

Real GDP per capita rate vs real GDP rate vs population

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The purpose of this project is to analyze the real gross domestic product of Mexico, and its rate, at constant prices of 2013 (Mexican pesos), and to analyze the relationship between this variable and the real GDP per capita. The following is the wrangling and analysis process.

In order to upload the datasets and to accomplish a proper analysis, we need to call the libraries tidyverse and readxl.

```
library(readxl)
library(tidyverse)

## — Attaching packages
──────────────────────────────────────── tidyverse
1.3.0 —

## ✓ ggplot2 3.3.2      ✓ purrr  0.3.4
## ✓ tibble  3.0.3      ✓ dplyr  1.0.0
## ✓ tidyr   1.1.0      ✓ stringr 1.4.0
## ✓ readr   1.3.1      ✓ forcats 0.5.0

## — Conflicts
────────────────────────────────────────
tidyverse_conflicts() —
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
```

The file is uploaded and analyzed (The reference of the file can be viewed in the Reference list below).

```
raw <- read_excel("PIBTR_2.xlsx", )

## New names:
## * `` -> ...3
## * `` -> ...4
## * `` -> ...5
## * `` -> ...6
## * `` -> ...7
## * ...

df_raw <- as.data.frame(raw) #We change the tibble into a data frame
head(df_raw) #Observe the first six rows
```

##		Concepto	1980
## 1		<NA>	T1
## 2		__abB.1bP - Producto interno bruto	7547882.1440000003
## 3	D.21-D.31 - Impuestos sobre los productos, netos		282092.939000000001
## 4		__cdB.1bV - Valor agregado bruto	7265789.20500000001
## 5		Actividades primarias	320667.549
## 6		Actividades secundarias	2864062.9
##	...3	...4	...5
...6			
## 1	T2	T3	T4
Meses			6
## 2	7536518.9919999996	7478780.8200000003	8008666.6399999997
	7542200.568		
## 3	281668.255	279510.36099999998	299314.201
	281880.59700000001		
## 4	7254850.7369999997	7199270.4589999998	7709352.4390000002
	7260319.9709999999		
## 5	287579.26799999998	304948.75099999999	316649.93199999997
	304123.40899999999		
## 6	2877701.6519999998	2935853.3149999999	3037769.9619999998
	2870882.2760000001		
##	...7	...8	1981
...10			
## 1	9 Meses	Anual	T1
T2			
## 2	7521060.6519999998	7642962.1490000002	8229212.7019999996
	8417818.0040000007		
## 3	281090.51799999998	285646.43900000001	307556.84299999999
	314605.73700000002		
## 4	7239970.1339999996	7357315.71	7921655.8590000002
	8103212.267		
## 5	304398.52299999999	307461.375	335400.962
	317798.02299999999		
## 6	2892539.2889999999	2928846.9569999999	3142427.449
	3286989.0789999999		
##	...11	...12	...13
...14			
## 1	T3	T4	6 Meses
Meses			9
## 2	8211045.5269999998	8614524.8650000002	8323515.3530000001
	8286025.4110000003		
## 3	306877.86700000003	321957.41700000002	311081.28999999998
	309680.14899999998		
## 4	7904167.6600000001	8292567.4479999999	8012434.0630000001
	7976345.2620000001		
## 5	322028.033	350034.52	326599.49300000002
	325075.67300000001		
## 6	3312083.3459999999	3270025.048	3214708.264
	3247166.625		
##	...15	1982	...17

```

...18
## 1          Anual          T1          T2
T3
## 2 8368150.2750000004 8512096.4000000004 8481760.7589999996
8198953.8990000002
## 3 312749.4660000001 318129.27799999999          316995.52
306425.95699999999
## 4 8055400.8090000004 8193967.1220000004 8164765.2390000001
7892527.9419999998
## 5 331315.3850000001          355697.185 327458.89899999998
302562.62
## 6 3252881.231000001          3269031.173 3294492.0460000001
3236595.5729999999
##          ...19          ...20          ...21
...22
## 1          T4          6 Meses          9 Meses
Anual
## 2 8277251.6890000002 8496928.5800000001 8397603.6860000007
8367515.6869999999
## 3 309352.2420000003 317562.39899999998 313850.25199999998
312725.74900000001
## 4 7967899.4469999997 8179366.1809999999 8083753.4340000004
8054789.9380000001
## 5 309605.31599999999 341578.04200000002 328572.90100000001
323831.005
## 6 3070717.2940000002          3281761.61          3266706.264
3217709.0219999999
##          1983          ...24          ...25
...26
## 1          T1          T2          T3
T4
## 2 8120479.8499999996 7997531.1169999996 7764430.8439999996
8127328.5880000005
## 3 303493.08399999997 298898.02399999998 290186.18400000001
303749.04700000002
## 4 7816986.7659999998 7698633.0930000003 7474244.6600000001
7823579.5410000002
## 5 337303.33899999998 315329.01799999998          313931.603
354682.58600000001
## 6          2905809.14          2914584.56 2898295.4019999998
2913668.5920000002
##          ...27          ...28          ...29
1984
## 1          6 Meses          9 Meses          Anual
T1
## 2 8059005.4840000002 7960813.9369999999 8002442.5999999996
8384896.2300000004
## 3          301195.554 297525.76400000002 299081.58500000002
313375.326
## 4 7757809.9299999997 7663288.1730000004 7703361.0149999997

```

8071520.9040000001				
## 5	326316.179	322187.98700000002	330311.63699999999	
339541.18400000001				
## 6	2910196.85	2906229.7009999999	2908089.4240000001	
2973296.202				
##	...31	...32	...33	
...34				
## 1	T2	T3	T4	6
Meses				
## 2	8232124.5729999999	8119301.5240000002	8389536.3739999998	
8308510.4019999998				
## 3	307665.67	303449.04599999997	313548.74599999998	
310520.49800000002				
## 4	7924458.9029999999	7815852.4780000001	8075987.6279999996	
7997989.9040000001				
## 5	331220.85600000003	321378.03200000001	347735.77399999998	
335381.02				
## 6	3011295.594	3076299.1540000001	3091669.5449999999	
2992295.898				
##	...35	...36	1985	
...38				
## 1	9 Meses	Anual	T1	
T2				
## 2	8245440.7759999996	8281464.6749999998	8539105.0409999993	
8487030.4680000003				
## 3	308163.34700000001	309509.69699999999	319138.69300000003	
317192.46899999998				
## 4	7937277.4280000003	7971954.9780000001	8219966.3480000002	
8169837.9989999998				
## 5	330713.35700000002	334968.962	335040.79200000002	
360471.27299999999				
## 6	3020296.983	3038140.1239999998	3141885.7110000001	
3139853.9449999998				
##	...39	...40	...41	
...42				
## 1	T3	T4	6 Meses	9
Meses				
## 2	8193121.9589999998	8528896.04900000006	8513067.7550000008	
8406419.1559999995				
## 3	306207.995	318757.14399999997	318165.58100000001	
314179.71899999998				
## 4	7886913.9639999997	8210138.9050000003	8194902.1739999996	
8092239.4369999999				
## 5	321072.88699999999	363838.27799999999	347756.033	
338861.65100000001				
## 6	3164352.2960000001	3140545.7310000001	3140869.8280000002	
3148697.3169999998				
##	...43	1986	...45	
...46				
## 1	Anual	T1	T2	

T3

## 2	8437038.3790000007	8208491.352	8409218.6520000007
	7769449.7829999998		
## 3	315324.07500000001	306782.40700000001	314284.34600000002
	290373.761		
## 4	8121714.3039999995	7901708.9450000003	8094934.3059999999
	7479076.0219999999		
## 5	345105.80800000002	355883.58899999998	346246.85800000001
	323899.73200000002		
## 6	3146659.4210000001	2982531.6779999998	3050829.2119999998
	2890542.659		
##	...47	...48	...49
	...50		
## 1	T4	6 Meses	9 Meses
	Anual		
## 2	8109501.7910000002	8308855.0020000003	8129053.2620000001
	8124165.3949999996		
## 3	303082.79200000002	310533.37699999998	303813.505
	303630.82699999999		
## 4	7806418.9989999998	7998321.6260000002	7825239.7580000004
	7820534.568		
## 5	336001.50900000002	351065.22399999999	342010.06
	340507.92200000002		
## 6	2842483.7009999999	3016680.4449999998	2974634.5159999998
	2941596.8130000001		
##	1987	...52	...53
	...54		
## 1	T1	T2	T3
	T4		
## 2	8119219.0379999997	8443175.1160000004	8038083.5609999998
	8568977.2870000005		
## 3	303445.96299999999	315553.42800000001	300413.62300000002
	320255.13199999998		
## 4	7815773.0750000002	8127621.6880000001	7737669.9380000001
	8248722.1550000003		
## 5	352816.712	351452.71100000001	324635.04599999997
	350203.82699999999		
## 6	2895722.7420000001	3066417.3620000002	3090423.0610000002
	3123479.9389999998		
##	...55	...56	...57
	1988		
## 1	6 Meses	9 Meses	Anual
	T1		
## 2	8281197.0769999996	8200159.2379999999	8292363.7510000002
	8378163.1619999995		
## 3	309499.696	306471.005	309917.03700000001
	313123.685		
## 4	7971697.3820000002	7893688.2340000002	7982446.7139999997
	8065039.477		
## 5	352134.712	342968.15600000002	344777.07400000002

341083.54599999997				
## 6	2981070.0520000001	3017521.0550000002	3044010.7760000001	
	3073401.6239999998			
##	...59	...60	...61	
	...62			
## 1	T2	T3	T4	6
Meses				
## 2	8546889.0280000009	8031742.4079999998	8636950.8440000005	
	8462526.0950000007			
## 3	319429.61	300176.63	322795.56099999999	
	316276.64799999999			
## 4	8227459.4179999996	7731565.7779999999	8314155.2829999998	
	8146249.4479999999			
## 5	340200.61599999998	310088.10600000003	341044.78600000002	
	340642.08100000001			
## 6	3119758.7859999998	3065880.0630000001	3150783.642	
	3096580.2050000001			
##	...63	...64	1989	
	...66			
## 1	9 Meses	Anual	T1	
	T2			
## 2	8318931.5329999998	8398436.3609999996	8575114.0590000004	
	8912465.8910000008			
## 3	310909.97499999998	313881.37199999997	320484.48599999998	
	333092.60200000001			
## 4	8008021.5580000002	8084554.9890000001	8254629.5729999999	
	8579373.2890000008			
## 5	330457.42300000001	333104.26400000002	337291.647	
	312941.97600000002			
## 6	3086346.824	3102456.0290000001	3146100.4879999999	
	3293615.8879999998			
##	...67	...68	...69	
	...70			
## 1	T3	T4	6 Meses	9
Meses				
## 2	8452556.7029999997	8881444.7620000001	8743789.9749999996	
	8646712.2180000003			
## 3	315904.054	331933.22499999998	326788.54399999999	
	323160.38099999999			
## 4	8136652.6490000002	8549511.5370000005	8417001.4309999999	
	8323551.8370000003			
## 5	318385.761	344995.15500000003	325116.81199999998	
	322873.12800000003			
## 6	3243889.1340000001	3223116.1630000002	3219858.1880000001	
	3227868.503			
##	...71	1990	...73	
	...74			
## 1	Anual	T1	T2	
	T3			
## 2	8705395.3540000003	8964419.6239999998	9262515.9049999993	

8885511.8440000005
3 325353.592 335034.31 346175.29599999997
332085.22700000001
4 8380041.7620000001 8629385.3139999993 8916340.6089999992
8553426.6170000006
5 328403.63500000001 335247.50300000003 354587.20899999997
311549.01299999998
6 3226680.4180000001 3353353.8969999999 3423351.361
3452428.412
...75 ...76 ...77
...78
1 T4 6 Meses 9 Meses
Anual
2 9522792.5089999996 9113467.7650000006 9037482.4580000006
9158809.9710000008
3 355902.81900000002 340604.80300000001 337764.94400000002
342299.413
4 9166889.6899999995 8772862.9619999994 8699717.5130000003
8816510.5580000002
5 407631.12199999997 344917.35600000003 333794.57500000001
352253.712
6 3487003.7570000002 3388352.6290000002 3409711.2230000002
3429034.3569999998
1991 ...80 ...81
...82
1 T1 T2 T3
T4
2 9268190.3289999999 9775235.3350000009 9176389.0160000008
9894608.9890000001
3 346387.37099999998 365337.56300000002 342956.40899999999
369799.00900000002
4 8921802.9580000006 9409897.7719999999 8833432.6070000008
9524809.9800000004
5 343401.28499999997 365899.40700000001 317055.73100000003
414243.25199999998
6 3426135.344 3577770.9789999998 3504123.4049999998
3615563.09
...83 ...84 ...85
1992
1 6 Meses 9 Meses Anual
T1
2 9521712.8320000004 9406604.8929999992 9528605.9169999994
9701986.3300000001
3 355862.467 351560.44799999997 356120.08799999999
362599.97
4 9165850.3650000002 9055044.4460000005 9172485.8289999999
9339386.3599999994
5 354650.34600000002 342118.80800000002 360149.91899999999
317289.35100000002
6 3501953.162 3502676.5759999999 3530898.2050000001

3606103.65				
##	...87	...88	...89	
...90				
## 1	T2	T3	T4	6
Meses				
## 2	9986417.75	9607923.0690000001	10155182.256999999	
9844202.0399999991				
## 3	373230.25	359084.47	379537.61800000002	
367915.11				
## 4	9613187.5	9248838.5989999995	9775644.6390000004	
9476286.9299999997				
## 5	358537.42800000001	313057.27500000002	419616.06099999999	
337913.39				
## 6	3646176.4739999999	3718514.1460000002	3693683.8769999999	
3626140.0619999999				
##	...91	...92	1993	
...94				
## 1	9 Meses	Anual	T1	
T2				
## 2	9765442.3829999994	9862877.352	10008894.663000001	
10171035.407				
## 3	364971.56300000002	368613.07699999999	388593.50799999997	
388084.19500000001				
## 4	9400470.8200000003	9494264.2750000004	9620301.1549999993	
9782951.2119999994				
## 5	329628.01799999998	352125.02899999998	356222.15399999998	
364092.18800000002				
## 6	3656931.423	3666119.537	3657173.1140000001	
3592667.58				
##	...95	...96	...97	
...98				
## 1	T3	T4	6 Meses	9
Meses				
## 2	10066258.405999999	10416096.231000001	10089965.035	
10082062.825999999				
## 3	379390.11800000002	422663.99900000001	388338.85200000001	
385355.94				
## 4	9686868.2890000008	9993432.2320000008	9701626.1840000004	
9696706.8849999998				
## 5	352560.80200000003	406012.52	360157.17099999997	
357625.04800000001				
## 6	3680608.23	3805311.8190000001	3624920.3470000001	
3643482.9750000001				
##	...99	1994	...101	
...102				
## 1	Anual	T1	T2	
T3				
## 2	10165571.176999999	10343388.49	10772526.228	
10602752.886				
## 3	394682.95500000002	409249.72899999999	428658.30300000001	

430235.41399999999
 ## 4 9770888.2219999991 9934138.7609999999 10343867.925000001
 10172517.471000001
 ## 5 369721.91600000003 349532.75400000002 388452.54200000002
 326544.90500000003
 ## 6 3683940.1860000002 3814213.307 3848188.9649999999
 3943451.4819999998
 ## ...103 ...104 ...105
 ...106
 ## 1 T4 6 Meses 9 Meses
 Anual
 ## 2 10952773.398 10557957.358999999 10572889.200999999
 10667860.25
 ## 3 433173.57900000003 418954.016 422714.48200000002
 425329.25599999999
 ## 4 10519599.819 10139003.343 10150174.719000001
 10242530.994000001
 ## 5 416051.62300000002 368992.64799999999 354843.4
 370145.45600000001
 ## 6 3948451.6690000002 3831201.1359999999 3868617.9180000001
 3888576.3560000001
 ## 1995 ...108 ...109
 ...110
 ## 1 T1 T2 T3
 T4
 ## 2 10189745.482999999 9795718.9969999995 9802904.3719999995
 10198513.301000001
 ## 3 409332.86599999998 363921.86300000001 374861.06699999998
 398450.15100000001
 ## 4 9780412.6170000006 9431797.1339999996 9428043.3039999995
 9800063.1490000002
 ## 5 345778.239 364700.33600000001 358865.50099999999
 432118.93300000002
 ## 6 3596884.3050000002 3302481.2769999998 3435316.4509999999
 3526855.7429999998
 ## ...111 ...112 ...113
 1996
 ## 1 6 Meses 9 Meses Anual
 T1
 ## 2 9992732.2400000002 9929456.284 9996720.5380000006
 10426430.907
 ## 3 386627.36499999999 382705.266 386641.48700000002
 406708.47600000002
 ## 4 9606104.875 9546751.0179999992 9610079.0510000009
 10019722.431
 ## 5 355239.28700000001 356448.02500000002 375365.75199999998
 381614.08799999999
 ## 6 3449682.7910000002 3444894.0109999999 3465384.4440000001
 3776237.4079999998
 ## ...115 ...116 ...117

...118					
## 1	T2	T3	T4		6
Meses					
## 2	10569227.512	10583112.1	11116526.604		
10497829.210000001					
## 3	393786.26	400158.71600000001	439556.96399999998		
400247.36800000002					
## 4	10175441.252	10182953.385	10676969.640000001		
10097581.842					
## 5	381038.87800000003	355982.908	441739.815		
381326.48300000001					
## 6	3746973.83399999998	3917543.20599999998	4059289.469		
3761605.62099999998					
##	...119	...120	1997		
...122					
## 1	9 Meses	Anual	T1		
T2					
## 2	10526256.84	10673824.280999999	10862932.039000001		
11460068.096999999					
## 3	400217.81699999998	410052.60399999999	415296.99699999997		
434107.935					
## 4	10126039.023	10263771.676999999	10447635.043		
11025960.162					
## 5	372878.62400000001	390093.92200000002	381977.53200000001		
392892.86700000003					
## 6	3813584.8160000001	3875010.97899999998	3974770.9640000002		
4114336.36799999998					
##	...123	...124	...125		
...126					
## 1	T3	T4	6 Meses		9
Meses					
## 2	11408200.828	11887380.083000001	11161500.068		
11243733.654999999					
## 3	443297.62699999998	468735.33299999998	424702.46600000001		
430900.853					
## 4	10964903.200999999	11418644.75	10736797.602		
10812832.801999999					
## 5	343451.19900000002	441757.07	387435.19900000002		
372773.86599999998					
## 6	4296176.4749999996	4338194.044999999	4044553.6660000002		
4128427.9360000002					
##	...127	1998	...129		
...130					
## 1	Anual	T1	T2		
T3					
## 2	11404645.262	11827638.014	12034464.210000001		
11972371.607000001					
## 3	440359.473	455705.14399999997	458753.15700000001		
454403.68599999999					
## 4	10964285.789000001	11371932.869999999	11575711.052999999		

11517967.921
 ## 5 390019.66700000002 400472.63199999998 395869.739
 374599.33899999998
 ## 6 4180869.463 4403979.216 4348689.99
 4515945.534
 ## ...131 ...132 ...133
 ...134
 ## 1 T4 6 Meses 9 Meses
 Anual
 ## 2 12139816.605 11931051.112 11944824.609999999
 11993572.608999999
 ## 3 467280.55800000002 457229.15 456287.32900000003
 459035.636
 ## 4 11672536.048 11473821.960999999 11488537.280999999
 11534536.972999999
 ## 5 436960.38900000002 398171.18599999999 390313.90399999998
 401975.52500000002
 ## 6 4453752.3559999997 4376334.6030000001 4422871.58
 4430591.7740000002
 ## 1999 ...136 ...137
 ...138
 ## 1 T1 T2 T3
 T4
 ## 2 12100154.549000001 12315219.075999999 12325229.130000001
 12554685.793
 ## 3 465406.43 478544.29399999999 479013.73200000002
 491472.83500000002
 ## 4 11634748.119000001 11836674.782 11846215.398
 12063212.958000001
 ## 5 441942.19300000003 389870.92700000003 363161.19300000003
 434696.06699999998
 ## 6 4492361.1629999997 4407481.07 4591794.0329999998
 4503163.9450000003
 ## ...139 ...140 ...141
 2000
 ## 1 6 Meses 9 Meses Anual
 T1
 ## 2 12207686.812000001 12246867.585000001 12323822.137
 12725022.062999999
 ## 3 471975.36200000002 474321.48599999998 478609.32299999997
 482883.85499999998
 ## 4 11735711.449999999 11772546.098999999 11845212.813999999
 12242138.208000001
 ## 5 415906.56 398324.77100000001 407417.59499999997
 422422.22499999998
 ## 6 4449921.1169999996 4497212.0889999997 4498700.0530000003
 4679081.2960000001
 ## ...143 ...144 ...145
 ...146
 ## 1 T2 T3 T4

Meses

```
## 2      12994568.899 13008792.244000001      13003302.161
12859795.481000001
## 3      483991.158      508508.66 478291.61099999998
483437.50699999998
## 4 12510577.742000001 12500283.584000001 12525010.550000001
12376357.975
## 5 413519.38199999998 346637.28899999999 461258.86300000001
417970.804
## 6 4638675.4450000003 4859033.7139999997 4609216.4859999996
4658878.37
##      ...147      ...148      2001
...150
```

```
## 1      9 Meses      Anual      T1
T2
## 2      12909461.069      12932921.342      12796119.499
12967530.185000001
## 3 491794.55800000002      488418.821      503815.049
500219.34
## 4      12417666.511      12444502.521 12292304.449999999
12467310.845000001
## 5 394192.96600000001      410959.44 408857.24599999998
443463.64500000002
## 6      4725596.818 4696501.7350000003 4639267.1880000001
4490483.148
##      ...151      ...152      ...153
...154
```

```
## 1      T3      T4      6 Meses
```

```
Meses
## 2      12857408.646 12901429.210000001      12881824.842
12873686.109999999
## 3 491740.59100000001 474788.12400000001 502017.19400000002
498591.66
## 4      12365668.055 12426641.085999999      12379807.648
12375094.449999999
## 5      381685.67 497817.12599999999      426160.446
411335.52100000001
## 6 4712173.89099999998 4533894.9040000001 4564875.1679999996
4613974.7429999998
##      ...155      2002      ...157
...158
```

```
## 1      Anual      T1      T2
T3
## 2      12880621.885 12415541.447000001      13112362.762
12889950.083000001
## 3 492640.77600000001      476020.185 503406.87699999998
501488.071
## 4 12387981.108999999      11939521.261      12608955.885
12388462.012
## 5 432955.92200000002      419345.272 438028.12599999999
```

```

378747.26799999998
## 6 4593954.7829999998 4399845.3470000001 4508189.4019999998
4626349.8660000004
##          ...159          ...160          ...161
...162
## 1          T4          6 Meses          9 Meses
Anual
## 2 13084104.380000001          12763952.104          12805951.431
12875489.668
## 3          502351.61 489713.53100000002 493638.37800000003
495816.68599999999
## 4          12581752.77 12274238.573000001 12312313.052999999
12379672.982000001
## 5          480003.538 428686.69900000002 412040.22200000001
429031.05099999998
## 6          4565219.017 4454017.3739999998 4511461.5379999997
4524900.9079999998
##          2003          ...164          ...165
...166
## 1          T1          T2          T3
T4
## 2 12803323.689999999          13182930.047 12954912.939999999
13305707.408
## 3 478501.13900000002 506687.29300000001          508065.114
517199.85800000001
## 4 12324822.550000001 12676242.754000001 12446847.825999999
12788507.549000001
## 5 434335.97499999998 453703.14600000001          393341.495
500491.52500000002
## 6 4545572.6950000003 4560262.2290000003 4671153.8729999997
4641100.148
##          ...167          ...168          ...169
2004
## 1          6 Meses          9 Meses          Anual
T1
## 2 12993126.868000001 12980388.892000001          13061718.521
13252629.581
## 3 492594.21600000001 497751.18199999997 502613.35100000002
502742.87099999998
## 4 12500532.652000001 12482637.710000001          12559105.17
12749886.710000001
## 5          444019.56 427126.87199999997 445468.03499999997
464247.17700000003
## 6 4552917.4620000003 4592329.5990000004 4604522.2359999996
4726021.7079999996
##          ...171          ...172          ...173
...174
## 1          T2          T3          T4
Meses
## 2          13732336 13438260.097999999 13872034.549000001

```

13492482.789999999

3 531489.00699999998 530276.71200000006 528002.86199999996
517115.93900000001

4 13200846.992000001 12907983.387 13344031.687000001
12975366.851

5 457607.51 379136.82699999999 522891.13400000002
460927.34299999999

6 4765953.108 4823286.10300000001 4812481.87399999998
4745987.40799999998

...175 ...176 2005
...178

1 9 Meses Anual T1
T2

2 13474408.560000001 13573815.057 13354787.873
14104833.946

3 521502.86300000001 523127.86300000001 517695.97100000002
550407.59199999995

4 12952905.696 13050687.194 12837091.903000001
13554426.354

5 433663.83799999999 455970.66200000001 434627.717
433367.75

6 4771753.63900000004 4781935.6979999999 4744525.483
4922286.36799999998

...179 ...180 ...181
...182

1 T3 T4 6 Meses
Meses

2 13782144.436000001 14306523.823999999 13729810.91
13747255.419

3 541645.33799999999 547653.69099999999 534051.78200000001
536582.96699999995

4 13240499.097999999 13758870.134 13195759.128
13210672.450999999

5 396089.28 493309.989 433997.73300000001
421361.58199999999

6 4887200.24600000003 4985028.0149999997 4833405.926
4851337.36600000004

...183 2006 ...185
...186

1 Anual T1 T2
T3

2 13887072.52 14107960.023 14700503.914999999
14435867.706

3 539350.64800000004 557034.35600000003 589660.20700000005
583737.60800000001

4 13347721.872 13550925.666999999 14110843.708000001
13852130.097999999

5 439348.68400000001 451479.288 474684.484
390257.06

6 4884760.0279999999 5001067.426 5091626.88100000001

5153343.125

...187 ...188 ...189

...190

1 T4 6 Meses 9 Meses

Anual

2 14800897.344000001 14404231.969000001 14414777.215

14511307.247

3 589261.82499999995 573347.28200000001 576810.72400000005

579923.49899999995

4 14211635.518999999 13830884.687999999 13837966.491

13931383.748

5 551322.74699999997 463081.886 438806.94400000002

466935.89500000002

6 5099881.8480000002 5046347.1529999999 5082012.477

5086479.82

2007 ...192 ...193

...194

1 T1 T2 T3

T4

2 14393727.372 14993339.387 14783298.236

15204938.905999999

3 568981.875 601369.21100000001 599747.005

587348.85400000005

4 13824745.497 14391970.176999999 14183551.231000001

14617590.051999999

5 470659.97100000002 502518.26199999999 409410.46899999998

564140.19799999997

6 5074114.4069999997 5137437.0489999996 5163809.1540000001

5159070.97

...195 ...196 ...197

2008

1 6 Meses 9 Meses Anual

T1

2 14693533.380000001 14723454.998 14843825.975

14563428.381999999

3 585175.54299999995 590032.69700000004 589361.73600000003

583764.11300000001

4 14108357.836999999 14133422.301000001 14254464.239

13979664.27

5 486589.11700000003 460862.90100000001 486682.22499999998

455913.80900000001

6 5105775.7280000001 5125120.2029999997 5133607.8949999996

5057545.1780000003

...199 ...200 ...201

...202

1 T2 T3 T4

Meses

2 15386334.051999999 14979494.721000001 15125053.569

14974881.217

3 630815.34600000002 619585.75800000003 609119.00300000003

607289.73
 ## 4 14755518.705 14359908.963 14515934.566
 14367591.488
 ## 5 512042.7509999999 401706.69500000001 576196.60100000002
 483978.28
 ## 6 5169344.2410000004 5091513.38 5000531.4579999996
 5113444.7089999998
 ## ...203 ...204 2009
 ...206
 ## 1 9 Meses Anual T1
 T2
 ## 2 14976419.051999999 15013577.681 13752148.814999999
 14012937.564999999
 ## 3 611388.40599999996 610821.05500000005 544393.53399999999
 547809.245
 ## 4 14365030.646 14402756.626 13207755.280999999
 13465128.32
 ## 5 456554.41800000001 486464.96399999998 450979.11200000002
 504523.37400000001
 ## 6 5106134.2659999998 5079733.5640000002 4607884.074
 4618873.193
 ## ...207 ...208 ...209
 ...210
 ## 1 T3 T4 6 Meses
 Meses
 ## 2 14231941.450999999 14882965.685000001 13882543.189999999
 13999009.277000001
 ## 3 584418.53899999999 609184.28599999996 546101.39
 558873.77300000004
 ## 4 13647522.912 14273781.399 13336441.800000001
 13440135.504000001
 ## 5 397485.70400000003 551636.25399999996 477751.24300000002
 450996.06300000002
 ## 6 4740761.6579999998 4832427.7189999996 4613378.6339999996
 4655839.642
 ## ...211 2010 ...213
 ...214
 ## 1 Anual T1 T2
 T3
 ## 2 14219998.379000001 14371721.473999999 14998399.316
 14921452.789999999
 ## 3 571451.40099999995 564548.73699999996 598643.30099999998
 603916.27899999998
 ## 4 13648546.978 13807172.736 14399756.015000001
 14317536.511
 ## 5 476156.11099999998 442771.05 533487.69799999997
 420307.45799999998
 ## 6 4699986.6610000003 4813774.4280000003 4926459.841
 4941622.193
 ## ...215 ...216 ...217


```

...218
## 1          T4          6 Meses          9 Meses
Anual
## 2          15499605.204          14685060.395 14763857.859999999
14947794.696
## 3 614467.80700000003 581596.01899999997 589036.10600000003
595394.03099999996
## 4          14885137.398          14103464.376 14174821.754000001
14352400.664999999
## 5 555549.91799999995 488129.37400000001 465522.06900000002
488029.03100000002
## 6 4970880.4570000004 4870117.13499999998 4893952.1540000001
4913184.2300000004
##          2011          ...220          ...221
...222
## 1          T1          T2          T3
T4
## 2          14902733.238          15413046.558          15526015.329
16139539.278999999
## 3          589760.54 616867.92500000005 624806.20499999996
646713.36600000004
## 4 14312972.698000001 14796178.632999999          14901209.124
15492825.913000001
## 5          439332.44 466688.59399999998 421549.36800000002
551075.87800000003
## 6          4888592.426 5022410.68400000004 5081998.5259999996
5219677.3470000001
##          ...223          ...224          ...225
2012
## 1          6 Meses          9 Meses          Anual
T1
## 2          15157889.898          15280598.375          15495333.601
15619752.447000001
## 3 603314.23300000001          610478.223 619537.00899999996
609391.27800000005
## 4 14554575.665999999 14670120.152000001          14875796.592
15010361.168
## 5 453010.51699999999          442523.467          469661.57
455690.59399999998
## 6 4955501.5549999997 4997667.2120000003 5053169.7460000003
5111749.99
##          ...227          ...228          ...229
...230
## 1          T2          T3          T4
Meses
## 2 16027465.052999999 15952811.209000001          16638865.895
15823608.75
## 3 623760.68999999994          634629.6 647143.02300000004
616575.98400000005
## 4          15403704.363 15318181.608999999          15991722.872

```

15207032.766000001
 ## 5 524425.32499999995 422535.3 595410.98100000003
 490057.96
 ## 6 5192599.3930000002 5245820.6160000004 5237469.6140000001
 5152174.6909999996
 ## ...231 ...232 2013
 ...234
 ## 1 9 Meses Anual T1
 T2
 ## 2 15866676.236 16059723.651000001 15719787.535
 16361864.290999999
 ## 3 622593.85600000003 628731.14800000004 606599.23499999999
 634088.04
 ## 4 15244082.380000001 15430992.503 15113188.300000001
 15727776.251
 ## 5 467550.40600000002 499515.55 459090.777
 543497.272
 ## 6 5183389.99899999998 5196909.90299999999 5069713.41700000004
 5203390.62200000004
 ## ...235 ...236 ...237
 ...238
 ## 1 T3 T4 6 Meses
 Meses
 ## 2 16186108.808 16840987.679000001 16040825.913000001
 16089253.544
 ## 3 643804.55900000001 653777.098 620343.63699999999
 628163.94499999995
 ## 4 15542304.248 16187210.581 15420482.275
 15461089.6
 ## 5 427915.88500000001 613118.84100000001 501294.02500000002
 476834.64500000002
 ## 6 5199164.96499999999 5268980.62 5136552.01900000003
 5157423.00100000002
 ## ...239 2014 ...241
 ...242
 ## 1 Anual T1 T2
 T3
 ## 2 16277187.078 16162068.203 16743444.571
 16649895.568
 ## 3 634567.23300000001 644173.653999999998 666811.90899999999
 676429.42099999997
 ## 4 15642619.845000001 15517894.549000001 16076632.663000001
 15973466.147
 ## 5 510905.69400000002 483223.84299999999 558289.28599999996
 453279.65399999998
 ## 6 5185312.40600000004 5204577.60599999997 5334813.34200000002
 5325272.36400000001
 ## ...243 ...244 ...245
 ...246
 ## 1 T4 6 Meses 9 Meses

Anual

## 2	17408791.666000001	16452756.387	16518469.447000001
	16741050.002		
## 3	708153.88500000001	655492.78099999996	662471.66099999996
	673892.21699999995		
## 4	16700637.780999999	15797263.606000001	15855997.786
	16067157.785		
## 5	625457.27800000005	520756.56400000001	498264.261
	530062.51500000001		
## 6	5410257.1090000002	5269695.4740000004	5288221.1040000003
	5318730.10500000004		
##	2015	...248	...249
	...250		
## 1	T1	T2	T3
	T4		
## 2	16710213.83	17261227.603	17331655.061000001
	17866336.089000002		
## 3	667506.67700000003	701117.19299999997	723570.36499999999
	759584.27300000004		
## 4	16042707.153000001	16560110.411	16608084.696
	17106751.816		
## 5	509017.12	566846.61399999994	453569.12199999997
	634684.71299999999		
## 6	5276397.02799999999	5345060.40199999998	5473295.03100000004
	5414496.11099999996		
##	...251	...252	...253
	2016		
## 1	6 Meses	9 Meses	Anual
	T1		
## 2	16985720.717	17101032.164999999	17292358.146000002
	17166339.662999999		
## 3	684311.93500000006	697398.07799999998	712944.62699999998
	718850.34199999995		
## 4	16301408.782	16403634.086999999	16579413.518999999
	16447489.321		
## 5	537931.86699999997	509810.95199999999	541029.39199999999
	513078.69		
## 6	5310728.7149999999	5364917.4869999997	5377312.1430000002
	5332067.13300000004		
##	...255	...256	...257
	...258		
## 1	T2	T3	T4
	Meses		
## 2	17780990.739	17625602.452	18416024.081999999
	17473665.201000001		
## 3	753658.48	775714.15	810532.82299999997
	736254.41099999996		
## 4	17027332.258000001	16849888.302000001	17605491.258000001
	16737410.789999999		
## 5	584005.99	474169.64	668986.72

548542.34

6 5418370.7010000004 5403246.6890000002 5423646.9900000002
5375218.9170000004

...259 ...260 2017
...262

1 9 Meses Anual T1
T2

2 17524310.951000001 17747239.234000001 17757880.976
18085472.857999999

3 749407.65800000005 764688.94900000002 758454.69700000004
788325.25300000003

4 16774903.294 16982550.285 16999426.278999999
17297147.605999999

5 523751.44 560060.26 538285.15300000005
598221.56099999999

6 5384561.5070000002 5394332.8779999996 5389992.4960000003
5373540.4119999995

...263 ...264 ...265
...266

1 T3 T4 6 Meses
Meses

2 17900776.074000001 18744915.359999999 17921676.916999999
17914709.969000001

3 797788.60400000005 825239.29399999999 773389.97499999998
781522.85100000002

4 17102987.469000001 17919676.066 17148286.942000002
17133187.118000001

5 480368.65399999998 698974.26699999999 568253.35699999996
538958.45600000001

6 5372030.8039999995 5387978.5369999995 5381766.4539999999
5378521.2369999997

...267 2018 ...269
...270

1 Anual T1 T2
T3

2 18122261.317000002 18017126.577 18667812.265999999
18405689.745999999

3 792451.96200000006 781091.94900000002 810808.13399999996
826608.54799999995

4 17329809.355 17236034.627999999 17857004.131999999
17579081.197999999

5 578962.40899999999 566831.13 616016.85100000002
487143.39899999998

6 5380885.5619999999 5363248.8930000002 5492604.4689999996
5445250.858

...271 ...272 ...273
...274

1 T4 6 Meses 9 Meses
Anual

2 18989547.399 18342469.421 18363542.863000002

18520043.997000001
3 856608.97400000005 795950.04099999997 806169.54299999995
818779.40099999995
4 18132938.425999999 17546519.379999999 17557373.318999998
17701264.596000001
5 706171.12 591423.99100000004 556663.79299999995
594040.625
6 5316709.3080000002 5427926.6809999999 5433701.4069999997
5404453.3820000002
2019R ...276 ...277
...278
1 T1 T2 T3
T4
2 18247589.151999999 18474906.102000002 18376100.534000002
18850755.011999998
3 800969.03599999996 800247.745 820663.93799999997
848094.61300000001
4 17446620.116 17674658.357000001 17555436.596000001
18002660.399
5 576068.13899999997 607899.03599999996 493596.07
691209.103
6 5348863.932 5315939.5120000001 5359281.892
5201422.3810000001
...279 ...280 ...281
2020R
1 6 Meses 9 Meses Anual
T1
2 18361247.627 18366198.596000001 18487337.699999999
18013060.736000001
3 800608.39099999995 807293.57299999997 817493.83299999998
775895.91599999997
4 17560639.237 17558905.022999998 17669843.866999999
17237164.82
5 591983.58799999999 559187.74800000002 592193.08700000006
561290.09499999997
6 5332401.7220000001 5341361.7779999999 5306376.9289999995
5226028.5980000002
...283 ...284 ...285
...286
1 T2 T3 T4
Meses
2 15015519.268999999 16770879.124 18005414.480999999
16514290.003
3 627861.34 711460.71900000004 767503.36399999994
701878.62800000003
4 14387657.929 16059418.404999999 17237911.118000001
15812411.374
5 584274.68999999994 509682.946 700527.88699999999
572782.39300000004
6 3965669.4369999999 4890797.55 5032375.3430000003

```

4595849.017
##          ...287          ...288          2021 ...290 ...291
...292
## 1          9 Meses          Anual          T1P          T2          T3
T4
## 2 16599819.710000001 16951218.403000001 17361534.715999998 <NA> <NA>
<NA>
## 3 705072.65800000005 720680.33499999996 709064.02099999995 <NA> <NA>
<NA>
## 4 15894747.051000001          16230538.068          16652470.695 <NA> <NA>
<NA>
## 5 551749.24399999995 588943.90399999998          577122.49 <NA> <NA>
<NA>
## 6 4694165.1950000003 4778717.73199999998 5086803.15799999998 <NA> <NA>
<NA>
##          ...293 ...294 ...295
## 1 6 Meses 9 Meses Anual
## 2 <NA> <NA> <NA>
## 3 <NA> <NA> <NA>
## 4 <NA> <NA> <NA>
## 5 <NA> <NA> <NA>
## 6 <NA> <NA> <NA>

```

tail(df_raw) *#Observe the first six rows*

```

##          Concepto          1980
## 2          __abB.1bP - Producto interno bruto 7547882.1440000003
## 3 D.21-D.31 - Impuestos sobre los productos, netos 282092.93900000001
## 4          __cdB.1bV - Valor agregado bruto 7265789.20500000001
## 5          Actividades primarias          320667.549
## 6          Actividades secundarias          2864062.9
## 7          Actividades terciarias 4081058.75600000001
##          ...3          ...4          ...5
...6
## 2 7536518.99199999996 7478780.82000000003 8008666.63999999997
7542200.568
## 3          281668.255 279510.36099999998          299314.201
281880.597000000001
## 4 7254850.73699999997 7199270.45899999998 7709352.43900000002
7260319.97099999999
## 5 287579.26799999998 304948.75099999999 316649.93199999997
304123.40899999999
## 6 2877701.65199999998 2935853.31499999999 3037769.96199999998
2870882.27600000001
## 7 4089569.81699999998 3958468.39300000002 4354932.54499999999
4085314.287
##          ...7          ...8          1981
...10
## 2 7521060.65199999998 7642962.14900000002 8229212.70199999996
8417818.00400000007

```

```

## 3 281090.51799999998 285646.43900000001 307556.84299999999
314605.73700000002
## 4 7239970.1339999996          7357315.71 7921655.8590000002
8103212.267
## 5 304398.52299999999          307461.375          335400.962
317798.02299999999
## 6 2892539.2889999999 2928846.9569999999          3142427.449
3286989.0789999999
## 7 4043032.3220000002          4121007.378 4443827.4479999999
4498425.165
##          ...11          ...12          ...13
...14
## 2 8211045.5269999998 8614524.8650000002 8323515.3530000001
8286025.4110000003
## 3 306877.86700000003 321957.41700000002 311081.28999999998
309680.14899999998
## 4 7904167.6600000001 8292567.4479999999 8012434.0630000001
7976345.2620000001
## 5          322028.033          350034.52 326599.49300000002
325075.67300000001
## 6 3312083.3459999999          3270025.048          3214708.264
3247166.625
## 7 4270056.2810000004          4672507.88          4471126.307
4404102.9649999999
##          ...15          1982          ...17
...18
## 2 8368150.2750000004 8512096.4000000004 8481760.7589999996
8198953.8990000002
## 3 312749.46600000001 318129.27799999999          316995.52
306425.95699999999
## 4 8055400.8090000004 8193967.1220000004 8164765.2390000001
7892527.9419999998
## 5 331315.38500000001          355697.185 327458.89899999998
302562.62
## 6 3252881.2310000001          3269031.173 3294492.0460000001
3236595.5729999999
## 7 4471204.1940000001 4569238.7640000004 4542814.2939999998
4353369.7489999998
##          ...19          ...20          ...21
...22
## 2 8277251.6890000002 8496928.5800000001 8397603.6860000007
8367515.6869999999
## 3 309352.24200000003 317562.39899999998 313850.25199999998
312725.74900000001
## 4 7967899.4469999997 8179366.1809999999 8083753.4340000004
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## 4      17560639.237 17558905.022999998 17669843.866999999
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## 5 591983.58799999999 559187.74800000002 592193.08700000006
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##	[295]	"...295"					

```
str(df_raw) #Know the structure of the dataset
```

```
## 'data.frame':    7 obs. of  295 variables:
## $ Concepto: chr  NA "__abB.1bP - Producto interno bruto" "D.21-D.31 -
Impuestos sobre los productos, netos" "__cdB.1bV - Valor agregado bruto" ...
## $ 1980 : chr  "T1" "7547882.1440000003" "282092.93900000001"
"7265789.2050000001" ...
## $ ...3 : chr  "T2" "7536518.9919999996" "281668.255"
"7254850.7369999997" ...
## $ ...4 : chr  "T3" "7478780.8200000003" "279510.36099999998"
"7199270.4589999998" ...
## $ ...5 : chr  "T4" "8008666.6399999997" "299314.201"
"7709352.4390000002" ...
## $ ...6 : chr  "6 Meses" "7542200.568" "281880.59700000001"
"7260319.9709999999" ...
## $ ...7 : chr  "9 Meses" "7521060.6519999998" "281090.51799999998"
"7239970.1339999996" ...
## $ ...8 : chr  "Anual" "7642962.1490000002" "285646.43900000001"
"7357315.71" ...
## $ 1981 : chr  "T1" "8229212.7019999996" "307556.84299999999"
"7921655.8590000002" ...
## $ ...10 : chr  "T2" "8417818.0040000007" "314605.73700000002"
"8103212.267" ...
## $ ...11 : chr  "T3" "8211045.5269999998" "306877.86700000003"
"7904167.6600000001" ...
## $ ...12 : chr  "T4" "8614524.8650000002" "321957.41700000002"
"8292567.4479999999" ...
## $ ...13 : chr  "6 Meses" "8323515.3530000001" "311081.28999999998"
"8012434.0630000001" ...
## $ ...14 : chr  "9 Meses" "8286025.4110000003" "309680.14899999998"
"7976345.2620000001" ...
## $ ...15 : chr  "Anual" "8368150.2750000004" "312749.46600000001"
"8055400.8090000004" ...
## $ 1982 : chr  "T1" "8512096.4000000004" "318129.27799999999"
"8193967.1220000004" ...
## $ ...17 : chr  "T2" "8481760.7589999996" "316995.52"
"8164765.2390000001" ...
## $ ...18 : chr  "T3" "8198953.8990000002" "306425.95699999999"
"7892527.9419999998" ...
## $ ...19 : chr  "T4" "8277251.6890000002" "309352.24200000003"
"7967899.4469999997" ...
## $ ...20 : chr  "6 Meses" "8496928.5800000001" "317562.39899999998"
"8179366.1809999999" ...
## $ ...21 : chr  "9 Meses" "8397603.6860000007" "313850.25199999998"
"8083753.4340000004" ...
## $ ...22 : chr  "Anual" "8367515.6869999999" "312725.74900000001"
"8054789.9380000001" ...
## $ 1983 : chr  "T1" "8120479.8499999996" "303493.08399999997"
"7816986.7659999998" ...
## $ ...24 : chr  "T2" "7997531.1169999996" "298898.02399999998"
```

```
"7698633.0930000003" ...
## $ ...25 : chr "T3" "7764430.8439999996" "290186.18400000001"
"7474244.6600000001" ...
## $ ...26 : chr "T4" "8127328.5880000005" "303749.04700000002"
"7823579.5410000002" ...
## $ ...27 : chr "6 Meses" "8059005.4840000002" "301195.554"
"7757809.9299999997" ...
## $ ...28 : chr "9 Meses" "7960813.9369999999" "297525.76400000002"
"7663288.1730000004" ...
## $ ...29 : chr "Anual" "8002442.5999999996" "299081.58500000002"
"7703361.0149999997" ...
## $ 1984 : chr "T1" "8384896.2300000004" "313375.326"
"8071520.9040000001" ...
## $ ...31 : chr "T2" "8232124.5729999999" "307665.67"
"7924458.9029999999" ...
## $ ...32 : chr "T3" "8119301.5240000002" "303449.04599999997"
"7815852.4780000001" ...
## $ ...33 : chr "T4" "8389536.3739999998" "313548.74599999998"
"8075987.6279999996" ...
## $ ...34 : chr "6 Meses" "8308510.4019999998" "310520.49800000002"
"7997989.9040000001" ...
## $ ...35 : chr "9 Meses" "8245440.7759999996" "308163.34700000001"
"7937277.4280000003" ...
## $ ...36 : chr "Anual" "8281464.6749999998" "309509.69699999999"
"7971954.9780000001" ...
## $ 1985 : chr "T1" "8539105.0409999993" "319138.69300000003"
"8219966.3480000002" ...
## $ ...38 : chr "T2" "8487030.4680000003" "317192.46899999998"
"8169837.9989999998" ...
## $ ...39 : chr "T3" "8193121.9589999998" "306207.995"
"7886913.9639999997" ...
## $ ...40 : chr "T4" "8528896.0490000006" "318757.14399999997"
"8210138.9050000003" ...
## $ ...41 : chr "6 Meses" "8513067.7550000008" "318165.58100000001"
"8194902.1739999996" ...
## $ ...42 : chr "9 Meses" "8406419.1559999995" "314179.71899999998"
"8092239.4369999999" ...
## $ ...43 : chr "Anual" "8437038.3790000007" "315324.07500000001"
"8121714.3039999995" ...
## $ 1986 : chr "T1" "8208491.352" "306782.40700000001"
"7901708.9450000003" ...
## $ ...45 : chr "T2" "8409218.6520000007" "314284.34600000002"
"8094934.3059999999" ...
## $ ...46 : chr "T3" "7769449.7829999998" "290373.761"
"7479076.0219999999" ...
## $ ...47 : chr "T4" "8109501.7910000002" "303082.79200000002"
"7806418.9989999998" ...
## $ ...48 : chr "6 Meses" "8308855.0020000003" "310533.37699999998"
"7998321.6260000002" ...
## $ ...49 : chr "9 Meses" "8129053.2620000001" "303813.505"
```

```

"7825239.7580000004" ...
## $ ...50 : chr "Anual" "8124165.3949999996" "303630.82699999999"
"7820534.568" ...
## $ 1987 : chr "T1" "8119219.0379999997" "303445.96299999999"
"7815773.0750000002" ...
## $ ...52 : chr "T2" "8443175.1160000004" "315553.42800000001"
"8127621.6880000001" ...
## $ ...53 : chr "T3" "8038083.5609999998" "300413.62300000002"
"7737669.9380000001" ...
## $ ...54 : chr "T4" "8568977.2870000005" "320255.13199999998"
"8248722.1550000003" ...
## $ ...55 : chr "6 Meses" "8281197.0769999996" "309499.696"
"7971697.3820000002" ...
## $ ...56 : chr "9 Meses" "8200159.2379999999" "306471.005"
"7893688.2340000002" ...
## $ ...57 : chr "Anual" "8292363.7510000002" "309917.03700000001"
"7982446.7139999997" ...
## $ 1988 : chr "T1" "8378163.1619999995" "313123.685" "8065039.477" ...
## $ ...59 : chr "T2" "8546889.0280000009" "319429.61"
"8227459.4179999996" ...
## $ ...60 : chr "T3" "8031742.4079999998" "300176.63"
"7731565.7779999999" ...
## $ ...61 : chr "T4" "8636950.8440000005" "322795.56099999999"
"8314155.2829999998" ...
## $ ...62 : chr "6 Meses" "8462526.0950000007" "316276.64799999999"
"8146249.4479999999" ...
## $ ...63 : chr "9 Meses" "8318931.5329999998" "310909.97499999998"
"8008021.5580000002" ...
## $ ...64 : chr "Anual" "8398436.3609999996" "313881.37199999997"
"8084554.9890000001" ...
## $ 1989 : chr "T1" "8575114.0590000004" "320484.48599999998"
"8254629.5729999999" ...
## $ ...66 : chr "T2" "8912465.8910000008" "333092.60200000001"
"8579373.2890000008" ...
## $ ...67 : chr "T3" "8452556.7029999997" "315904.054"
"8136652.6490000002" ...
## $ ...68 : chr "T4" "8881444.7620000001" "331933.22499999998"
"8549511.5370000005" ...
## $ ...69 : chr "6 Meses" "8743789.9749999996" "326788.54399999999"
"8417001.4309999999" ...
## $ ...70 : chr "9 Meses" "8646712.2180000003" "323160.38099999999"
"8323551.8370000003" ...
## $ ...71 : chr "Anual" "8705395.3540000003" "325353.592"
"8380041.7620000001" ...
## $ 1990 : chr "T1" "8964419.6239999998" "335034.31"
"8629385.3139999993" ...
## $ ...73 : chr "T2" "9262515.9049999993" "346175.29599999997"
"8916340.6089999992" ...
## $ ...74 : chr "T3" "8885511.8440000005" "332085.22700000001"
"8553426.6170000006" ...

```

```

## $ ...75 : chr "T4" "9522792.5089999996" "355902.819000000002"
"9166889.6899999995" ...
## $ ...76 : chr "6 Meses" "9113467.7650000006" "340604.803000000001"
"8772862.9619999994" ...
## $ ...77 : chr "9 Meses" "9037482.4580000006" "337764.944000000002"
"8699717.5130000003" ...
## $ ...78 : chr "Anual" "9158809.9710000008" "342299.413"
"8816510.5580000002" ...
## $ 1991 : chr "T1" "9268190.3289999999" "346387.370999999998"
"8921802.9580000006" ...
## $ ...80 : chr "T2" "9775235.3350000009" "365337.563000000002"
"9409897.7719999999" ...
## $ ...81 : chr "T3" "9176389.0160000008" "342956.408999999999"
"8833432.6070000008" ...
## $ ...82 : chr "T4" "9894608.9890000001" "369799.009000000002"
"9524809.9800000004" ...
## $ ...83 : chr "6 Meses" "9521712.8320000004" "355862.467"
"9165850.3650000002" ...
## $ ...84 : chr "9 Meses" "9406604.8929999992" "351560.447999999997"
"9055044.4460000005" ...
## $ ...85 : chr "Anual" "9528605.9169999994" "356120.087999999999"
"9172485.8289999999" ...
## $ 1992 : chr "T1" "9701986.3300000001" "362599.97"
"9339386.3599999994" ...
## $ ...87 : chr "T2" "9986417.75" "373230.25" "9613187.5" ...
## $ ...88 : chr "T3" "9607923.0690000001" "359084.47"
"9248838.5989999995" ...
## $ ...89 : chr "T4" "10155182.2569999999" "379537.618000000002"
"9775644.6390000004" ...
## $ ...90 : chr "6 Meses" "9844202.03999999991" "367915.11"
"9476286.9299999997" ...
## $ ...91 : chr "9 Meses" "9765442.3829999994" "364971.563000000002"
"9400470.8200000003" ...
## $ ...92 : chr "Anual" "9862877.352" "368613.076999999999"
"9494264.2750000004" ...
## $ 1993 : chr "T1" "10008894.6630000001" "388593.507999999997"
"9620301.1549999993" ...
## $ ...94 : chr "T2" "10171035.407" "388084.195000000001"
"9782951.2119999994" ...
## $ ...95 : chr "T3" "10066258.4059999999" "379390.118000000002"
"9686868.2890000008" ...
## $ ...96 : chr "T4" "10416096.2310000001" "422663.999000000001"
"9993432.2320000008" ...
## $ ...97 : chr "6 Meses" "10089965.035" "388338.852000000001"
"9701626.1840000004" ...
## $ ...98 : chr "9 Meses" "10082062.8259999999" "385355.94"
"9696706.8849999998" ...
## $ ...99 : chr "Anual" "10165571.1769999999" "394682.955000000002"
"9770888.2219999991" ...
## [list output truncated]

```

We see that the first row has the names “T1”, “T2”, “T3”, “T4”, “6 Meses”, “9 Meses”, and “Anual”. Our aim is to get the data from the second column (`_abB.1bP` - Producto interno bruto), which the real gross DOMESTIC product from Mexico, and the data that is stored in “Anual” (Anual means Annual in Spanish). So, we are basically extracting the annual real GDP from different years.

#We extract the first 2 rows

```
df_raw12 <- df_raw[1:2,]
```

head(df_raw12) #Let's check how it looks

```
##                               Concepto                               1980                               ...3
## 1                               <NA>                               T1                               T2
## 2 __abB.1bP - Producto interno bruto 7547882.1440000003 7536518.9919999996
##                               ...4                               ...5                               ...6                               ...7
## 1                               T3                               T4                               6 Meses                               9 Meses
## 2 7478780.8200000003 8008666.6399999997 7542200.568 7521060.6519999998
##                               ...8                               1981                               ...10
...11
## 1                               Anual                               T1                               T2
T3
## 2 7642962.1490000002 8229212.7019999996 8417818.0040000007
8211045.5269999998
##                               ...12                               ...13                               ...14
...15
## 1                               T4                               6 Meses                               9 Meses
Anual
## 2 8614524.8650000002 8323515.3530000001 8286025.4110000003
8368150.2750000004
##                               1982                               ...17                               ...18
...19
## 1                               T1                               T2                               T3
T4
## 2 8512096.4000000004 8481760.7589999996 8198953.8990000002
8277251.6890000002
##                               ...20                               ...21                               ...22
1983
## 1                               6 Meses                               9 Meses                               Anual
T1
## 2 8496928.5800000001 8397603.6860000007 8367515.6869999999
8120479.8499999996
##                               ...24                               ...25                               ...26
...27
## 1                               T2                               T3                               T4                               6
Meses
## 2 7997531.1169999996 7764430.8439999996 8127328.5880000005
8059005.4840000002
##                               ...28                               ...29                               1984
...31
## 1                               9 Meses                               Anual                               T1
T2
```


## 2	7960813.9369999999	8002442.5999999996	8384896.2300000004	
	8232124.5729999999			
##	...32	...33	...34	
...35				
## 1	T3	T4	6 Meses	9
Meses				
## 2	8119301.5240000002	8389536.3739999998	8308510.4019999998	
	8245440.7759999996			
##	...36	1985	...38	
...39				
## 1	Anual	T1	T2	
T3				
## 2	8281464.6749999998	8539105.0409999993	8487030.4680000003	
	8193121.9589999998			
##	...40	...41	...42	
...43				
## 1	T4	6 Meses	9 Meses	
Anual				
## 2	8528896.0490000006	8513067.7550000008	8406419.1559999995	
	8437038.3790000007			
##	1986	...45	...46	...47
## 1	T1	T2	T3	T4
## 2	8208491.352	8409218.6520000007	7769449.7829999998	8109501.7910000002
##	...48	...49	...50	
1987				
## 1	6 Meses	9 Meses	Anual	
T1				
## 2	8308855.0020000003	8129053.2620000001	8124165.3949999996	
	8119219.0379999997			
##	...52	...53	...54	
...55				
## 1	T2	T3	T4	6
Meses				
## 2	8443175.1160000004	8038083.5609999998	8568977.2870000005	
	8281197.0769999996			
##	...56	...57	1988	
...59				
## 1	9 Meses	Anual	T1	
T2				
## 2	8200159.2379999999	8292363.7510000002	8378163.1619999995	
	8546889.0280000009			
##	...60	...61	...62	
...63				
## 1	T3	T4	6 Meses	9
Meses				
## 2	8031742.4079999998	8636950.8440000005	8462526.0950000007	
	8318931.5329999998			
##	...64	1989	...66	
...67				
## 1	Anual	T1	T2	

T3
2 8398436.3609999996 8575114.0590000004 8912465.8910000008
8452556.7029999997
...68 ...69 ...70
...71
1 T4 6 Meses 9 Meses
Anual
2 8881444.7620000001 8743789.9749999996 8646712.2180000003
8705395.3540000003
1990 ...73 ...74
...75
1 T1 T2 T3
T4
2 8964419.6239999998 9262515.9049999993 8885511.8440000005
9522792.5089999996
...76 ...77 ...78
1991
1 6 Meses 9 Meses Anual
T1
2 9113467.7650000006 9037482.4580000006 9158809.9710000008
9268190.3289999999
...80 ...81 ...82
...83
1 T2 T3 T4 6
Meses
2 9775235.3350000009 9176389.0160000008 9894608.9890000001
9521712.8320000004
...84 ...85 1992 ...87
1 9 Meses Anual T1 T2
2 9406604.8929999992 9528605.9169999994 9701986.3300000001 9986417.75
...88 ...89 ...90
...91
1 T3 T4 6 Meses 9
Meses
2 9607923.0690000001 10155182.256999999 9844202.0399999991
9765442.3829999994
...92 1993 ...94 ...95
1 Anual T1 T2 T3
2 9862877.352 10008894.6630000001 10171035.407 10066258.405999999
...96 ...97 ...98 ...99
1 T4 6 Meses 9 Meses Anual
2 10416096.2310000001 10089965.035 10082062.825999999 10165571.176999999
1994 ...101 ...102 ...103 ...104
1 T1 T2 T3 T4 6 Meses
2 10343388.49 10772526.228 10602752.886 10952773.398 10557957.358999999
...105 ...106 1995 ...108
1 9 Meses Anual T1 T2
2 10572889.200999999 10667860.25 10189745.482999999 9795718.9969999995
...109 ...110 ...111 ...112
1 T3 T4 6 Meses 9 Meses

```

## 2 9802904.3719999995 10198513.301000001 9992732.2400000002 9929456.284
##      ...113      1996      ...115      ...116      ...117
## 1      Anual      T1      T2      T3      T4
## 2 9996720.5380000006 10426430.907 10569227.512 10583112.1 11116526.604
##      ...118      ...119      ...120      1997
## 1      6 Meses      9 Meses      Anual      T1
## 2 10497829.210000001 10526256.84 10673824.280999999 10862932.039000001
##      ...122      ...123      ...124      ...125
## 1      T2      T3      T4      6 Meses
## 2 11460068.096999999 11408200.828 11887380.083000001 11161500.068
##      ...126      ...127      1998      ...129
## 1      9 Meses      Anual      T1      T2
## 2 11243733.654999999 11404645.262 11827638.014 12034464.210000001
##      ...130      ...131      ...132      ...133
## 1      T3      T4      6 Meses      9 Meses
## 2 11972371.607000001 12139816.605 11931051.112 11944824.609999999
##      ...134      1999      ...136
...137
## 1      Anual      T1      T2
T3
## 2 11993572.608999999 12100154.549000001 12315219.075999999
12325229.130000001
##      ...138      ...139      ...140      ...141
## 1      T4      6 Meses      9 Meses      Anual
## 2 12554685.793 12207686.812000001 12246867.585000001 12323822.137
##      2000      ...143      ...144      ...145
## 1      T1      T2      T3      T4
## 2 12725022.062999999 12994568.899 13008792.244000001 13003302.161
##      ...146      ...147      ...148      2001
...150
## 1      6 Meses      9 Meses      Anual      T1
T2
## 2 12859795.481000001 12909461.069 12932921.342 12796119.499
12967530.185000001
##      ...151      ...152      ...153      ...154
...155
## 1      T3      T4      6 Meses      9 Meses
Anual
## 2 12857408.646 12901429.210000001 12881824.842 12873686.109999999
12880621.885
##      2002      ...157      ...158      ...159
## 1      T1      T2      T3      T4
## 2 12415541.447000001 13112362.762 12889950.083000001 13084104.380000001
##      ...160      ...161      ...162      2003      ...164
## 1      6 Meses      9 Meses      Anual      T1      T2
## 2 12763952.104 12805951.431 12875489.668 12803323.689999999 13182930.047
##      ...165      ...166      ...167      ...168
## 1      T3      T4      6 Meses      9 Meses
## 2 12954912.939999999 13305707.408 12993126.868000001 12980388.892000001
##      ...169      2004      ...171      ...172      ...173

```

## 1	Anual	T1	T2	T3	T4
## 2	13061718.521	13252629.581	13732336	13438260.097999999	13872034.549000001
##	...174	...175	...176	2005	
...	178				
## 1	6 Meses	9 Meses	Anual	T1	
T2					
## 2	13492482.789999999	13474408.560000001	13573815.057	13354787.873	
	14104833.946				
##	...179	...180	...181	...182	
...	183				
## 1	T3	T4	6 Meses	9 Meses	
Anual					
## 2	13782144.436000001	14306523.823999999	13729810.91	13747255.419	
	13887072.52				
##	2006	...185	...186	...187	
## 1	T1	T2	T3	T4	
## 2	14107960.023	14700503.914999999	14435867.706	14800897.344000001	
##	...188	...189	...190	2007	...192
## 1	6 Meses	9 Meses	Anual	T1	T2
## 2	14404231.969000001	14414777.215	14511307.247	14393727.372	14993339.387
##	...193	...194	...195	...196	
...	197				
## 1	T3	T4	6 Meses	9 Meses	
Anual					
## 2	14783298.236	15204938.905999999	14693533.380000001	14723454.998	
	14843825.975				
##	2008	...199	...200	...201	
## 1	T1	T2	T3	T4	
## 2	14563428.381999999	15386334.051999999	14979494.721000001	15125053.569	
##	...202	...203	...204	2009	
## 1	6 Meses	9 Meses	Anual	T1	
## 2	14974881.217	14976419.051999999	15013577.681	13752148.814999999	
##	...206	...207	...208		
...	209				
## 1	T2	T3	T4	6	
Meses					
## 2	14012937.564999999	14231941.450999999	14882965.685000001		
	13882543.189999999				
##	...210	...211	2010	...213	
## 1	9 Meses	Anual	T1	T2	
## 2	13999009.277000001	14219998.379000001	14371721.473999999	14998399.316	
##	...214	...215	...216	...217	
...	218				
## 1	T3	T4	6 Meses	9 Meses	
Anual					
## 2	14921452.789999999	15499605.204	14685060.395	14763857.859999999	
	14947794.696				
##	2011	...220	...221	...222	...223
## 1	T1	T2	T3	T4	6 Meses
## 2	14902733.238	15413046.558	15526015.329	16139539.278999999	15157889.898

##	...	224	...	225	2012	...	227
## 1	9 Meses		Anual		T1		T2
## 2	15280598.375	15495333.601	15619752.447	000001	16027465.052	9999999	
##	...	228	...	229	...	230	...
...	232						
## 1		T3		T4	6 Meses		9 Meses
Anual							
## 2	15952811.209	000001	16638865.895	15823608.75	15866676.236		
	16059723.651	000001					
##	2013		...	234	...	235	...
## 1	T1			T2		T3	
## 2	15719787.535	16361864.290	9999999	16186108.808	16840987.679	000001	
##	...	237	...	238	...	239	2014
## 1	6 Meses		9 Meses		Anual		T1
## 2	16040825.913	000001	16089253.544	16277187.078	16162068.203	16743444.571	T2
##	...	242	...	243	...	244	...
...	246						
## 1		T3		T4	6 Meses		9 Meses
Anual							
## 2	16649895.568	17408791.666	000001	16452756.387	16518469.447	000001	
	16741050.002						
##	2015		...	248	...	249	...
...	251						
## 1	T1		T2		T3		T4
Meses							6
## 2	16710213.83	17261227.603	17331655.061	000001	17866336.089	000002	
	16985720.717						
##	...	252	...	253	2016	...	255
## 1	9 Meses		Anual		T1		T2
## 2	17101032.164	9999999	17292358.146	000002	17166339.662	9999999	17780990.739
##	...	256	...	257	...	258	...
## 1	T3			T4	6 Meses		9 Meses
## 2	17625602.452	18416024.081	9999999	17473665.201	000001	17524310.951	000001
##	...	260	2017		...	262	...
## 1	Anual		T1		T2		T3
## 2	17747239.234	000001	17757880.976	18085472.857	9999999	17900776.074	000001
##	...	264	...	265	...	266	
...	267						
## 1		T4		6 Meses		9 Meses	
Anual							
## 2	18744915.359	9999999	17921676.916	9999999	17914709.969	000001	
	18122261.317	000002					
##	2018		...	269	...	270	...
...	272						
## 1	T1		T2		T3		T4
Meses							6
## 2	18017126.577	18667812.265	9999999	18405689.745	9999999	18989547.399	
	18342469.421						
##	...	273	...	274	2019R		
...	276						

```
## 1          9 Meses          Anual          T1
T2
## 2 18363542.863000002 18520043.997000001 18247589.151999999
18474906.102000002
##          ...277          ...278          ...279          ...280
## 1          T3          T4          6 Meses          9 Meses
## 2 18376100.534000002 18850755.011999998 18361247.627 18366198.596000001
##          ...281          2020R          ...283          ...284
## 1          Anual          T1          T2          T3
## 2 18487337.699999999 18013060.736000001 15015519.268999999 16770879.124
##          ...285          ...286          ...287          ...288
## 1          T4          6 Meses          9 Meses          Anual
## 2 18005414.480999999 16514290.003 16599819.710000001 16951218.403000001
##          2021 ...290 ...291 ...292 ...293 ...294 ...295
## 1          T1P          T2          T3          T4 6 Meses 9 Meses Anual
## 2 17361534.715999998 <NA> <NA> <NA> <NA> <NA> <NA>
```

#To make the wrangling easier, Let's change the row names

```
rownames(df_raw12) <- c("Season", "GDP")
```

#Let's select all the columns except the first one

```
df_raw12 <- df_raw12 %>% select(-Concepto)
```

#We elongate the data set with only the real GDP

```
df_raw2_1 <- gather(df_raw12[2,], key = "Period", value = "GDP")
```

```
df_raw2_1 <- transform(df_raw2_1, GDP = as.numeric(GDP)) #We transform GDP to numeric
```

```
head(df_raw2_1) #We see how it looks
```

```
##   Period   GDP
## 1  1980 7547882
## 2   ...3 7536519
## 3   ...4 7478781
## 4   ...5 8008667
## 5   ...6 7542201
## 6   ...7 7521061
```

#We do the same for row 1

```
df_raw1_1 <- gather(df_raw12[1,], key = "Period", value = "Season")
```

```
head(df_raw1_1)
```

```
##   Period Season
## 1  1980     T1
## 2   ...3     T2
## 3   ...4     T3
## 4   ...5     T4
## 5   ...6 6 Meses
## 6   ...7 9 Meses
```

Now that we have df_raw1_1 and df_raw2_1, we do the final data wrangling.

#Both variables need to have the same structure (294 obs. of 2 variables)

```
str(df_raw1_1)
```

```
## 'data.frame': 294 obs. of 2 variables:
## $ Period: chr "1980" "...3" "...4" "...5" ...
## $ Season: chr "T1" "T2" "T3" "T4" ...
```

```
str(df_raw2_1)
```

```
## 'data.frame': 294 obs. of 2 variables:
## $ Period: chr "1980" "...3" "...4" "...5" ...
## $ GDP : num 7547882 7536519 7478781 8008667 7542201 ...
```

#Let's check (just to be sure) if the Period column for both variables is identical

```
identical(df_raw1_1[,1], df_raw2_1[,1])
```

```
## [1] TRUE
```

#It is, and therefore we can make a new data frame that contains Period, GDP, and Season

```
r_gdp <- cbind(df_raw2_1, df_raw1_1[,2])#We bind the columns
colnames(r_gdp) <- c("Period", "GDP", "Season") #We set the column names
factor(r_gdp[,3]) #We factor the third column to see if "Anual" is written in
the same format
```

```
## [1] T1      T2      T3      T4      6 Meses 9 Meses Anual  T1      T2
## [10] T3      T4      6 Meses 9 Meses Anual  T1      T2      T3      T4
## [19] 6 Meses 9 Meses Anual  T1      T2      T3      T4      6 Meses 9
Meses
## [28] Anual  T1      T2      T3      T4      6 Meses 9 Meses Anual  T1
## [37] T2      T3      T4      6 Meses 9 Meses Anual  T1      T2      T3
## [46] T4      6 Meses 9 Meses Anual  T1      T2      T3      T4      6
Meses
## [55] 9 Meses Anual  T1      T2      T3      T4      6 Meses 9 Meses
Anual
## [64] T1      T2      T3      T4      6 Meses 9 Meses Anual  T1      T2
## [73] T3      T4      6 Meses 9 Meses Anual  T1      T2      T3      T4
## [82] 6 Meses 9 Meses Anual  T1      T2      T3      T4      6 Meses 9
Meses
## [91] Anual  T1      T2      T3      T4      6 Meses 9 Meses Anual  T1
## [100] T2      T3      T4      6 Meses 9 Meses Anual  T1      T2      T3
## [109] T4      6 Meses 9 Meses Anual  T1      T2      T3      T4      6
Meses
## [118] 9 Meses Anual  T1      T2      T3      T4      6 Meses 9 Meses
Anual
## [127] T1      T2      T3      T4      6 Meses 9 Meses Anual  T1      T2
## [136] T3      T4      6 Meses 9 Meses Anual  T1      T2      T3      T4
## [145] 6 Meses 9 Meses Anual  T1      T2      T3      T4      6 Meses 9
Meses
## [154] Anual  T1      T2      T3      T4      6 Meses 9 Meses Anual  T1
## [163] T2      T3      T4      6 Meses 9 Meses Anual  T1      T2      T3
## [172] T4      6 Meses 9 Meses Anual  T1      T2      T3      T4      6
Meses
```

```
## [181] 9 Meses Anual T1 T2 T3 T4 6 Meses 9 Meses
Anual
## [190] T1 T2 T3 T4 6 Meses 9 Meses Anual T1 T2
## [199] T3 T4 6 Meses 9 Meses Anual T1 T2 T3 T4
## [208] 6 Meses 9 Meses Anual T1 T2 T3 T4 6 Meses 9
Meses
## [217] Anual T1 T2 T3 T4 6 Meses 9 Meses Anual T1
## [226] T2 T3 T4 6 Meses 9 Meses Anual T1 T2 T3
## [235] T4 6 Meses 9 Meses Anual T1 T2 T3 T4 6
Meses
## [244] 9 Meses Anual T1 T2 T3 T4 6 Meses 9 Meses
Anual
## [253] T1 T2 T3 T4 6 Meses 9 Meses Anual T1 T2
## [262] T3 T4 6 Meses 9 Meses Anual T1 T2 T3 T4
## [271] 6 Meses 9 Meses Anual T1 T2 T3 T4 6 Meses 9
Meses
## [280] Anual T1 T2 T3 T4 6 Meses 9 Meses Anual T1P
## [289] T2 T3 T4 6 Meses 9 Meses Anual
## Levels: 6 Meses 9 Meses Anual T1 T1P T2 T3 T4
```

#Now we filter the data to only include the Annual data

```
r_gdp <- r_gdp %>% filter(Season=="Anual") %>% select(-Season)
str(r_gdp)
```

```
## 'data.frame': 42 obs. of 2 variables:
## $ Period: chr "...8" "...15" "...22" "...29" ...
## $ GDP : num 7642962 8368150 8367516 8002443 8281465 ...
```

```
head(r_gdp)
```

```
## Period GDP
## 1 ...8 7642962
## 2 ...15 8368150
## 3 ...22 8367516
## 4 ...29 8002443
## 5 ...36 8281465
## 6 ...43 8437038
```

```
tail(r_gdp)
```

```
## Period GDP
## 37 ...260 17747239
## 38 ...267 18122261
## 39 ...274 18520044
## 40 ...281 18487338
## 41 ...288 16951218
## 42 ...295 NA
```

#Previously we saw that the period was from 1980 to 2021, so Let's change the Period column

```
Period <- 1980:2021 #We create a variable with the proper years to bind it to
```


the dataset

```
r_gdp <- r_gdp %>% select(-Period)#We select all the columns except Period
r_gdp <- cbind(Period, r_gdp)
head(r_gdp)
```

```
##   Period      GDP
## 1  1980 7642962
## 2  1981 8368150
## 3  1982 8367516
## 4  1983 8002443
## 5  1984 8281465
## 6  1985 8437038
```

```
tail(r_gdp)
```

```
##   Period      GDP
## 37 2016 17747239
## 38 2017 18122261
## 39 2018 18520044
## 40 2019 18487338
## 41 2020 16951218
## 42 2021      NA
```

We have the real gross domestic product variable, with it we can calculate real GDP per capita by uploading the total population dataset throughout the years (reference [2]).

#We upload the population dataset and analyze it

```
pop <- read_excel("tot_pop.xls")
str(pop)
```

```
## tibble [264 × 65] (S3: tbl_df/tbl/data.frame)
## $ Country Name : chr [1:264] "Aruba" "Afghanistan" "Angola" "Albania"
## ...
## $ Country Code : chr [1:264] "ABW" "AFG" "AGO" "ALB" ...
## $ Indicator Name: chr [1:264] "Population, total" "Population, total"
## "Population, total" "Population, total" ...
## $ Indicator Code: chr [1:264] "SP.POP.TOTL" "SP.POP.TOTL" "SP.POP.TOTL"
## "SP.POP.TOTL" ...
## $ 1960 : num [1:264] 54211 8996973 5454933 1608800 13411 ...
## $ 1961 : num [1:264] 55438 9169410 5531472 1659800 14375 ...
## $ 1962 : num [1:264] 56225 9351441 5608539 1711319 15370 ...
## $ 1963 : num [1:264] 56695 9543205 5679458 1762621 16412 ...
## $ 1964 : num [1:264] 57032 9744781 5735044 1814135 17469 ...
## $ 1965 : num [1:264] 57360 9956320 5770570 1864791 18549 ...
## $ 1966 : num [1:264] 57715 10174836 5781214 1914573 19647 ...
## $ 1967 : num [1:264] 58055 10399926 5774243 1965598 20758 ...
## $ 1968 : num [1:264] 58386 10637063 5771652 2022272 21890 ...
## $ 1969 : num [1:264] 58726 10893776 5803254 2081695 23058 ...
## $ 1970 : num [1:264] 59063 11173642 5890365 2135479 24276 ...
## $ 1971 : num [1:264] 59440 11475445 6040777 2187853 25559 ...
## $ 1972 : num [1:264] 59840 11791215 6248552 2243126 26892 ...
```

```

## $ 1973      : num [1:264] 60243 12108963 6496962 2296752 28232 ...
## $ 1974      : num [1:264] 60528 12412950 6761380 2350124 29520 ...
## $ 1975      : num [1:264] 60657 12689160 7024000 2404831 30705 ...
## $ 1976      : num [1:264] 60586 12943093 7279509 2458526 31777 ...
## $ 1977      : num [1:264] 60366 13171306 7533735 2513546 32771 ...
## $ 1978      : num [1:264] 60103 13341198 7790707 2566266 33737 ...
## $ 1979      : num [1:264] 59980 13411056 8058067 2617832 34818 ...
## $ 1980      : num [1:264] 60096 13356511 8341289 2671997 36067 ...
## $ 1981      : num [1:264] 60567 13171673 8640446 2726056 37500 ...
## $ 1982      : num [1:264] 61345 12882528 8952950 2784278 39114 ...
## $ 1983      : num [1:264] 62201 12537730 9278096 2843960 40867 ...
## $ 1984      : num [1:264] 62836 12204292 9614754 2904429 42706 ...
## $ 1985      : num [1:264] 63026 11938208 9961997 2964762 44600 ...
## $ 1986      : num [1:264] 62644 11736179 10320111 3022635 46517 ...
## $ 1987      : num [1:264] 61833 11604534 10689250 3083605 48455 ...
## $ 1988      : num [1:264] 61079 11618005 11068050 3142336 50434 ...
## $ 1989      : num [1:264] 61032 11868877 11454777 3227943 52448 ...
## $ 1990      : num [1:264] 62149 12412308 11848386 3286542 54509 ...
## $ 1991      : num [1:264] 64622 13299017 12248901 3266790 56671 ...
## $ 1992      : num [1:264] 68235 14485546 12657366 3247039 58888 ...
## $ 1993      : num [1:264] 72504 15816603 13075049 3227287 60971 ...
## $ 1994      : num [1:264] 76700 17075727 13503747 3207536 62677 ...
## $ 1995      : num [1:264] 80324 18110657 13945206 3187784 63850 ...
## $ 1996      : num [1:264] 83200 18853437 14400719 3168033 64360 ...
## $ 1997      : num [1:264] 85451 19357126 14871570 3148281 64327 ...
## $ 1998      : num [1:264] 87277 19737765 15359601 3128530 64142 ...
## $ 1999      : num [1:264] 89005 20170844 15866869 3108778 64370 ...
## $ 2000      : num [1:264] 90853 20779953 16395473 3089027 65390 ...
## $ 2001      : num [1:264] 92898 21606988 16945753 3060173 67341 ...
## $ 2002      : num [1:264] 94992 22600770 17519417 3051010 70049 ...
## $ 2003      : num [1:264] 97017 23680871 18121479 3039616 73182 ...
## $ 2004      : num [1:264] 98737 24726684 18758145 3026939 76244 ...
## $ 2005      : num [1:264] 100031 25654277 19433602 3011487 78867 ...
## $ 2006      : num [1:264] 100834 26433049 20149901 2992547 80993 ...
## $ 2007      : num [1:264] 101222 27100536 20905363 2970017 82684 ...
## $ 2008      : num [1:264] 101358 27722276 21695634 2947314 83862 ...
## $ 2009      : num [1:264] 101455 28394813 22514281 2927519 84463 ...
## $ 2010      : num [1:264] 101669 29185507 23356246 2913021 84449 ...
## $ 2011      : num [1:264] 102046 30117413 24220661 2905195 83747 ...
## $ 2012      : num [1:264] 102560 31161376 25107931 2900401 82427 ...
## $ 2013      : num [1:264] 103159 32269589 26015780 2895092 80774 ...
## $ 2014      : num [1:264] 103774 33370794 26941779 2889104 79213 ...
## $ 2015      : num [1:264] 104341 34413603 27884381 2880703 78011 ...
## $ 2016      : num [1:264] 104872 35383128 28842484 2876101 77297 ...
## $ 2017      : num [1:264] 105366 36296400 29816748 2873457 77001 ...
## $ 2018      : num [1:264] 105845 37172386 30809762 2866376 77006 ...
## $ 2019      : num [1:264] 106314 38041754 31825295 2854191 77142 ...
## $ 2020      : logi [1:264] NA NA NA NA NA NA ...

```

```
head(pop)
```

```
## # A tibble: 6 x 65
##   `Country Name` `Country Code` `Indicator Name` `Indicator Code` `1960`
##   `1961`
##   <chr>          <chr>          <chr>          <chr>          <dbl>
##   <dbl>
## 1 Aruba          ABW          Population, tot... SP.POP.TOTL      5.42e4
##   5.54e4
## 2 Afghanistan    AFG          Population, tot... SP.POP.TOTL      9.00e6
##   9.17e6
## 3 Angola          AGO          Population, tot... SP.POP.TOTL      5.45e6
##   5.53e6
## 4 Albania         ALB          Population, tot... SP.POP.TOTL      1.61e6
##   1.66e6
## 5 Andorra         AND          Population, tot... SP.POP.TOTL      1.34e4
##   1.44e4
## 6 Arab World      ARB          Population, tot... SP.POP.TOTL      9.22e7
##   9.47e7
## # ... with 59 more variables: `1962` <dbl>, `1963` <dbl>, `1964` <dbl>,
## # `1965` <dbl>, `1966` <dbl>, `1967` <dbl>, `1968` <dbl>, `1969` <dbl>,
## # `1970` <dbl>, `1971` <dbl>, `1972` <dbl>, `1973` <dbl>, `1974` <dbl>,
## # `1975` <dbl>, `1976` <dbl>, `1977` <dbl>, `1978` <dbl>, `1979` <dbl>,
## # `1980` <dbl>, `1981` <dbl>, `1982` <dbl>, `1983` <dbl>, `1984` <dbl>,
## # `1985` <dbl>, `1986` <dbl>, `1987` <dbl>, `1988` <dbl>, `1989` <dbl>,
## # `1990` <dbl>, `1991` <dbl>, `1992` <dbl>, `1993` <dbl>, `1994` <dbl>,
## # `1995` <dbl>, `1996` <dbl>, `1997` <dbl>, `1998` <dbl>, `1999` <dbl>,
## # `2000` <dbl>, `2001` <dbl>, `2002` <dbl>, `2003` <dbl>, `2004` <dbl>,
## # `2005` <dbl>, `2006` <dbl>, `2007` <dbl>, `2008` <dbl>, `2009` <dbl>,
## # `2010` <dbl>, `2011` <dbl>, `2012` <dbl>, `2013` <dbl>, `2014` <dbl>,
## # `2015` <dbl>, `2016` <dbl>, `2017` <dbl>, `2018` <dbl>, `2019` <dbl>,
## # `2020` <lgl>
```

```
#Let's check if Mexico appears
pop[pop$`Country Name`=="Mexico",1]
```

```
## # A tibble: 1 x 1
##   `Country Name`
##   <chr>
## 1 Mexico
```

```
#Since it appears, let's save the mexican population in a variable and
elongate the dataset
```

```
pop_mex <- pop[pop$`Country Name`=="Mexico",]
pop_mex <- pop_mex %>% select(-c(`Country Name`, `Country Code`,
                                `Indicator Name`, `Indicator Code`)) %>%
  gather(key = "Years", value="Population", convert = T) %>%
  as.data.frame()
head(pop_mex)

##   Years Population
## 1 1960 37771859
## 2 1961 38966056
```

```
## 3 1962 40195319
## 4 1963 41462369
## 5 1964 42771079
## 6 1965 44123853

tail(pop_mex)

##      Years Population
## 56 2015 121858258
## 57 2016 123333376
## 58 2017 124777324
## 59 2018 126190788
## 60 2019 127575529
## 61 2020      NA

str(pop_mex)

## 'data.frame':    61 obs. of  2 variables:
##  $ Years      : int  1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 ...
##  $ Population: num  37771859 38966056 40195319 41462369 42771079 ...
```

Now we have the total mexican population from 1960 to 2020. However, we need to know which years coincide between pop_mex and r_gdp.

```
n_rgdp <- r_gdp %>% filter(Period %in%
intersect(r_gdp[, "Period"], pop_mex[, "Years"]))
n_pop_mex <- pop_mex %>% filter(Years %in%
intersect(r_gdp[, "Period"], pop_mex[, "Years"]))
str(n_rgdp)

## 'data.frame':    41 obs. of  2 variables:
##  $ Period: int  1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 ...
##  $ GDP   : num  7642962 8368150 8367516 8002443 8281465 ...

str(n_pop_mex)

## 'data.frame':    41 obs. of  2 variables:
##  $ Years      : int  1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 ...
##  $ Population: num  67761372 69407624 71058654 72709299 74352631 ...
```

Everything is set for us to compute the real GDP per capita. Therefore, we create a new data frame that includes both the population and the real GDP so that we can filter out those rows with NAs.

```
#New data frame
rgdp_pop <- cbind(n_rgdp, n_pop_mex) %>% select(-Years)
#We check if there are any NAs in the data frame
sum(is.na(rgdp_pop))

## [1] 1
```

#Since there is 1 NA, let's filter it out

```
rgdp_pop <- rgdp_pop %>% filter(!is.na(Period) & !is.na(GDP) &
!is.na(Population))
str(rgdp_pop)
```

```
## 'data.frame':   40 obs. of  3 variables:
## $ Period      : int   1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 ...
## $ GDP         : num   7642962 8368150 8367516 8002443 8281465 ...
## $ Population: num   67761372 69407624 71058654 72709299 74352631 ...
```

```
summary(rgdp_pop)
```

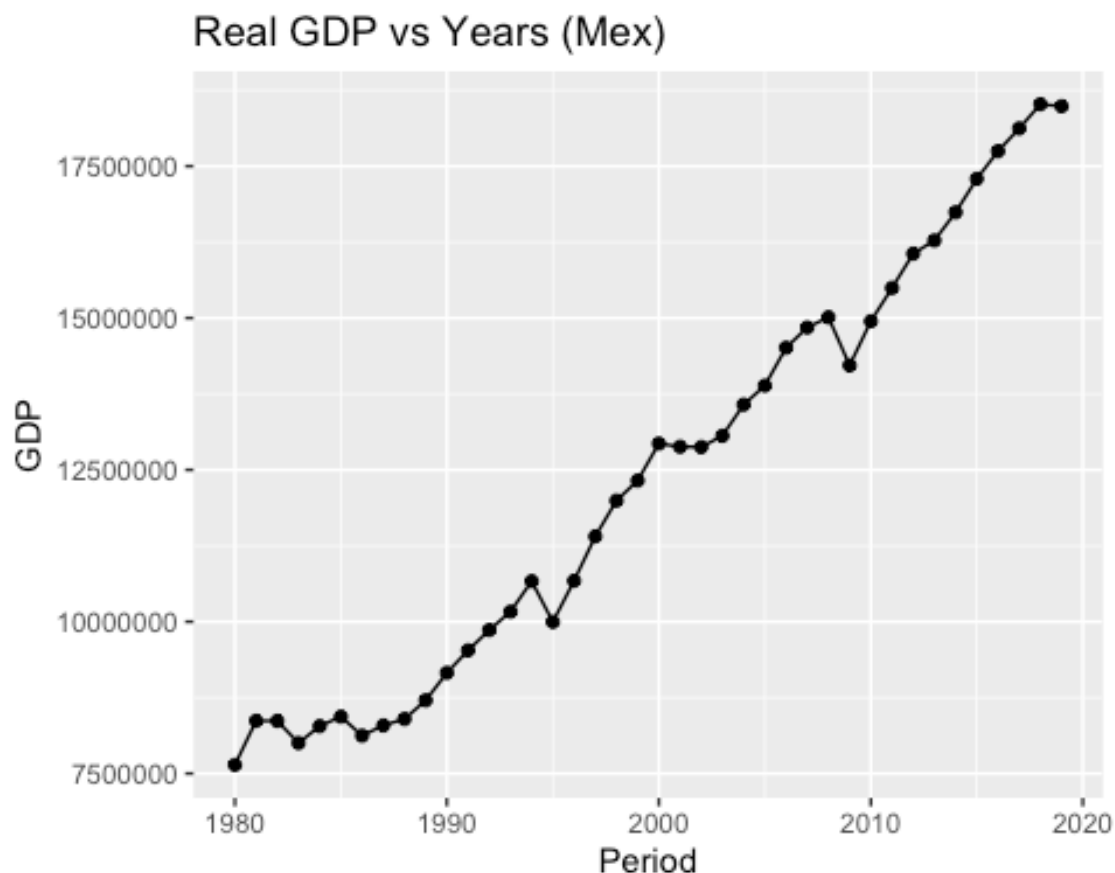
```
##      Period      GDP      Population
## Min.   :1980   Min.   : 7642962   Min.   : 67761372
## 1st Qu.:1990   1st Qu.: 9045456   1st Qu.: 83549582
## Median :2000   Median :12599656   Median : 98192338
## Mean   :2000   Mean   :12397173   Mean   : 98099475
## 3rd Qu.:2009   3rd Qu.:14964240   3rd Qu.:112871156
## Max.   :2019   Max.   :18520044   Max.   :127575529
```

```
head(rgdp_pop)
```

```
##   Period      GDP Population
## 1  1980  7642962   67761372
## 2  1981  8368150   69407624
## 3  1982  8367516   71058654
## 4  1983  8002443   72709299
## 5  1984  8281465   74352631
## 6  1985  8437038   75983485
```

It is now clear that the period that includes all the data that coincides timewise goes from 1980 to 2019. Let's make a plot of both GDP and GDP per capita.

```
rgdp_pop %>% ggplot(aes(Period, GDP)) +
  ggtitle("Real GDP vs Years (Mex)") +
  geom_point() + geom_line()
```



We see the real gross domestic product of Mexico, at constant prices of 2013 (Mexican pesos), has increased considerably since 1980. We now need to compute the real gross internal product per capita.

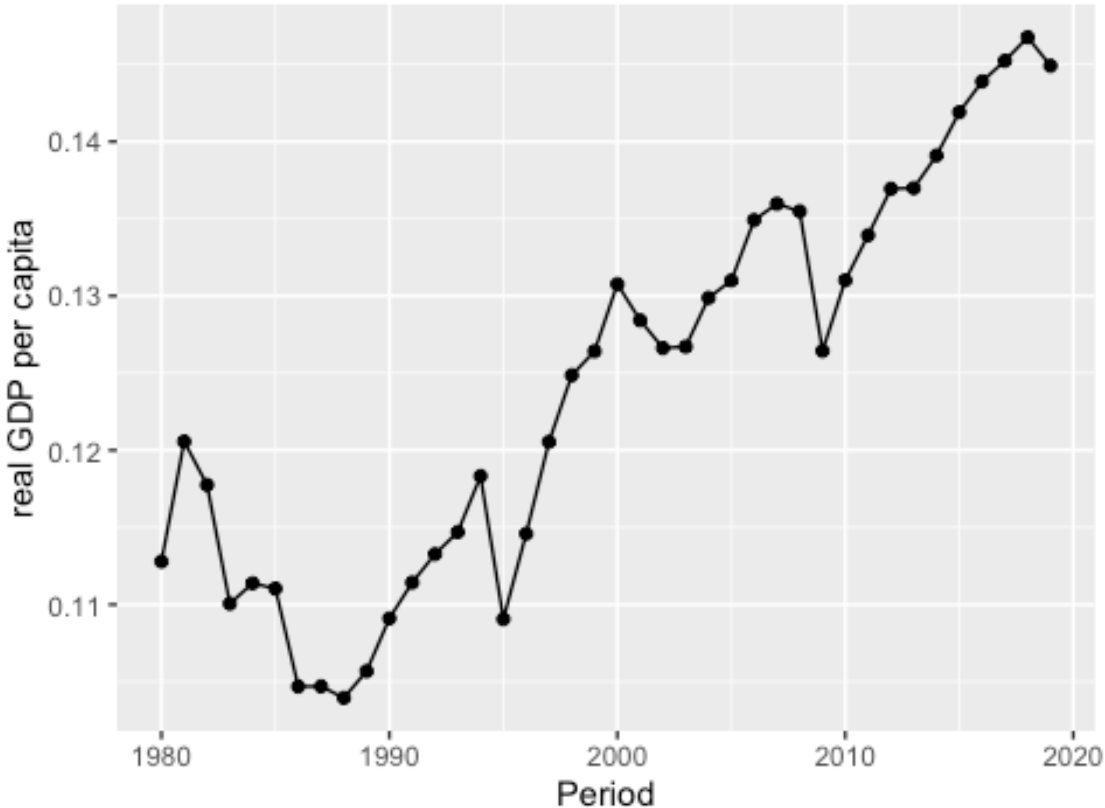
```
r_GDP_pc <- rgdp_pop[, "GDP"] / rgdp_pop[, "Population"] #We create a variable of the real GDP per capita
n_rgdp_pop <- cbind(rgdp_pop, r_GDP_pc) #We create a new data frame
head(n_rgdp_pop)
```

```
##   Period    GDP Population  r_GDP_pc
## 1  1980 7642962   67761372 0.1127923
## 2  1981 8368150   69407624 0.1205653
## 3  1982 8367516   71058654 0.1177551
## 4  1983 8002443   72709299 0.1100608
## 5  1984 8281465   74352631 0.1113809
## 6  1985 8437038   75983485 0.1110378
```

#Let's make a plot

```
n_rgdp_pop %>% ggplot(aes(Period, r_GDP_pc)) +
  ggtitle("Real GDP per capita vs Years (Mex)") +
  ylab("real GDP per capita") +
  geom_point() + geom_line()
```

Real GDP per capita vs Years (Mex)



The plot suggests that between 1981 and 1988 perhaps the real GDP was shrinking, or it was not growing as fast as the population. However, from 1989 to 2019, although it has some fluctuations, the curve increased.

To answer how it is increasing, we must compute the growth rate of both real GDP and real GDP per capita using the below formula.

$$r = \frac{GDP_f - GDP_i}{GDP_i} \cdot 100$$

```
i <- 1
f <- 2
GDP_r <- c()#GDP rate variable
year <- c()#year variable
for (j in 1:39){
  v <- (n_rgdp_pop[f,"GDP"]-n_rgdp_pop[i,"GDP"])/(n_rgdp_pop[i,"GDP"])*100#We
compute
  GDP_r <- append(GDP_r, v) #We append
  year <- append(year, n_rgdp_pop[f,"Period"]) #We append
  i <- i+1 #This variable needs to increase by one
  f <- f+1 #This variable needs to increase by one
}
```

```
GDP_ra <- cbind(GDP_r, year)
head(GDP_ra)
```

```
##           GDP_r year
## [1,]  9.488312409 1981
## [2,] -0.007583372 1982
## [3,] -4.362980610 1983
## [4,]  3.486711357 1984
## [5,]  1.878577161 1985
## [6,] -3.708327140 1986
```

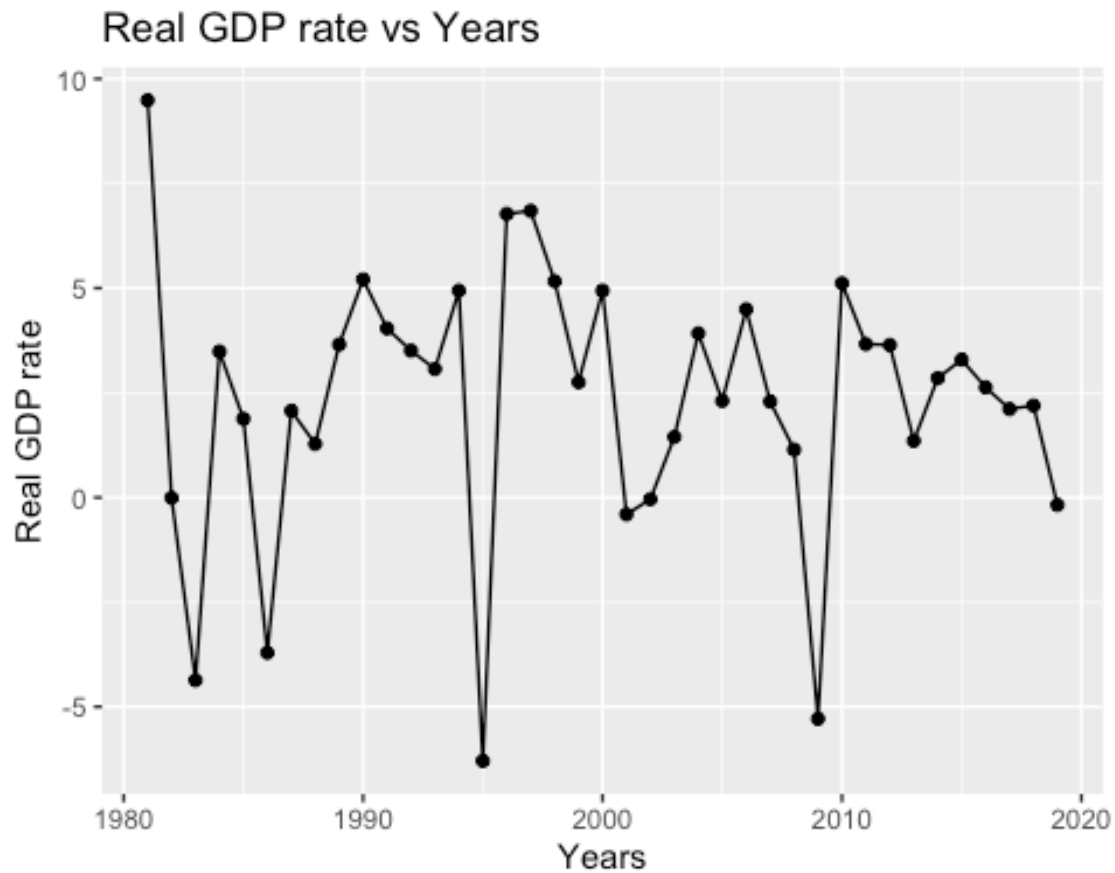
Now let's do the same thing for the real GDP per capita

```
i <- 1
f <- 2
GDPpc_r <- c()#GDP per capita rate variable
for (j in 1:39){
  v <- (n_rgdp_pop[f,"r_GDP_pc"]-
n_rgdp_pop[i,"r_GDP_pc"])/(n_rgdp_pop[i,"r_GDP_pc"])*100#We compute
  GDPpc_r <- append(GDPpc_r, v)#We append
  i <- i+1 #This variable needs to increase by one
  f <- f+1#This variable needs to increase by one
}
GDP_ra <- as.data.frame(cbind(GDP_ra, GDPpc_r))
head(GDP_ra)
```

```
##           GDP_r year      GDPpc_r
## 1  9.488312409 1981  6.8914024
## 2 -0.007583372 1982 -2.3308821
## 3 -4.362980610 1983 -6.5341302
## 4  3.486711357 1984  1.1994618
## 5  1.878577161 1985 -0.3080702
## 6 -3.708327140 1986 -5.7131195
```

Let's see how the real GDP rate has evolved over time.

```
GDP_ra %>% ggplot(aes(year, GDP_r))+
  xlab("Years")+
  ylab("Real GDP rate")+
  ggtitle("Real GDP rate vs Years")+
  geom_point()+geom_line()
```

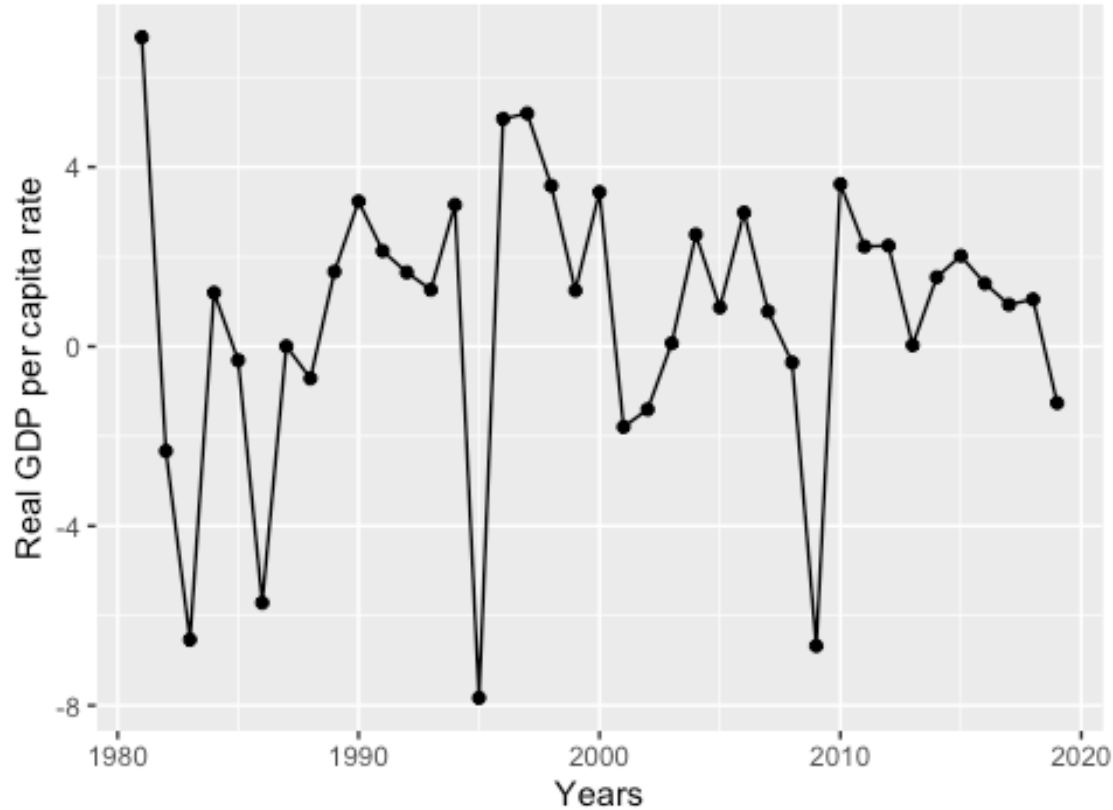



Based

on the graph, Mexico has not have a rate that suggests constant growth, meaning it fluctuates and doesn't seem to stay at constant rate.

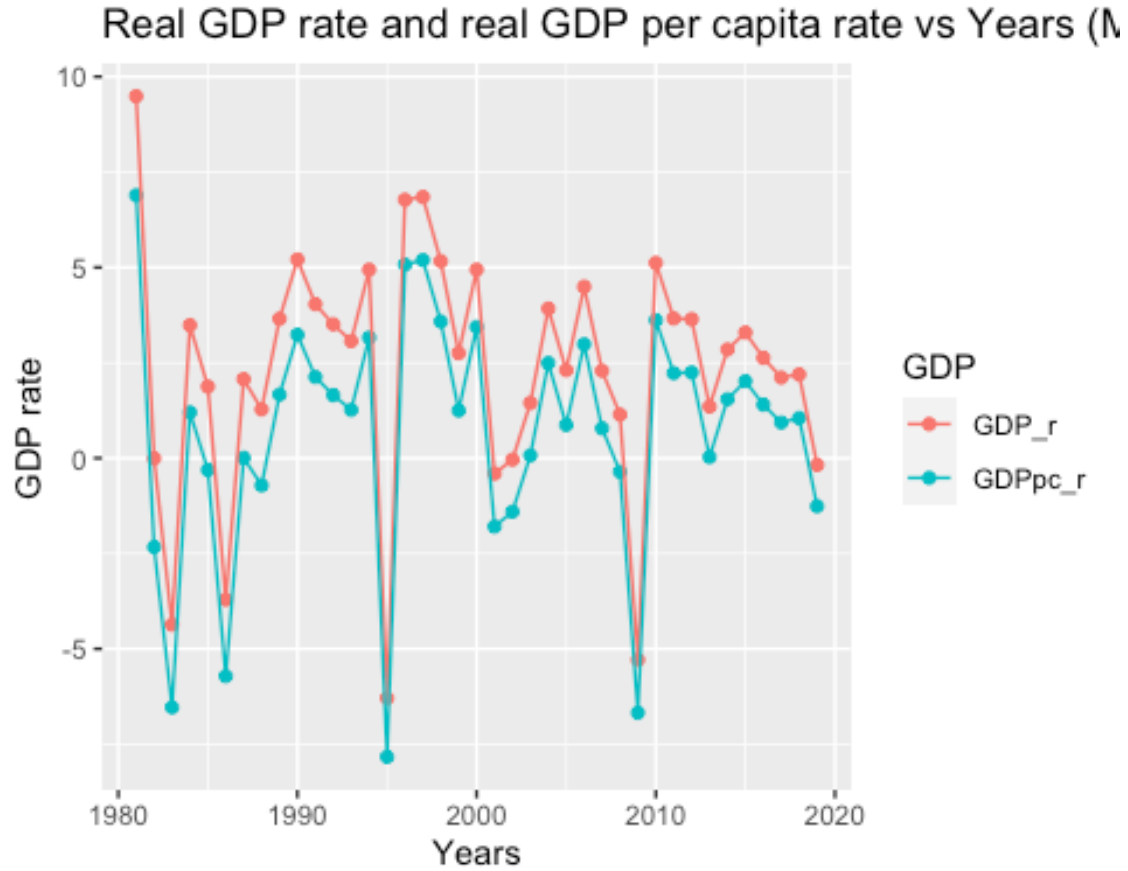
```
GDP_ra %>% ggplot(aes(year, GDPpc_r))+  
  xlab("Years")+  
  ylab("Real GDP per capita rate")+  
  ggtitle("Real GDP per capita rate vs Years")+  
  geom_point()+geom_line()
```

Real GDP per capita rate vs Years



The real GDP per capita rate has the same pattern of growth as the real GDP rate. Let's compare both graphs side by side.

```
GDP_ra %>% gather(key="GDP", value = GDPpc_r, -year) %>% #We elongate the
data (the column GDPpc_r has all the rates)
  ggplot(aes(year, GDPpc_r, col=GDP))+ #x=years, y=GDPpc_r, and the color
will be based on the GDP, which labels if it is real GDP rate or real GDP per
capita rate
  xlab("Years")+
  ylab("GDP rate")+
  ggtitle("Real GDP rate and real GDP per capita rate vs Years (Mex)")+
  geom_point()+geom_line()
```



The real GDP per capita rate is smaller across the years than the real GDP rate. Let

$$r_{GDPpc} = \frac{\frac{GDP_n}{N_\alpha} - \frac{GDP_{n-1}}{N_\beta}}{\frac{GDP_{n-1}}{N_\beta}} \cdot 100$$

be the real GDP per capita equation. If we start to develop the equation, we get

$$r_{GDPpc} = \left(\frac{\frac{GDP_n}{N_\alpha}}{\frac{GDP_{n-1}}{N_\beta}} - 1 \right) \cdot 100$$

$$r_{GDPpc} = \left(\frac{N_\beta}{N_\alpha} \cdot \frac{GDP_n}{GDP_{n-1}} - 1 \right) \cdot 100$$

If N_α , which is the population of the year n , is bigger than N_β , then the solution will be smaller than that of the real GDP rate, which has the following equation:

$$r_{GDPpc} = \left(\frac{GDP_n}{GDP_{n-1}} - 1 \right) \cdot 100$$

Due to the fact that $N_\alpha > N_\beta$ the fraction gives a number smaller than zero, which implies that the product

$$\frac{N_\beta}{N_\alpha} \cdot \frac{GDP_n}{GDP_{n-1}}$$

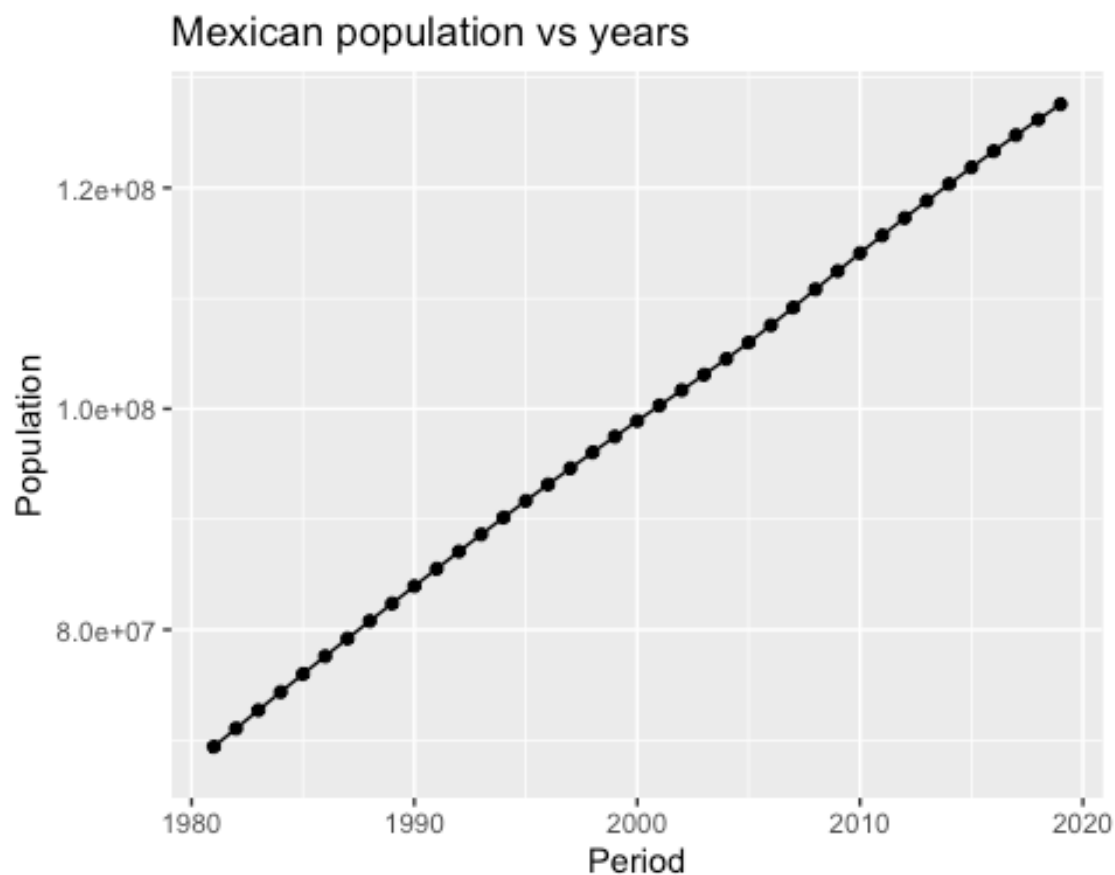
to be a smaller number than

$$\frac{GDP_n}{GDP_{n-1}}$$

$N_\alpha > N_\beta$ implies that the population from a year n increased with respect to the year $n-1$, and since the real GDP per capita rate across the years is always smaller than the real GDP rate, then the population from 1981 to 2019 only increased. Let's see if that is true:

```
n_rgdpop %>% ggplot(aes(Period, Population))+xlim(1981,
2019)+ggtitle("Mexican population vs years")+
  geom_point()+geom_line()

## Warning: Removed 1 rows containing missing values (geom_point).
## Warning: Removed 1 row(s) containing missing values (geom_path).
```



As we can see by the plot, the mexican population has indeed increased.

The only way for the real GDP per capita rate to be greater than the real GDP rate, is for the Mexican population to decrease or not increase so rapidly, followed (preferably) by a significant increase in the real GDP of year n.

REFERENCES

1] Parkin, M. (2018). Economía. Twelfth Edition. Mexico: Pearson. pp 497-498.

[2] [www.inegi.org.mx](https://www.inegi.org.mx/app/tabulados/default.aspx?pr=38&vr=5&in=2&tp=20&wr=1&cno=2). (n.d.). Tabulados. [online] Disponible en: <https://www.inegi.org.mx/app/tabulados/default.aspx?pr=38&vr=5&in=2&tp=20&wr=1&cno=2> [Accessed 28 May 2021].

[3] [data.worldbank.org](https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart&locations=MX). (n.d.). Population, total - Mexico | Data. [online] Available at: <https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart&locations=MX> [Accessed 28 May 2021].