

VARIABLES THAT IMPACT NCAA BASKETBALL SUCCESS

Alexander Albrecht & Amélie Devine

INTRO

- Do off-the-court factors impact a school's men's basketball results for an individual season? If so, which factors are most important in predicting the results of a season?
- We took data from the top 8 conferences in men's college basketball and looked at a bunch of variables including revenue and enrollment



DATA SOURCE

- Compiled Data from the U.S. Department of Education Equity in Athletics Data Analysis
- Original Data was compiled for Sports Analytics Company for Research into all Division 1 College Athletics Programs
 - 50 variables, including profits for all sports
- Cut Down to 8 variables for this project

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Start School Name	Conference	Power 5 / Group of 5 / Football	FBS/FCS/No Football	Separate Football Conference	School Location	School State	Nickname	Date Joined Conf	Enrollment	Public/Private	AD Name	AD Email Address	AD Phone Number	AD Budget	Media Rights	Football Revenue	Football Expenses	Football Revenue-Expenses	Men's Basketball Revenue	Men's Basketball Expenses	Men's Basketball Revenue-Expenses	Women's Basketball Revenue	Women's Basketball Expenses			
Total																\$5,996,468,488	\$4,950,633,129	\$1,045,835,359	\$1,971,428,809	\$1,674,409,064	\$2,078,748,748	\$172,804,174	\$476,371,010	\$2,453,539,770		
Average																\$15,746	\$11,516,987	\$4,476,191	\$4,651,136	\$3,922,768	\$1,981,073	\$2,453,539				
206	Fortbush University	A-10	No		New York	NY	Rams	1986	16,516	Private	David Roach	droach4@fortbush.edu	718-817-4302			NBC Sports	\$7,833,065	\$7,833,065	\$0	\$6,196,401	\$6,196,401	\$0	\$4,077,061	\$4,077,061		
217	Virginia Commonwealth Uni	A-10	No		Richmond	VA	Rams	2012	31,076	Public	Ed McLaughlin	athleticad@vcu.edu	804-828-6662			NBC Sports	N/A	N/A	\$6,598,515	\$7,121,576	\$1,476,939	\$3,937,554	\$3,937,554			
216	Saint Louis University	A-10	No		St. Louis	MO	Billikens	2008	12,883	Private	Chris May	chmay@slu.edu	314-977-3187			NBC Sports	N/A	N/A	\$7,623,032	\$7,623,032	\$0	\$1,179,359	\$1,179,359			
207	George Mason University	A-10	No		Fairfax	VA	Patriots	2013	38,047	Public	New Rogers Center	crogers@gmason.edu				NBC Sports	N/A	N/A	\$5,072,248	\$5,072,248	\$0	\$2,895,388	\$2,895,388			
215	Saint Joseph's University	A-10	No		Philadelphia	PA	Hawks	1982	7,589	Private	Jeff Bodenheimer	athleticdirector@sju.edu	(610) 660-1707			NBC Sports	N/A	N/A	\$5,251,050	\$5,251,050	\$0	\$2,855,652	\$2,855,652			
208	George Washington University	A-10	No		Washington	D.C.	Revolutionaries	1978	28,172	Private	Tony Vogel	tvogel@gwu.edu				NBC Sports	N/A	N/A	\$4,111,130	\$4,111,130	\$0	\$2,789,098	\$2,789,098			
213	University of Massachusetts A-10	No			Amherst	MA	Minutemen and Minutewomen	1979	30,393	Public	Pete Benfield	pbfield@umass.edu				NBC Sports	\$10,714,989	\$10,714,989	\$0	\$4,454,190	\$4,454,190					
214	University of Richmond	A-10	No		Richmond	VA	Spiders	2001	4,002	Private	John Harb	athleticdirector@richmond.edu				NBC Sports	\$7,128,073	\$7,128,073	\$5,482,607	\$5,482,607	\$0	\$2,734,507	\$2,734,507			
212	University of Rhode Island	A-10	No		Kingston	RI	Rams	1980	16,883	Public	Thom Ryan	tryan@uri.edu	401-874-6248			NBC Sports	\$5,544,879	\$5,453,886	\$110,993	\$4,518,114	\$5,082,239	\$183,903	\$2,688,435	\$2,688,435		
209	Queens University	A-10	No		Pittsburgh	PA	Dukes	1983	9,274	Private	Drew Hager	hagerd@duke.edu				NBC Sports	\$4,024,032	\$4,024,032	\$0	\$5,464,054	\$5,464,054	\$0	\$2,900,205	\$2,900,205		
210	Loyola University Chicago	A-10	No		Chicago	IL	Ramblers	2022	16,837	Private	Steve Watson	watson4@luc.edu				NBC Sports	N/A	N/A	\$4,536,549	\$4,536,549	\$0	\$2,071,018	\$2,071,018			
203	Davidson College	A-10	No		Davidson	NC	Wildcats	2014	1,843	Private	Chris Curcio	chcurcio@davidson.edu				NBC Sports	\$1,891,102	\$1,822,339	\$58,963	\$3,738,010	\$3,948,968	\$208,695	\$2,029,695	\$2,029,695		
214	St. Bonaventure University	A-10	No		St. Bonaventure	NY	Bonies	1979	2,281	Private	Joe Marchetti		716-375-2282			NBC Sports	N/A	N/A	\$4,239,342	\$4,239,342	\$0	\$1,904,186	\$1,904,186			
208	La Salle University	A-10	No		Philadelphia	PA	Explorers	1985	5,191	Private	athletic@lasalle.edu					NBC Sports	N/A	N/A	\$3,222,316	\$3,222,316	\$0	\$1,808,691	\$1,808,691			
202	University of Dayton	A-10	No		Dayton	OH	Flyers	1985	11,241	Private	Nat Sullivan	ASullivan@dayton.edu				NBC Sports	\$187,000	\$1,403,309	\$1,216,309	\$4,867,248	\$5,227,688	\$1,610,449	\$3,962,101	\$3,962,101		
208	Temple University	AAC	Yes	FBS	Philadelphia	PA	Owls	2013	37,380	Public	Arthur Johnson	athletic@temple.edu	215-204-7799			ESPN	\$2,073,314	\$2,073,314	\$1,296,308	\$18,878,904	\$6,857,248	\$8,227,656	\$1,614,449	\$4,643,843	\$4,643,843	
208	Southern Methodist University	AAC	Yes	FBS	N/A	TX	Mustangs	2013	11,849	Private	Rick Hart	hart@smu.edu				ESPN	\$2,075,598	\$2,075,598	\$0	\$4,143,877	\$4,143,877	\$0	\$4,180,189	\$4,180,189		
207	University of South Florida	AAC	Yes	FBS	Tampa	FL	Bulls	2013	50,800	Public	Michael Kelly	michaelkelly@usf.edu				ESPN	\$18,695,341	\$18,695,341	\$0	\$4,300,060	\$4,300,060	\$0	\$3,854,179	\$3,854,179		
217	University of Tulsa	AAC	Yes	FBS	Tulsa	OK	Garden Hosiannas	2014	3,343	Private	Rick Dickson	rdickson@tulsa.edu	918-631-3112			ESPN	\$13,862,243	\$13,862,243	\$0	\$6,843,531	\$6,843,531	\$0	\$1,816,487	\$1,816,487		
206	University of Memphis	AAC	Yes	FBS	Memphis	TN	Tigers	2013	21,458	Public	Land Veach	athleticdirector@memphis.edu	901-678-5395			ESPN	\$17,086,532	\$17,086,532	\$0	\$13,735,823	\$13,735,823	\$0	\$2,945,180	\$2,945,180		
217	Winthrop State University	AAC	Yes	No Football	Winthrop	NC	Brooksies	2017	15,778	Public	Kevin Sael	ksael@winthrop.edu				ESPN	N/A	N/A	\$5,801,398	\$4,535,431	\$1,265,198	\$2,374,823	\$2,374,823			
204	East Carolina University	AAC	Yes	FBS	Greenville	NC	Phobias	2014	28,628	Public	Jon Gilbert	athletic_director@ecu.edu	(252) 737-4502			ESPN	\$14,582,580	\$14,581,138	\$1,442	\$4,255,334	\$4,254,033	\$1,271	\$2,342,224	\$2,342,224		
186	Charlotte	AAC	Yes	FBS	Charlotte	NC	49ers	2013	30,146	Public	Mike Hill	athleticdirector@charlotte.edu	704-687-1054			CBS SportsNet	\$9,710,108	\$9,710,108	\$0	\$3,595,247	\$3,595,247	\$0	\$2,529,582	\$2,529,582		
186	New University	AAC	Yes	FBS	Houston	TX	Owls	2009	7,124	Private	Joe Kargant	athleticdirector@ucd.edu				CBS SportsNet	\$12,625,695	\$12,625,695	\$0	\$3,507,525	\$3,507,525	\$0	\$2,280,444	\$2,280,444		
181	University of Alabama at B	AAC	Yes	FBS	Birmingham	AL	Blacons	1985	21,923	Public	Gregory McQuibb	gregmquibb@ua-b.edu				CBS SportsNet	\$14,159,566	\$14,159,566	\$0	\$4,584,650	\$4,584,650	\$2,277,831	\$2,277,831	\$2,277,831		
187	University of North Texas	AAC	Yes	FBS	Denton	TX	Mean Green	2013	42,372	Public	James Mosley	athleticdirector@unt.edu				CBS SportsNet	\$11,258,741	\$11,258,741	\$0	\$5,111,210	\$5,111,210	\$0	\$2,139,028	\$2,139,028		
180	University of Texas at San	AAC	Yes	FBS	San Antonio	TX	Roadrunners	2013	34,734	Public	Lisa Campese	lcampese@utsa.edu				CBS SportsNet	\$12,835,633	\$12,835,633	\$0	\$2,528,601	\$2,528,601	\$0	\$2,031,447	\$2,031,447		
182	Florida Atlantic University	AAC	Yes	FBS	Boca Raton	FL	Owls	2013	29,172	Public	Brian White	athleticdirector@fau.edu	561-397-3199			CBS SportsNet	\$13,547,960	\$13,547,960	\$0	\$2,894,834	\$2,894,834	\$0	\$1,981,308	\$1,981,308		
210	Tulane University	AAC	Yes	FBS	New Orleans	LA	Green Wave	2014	11,722	Private	Troy Damons	tdamons@tulane.edu				ESPN	\$8,177,788	\$8,177,788	\$3,065,098	\$6,202,966	\$473,689	\$1,144,818	\$1,144,818			
216	University of Louisville	AAC	Yes	FBS	Louisville	KY	Cardinals	2014	21,430	Public	Jeff Hunt	athleticdirector@louisville.edu				ESPN	\$4,964,931	\$4,964,931	\$0	\$21,803,488	\$21,803,488	\$0	\$6,974,748	\$6,974,748		
216	University of Miami	AAC	Yes	FBS	Coral Gables	FL	Hurricanes	2004	17,411	Private	Don Raskovich	athleticdirector@miami.edu				ESPN	\$76,208,277	\$74,208,277	\$0	\$9,879,105	\$9,879,105	\$41,699	\$6,562,501	\$6,562,501		
285	University of Virginia	AAC	Yes	FBS	Charlottesville	VA	Cavaliers, Wahoos	1953	25,018	Public	Carla Williams	cwilliams@virginia.edu	434-962-6100			ESPN	\$48,118,214	\$30,032,481	\$17,485,353	\$14,598,575	\$12,272,802	\$2,324,773	\$5,843,060	\$5,843,060		
286	University of Notre Dame	AAC	Yes	FBS	Notre Dame	IN	Fighting Irish	2013	12,881	Private	Jack Swarbrick					ESPN	\$18,868,833	\$9,465,697	\$7,722,698	\$10,817,411	\$10,817,411	\$0	\$5,300,016	\$5,300,016		
217	Georgia Institute of Techno	AAC	Yes	FBS	Atlanta	GA	Yellow Jackets	1979	36,489	Public	J. Pat					ESPN	\$28,746,322	\$29,244,500	\$2,443,822	\$9,286,479	\$9,286,479	\$1,044,678	\$4,769,468	\$4,769,468		
283	University of Pittsburgh	AAC	Yes	FBS	Pittsburgh	PA	Panthers	2013	28,391	Public	Heather Lyke	athleticdirector@pitt.edu	412-648-8230			ESPN	\$47,179,220	\$39,232,335	\$7,945,885	\$10,934,877	\$2,033,868	\$4,444,816	\$4,444,816			
214	Clemson University	AAC	Yes	FBS	Clemson	SC	Tigers	1983	28,822	Public	Grady Lyle					ESPN	\$68,912,780	\$50,889,277	\$18,023,493	\$8,035,348	\$8,035,348	\$0	\$4,262,101	\$4,262,101		
216	Wake Forest University	AAC	Yes	FBS	Winston-Salem	NC	Demon Deacons	1983	8,789	Private	John Curcio	athleticdirector@wake.edu	336-768-3140			ESPN	\$34,341,360	\$28,442,250	\$5,899,110	\$10,091,485	\$10,091,485	\$0	\$4,962,597	\$4,962,597		
216	Duke University	AAC	Yes	FBS	Durham	NC	Blue Devils	1953	16,780	Private	Nora King	athleticdirector@duke.edu				ESPN	\$64,725,236	\$38,277,825	\$26,447,311	\$45,108,336	\$28,019,888	\$17,088,448	\$7,037,960	\$7,037,960		
284	Syracuse University	AAC	Yes	FBS	Syracuse	NY	Orange	2013	21,222	Public	John Whelan	athleticdirector@syr.edu				ESPN	\$56,242,311	\$27,069,220	\$29,173,091	\$58,159,381	\$14,822,271	\$18,336,662	\$1,693,301	\$6,685,816	\$6,685,816	
280	University of Tennessee	AAC	Yes	FBS	Knoxville	TN	Seminoles	1981	45,493	Public	Michael Allen	athleticdirector@utk.edu				ESPN	\$53,868,338	\$33,868,338	\$20,172,885	\$16,897,326	\$11,104,464	\$3,862,862	\$1,239,890	\$2,560,926	\$2,560,926	
280	University of North Carolina	AAC	Yes	FBS	Chapel Hill	NC	Tar Heels	1953	30,101	Public	Bruce Cunningham	brucecunningham@unc.edu	800-644-1079			ESPN	\$55,404,225	\$34,368,323	\$21,035,902	\$13,965,931	\$12,445,368	\$18,538,085	\$1,228,367	\$4,583,414	\$4,583,414	
286	Virginia Tech	AAC	Yes	FBS	Blacksburg	VA	Hokies	2004	36,383	Public	Willie Boback	willieboback@vt.edu				ESPN	\$52,962,813	\$37,820,898	\$15,141,204	\$12,456,699	\$6,454,702	\$1,176,993	\$3,696,741	\$3,696,741		
281	North Carolina State University	AAC	Yes	FBS	Raleigh	NC	Wolfpack	1983	36,304	Public	Ben Compton	bencompton@ncsu.edu	(919) 515-2109			ESPN	\$62,241,581	\$29,337,617	\$32,903,964	\$15,377,173	\$10,008,714	\$5,371,988	\$1,048,407	\$1,048,407		
273	Boston College	AAC	Yes	FBS	Cheshnut Hill	MA	Eagles	1983	14,890	Private	Brian James	bjames@bc.edu				ESPN	\$38,009,926	\$28,364,617	\$9,645,309	\$33,993,993	\$340,040	\$346,423	\$4,384,48	\$4,384,48		
189	University at Albany	American East	No	FCS	Albany	NY	Great Danes	2001	17,746	Public	Mark Benson	mbenson@albany.edu				ESPN+ESPN	\$16,442,082	\$2,022,116	\$4,399,997	\$729,403	\$2,10,116	\$1,977,322	\$332,794	\$1,824,986	\$1,824,986	
180	Binghamton University	American East	No		Vestal	NY	Bearcats	2001	17,748	Public	Eugene Marshall					ESPN+ESPN	N/A	N/A	N/A	\$2,022,116	\$0	\$1,764,800	\$1,764,800			
186	New Jersey Institute of Tech	American East	No		Highlanders	NJ	Highlanders	2020	11,901	Public	Lenny Kaplan	kaplanl@njit.edu				ESPN+ESPN	N/A	N/A	\$1,947,062	\$1,947,371	\$5,771	\$1,722,984	\$1,714,66			
180	University of Maryland, Balt	American East	No		Catonsville	MD	Retrievers	2003	13,797	Public	Ben Smith	bensmith@umary.edu				ESPN+ESPN	N/A	N/A	\$2,233,468	\$2,233,468	\$0	\$1,991,216	\$1,991,216			
180	Stony Brook University	American East	No		Suffolk	NY	Bulldogs	2002	3,761	Private	Bill Smith	smithb@stony.edu				ESPN+ESPN	\$5,497,771	\$5,497,771	\$0	\$2,132,468	\$2,132,468	\$0	\$1,800,862	\$1,800,862		

DATA PREVIEW

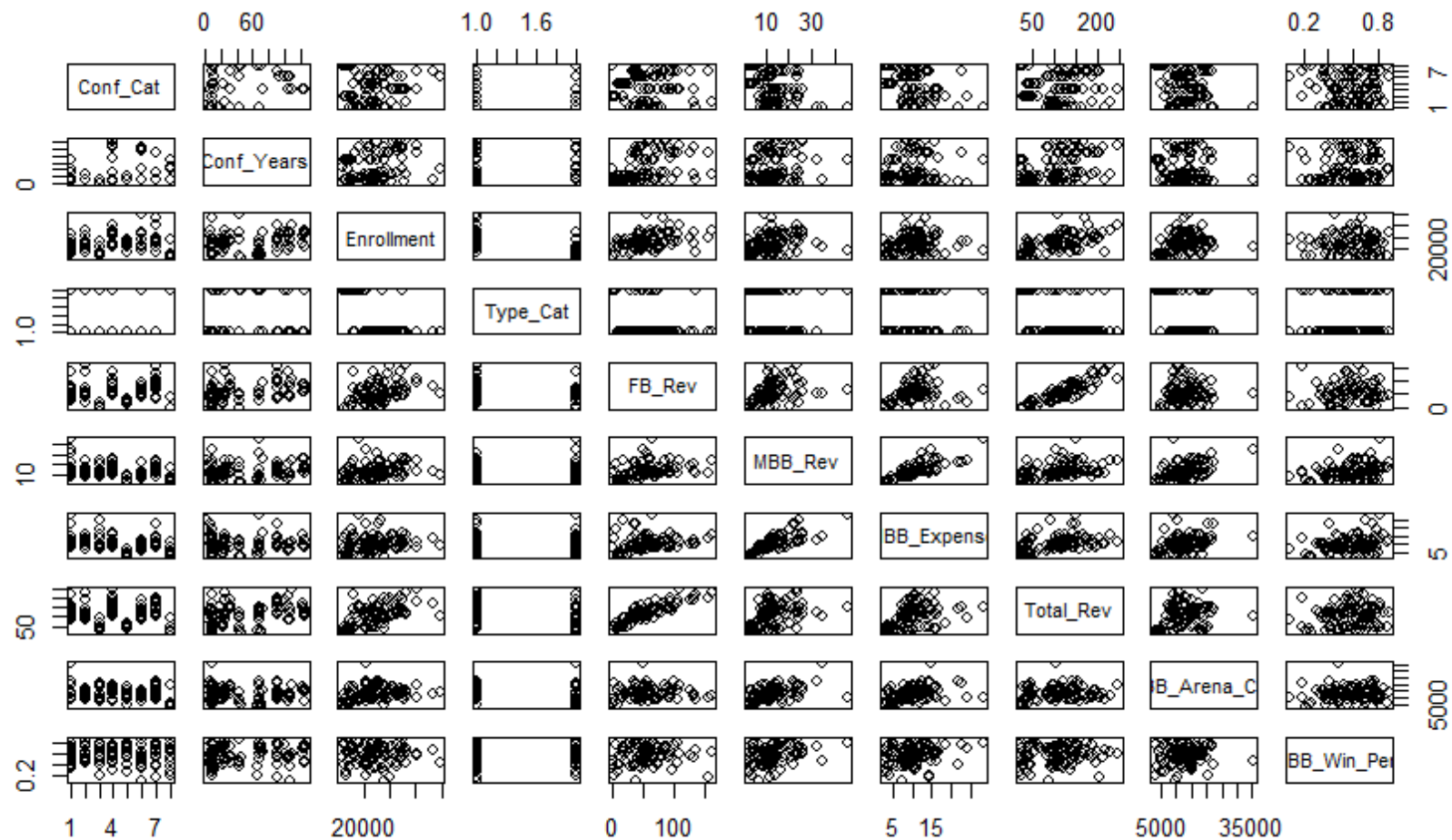
	A	B	C	D	E	F	G	I	J	K	L
1	School Name	Conf_Cat	Years in Conference	Enrollment	Type_Cat	Football Revenue	Men's Basketball Revenue	MBB Profit	Line 14: Grand Total Revenues	Men's Basketball Arena Capacity	MBB Winning %
2	Clemson University	1	69	25,822	1	\$68,912,760	\$8,035,346	\$0	\$140,436,882	9000	51.52%
3	Boston College	1	17	14,890	2	\$38,009,926	\$8,333,993	-\$340,040	\$95,703,917	8606	39.39%
4	Georgia Institute of Technology	1	43	36,489	1	\$28,788,322	\$9,258,729	\$1,048,678	\$93,696,369	8600	37.50%
5	University of Miami	1	18	17,811	2	\$74,206,277	\$9,978,355	\$41,699	\$148,497,805	7972	70.27%
6	Wake Forest University	1	69	8,789	2	\$28,341,365	\$10,061,485	\$98,888	\$84,889,487	14665	71.43%
7	University of Notre Dame	1	9	12,681	2	\$136,688,613	\$10,817,411	\$0	\$215,302,668	9149	68.57%
8	Virginia Tech	1	18	36,383	1	\$52,962,813	\$12,456,695	\$4,051,993	\$109,216,783	10052	63.89%
9	University of Pittsburgh	1	9	28,391	1	\$47,178,220	\$12,968,545	\$2,033,868	\$122,722,495	12508	34.38%
10	University of Virginia	1	69	25,018	1	\$48,118,214	\$14,598,575	\$2,324,773	\$128,298,742	14593	60.00%
11	North Carolina State University	1	69	36,304	1	\$52,241,521	\$15,377,713	\$5,370,999	\$102,387,569	19557	74.36%
12	Florida State University	1	31	45,493	1	\$78,697,218	\$16,987,326	\$5,882,862	\$162,146,012	12100	54.84%
13	University of Louisville	1	8	21,430	1	\$34,994,931	\$21,853,488	\$0	\$139,978,924	22090	40.63%
14	University of North Carolina at Chapel Hill	1	69	30,101	1	\$55,604,225	\$31,965,031	\$19,519,663	\$119,569,409	21750	74.36%
15	Syracuse University	1	9	21,322	2	\$50,242,311	\$34,157,191	\$19,334,920	\$105,631,408	35446	48.48%
16	Duke University	1	69	16,780	2	\$64,725,236	\$45,108,538	\$17,088,650	\$150,517,681	9314	82.05%
17	West Virginia University	2	10	25,474	1	\$19,787,210	\$8,371,424	-\$1,356,711	\$97,067,706	14000	48.48%
18	Kansas State University	2	26	20,229	1	\$50,528,678	\$10,163,782	\$2,510,671	\$100,822,204	12528	45.16%
19	Oklahoma State University	2	26	24,660	1	\$49,465,735	\$11,360,616	\$3,862,472	\$101,526,357	13611	50.00%
20	Texas Christian University (TCU)	2	10	11,938	2	\$71,767,270	\$12,670,472	\$2,292	\$138,998,636	8500	61.76%
21	Baylor University	2	26	20,626	2	\$48,492,390	\$13,308,914	\$0	\$111,131,098	10347	79.41%
22	University of Oklahoma	2	26	28,052	1	\$132,659,502	\$14,034,622	\$1,628,567	\$186,948,657	11528	54.29%
23	Texas Tech University	2	26	40,666	1	\$60,218,700	\$15,290,989	\$3,432,306	\$103,708,791	15300	72.97%
24	Iowa State University	2	26	30,708	1	\$55,861,324	\$15,676,249	\$8,233,209	\$86,775,037	14376	62.86%
25	University of Kansas	2	26	27,685	1	\$39,077,010	\$17,126,971	\$1,618,077	\$124,842,549	16300	85.00%
26	University of Texas at Austin	2	26	51,892	1	\$161,532,860	\$23,637,212	\$7,782,313	\$230,503,008	10763	64.71%
27	DePaul University	3	9	21,922	2	N/A	\$7,614,927	\$0	\$33,627,815	10387	48.39%

DATA & VARIABLES

- 9 independent variables: conference (Conf_Cat), years in conference (Conf_Years), school enrollment (Enrollment), private/public university (Type_Cat), football revenue (FB_Rev), men's basketball revenue (MBB_Rev), total revenue (Total_Rev), men's basketball expenses (MBB_Expense), men's basketball arena capacity (MBB_Arena_Cap)
 - quantified conferences 1–8 and public schools (1) vs private schools (2)
- dependent variable: men's basketball winning percentage

Conferences & Categories	
ACC	1
Big 12	2
Big East	3
BIG-10	4
Mountain West	5
PAC-12	6
SEC	7
WCC	8

PAIRED DATA



ORIGINAL MODEL

```
Call:
lm(formula = MBB_Win_Perc ~ ., data = data)
```

```
Residuals:
```

```
      Min       1Q   Median       3Q      Max
-0.44357 -0.09320  0.00254  0.13578  0.29816
```

```
Coefficients:
```

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	4.407e-01	1.287e-01	3.424	0.00103	**
Conf_Cat	4.518e-03	1.005e-02	0.450	0.65442	
Conf_Years	2.257e-05	5.537e-04	0.041	0.96759	
Enrollment	2.555e-09	1.738e-06	0.001	0.99883	
Type_Cat	1.596e-02	5.645e-02	0.283	0.77817	
FB_Rev	-1.022e-03	1.226e-03	-0.834	0.40727	
MBB_Rev	8.970e-03	5.133e-03	1.747	0.08488	.
MBB_Expense	-3.520e-03	7.637e-03	-0.461	0.64628	
Total_Rev	7.857e-04	1.007e-03	0.780	0.43795	
MBB_Arena_Cap	-1.725e-06	4.732e-06	-0.365	0.71650	

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.1674 on 71 degrees of freedom
```

```
(15 observations deleted due to missingness)
```

```
Multiple R-squared:  0.1151,    Adjusted R-squared:  0.002878
```

```
F-statistic: 1.026 on 9 and 71 DF,  p-value: 0.4284
```

- only 2 significant predictors: intercept & MBB revenue
- Interpretation of Slope: As total revenue increases by \$1 million, the winning percentage is expected to increase by 0.07857%, holding all other variables in the model constant.

PROCESS TO REDUCED MODEL: BEST SUBSET REGRESSION

x <chr>	k	r2 <dbl>	adjr2 <dbl>	AIC <dbl>	BIC <dbl>	r2press <dbl>	Cp <dbl>
MBB_Rev	1	0.1029232	0.093379792	-73.39222	-65.69918	0.06739601	-4.2247161
Type_Cat MBB_Rev	2	0.1091770	0.090019531	-72.06382	-61.80643	0.05015541	-2.8366298
Conf_Cat Type_Cat MBB_Rev	3	0.1122669	0.083319121	-70.39739	-57.57564	0.03465980	-1.1389661
Conf_Cat Conf_Years Type_Cat MBB_Rev	4	0.1130322	0.074044600	-68.48018	-53.09409	0.01385079	0.7861566
Conf_Cat Conf_Years Type_Cat MBB_Rev MBB_Expense	5	0.1133328	0.064073514	-66.51272	-48.56228	-0.01340984	2.7567434
Conf_Cat FB_Rev MBB_Rev MBB_Expense Total_Rev MBB_Arena_Cap	6	0.1137947	0.041940162	-54.29030	-35.13471	-0.07828786	4.1010231
Conf_Cat Type_Cat FB_Rev MBB_Rev MBB_Expense Total_Rev MBB_Arena_Cap	7	0.1150331	0.030173247	-52.40358	-30.85354	-0.12876150	6.0016622
Conf_Cat Conf_Years Type_Cat FB_Rev MBB_Rev MBB_Expense Total_Rev MBB_Arena_Cap	8	0.1150538	0.016726421	-50.40547	-26.46098	-0.16017053	8.0000022
Conf_Cat Conf_Years Enrollment Type_Cat FB_Rev MBB_Rev MBB_Expense Total_Rev MBB_Arena_Ca	9	0.1150538	0.002877527	-48.40547	-22.06653	-0.18417435	10.0000000

9 rows | 1-1 of 7 columns

- Best R^2 : model 8 & 9 (highest) Best R_{adj}^2 : model 1 (highest) Best R_{press}^2 : model 1 (highest) Best C_p : model 8 (closest to $k+1$) Best AIC: model 1 (lowest) Best BIC: model 1 (lowest)
- We choose model 1 as our best model because it fits 4/6 optimality criterion

PROCESS TO REDUCED MODEL: STEPWISE SELECTION AND BACKWARD ELIMINATION

- Stepwise Selection
 - Only added MBB Revenue
- Backward Elimination
 - Removed all variables except for MBB Revenue

REDUCED MODEL: SIMPLE LINEAR REGRESSION

```
Call:
lm(formula = MBB_Win_Perc ~ MBB_Rev, data = data)

Residuals:
    Min       1Q   Median       3Q      Max
-0.44098 -0.10004  0.00514  0.13058  0.28528

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.482490   0.034033  14.177  < 2e-16 ***
MBB_Rev      0.007378   0.002247   3.284  0.00144 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1617 on 94 degrees of freedom
Multiple R-squared:  0.1029,    Adjusted R-squared:  0.09338
F-statistic: 10.78 on 1 and 94 DF,  p-value: 0.001438

Analysis of Variance Table

Response: MBB_Win_Perc
      Df Sum Sq Mean Sq F value    Pr(>F)
MBB_Rev  1  0.28204  0.282045   10.785 0.001438 **
Residuals 94  2.45830  0.026152
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

- Best Subset Regression, Stepwise Selection, and Backward Elimination all chose model 1 (with only 1 predictor: MBB revenue) as the best model
- Interpretation of Estimates:
 - If a school had \$0 revenue from men's basketball, they would be expected to win 48.25% of their games.
 - As men's basketball revenue increases by \$1 million, the winning percentage is expected to increase by as much as 0.7%.

TESTING THE MODEL: FULL VS REDUCED

- H_0 : Reduced model is adequate.
 H_a : Full model is adequate.
- F test statistic: $\frac{(2.2458 - 1.988)/(9 - 1)}{1.988/(96 - (9 + 1))} = 1.394$
- F critical value: `qf(0.05, 8, 86, lower.tail=F)` = 2.048
- Decision: F test < F critical so we fail to reject H_0
- Conclusion: We do not have enough evidence to show the full model is adequate, so we can use the reduced model.

TESTING THE MODEL: SIGNIFICANCE OF ESTIMATES

- $H_0: \beta_j = 0$; the j^{th} predictor is not significant
 $H_a: \beta_j \neq 0$; the j^{th} predictor is significant
- MBB_Rev p-value: 0.00144
- Decision: p-value much less than $\alpha = 0.05$, so we reject H_0
- Conclusion: We have evidence that MBB revenue is a significant predictor.

PREDICTIONS

- using Villanova as a test predictor: MBB revenue was \$20.513366 million
- our model predicted Nova to have a win percentage of 63.38%
 - actual was 78.95%, so 19.7% error

```
#Predict using NOVA!  
```{r}  
test = data.frame(MBB_Rev=20.513366)
predict(new_fit, test)
```
```

```
      1  
0.6338475
```

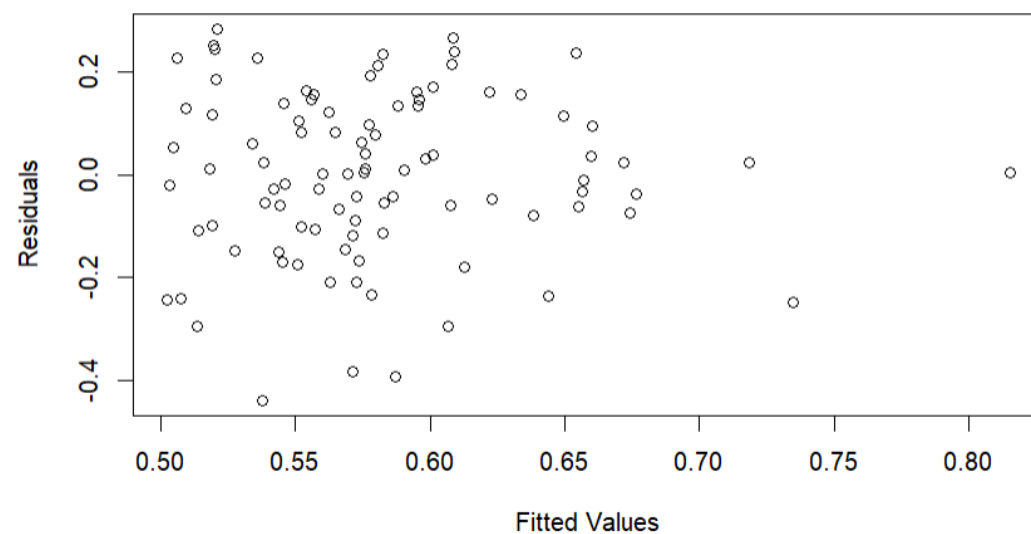
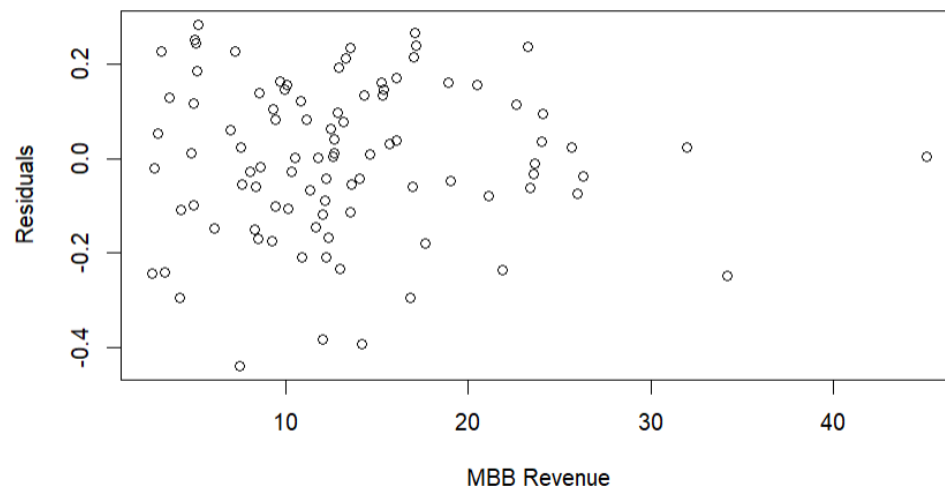
- Prediction Interval: We are 95% confident that the true winning percentage of an NCAA men's basketball team with \$21,513,366 revenue due to men's basketball is between 30.95% and 95.82%.

| | fit | lwr | upr |
|---|-----------|-----------|-----------|
| 1 | 0.6338475 | 0.3094646 | 0.9582305 |
- Confidence Interval: We are 95% confident that the true increase in winning percentage per \$1 million increase in men's basketball revenue is between 58.78% and 67.99%.

| | fit | lwr | upr |
|---|-----------|-----------|-----------|
| 1 | 0.6338475 | 0.5877517 | 0.6799433 |

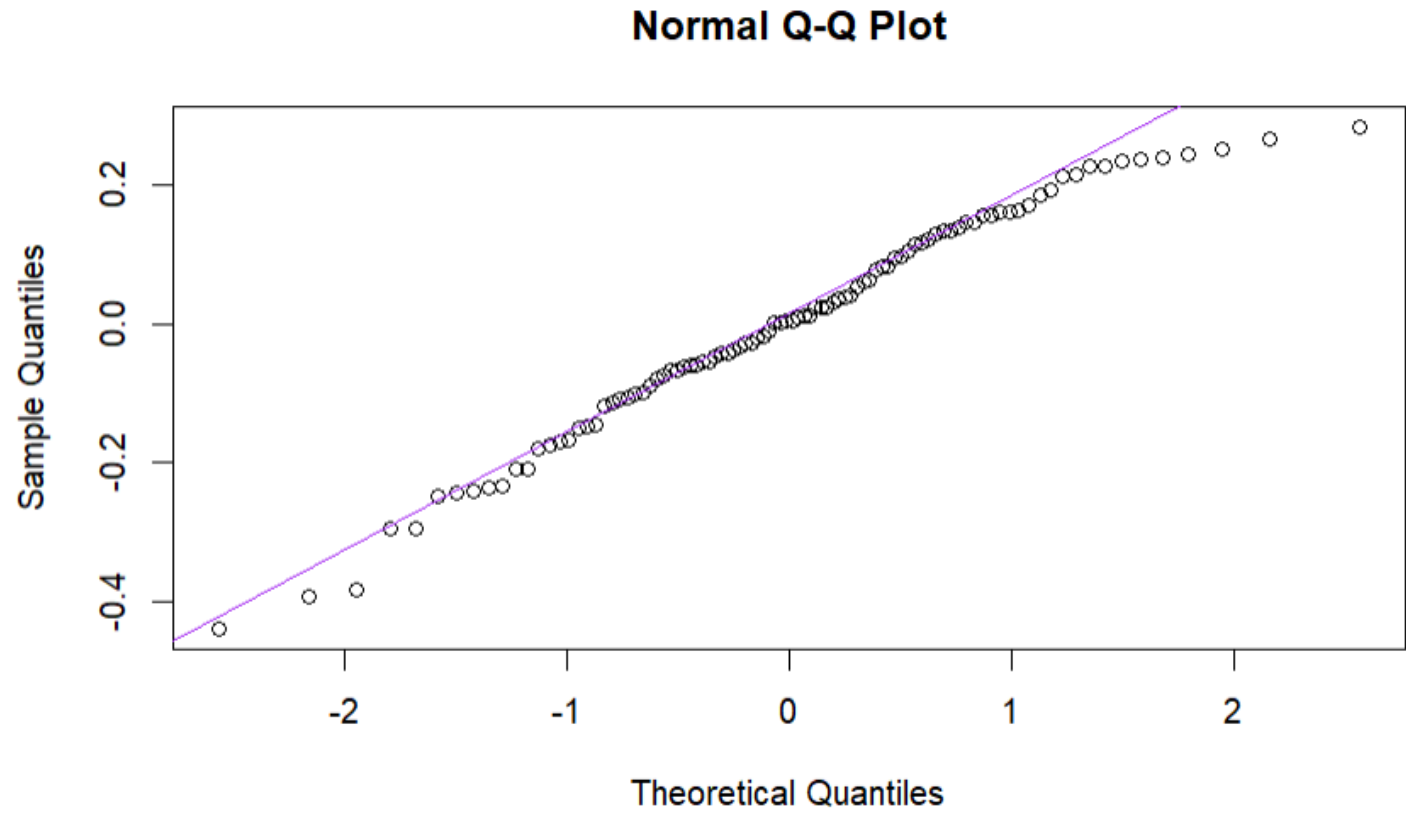
ASSUMPTIONS

- Linearity & Constant Variance satisfied



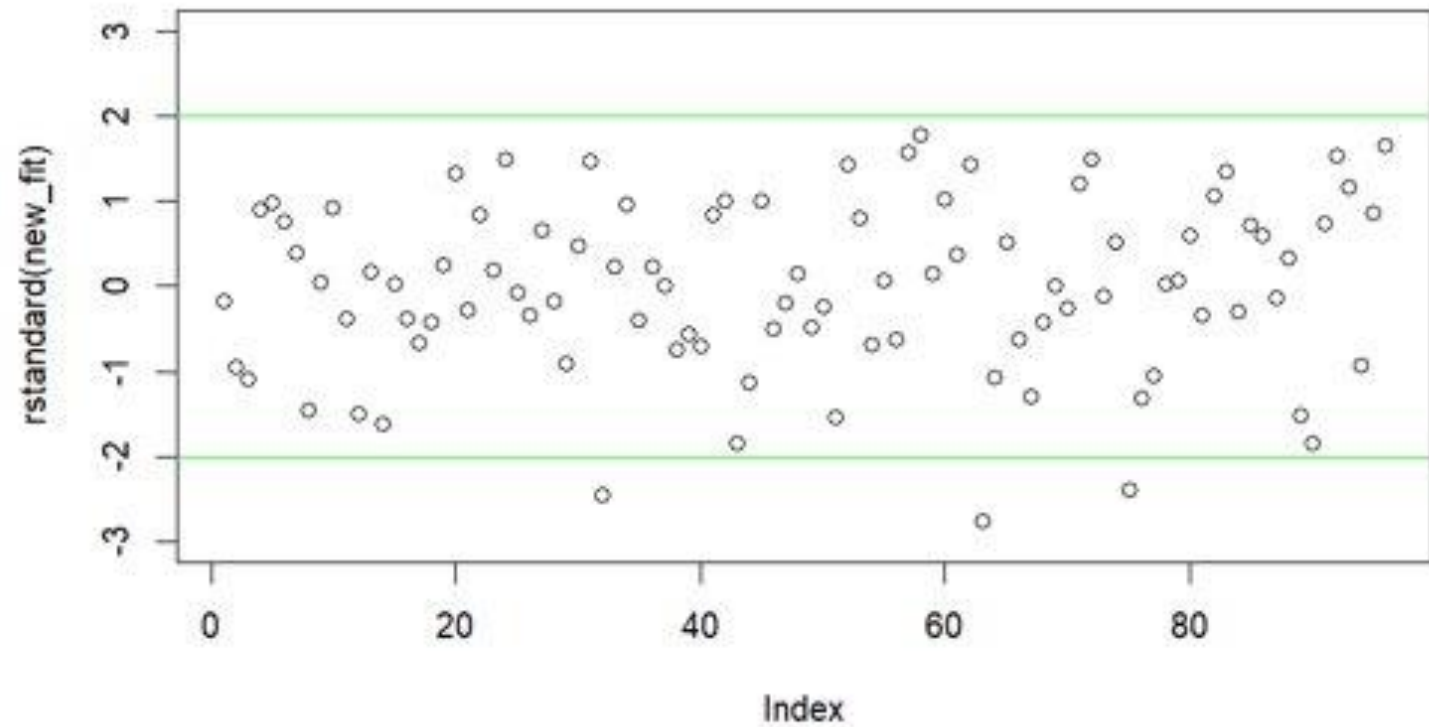
NORMALITY

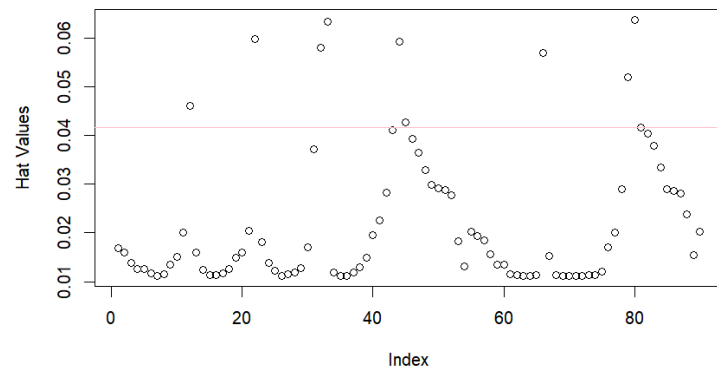
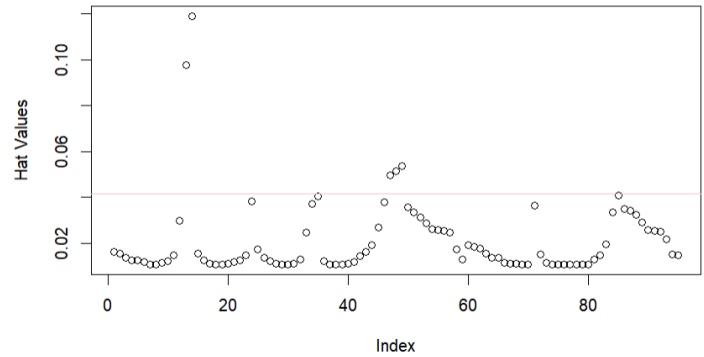
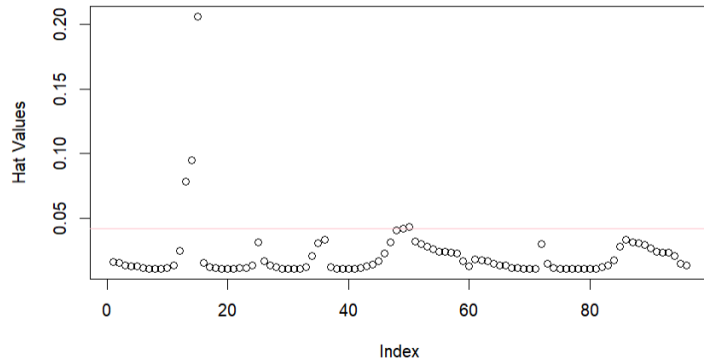
- Normality satisfied
 - Wilk-Shapiro value = 0.97759
 - p-value = 0.099



OUTLIERS

- 3 outliers, but not super far
- None were also influential





INFLUENTIAL POINTS

- 4 influential points initially, then remove the most influential
- now 5 influential points, so we removed all 5
- then many more influential points
 - Back to the original data set since the overall model was generally the same

SUMMARY AND CONCLUSIONS

- Reconsider Initial Research Questions:
 - Do off-the-court factors impact a school's men's basketball results for an individual season?
 - If so, which factors are most important in predicting the results of a season?

SUMMARY AND CONCLUSIONS CONT'D

- Linear regression indicates that it is possible to predict the results of a season through off-court values
- Win Percentage = $0.48249 - 0.007378(\text{MBB Revenue})$
- However, we cannot predict a team's winning percentage with much precision
 - Our adjusted R^2 value for the linear regression model is only about 9.3%
 - We can say that a team's men's basketball revenue and their winning percentage are lightly linearly correlated
 - Our tests indicated that no other variables were able to predict men's basketball winning percentage with any significance

LOOKING FORWARD

- Look at time-series data to see how revenues over time are correlated to a team's success over the years
- Incorporate more variables and smaller schools (schools that are in smaller conferences with less money) in order to help those schools with tighter budgets
- We plan to investigate this relationship with additional skills and model capabilities in the future

THANK YOU AND WORKS CITED

Works Cited

“2021-2022 Division 1 Athletics Information.” *Equity in Athletics*, ope.ed.gov/athletics/#/. Accessed 11 Dec. 2023.