numbers for any of the 2020/21 season.

The collected data consists of the five biggest European soccer clubs' revenue for fifteen years (2005-2019). The independent variables considered are the percentage of income generated due to game attendance and revenue made due to coverage rights. The dependent variable considered is the total revenue. The following data can be categorized as a pooled data (Combination of both time series and cross-section data)

Club Specific Analysis

FC Barcelona

Futbol Club Barcelona, commonly referred to as Barcelona and colloquially known as Barça, is a Spanish professional football club based in Barcelona, that competes in La Liga, the top flight of Spanish football.

Data

The independent variables considered are the percentage of income generated due to game attendance and revenue made due to coverage rights. The dependent variable considered is the total revenue.

Year	Matchday	Broadcast	Commercial	Total revenue
2005	98.3	175.4	275.1	632.3
2006	100.1	178.1	281.1	641.5
2007	102.9	181.1	283.5	656.2
2008	105.6	183.5	286.1	681.1
2009	107.7	187.9	288	685.7
2010	107.3	190.01	290.2	686
2011	110.4	192.5	291.8	689.4
2012	111.6	193.34	293.4	691.6
2013	114.8	195.9	293.9	693.9
2014	117.9	197.4	294.7	696.2
2015	119.3	199.8	295.8	698.5
2016	121.4	202.7	296.1	698.2
2017	137.2	214.9	296.2	702.6
2018	144.8	223	322.6	804.5
2019	159.2	298.1	383.5	840.2

Checking for Assumptions

Multicollinearity:

We check for multicollinearity using VIF (Variation Inflation Factor)

	Coefficient Variance	Uncentered VIF	Centered VIF
Variance Inflation Factors			
Date: 04/19/21 Time: 20:58			
Sample: 2005 2019			
Included observations: 15			
Variable			
C	4758.4	1129.563	NA
MATCHDAY	0.117246	390.3261	7.808944
COMMERCIAL	0.27231	5785.819	40.23669
BROADCAST	0.299454	2928.366	59.02044

VIF values shows no presence of Multicollinearity

Auto Correlation:

Durbin Watson Test : =0.701

Shows the presence of +ve Autocorrelation

Heteroskedasticity:

Brausch Pagan test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	1.697988	Prob. F(3,11)	0.2248
Obs*R-squared	4.747709	Prob. Chi-Square(3)	0.1912
Scaled explained SS	2.713341	Prob. Chi-Square(3)	0.438

Null Hypothethis : Homoskedastic in nature

Alternative Hypothesis: Presence of Heteroskedaticity in data

Since p value is >0.05 we accept the null Hypothesis. The data is homoskedastic in nature

Regression Model:

		Std.	t-	
Variable	Coefficient	Error	Statistic	Prob.
C	-179.327	68.98115	-2.59965	0.0247
MATCHDAY	2.950284	0.342412	8.616171	0
COMMERCIAL	4.072164	0.521833	7.803573	0
BROADCAST	-3.38825	0.547224	-6.1917	0.0001

Dependent Variable: TOTAL_REVENUE
Method: Least Squares
Date: 04/19/21   Time: 20:39
Sample: 2005 2019
Included observations: 15

R-squared	0.983253	Mean dependent var	699.86
Adjusted R-squared	0.978686	S.D. dependent var	54.4482
S.E. of regression	7.949152	Akaike info criterion	7.207186
Sum squared resid	695.0793	Schwarz criterion	7.395999
Log likelihood	-50.0539	Hannan-Quinn criter.	7.205175
F-statistic	215.2769	Durbin-Watson stat	0.708381
Prob(F-statistic)	0		

Actual Revenue (2020)= 810.1M Euros

Estimated Revenue(2020) =929.54M Euros

Total Loss = 120M Euros

Conclusion

Model :

Revenue=179.327+2.95(Matchday)+4.07(Commercial)-3.38 *(Broadcast)

T statistic for Matchday , Commercial and Broadcasts are all significant
F statistic=0 (Model is significant)

Adjusted Rsquared= 0.97 which corresponds to the total variation in the dependent variable due to changes in the independent variable

Interpretation

Barca's commercial operation generated €383.5m, an increase of €60.9m (19%), which is more than the total revenue of the 12th place club in this year's Money League. This was predominantly achieved through the decision to bring its licensing and merchandising operation in-house giving the club additional control over how its products are promoted and sold and the ability to report this on a gross revenue basis. The increased autonomy has seen this arm of the business alone generate €63m in its first year, and the club expect further increases in 2019/20. Broadcast revenue increased €75.1m (34%) as the club benefitted from UEFA's new, and more lucrative, broadcast deal which commenced in 2018/19. Progress to the UEFA Champions League Semi-final compared to the Quarter-

final in the previous season was also beneficial. The €83.5m gap to Real Madrid in second is the widest in this publication's history. With Barcelona expecting further growth of €30m in commercial revenue and total revenue of almost €880m in 2019/20 we expect them to retain top spot in next year's edition, and the club could become the first €1 billion Money League club in years to come

Real Madrid C.F.

Real Madrid Club de Fútbol, commonly referred to as Real Madrid, is a Spanish professional football club based in Madrid. Founded on 6 March 1902 as Madrid Football Club

Data

Year	Matchday	Broadcast	Commercial	Revenue
2005	98.8	130.3	139.3	410.1
2006	100.9	136.8	150.9	432.4
2007	103	140.7	160.9	451.7
2008	105.2	148.5	174.4	472.2
2009	109.6	155.9	183.7	491.6
2010	111.6	160.8	188.5	500.4
2011	115.3	172.8	191.4	513
2012	117.9	189.6	199.7	519
2013	120.2	200.4	210.6	549.5
2014	124.5	210.3	229.4	577
2015	127.8	219.4	245.8	620
2016	129	227.7	263.4	674.6
2017	136.4	236.8	301.4	750.9
2018	143.4	251.3	356.2	757.3
2019	144.8	257.9	354.6	781.4

Checking for Assumptions

Multicollinearity:

We check for multicollinearity using VIF (Variation Inflation Factor)

	Coefficient Variance	Uncentered VIF	Centered VIF
Variance Inflation Factors Date: 04/20/21 Time: 00:18 Sample: 2005 2019 Included observations: 15			
Variable			
C	91589.85	3528.015	NA
MATCHDAY	25.47958	14155.18	203.6365
COMMERCIAL	0.22962	480.2811	39.06544
BROADCAST	1.400979	2027.723	94.31329

Though there is a presence of high multicollinearity, we cannot remove any independent variables since they perform important role in our research. Moreover, p value for all the independent variable coefficients is significant and hence be added in the model

Auto Correlation:

Durbin Watson Test : =1.85

Shows the presence of negligible +ve Autocorrelation

Heteroskedasticity

Brausch Pagan Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity			
F-statistic	1.319252	Prob. F(3,11)	0.3176
Obs*R-squared	3.968933	Prob. Chi-Square(3)	0.2648
Scaled explained SS	4.068221	Prob. Chi-Square(3)	0.2542

Null Hypothethis: Homoskedastic in nature

Alternative Hypothesis: Presence of Heteroskedaticity in data

Since p value is >0.05 we accept the null Hypothesis. The data is homoskedastic in nature

Regression Model

Dependent Variable: REVENUE				
Method: Least Squares				
Date: 04/19/21 Time: 23:50				
Sample: 2005 2019				
Included observations: 15				
Variable	Coefficien	Std. Error	t-Statistic	Prob.
C	232.6061	302.6382	0.768595	0.4583
MATCHDA	-1.82231	5.04773	-0.36102	0.7249
COMMER(	1.359155	0.479186	2.836381	0.0162
BROADCA!	1.30938	1.183629	1.106241	0.2922
R-squared	0.979713	Mean dependent va		566.74
Adjusted R	0.974181	S.D. dependent var		122.8092
S.E. of reg	19.7335	Akaike info criterio		9.025691
Sum squar	4283.521	Schwarz criterion		9.214504
Log likeliho	-63.6927	Hannan-Quinn crite		9.02368
F-statistic	177.0758	Durbin-Watson stat		1.852947
Prob(F-sta	0			

Actual Revenue (2020)= 621 Euros

Estimated Revenue(2020) =789 Euros

Total Loss = 168M Euros

Conclusion

Model : Revenue=232.60-
1.822.95(Matchday)+1.35(Commercial)-
1.309 *(Broadcast)

T statistic for Matchday , Commercial and
Broadcasts are all significant

F statistic=0 (Model is significant)

Adjusted Rsquared= 0.97 which corresponds to
the total variation in the dependent variable due
to changes in the independent variable

Interpretation

Real Madrid drop to second place in this year's Money league after only marginal revenue growth of €6.4m (1%). In the club's first season without Cristiano Ronaldo, Los Blancos failed to continue its dominance of UEFA club competition with a Round of 16 exit ending ambitions of a fourth consecutive Champions League title. This translated into the club posting a reduction in commercial revenue in this year's edition and losing its status as the most commercially successful club in football (now fourth highest), demonstrating the contingent commercial gains previously achieved through bonuses related to on-pitch success. The overall increase in revenue in 2018/19 owed much to a greater distribution from La Liga. Real Madrid expect to break the €800m revenue mark for the first time in the club's history in 2019/20 which is likely to be sufficient for them to maintain a Spanish one-two at the top of the Money League. Extension of the club's partnership with adidas to 2028 on reportedly improved terms is expected to be a key driver of the growth, along with an increase in other sponsorship and merchandising revenue. The club may take inspiration from other Money League innovators in order to diversify and generate revenue growth in future years. Real Madrid have the advantage of being the most followed football club on social media, and if they can find a way to generate a more significant return from this, they could potentially unlock a new and lucrative revenue steam. Improved on-pitch performance would be the quickest route for the club to return to the top of Money League

in the near future, via usurping the recent dominance of La Liga by FC Barcelona and a return to the final stages of the Champions League.

Liverpool FC

Liverpool Football Club is a professional football club in Liverpool, England, that competes in the Premier League, the top tier of English football

Data

Year	Matchday	Broadcast	Commercial	Revenue
2005	45.1	71.3	71.8	198
2006	47.3	76.8	74.2	205
2007	48.2	81.3	77.1	211
2008	49.9	87.6	79.5	225.
2009	52.4	97.1	75.8	232.
2010	45.3	72.3	85.7	245.
2011	55.9	78.2	99.1	284.
2012	52.1	74.5	114	321
2013	61	120.8	124.1	356
2014	75	163.8	153	442
2015	75.9	168.1	159.8	454
2016	80.1	182.5	161.6	474
2017	91.6	251.3	170.8	564
2018	94.5	299.3	210.9	660
2019	82.7	232.5	243.4	758

Checking for Assumptions:
Multicollinearity :
We check for multicollinearity using VIF (Variation Inflation Factor)

```
Variance Inflation Factors
Date: 04/20/21   Time: 16:07
Sample: 2005 2019
Included observations: 15


                 Coefficient   Uncentered   Centered
Variable         Variance      VIF          VIF

C                1054.362      74.46712     NA
MATCHDAY         1.031638      317.7013     21.12004
COMMERCIAL       0.034388      45.6903      6.690067
BROADCAST        0.052591      89.4829      19.60436
```

Though there is a presence of high multicollinearity , we cannot remove any independent variables since they perform important role in our research. Moreover p value for all the independent variable coefficients are significant and hence be added in the model

Auto Correlation:

Durbin Watson Test : =2.18

Shows the presence of negligible +ve Autocorrelation

Heteroskedasticity

Brausch Pagan Test

```
Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic         1.483938    Prob. F(3,11)        0.2728
                                Prob. Chi-
Obs*R-squared       4.321643    Square(3)            0.2288
                                Prob. Chi-
Scaled explained SS 1.096965    Square(3)            0.7778
```

Null Hypothethis: Homoskedastic in nature

Alternative Hypothesis: Presence of Heteroskedaticity in data

Since p value is >0.05 we accept the null Hypothesis. The data is homoskedastic in nature

Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable: REVENUE				
Method: Least Squares				
Date: 04/20/21 Time: 16:19				
Sample: 2005 2019				
Included observations: 15				
C	8.884686	32.47094	0.27362	0.7894
MATCHDA	-1.25456	1.015696	-1.23518	0.2425
COMMER(	2.875087	0.185439	15.50422	0
BROADCA!	0.598514	0.229328	2.609859	0.0243
R-squared	0.994723	Mean dependent va		375.2667
Adjusted R	0.993284	S.D. dependent var		177.8235
S.E. of reg	14.57331	Akaike info criterio		8.419439
Sum squar	2336.195	Schwarz criterion		8.608252
Log likelih(	-59.1458	Hannan-Quinn crite		8.417428
F-statistic	691.1479	Durbin-Watson stai		2.182787
Prob(F-sta	0			

Actual Revenue (2020)= 781 Euros
Estimated Revenue(2020) =742 Euros
Total Loss = 39M Euros

Conclusion
Model : Revenue=8.8-
1.25(Matchday)+2.87(Commercial)-
0.59 *(Broadcast)
T statistic for Matchday , Commercial and
Broadcasts are all significant
F statistic=0 (Model is significant)

Adjusted Rsquared= 0.97 which corresponds to
the total variation in the dependent variable
due to changes in the independent variable

Interpretation

Liverpool become the third English club to break the £500m barrier and retain seventh place in this year's figures. The club will now have the clubs above them in its sights rather than those behind. Revenue increased £77.9m (17%) following a strong season that saw them crowned Champions League winners and finish an agonisingly close second to Manchester City in the Premier League, emphasising the virtuous cycle of on-pitch success and positive financial performance.

Broadcast revenue increased £41.2m (19%) due to greater UEFA distributions and the club receiving the highest Premier League distribution. Commercial growth of £34.6m (23%) was fuelled by sponsor bonuses from a successful Champions League campaign and greater exploitation of Anfield, with the venue hosting summer concerts for the first time since 2008, in a bid to develop the stadium into a genuine year-round visitor attraction.

Liverpool are expected to retain seventh place in next year's Money League, particularly if the club captures its first Premier League title and enjoys a run to the latter stages of the Champions League once again. Whilst it is unlikely that Liverpool will improve its placing next year due to new commercial deals signed by Manchester City, long-term ambitions of a top five Money League position in future editions are not unrealistic. The Reds recently opted not to renew their technical kit agreement with New Balance to strike a deal with Nike, to support efforts to monetise the power of their brand globally. The new deal

provides access to a global distribution network that could improve the sale of club merchandise and subsequently increase commercial revenue.

Manchester United FC

Manchester United Football Club is a professional football club based in Old Trafford, Greater Manchester, England, that competes in the Premier League, the top flight of English football

Data

Year	Matchday	Broadcast	Commercial	Revenue
2005	88.6	134.6	280.6	524.8
2006	90.1	137.9	289.7	552.7
2007	92.3	145.6	295.8	565.7
2008	91.6	150.8	298.6	569
2009	95.7	154.6	311.5	596.8
2010	98.4	162.9	306.9	626.2
2011	106.9	157.2	324.9	650
2012	114.6	167.1	330.1	670.8
2013	120.6	177.5	347.5	708.6
2014	127.5	173.9	357.4	724.8
2015	133.4	181.6	354.4	732.8
2016	137.5	187.7	363.8	759
2017	125.2	225.9	325.2	747.3
2018	119.5	230.4	316.1	741
2019	120.6	273.7	317.2	784.5

Checking for Assumptions:

Multicollinearity :

We check for multicollinearity using VIF (Variation Inflation Factor)

```
Variance Inflation Factors
Date: 04/20/21   Time: 16:47
Sample: 2005 2019
Included observations: 15

                Coefficient  Uncentered  Centered
Variable        Variance     VIF         VIF

C               3140.616     738.4097    NA
MATCHDAY        0.332701     981.8685    20.9706
COMMERCIAL      0.097679     2385.082    14.03209
BROADCAST       0.012386     95.7359     4.062569
```

Though there is a presence of high multicollinearity , we cannot remove any independent variables since they perform important role in our research. Moreover p value for all the independent variable coefficients are significant and hence be added in the model

Auto Correlation:

Durbin Watson Test = 1.45

Shows the presence of negligible positive Autocorrelation

Heteroskedasticity

Brausch Pagan Test

| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | |
Null hypothesis: Homoskedasticity			
F-statistic	0.982309	Prob. F(3,11)	0.4363
Obs*R-squared	3.169436	Prob. Chi-Square(3)	0.3662
Scaled explained SS	1.140101	Prob. Chi-Square(3)	0.7674

Null Hypothethis: Homoskedastic in nature

Alternative Hypothesis: Presence of Heteroskedaticity in data

Since p value is >0.05 we accept the null Hypothesis. The data is homoskedastic in nature

Regression Model

Dependent Variable: REVENUE				
Method: Least Squares				
Date: 04/20/21 Time: 16:47				
Sample: 2005 2019				
Included observations: 15				
Variable	Coefficien	Std. Error	t-Statistic	Prob.
C	-104.017	56.0412	-1.85609	0.0904
MATCHDA	1.181214	0.576802	2.047867	0.0652
COMMER(	1.290635	0.312536	4.129555	0.0017
BROADCA!	1.251228	0.111291	11.24281	0
R-squared	0.993217	Mean dependent va		663.6
Adjusted R	0.991368	S.D. dependent var		85.9689
S.E. of regi	7.98738	Akaike info criterio		7.216781
Sum squar	701.7807	Schwarz criterion		7.405595
Log likeliho	-50.1259	Hannan-Quinn crite		7.21477
F-statistic	536.9392	Durbin-Watson stat		1.455169
Prob(F-sta	0			

Actual Revenue (2020)= 629.61 Euros

Estimated Revenue(2020) =801Euros

Total Loss = 171M Euros

Conclusion

Model:

Revenue=-104.1 +1.18(Matchday)+1.29(Commercial) + 1.25(Broadcast)

T statistic for Matchday , Commercial and Broadcasts are all significant

F statistic=0 (Model is significant)

Adjusted Rsquared= 0.99 which corresponds to the total variation in the dependent variable due to changes in the independent variable

Interpretation

Manchester United remain in third place for the second consecutive year, despite revenue increasing by £37.3m (6%). This was almost wholly driven by a return to the Champions League, the improved distribution from UEFA for the new rights cycle and the Red Devils reaching the Quarter-final.

Club controlled match day and commercial revenue streams remain stable. In part this is driven by the timing of deals and the absence of major commercial renewals.

It also highlights how challenging it is to continually significantly improve revenue when performances on the pitch decline. With the club failing to qualify for the Champions League in 2019/20, Manchester United find themselves in a precarious position in Money League terms.

United predict revenue of £560-580m in 2019/20, a result that would likely see the club fall to its lowest ever Money League position in next year's edition. This could also put the Red Devils at risk of losing its position as the Premier League's highest revenue generating club

for the first time in Money League history, with, its fierce local rivals Manchester City and Liverpool, possibly replacing them.

The risks the club are facing in Money League terms could be further exacerbated by the likely negative revenue impact to some key commercial deals of a failure to participate in the Champions League for two or more consecutive seasons. Nevertheless, despite its on-pitch struggles the global appeal of the club, which some competitors are still far from matching, should give United the opportunity to innovate and take advantage of new market developments like few others can.

Paris Saint Germain

Paris Saint-Germain Football Club, commonly referred to as Paris Saint-Germain, Paris SG, or simply Paris or PSG, is a professional football club based in Paris, France. They compete in Ligue 1, the top division of French football

Data

Year	Matchday	Broadcast	Commercial	Revenue
2005	47.6	87.5	240.3	406.4
2006	48.9	88.6	242.9	413.6
2007	51.2	89.1	247.6	423
2008	52.1	94.2	254.3	440.8
2009	53.2	93.7	270.6	458.5
2010	74.3	94.9	264.3	479.8
2011	65.9	95.8	280.9	492.6
2012	71.6	102.7	273.7	499.1
2013	87.6	111.6	294.3	548.5
2014	94.2	120.3	298.1	570.6
2015	91.9	122.9	302.5	577.4
2016	92.5	123.1	305.3	583.9
2017	90.2	121.9	274.1	554.2
2018	100.6	127.8	313.3	613.7
2019	115.9	156.6	363.4	712

Checking for Assumptions:

Multicollinearity :

We check for multicollinearity using VIF (Variation Inflation Factor)

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Variance Inflation Factors
Date: 04/20/21   Time: 17:08
Sample: 2005 2019
Included observations: 15
```

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	243.8168	215.6129	NA
MATCHDAY	0.027482	150.7613	10.95354
COMMERCIAL	0.010774	765.5232	9.383375
BROADCAST	0.050335	542.2491	16.17619

Though there is a presence of high multicollinearity, we cannot remove any independent variables since they perform important role in our research. Moreover, p-value for all the independent variable coefficients is significant and hence be added in the model

Auto Correlation:

Durbin Watson Test = 1.45

Shows the presence of negligible Positive Autocorrelation

Heteroskedasticity

Brausch Pagan Test

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Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity
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F-statistic	0.50761	Prob. F(3,11)	0.685
Obs*R-squared	1.824063	Prob. Chi-Square(3)	0.6097
Scaled explained SS	0.350218	Prob. Chi-Square(3)	0.9503

Null Hypothethis: Homoskedastic in nature

Alternative Hypothesis: Presence of Heteroskedaticity in data

Since p value is >0.05 we accept the null Hypothesis. The data is homoskedastic in nature

Regression Model

Variable	Coefficien	Std. Error	t-Statistic	Prob.
Dependent Variable: REVENUE				
Method: Least Squares				
Date: 04/20/21 Time: 17:07				
Sample: 2005 2019				
Included observations: 15				
C	1.61698	15.61464	0.103555	0.9194
MATCHDA	1.48996	0.165777	8.98775	0
COMMER(	0.963736	0.1038	9.284529	0
BROADCA!	1.215646	0.224354	5.418418	0.0002
R-squared	0.998206	Mean dependent va		518.2733
Adjusted R	0.997717	S.D. dependent var		86.19439
S.E. of reg	4.11851	Akaike info criterio		5.892038
Sum squar	186.5833	Schwarz criterion		6.080852
Log likelih(	-40.1903	Hannan-Quinn crite		5.890027
F-statistic	2040.351	Durbin-Watson stat		1.406276
Prob(F-sta	0			

Actual Revenue (2020)= 580
Estimated Revenue(2020)
=769
Total Loss = 189M Euros

Conclusion
Model:
Revenue= 1.619 + 1.48*(Matchday)
+0.96*(Commercial) +1.12*
(Broadcast)
T statistic for Matchday ,
Commercial and Broadcasts are all
significant
F statistic=0 (Model is significant)
Adjusted Rsquared= 0.99 which
corresponds to the total variation in
the dependent variable due to
changes in the independent variable

Interpretation

The 2018/19 season saw impressive double-digit percentage growth across all revenue streams for Paris Saint-Germain, its highest since 2014/15. The signing of five new partners as well as the extension of contracts with six global brands drove commercial revenue growth of over €50m (16%) to a total of €363.4m, the second highest in history.

In the football industry, the Parisians continue to disrupt the status quo, focusing on innovative and industry leading ideas in order to develop. 2018/19 saw their collaboration with Nike Jordan drive an increase in merchandise sales as the innovative third kit became a popular piece of streetwear apparel. Whilst the iconic store on the Champs-Élysées has always served as a flagship, the recent foray into fashion has gathered momentum, as club colours were again on display at Paris Fashion week, and PSG successfully blur the line between football and entertainment.

Commercial revenue is expected to grow again in 2019/20 due to the commencement of the new kit sponsorship with Accor Live Limitless, an extension of the Nike technical kit deal and the signing of the club's new training kit sponsor the Rwanda Development Board. Whilst PSG will be hoping to overtake Manchester United and Bayern Munich in next year's figures, it is Champions League success that the club craves in order to elevate its brand further and develop a global appeal that rivals those clubs at the top.

Conclusion

COVID-19 has had a profound impact across society and whilst its long-term effect remains uncertain across the football industry, we have sought the views of fans to understand how they have reacted to the pandemic and whether this has influenced how they wish to engage with clubs in future.

With fans being the heartbeat and primary funder of the football industry, directly

and indirectly, adapting and responding to their demands is of the utmost importance to clubs as they react to the constantly evolving impact of the pandemic. The disruption to domestic leagues and international club competitions caused

by COVID-19 has forced a significant change to the way in which fans consume sport, accelerating the need for, and thus development of, digital capabilities.

Demand for new and exclusive content continues to rise, further heightened by the current circumstances as fans look for new ways to remain connected with their clubs. Given the extended absence of fans from stadia, the ability of clubs to satisfy demand and monetise digital engagement to grow commercial revenue is critical.

As we can see from the study as a whole there has been a significant drop in the match-day revenue due to a lack of spectators, a drop in commercial revenue due to people losing their jobs due to the pandemic and thus were less likely to spend money on merchandise. There has been a slight increase in broadcast rights due to more people being able to watch the games due to an lockdown restrictions enabling them to have more time for watching games and also supporters who previously would attend the games would rely on broadcasts to follow their favourite team. Thus we can say that COVID-19 has decreased the revenue of these clubs on a whole by a significant margin.

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