# visualization project

Topic:- Privatization of Space

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28/11/2021

**Brief description of the project:-**

The dataset I am working on for this project is named “privatization of Space”. this dataset contains 15 columns and 4324 rows. it contains the details of every space launch from 1957 to 2020, Included for each launch is the organization responsible for the launch. we will also see where and when the launch took place. the valriables in the datasets are company Name, Location, status rocket, status(paas/fail), and private or state run,etc… so from here we can conclude that how much the private companies are growing in this aspect. The question I want to answer from this datasets are

1)How have we seen the private sector fair over the years? 2)which organisations are most succesful?

```
Global_Space_Launches <- read.csv("Global Space Launches.csv")
names(Global_Space_Launches)
```

```
##  [1] "Company.Name"              "Location"
##  [3] "Detail"                    "Status.Rocket"
##  [5] "Rocket"                    "Status.Mission"
##  [7] "Country.of.Launch"         "Companys.Country.of.Origin"
##  [9] "Private.or.State.Run"      "DateTime"
## [11] "Year"                      "Month"
## [13] "Day"                       "Date"
## [15] "Time"
```

The names of the varibales in this data set are given above. so in this component I will try to analyse the types of the variables, e.g continuous, discrete, categorical, etc..

below I have created a data frame containing all the details of the 8 variable which I will be using in this project

```
x=c('Company.Name','Location','Details','Status Rocket','status Mission','Cou
ntry.of.Launch','Companys.Country.of.Origin','Private.or.State.Run','year','m
onth')

y=c('nominal (categorical)','nominal (categorical)','nominal (categorical)','
binary (categorical)','ordinal(categorical)','nominal (categorical)','nominal
(categorical)','binary (categorical)','numeric','numeric')

z=c("The variable Comapny.Name is basically collection 55 unique companies pa
```

```
rticipated in in this rocket launch",
    "it stores all the lauch location","this variable contains the specificat
ion  of all the rockets","Showing if a rocket is currently in use","One of 4
categorical elements showing the the result of the launch"," we have 16 diffe
rent countries from where the launches took place","the country that the orga
nization is from","the organizations category think SpaceX for private and NA
SA for State","the year in which the launch took place","month of the launch"
)

nature_of_variable= data.frame(cbind(variable_name=x,type=y,description=z))
nature_of_variable
```

```
##                 variable_name                type
## 1                Company.Name         nominal (categorical)
## 2                    Location         nominal (categorical)
## 3                     Details         nominal (categorical)
## 4               Status Rocket         binary (categorical)
## 5              status Mission         ordinal(categorical)
## 6           Country.of.Launch         nominal (categorical)
## 7  Companys.Country.of.Origin         nominal (categorical)
## 8        Private.or.State.Run         binary (categorical)
## 9                        year               numeric
## 10                      month               numeric
##
description
## 1  The variable Comapny.Name is basically collection 55 unique companies
participated in in this rocket launch
## 2  it stores all the lauch location
## 3  this variable contains the specification  of all the rockets
## 4  Showing if a rocket is currently in use
## 5  One of 4 categorical elements showing the the result of the launch
## 6  we have 16 different countries from where the launches took place
## 7  the country that the organization is from
## 8  the organizations category think SpaceX for private and NASA for State
## 9  the year in which the launch took place
## 10 month of the launch
```

1)Company.Name

```
unique(Global_Space_Launches$Company.Name)
```

```
##  [1] "SpaceX"          "CASIC"           "Roscosmos"       "ULA"
##  [5] "JAXA"            "Northrop"        "ExPace"          "IAI"
##  [9] "Rocket Lab"      "Virgin Orbit"    "VKS RF"          "MHI"
## [13] "IRGC"            "Arianespace"     "ISA"             "BlueOrigin"
## [17] "ISRO"            "Exos"            "ILS"             "i-Space"
## [21] "OneSpace"        "Landspace"       "Eurockot"        "LandLaunch"
## [25] "KCST"            "Sandia"          "Kosmotras"       "Khrunichev"
## [29] "Sea Launch"      "KARI"            "ESA"             "NASA"
## [33] "Boeing"          "ISAS"            "SRC"             "MITT"
## [37] "Lockheed"        "AEB"             "Starsem"         "RVSN USSR"
```

```
## [41] "EER"              "General Dynamics" "Martin Marietta"  "Yuzhmash"
## [45] "Douglas"          "ASI"              "US Air Force"     "CNES"
## [49] "CECLES"           "RAE"              "UT"               "OKB-586"
## [53] "AMBA"             "Arme de l'Air"    "US Navy"
```

The variable 'Comapny.Name' is basically collection 55 unique companies participated in in this rocket launch. since the names are in an undisputable order so it is a nominal variable.

2)location

```
head(unique(Global_Space_Launches$Location))
```

```
## [1] "LC-39A, Kennedy Space Center, Florida, USA"
## [2] "Site 9401 (SLS-2), Jiuquan Satellite Launch Center, China"
## [3] "Pad A, Boca Chica, Texas, USA"
## [4] "Site 200/39, Baikonur Cosmodrome, Kazakhstan"
## [5] "SLC-41, Cape Canaveral AFS, Florida, USA"
## [6] "LC-9, Taiyuan Satellite Launch Center, China"
```

the variable "location" is also a nominal variable.

3) detail

```
head(unique(Global_Space_Launches$Detail))
```

```
## [1] "Falcon 9 Block 5 | Starlink V1 L9 & BlackSky"
## [2] "Long March 2D | Gaofen-9 04 & Q-SAT"
## [3] "Starship Prototype | 150 Meter Hop"
## [4] "Proton-M/Briz-M | Ekspress-80 & Ekspress-103"
## [5] "Atlas V 541 | Perseverance"
## [6] "Long March 4B | Ziyuan-3 03, Apocalypse-10 & NJU-HKU 1"
```

this variable contains the specification of all the rockets. so it is a nominal variable again.

4)statusrocket

```
unique(Global_Space_Launches$Status.Rocket)
```

```
## [1] "StatusActive"  "StatusRetired"
```

it is a binary variable. since it has only two types "statusactive" and "statusRetired", this two are opposite to each other.

5)Status.Mission

```
unique(Global_Space_Launches$Status.Mission)
```

```
## [1] "Success"           "Failure"           "Prelaunch Failure"
## [4] "Partial Failure"
```

it is an ordinal variable. because it has more than two category following a particular order.

6)Country.of.Launch

```
unique(Global_Space_Launches$Country.of.Launch)
```

```
##  [1] "USA"         "China"       "Kazakhstan"  "Japan"       "Israel"
##  [6] "New Zealand" "Russia"      "Iran"        "France"      "India"
## [11] "North Korea" "Sea Launch"  "South Korea" "Brazil"      "Kenya"
## [16] "Australia"
```

here we have 16 different countries from where the launches took place. so it is agian a nominal variable.

7)Companys.Country.of.Origin

```
unique(Global_Space_Launches$Companys.Country.of.Origin)
```

```
##  [1] "USA"           "China"         "Russia"        "Japan"
##  [5] "Isreal"        "Iran"          "Multi"         "India"
##  [9] "Germany"       "North Korea"   "South Korea"   "Brazil"
## [13] "Ukraine"       "Italy"         "France"        "England"
## [17] "Arme de l'Air"
```

so the private compnies which took part in space lauch, belongs to an of this 17 countires. it is an nominal variable.

8)Private.or.state.run

```
unique(Global_Space_Launches$Private.or.State.Run)
```

```
## [1] "P" "S"
```

here S stands for State and P stands for private. so it basically shows us the launches are either from a private organisation or state(Nasa). it is an binary variable.

```
company=unique(Global_Space_Launches$Company.Name)
nol=c()
noc=c()
for(i in company){
  noc=c(noc,i)
  nol=c(nol,nrow(subset(Global_Space_Launches,Company.Name==i)))
}
launch= data.frame(cbind(Company_name=noc,No_of_lauch=nol))
launch
```

```
##        Company_name No_of_lauch
## 1            SpaceX         100
## 2             CASIC         256
## 3         Roscosmos          55
## 4               ULA         140
## 5              JAXA           7
## 6          Northrop          83
```

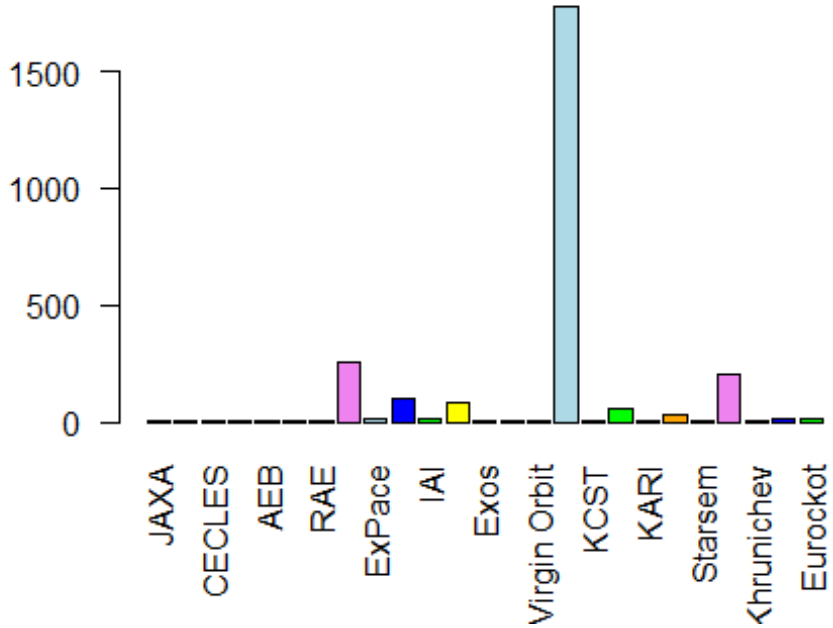
```
## 7            ExPace          10
## 8               IAI          11
## 9        Rocket Lab          13
## 10     Virgin Orbit           1
## 11           VKS RF         201
## 12              MHI          84
## 13             IRGC           1
## 14      Arianespace         279
## 15              ISA          13
## 16      Blue Origin          12
## 17             ISRO          76
## 18             Exos           4
## 19              ILS          46
## 20          i-Space           1
## 21         OneSpace           1
## 22        Landspace           1
## 23         Eurockot          13
## 24      Land Launch           7
## 25             KCST           5
## 26           Sandia           1
## 27        Kosmotras          22
## 28       Khrunichev           1
## 29       Sea Launch          36
## 30             KARI           3
## 31              ESA          13
## 32             NASA         203
## 33           Boeing         136
## 34             ISAS          30
## 35              SRC           3
## 36             MITT           7
## 37         Lockheed          79
## 38              AEB           3
## 39          Starsem           1
## 40        RVSN USSR        1777
## 41              EER           1
## 42 General Dynamics         251
## 43  Martin Marietta         114
## 44         Yuzhmash           2
## 45          Douglas           1
## 46              ASI           9
## 47     US Air Force         161
## 48             CNES           8
## 49           CECLES           4
## 50              RAE           2
## 51               UT           5
## 52          OKB-586           2
## 53             AMBA           8
## 54    Arme de l'Air           4
## 55          US Navy          17
```

this are the lists of the companies who has maximum number of launches and minimum number of launches respexctively

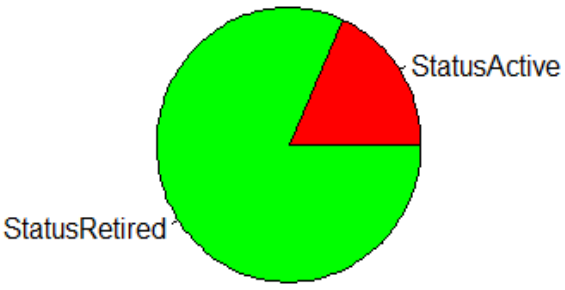
```
subset(launch,No_of_lauch==max(nol))

##    Company_name No_of_lauch
## 40    RVSN USSR        1777

subset(launch,No_of_lauch==min(nol))

##    Company_name No_of_lauch
## 10 Virgin Orbit           1
## 13         IRGC           1
## 20      i-Space           1
## 21     OneSpace           1
## 22    Landspace           1
## 26       Sandia           1
## 28   Khrunichev           1
## 39      Starsem           1
## 41          EER           1
## 45      Douglas           1
```

I am intending to show a barplot of the company name and the number of launches,since it is difficult to show all the 55 companies in same plot, so i am taking a sample of size 25 to do it.

```
sam=sample(company,size=25)
nol1=c()
for(i in sam){
  nol1=c(nol1,nrow(subset(Global_Space_Launches,Company.Name==i)))
}
barplot(nol1,names.arg = sam, col=c('violet','light blue','blue','green','yel
low','orange','red'),las=2)
```




```
active=nrow(subset(Global_Space_Launches,Status.Rocket=='StatusActive'))
retired=nrow(subset(Global_Space_Launches,Status.Rocket=="StatusRetired"))

pie(x=c(active,retired),labels = c('StatusActive','StatusRetired'),col=c('red
','green'))
```



so majority of the rockets are now in retired condition.

below is the table for number of active and retired rocket from each company.

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

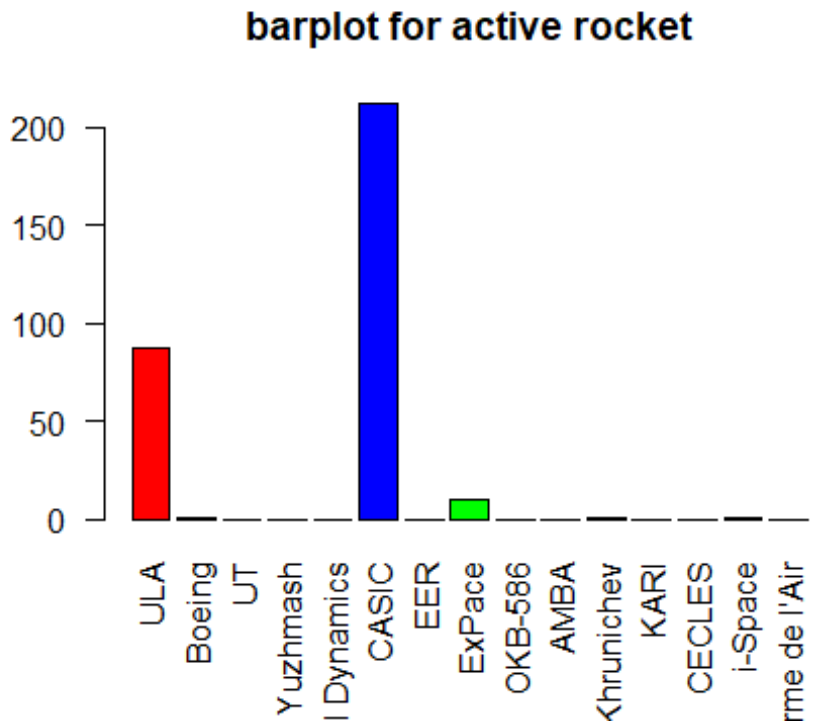
```
active_number=c()
retired_number=c()
for(i in company){
  active_number=c(active_number,nrow(filter(Global_Space_Launches,Company.Nam
e==i, Status.Rocket=='StatusActive')))
  retired_number=c(retired_number,nrow(filter(Global_Space_Launches,Company.N
ame==i,Status.Rocket=='StatusRetired')))
}
rocket_status<- data.frame(cbind(Company_Name=company,status_active=active_nu
mber,status_retired=retired_number))
rocket_status
```

```
##        Company_Name     status_active  status_retired
## 1            SpaceX            38             62
## 2             CASIC           212             44
## 3         Roscosmos            32             23
## 4               ULA            87             53
## 5              JAXA             6              1
## 6          Northrop            63             20
## 7            ExPace            10              0
## 8               IAI             5              6
## 9        Rocket Lab            13              0
## 10     Virgin Orbit             1              0
## 11           VKS RF            27            174
## 12              MHI            32             52
## 13             IRGC             1              0
## 14      Arianespace           114            165
## 15              ISA             9              4
## 16      Blue Origin            12              0
## 17             ISRO            50             26
## 18             Exos             4              0
## 19              ILS            13             33
## 20          i-Space             1              0
## 21         OneSpace             1              0
```

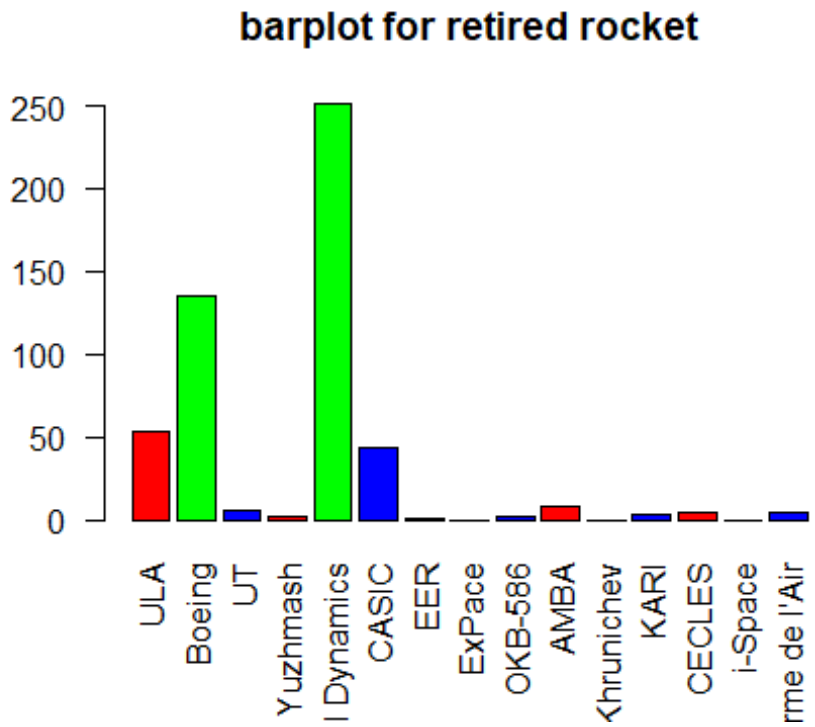
```
## 22        Landspace             0              1
## 23         Eurockot             0             13
## 24      Land Launch             7              0
## 25             KCST             3              2
## 26           Sandia             1              0
## 27        Kosmotras             0             22
## 28       Khrunichev             1              0
## 29       Sea Launch            36              0
## 30             KARI             0              3
## 31              ESA             1             12
## 32             NASA             0            203
## 33           Boeing             1            135
## 34             ISAS             0             30
## 35              SRC             0              3
## 36             MITT             6              1
## 37         Lockheed             0             79
## 38              AEB             3              0
## 39          Starsem             0              1
## 40        RVSN USSR             0           1777
## 41              EER             0              1
## 42 General Dynamics             0            251
## 43  Martin Marietta             0            114
## 44         Yuzhmash             0              2
## 45          Douglas             0              1
## 46              ASI             0              9
## 47     US Air Force             0            161
## 48             CNES             0              8
## 49           CECLES             0              4
## 50              RAE             0              2
## 51               UT             0              5
## 52          OKB-586             0              2
## 53             AMBA             0              8
## 54    Arme de l'Air             0              4
## 55          US Navy             0             17
```

since it is difficult to show the barplots for active and retired rocket for eaxh company, so i have taken a sample of size 15 to draw the plots.

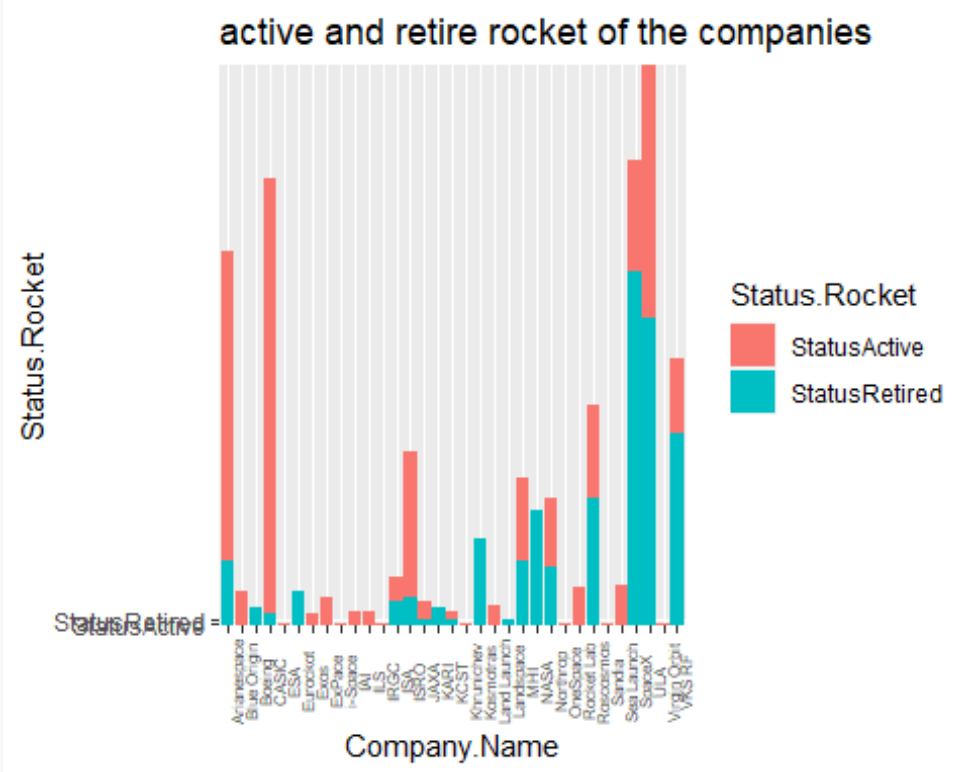
```
library(dplyr)
Sample_rocket_status=sample(company,size=15)
sample_active_number=c()
 sample_retired_number=c()
for( i in Sample_rocket_status){
  sample_active_number=c(sample_active_number,nrow(filter(Global_Space_Launch
es,Company.Name==i,Status.Rocket=='StatusActive')))
  sample_retired_number=c(sample_retired_number,nrow(filter(Global_Space_Laun
ches,Company.Name==i,Status.Rocket=='StatusRetired')))
}
barplot(sample_active_number,names.arg = Sample_rocket_status,las=2,col =c('r
ed','green','blue'),main = 'barplot for active rocket')
```




```
barplot(sample_retired_number,names.arg = Sample_rocket_status,las=2,col =c('
red','green','blue'),main = 'barplot for retired rocket')
```



```
library(ggplot2)
o1=Global_Space_Launches[,c(1,4)]
ggplot(head(o1,900),aes(x=Company.Name,y=Status.Rocket,fill=Status.Rocket))+g
eom_bar(stat = 'identi ty')+theme(axis.text.x = element_text(angle = 90,size
= 6))+ggtitle("active and ret

ire rocket of the companies")
```




```
subset(rocket_status,status_active==max(active_number))

##   Company_Name status_active status_retired
## 2        CASIC           212             44

subset(rocket_status,status_active==min(active_number))

##        Company_Name     status_active   status_retired
## 22        Landspace                 0               1
## 23         Eurockot                 0              13
## 27        Kosmotras                 0              22
## 30             KARI                 0               3
## 32             NASA                 0             203
## 34             ISAS                 0              30
## 35              SRC                 0               3
## 37         Lockheed                 0              79
## 39          Starsem                 0               1
## 40        RVSN USSR                 0            1777
```

```
## 41              EER             0              1
## 42 General Dynamics             0            251
## 43  Martin Marietta             0            114
## 44         Yuzhmash             0              2
## 45          Douglas             0              1
## 46              ASI             0              9
## 47     US Air Force             0            161
## 48             CNES             0              8
## 49           CECLES             0              4
## 50              RAE             0              2
## 51               UT             0              5
## 52          OKB-586             0              2
## 53             AMBA             0              8
## 54    Arme de l'Air             0              4
## 55          US Navy             0             17

subset(rocket_status,status_retired==max(retired_number))

##    Company_Name status_active status_retired
## 40    RVSN USSR             0           1777

subset(rocket_status,status_retired==min(retired_number))

##    Company_Name status_active status_retired
## 7         ExPace            10              0
## 9     Rocket Lab            13              0
## 10 Virgin Orbit             1              0
## 13         IRGC             1              0
## 16  Blue Origin            12              0
## 18         Exos             4              0
## 20      i-Space             1              0
## 21     OneSpace             1              0
## 24  Land Launch             7              0
## 26       Sandia             1              0
## 28   Khrunichev             1              0
## 29   Sea Launch            36              0
## 38          AEB             3              0
```

so company 'CASIC' possess max number of active rocket, and 'RVSN USSR' possess max number of retire rocket, whereas several companies has all active and all retire rocket.

```
library(dplyr)
success=c()
faliure=c()
prelaunch_faliure=c()
partial_faliure=c()
for(i in company){
  success=c(success,nrow(filter(Global_Space_Launches,Company.Name==i,Status.
Mission=="Success")))
  faliure=c(faliure,nrow(filter(Global_Space_Launches,Company.Name==i,Status.
Mission=="Failure")))
```

```
  prelaunch_faliure=c(prelaunch_faliure,nrow(filter(Global_Space_Launches,Com
pany.Name==i,Status.Mission=="Prelaunch Failure")))
  partial_faliure=c(partial_faliure,nrow(filter(Global_Space_Launches,Company
.Name==i,Status.Mission=="Partial Failure")))
}
mission_status<-data.frame(cbind(company,No_success=success,No_faliure=faliur
e,No_prelaunch_faliure=prelaunch_faliure,No_partial_faliure=partial_faliure))
mission_status
```

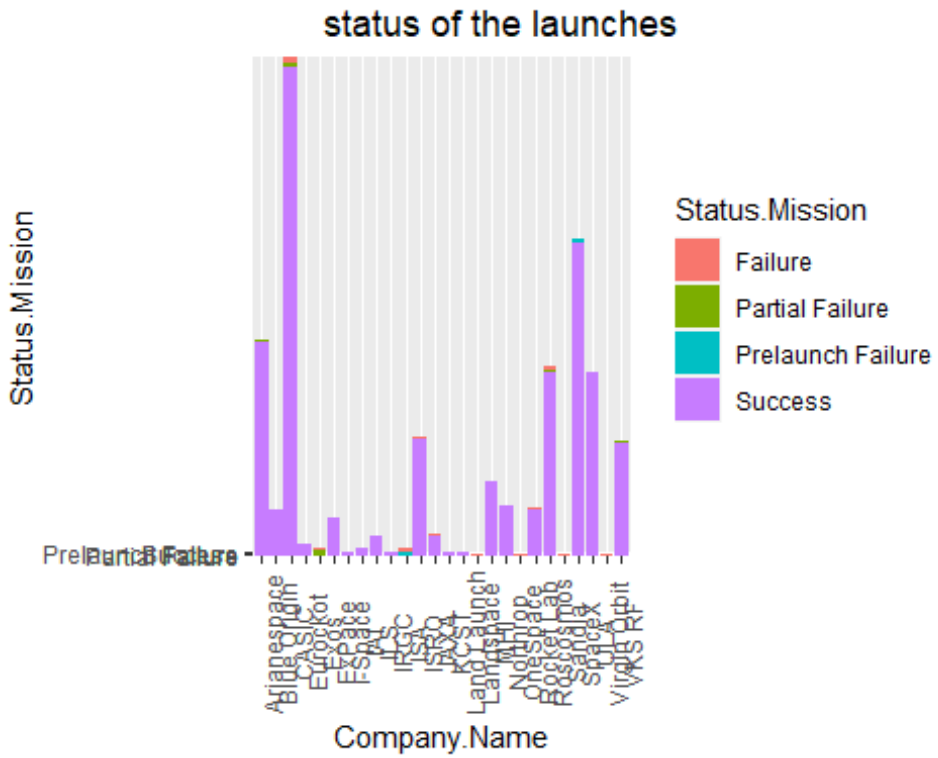
```
##             company    No_success     No_faliure     No_prelaunch_faliure
## 1            SpaceX         94          4                    1
## 2             CASIC        234         16                    0
## 3         Roscosmos         51          3                    0
## 4               ULA        139          0                    0
## 5              JAXA          6          1                    0
## 6          Northrop         74          7                    0
## 7            ExPace          9          1                    0
## 8               IAI          9          2                    0
## 9        Rocket Lab         11          2                    0
## 10     Virgin Orbit          0          1                    0
## 11           VKS RF        188          7                    0
## 12              MHI         80          2                    0
## 13             IRGC          1          0                    0
## 14      Arianespace        269          7                    0
## 15              ISA          4          8                    1
## 16      Blue Origin         12          0                    0
## 17             ISRO         63          8                    0
## 18             Exos          0          1                    0
## 19              ILS         45          0                    0
## 20          i-Space          1          0                    0
## 21         OneSpace          0          1                    0
## 22        Landspace          0          1                    0
## 23         Eurockot         12          1                    0
## 24      Land Launch          6          0                    0
## 25             KCST          2          3                    0
## 26            Sandia         0          1                    0
## 27        Kosmotras         21          1                    0
## 28       Khrunichev          1          0                    0
## 29       Sea Launch         33          3                    0
## 30             KARI          1          2                    0
## 31              ESA          9          3                    0
## 32             NASA        186         11                    0
## 33           Boeing        131          3                    0
## 34             ISAS         26          3                    0
## 35              SRC          2          1                    0
## 36             MITT          6          1                    0
## 37         Lockheed         74          5                    0
## 38              AEB          0          2                    1
## 39          Starsem          1          0                    0
## 40        RVSN USSR       1614        121                    1
```

```
## 41              EER          0          1                     0
## 42 General Dynamics        203         37                     0
## 43  Martin Marietta        100         11                     0
## 44         Yuzhmash          2          0                     0
## 45          Douglas          1          0                     0
## 46              ASI          9          0                     0
## 47     US Air Force        129         30                     0
## 48             CNES          6          2                     0
## 49           CECLES          1          3                     0
## 50              RAE          1          1                     0
## 51               UT          1          4                     0
## 52          OKB-586          2          0                     0
## 53             AMBA          4          3                     0
## 54    Arme de l'Air          3          0                     0
## 55          US Navy          2         14                     0
##    No_partial_faliure
## 1                   1
## 2                   6
## 3                   1
## 4                   1
## 5                   0
## 6                   2
## 7                   0
## 8                   0
## 9                   0
## 10                  0
## 11                  6
## 12                  2
## 13                  0
## 14                  3
## 15                  0
## 16                  0
## 17                  5
## 18                  3
## 19                  1
## 20                  0
## 21                  0
## 22                  0
## 23                  0
## 24                  1
## 25                  0
## 26                  0
## 27                  0
## 28                  0
## 29                  0
## 30                  0
## 31                  1
## 32                  6
## 33                  2
## 34                  1
```

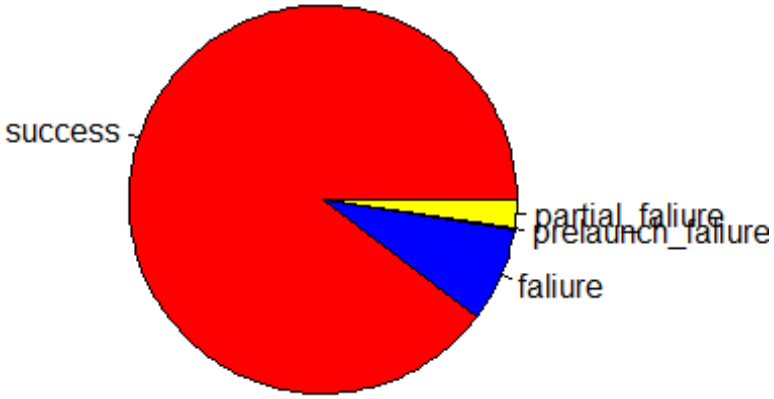
```
## 35                   0
## 36                   0
## 37                   0
## 38                   0
## 39                   0
## 40                  41
## 41                   0
## 42                  11
## 43                   3
## 44                   0
## 45                   0
## 46                   0
## 47                   2
## 48                   0
## 49                   0
## 50                   0
## 51                   0
## 52                   0
## 53                   1
## 54                   1
## 55                   1
```

below is the barplot for mission_status, I have shown the barplot for 1st 500 entries, otherwise it's becoming too congested.

```
library(ggplot2)
mission_data=Global_Space_Launches[,c(1,6)]
ggplot(head(mission_data,500),aes(x=Company.Name,y=Status.Mission,fill=Status
.Mission))+geom_bar(stat = 'identity')+theme(axis.text.x = element_text(angle
= 90))+ggtitle("       status of the launches")
```




```
pie(x=c(sum(success), sum(faliure), sum(prelaunch_faliure),sum(partial_faliur
e)),labels=c('success','faliure','prelaunch_faliure','partial_faliure'),col=c
('red','blue','green','yellow'),radius=1 )
```




```
subset(mission_status,No_success==max(as.integer(mission_status$No_success)))
```

```
##    company   No_success No_faliure No_prelaunch_faliure No_partial_faliure
## 40 RVSN USSR       1614        121                    1                 41
```

So RVSN USSR has mximum number of success in launching

```
subset(mission_status,No_faliure==max(as.integer(mission_status$No_faliure)))
```

```
##      company No_success No_faliure No_prelaunch_faliure No_partial_faliure
## 40 RVSN USSR       1614        121                    1                 41
```

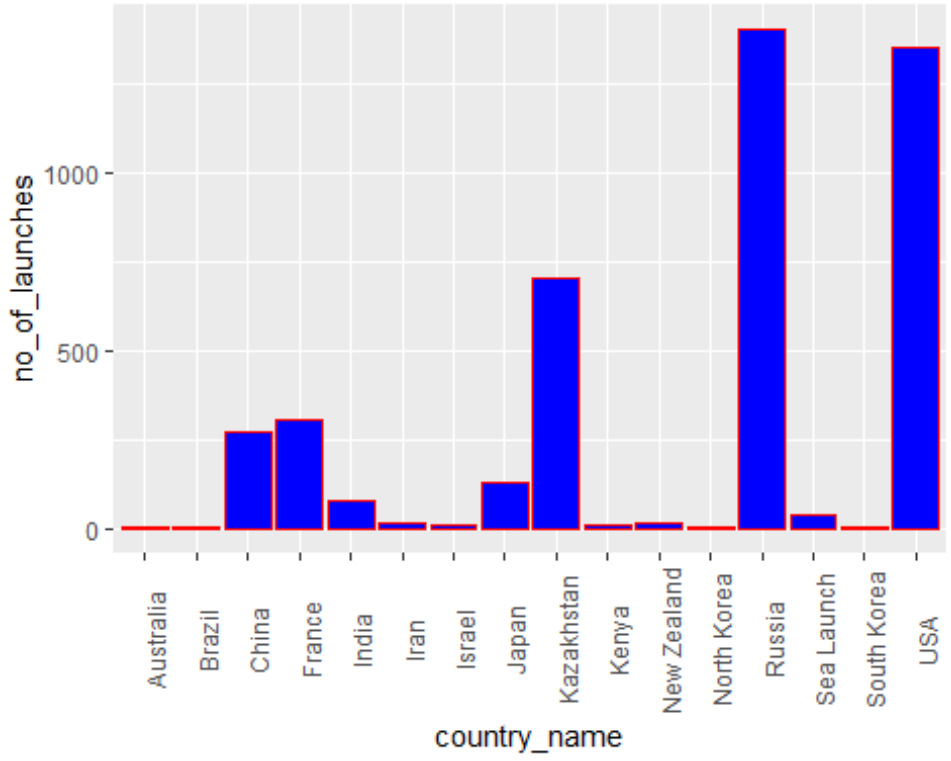
this comapny also holds a record in maximum number of unsuccessful launches.

```
country=unique(Global_Space_Launches$Country.of.Launch)
total_launch=c()
for(i in country){
  total_launch=c(total_launch,nrow(subset(Global_Space_Launches,Country.of.La
unch==i)))
}
country_data=data.frame(cbind(country_name=country,no_of_launch=total_launch)
```

```
)
country_data
```

```
##    country_name no_of_launch
## 1           USA         1351
## 2         China          269
## 3    Kazakhstan          701
## 4         Japan          126
## 5        Israel           11
## 6   New Zealand           13
## 7        Russia         1398
## 8          Iran           14
## 9        France          303
## 10        India           76
## 11  North Korea            5
## 12   Sea Launch           36
## 13  South Korea            3
## 14       Brazil            3
## 15        Kenya            9
## 16    Australia            6
```

```
library(ggplot2)
library(dplyr)
ggplot(arrange(country_data,as.integer(no_of_launch)),aes(x=country_name,y=so
rt(as.integer(no_of_launch))))+geom_bar(stat='identity',fill='blue',col="red"
)+theme(axis.text.x = element_text(angle = 90))+ylim(0,1400)+labs(x="country_
name",y="no_of_launches")
```



most of the launches happend in usa and russia, of all the lauches aprroximately 31.24% occured in usa and 32.33% occured in Russia.kazakistan is in 3rd place in this mission.

below is the table of all the comanies and its coresponding companies

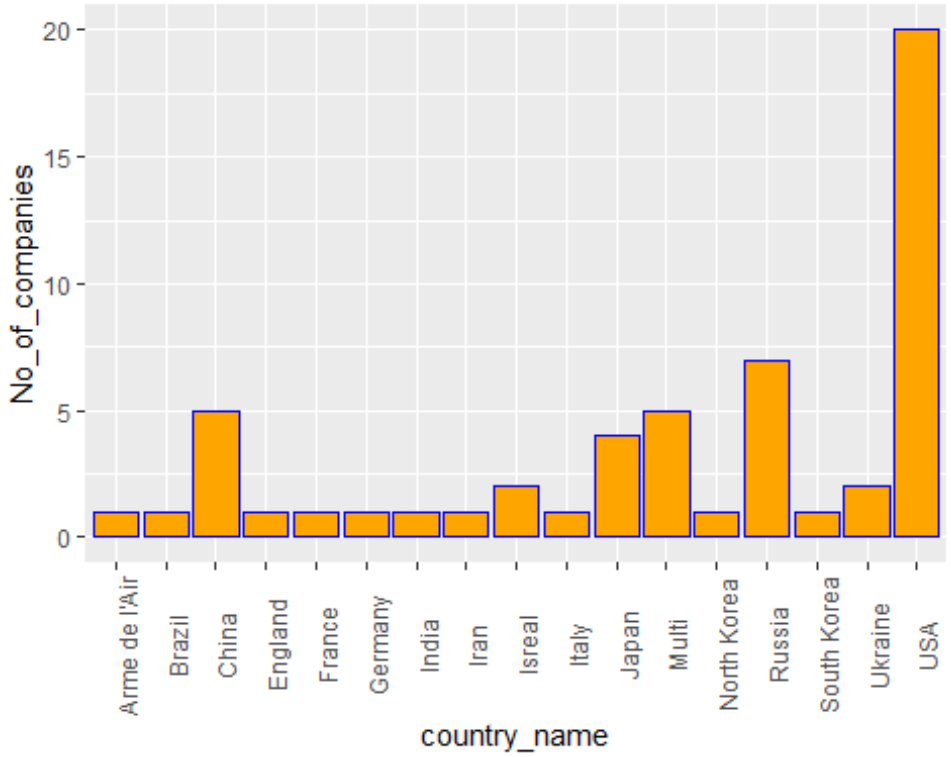
```
company_data=unique(Global_Space_Launches[c(1,8)])

company_data
```

```
##          Company.Name          Companys.Country.of.Origin
## 1              SpaceX                                 USA
## 2               CASIC                               China
## 4           Roscosmos                              Russia
## 5                 ULA                                 USA
## 10              JAXA                               Japan
## 11          Northrop                                 USA
## 12            ExPace                               China
## 14               IAI                              Isreal
## 16        Rocket Lab                                 USA
## 28       Virgin Orbit                                USA
## 29             VKS RF                              Russia
## 30                MHI                               Japan
## 36               IRGC                                Iran
## 41        Arianespace                               Multi
## 53                ISA                              Isreal
## 72        Blue Origin                                 USA
## 73               ISRO                               India
## 92               Exos                                USA
## 96                ILS                                USA
## 121           i-Space                               China
## 153          OneSpace                               China
## 203         Landspace                               China
## 251          Eurockot                             Germany
## 290       Land Launch                               Multi
## 462              KCST                         North Korea
## 482            Sandia                                USA
## 512         Kosmotras                              Russia
## 524        Khrunichev                              Russia
## 557        Sea Launch                               Multi
## 620              KARI                         South Korea
## 658               ESA                               Multi
## 683              NASA                                USA
## 895            Boeing                                USA
## 903               ISAS                              Japan
## 921               SRC                                 USA
## 925              MITT                              Russia
## 942          Lockheed                                USA
## 1033              AEB                              Brazil
## 1047          Starsem                              Russia
## 1300        RVSN USSR                              Russia
```

```
## 1484              EER                          USA
## 1519 General Dynamics                          USA
## 1534  Martin Marietta                          USA
## 1720         Yuzhmash                       Ukraine
## 1895          Douglas                          USA
## 1953              ASI                        Italy
## 2208     US Air Force                          USA
## 2888             CNES                       France
## 3300           CECLES                        Multi
## 3303              RAE                      England
## 3490               UT                        Japan
## 3686          OKB-586                       Ukraine
## 3712             AMBA                          USA
## 3801    Arme de l'Air             Arme de l'Air
## 4278          US Navy                          USA
```

barplot for countries and the companies which the company belongs to

```
library(ggplot2)
val1=unique(company_data$Companys.Country.of.Origin)
val=c()
for(i in val1){
  val=c(val,nrow(subset(company_data,Companys.Country.of.Origin==i)))
}
o=data.frame(cbind(country_name=val1,No_of_companies=val))
ggplot(arrange(o,as.integer(No_of_companies)),aes(x=country_name,y=sort(as.in
teger(No_of_companies))))+geom_bar(stat='identity',fill='orange',col='blue')+
theme(axis.text.x = element_text(angle = 90))+labs(x='country_name',y='No_of_
companies')
```

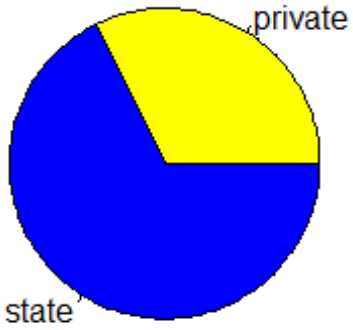



```
 nrow(subset(company_data,Companys.Country.of.Origin=="USA"))
```

```
## [1] 20
```

pie chart for state and private companies participated in rocket launch.

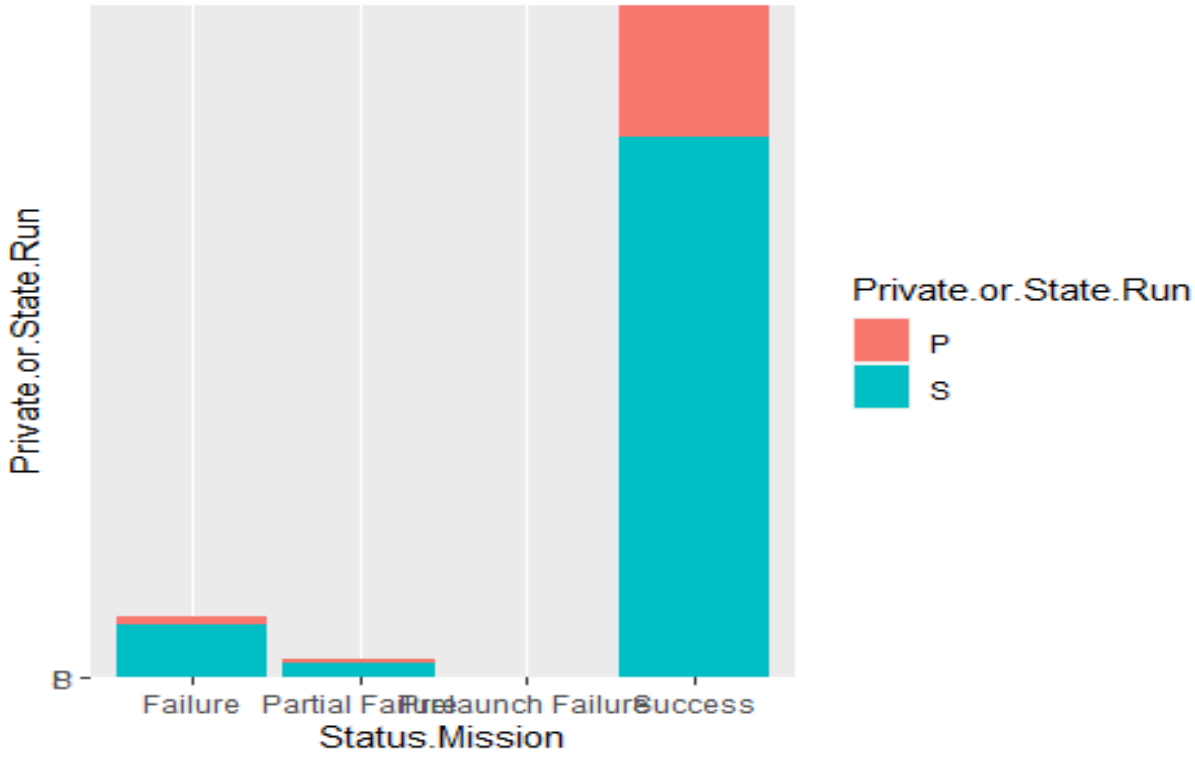
```
pri=nrow(subset(Global_Space_Launches,Private.or.State.Run=='P'))
sta=nrow(subset(Global_Space_Launches,Private.or.State.Run=='S'))
pie(x=c(pri,sta),labels=c('private','state'),col=c('yellow','blue'))
```




so it is clear from the pie chart that majority of the launches are state project.

bivariate plot for success, falure of launch over government and private project

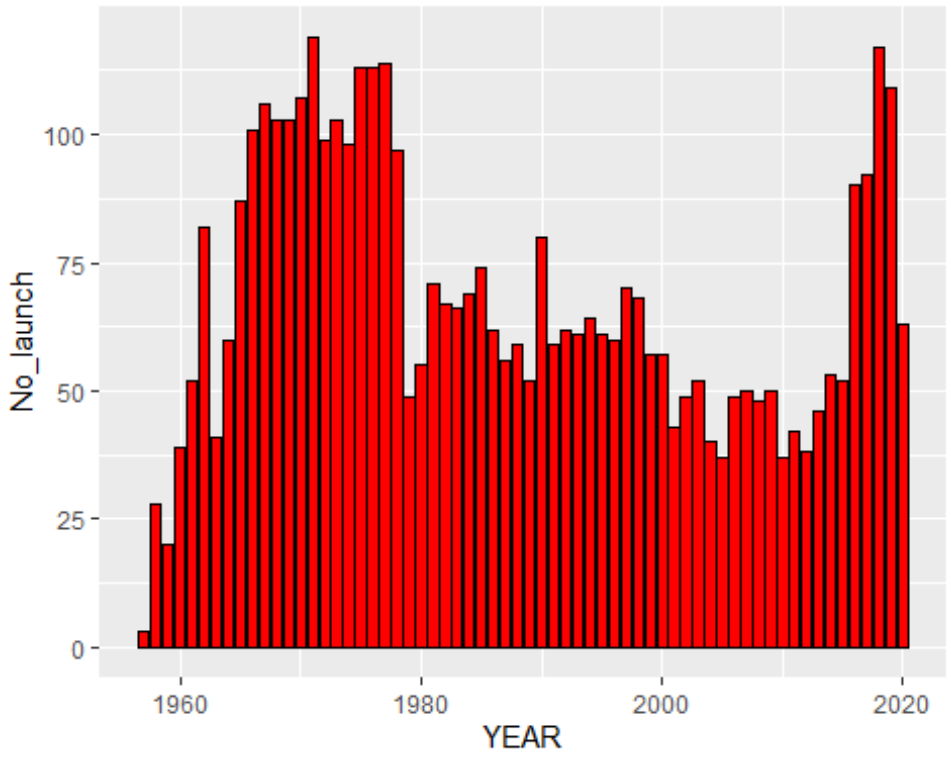
```
check1=Global_Space_Launches[,c(6,9)]
ggplot(check1,aes(x=Status.Mission,y=Private.or.State.Run,fill=Private.or.Sta
te.Run))+geom_bar(stat='identity')
```



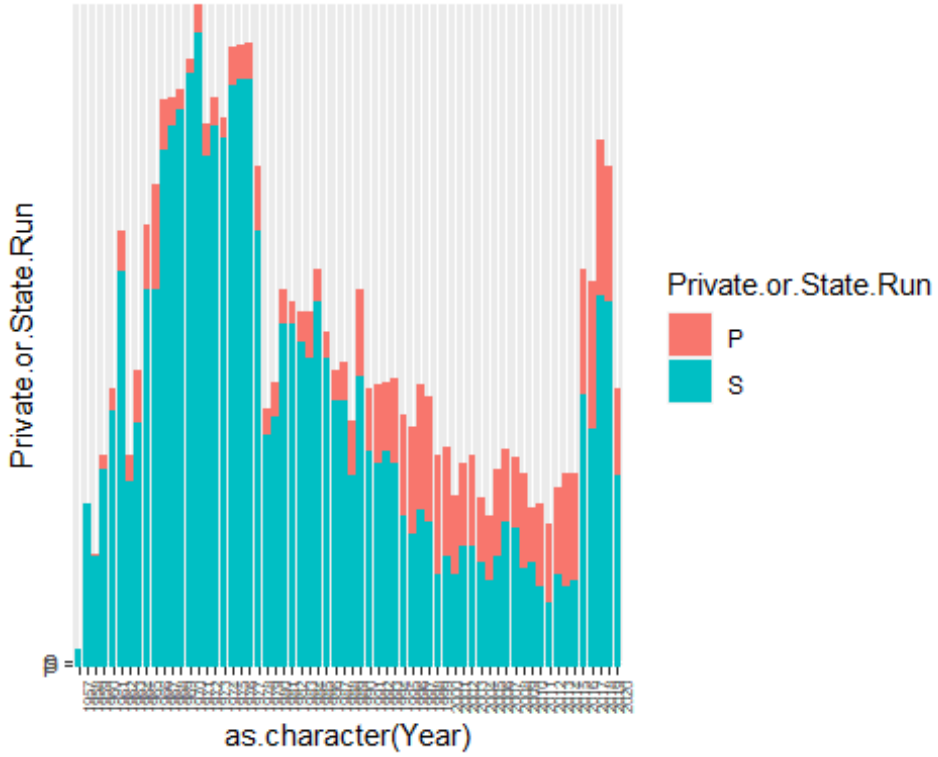

it is clear from the plot that the success rate is higher for state category.

barplot for number of launches in a particular year.

```
library(ggplot2)
year=unique(Global_Space_Launches$Year)
no_of_launch_year=c()
for(i in year){
  no_of_launch_year=c(no_of_launch_year,nrow(subset(Global_Space_Launches,Yea
r==i)))

}
year_data=data.frame(cbind(YEAR=year,No_launch=no_of_launch_year))
ggplot(year_data,aes(x=YEAR,y=No_launch))+geom_bar(stat = 'identity',fill='re
d',col='black')
```




```
library(ggplot2)
library(dplyr)
demo=Global_Space_Launches[,c(9,11)]
ggplot(demo,aes(x=as.character(Year),y= Private.or.State.Run,fill=Private.or.
State.Run))+geom_bar(stat='identity')+theme(axis.text.x = element_text(angle=
90,size = 6))
```




```
subset(year_data,No_launch==max(year_data$No_launch))
```

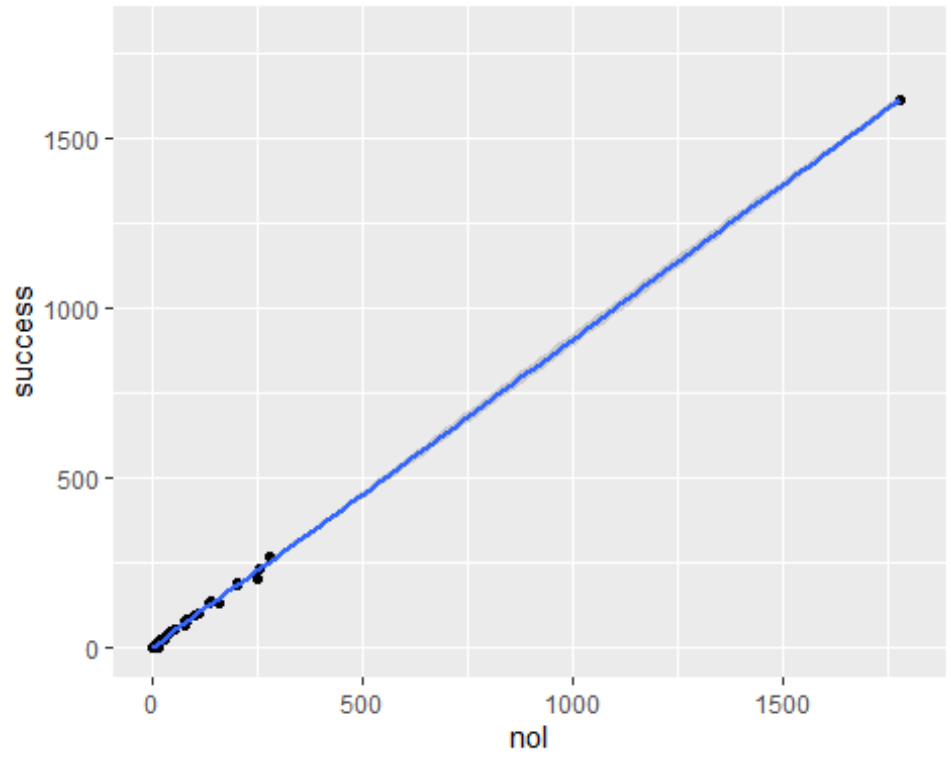
```
##    YEAR No_launch
## 50 1971       119
```

so in 1971 maximum number of launches took place.

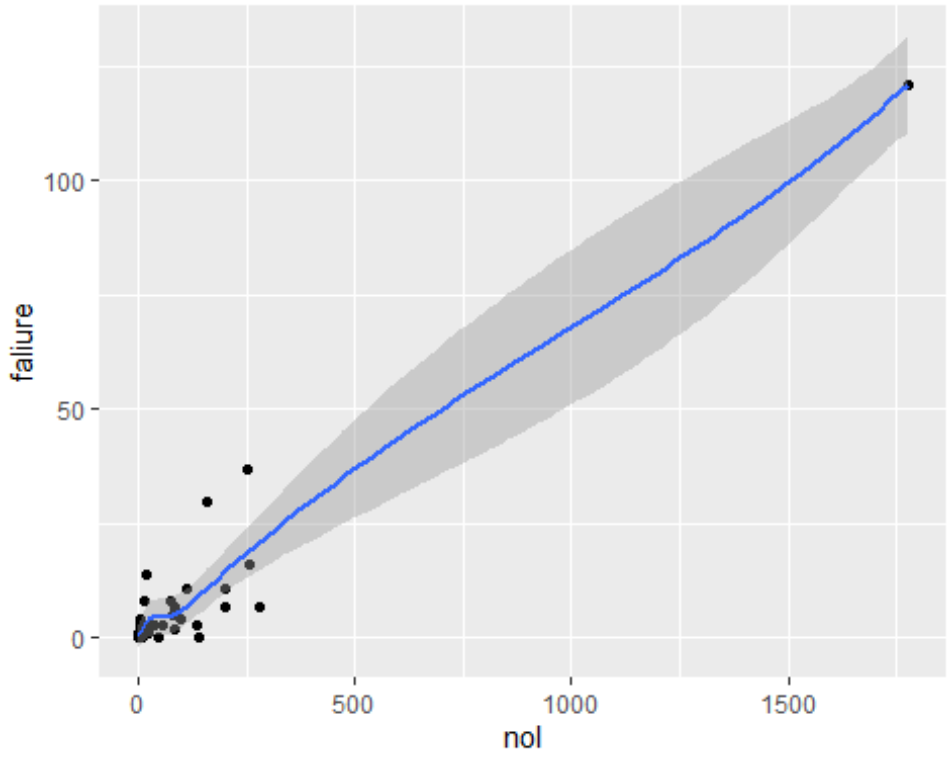
bivariate plots of number of success and number of faliure over total number of launch for each comapny

```
library(ggplot2)
check=data.frame(cbind(company_name=company,no_of_launch=nol,no_of_success=su
ccess,no_of_faliure=faliure))
qplot(nol,success,data=check,geom = c("point", "smooth"),xlim = c(0,1800),yli
m = c(0,1800))
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```

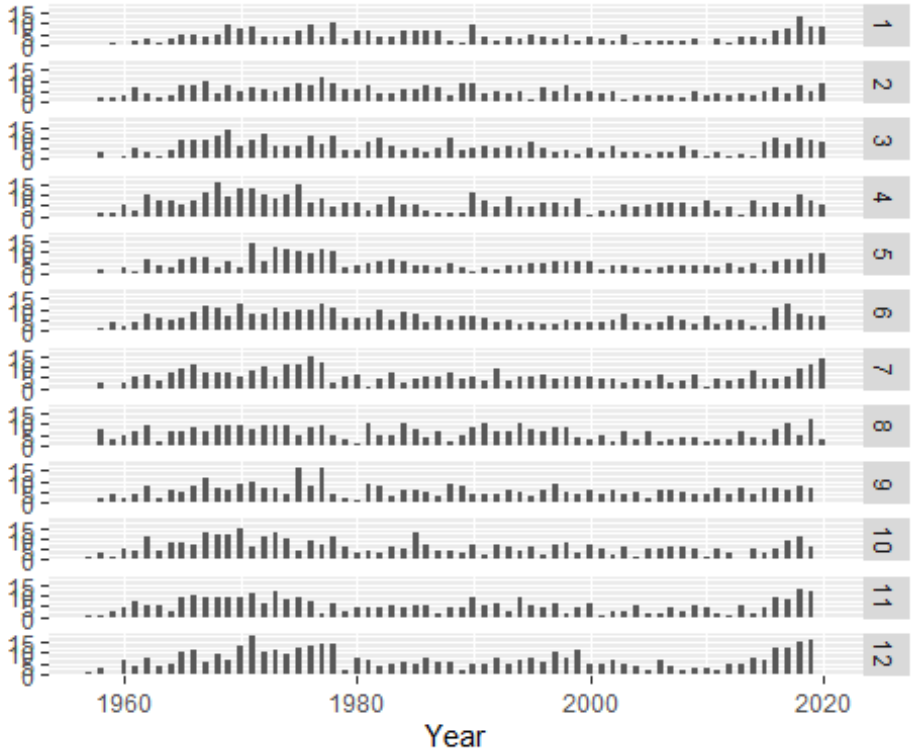



```
qplot(nol,faliure,data=check,geom = c("point", "smooth"))

## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



bivariate plot for number of launches of every year from 1957 to 2020 over each months

```
library(ggplot2)
qplot(Year,data=Global_Space_Launches,facets = Month ~.,geom="histogram",stat
="count",binwidth = 0.5)

## Warning: `stat` is deprecated
```




**CONCLUSION**:- From all the univarite and multivariate plots and charts i have reache to certain number of comclusion.

1) The Russian Company **RVVN USSR** has launched maximum number of rockets.
2) Of all the rockets launched most of them are now currently in "retired" condition.
3) Company **'CASIC'** possess max number of active rocket, and for **'RVVN USSR'** all the rockets are currently retired.
4) Majority of the launches are successful. **RVVN USSR** holds a record of maximum number of success and failure both.
5) Majority of those launches took place in **USA, USSR**, and **Kazakhstan.**
6) The private companies are mainly from **USA.** It has a total of 20 private and state companies.
7) Among all the launches more than 50% are from **state category**.
8) the Companies which are from state category are more successful in launching than the private companies
9) the number of launches per year doesn't follow a fixed pattern. so we can't predict from this data that the no of launch will gradually increase over the year in future.

however the number of private company is increasing over the year. maximum number of launch took place in 1971.

10) The total Number of launch and total number success depends on each other almost linearly.but the same can't be predicted in case of failure.

**As the project is named privatization of space, my final conclusion is:- since not majority of the launches are yet from private companies. so the space has not become privatized yet, but maybe in near future private companies will be in lead role for rocket launching.**