Austin Market Project

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Exercise One

```
#Load in & vector data
market <- read_csv("Data for Exercise 1 - 2.csv")
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   Quarter = col_character(),
##   `Building ID` = col_double(),
##   `Property Name` = col_character(),
##   `Vacant SF Direct` = col_number(),
##   `Vacant SF Sublease` = col_double(),
##   `Base Rent` = col_character(),
##   `Op/Ex` = col_character()
## )
```

```
properties <- read_csv("Data for Exercise 1 - Landlord Representation Pitch.csv")
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   `Building ID` = col_double(),
##   `Property Name` = col_character(),
##   `Property Size` = col_number(),
##   `Property Submarket` = col_character(),
##   `Year Built` = col_double(),
##   Stories = col_double(),
##   Class = col_character()
## )
```

```
dev_pipe<- read_csv("Development Pipeline.csv")
```

```
## Warning: Missing column names filled in: 'X6' [6], 'X7' [7], 'X8' [8], 'X9' [9]
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   Development = col_character(),
##   `Property Size` = col_character(),
##   Percent = col_character(),
##   Submarket = col_character(),
##   Quarter = col_character(),
##   X6 = col_logical(),
```

```
##   X7 = col_character(),
##   X8 = col_logical(),
##   X9 = col_logical()
## )
```

```
Leases <- read_csv("Leases.csv")
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   Tenant = col_character(),
##   Submarket = col_character(),
##   `Transaction Type` = col_character(),
##   Size = col_number(),
##   Commencement = col_character(),
##   `Lease Term (Months)` = col_double(),
##   `Lease Expiration` = col_character(),
##   `Lease Execution` = col_character(),
##   `Start NNN Lease Rate` = col_character(),
##   `Operating Expenses` = col_character(),
##   TI = col_character(),
##   `Escalation Amount` = col_double(),
##   `Escalation Type` = col_character(),
##   `Lease Free Rent (Months)` = col_double(),
##   `Free Rent Type` = col_character()
## )
```

```
#Join Datasets
df<-left_join(market,properties,by = "Building ID")
df$`Base Rent` = as.numeric(gsub("[\\$,]", "", df$`Base Rent`))
df$`Op/Ex` = as.numeric(gsub("[\\$,]", "", df$`Op/Ex`))
dev_pipe$`Property Size` = as.numeric(gsub("[\\SF,]","",dev_pipe$`Property Size`))
```

Building Identification

```
#Isolate most under performing building by taking average vacancy by quarter and
#comparing to average vacancy by submarket
df%>%
  group_by(`Building ID`,Quarter)%>%
  summarise(vacancy_rate=
              (`Vacant SF Direct`+`Vacant SF Sublease`)/`Property Size`,
            `Property Submarket`)%>%
  mutate(row = row_number()) %>%
  pivot_wider(names_from = "Quarter", values_from = "vacancy_rate")%>%
  select(-row)%>%
  mutate(avg_vacancy=(sum(`2019 Q1`+`2019 Q2`+`2019 Q3`+`2019 Q4`+`2020 Q1`+
  `2020 Q2`+`2020 Q3`+`2020 Q4`+`2021 Q1`+`2021 Q2`+`2021 Q3`+`2021 Q4`+
  `2022 Q1`)/13))%>%
  arrange(-avg_vacancy)%>%
  select(-`NA`)%>%
  na.omit()%>%
  group_by(`Property Submarket`)%>%
  mutate(mean_market=mean(avg_vacancy))%>%
  mutate(performance=avg_vacancy-mean_market)%>%
```

```
  arrange(-performance)
```

```
## `summarise()` regrouping output by 'Building ID', 'Quarter' (override with `.groups` argument)
```

```
## # A tibble: 279 x 18
## # Groups:   Property Submarket [4]
##    `Building ID` `Property Subma~ `2019 Q1` `2019 Q2` `2019 Q3` `2019 Q4`
##            <dbl> <chr>                <dbl>     <dbl>     <dbl>     <dbl>
##  1           222 Northwest            0.505    0.505     0.485     0.938
##  2             1 Northwest            0.574    0.574     0.574     0.574
##  3            36 Northwest            0        0         0         0
##  4            97 Northwest            0.217    0.396     0.396     0.396
##  5           196 Northwest            0.662    0.520     0.520     0.520
##  6            33 Southwest            0        0         0.0300    0.0300
##  7           105 Northwest            0.309    0.164     0         0
##  8           296 Northwest            0.197    0.0246    0.0246    0.655
##  9            63 Northwest            0.255    0.255     0.255     0.215
## 10           218 Northwest            0.352    0.317     0.233     0.495
## # ... with 269 more rows, and 12 more variables: `2020 Q1` <dbl>, `2020
## #   Q2` <dbl>, `2020 Q3` <dbl>, `2020 Q4` <dbl>, `2021 Q1` <dbl>, `2021
## #   Q2` <dbl>, `2021 Q3` <dbl>, `2021 Q4` <dbl>, `2022 Q1` <dbl>,
## #   avg_vacancy <dbl>, mean_market <dbl>, performance <dbl>
```

From the data tables we are able to determine that the building with the lowest performance in its submarket was building 222. It has a 68% greater average vacancy rate than its submarket Northwest. Additionally, upon examining the quarterly values it can be seen that this building is trending towards higher percentage of vacancy. This rising vacancy disparity suggests that there is lots of potential yield for the building being left on the table being created by poor management.

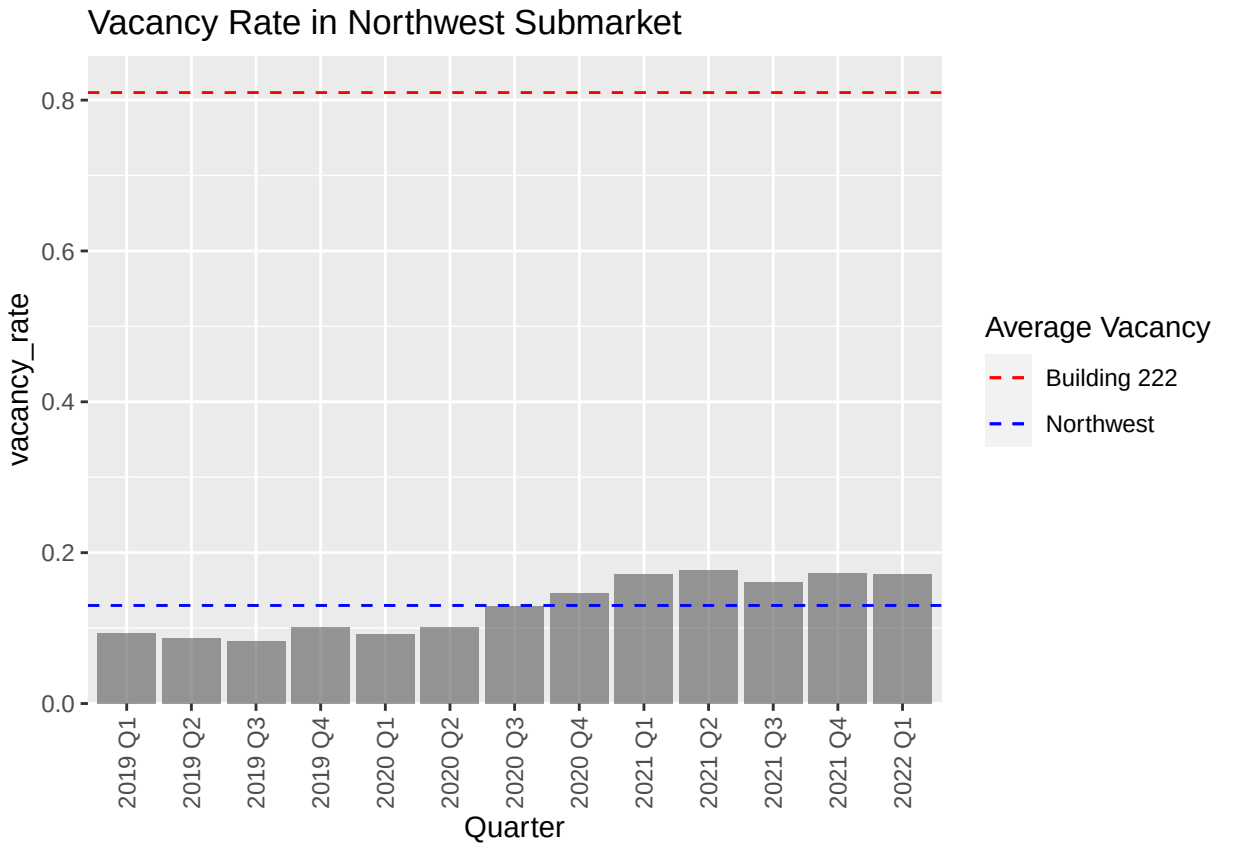
```
# Comparing the mean rent from building 222 to the mean of its submarket
df%>%
  group_by(`Building ID`)%>%
  mutate(avg_rent=mean(`Base Rent`),mean_opex=mean(`Op/Ex`))%>%
  group_by(`Property Submarket`)%>%
  mutate(submarket_rent=mean(avg_rent,na.rm = T
                             ))%>%
  mutate(diff=avg_rent-submarket_rent,na.rm = T)%>%
  select(`Building ID`,avg_rent,`Property Submarket`,
         submarket_rent,diff,`Year Built`,
         `Property Size`,mean_opex)%>%
  filter(`Building ID`==222)%>%
  unique()%>%
  print()
```

```
## # A tibble: 1 x 8
## # Groups:   Property Submarket [1]
##   `Building ID` avg_rent `Property Subma~ submarket_rent  diff `Year Built`
##           <dbl>    <dbl> <chr>                     <dbl> <dbl>        <dbl>
## 1           222     22.1 Northwest                  26.6 -4.50         1999
## # ... with 2 more variables: `Property Size` <dbl>, mean_opex <dbl>
```

The average rent of building 222 is 4.5 less than the average submarket rent.

Data Visualization

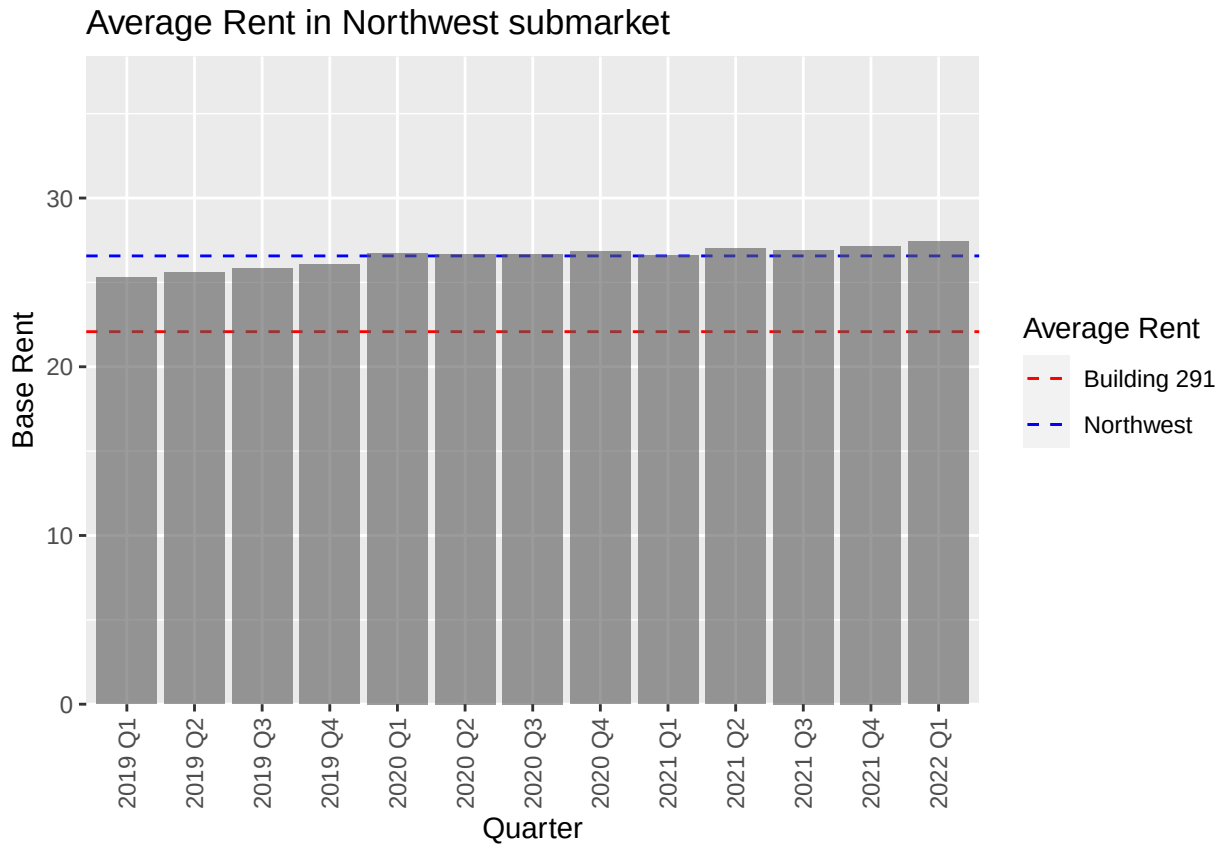
```
#Data Visualization
df%>%
  mutate(hline=0.81)%>%
  mutate(vacancy_rate=
           (`Vacant SF Direct`+`Vacant SF Sublease`)/`Property Size`)%>%
  filter(`Property Submarket`=="Northwest")%>%
  na.omit()%>%
  ggplot(aes(x = Quarter, y = vacancy_rate)) +
  geom_bar(stat = "summary", fun = "mean",position = "dodge",alpha=0.6)+
  geom_hline(aes(yintercept = hline, linetype = "Building 222"), color= 'red') +
  geom_hline(aes(yintercept = 0.13, linetype = "Northwest"), color= 'blue') +
  scale_linetype_manual(name = "Average Vacancy", values = c(2, 2),
                        guide = guide_legend(override.aes = list(color = c('red','blue'))))+
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))+
  scale_y_continuous(expand = expansion(mult = c(0, 0.06)))+
  ggtitle("Vacancy Rate in Northwest Submarket")
```



Building 222's vacancy is considerably higher than it's market average. The market average sits around 0.13 whereas the average vacancy for building 222 sits at 0.81. We see that something about this building is failing to attract the clientele that are present in the submarket they are in.

```
#Data Visualization
df%>%
  mutate(hline=22.08)%>%
  filter(`Property Submarket`=="Northwest")%>%
```

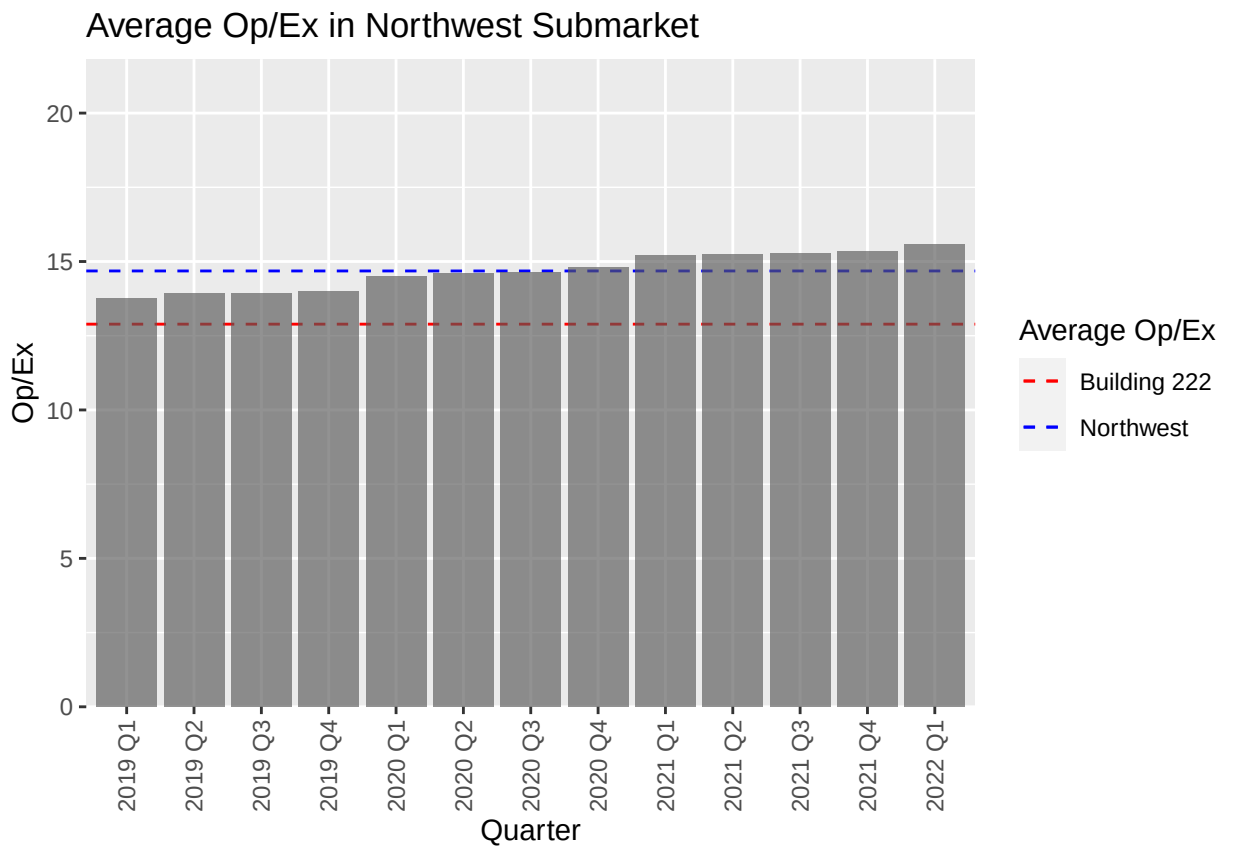
```
  mutate(total_vacant=`Vacant SF Direct`+`Vacant SF Sublease`)%>%
  mutate(prop_vacant=(total_vacant/`Property Size`))%>%
  na.omit()%>%
  ggplot(aes(x = Quarter, y = `Base Rent`)) +
   geom_hline(aes(yintercept= hline, linetype = "Building 291"),
              colour= 'red') +
   geom_hline(aes(yintercept = 26.57, linetype = "Northwest"), color= 'blue') +
  scale_linetype_manual(name = "Average Rent",
                        values = c(2, 2),
                        guide = guide_legend(override.aes = list(color = c("red","blue"))
                                             ))+
  geom_bar(stat = "summary", fun = "mean",position = "dodge",alpha=0.6)+
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))+
  scale_y_continuous(expand = expansion(mult = c(0, 0.4)))+
  ggtitle("Average Rent in Northwest submarket")
```



Building 222 shows a rent lower than the average for the Northwest submarket. The mean of the Northwest submarket is around 26.57 whereas the average rent for building 291 is much lower at 22.08. This shows us that the building has been unable to capture the profits others in the submarket have been able to.

```
#Data Visualization
df%>%
  mutate(hline=12.89)%>%
  filter(`Property Submarket`=="Northwest")%>%
  mutate(total_vacant=`Vacant SF Direct`+`Vacant SF Sublease`)%>%
  mutate(prop_vacant=(total_vacant/`Property Size`))%>%
  na.omit()%>%
```

```
  mutate(mline=mean(`Op/Ex`))%>%
  ggplot(aes(x = Quarter, y = `Op/Ex`)) +
  geom_hline(aes(yintercept= hline, linetype = "Building 222"), colour= 'red') +
  geom_hline(aes(yintercept = mline, linetype = "Northwest"), color= 'blue') +
  scale_linetype_manual(name = "Average Op/Ex", values = c(2, 2),
                        guide = guide_legend(override.aes = list(color = c("red","blue"))))+
  geom_bar(stat = "summary", fun = "mean",position = "dodge",alpha=0.65)+
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))+
  scale_y_continuous(expand = expansion(mult = c(0, 0.4)))+
  ggtitle("Average Op/Ex in Northwest Submarket")
```



Here we see that building 222's mean operating expenses are slightly lower than the average in the region. The mean op/ex for the region are slightly less than fifteen, whereas the average op/ex for building 222 are 12.89. This is suggestive of the building being of a lower quality, but ripe for investment.

Part D

A.

```
#graph showing the volume of new development expected to deliver in the
#submarket over the coming years
require(scales)
```

```
## Loading required package: scales
```

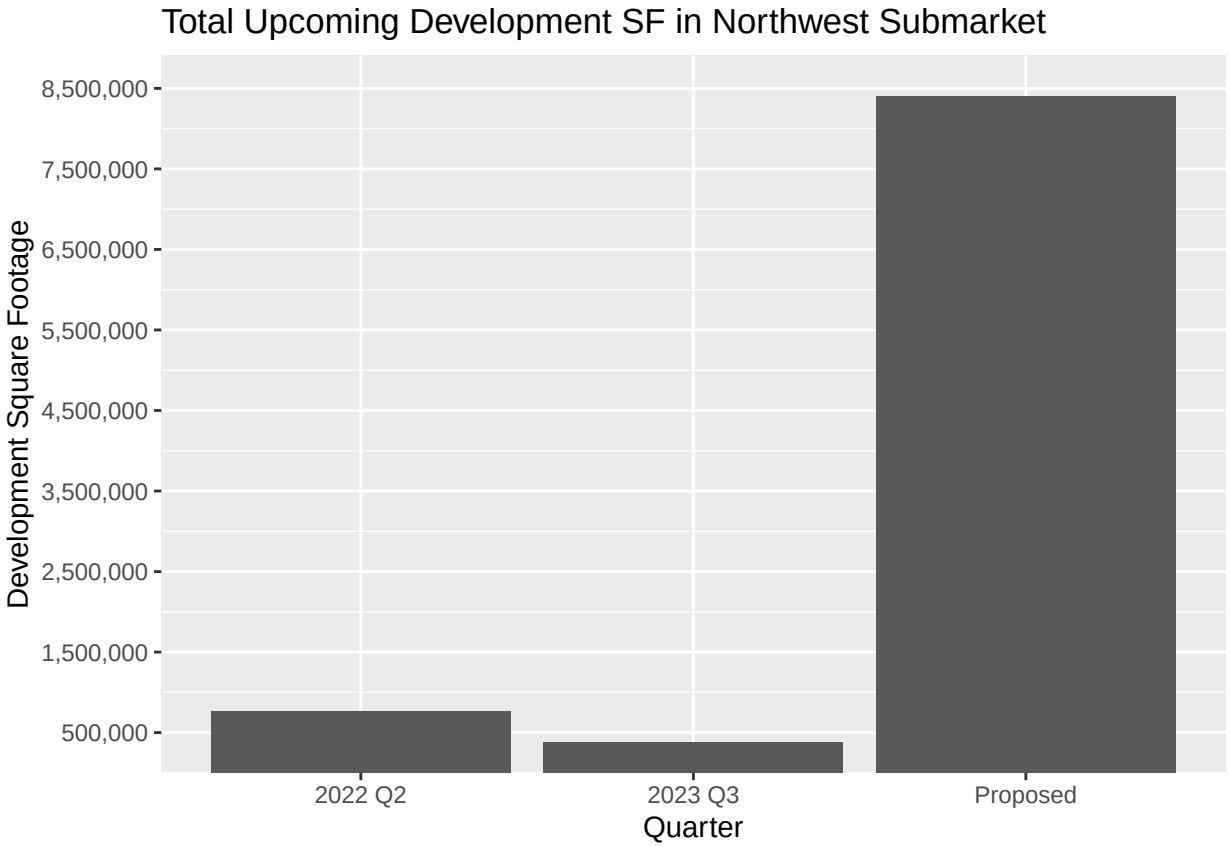
```
##
## Attaching package: 'scales'

## The following object is masked from 'package:purrr':
##
##     discard

## The following object is masked from 'package:readr':
##
##     col_factor
```

```
dev_pipe%>%
  filter(Submarket=="Northwest")%>%
  group_by(Quarter)%>%
  summarise(Total_SF=sum(`Property Size`))%>%
  ggplot(aes(x=Quarter,y=Total_SF))+
  geom_bar(stat = "identity")+
  scale_y_continuous(name="Development Square Footage",
                     expand = expansion(mult = c(0, 0.06)),
                     labels = comma,
                     breaks = c(500000,
                                1500000,
                                2500000,
                                3500000,
                                4500000,
                                5500000,
                                6500000,
                                7500000,
                                8500000))+
  ggtitle("Total Upcoming Development SF in Northwest Submarket")
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```



In this graph we can see that in the Northwest region there is a great deal of planned square footage in 2022 Q2 and 2023 Q3, but there is far more proposed SF without a set development period. This lets us know that the region is growing rapidly and will continue doing so for a long time. ## B.

```
#Create a list of lease comps signed within the last two years that are relevant
#to the landlord's building
Leases%>%
  filter(Submarket=="Northwest")%>%
  print()
```

```
## # A tibble: 142 x 15
##    Tenant Submarket `Transaction Ty~   Size Commencement `Lease Term (Mo~
##    <chr>  <chr>     <chr>             <dbl> <chr>                   <dbl>
##  1 Tenan~ Northwest Renewal            3262 11/1/2020                  36
##  2 Tenan~ Northwest New Lease         20205 9/1/2021                   27
##  3 Tenan~ Northwest Renewal           63000 5/1/2021                   69
##  4 Tenan~ Northwest Renewal           34426 5/1/2021                   69
##  5 Tenan~ Northwest Renewal           28733 5/1/2021                   69
##  6 Tenan~ Northwest New Lease          1705 8/1/2021                   65
##  7 Tenan~ Northwest <NA>               6989 7/1/2021                   18
##  8 Tenan~ Northwest New Lease          1686 <NA>                       64
##  9 Tenan~ Northwest New Lease        332000 <NA>                      115
## 10 Tenan~ Northwest New Lease          3520 5/1/2021                   24
## # ... with 132 more rows, and 9 more variables: `Lease Expiration` <chr>,
## #   `Lease Execution` <chr>, `Start NNN Lease Rate` <chr>, `Operating
## #   Expenses` <chr>, TI <chr>, `Escalation Amount` <dbl>, `Escalation
## #   Type` <chr>, `Lease Free Rent (Months)` <dbl>, `Free Rent Type` <chr>
```

With this list the investors can get a better idea of what they should be looking for with their lease for building 222. ## Propose rental rate

```
library(leaps)

df1<-df%>%
  mutate(vacancy_rate=
           (`Vacant SF Direct`+`Vacant SF Sublease`)/`Property Size`)
my_lm<-regsubsets(`Base Rent`~`Property Size`+
                    Stories+
                    `Year Built`+
                    `Op/Ex`+
                    `Property Submarket`+
                    vacancy_rate,
                  data = df1)

new_lm<-lm(`Base Rent`~`Property Size`+`Year Built`+`Op/Ex`+`Property Submarket`,data = df1)

#The model indicates that
summary(my_lm)
```

```
## Subset selection object
## Call: regsubsets.formula(`Base Rent` ~ `Property Size` + Stories +
##     `Year Built` + `Op/Ex` + `Property Submarket` + vacancy_rate,
##     data = df1)
## 8 Variables  (and intercept)
##                                Forced in Forced out
## `Property Size`                    FALSE      FALSE
## Stories                            FALSE      FALSE
## `Year Built`                       FALSE      FALSE
## `Op/Ex`                            FALSE      FALSE
## `Property Submarket`East           FALSE      FALSE
## `Property Submarket`Northwest      FALSE      FALSE
## `Property Submarket`Southwest      FALSE      FALSE
## vacancy_rate                       FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: exhaustive
##          `Property Size` Stories `Year Built` `Op/Ex` `Property Submarket`East
## 1  ( 1 ) " "             " "     " "           "*"     " "
## 2  ( 1 ) "*"             " "     " "           "*"     " "
## 3  ( 1 ) "*"             " "     " "           "*"     "*"
## 4  ( 1 ) "*"             " "     " "           "*"     "*"
## 5  ( 1 ) "*"             " "     "*"           "*"     "*"
## 6  ( 1 ) "*"             " "     "*"           "*"     "*"
## 7  ( 1 ) "*"             " "     "*"           "*"     "*"
## 8  ( 1 ) "*"             "*"     "*"           "*"     "*"
##          `Property Submarket`Northwest `Property Submarket`Southwest
## 1  ( 1 ) " "                           " "
## 2  ( 1 ) " "                           " "
## 3  ( 1 ) " "                           " "
## 4  ( 1 ) "*"                           " "
## 5  ( 1 ) "*"                           " "
## 6  ( 1 ) "*"                           "*"
## 7  ( 1 ) "*"                           "*"
## 8  ( 1 ) "*"                           "*"
```

```
##          vacancy_rate
## 1  ( 1 ) " "
## 2  ( 1 ) " "
## 3  ( 1 ) " "
## 4  ( 1 ) " "
## 5  ( 1 ) " "
## 6  ( 1 ) " "
## 7  ( 1 ) "*"
## 8  ( 1 ) "*"
```

```
#Using a combination of subset and subtractive model building, we arrive at our final variables
summary(new_lm)
```

```
##
## Call:
## lm(formula = `Base Rent` ~ `Property Size` + `Year Built` + `Op/Ex` +
##     `Property Submarket`, data = df1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13.1150  -2.5262  -0.3007   1.8948  24.9749
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                    -1.425e+02  9.242e+00 -15.417  < 2e-16 ***
## `Property Size`                 1.992e-05  9.370e-07  21.257  < 2e-16 ***
## `Year Built`                    8.054e-02  4.700e-03  17.136  < 2e-16 ***
## `Op/Ex`                         7.406e-01  2.230e-02  33.206  < 2e-16 ***
## `Property Submarket`East        4.647e+00  4.802e-01   9.678  < 2e-16 ***
## `Property Submarket`Northwest -4.567e+00  3.389e-01 -13.475  < 2e-16 ***
## `Property Submarket`Southwest -2.567e+00  3.425e-01  -7.497 8.13e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.699 on 3670 degrees of freedom
##   (989436 observations deleted due to missingness)
## Multiple R-squared:  0.7184, Adjusted R-squared:  0.7179
## F-statistic:  1560 on 6 and 3670 DF,  p-value: < 2.2e-16
```

```
#Building 222(`Property Size`= 37400,`Year Built`= 1999,`Op/Ex`= 12.89))

#`Base Rent`=-1.425e+02 + 1.992e-05(Property Size) + 8.054e-02(Year Built) +
# 7.406e-01(Op/Ex)+-4.567e+00(Property Submarket`Northwest)
predicted_rent=sum(-1.425e+02 +
                     (1.992e-05*37400) +
                     (8.054e-02*1999)+
                     (7.406e-01*12.89)+
                     (-4.567e+00*1))
print(predicted_rent)
```

```
## [1] 24.2238
```

Based on the linear model, which includes the best numeric variables after model building, the rent for building 222 should be 24.22. This will bring the rent closer to the submarket average and hopefully make it more appealing on the surface.