00_explore_WHD_data

March 31, 2021

[1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

1 DOL Data Exploration

1.1 Exploring the whole dataset

[207]:

```
url = 'https://enfxfr.dol.gov/data_catalog/WHD/whd_whisard_20210127.csv.zip'
```

[208]:

```
raw_dol = pd.read_csv(url,
                      index_col=None,
                      dtype={7:'string'})
raw_dol['findings_start_date'] = pd.to_datetime(raw_dol['findings_start_date'],␣
 ↪errors='coerce')
raw_dol['findings_end_date'] = pd.to_datetime(raw_dol['findings_end_date'],␣
 ↪errors='coerce')
print(f'raw dataframe has {len(raw_dol.columns)} columns and {len(raw_dol)}␣
 ↪rows')
```

```
raw dataframe has 110 columns and 309680 rows
```

[209]:

```
raw_dol.head(5)
```

[209]:

```
   case_id                                      trade_nm  \
0  1428484                                Reliant Energy
1  1784005  Healthcare Services Group at Westwood Center
2  1460300                         Central Avenue Bakery
3  1294821                            Gallagher Services
4  1437099                  Dragon Dynasty Oriental Mart

                        legal_name          street_addr_1_txt  \
0  Reliant Energy Retail Services, LLC                1000 Main
1      Healthcare Services Group, Inc.           298 Main Street
2          Central Avenue Bakery, Inc.        679 Central Avenue
```

```
3                   Catholic Cherities        2520 Pot Spring Road
4                                  NaN  2299 South Ridgewood Avenue

                 cty_nm st_cd   zip_cd naic_cd  \
0               Houston    TX  77002.0   09310
1                 Keene    NH   3431.0    0967
2             Pawtucket    RI   2861.0  311811
3  Lutherville Timonium    MD  21093.0   09690
4         Daytona Beach    FL  32119.0   42449

                              naics_code_description  case_violtn_cnt  …  \
0  State Generation and Distribution of Electric …                0  …
1                                Local Nursing Homes                1  …
2                                    Retail Bakeries                4  …
3  Local Group Homes for Mentally and Physically …                0  …
4  Other Grocery and Related Products Merchant Wh…                0  …

   flsa_smwsl_bw_atp_amt  flsa_smwsl_ee_atp_cnt  eev_violtn_cnt  \
0                    0.0                      0               0
1                    0.0                      0               0
2                    0.0                      0               0
3                    0.0                      0               0
4                    0.0                      0               0

   h2b_violtn_cnt h2b_bw_atp_amt h2b_ee_atp_cnt  sraw_violtn_cnt  \
0               0            0.0              0                0
1               0            0.0              0                0
2               0            0.0              0                0
3               0            0.0              0                0
4               0            0.0              0                0

  sraw_bw_atp_amt  sraw_ee_atp_cnt                    ld_dt
0             0.0                0  2015-02-20 01:00:06 EST
1             0.0                0  2016-06-11 02:22:25 EDT
2             0.0                0  2015-02-20 01:00:06 EST
3             0.0                0  2015-02-20 01:00:06 EST
4             0.0                0  2015-02-20 01:00:06 EST

[5 rows x 110 columns]
```

[21]:

```
raw_dol.describe()
```

[21]:

```
            case_id         zip_cd  case_violtn_cnt  cmp_assd_cnt  \
count  3.096800e+05  309661.000000    309680.000000  3.096800e+05
mean   1.639501e+06   50673.925780        35.459494  6.471105e+02
std    1.946843e+06   29224.061948      1731.678004  9.886105e+03
min    0.000000e+00     601.000000         0.000000  0.000000e+00
```

```
25%    1.504257e+06   28001.000000         1.000000  0.000000e+00
50%    1.645296e+06   48075.000000         3.000000  0.000000e+00
75%    1.769142e+06   77586.000000        12.000000  0.000000e+00
max    1.081029e+09   99929.000000    530002.000000  3.129900e+06

       ee_violtd_cnt    bw_atp_amt     ee_atp_cnt  flsa_violtn_cnt  \
count  309680.000000  3.096800e+05  309680.000000    309680.000000
mean       14.372178  1.173674e+04      12.859290        13.824583
std       179.609428  1.328974e+05     176.756362       179.924239
min         0.000000  0.000000e+00       0.000000         0.000000
25%         0.000000  0.000000e+00       0.000000         0.000000
50%         2.000000  3.475950e+02       1.000000         2.000000
75%         9.000000  5.470535e+03       8.000000         9.000000
max     76664.000000  3.970437e+07   76664.000000     76664.000000

       flsa_bw_atp_amt  flsa_ee_atp_cnt  …  flsa_smwsl_violtn_cnt  \
count     3.096800e+05    309680.000000  …          309680.000000
mean      8.611195e+03        11.092030  …               0.000036
std       1.160610e+05       174.755015  …               0.007409
min       0.000000e+00         0.000000  …               0.000000
25%       0.000000e+00         0.000000  …               0.000000
50%       0.000000e+00         0.000000  …               0.000000
75%       3.556000e+03         6.000000  …               0.000000
max       3.970437e+07     76664.000000  …               3.000000

       flsa_smwsl_bw_atp_amt  flsa_smwsl_ee_atp_cnt  eev_violtn_cnt  \
count          309680.000000          309680.000000   309680.000000
mean                0.002598               0.000029        0.000052
std                 0.806373               0.005960        0.007188
min                 0.000000               0.000000        0.000000
25%                 0.000000               0.000000        0.000000
50%                 0.000000               0.000000        0.000000
75%                 0.000000               0.000000        0.000000
max               382.050000               2.000000        1.000000

       h2b_violtn_cnt  h2b_bw_atp_amt  h2b_ee_atp_cnt  sraw_violtn_cnt  \
count   309680.000000   309680.000000   309680.000000         309680.0
mean         0.050407       34.129595        0.023705              0.0
std          2.629388     2780.908164        1.225952              0.0
min          0.000000        0.000000        0.000000              0.0
25%          0.000000        0.000000        0.000000              0.0
50%          0.000000        0.000000        0.000000              0.0
75%          0.000000        0.000000        0.000000              0.0
max        595.000000   918682.500000      215.000000              0.0

       sraw_bw_atp_amt  sraw_ee_atp_cnt
count         309680.0         309680.0
```

```
mean                 0.0              0.0
std                  0.0              0.0
min                  0.0              0.0
25%                  0.0              0.0
50%                  0.0              0.0
75%                  0.0              0.0
max                  0.0              0.0

[8 rows x 99 columns]
```

[215]:

```
# Show the date range of the data.
max_date = max(raw_dol['findings_end_date'])
min_date = min(raw_dol['findings_start_date'])
print(f'case date range is from {min_date} to {max_date}')
max_entry = max(raw_dol['ld_dt'])
min_entry = min(raw_dol['ld_dt'])
print(f'date entry time range is from {min_entry} to {max_entry}')
```

```
case date range is from 1900-01-09 00:00:00 to 2020-12-30 00:00:00
date entry time range is from 2015-02-20 01:00:06 EST to 2021-01-27 00:18:05 EST
```

[20]:

```
raw_dol.isnull().sum().sort_values(ascending=False)
```

[20]:

```
flsa_repeat_violator      291725
legal_name                  3174
naic_cd                      155
naics_code_description       155
zip_cd                        19
                             …
flsa_smwpw_ee_atp_cnt          0
flsa_hmwkr_violtn_cnt          0
flsa_hmwkr_bw_atp_amt          0
flsa_hmwkr_ee_atp_cnt          0
case_id                        0
Length: 110, dtype: int64
```

[65]:

```
print(len(raw_dol['legal_name'].unique()))
print(f'doesn''t match the df size, so there are repetitives')
```

```
265929
doesnt match the df size, so there are repetitives
```

[66]:

```
# try to create unique identifier
# but weird thing is that adding 'naic_cd' or not yeilds different unique number
raw_dol['combined_id'] =␣
 ↪raw_dol[['legal_name','naic_cd','zip_cd','street_addr_1_txt']].apply(
    lambda x: '_'.join(map(str, x)), axis=1)
```

```
print(len(raw_dol['combined_id'].unique()))
```

```
305787
```

1.1.1 general plotting

[69]:

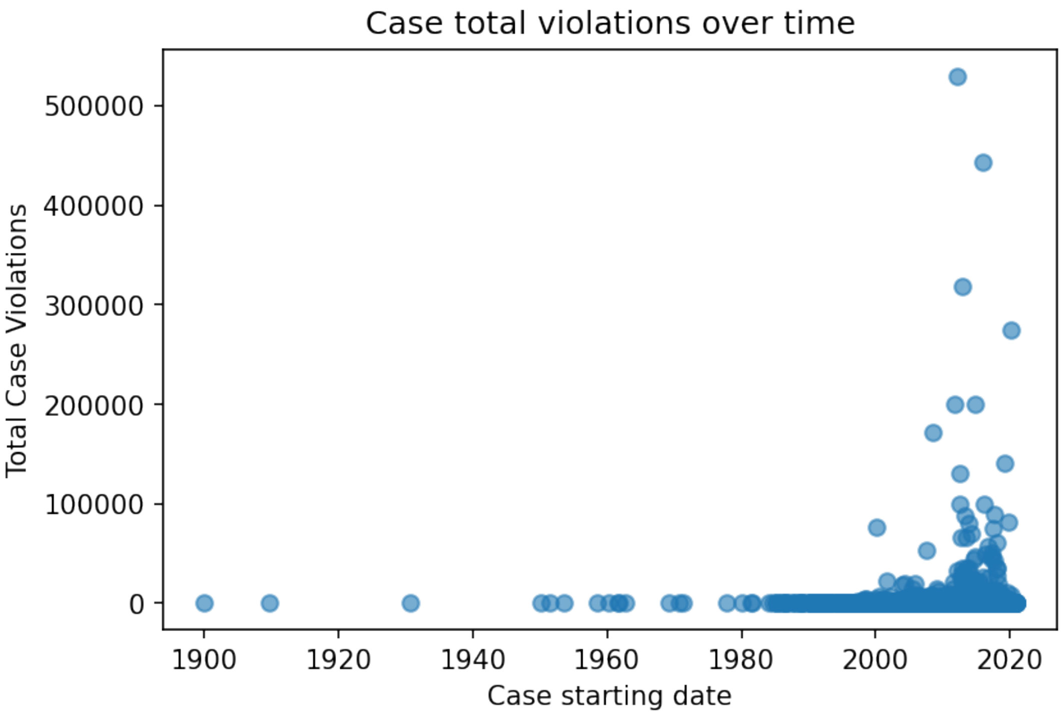
```
plt.rcParams['figure.dpi'] = 150
```

[113]:

```
fig, ax1 = plt.subplots()
ax1.scatter(raw_dol['findings_start_date'],raw_dol['case_violtn_cnt'], alpha=0.
 ↪6)
ax1.set_xlabel('Case starting date')
ax1.set_ylabel('Total Case Violations')
plt.title('Case total violations over time')
```

[113]:

```
Text(0.5, 1.0, 'Case total violations over time')
```

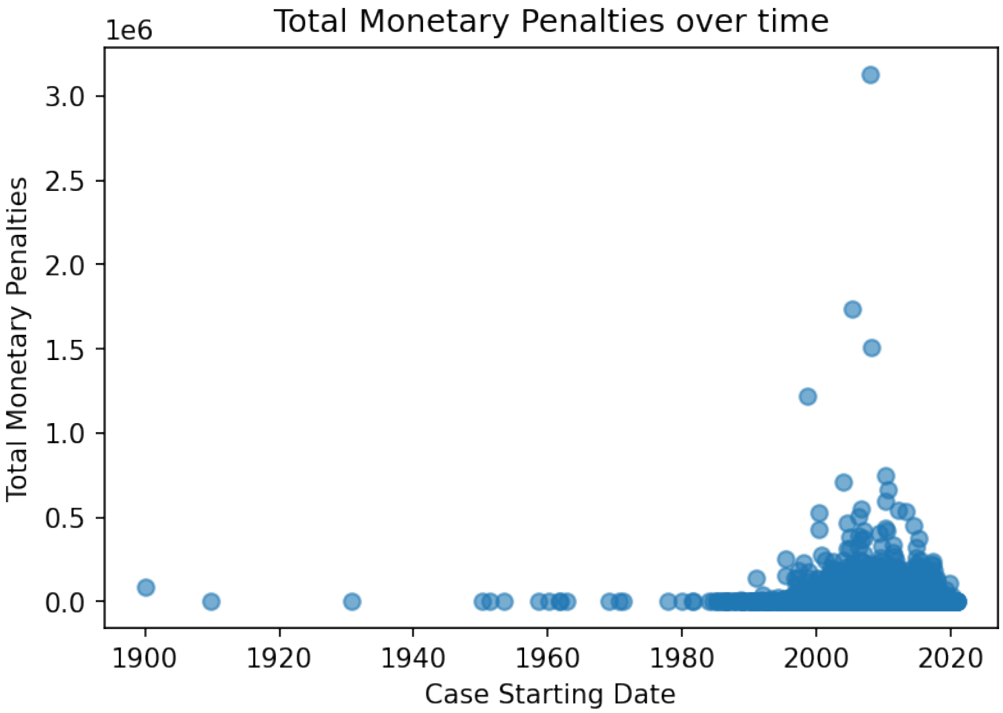


[114]:

```
fig, ax1 = plt.subplots()
ax1.scatter(raw_dol['findings_start_date'],raw_dol['cmp_assd_cnt'], alpha=0.6)
ax1.set_xlabel('Case Starting Date')
ax1.set_ylabel('Total Monetary Penalties')
plt.title('Total Monetary Penalties over time')
```

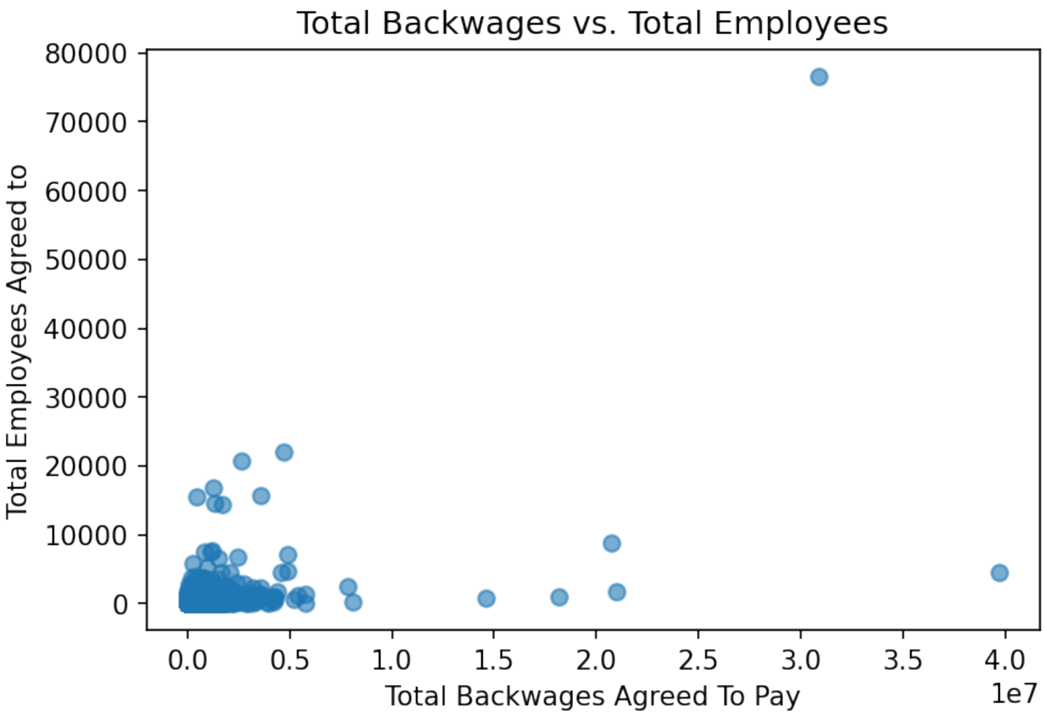
[114]:

```
Text(0.5, 1.0, 'Total Monetary Penalties over time')
```



```
[136]: fig, ax1 = plt.subplots()
       ax1.scatter(raw_dol['bw_atp_amt'],raw_dol['ee_atp_cnt'], alpha=0.6)
       ax1.set_xlabel('Total Backwages Agreed To Pay')
       ax1.set_ylabel('Total Employees Agreed to')
       plt.title('Total Backwages vs. Total Employees')
```

```
[136]: Text(0.5, 1.0, 'Total Backwages vs. Total Employees')
```



1.2 H2A Violation Data

[210]:

```
# create indicator column for H2A violation cases
raw_dol['h2a_indicator'] = (raw_dol['h2a_violtn_cnt'] > 0).astype('int')
# pull out the H2A data
h2a_df = raw_dol[(raw_dol['h2a_indicator']==1)]
```

[174]:

```
h2a_df.describe()
```

[174]:

```
            case_id         zip_cd  case_violtn_cnt  cmp_assd_cnt  \
count  3.415000e+03   3415.000000      3415.000000  3.415000e+03
mean   1.700525e+06  42937.364568        37.055051  1.001720e+04
std    1.569606e+05  25518.246853       122.372992  6.850848e+04
min    2.573870e+05    601.000000         1.000000  0.000000e+00
25%    1.594660e+06  24080.000000         3.000000  0.000000e+00
50%    1.729788e+06  36582.000000         8.000000  1.350000e+03
75%    1.827594e+06  67467.000000        25.000000  5.400000e+03
max    1.921534e+06  99357.000000      2667.000000  3.129900e+06

       ee_violtd_cnt    bw_atp_amt  ee_atp_cnt  flsa_violtn_cnt  \
count    3415.000000  3.415000e+03  3415.000000      3415.000000
mean       17.408785  8.614096e+03    14.448023         2.059444
std        65.059797  5.184395e+04    57.885127        13.071353
```

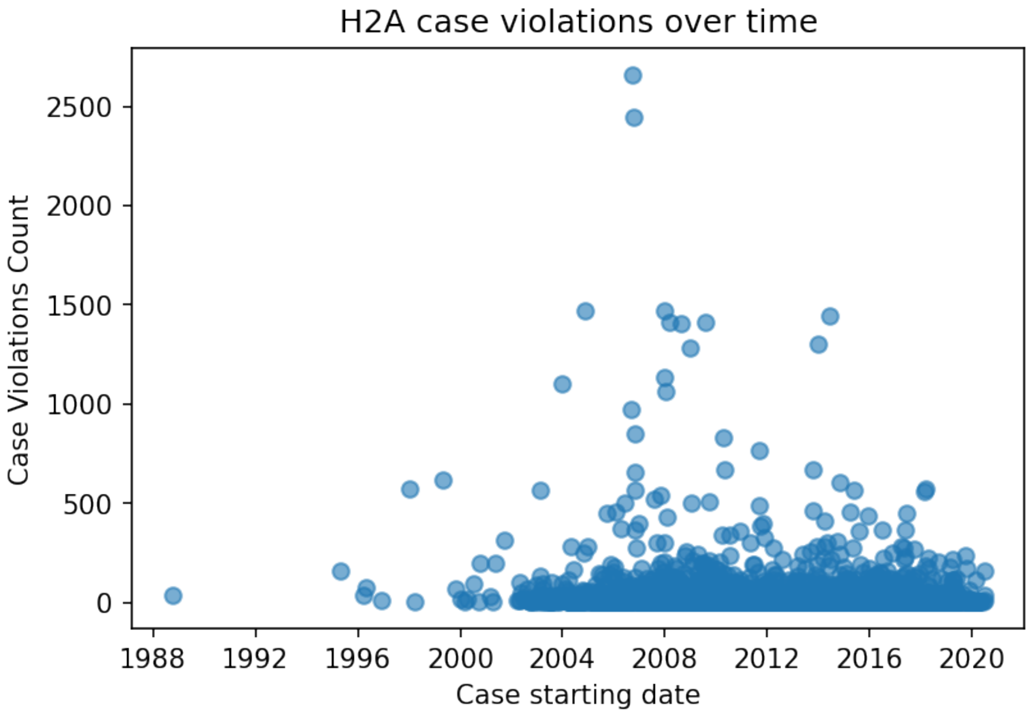
```
min        0.000000  0.000000e+00     0.000000         0.000000
25%        0.000000  0.000000e+00     0.000000         0.000000
50%        2.000000  4.078000e+01     1.000000         0.000000
75%       11.000000  3.962270e+03     8.000000         1.000000
max     1464.000000  2.338700e+06  1365.000000       398.000000

       flsa_bw_atp_amt  flsa_ee_atp_cnt  …  flsa_smwsl_ee_atp_cnt  \
count      3415.000000      3415.000000  …                 3415.0
mean        865.224940         1.293411  …                    0.0
std        6947.471246         9.538594  …                    0.0
min           0.000000         0.000000  …                    0.0
25%           0.000000         0.000000  …                    0.0
50%           0.000000         0.000000  …                    0.0
75%           0.000000         0.000000  …                    0.0
max      152868.770000       234.000000  …                    0.0

       eev_violtn_cnt  h2b_violtn_cnt  h2b_bw_atp_amt  h2b_ee_atp_cnt  \
count     3415.000000      3415.00000          3415.0          3415.0
mean         0.000293         0.00410             0.0             0.0
std          0.017112         0.13898             0.0             0.0
min          0.000000         0.00000             0.0             0.0
25%          0.000000         0.00000             0.0             0.0
50%          0.000000         0.00000             0.0             0.0
75%          0.000000         0.00000             0.0             0.0
max          1.000000         6.00000             0.0             0.0

       sraw_violtn_cnt  sraw_bw_atp_amt  sraw_ee_atp_cnt  h2b_indicator  \
count           3415.0           3415.0           3415.0    3415.000000
mean               0.0              0.0              0.0       0.001171
std                0.0              0.0              0.0       0.034209
min                0.0              0.0              0.0       0.000000
25%                0.0              0.0              0.0       0.000000
50%                0.0              0.0              0.0       0.000000
75%                0.0              0.0              0.0       0.000000
max                0.0              0.0              0.0       1.000000

       h2a_indicator
count         3415.0
mean             1.0
std              0.0
min              1.0
25%              1.0
50%              1.0
75%              1.0
max              1.0

[8 rows x 101 columns]
```

[205]:

```python
plt.scatter(h2a_df['findings_start_date'],h2a_df['h2a_violtn_cnt'], alpha=0.6)
plt.xlabel('Case starting date')
plt.ylabel('Case Violations Count')
plt.title('H2A case violations over time')
```

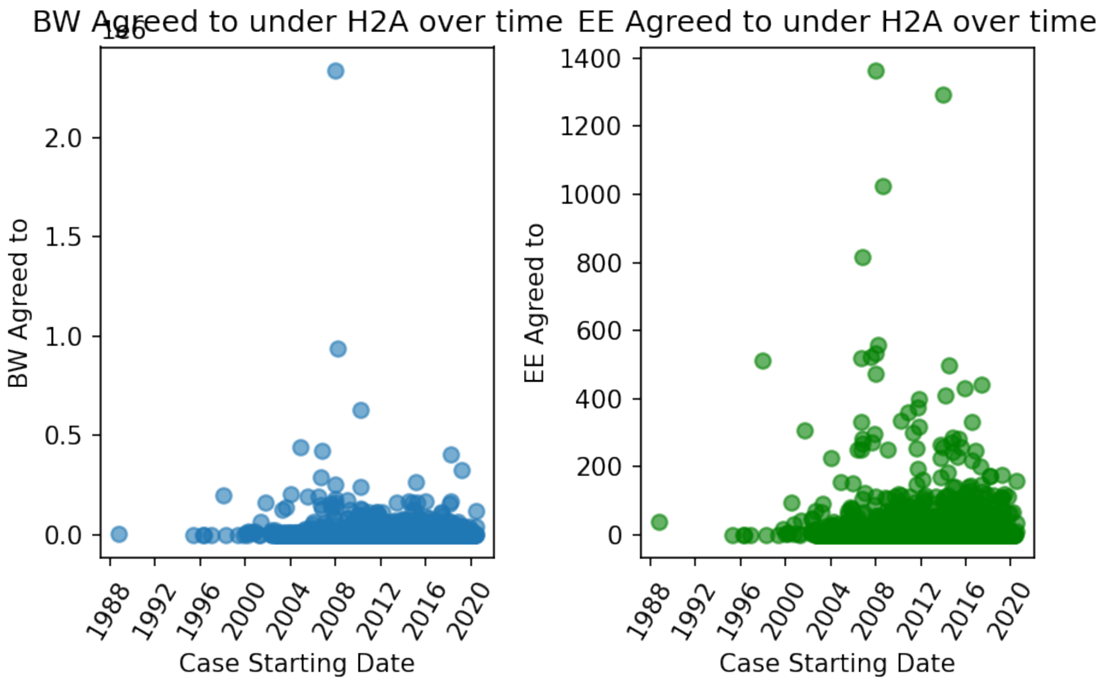
[205]:

```
Text(0.5, 1.0, 'H2A case violations over time')
```



[177]:

```python
# plots of backwages and employees agreed to overtime
plt.subplot(1, 2, 1)
plt.scatter(h2a_df['findings_start_date'],h2a_df['h2a_bw_atp_amt'], alpha=0.6)
plt.xlabel('Case Starting Date')
plt.ylabel('BW Agreed to')
plt.title('BW Agreed to under H2A over time')
plt.xticks(rotation=60)

plt.subplot(1, 2, 2)
plt.scatter(h2a_df['findings_start_date'], h2a_df['h2a_ee_atp_cnt'],␣
 ↪color='green', alpha=0.6)
plt.xlabel('Case Starting Date')
plt.ylabel('EE Agreed to')
plt.title('EE Agreed to under H2A over time')
plt.xticks(rotation=60)
plt.tight_layout()
```

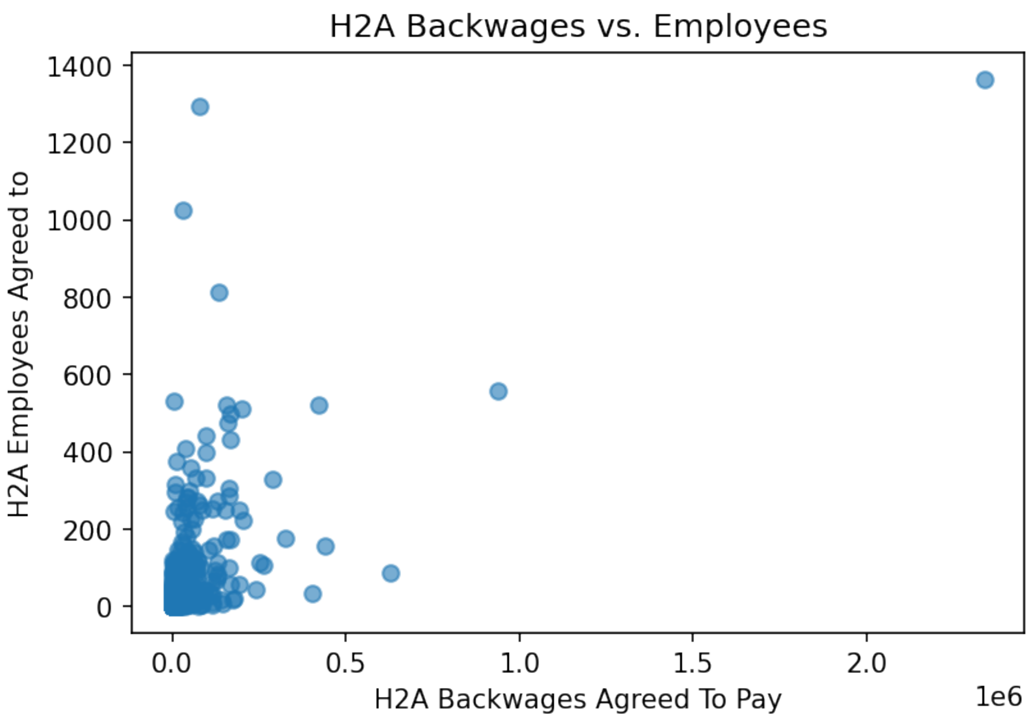


[185]:

```
fig, ax1 = plt.subplots()
ax1.scatter(h2a_df['h2a_bw_atp_amt'],h2a_df['h2a_ee_atp_cnt'], alpha=0.6)
ax1.set_xlabel('H2A Backwages Agreed To Pay')
ax1.set_ylabel('H2A Employees Agreed to')
plt.title('H2A Backwages vs. Employees')
```

[185]:

```
Text(0.5, 1.0, 'H2A Backwages vs. Employees')
```



1.3 H2B Related Data

```
[211]: # create indicator column for H2B violation cases
       raw_dol['h2b_indicator'] = (raw_dol['h2b_violtn_cnt'] > 0.).astype('int')
       # pull out the h2b violation data
       h2b_df = raw_dol[(raw_dol['h2b_indicator']==1)]
```

```
[250]: h2b_df.head(5)
```

```
[250]:       case_id                                 trade_nm  \
       999   1627223           MT ST HELENS REFORESTATION, INC.
       2590  1613008                      Shearon Environmental
       6737  1590942                    Lake County Landscaping
       7174  1655210                             Oaseas Resorts
       7735  1662573  Ultimate Services Professional Grounds MGMT

                                            legal_name  \
       999             MT ST HELENS REFORESTATION, INC.
       2590      Shearon Environmental Design Co., Inc.
       6737        Lake County Landscape & Supply, Inc
       7174                                Oaseas, LLC
       7735  Ultimate Services Professional Grounds MGMT
```

```
                   street_addr_1_txt            cty_nm st_cd   zip_cd naic_cd  \
999             118 Market Boulevard          Chehalis    WA  98532.0  113110
2590          5160 Militia Hill Road  Plymouth Meeting    PA  19462.0  561730
6737                     P O Box  70       Grand River    OH  44045.0  561730
7174  415 Richard Blvd Jackson Blvd.       Panama City    FL  32408.0  721110
7735                   31 Tosun Road           Wolcott    CT   6716.0  561730

                        naics_code_description  case_violtn_cnt  ...  \
999                    Timber Tract Operations              255  ...
2590                      Landscaping Services              128  ...
6737                      Landscaping Services               48  ...
7174  Hotels (except Casino Hotels) and Motels               56  ...
7735                      Landscaping Services              196  ...

      eev_violtn_cnt  h2b_violtn_cnt  h2b_bw_atp_amt  h2b_ee_atp_cnt  \
999                0               3             0.0               0
2590               0              63          9005.0              43
6737               0               1             0.0               0
7174               0               1             0.0               0
7735               0             196        280000.0              89

     sraw_violtn_cnt sraw_bw_atp_amt  sraw_ee_atp_cnt  \
999                0             0.0                0
2590               0             0.0                0
6737               0             0.0                0
7174               0             0.0                0
7735               0             0.0                0

                        ld_dt  h2a_indicator  h2b_indicator
999   2016-02-19 01:00:04 EST              0              1
2590  2016-06-11 02:22:25 EDT              0              1
6737  2016-02-19 01:00:04 EST              1              1
7174  2016-02-19 01:00:04 EST              0              1
7735  2016-02-19 01:00:04 EST              0              1

[5 rows x 112 columns]
```

[132]:

```
h2b_df.describe()
```

[132]:

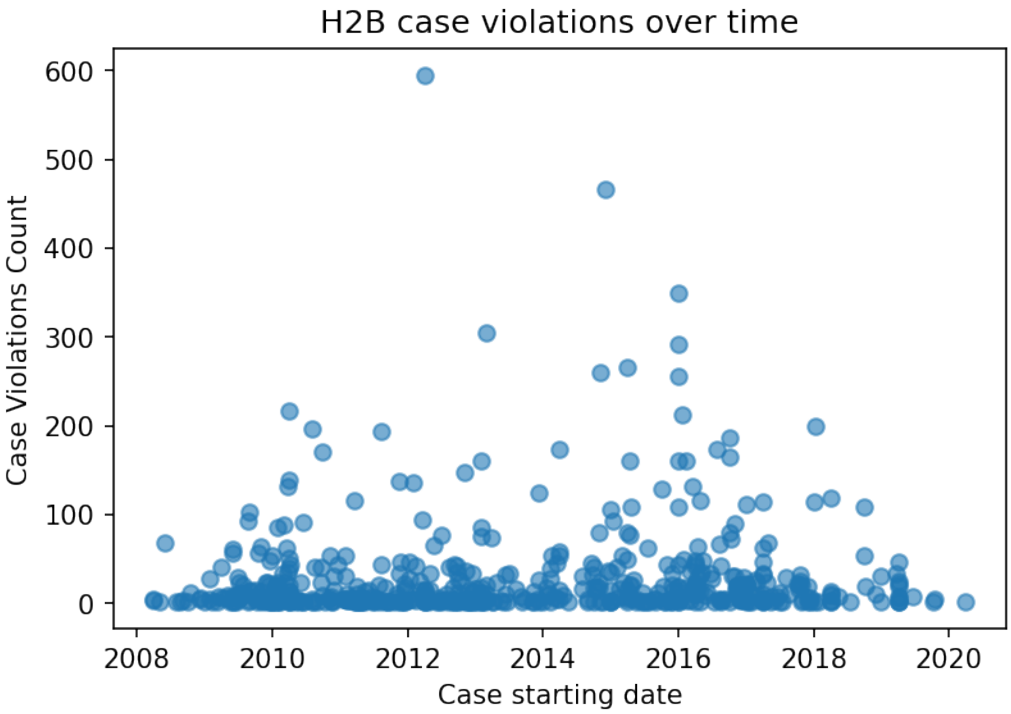
```
            case_id        zip_cd  case_violtn_cnt   cmp_assd_cnt  \
count  5.410000e+02    541.000000       541.000000     541.000000
mean   1.745596e+06  49337.118299        53.371534   16179.400000
std    9.821777e+04  29488.208340       136.632315   23000.273403
min    1.532503e+06   1201.000000         1.000000       0.000000
25%    1.665360e+06  21664.000000         5.000000    2388.000000
50%    1.741576e+06  49757.000000        21.000000    8837.600000
75%    1.835341e+06  77023.000000        56.000000   20913.460000
```

```
max    1.915934e+06  99686.000000      2645.000000  206689.680000

       ee_violtd_cnt    bw_atp_amt  ee_atp_cnt  flsa_violtn_cnt  \
count     541.000000  5.410000e+02  541.000000       541.000000
mean       27.414048  2.793141e+04   23.072089        15.524954
std        50.672903  8.354213e+04   38.672178        44.727175
min         0.000000  0.000000e+00    0.000000         0.000000
25%         1.000000  0.000000e+00    0.000000         0.000000
50%        12.000000  5.021220e+03   10.000000         1.000000
75%        32.000000  2.565062e+04   29.000000        11.000000
max       699.000000  1.277550e+06  342.000000       486.000000

       flsa_bw_atp_amt  flsa_ee_atp_cnt  …  flsa_smwsl_bw_atp_amt  \
count       541.000000       541.000000  …                  541.0
mean       7795.460998        10.613678  …                    0.0
std       38286.986975        28.972409  …                    0.0
min           0.000000         0.000000  …                    0.0
25%           0.000000         0.000000  …                    0.0
50%           0.000000         0.000000  …                    0.0
75%        2525.560000         8.000000  …                    0.0
max      701137.730000       338.000000  …                    0.0

       flsa_smwsl_ee_atp_cnt  eev_violtn_cnt  h2b_violtn_cnt  h2b_bw_atp_amt  \
count                  541.0           541.0      541.000000      541.000000
mean                     0.0             0.0       28.853974    19536.512163
std                      0.0             0.0       55.966218    63665.234308
min                      0.0             0.0        1.000000        0.000000
25%                      0.0             0.0        2.000000        0.000000
50%                      0.0             0.0        9.000000     1185.000000
75%                      0.0             0.0       29.000000    13013.230000
max                      0.0             0.0      595.000000   918682.500000

       h2b_ee_atp_cnt  sraw_violtn_cnt  sraw_bw_atp_amt  sraw_ee_atp_cnt  \
count      541.000000            541.0            541.0            541.0
mean        13.569316              0.0              0.0              0.0
std         26.034046              0.0              0.0              0.0
min          0.000000              0.0              0.0              0.0
25%          0.000000              0.0              0.0              0.0
50%          3.000000              0.0              0.0              0.0
75%         15.000000              0.0              0.0              0.0
max        215.000000              0.0              0.0              0.0

       h2b_indicator
count          541.0
mean             1.0
std              0.0
min              1.0
```

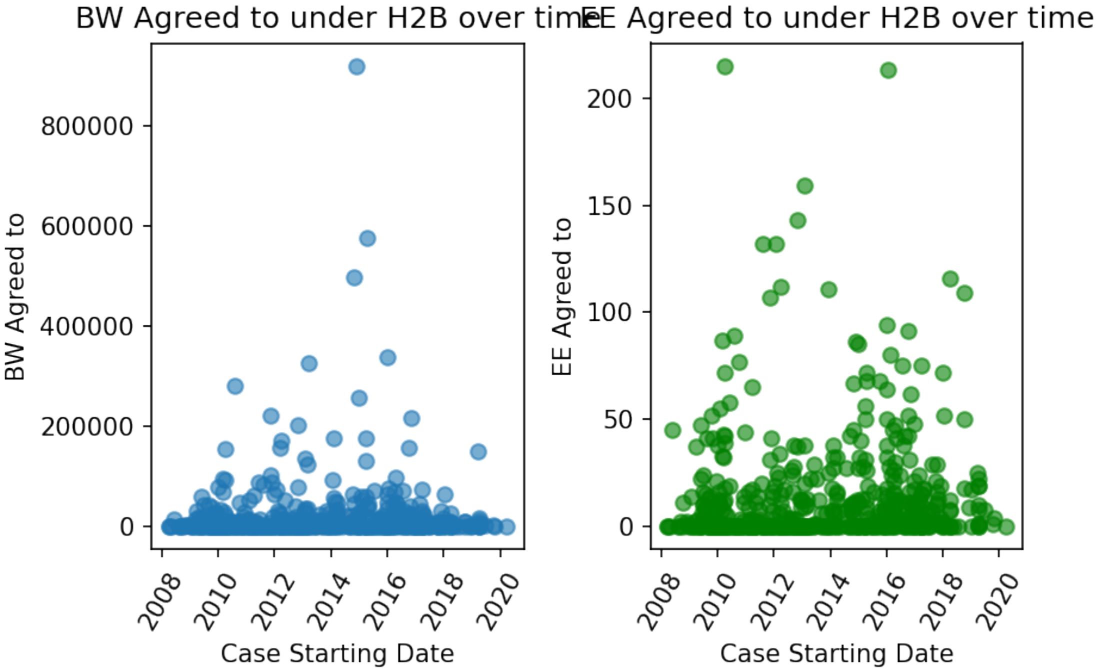
```
25%               1.0
50%               1.0
75%               1.0
max               1.0

[8 rows x 100 columns]
```

[134]:
```
fig, ax1 = plt.subplots()
ax1.scatter(h2b_df['findings_start_date'],h2b_df['h2b_violtn_cnt'], alpha=0.6)
ax1.set_xlabel('Case starting date')
ax1.set_ylabel('Case Violations Count')
plt.title('H2B case violations over time')
```

[134]:
```
Text(0.5, 1.0, 'H2B case violations over time')
```

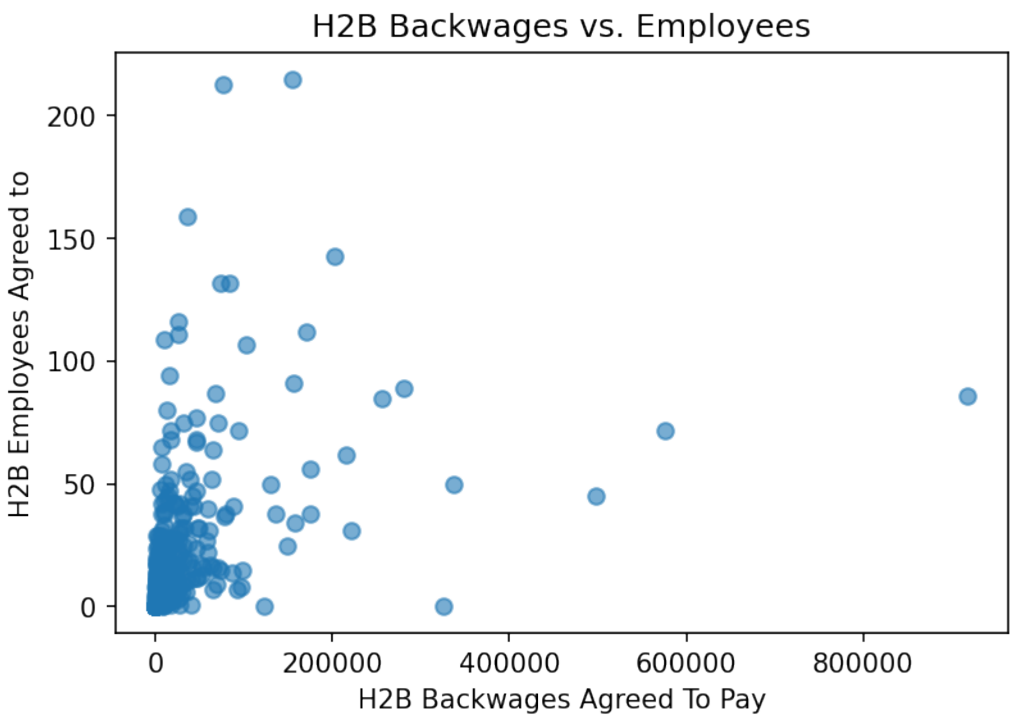


[155]:
```
# plots of backwages and employees agreed to overtime
plt.subplot(1, 2, 1)
plt.scatter(h2b_df['findings_start_date'],h2b_df['h2b_bw_atp_amt'], alpha=0.6)
plt.xlabel('Case Starting Date')
plt.ylabel('BW Agreed to')
plt.title('BW Agreed to under H2B over time')
plt.xticks(rotation=60)
plt.subplot(1, 2, 2)
plt.scatter(h2b_df['findings_start_date'], h2b_df['h2b_ee_atp_cnt'],␣
 ↪color='green', alpha=0.6)
plt.xlabel('Case Starting Date')
plt.ylabel('EE Agreed to')
plt.title('EE Agreed to under H2B over time')
plt.xticks(rotation=60)
plt.tight_layout()
```



```
[184]: fig, ax1 = plt.subplots()
       ax1.scatter(h2b_df['h2b_bw_atp_amt'],h2b_df['h2b_ee_atp_cnt'], alpha=0.6)
       ax1.set_xlabel('H2B Backwages Agreed To Pay')
       ax1.set_ylabel('H2B Employees Agreed to')
       plt.title('H2B Backwages vs. Employees')
```

```
[184]: Text(0.5, 1.0, 'H2B Backwages vs. Employees')
```



1.4 H2 violation comparison

```
[244]: # count of case frequency by state for h2a and h2b
state_freq_h2a = h2a_df['st_cd'].value_counts()
print('top 12 state with most h2a inspected cases')
print(state_freq_h2a[:12])
```

```
count of cases by state for h2a
FL    394
NY    315
KY    293
VA    281
NC    155
LA    138
MS    112
TX    104
KS    103
CA     98
PA     96
TN     93
Name: st_cd, dtype: int64
```

[245]:

```
state_freq_h2b = h2b_df['st_cd'].value_counts()
print('top 12 state with most h2b inspected cases')
print(state_freq_h2a[:12])
```

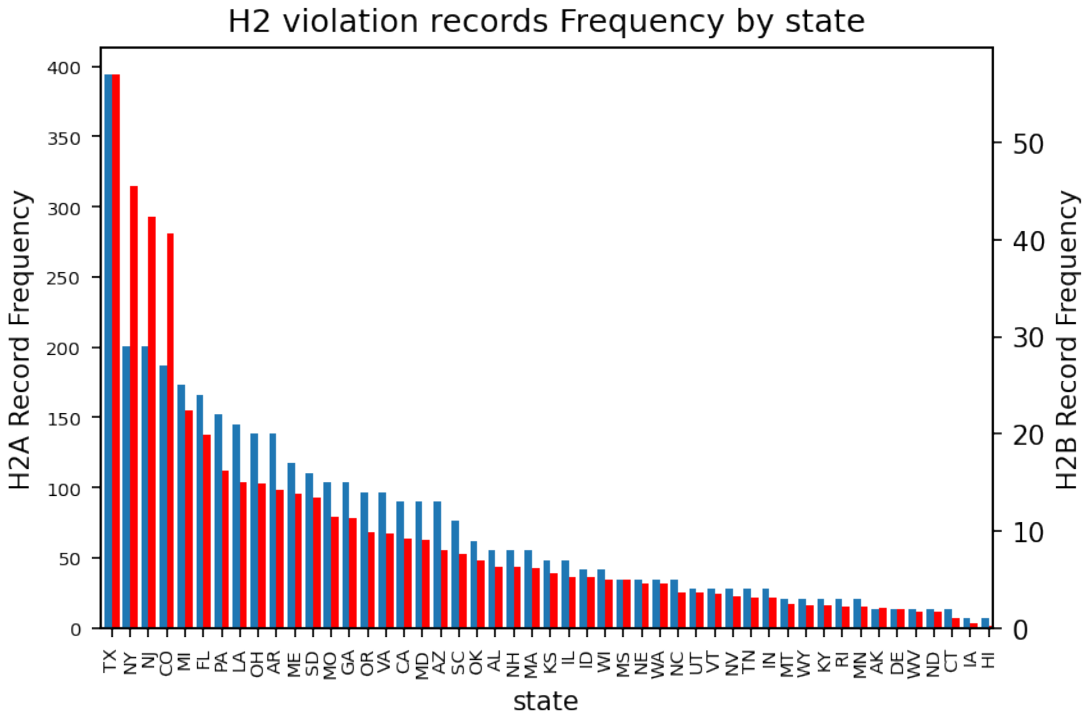
```
top 12 state with most h2b inspected cases
FL    394
NY    315
KY    293
VA    281
NC    155
LA    138
MS    112
TX    104
KS    103
CA     98
PA     96
TN     93
Name: st_cd, dtype: int64
```

[246]:

```
# records per state
# based on the frequency of records, not on violation count
width = 0.4
fig, ax1 = plt.subplots()
state_freq_h2a.plot(kind='bar',color='red', position =0, ax=ax1, width=width)
ax2 = ax1.twinx()
state_freq_h2b.plot(kind='bar', ax=ax2, position=1, width=width)
ax1.set_xlabel('state', fontsize=10)
ax1.set_ylabel('H2A Record Frequency', fontsize=10)
ax2.set_ylabel('H2B Record Frequency')
ax1.tick_params(labelsize=7)
plt.title('H2 violation records Frequency by state')
```

[246]:

```
Text(0.5, 1.0, 'H2 violation records Frequency by state')
```



```
[220]: # count of case frequency by industry code and description for h2a and h2b
       h2a_df[['naic_cd','naics_code_description']].value_counts()
```

```
[220]: naic_cd  naics_code_description
       111910   Tobacco Farming                                       461
       115115   Farm Labor Contractors and Crew Leaders               396
       111219   Other Vegetable (except Potato) and Melon Farming     293
       111331   Apple Orchards                                        260
       111421   Nursery and Tree Production                           202
                                                                     …
       339999   All Other Miscellaneous Manufacturing                   1
       424460   Fish and Seafood Merchant Wholesalers                   1
       424480   Fresh Fruit and Vegetable Merchant Wholesalers          1
       11141    Food Crops Grown Under Cover                            1
       333111   Farm Machinery and Equipment Manufacturing              1
       Length: 146, dtype: int64
```

```
[221]: h2b_df[['naic_cd','naics_code_description']].value_counts()
```

```
[221]: naic_cd  naics_code_description
       561730   Landscaping Services                                                146
       721110   Hotels (except Casino Hotels) and Motels                             66
       541320   Landscape Architectural Services                                     33
```

```
115310   Support Activities for Forestry                                      30
722110   Full-Service Restaurants                                             14
                                                                            …
48412    General Freight Trucking, Long-Distance                               1
484210   Used Household and Office Goods Moving                                1
48423    Specialized Freight (except Used Goods) Trucking, Long-Distance       1
485113   Bus and Other Motor Vehicle Transit Systems                           1
111211   Potato Farming                                                        1
Length: 111, dtype: int64
```

[247]:

```
# count of H2A violations by state
h2a_vio_state = h2a_df.groupby(['st_cd'])['h2a_violtn_cnt'].sum().
 ↪sort_values(ascending=False)
print('top 12 state with most h2a violation counts')
print(h2a_vio_state[:12])
```

```
top 12 state with most h2a violation counts
st_cd
FL    16882
CA    13529
MS     7267
VA     5898
KY     4929
AZ     4812
NC     4404
NY     4271
WA     4101
GA     3882
LA     3615
TX     3368
Name: h2a_violtn_cnt, dtype: int64
```

[248]:

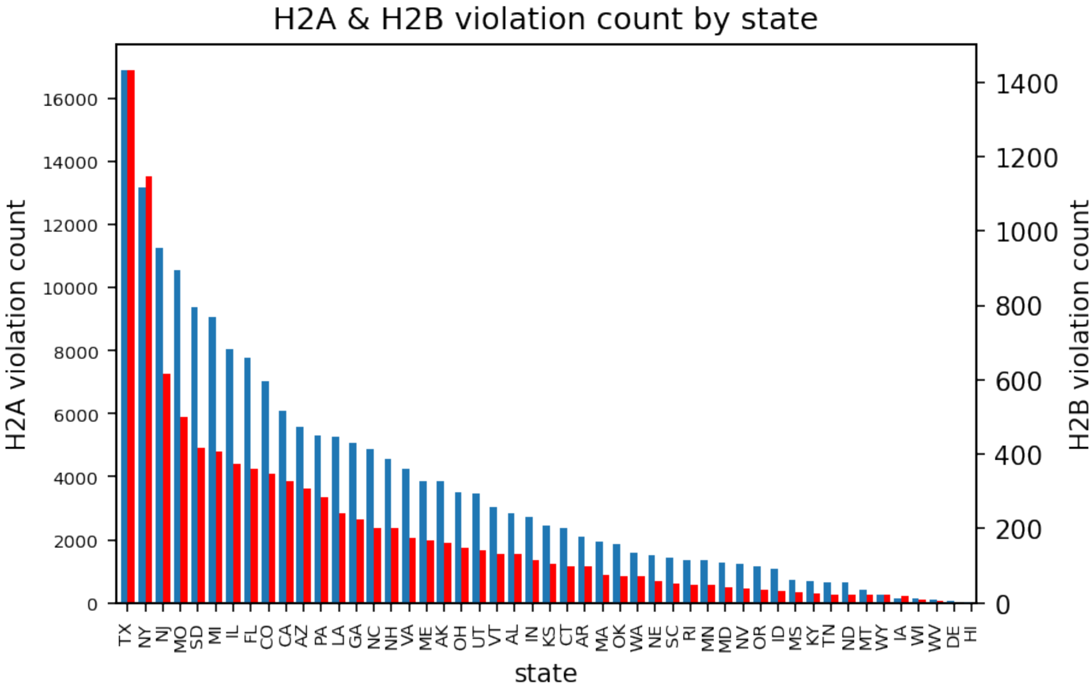
```
# count of H2B violations by state
h2b_vio_state = h2b_df.groupby(['st_cd'])['h2b_violtn_cnt'].sum().
 ↪sort_values(ascending=False)
print('top 12 state with most h2b violation counts')
print(h2b_vio_state[:12])
```

```
top 12 state with most h2b violation counts
st_cd
TX    1432
NY    1118
NJ     954
MO     895
SD     795
MI     769
IL     683
```

```
FL     658
CO     598
CA     516
AZ     473
PA     449
Name: h2b_violtn_cnt, dtype: int64
```

```
[249]: width = 0.4
       fig, ax1 = plt.subplots()
       h2a_vio_state.plot(kind='bar',color='red', position =0, ax=ax1, width=width)
       ax2 = ax1.twinx()
       h2b_vio_state.plot(kind='bar', ax=ax2, position=1, width=width)
       ax1.set_xlabel('state', fontsize=10)
       ax1.set_ylabel('H2A violation count', fontsize=10)
       ax2.set_ylabel('H2B violation count')
       ax1.tick_params(labelsize=7)
       plt.title('H2A & H2B violation count by state')
```

```
[249]: Text(0.5, 1.0, 'H2A & H2B violation count by state')
```



```
[ ]: # following code are not used
     h2_combined = pd.concat([h2a_df, h2b_df], axis=0, ignore_index=False)
     h2_combined['ab_group'] = (len(h2a_df)*(0,) + len(h2b_df)*(1,))
     h2_combined.reset_index(inplace=True)
```

[187]:

```
h2_df = raw_dol[(raw_dol['h2b_indicator']==1)|(raw_dol['h2a_indicator']==1)]
```