datafest2

```
library(tidyverse)
```

```
Warning: package 'purrr' was built under R version 4.4.3
```

```
-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.1     v tibble    3.2.1
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.0.4
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to becor
```

```
lease <- read.csv("Leases.csv")
head(lease)
```

```
  year quarter monthsigned  market           building_name
1 2018      Q1           1 Atlanta 10 Glenlake North Tower
2 2018      Q1           1 Atlanta           100 City View
3 2018      Q1           1 Atlanta           1000 Parkwood
4 2018      Q1           1 Atlanta          1100 Circle 75
5 2018      Q1           1 Atlanta            1200 Ashwood
6 2018      Q1           1 Atlanta            1200 Ashwood
                                                                    building_id
1 Atlanta_Central Perimeter_Atlanta_10 Glenlake North Tower_10 Glenlake Pky NE
```

```
2                 Atlanta_Northwest_Atlanta_100 City View_3330 Cumberland Blvd
3                 Atlanta_Northwest_Atlanta_1000 Parkwood_1000 Parkwood Cir SE
4               Atlanta_Northwest_Atlanta_1100 Circle 75_1100 Circle 75 Pky SE
5              Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
6              Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
               address region    city state   zip internal_submarket
1    10 Glenlake Pky NE  South Atlanta    GA 30328  Central Perimeter
2  3330 Cumberland Blvd  South Atlanta    GA 30339          Northwest
3  1000 Parkwood Cir SE  South Atlanta    GA 30339          Northwest
4 1100 Circle 75 Pky SE  South Atlanta    GA 30339          Northwest
5      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
6      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
  internal_class leasedSF                company_name
1              A    24736 Capital Investment Advisors
2              A      965                        <NA>
3              A     2215                   Efc Moen
4              O     1925                        <NA>
5              A     2404                        <NA>
6              A     5091                        <NA>
                internal_industry transaction_type internal_market_cluster
1 Financial Services and Insurance        Expansion                    <NA>
2                           <NA>              New                    <NA>
3                           <NA>              New                    <NA>
4                           <NA>              New                    <NA>
5                           <NA>              New                    <NA>
6                           <NA>              New                    <NA>
  costarID space_type CBD_suburban       RBA available_space
1   445509      Relet     Suburban 101140416        20239067
2   436994      Relet     Suburban 101140416        20239067
3   434890      Relet     Suburban 101140416        20239067
4   434720      Relet     Suburban  65810449        12728989
5   437562      Relet     Suburban 101140416        20239067
6   437562      Relet     Suburban 101140416        20239067
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.2001086            27.65589     24.34569
3               0.2001086            27.65589     24.34569
4               0.1934190            18.56089     24.34569
5               0.2001086            27.65589     24.34569
6               0.2001086            27.65589     24.34569
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
```

```
3                     NA                              NA
4                     NA                              NA
5                     NA                              NA
6                     NA                              NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                 NA                     NA
2                         NA                 NA                     NA
3                         NA                 NA                     NA
4                         NA                 NA                     NA
5                         NA                 NA                     NA
6                         NA                 NA                     NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                 NA
2                             NA                         NA                 NA
3                             NA                         NA                 NA
4                             NA                         NA                 NA
5                             NA                         NA                 NA
6                             NA                         NA                 NA
  leasing
1 1205126
2 1205126
3 1205126
4  715742
5 1205126
6 1205126
```

```
names(lease)
```

```
 [1] "year"                          "quarter"
 [3] "monthsigned"                   "market"
 [5] "building_name"                 "building_id"
 [7] "address"                       "region"
 [9] "city"                          "state"
[11] "zip"                           "internal_submarket"
[13] "internal_class"                "leasedSF"
[15] "company_name"                  "internal_industry"
[17] "transaction_type"              "internal_market_cluster"
[19] "costarID"                      "space_type"
[21] "CBD_suburban"                  "RBA"
[23] "available_space"               "availability_proportion"
[25] "internal_class_rent"           "overall_rent"
[27] "direct_available_space"        "direct_availability_proportion"
```

```
[29] "direct_internal_class_rent"     "direct_overall_rent"
[31] "sublet_available_space"         "sublet_availability_proportion"
[33] "sublet_internal_class_rent"     "sublet_overall_rent"
[35] "leasing"
```

```
market_price_avl <- read.csv("Price_and_Availability_Data.csv")
head(market_price_avl)
```

```
  year quarter    market internal_class       RBA available_space
1 2018      Q1   Atlanta              A 101140416        20239067
2 2018      Q1   Atlanta              O  65810449        12728989
3 2018      Q1    Austin              A  36815073         4281986
4 2018      Q1    Austin              O  27947525         3360936
5 2018      Q1 Baltimore              A  41033288         6813380
6 2018      Q1 Baltimore              O  40265706         6531089
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.1934190            18.56089     24.34569
3               0.1163107            40.38471     36.59662
4               0.1210818            30.11866     36.59662
5               0.1660452            27.10483     22.95403
6               0.1621998            20.12099     22.95403
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                 NA                     NA
2                         NA                 NA                     NA
3                         NA                 NA                     NA
4                         NA                 NA                     NA
5                         NA                 NA                     NA
6                         NA                 NA                     NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
```

```
6                              NA                              NA                    NA
  leasing
1 1205126
2  715742
3 1738905
4  185674
5  380750
6  247089
```

```
names(market_price_avl)
```

```
 [1] "year"                           "quarter"
 [3] "market"                         "internal_class"
 [5] "RBA"                            "available_space"
 [7] "availability_proportion"        "internal_class_rent"
 [9] "overall_rent"                   "direct_available_space"
[11] "direct_availability_proportion" "direct_internal_class_rent"
[13] "direct_overall_rent"            "sublet_available_space"
[15] "sublet_availability_proportion" "sublet_internal_class_rent"
[17] "sublet_overall_rent"            "leasing"
```

```
unemp <- read.csv("Unemployment.csv")
head(unemp)
```

```
  year quarter month state unemployment_rate
1 2018      Q1     1    AZ               4.9
2 2018      Q1     1    CA               4.4
3 2018      Q1     1    CO               2.9
4 2018      Q1     1    DE               4.1
5 2018      Q1     1    DC               5.9
6 2018      Q1     1    FL               3.9
```

```
names(unemp)
```

```
[1] "year"              "quarter"           "month"
[4] "state"             "unemployment_rate"
```

```
market_occup <- read.csv("Major_Market_Occupancy_Data.csv")
head(market_occup)
```

```
  year quarter          market ending_occupancy_proportion
1 2020      Q1 Washington D.C.                         0.19
2 2020      Q1       Manhattan                         0.08
3 2020      Q1         Chicago                         0.14
4 2020      Q1         Houston                         0.33
5 2020      Q1    Philadelphia                         0.20
6 2020      Q1   San Francisco                         0.09
  starting_occupancy_proportion avg_occupancy_proportion
1                          0.98                0.7857143
2                          0.98                0.7328571
3                          0.99                0.7885714
4                          0.99                0.8357143
5                          0.99                0.8171429
6                          0.99                0.7185714
```

```
names(market_occup)
```

```
[1] "year"                          "quarter"
[3] "market"                        "ending_occupancy_proportion"
[5] "starting_occupancy_proportion" "avg_occupancy_proportion"
```

```
df <- read.csv("merged_lease_unemployment_markets.csv")
head(df)
```

```
  year quarter monthsigned  market           building_name
1 2018      Q1           1 Atlanta 10 Glenlake North Tower
2 2018      Q1           1 Atlanta           100 City View
3 2018      Q1           1 Atlanta           1000 Parkwood
4 2018      Q1           1 Atlanta          1100 Circle 75
5 2018      Q1           1 Atlanta            1200 Ashwood
6 2018      Q1           1 Atlanta            1200 Ashwood
                                                                    building_id
1 Atlanta_Central Perimeter_Atlanta_10 Glenlake North Tower_10 Glenlake Pky NE
2                Atlanta_Northwest_Atlanta_100 City View_3330 Cumberland Blvd
3                Atlanta_Northwest_Atlanta_1000 Parkwood_1000 Parkwood Cir SE
4              Atlanta_Northwest_Atlanta_1100 Circle 75_1100 Circle 75 Pky SE
5             Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
6             Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
               address region    city state   zip internal_submarket
1   10 Glenlake Pky NE  South Atlanta    GA 30328  Central Perimeter
2 3330 Cumberland Blvd  South Atlanta    GA 30339          Northwest
```

```
3  1000 Parkwood Cir SE  South Atlanta    GA 30339          Northwest
4 1100 Circle 75 Pky SE  South Atlanta    GA 30339          Northwest
5      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
6      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
  internal_class leasedSF                company_name
1              A    24736 Capital Investment Advisors
2              A      965
3              A     2215                    Efc Moen
4              O     1925
5              A     2404
6              A     5091
                internal_industry transaction_type internal_market_cluster
1 Financial Services and Insurance        Expansion
2                                               New
3                                               New
4                                               New
5                                               New
6                                               New
  costarID space_type CBD_suburban       RBA available_space
1   445509      Relet     Suburban 101140416        20239067
2   436994      Relet     Suburban 101140416        20239067
3   434890      Relet     Suburban 101140416        20239067
4   434720      Relet     Suburban  65810449        12728989
5   437562      Relet     Suburban 101140416        20239067
6   437562      Relet     Suburban 101140416        20239067
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.2001086            27.65589     24.34569
3               0.2001086            27.65589     24.34569
4               0.1934190            18.56089     24.34569
5               0.2001086            27.65589     24.34569
6               0.2001086            27.65589     24.34569
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                  NA                     NA
2                         NA                  NA                     NA
3                         NA                  NA                     NA
```

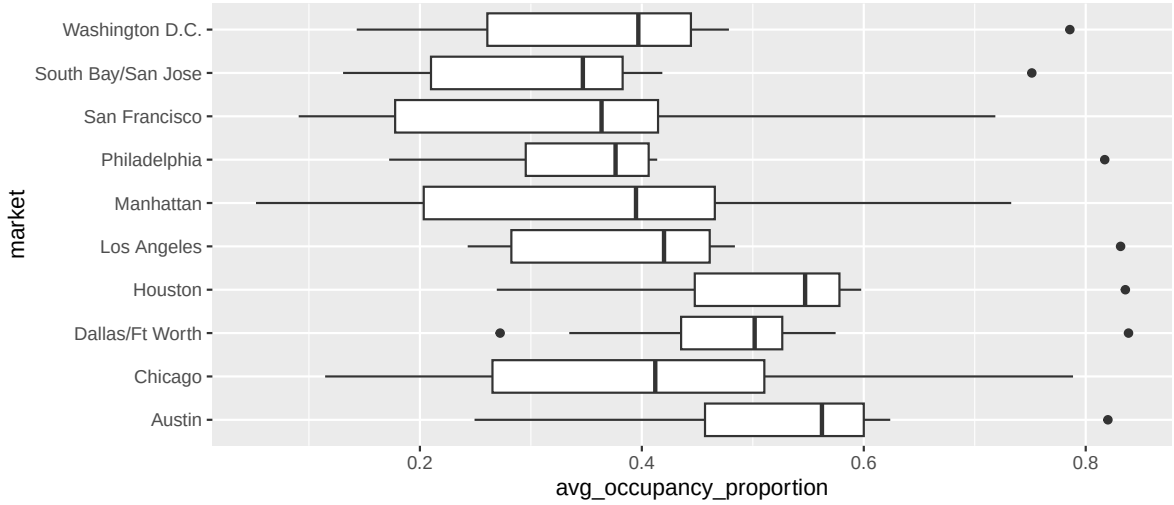
```
4                          NA                  NA                       NA
5                          NA                  NA                       NA
6                          NA                  NA                       NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing unemployment_rate ending_occupancy_proportion
1 1205126               4.3                         NA
2 1205126               4.3                         NA
3 1205126               4.3                         NA
4  715742               4.3                         NA
5 1205126               4.3                         NA
6 1205126               4.3                         NA
  starting_occupancy_proportion avg_occupancy_proportion
1                            NA                       NA
2                            NA                       NA
3                            NA                       NA
4                            NA                       NA
5                            NA                       NA
6                            NA                       NA
```

```
names(df)
```

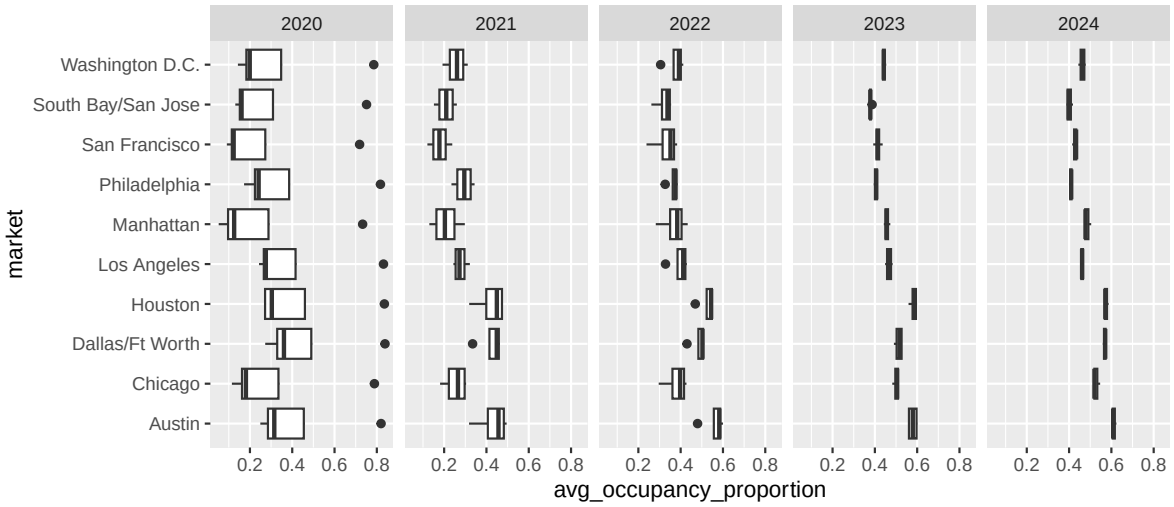
```
 [1] "year"                          "quarter"
 [3] "monthsigned"                   "market"
 [5] "building_name"                 "building_id"
 [7] "address"                       "region"
 [9] "city"                          "state"
[11] "zip"                           "internal_submarket"
[13] "internal_class"                "leasedSF"
[15] "company_name"                  "internal_industry"
[17] "transaction_type"              "internal_market_cluster"
[19] "costarID"                      "space_type"
[21] "CBD_suburban"                  "RBA"
[23] "available_space"               "availability_proportion"
[25] "internal_class_rent"           "overall_rent"
[27] "direct_available_space"        "direct_availability_proportion"
[29] "direct_internal_class_rent"    "direct_overall_rent"
```

```
[31] "sublet_available_space"          "sublet_availability_proportion"
[33] "sublet_internal_class_rent"      "sublet_overall_rent"
[35] "leasing"                         "unemployment_rate"
[37] "ending_occupancy_proportion"     "starting_occupancy_proportion"
[39] "avg_occupancy_proportion"
```

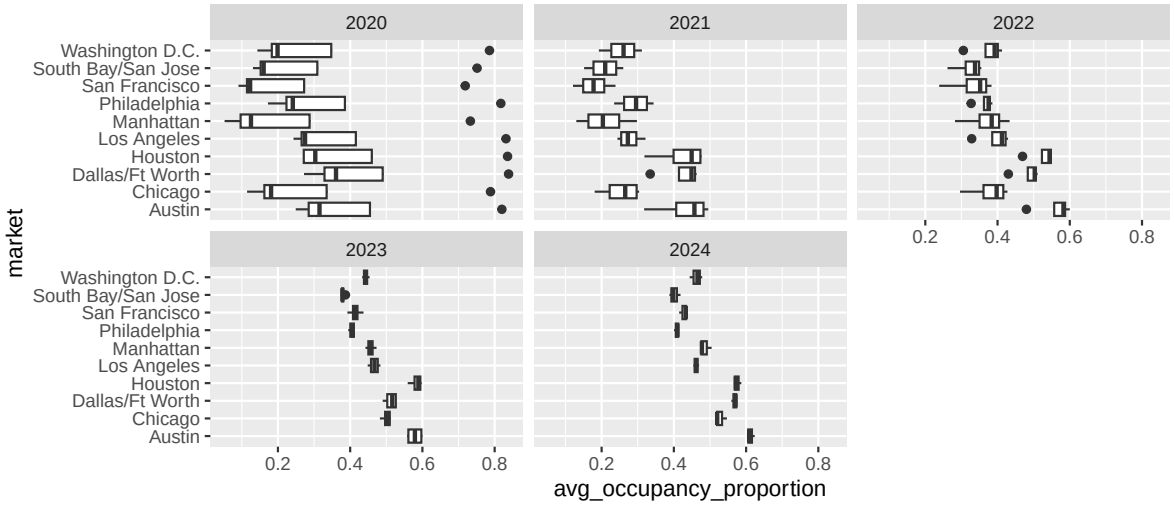
```
ggplot(market_occup, aes(market, avg_occupancy_proportion)) +
  geom_boxplot() +
  coord_flip()
```



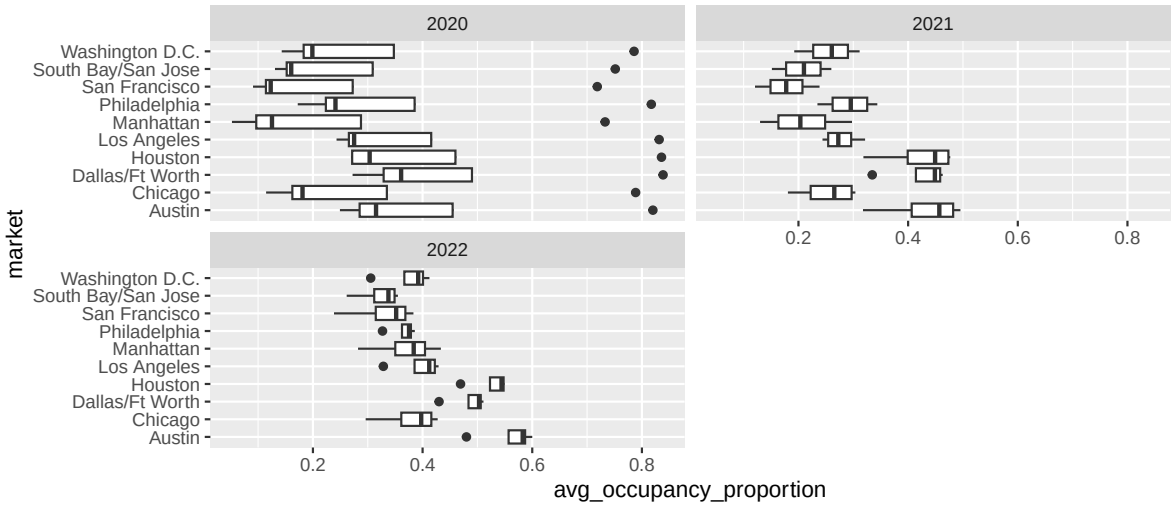

```
ggplot(market_occup, aes(market, avg_occupancy_proportion)) +
  geom_boxplot() +
  coord_flip() +
  facet_grid(~year)
```



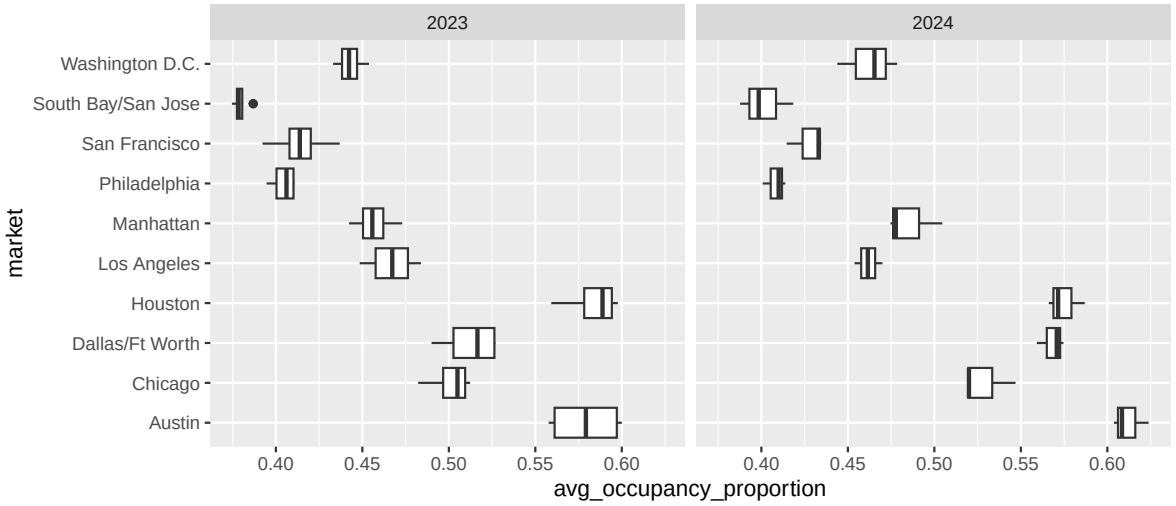

```
ggplot(market_occup, aes(market, avg_occupancy_proportion)) +
  geom_boxplot() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```




```
ggplot(market_occup %>% filter(year < 2023), aes(market, avg_occupancy_proportion)) +
  geom_boxplot() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```

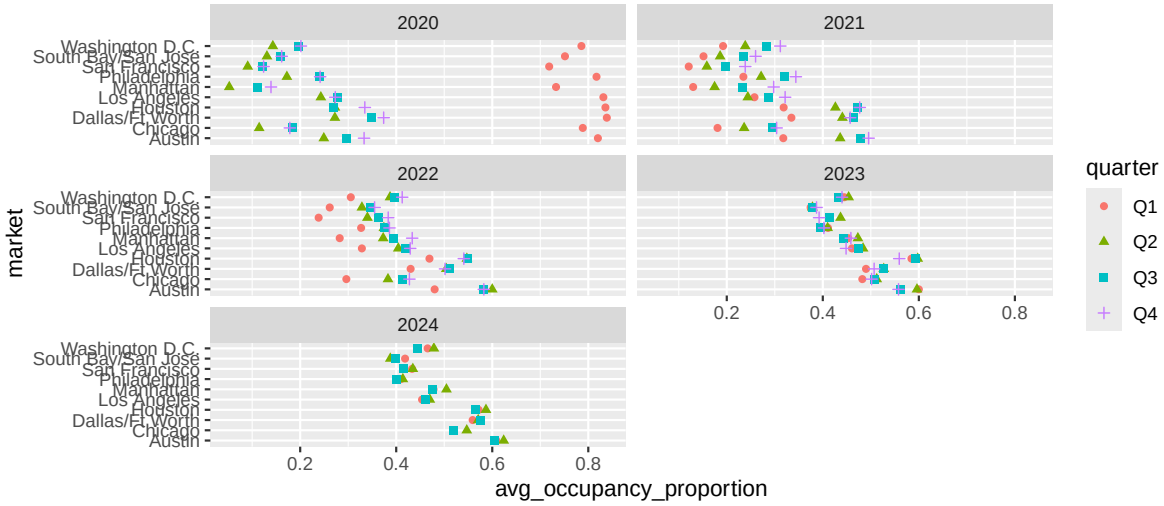



```
ggplot(market_occup %>% filter(year > 2022), aes(market, avg_occupancy_proportion)) +
  geom_boxplot() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 1)
```

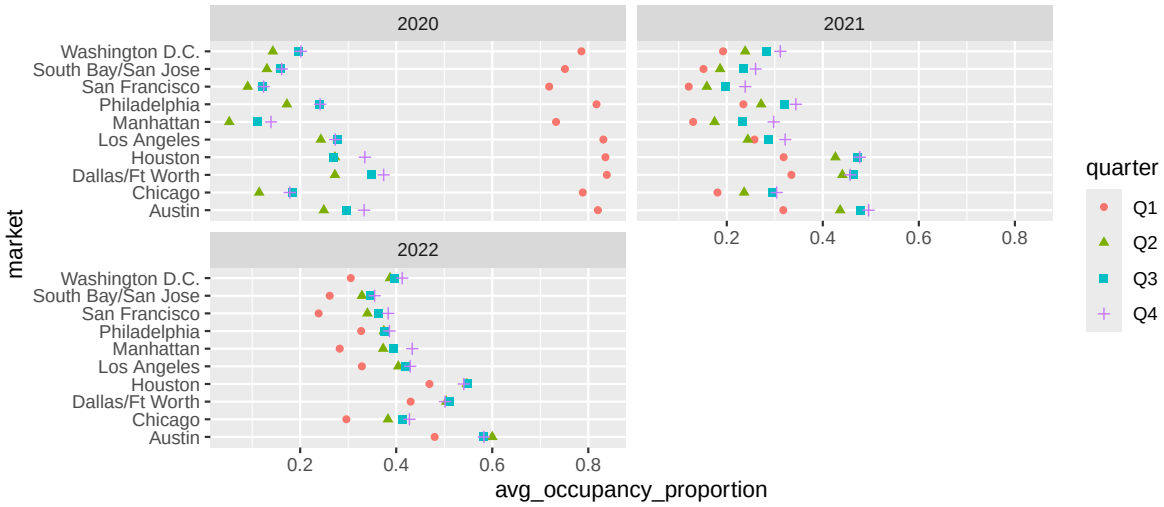



```
ggplot(market_occup , aes(market, avg_occupancy_proportion, color = quarter, shape = quarter)
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```

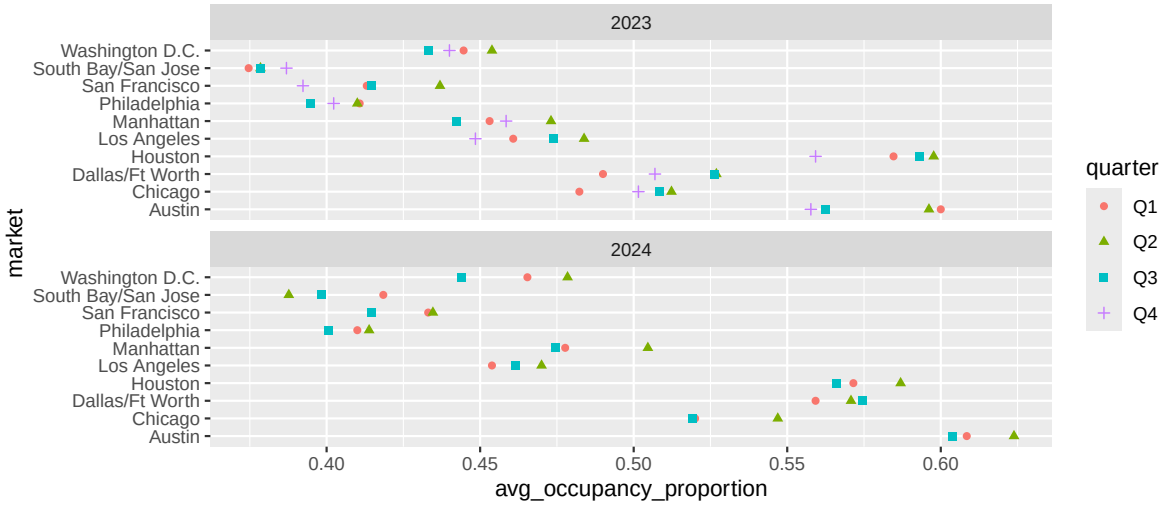

```
ggplot(market_occup , aes(market, avg_occupancy_proportion, color = quarter, shape = quarter)
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 3)
```



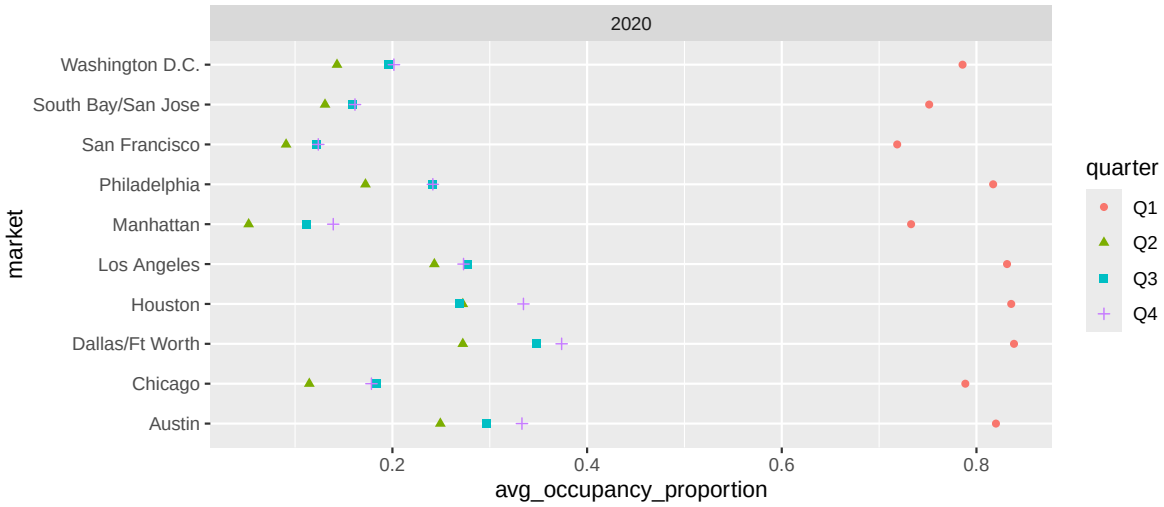

```
ggplot(market_occup %>% filter(year < 2023), aes(market, avg_occupancy_proportion, color = qu
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```



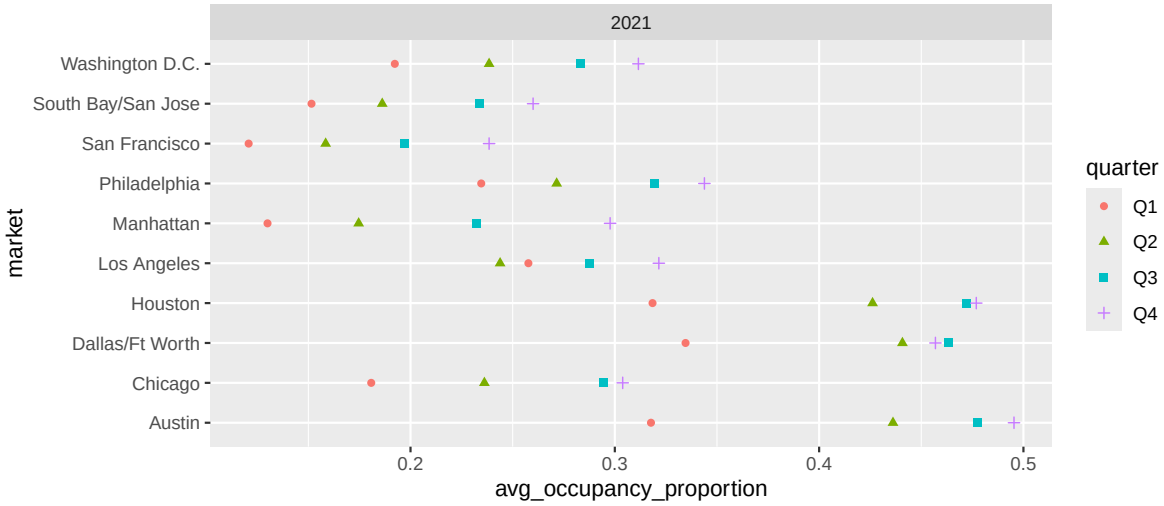

```
ggplot(market_occup %>% filter(year > 2022), aes(market, avg_occupancy_proportion, color = qu
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```




```
ggplot(market_occup %>% filter(year == 2020), aes(market, avg_occupancy_proportion, color = q
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 1)
```

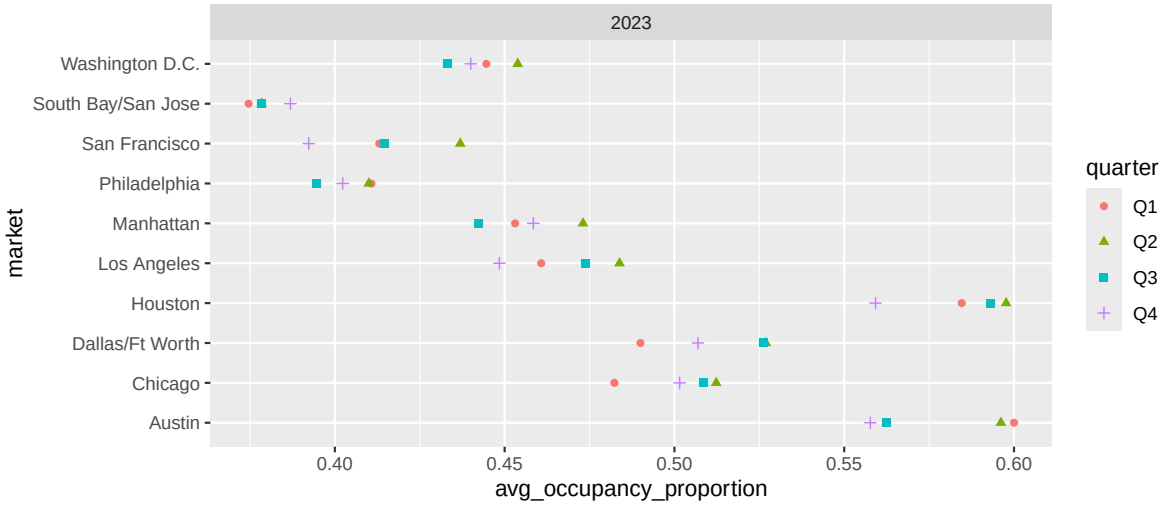



```
ggplot(market_occup %>% filter(year == 2021), aes(market, avg_occupancy_proportion, color = q
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```




```
ggplot(market_occup %>% filter(year == 2022), aes(market, avg_occupancy_proportion, color = q
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```


```
ggplot(market_occup %>% filter(year == 2023), aes(market, avg_occupancy_proportion, color = q
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```




```
ggplot(market_occup %>% filter(year == 2024), aes(market, avg_occupancy_proportion, color = q
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), nrow = 2)
```


```r
market_price_avl <- read.csv("Price_and_Availability_Data.csv")
head(market_price_avl)
```

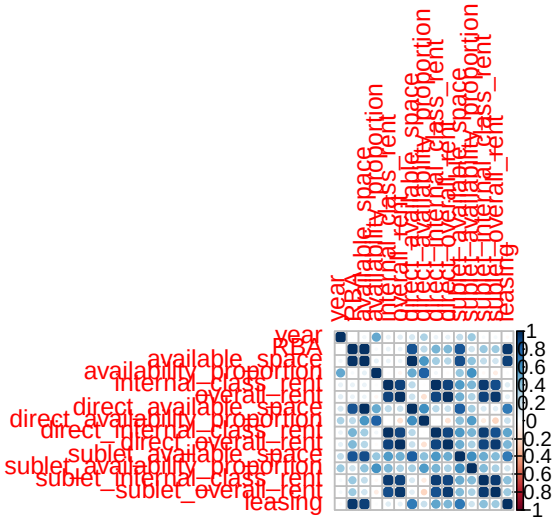
```
  year quarter    market internal_class       RBA available_space
1 2018      Q1   Atlanta              A 101140416        20239067
2 2018      Q1   Atlanta              O  65810449        12728989
3 2018      Q1    Austin              A  36815073         4281986
4 2018      Q1    Austin              O  27947525         3360936
5 2018      Q1 Baltimore              A  41033288         6813380
6 2018      Q1 Baltimore              O  40265706         6531089
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.1934190            18.56089     24.34569
3               0.1163107            40.38471     36.59662
4               0.1210818            30.11866     36.59662
5               0.1660452            27.10483     22.95403
6               0.1621998            20.12099     22.95403
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                  NA                     NA
2                         NA                  NA                     NA
```

```
3                          NA                  NA                     NA
4                          NA                  NA                     NA
5                          NA                  NA                     NA
6                          NA                  NA                     NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing
1 1205126
2  715742
3 1738905
4  185674
5  380750
6  247089
```

```
names(market_price_avl)
```

```
 [1] "year"                          "quarter"
 [3] "market"                        "internal_class"
 [5] "RBA"                           "available_space"
 [7] "availability_proportion"       "internal_class_rent"
 [9] "overall_rent"                  "direct_available_space"
[11] "direct_availability_proportion" "direct_internal_class_rent"
[13] "direct_overall_rent"           "sublet_available_space"
[15] "sublet_availability_proportion" "sublet_internal_class_rent"
[17] "sublet_overall_rent"           "leasing"
```

```
corrplot::corrplot(cor(market_price_avl[, -c(2, 3, 4)], use = "pairwise.complete.obs"))
```

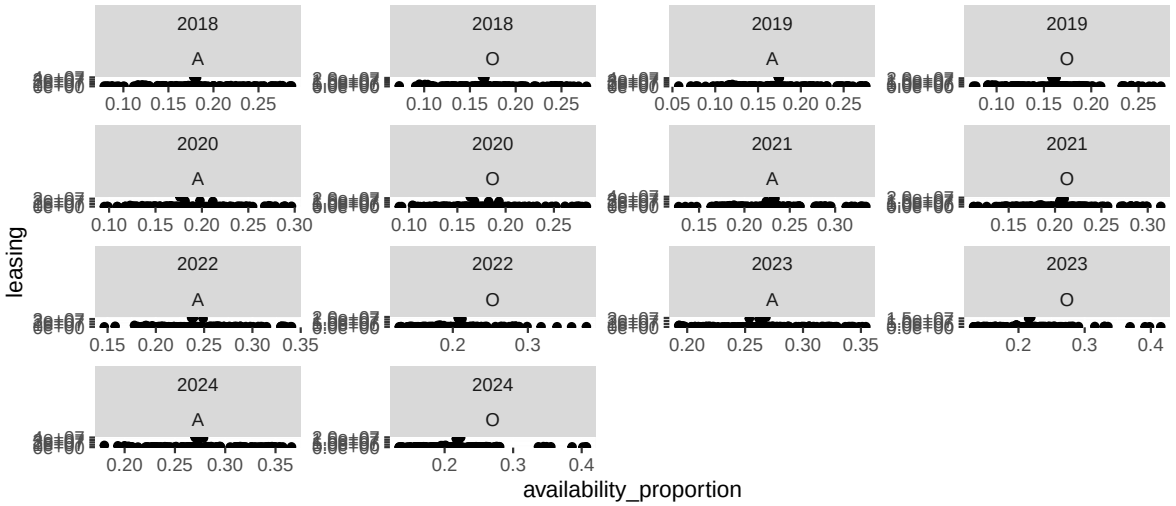



```
market_price_avl %>%
  group_by(market) %>%
  summarize(
    count = n(),
    avg_available_space = mean(available_space)
  )
```

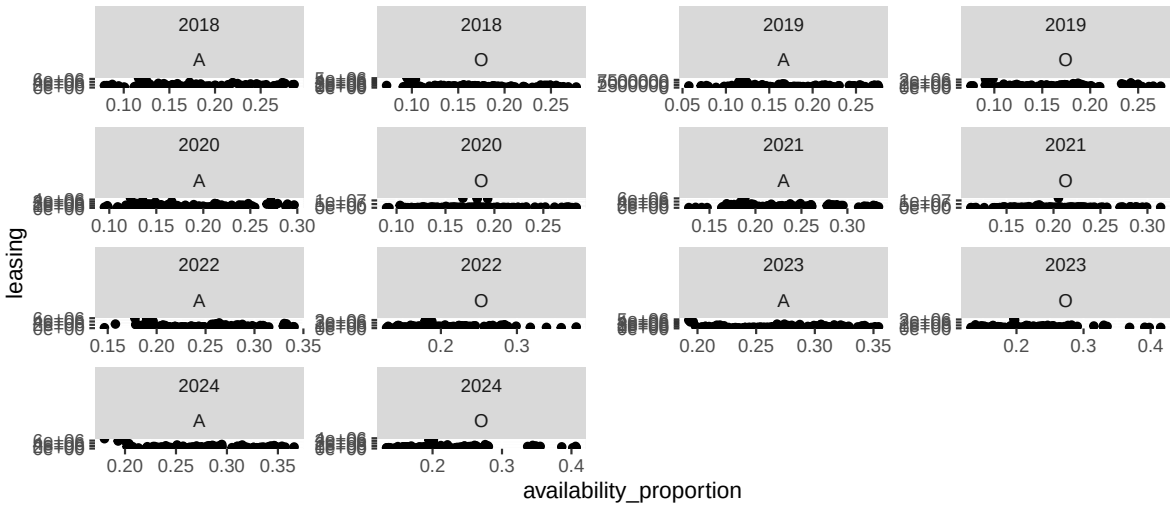
```
# A tibble: 30 x 3
   market           count avg_available_space
   <chr>            <int>               <dbl>
 1 Atlanta             56           21294190.
 2 Austin              56            7016377.
 3 Baltimore           56            6830213.
 4 Boston              56           20819899.
 5 Charlotte           56            5817817.
 6 Chicago Suburbs     56           14487202.
 7 Dallas-Ft. Worth    56           28770400.
 8 Denver-Boulder      56           13212848.
 9 Detroit             56            9140026.
10 Downtown Chicago    56           15947431.
# i 20 more rows
```

```
# market_price_avl_filt <- market_price_avl %>% filter(leasing > 10000)
# head(market_price_avl)
# dim(market_price_avl)
# dim(market_price_avl_filt)
```

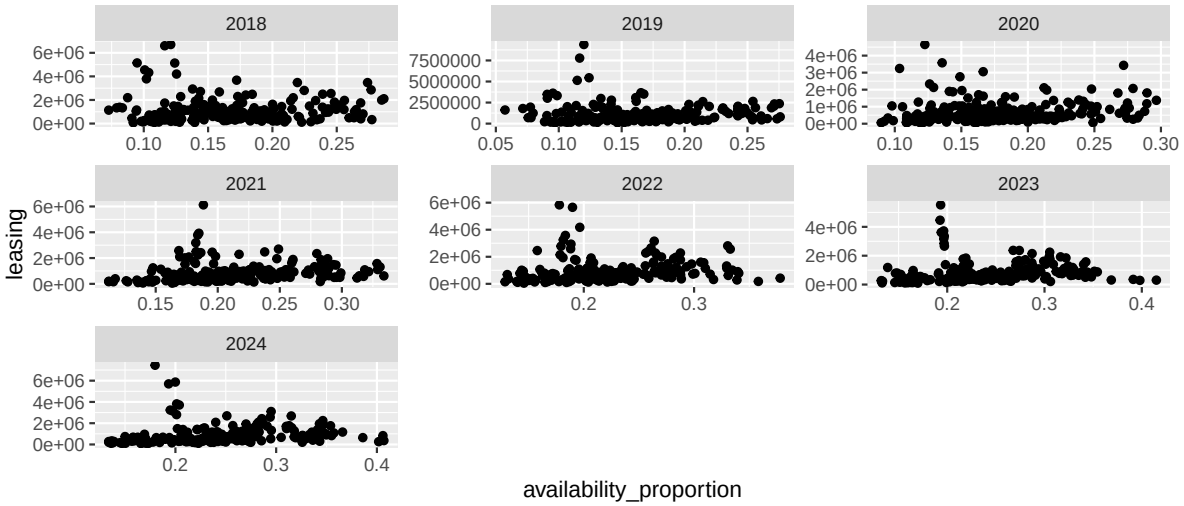
```
ggplot(market_price_avl, aes(leasing, availability_proportion)) +
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year, internal_class), scales = "free")
```




```
ggplot(market_price_avl %>% filter(leasing < 13500000), aes(leasing, availability_proportion)
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year, internal_class), scales = "free")
```



```
ggplot(market_price_avl %>% filter(leasing < 10000000), aes(leasing, availability_proportion)
  geom_point() +
  coord_flip() +
  facet_wrap(vars(year), scales = "free")
```




```
lease2 <- lease %>% mutate(quarter_label = paste(year, quarter))
head(lease2)
```

```
  year quarter monthsigned  market           building_name
1 2018      Q1           1 Atlanta 10 Glenlake North Tower
2 2018      Q1           1 Atlanta           100 City View
3 2018      Q1           1 Atlanta           1000 Parkwood
4 2018      Q1           1 Atlanta          1100 Circle 75
5 2018      Q1           1 Atlanta            1200 Ashwood
6 2018      Q1           1 Atlanta            1200 Ashwood
                                                                      building_id
1 Atlanta_Central Perimeter_Atlanta_10 Glenlake North Tower_10 Glenlake Pky NE
2                Atlanta_Northwest_Atlanta_100 City View_3330 Cumberland Blvd
3                Atlanta_Northwest_Atlanta_1000 Parkwood_1000 Parkwood Cir SE
4              Atlanta_Northwest_Atlanta_1100 Circle 75_1100 Circle 75 Pky SE
5             Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
6             Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
               address region    city state   zip internal_submarket
1    10 Glenlake Pky NE  South Atlanta    GA 30328  Central Perimeter
2  3330 Cumberland Blvd  South Atlanta    GA 30339          Northwest
3  1000 Parkwood Cir SE  South Atlanta    GA 30339          Northwest
```

```
4 1100 Circle 75 Pky SE  South Atlanta    GA 30339          Northwest
5      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
6      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
  internal_class leasedSF                company_name
1              A    24736 Capital Investment Advisors
2              A      965                        <NA>
3              A     2215                    Efc Moen
4              O     1925                        <NA>
5              A     2404                        <NA>
6              A     5091                        <NA>
                 internal_industry transaction_type internal_market_cluster
1 Financial Services and Insurance        Expansion                    <NA>
2                             <NA>              New                    <NA>
3                             <NA>              New                    <NA>
4                             <NA>              New                    <NA>
5                             <NA>              New                    <NA>
6                             <NA>              New                    <NA>
  costarID space_type CBD_suburban       RBA available_space
1   445509      Relet     Suburban 101140416        20239067
2   436994      Relet     Suburban 101140416        20239067
3   434890      Relet     Suburban 101140416        20239067
4   434720      Relet     Suburban  65810449        12728989
5   437562      Relet     Suburban 101140416        20239067
6   437562      Relet     Suburban 101140416        20239067
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.2001086            27.65589     24.34569
3               0.2001086            27.65589     24.34569
4               0.1934190            18.56089     24.34569
5               0.2001086            27.65589     24.34569
6               0.2001086            27.65589     24.34569
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                  NA                     NA
2                         NA                  NA                     NA
3                         NA                  NA                     NA
4                         NA                  NA                     NA
```

```
5                          NA                   NA                       NA
6                          NA                   NA                       NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing quarter_label
1 1205126       2018 Q1
2 1205126       2018 Q1
3 1205126       2018 Q1
4  715742       2018 Q1
5 1205126       2018 Q1
6 1205126       2018 Q1
```

```
names(lease2)
```

```
 [1] "year"                          "quarter"
 [3] "monthsigned"                   "market"
 [5] "building_name"                 "building_id"
 [7] "address"                       "region"
 [9] "city"                          "state"
[11] "zip"                           "internal_submarket"
[13] "internal_class"                "leasedSF"
[15] "company_name"                  "internal_industry"
[17] "transaction_type"              "internal_market_cluster"
[19] "costarID"                      "space_type"
[21] "CBD_suburban"                  "RBA"
[23] "available_space"               "availability_proportion"
[25] "internal_class_rent"           "overall_rent"
[27] "direct_available_space"        "direct_availability_proportion"
[29] "direct_internal_class_rent"    "direct_overall_rent"
[31] "sublet_available_space"        "sublet_availability_proportion"
[33] "sublet_internal_class_rent"    "sublet_overall_rent"
[35] "leasing"                       "quarter_label"
```

```
unique(lease2$market)
```

```
 [1] "Atlanta"             "Austin"              "Baltimore"
```

```
 [4] "Boston"              "Charlotte"           "Chicago"
 [7] "Chicago Suburbs"     "Dallas/Ft Worth"     "Denver"
[10] "Detroit"             "Houston"             "Los Angeles"
[13] "Manhattan"           "Nashville"           "Northern New Jersey"
[16] "Northern Virginia"   "Orange County"       "Philadelphia"
[19] "Phoenix"             "Raleigh/Durham"      "Salt Lake City"
[22] "San Diego"           "San Francisco"       "Seattle"
[25] "South Bay/San Jose"  "South Florida"       "Southern Maryland"
[28] "Tampa"               "Washington D.C."
```

```
unique(market_price_avl$market)
```

```
 [1] "Atlanta"             "Austin"              "Baltimore"
 [4] "Boston"              "Charlotte"           "Chicago Suburbs"
 [7] "Dallas-Ft. Worth"    "Denver-Boulder"      "Detroit"
[10] "Downtown Chicago"    "Houston"             "Los Angeles"
[13] "Nashville"           "Manhattan"           "Northern New Jersey"
[16] "Northern Virginia"   "Orange County (CA)"  "Philadelphia"
[19] "Phoenix"             "Raleigh-Durham"      "Salt Lake City"
[22] "San Diego"           "San Francisco"       "Seattle"
[25] "South Bay"           "South Florida"       "Suburban Maryland"
[28] "Tampa"               "US National"         "Washington DC"
```

```
texas_price <- lease2 %>%
  filter(
    market %in% c("Houston", "Austin"), year >= 2018 & year <= 2024) %>%
  mutate(available_space_div = available_space/1000)

head(texas_price)
```

```
  year quarter monthsigned market       building_name
1 2018      Q1           1 Austin        100 Congress
2 2018      Q1           1 Austin        100 Congress
3 2018      Q1           1 Austin            400 West
4 2018      Q1           1 Austin 500 West 2nd Street
5 2018      Q1           1 Austin      6776 Ingram Rd
6 2018      Q1           1 Austin      6776 Ingram Rd
                                        building_id          address region
1    Austin_CBD_Austin_100 Congress_100 Congress Ave 100 Congress Ave  South
2    Austin_CBD_Austin_100 Congress_100 Congress Ave 100 Congress Ave  South
3           Austin_CBD_Austin_400 West_400 W 15th St    400 W 15th St  South
```

```
4 Austin_CBD_Austin_500 West 2nd Street_500 W 2nd St     500 W 2nd St  South
5  Austin_CBD_Austin_6776 Ingram Rd_600 Congress Ave 600 Congress Ave  South
6  Austin_CBD_Austin_6776 Ingram Rd_600 Congress Ave 600 Congress Ave  South
    city state   zip internal_submarket internal_class leasedSF company_name
1 Austin    TX 78701                CBD              A     3050         <NA>
2 Austin    TX 78701                CBD              A     2181    Polsource
3 Austin    TX 78701                CBD              A     1582         <NA>
4 Austin    TX 78701                CBD              A    20070         <NA>
5 Austin    TX 78701                CBD              A     7857         <NA>
6 Austin    TX 78701                CBD              A    11094         <NA>
  internal_industry transaction_type internal_market_cluster costarID
1              <NA>              New                    <NA>   591425
2              <NA>              New                    <NA>   591425
3              <NA>              New                    <NA>   591214
4              <NA>              New                    <NA>  8386978
5              <NA>              New                    <NA>   591286
6              <NA>              New                    <NA>   591286
  space_type CBD_suburban      RBA available_space availability_proportion
1      Relet          CBD 36815073         4281986               0.1163107
2     Sublet          CBD 36815073         4281986               0.1163107
3      Relet          CBD 36815073         4281986               0.1163107
4      Relet          CBD 36815073         4281986               0.1163107
5      Relet          CBD 36815073         4281986               0.1163107
6      Relet          CBD 36815073         4281986               0.1163107
  internal_class_rent overall_rent direct_available_space
1            40.38471     36.59662                     NA
2            40.38471     36.59662                     NA
3            40.38471     36.59662                     NA
4            40.38471     36.59662                     NA
5            40.38471     36.59662                     NA
6            40.38471     36.59662                     NA
  direct_availability_proportion direct_internal_class_rent direct_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  sublet_available_space sublet_availability_proportion
1                     NA                            NA
2                     NA                            NA
3                     NA                            NA
4                     NA                            NA
```

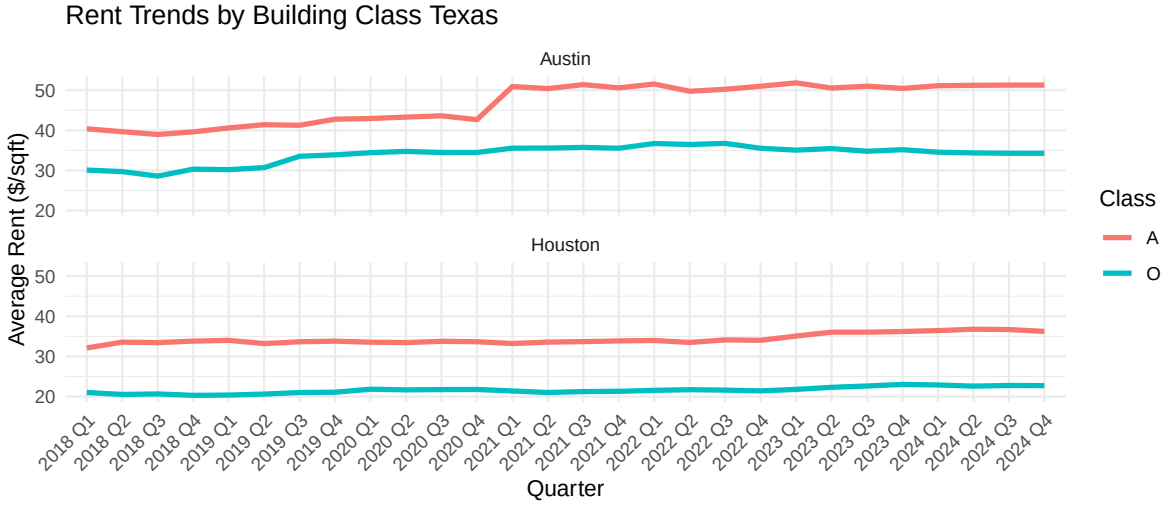
```
5                     NA                              NA
6                     NA                              NA
  sublet_internal_class_rent sublet_overall_rent leasing quarter_label
1                         NA                  NA 1738905       2018 Q1
2                         NA                  NA 1738905       2018 Q1
3                         NA                  NA 1738905       2018 Q1
4                         NA                  NA 1738905       2018 Q1
5                         NA                  NA 1738905       2018 Q1
6                         NA                  NA 1738905       2018 Q1
  available_space_div
1            4281.986
2            4281.986
3            4281.986
4            4281.986
5            4281.986
6            4281.986
```

```
market_price_avl2 <- market_price_avl %>%
  mutate(quarter_label = paste(year, quarter)) %>%
  filter(market %in% c("Houston", "Austin", "Dallas-Ft. Worth"))%>%
  mutate(available_space_div = available_space/1000)
# texas_price2 <- texas_price %>%
#   mutate(avge = )
```

```
ggplot(texas_price, aes(quarter_label, available_space_div, color = internal_class, group = i
  geom_line(size = 1.2) +
  labs(title = "Rent Trends by Building Class Texas",
y = "Available Space/1000", x = "Quarter", color = "Class") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  facet_wrap(~market, nrow = 2)
```

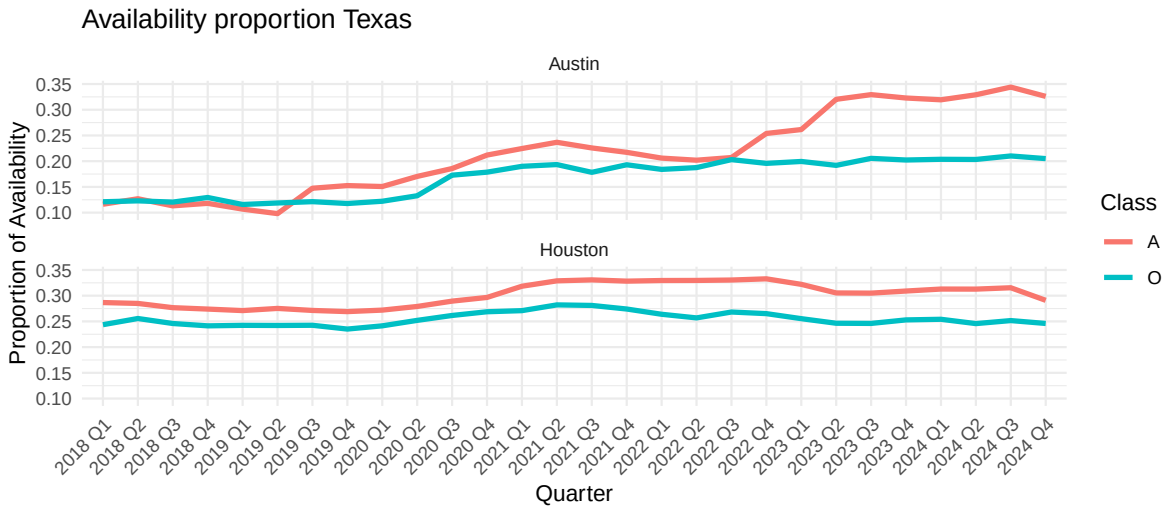
```
Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
i Please use `linewidth` instead.
```


```
ggplot(texas_price, aes(quarter_label, internal_class_rent, color = internal_class, group = i
  geom_line(size = 1.2) +
  labs(title = "Rent Trends by Building Class Texas",
y = "Average Rent ($/sqft)", x = "Quarter", color = "Class") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  facet_wrap(~market, nrow = 2)
```

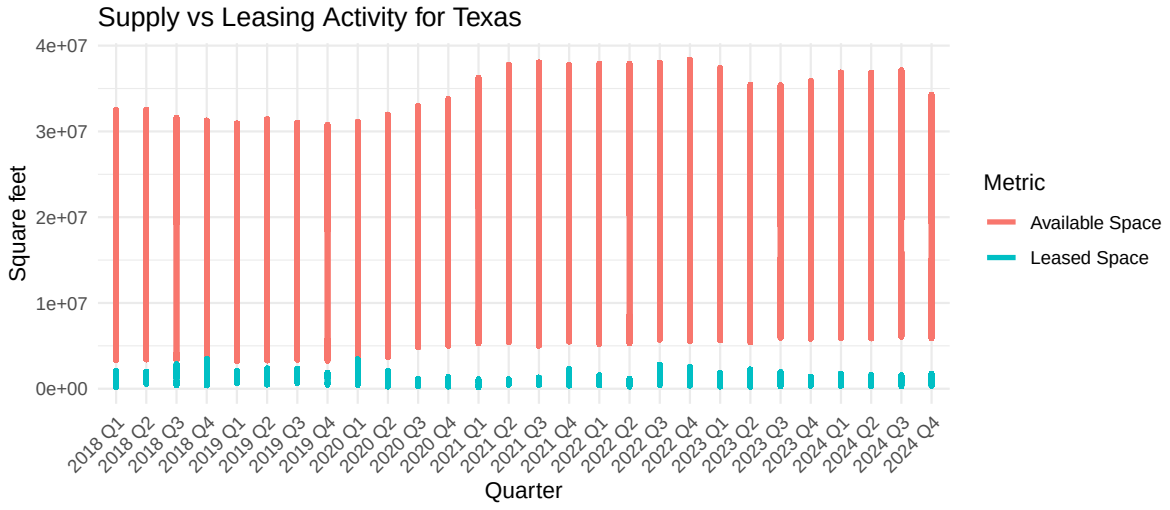



```
ggplot(texas_price, aes(quarter_label, availability_proportion, color = internal_class, grou
  geom_line(size = 1.2) +
  labs(title = "Availability proportion Texas",
```

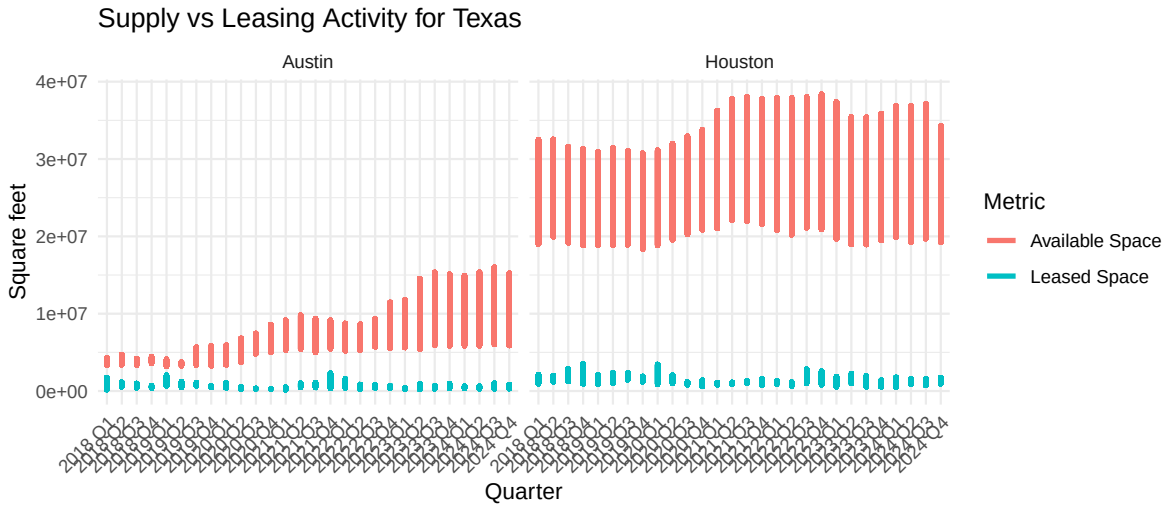
```
y = "Proportion of Availability", x = "Quarter", color = "Class") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  facet_wrap(~market, nrow = 2)
```



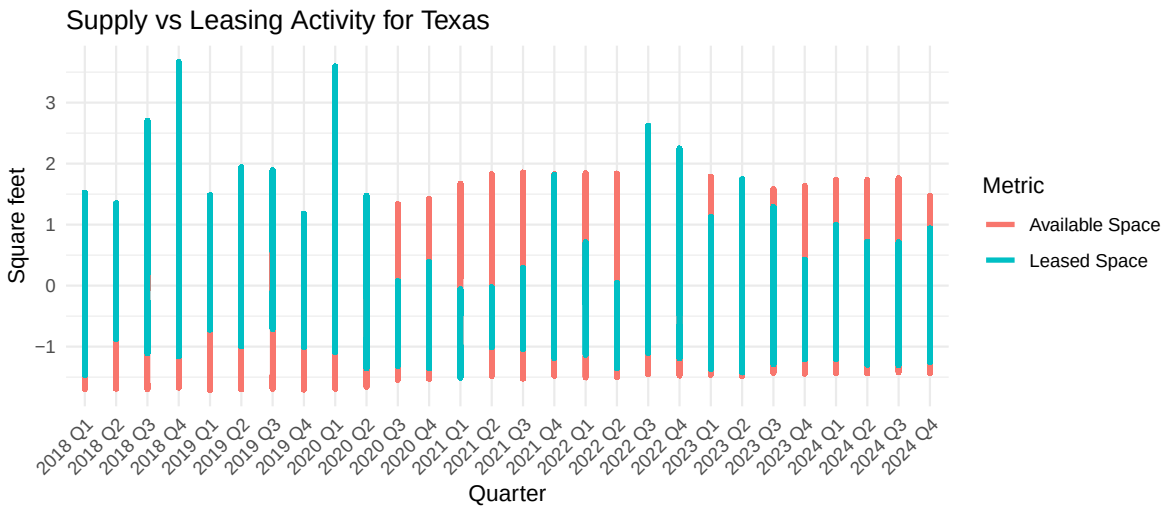

```
ggplot(texas_price, aes(x = quarter_label)) +
  geom_line(aes(y = available_space, color = "Available Space"), size = 1.2) +
  geom_line(aes(y = leasing, color = "Leased Space"), size = 1.2) +
  labs(title = "Supply vs Leasing Activity for Texas", y = "Square feet", x = "Quarter", colo
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



```
ggplot(texas_price, aes(x = quarter_label)) +
  geom_line(aes(y = available_space, color = "Available Space"), size = 1.2) +
  geom_line(aes(y = leasing, color = "Leased Space"), size = 1.2) +
  labs(title = "Supply vs Leasing Activity for Texas", y = "Square feet", x = "Quarter", colo
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  facet_wrap(~market)
```



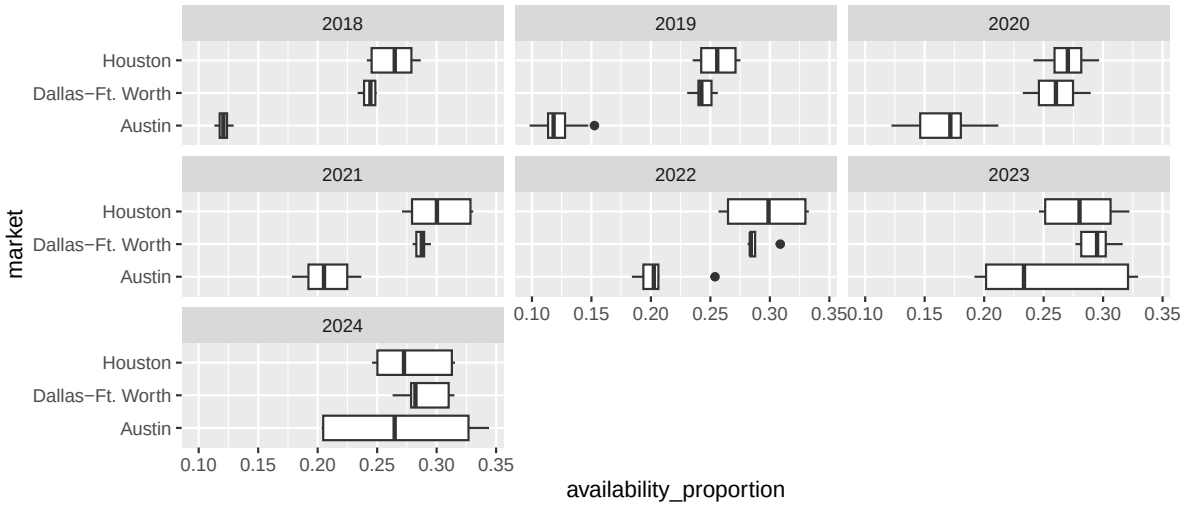

```
texas_std <- texas_price %>%
  mutate(
    available_z = scale(available_space)[, 1],
    leasing_z = scale(leasing)[, 1]
  )

ggplot(texas_std, aes(x = quarter_label)) +
  geom_line(aes(y = available_z, color = "Available Space"), size = 1.2) +
  geom_line(aes(y = leasing_z, color = "Leased Space"), size = 1.2) +
  labs(title = "Supply vs Leasing Activity for Texas", y = "Square feet", x = "Quarter", colo
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
names(texas_price)
```

```
 [1] "year"                          "quarter"
 [3] "monthsigned"                   "market"
 [5] "building_name"                 "building_id"
 [7] "address"                       "region"
 [9] "city"                          "state"
[11] "zip"                           "internal_submarket"
[13] "internal_class"                "leasedSF"
[15] "company_name"                  "internal_industry"
[17] "transaction_type"              "internal_market_cluster"
[19] "costarID"                      "space_type"
[21] "CBD_suburban"                  "RBA"
[23] "available_space"               "availability_proportion"
[25] "internal_class_rent"           "overall_rent"
[27] "direct_available_space"        "direct_availability_proportion"
[29] "direct_internal_class_rent"    "direct_overall_rent"
[31] "sublet_available_space"        "sublet_availability_proportion"
[33] "sublet_internal_class_rent"    "sublet_overall_rent"
[35] "leasing"                       "quarter_label"
[37] "available_space_div"
```

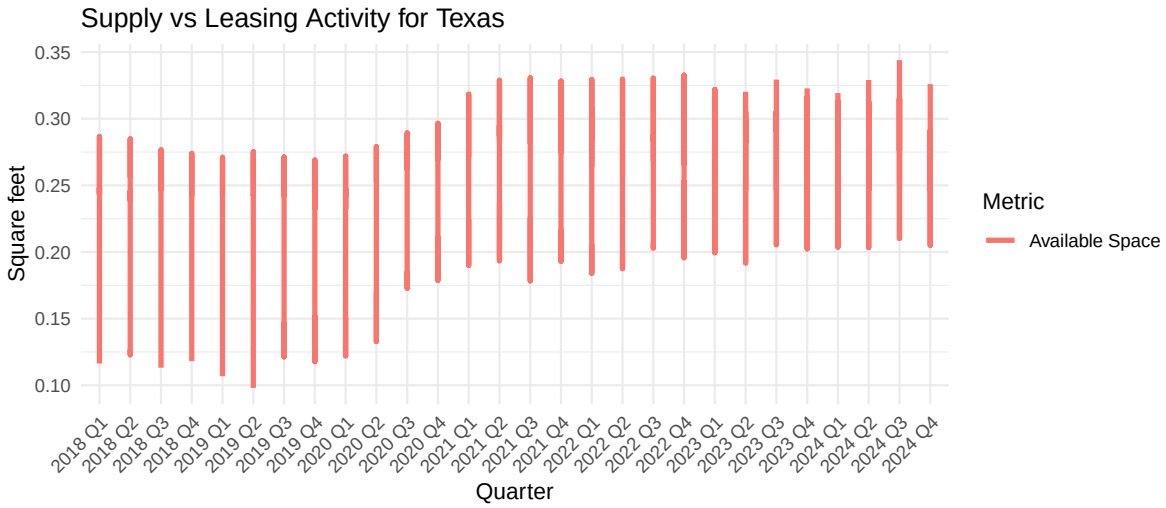
```
ggplot(market_price_avl2, aes(market, availability_proportion)) +
  geom_boxplot() +
  coord_flip() +
  facet_wrap(~year)
```




```
unique(market_price_avl$market)
```

```
 [1] "Atlanta"            "Austin"             "Baltimore"
 [4] "Boston"             "Charlotte"          "Chicago Suburbs"
 [7] "Dallas-Ft. Worth"   "Denver-Boulder"     "Detroit"
[10] "Downtown Chicago"   "Houston"            "Los Angeles"
[13] "Nashville"          "Manhattan"          "Northern New Jersey"
[16] "Northern Virginia"  "Orange County (CA)" "Philadelphia"
[19] "Phoenix"            "Raleigh-Durham"     "Salt Lake City"
[22] "San Diego"          "San Francisco"      "Seattle"
[25] "South Bay"          "South Florida"      "Suburban Maryland"
[28] "Tampa"              "US National"        "Washington DC"
```

```
ggplot(market_price_avl2, aes(x = quarter_label)) +
  geom_line(aes(y = availability_proportion, color = "Available Space"), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
  labs(title = "Supply vs Leasing Activity for Texas", y = "Square feet", x = "Quarter", colo
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
# market_price_avl2 <- market_price_avl %>%
#   mutate(quarter_label = paste(year, quarter)) %>%
#   filter(market %in% c("Houston", "Austin", "Dallas-Ft. Worth"))%>%
#   mutate(available_space_div = available_space/1000)
```

```
market_price_avl_cal <- market_price_avl %>%
  mutate(quarter_label = paste(year, quarter)) %>%
  filter(market %in% c("San Francisco", "Los Angeles", "South Bay/San Jose", "San Diego", "O
  mutate(available_space_div = available_space/1000)
head(market_price_avl_cal)
```

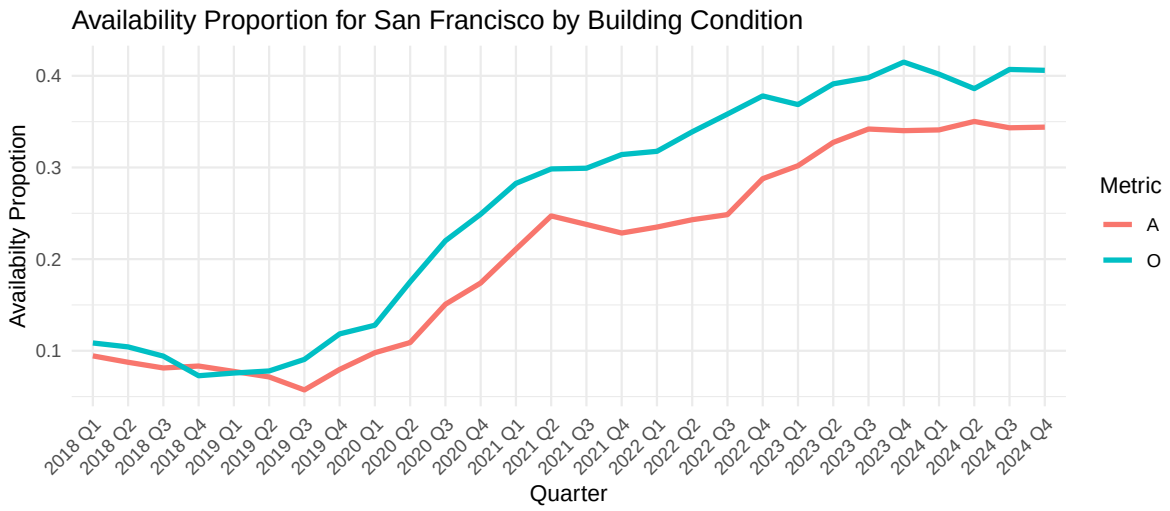
```
  year quarter             market internal_class       RBA available_space
1 2018      Q1        Los Angeles              A 143744668        26495057
2 2018      Q1        Los Angeles              O  68338197        14154981
3 2018      Q1 Orange County (CA)              A  42676775         8496263
4 2018      Q1 Orange County (CA)              O  40590141         6443150
5 2018      Q1          San Diego              A  30551450         4923858
6 2018      Q1          San Diego              O  33356642         4634398
  availability_proportion internal_class_rent overall_rent
1               0.1843203            39.90171     36.95900
2               0.2071313            31.90239     36.95900
3               0.1990840            33.95114     32.11846
4               0.1587368            30.65501     32.11846
5               0.1611661            36.53313     32.61946
6               0.1389348            28.33964     32.61946
  direct_available_space direct_availability_proportion
```

```
1                     NA                              NA
2                     NA                              NA
3                     NA                              NA
4                     NA                              NA
5                     NA                              NA
6                     NA                              NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                  NA                     NA
2                         NA                  NA                     NA
3                         NA                  NA                     NA
4                         NA                  NA                     NA
5                         NA                  NA                     NA
6                         NA                  NA                     NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing quarter_label available_space_div
1 2480075       2018 Q1           26495.057
2  834899       2018 Q1           14154.981
3  810031       2018 Q1            8496.263
4  555694       2018 Q1            6443.150
5  661104       2018 Q1            4923.858
6  637912       2018 Q1            4634.398
```

```
unique(market_price_avl_cal$market)
```

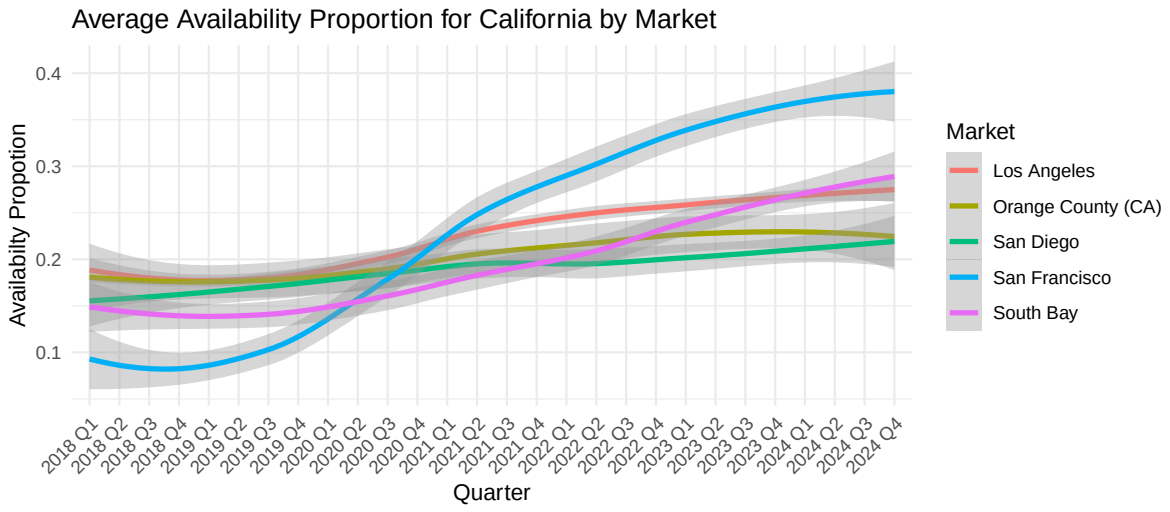
```
[1] "Los Angeles"        "Orange County (CA)" "San Diego"
[4] "San Francisco"      "South Bay"
```

```
market_price_avl_cal |>
  filter(market == "San Francisco") |>
  ggplot(aes(x = quarter_label, group = internal_class)) +
    geom_line(aes(y = availability_proportion, color = internal_class), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Availability Proportion for San Francisco by Building Condition", y = "Ava
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



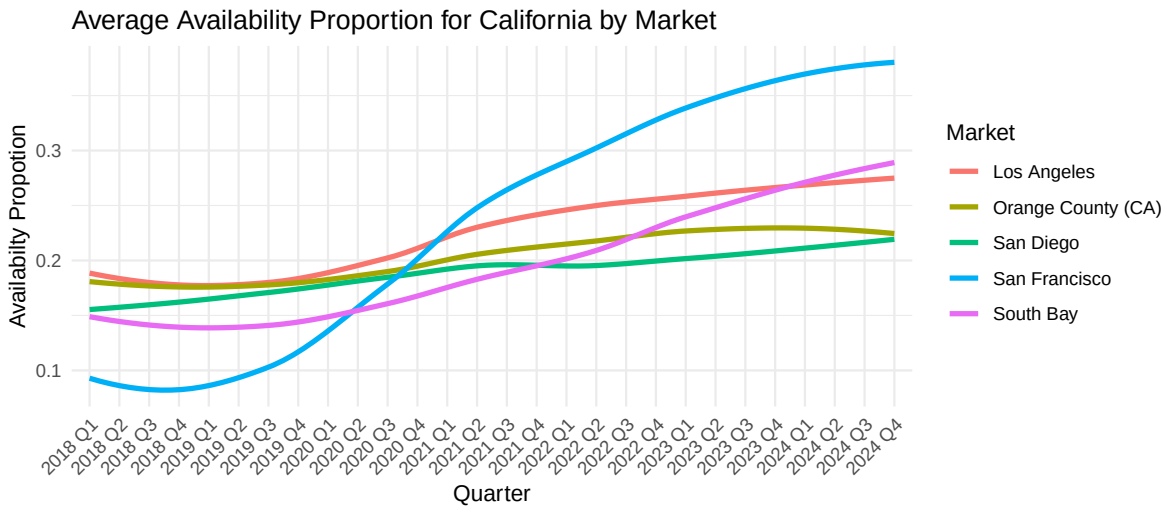

```
market_price_avl_cal |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for California by Market", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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



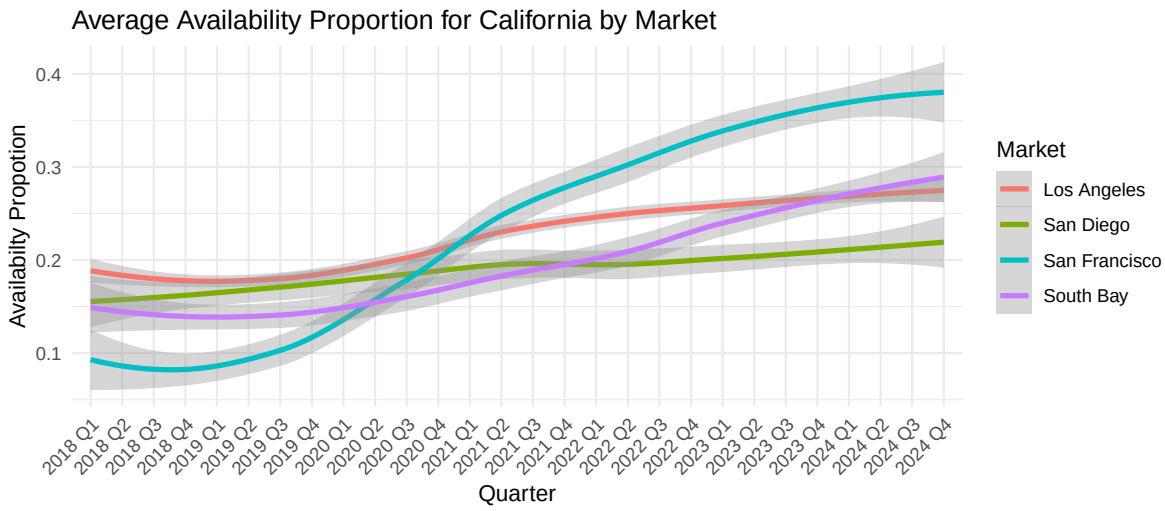
```
market_price_avl_cal |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for California by Market", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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



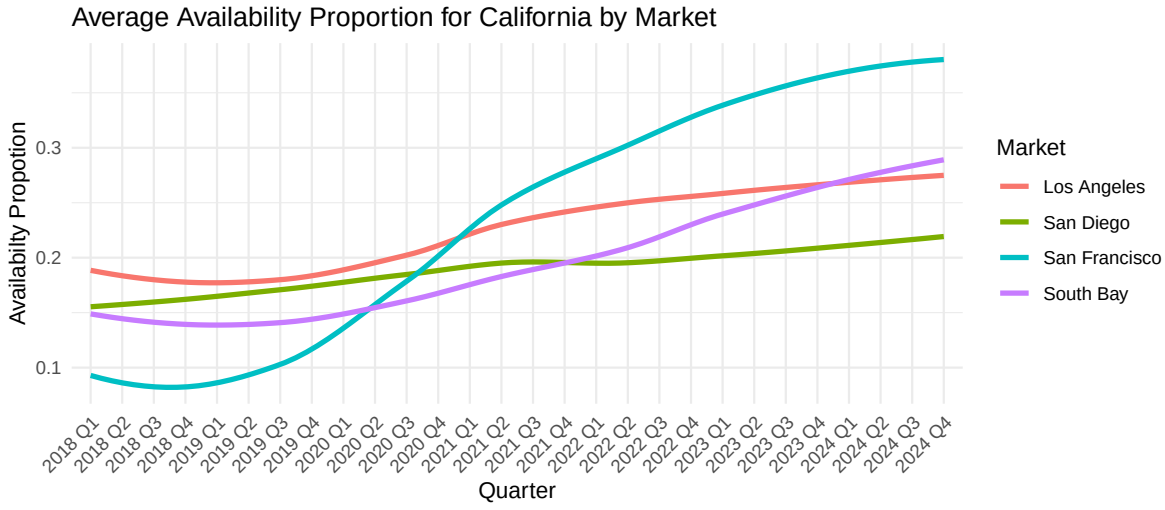

```
market_price_avl_cal |>
  filter(market %in% c("San Francisco", "South Bay", "Los Angeles", "San Diego")) |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for California by Market", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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




```
market_price_avl_cal |>
  filter(market %in% c("San Francisco", "South Bay", "Los Angeles", "San Diego")) |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for California by Market", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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



```r
market_price_avl_tx <- market_price_avl %>%
  mutate(quarter_label = paste(year, quarter)) %>%
  filter(market %in% c("Houston", "Austin", "Dallas-Ft. Worth")) %>%
  mutate(available_space_div = available_space/1000)
head(market_price_avl_tx)
```

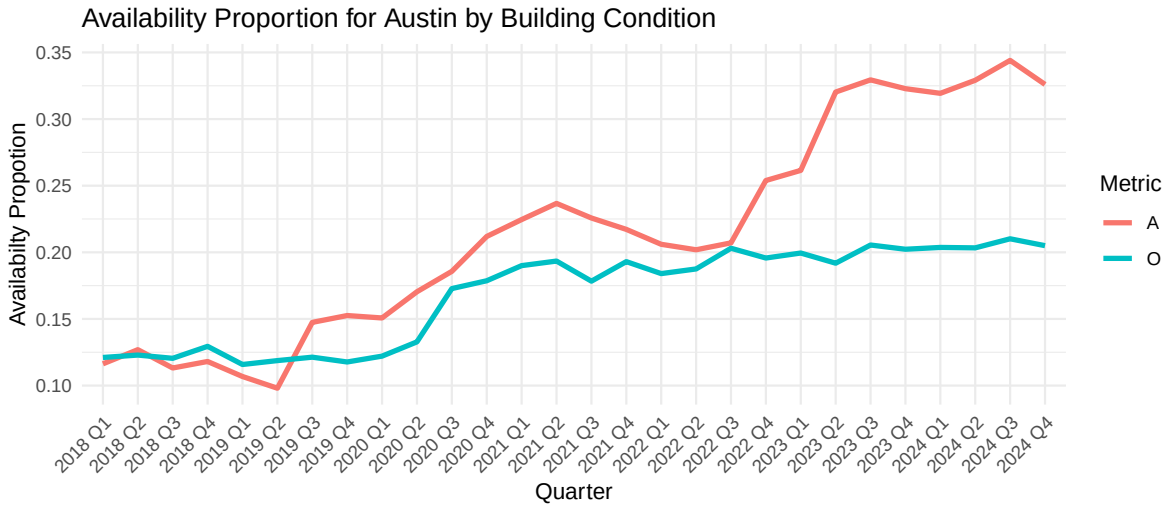
```
  year quarter           market internal_class       RBA available_space
1 2018      Q1           Austin              A  36815073         4281986
2 2018      Q1           Austin              O  27947525         3360936
3 2018      Q1 Dallas-Ft. Worth              A 121184708        30083227
4 2018      Q1 Dallas-Ft. Worth              O  83574408        20321410
5 2018      Q1          Houston              A 113376552        32500251
6 2018      Q1          Houston              O  78051358        19007505
  availability_proportion internal_class_rent overall_rent
1               0.1163107            40.38471     36.59662
2               0.1210818            30.11866     36.59662
3               0.2482428            26.20993     24.06306
4               0.2431535            20.94065     24.06306
5               0.2866576            32.10538     27.92312
6               0.2436146            21.03082     27.92312
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                  NA                     NA
2                         NA                  NA                     NA
3                         NA                  NA                     NA
4                         NA                  NA                     NA
5                         NA                  NA                     NA
6                         NA                  NA                     NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing quarter_label available_space_div
```

```
1 1738905       2018 Q1            4281.986
2  185674       2018 Q1            3360.936
3 1818846       2018 Q1           30083.227
4 1241663       2018 Q1           20321.410
5 2103443       2018 Q1           32500.251
6  968423       2018 Q1           19007.505
```

```r
unique(market_price_avl_tx$market)
```

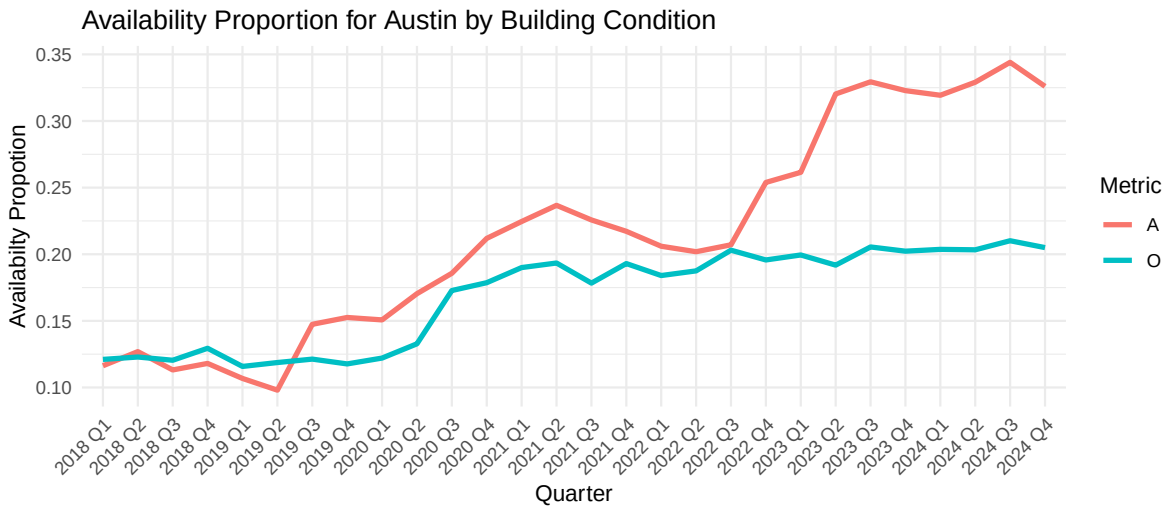
```
[1] "Austin"           "Dallas-Ft. Worth" "Houston"
```

```r
market_price_avl_tx |>
  filter(market == "Austin") |>


  ggplot(aes(x = quarter_label, group = internal_class)) +
    geom_line(aes(y = availability_proportion, color = internal_class), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Availability Proportion for Austin by Building Condition", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

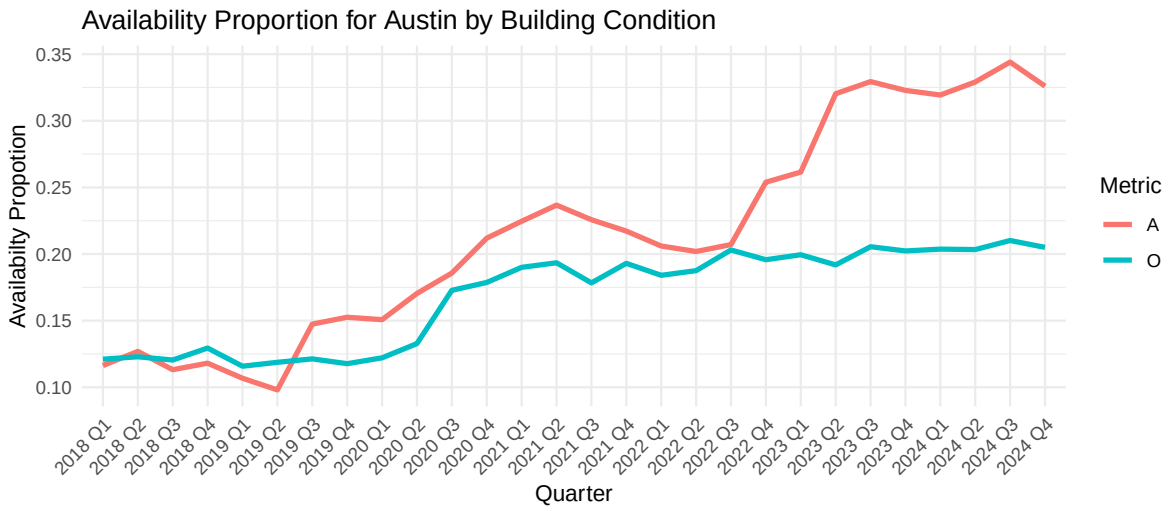



```r
market_price_avl_tx |>
  filter(market == "Austin") |>
  ggplot(aes(x = quarter_label, group = internal_class)) +
```

```
    geom_line(aes(y = availability_proportion, color = internal_class), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Availability Proportion for Austin by Building Condition", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



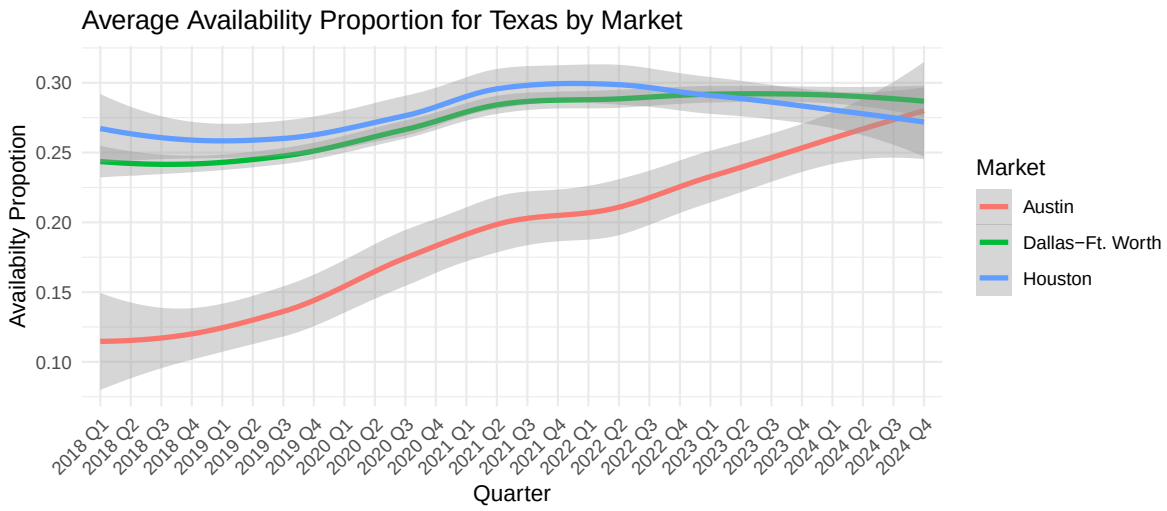

```
market_price_avl_tx |>
  filter(market == "Austin") |>
  ggplot(aes(x = quarter_label, group = internal_class)) +
    geom_line(aes(y = availability_proportion, color = internal_class), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Availability Proportion for Austin by Building Condition", y = "Availabilty
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
# head(market_price_avl_tx)
```

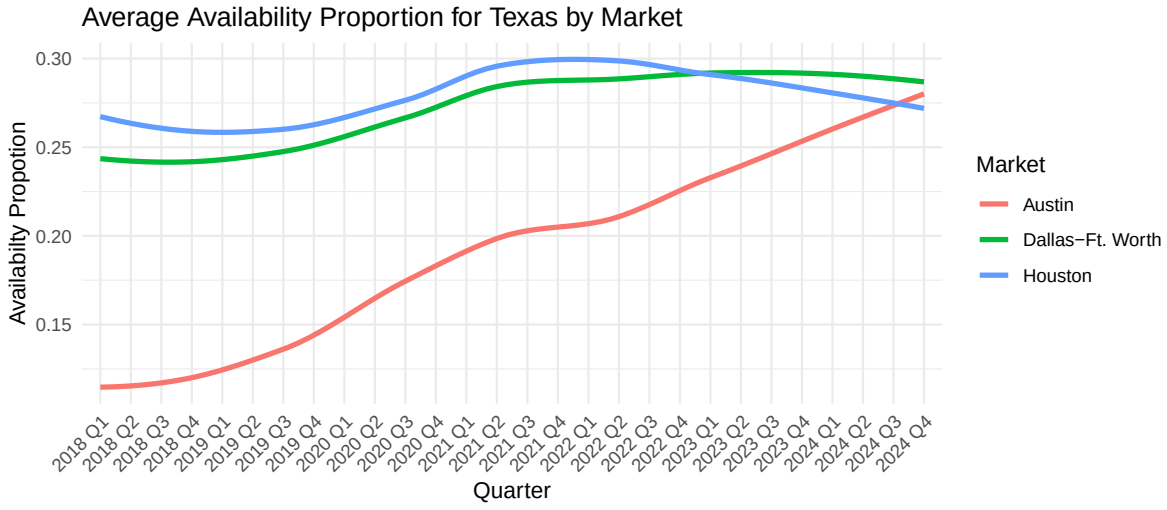
```
#figwidth, figheight
market_price_avl_tx |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for Texas by Market", y = "Availabilty Pro
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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



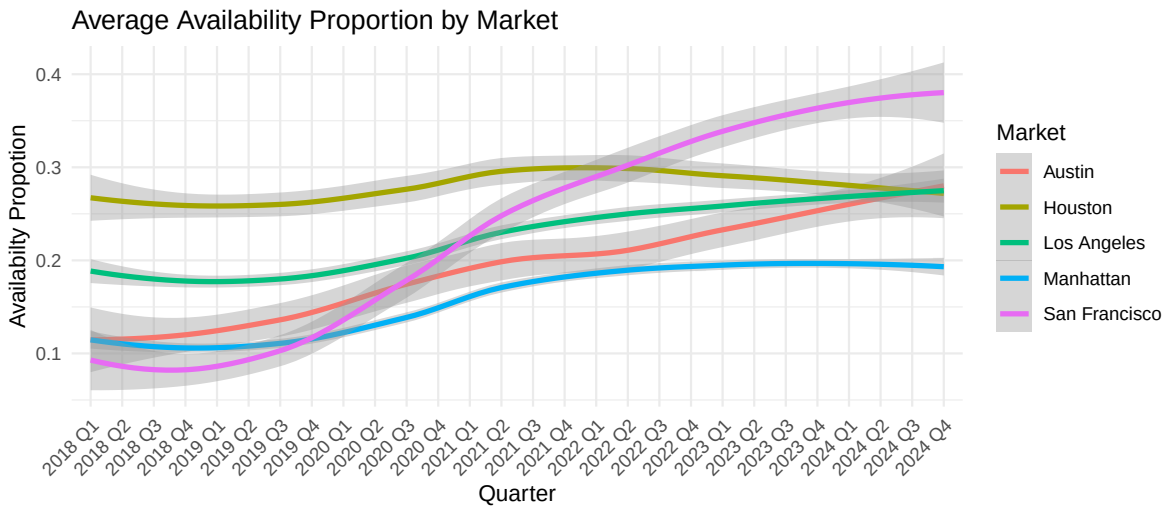

```
market_price_avl_tx |>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
  #geom_line(aes(y = leasing, color = "Leasing"), size = 1.2) +
    labs(title = "Average Availability Proportion for Texas by Market", y = "Availabilty Pro
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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



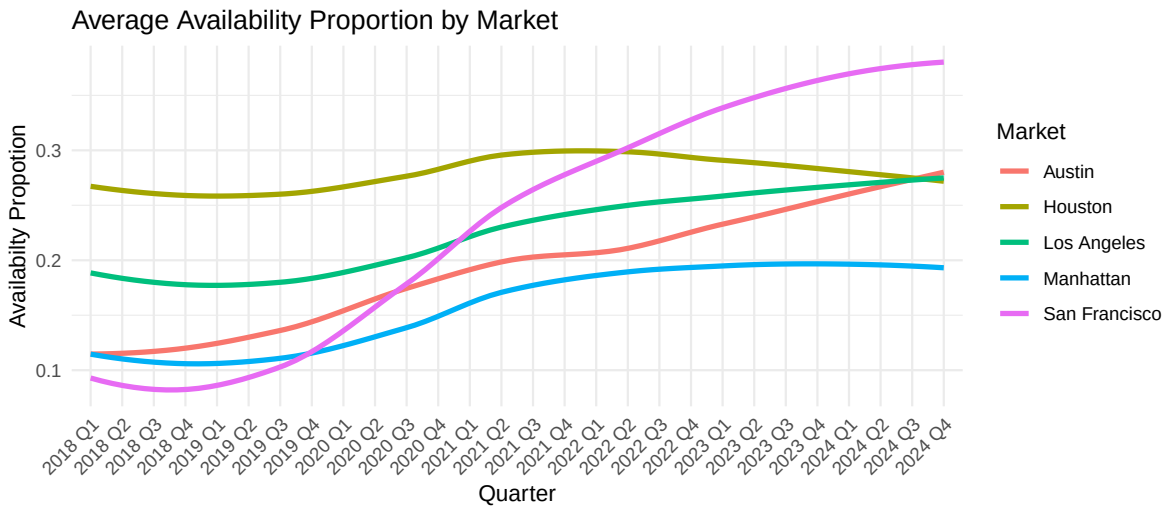
```
market_price_avl %>%
  mutate(quarter_label = paste(year, quarter)) %>%
  filter(market %in% c("Austin", "Detriot", "Houston", "Los Angeles", "Manhattan", "San Franc
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
    labs(title = "Average Availability Proportion by Market", y = "Availabilty Propotion", x
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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




```
market_price_avl %>%
  mutate(quarter_label = paste(year, quarter)) %>%
  filter(market %in% c("Austin", "Detriot", "Houston", "Los Angeles", "Manhattan", "San Franc
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
    labs(title = "Average Availability Proportion by Market", y = "Availabilty Propotion", x
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

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




```
# market_price_avl %>%
#   mutate(quarter_label = paste(year, quarter)) %>%
#   filter(market %in% c("Austin", "Detriot", "Houston", "Los Angeles", "Manhattan", "San Fra

df2 <- df %>%
  mutate(quarter_label = paste(year, quarter))
head(df2)
```

```
  year quarter monthsigned  market           building_name
1 2018      Q1           1 Atlanta 10 Glenlake North Tower
2 2018      Q1           1 Atlanta           100 City View
3 2018      Q1           1 Atlanta           1000 Parkwood
4 2018      Q1           1 Atlanta          1100 Circle 75
5 2018      Q1           1 Atlanta            1200 Ashwood
6 2018      Q1           1 Atlanta            1200 Ashwood
                                                                      building_id
1 Atlanta_Central Perimeter_Atlanta_10 Glenlake North Tower_10 Glenlake Pky NE
2                 Atlanta_Northwest_Atlanta_100 City View_3330 Cumberland Blvd
3                 Atlanta_Northwest_Atlanta_1000 Parkwood_1000 Parkwood Cir SE
4               Atlanta_Northwest_Atlanta_1100 Circle 75_1100 Circle 75 Pky SE
5              Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
6              Atlanta_Central Perimeter_Atlanta_1200 Ashwood_1200 Ashwood Pky
               address region    city state   zip internal_submarket
1    10 Glenlake Pky NE  South Atlanta    GA 30328  Central Perimeter
2  3330 Cumberland Blvd  South Atlanta    GA 30339          Northwest
3  1000 Parkwood Cir SE  South Atlanta    GA 30339          Northwest
4 1100 Circle 75 Pky SE  South Atlanta    GA 30339          Northwest
```

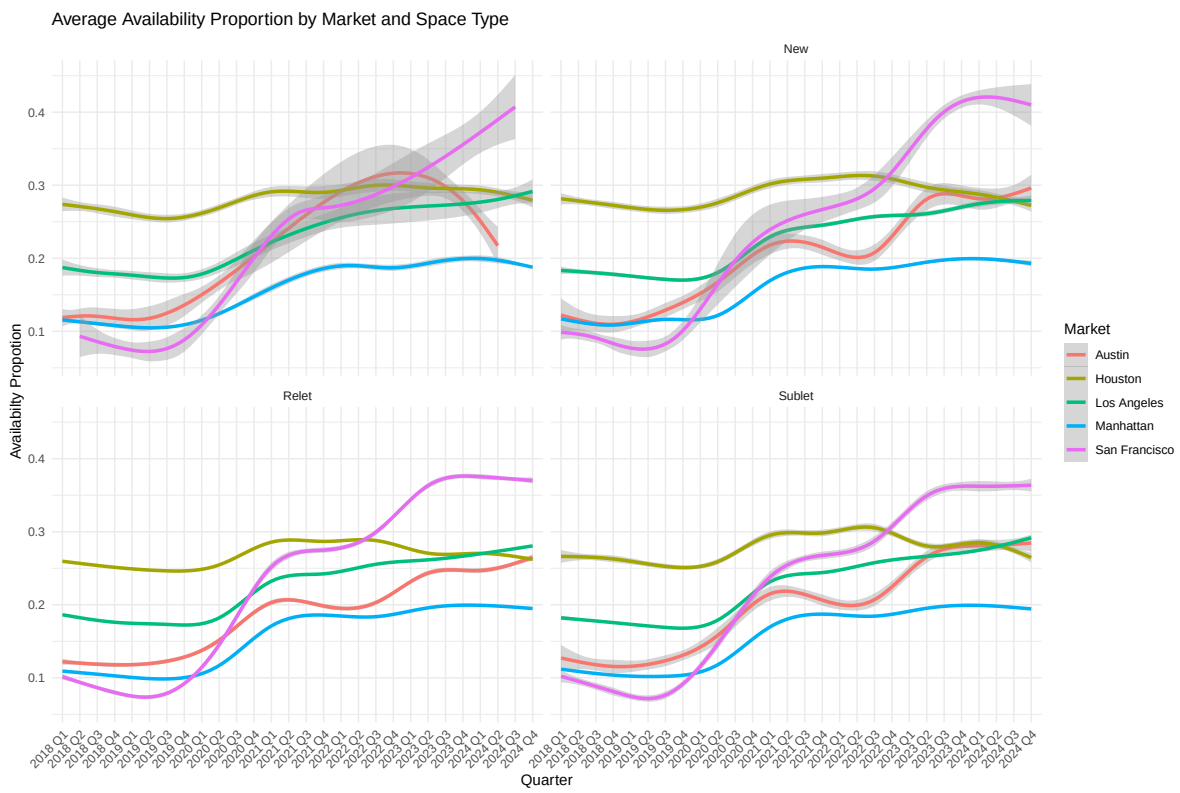
```
5      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
6      1200 Ashwood Pky  South Atlanta    GA 30338  Central Perimeter
  internal_class leasedSF                company_name
1              A    24736 Capital Investment Advisors
2              A      965
3              A     2215                    Efc Moen
4              O     1925
5              A     2404
6              A     5091
                internal_industry transaction_type internal_market_cluster
1 Financial Services and Insurance        Expansion
2                                             New
3                                             New
4                                             New
5                                             New
6                                             New
  costarID space_type CBD_suburban       RBA available_space
1   445509      Relet     Suburban 101140416        20239067
2   436994      Relet     Suburban 101140416        20239067
3   434890      Relet     Suburban 101140416        20239067
4   434720      Relet     Suburban  65810449        12728989
5   437562      Relet     Suburban 101140416        20239067
6   437562      Relet     Suburban 101140416        20239067
  availability_proportion internal_class_rent overall_rent
1               0.2001086            27.65589     24.34569
2               0.2001086            27.65589     24.34569
3               0.2001086            27.65589     24.34569
4               0.1934190            18.56089     24.34569
5               0.2001086            27.65589     24.34569
6               0.2001086            27.65589     24.34569
  direct_available_space direct_availability_proportion
1                     NA                             NA
2                     NA                             NA
3                     NA                             NA
4                     NA                             NA
5                     NA                             NA
6                     NA                             NA
  direct_internal_class_rent direct_overall_rent sublet_available_space
1                         NA                 NA                     NA
2                         NA                 NA                     NA
3                         NA                 NA                     NA
4                         NA                 NA                     NA
5                         NA                 NA                     NA
```

```
6                           NA                   NA                        NA
  sublet_availability_proportion sublet_internal_class_rent sublet_overall_rent
1                             NA                         NA                  NA
2                             NA                         NA                  NA
3                             NA                         NA                  NA
4                             NA                         NA                  NA
5                             NA                         NA                  NA
6                             NA                         NA                  NA
  leasing unemployment_rate ending_occupancy_proportion
1 1205126               4.3                         NA
2 1205126               4.3                         NA
3 1205126               4.3                         NA
4  715742               4.3                         NA
5 1205126               4.3                         NA
6 1205126               4.3                         NA
  starting_occupancy_proportion avg_occupancy_proportion quarter_label
1                            NA                       NA       2018 Q1
2                            NA                       NA       2018 Q1
3                            NA                       NA       2018 Q1
4                            NA                       NA       2018 Q1
5                            NA                       NA       2018 Q1
6                            NA                       NA       2018 Q1
```

```
df2 %>%
  filter(market %in% c("Austin", "Detriot", "Houston", "Los Angeles", "Manhattan", "San Franc
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
    labs(title = "Average Availability Proportion by Market and Space Type", y = "Availabilty
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

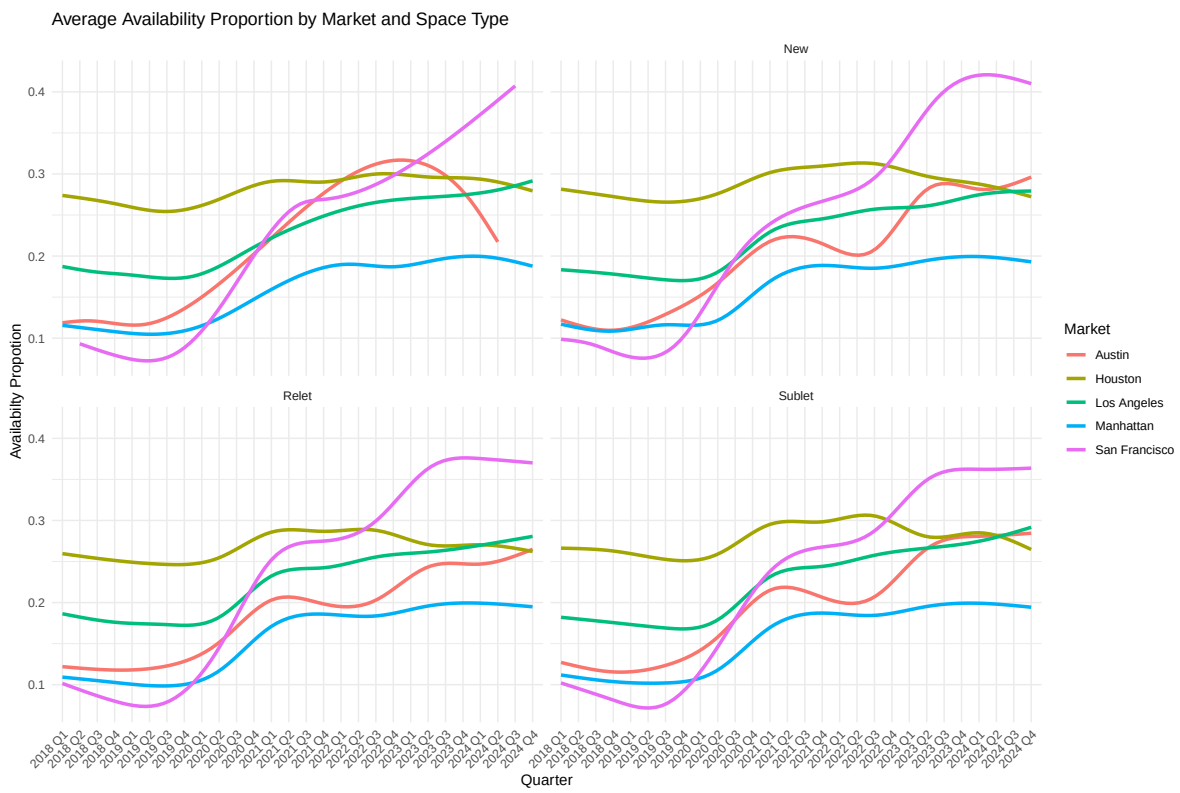
```
Warning: Removed 1 row containing non-finite outside the scale range
(`stat_smooth()`).
```




```
df2 %>%
  filter(market %in% c("Austin", "Detriot", "Houston", "Los Angeles", "Manhattan", "San Franc
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
    labs(title = "Average Availability Proportion by Market and Space Type", y = "Availabilty
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

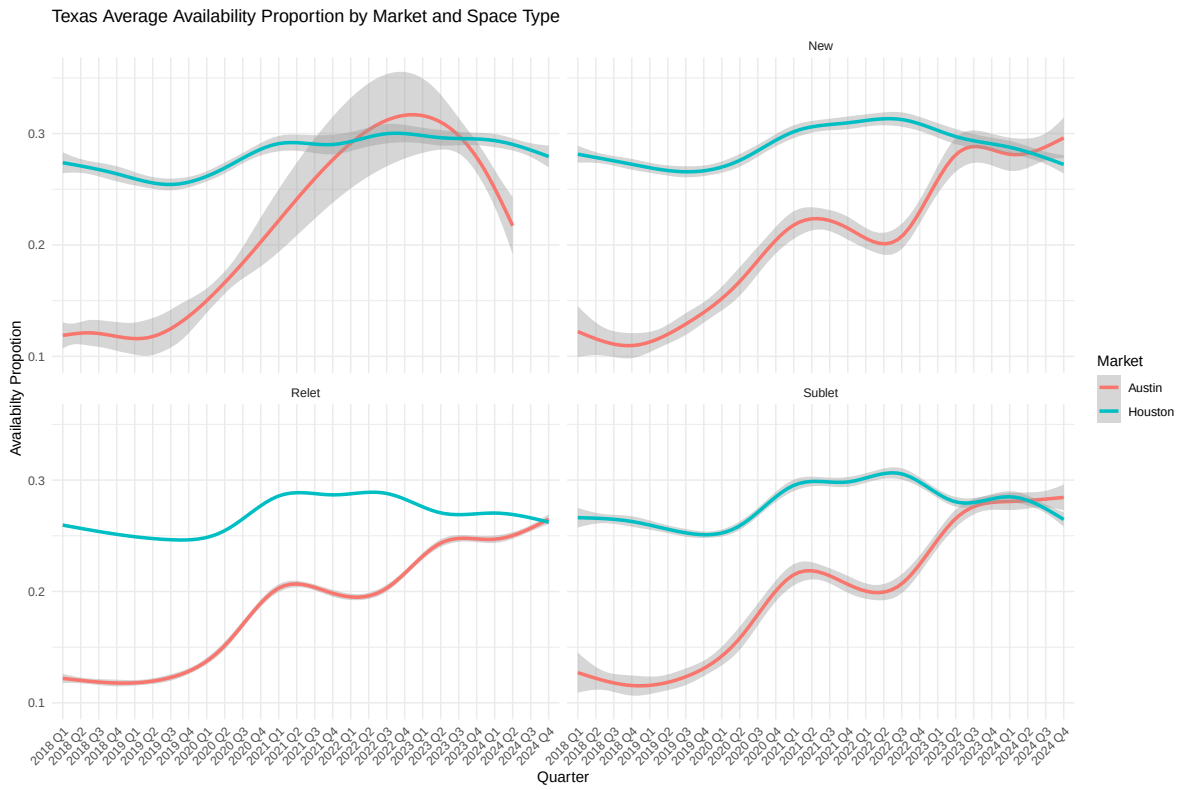
```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

```
Warning: Removed 1 row containing non-finite outside the scale range
(`stat_smooth()`).
```




```
### - Texas

df2 %>%
  filter(market %in% c("Houston", "Austin", "Dallas-Ft. Worth", "Dallas/Ft Worth")) %>%
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
    labs(title = "Texas Average Availability Proportion by Market and Space Type", y = "Avail
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

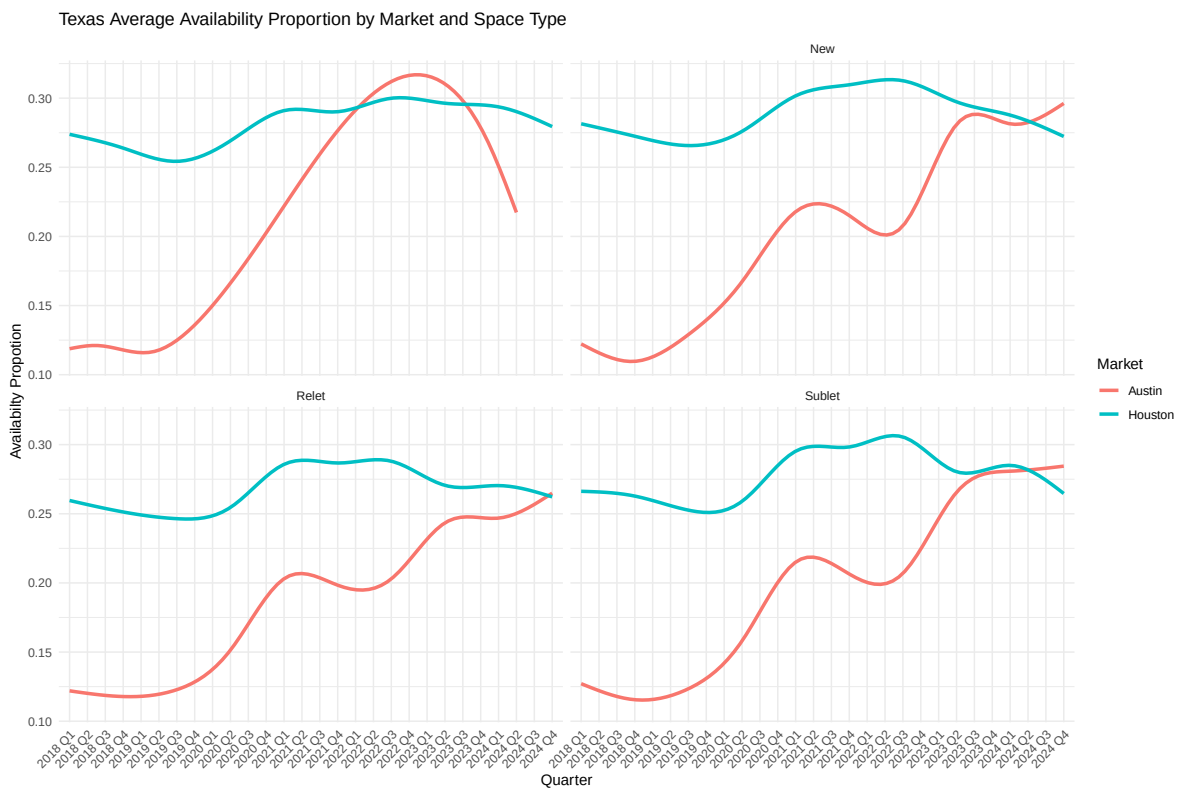
```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

Warning: Removed 15272 rows containing non-finite outside the scale range
(`stat_smooth()`).
```




```
df2 %>%
  filter(market %in% c("Houston", "Austin", "Dallas-Ft. Worth", "Dallas/Ft Worth")) %>%
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
    labs(title = "Texas Average Availability Proportion by Market and Space Type", y = "Avail
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

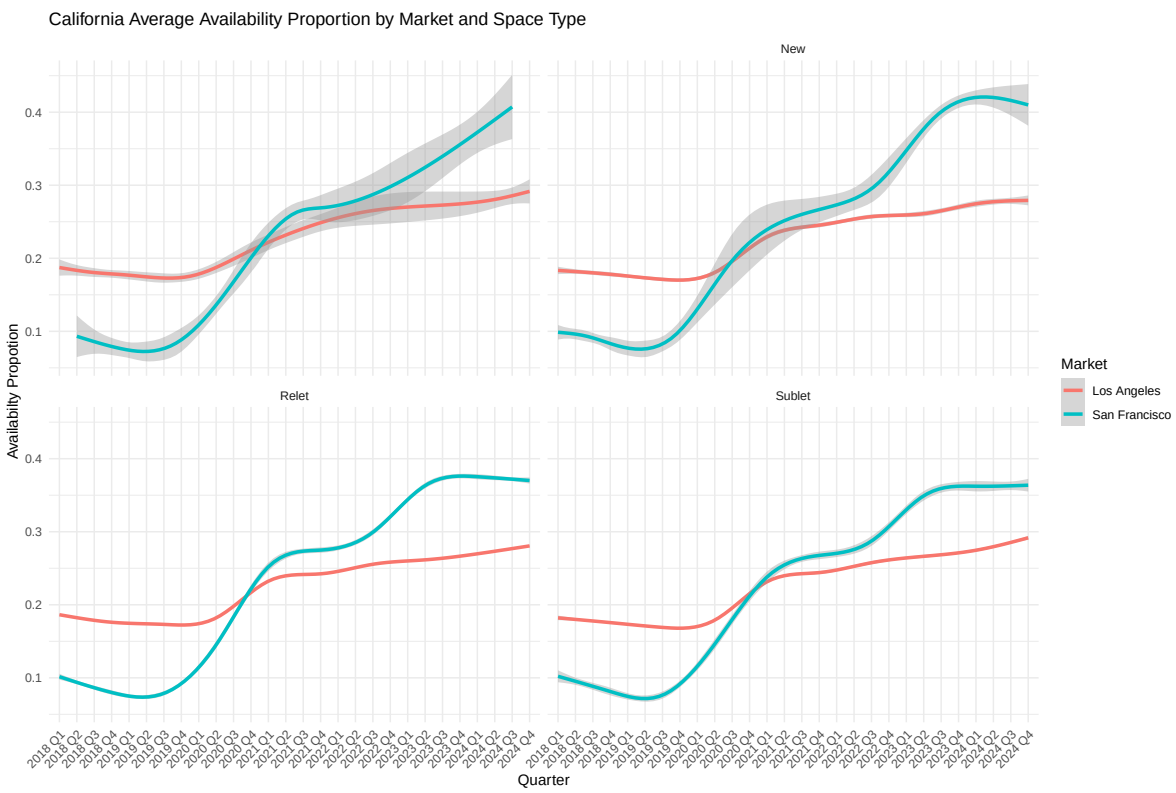
```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

```
Warning: Removed 15272 rows containing non-finite outside the scale range
(`stat_smooth()`).
```




```
### California

df2 %>%
  filter(market %in% c("Los Angeles", "San Francisco", "South Bay/San Jose", "South Bay")) %>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2) +
    labs(title = "California Average Availability Proportion by Market and Space Type", y = "
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

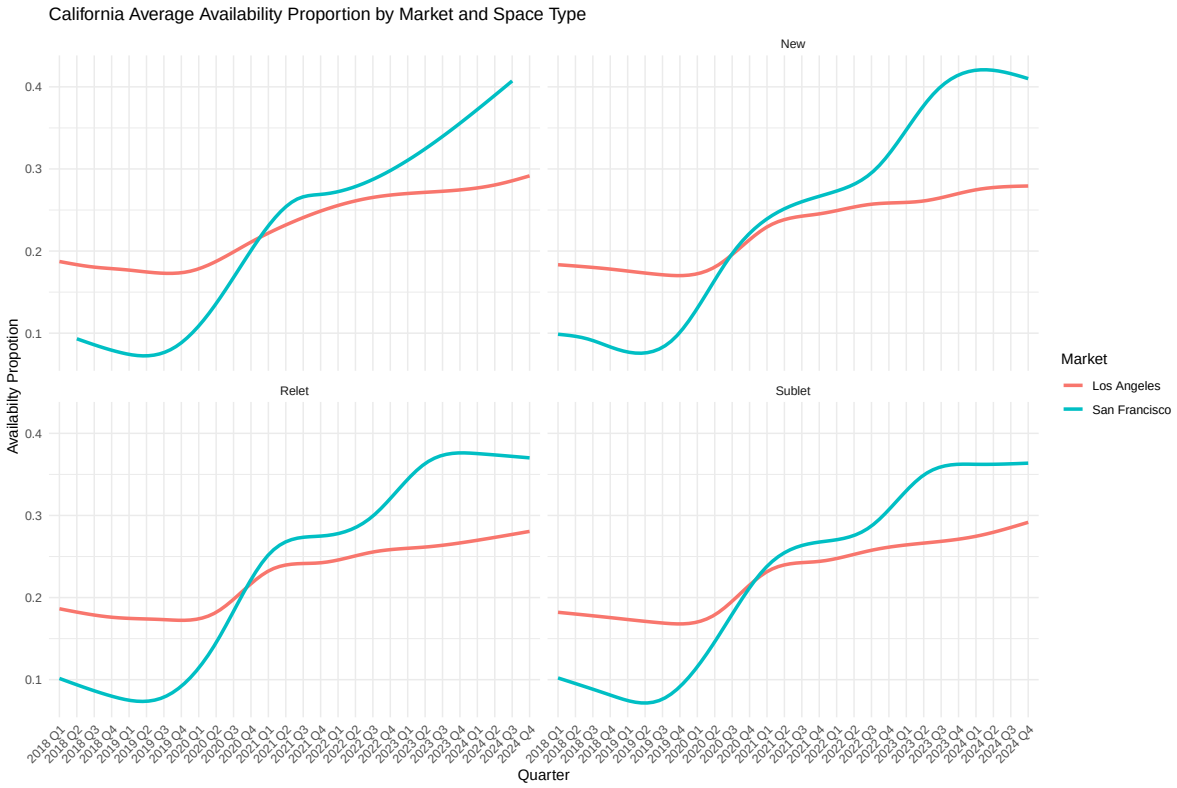
```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

Warning: Removed 3401 rows containing non-finite outside the scale range
(`stat_smooth()`).
```

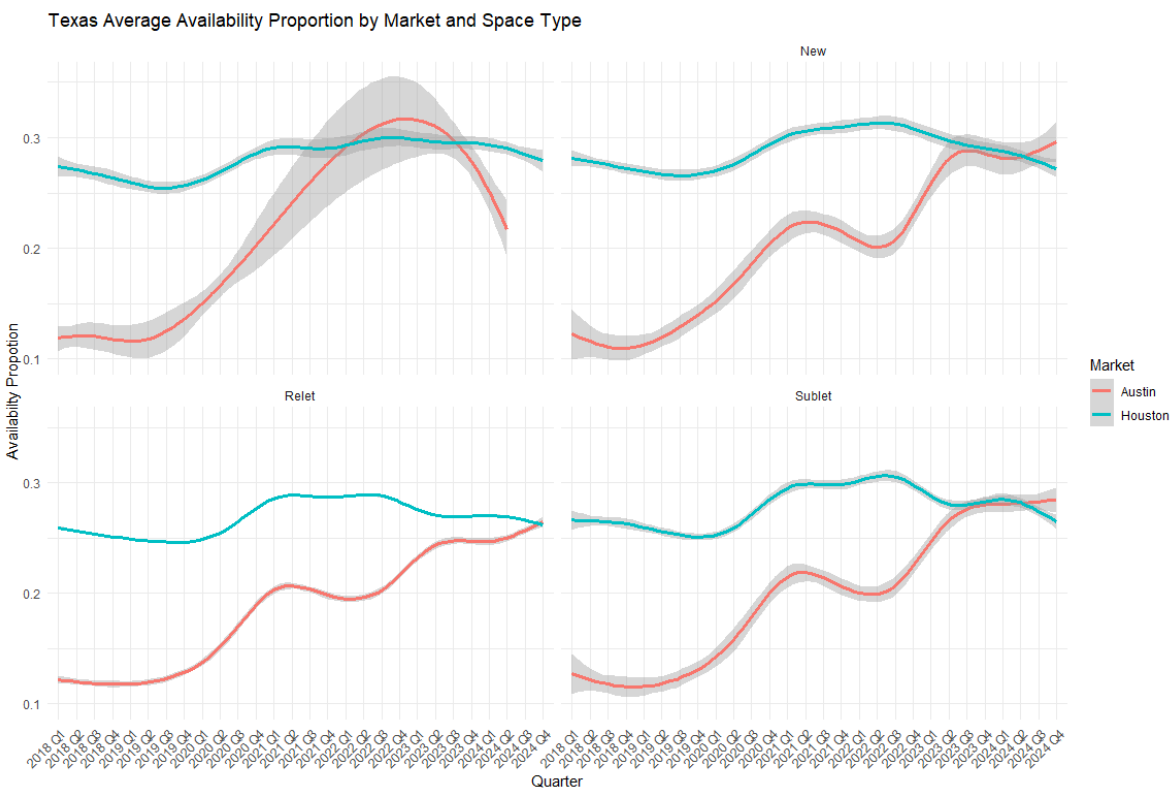



```
df2 %>%
  filter(market %in% c("Los Angeles", "San Francisco", "South Bay/San Jose", "South Bay")) %>
  ggplot(aes(x = quarter_label, group = market)) +
    geom_smooth(aes(y = availability_proportion, color = market), size = 1.2, se = FALSE) +
    labs(title = "California Average Availability Proportion by Market and Space Type", y = "
  facet_wrap(~space_type) +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
`geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

```
Warning: Removed 3401 rows containing non-finite outside the scale range
(`stat_smooth()`).
```


California Average Availability Proportion by Market and Space Type
New
Relet
Sublet
Availabilty Propotion
0.1
0.2
0.3
0.4
Quarter
Market
Los Angeles
San Francisco


Texas Average Availability Proportion by Market and Space Type
New
Relet
Sublet
Availabilty Propotion
0.1
0.2
0.3
Quarter
Market
Austin
Houston