Investigate_a_Dataset

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1 Project: Investigating NICS background checks with FBI Gun Data

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2.1 Table of Contents

    ## Introduction

The data that is used in this project is retrieved from the FBI's National Instant Criminal Background Check System. The goal of this project is invesitigating NICS background checks to identify data trends of US gun purchases and creating visualisations using Python,NumPy, Pandas and Matplotlib.

The NICS bankground check is used by to determine whether a prospective buyer is eligible to buy firms or explosives. Gun shops call into this system to ensure that each customer does not have a criminal record or isn't otherwise ineligible to make a purchase. The data has been supplemented with state level data from census.gov.

```
In [1]: # Use this cell to set up import statements for all of the packages that you
        import pandas as pd
        import numpy as np
        import datetime
        from statistics import mode
        import seaborn as sns
        % matplotlib inline
        import matplotlib.pyplot as plt
        get_ipython().run_line_magic('matplotlib', 'inline')
```

    ## Data Wrangling

Tip: In this section of the report, you will load in the data, check for cleanliness, and then trim and clean your dataset for analysis. Make sure that you document your steps carefully and justify your cleaning decisions.

2.1.1 General Properties

```
In [2]: #read from CSV file
        census = pd.read_csv('U.S. Census Data.csv')
        #read from excel data format file
        gun = pd.read_excel('gun_data.xlsx')

In [3]: gun.head()
```

```
Out[3]:     month        state   permit  permit_recheck  handgun  long_gun    other  \
        0  2017-09      Alabama  16717.0             0.0   5734.0    6320.0    221.0
        1  2017-09       Alaska    209.0             2.0   2320.0    2930.0    219.0
        2  2017-09      Arizona   5069.0           382.0  11063.0    7946.0    920.0
        3  2017-09     Arkansas   2935.0           632.0   4347.0    6063.0    165.0
        4  2017-09   California  57839.0             0.0  37165.0   24581.0   2984.0

           multiple  admin  prepawn_handgun  ...   returned_other  rentals_handgun  \
        0       317    0.0             15.0  ...              0.0              0.0
        1       160    0.0              5.0  ...              0.0              0.0
        2       631    0.0             13.0  ...              0.0              0.0
        3       366   51.0             12.0  ...              0.0              0.0
        4         0    0.0              0.0  ...              0.0              0.0

           rentals_long_gun  private_sale_handgun  private_sale_long_gun  \
        0               0.0                   9.0                   16.0
        1               0.0                  17.0                   24.0
        2               0.0                  38.0                   12.0
        3               0.0                  13.0                   23.0
        4               0.0                   0.0                    0.0

           private_sale_other  return_to_seller_handgun  return_to_seller_long_gun  \
        0                 3.0                       0.0                        0.0
        1                 1.0                       0.0                        0.0
        2                 2.0                       0.0                        0.0
        3                 0.0                       0.0                        2.0
        4                 0.0                       0.0                        0.0

           return_to_seller_other   totals
        0                     3.0    32019
        1                     0.0     6303
        2                     0.0    28394
        3                     1.0    17747
        4                     0.0   123506

        [5 rows x 27 columns]
```

```
In [4]: gun.describe()

Out[4]:                 permit  permit_recheck        handgun        long_gun  \
        count    12461.000000     1100.000000   12465.000000    12466.000000
        mean      6413.629404     1165.956364    5940.881107     7810.847585
        std      23752.338269     9224.200609    8618.584060     9309.846140
        min          0.000000        0.000000       0.000000        0.000000
        25%          0.000000        0.000000     865.000000     2078.250000
        50%        518.000000        0.000000    3059.000000     5122.000000
        75%       4272.000000        0.000000    7280.000000    10380.750000
        max     522188.000000   116681.000000  107224.000000   108058.000000

                        other       multiple          admin  prepawn_handgun  \
        count     5500.000000   12485.000000   12462.000000     10542.000000
        mean       360.471636     268.603364      58.898090         4.828021
        std       1349.478273     783.185073     604.814818        10.907756
        min          0.000000       0.000000       0.000000         0.000000
        25%         17.000000      15.000000       0.000000         0.000000
        50%        121.000000     125.000000       0.000000         0.000000
        75%        354.000000     301.000000       0.000000         5.000000
        max      77929.000000   38907.000000   28083.000000       164.000000

                prepawn_long_gun   prepawn_other      ...      returned_other  \
        count       10540.000000     5115.000000      ...         1815.000000
        mean            7.834156        0.165591      ...            1.027548
        std            16.468028        1.057105      ...            4.386296
        min             0.000000        0.000000      ...            0.000000
        25%             0.000000        0.000000      ...            0.000000
        50%             1.000000        0.000000      ...            0.000000
        75%             8.000000        0.000000      ...            0.000000
        max           269.000000       49.000000      ...           64.000000

                rentals_handgun  rentals_long_gun  private_sale_handgun  \
        count        990.000000        825.000000           2750.000000
        mean           0.076768          0.087273             14.936000
        std            0.634503          0.671649             71.216021
        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              2.000000
        max           12.000000         12.000000           1017.000000

                private_sale_long_gun  private_sale_other  return_to_seller_handgun  \
        count            2750.000000         2750.000000               2475.000000
        mean               11.602909            1.030182                  0.402020
        std                54.253090            4.467843                  1.446568
        min                 0.000000            0.000000                  0.000000
        25%                 0.000000            0.000000                  0.000000
```

3

```
50%                  0.000000               0.000000                 0.000000
75%                  4.000000               0.000000                 0.000000
max                777.000000              71.000000                28.000000

         return_to_seller_long_gun  return_to_seller_other         totals
count                  2750.000000             2255.000000   12485.000000
mean                      0.441818                0.105987   21595.725911
std                       1.528223                0.427363   32591.418387
min                       0.000000                0.000000       0.000000
25%                       0.000000                0.000000    4638.000000
50%                       0.000000                0.000000   12399.000000
75%                       0.000000                0.000000   25453.000000
max                      17.000000                4.000000  541978.000000

[8 rows x 25 columns]
```

In [5]: #run census data
census.head()

Out[5]:   Fact Fact Note   Alabama \
```
0            Population estimates, July 1, 2016,  (V2016)    NaN  4,863,300
1   Population estimates base, April 1, 2010,  (V2...    NaN  4,780,131
2   Population, percent change - April 1, 2010 (es...    NaN      1.70%
3                   Population, Census, April 1, 2010    NaN  4,779,736
4   Persons under 5 years, percent, July 1, 2016, ...    NaN      6.00%

      Alaska    Arizona   Arkansas  California   Colorado Connecticut Delaware  \
0   741,894  6,931,071  2,988,248  39,250,017  5,540,545   3,576,452  952,065
1   710,249  6,392,301  2,916,025  37,254,522  5,029,324   3,574,114  897,936
2     4.50%      8.40%      2.50%       5.40%     10.20%       0.10%    6.00%
3   710,231  6,392,017  2,915,918  37,253,956  5,029,196   3,574,097  897,934
4     7.30%      6.30%      6.40%       6.30%      6.10%       5.20%    5.80%

        ...   South Dakota Tennessee        Texas       Utah  Vermont   Virginia  \
0       ...         865454   6651194  27,862,596  3,051,217  624,594  8,411,808
1       ...         814195   6346298  25,146,100  2,763,888  625,741  8,001,041
2       ...          0.063     0.048      10.80%     10.40%   -0.20%      5.10%
3       ...         814180   6346105  25,145,561  2,763,885  625,741  8,001,024
4       ...          0.071     0.061       7.20%      8.30%    4.90%      6.10%

   Washington West Virginia  Wisconsin  Wyoming
0   7,288,000     1,831,102  5,778,708  585,501
1   6,724,545     1,853,011  5,687,289  563,767
2       8.40%        -1.20%      1.60%    3.90%
3   6,724,540     1,852,994  5,686,986  563,626
4       6.20%         5.50%      5.80%    6.50%

[5 rows x 52 columns]
```

```
In [6]: census.describe()

Out[6]:                                           Fact Fact Note      Alabama Alaska Arizona  \
        count                                       80         28          65     65      65
        unique                                      80         15          65     64      64
        top      Nonminority-owned firms, 2012      (c)  50,645.33  7.30%  50.30%
        freq                                         1          6           1      2       2

                Arkansas California Colorado Connecticut Delaware    ...    South Dakota  \
        count         65         65       65          65       65    ...              65
        unique        64         63       64          63       64    ...              65
        top        50.90%      6.80%    3.30%       0.10%   51.60%   ...           75811
        freq           2          2        2           2        2    ...               1

                Tennessee   Texas   Utah Vermont Virginia Washington West Virginia  \
        count          65      65     65      65       65         65            65
        unique         64      64     64      63       65         65            64
        top         0.048  50.40%  2.50%   1.90%    9.10%  7,288,000         1.50%
        freq            2       2      2       2        1          1             2

                Wisconsin Wyoming
        count          65      65
        unique         65      64
        top        40,507   7.10%
        freq            1       2

        [4 rows x 52 columns]
```

Data Cleaning Gun datasets:

```
In [7]: gun.head()

Out[7]:     month       state    permit  permit_recheck   handgun   long_gun     other  \
        0  2017-09     Alabama  16717.0             0.0    5734.0     6320.0     221.0
        1  2017-09      Alaska    209.0             2.0    2320.0     2930.0     219.0
        2  2017-09     Arizona   5069.0           382.0   11063.0     7946.0     920.0
        3  2017-09    Arkansas   2935.0           632.0    4347.0     6063.0     165.0
        4  2017-09  California  57839.0             0.0   37165.0    24581.0    2984.0

           multiple  admin  prepawn_handgun    ...    returned_other  rentals_handgun  \
        0       317    0.0             15.0    ...               0.0              0.0
        1       160    0.0              5.0    ...               0.0              0.0
        2       631    0.0             13.0    ...               0.0              0.0
        3       366   51.0             12.0    ...               0.0              0.0
        4         0    0.0              0.0    ...               0.0              0.0

           rentals_long_gun  private_sale_handgun  private_sale_long_gun  \
        0               0.0                   9.0                   16.0
        1               0.0                  17.0                   24.0
```

```
               2            0.0                   38.0                      12.0
               3            0.0                   13.0                      23.0
               4            0.0                    0.0                       0.0

                  private_sale_other  return_to_seller_handgun  return_to_seller_long_gun  \
               0                 3.0                       0.0                        0.0
               1                 1.0                       0.0                        0.0
               2                 2.0                       0.0                        0.0
               3                 0.0                       0.0                        2.0
               4                 0.0                       0.0                        0.0

                  return_to_seller_other  totals
               0                     3.0   32019
               1                     0.0    6303
               2                     0.0   28394
               3                     1.0   17747
               4                     0.0  123506

               [5 rows x 27 columns]

In [8]: gun.dtypes

Out[8]: month                      object
        state                      object
        permit                     float64
        permit_recheck             float64
        handgun                    float64
        long_gun                   float64
        other                      float64
        multiple                     int64
        admin                      float64
        prepawn_handgun            float64
        prepawn_long_gun           float64
        prepawn_other              float64
        redemption_handgun         float64
        redemption_long_gun        float64
        redemption_other           float64
        returned_handgun           float64
        returned_long_gun          float64
        returned_other             float64
        rentals_handgun            float64
        rentals_long_gun           float64
        private_sale_handgun       float64
        private_sale_long_gun      float64
        private_sale_other         float64
        return_to_seller_handgun   float64
        return_to_seller_long_gun  float64
        return_to_seller_other     float64
```

```
        totals                         int64
        dtype: object
```

In [9]: gun.count()

Out[9]: month   12485
        state   12485
        permit   12461
        permit_recheck   1100
        handgun   12465
        long_gun   12466
        other   5500
        multiple   12485
        admin   12462
        prepawn_handgun   10542
        prepawn_long_gun   10540
        prepawn_other   5115
        redemption_handgun   10545
        redemption_long_gun   10544
        redemption_other   5115
        returned_handgun   2200
        returned_long_gun   2145
        returned_other   1815
        rentals_handgun   990
        rentals_long_gun   825
        private_sale_handgun   2750
        private_sale_long_gun   2750
        private_sale_other   2750
        return_to_seller_handgun   2475
        return_to_seller_long_gun   2750
        return_to_seller_other   2255
        totals   12485
        dtype: int64

In [10]: census.head()

Out[10]:

	Fact	Fact Note	Alabama
0	Population estimates, July 1, 2016, (V2016)	NaN	4,863,300
1	Population estimates base, April 1, 2010, (V2...	NaN	4,780,131
2	Population, percent change - April 1, 2010 (es...	NaN	1.70%
3	Population, Census, April 1, 2010	NaN	4,779,736
4	Persons under 5 years, percent, July 1, 2016, ...	NaN	6.00%

	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware
0	741,894	6,931,071	2,988,248	39,250,017	5,540,545	3,576,452	952,065
1	710,249	6,392,301	2,916,025	37,254,522	5,029,324	3,574,114	897,936
2	4.50%	8.40%	2.50%	5.40%	10.20%	0.10%	6.00%
3	710,231	6,392,017	2,915,918	37,253,956	5,029,196	3,574,097	897,934
4	7.30%	6.30%	6.40%	6.30%	6.10%	5.20%	5.80%

```
       ...      South Dakota Tennessee      Texas       Utah   Vermont   Virginia  \
0      ...            865454   6651194  27,862,596  3,051,217   624,594  8,411,808
1      ...            814195   6346298  25,146,100  2,763,888   625,741  8,001,041
2      ...             0.063     0.048      10.80%     10.40%    -0.20%      5.10%
3      ...            814180   6346105  25,145,561  2,763,885   625,741  8,001,024
4      ...             0.071     0.061       7.20%      8.30%     4.90%      6.10%


   Washington West Virginia  Wisconsin   Wyoming
0  7,288,000     1,831,102  5,778,708   585,501
1  6,724,545     1,853,011  5,687,289   563,767
2      8.40%        -1.20%      1.60%     3.90%
3  6,724,540     1,852,994  5,686,986   563,626
4      6.20%         5.50%      5.80%     6.50%


[5 rows x 52 columns]
```

In [11]: *#Replacing the NaN results as "No Records"*
         gun.fillna('No record', inplace = True)
         gun.isnull().any()

Out[11]: month   False
         state   False
         permit   False
         permit_recheck   False
         handgun   False
         long_gun   False
         other   False
         multiple   False
         admin   False
         prepawn_handgun   False
         prepawn_long_gun   False
         prepawn_other   False
         redemption_handgun   False
         redemption_long_gun   False
         redemption_other   False
         returned_handgun   False
         returned_long_gun   False
         returned_other   False
         rentals_handgun   False
         rentals_long_gun   False
         private_sale_handgun   False
         private_sale_long_gun   False
         private_sale_other   False
         return_to_seller_handgun   False
         return_to_seller_long_gun   False
         return_to_seller_other   False
         totals   False
         dtype: bool

```
In [12]: census.dtypes

Out[12]: Fact              object
         Fact Note         object
         Alabama           object
         Alaska            object
         Arizona           object
         Arkansas          object
         California        object
         Colorado          object
         Connecticut       object
         Delaware          object
         Florida           object
         Georgia           object
         Hawaii            object
         Idaho             object
         Illinois          object
         Indiana           object
         Iowa              object
         Kansas            object
         Kentucky          object
         Louisiana         object
         Maine             object
         Maryland          object
         Massachusetts     object
         Michigan          object
         Minnesota         object
         Mississippi       object
         Missouri          object
         Montana           object
         Nebraska          object
         Nevada            object
         New Hampshire     object
         New Jersey        object
         New Mexico        object
         New York          object
         North Carolina    object
         North Dakota      object
         Ohio              object
         Oklahoma          object
         Oregon            object
         Pennsylvania      object
         Rhode Island      object
         South Carolina    object
         South Dakota      object
         Tennessee         object
         Texas             object
         Utah              object
```

```
         Vermont            object
         Virginia           object
         Washington         object
         West Virginia      object
         Wisconsin          object
         Wyoming            object
         dtype: object
```

In [13]: `index_census_state = census.iloc[0].index`
         `index_census_state`

Out[13]: Index(['Fact', 'Fact Note', 'Alabama', 'Alaska', 'Arizona', 'Arkansas',
                'California', 'Colorado', 'Connecticut', 'Delaware', 'Florida',
                'Georgia', 'Hawaii', 'Idaho', 'Illinois', 'Indiana', 'Iowa', 'Kansas',
                'Kentucky', 'Louisiana', 'Maine', 'Maryland', 'Massachusetts',
                'Michigan', 'Minnesota', 'Mississippi', 'Missouri', 'Montana',
                'Nebraska', 'Nevada', 'New Hampshire', 'New Jersey', 'New Mexico',
                'New York', 'North Carolina', 'North Dakota', 'Ohio', 'Oklahoma',
                'Oregon', 'Pennsylvania', 'Rhode Island', 'South Carolina',
                'South Dakota', 'Tennessee', 'Texas', 'Utah', 'Vermont', 'Virginia',
                'Washington', 'West Virginia', 'Wisconsin', 'Wyoming'],
               dtype='object')

In [14]: *#As per the previous- using index 2 to remove fact and fact note.*
         `index_census_state = index_census_state[2:]`
         `index_census_state`

Out[14]: Index(['Alabama', 'Alaska', 'Arizona', 'Arkansas', 'California', 'Colorado',
                'Connecticut', 'Delaware', 'Florida', 'Georgia', 'Hawaii', 'Idaho',
                'Illinois', 'Indiana', 'Iowa', 'Kansas', 'Kentucky', 'Louisiana',
                'Maine', 'Maryland', 'Massachusetts', 'Michigan', 'Minnesota',
                'Mississippi', 'Missouri', 'Montana', 'Nebraska', 'Nevada',
                'New Hampshire', 'New Jersey', 'New Mexico', 'New York',
                'North Carolina', 'North Dakota', 'Ohio', 'Oklahoma', 'Oregon',
                'Pennsylvania', 'Rhode Island', 'South Carolina', 'South Dakota',
                'Tennessee', 'Texas', 'Utah', 'Vermont', 'Virginia', 'Washington',
                'West Virginia', 'Wisconsin', 'Wyoming'],
               dtype='object')

In [15]: *#Number of states*
         `len(index_census_state)`

Out[15]: 50

In [16]: *#List the number of states*
         `index_gun_state = gun.groupby('state').sum().index`
         `index_gun_state`

Out[16]: Index(['Alabama', 'Alaska', 'Arizona', 'Arkansas', 'California', 'Colorado',
                'Connecticut', 'Delaware', 'District of Columbia', 'Florida', 'Georgia',

```
                'Guam', 'Hawaii', 'Idaho', 'Illinois', 'Indiana', 'Iowa', 'Kansas',
                'Kentucky', 'Louisiana', 'Maine', 'Mariana Islands', 'Maryland',
                'Massachusetts', 'Michigan', 'Minnesota', 'Mississippi', 'Missouri',
                'Montana', 'Nebraska', 'Nevada', 'New Hampshire', 'New Jersey',
                'New Mexico', 'New York', 'North Carolina', 'North Dakota', 'Ohio',
                'Oklahoma', 'Oregon', 'Pennsylvania', 'Puerto Rico', 'Rhode Island',
                'South Carolina', 'South Dakota', 'Tennessee', 'Texas', 'Utah',
                'Vermont', 'Virgin Islands', 'Virginia', 'Washington', 'West Virginia',
                'Wisconsin', 'Wyoming'],
            dtype='object', name='state')
```

In [17]: `len(index_gun_state)` *#Number of states have changed from 50 to 55*

Out[17]: 55

In [18]: *#To identify why the number of states had changed from 50 to 55*
         `for state in index_gun_state:`
             `if state not in index_census_state:`
                 `print(state)`


```
District of Columbia
Guam
Mariana Islands
Puerto Rico
Virgin Islands
```

In [19]: *#Extracting the Year and months column which wil print off an array*
         `gun['year']=gun['month'].apply(lambda x: x.split("-")[0]).astype(int)`
         `gun['year'].unique()`

Out[19]: array([2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007,
             2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998])

In [20]: *#*
         `gun['months'] = gun['month'].apply(lambda x: x.split("-")[1]).astype(int)`
         `gun['months'].unique()`

Out[20]: array([9, 8, 7, 6, 5, 4, 3, 2, 1, 12, 11, 10])

In [21]: *#check the gun*
         `gun.head(9)`

Out[21]:   month   state permit permit_recheck handgun long_gun other \
         0 2017-09   Alabama 16717   0   5734   6320   221
         1 2017-09   Alaska   209   2   2320   2930   219
         2 2017-09   Arizona   5069   382   11063   7946   920

                                           11
```

```
3  2017-09              Arkansas   2935           632   4347   6063   165
4  2017-09            California  57839             0  37165  24581  2984
5  2017-09              Colorado   4356             0  15751  13448  1007
6  2017-09           Connecticut   4343           673   4834   1993   274
7  2017-09              Delaware    275             0   1414   1538    66
8  2017-09  District of Columbia      1             0     56      4     0

   multiple admin prepawn_handgun  ...  rentals_long_gun  \
0       317     0              15  ...                 0
1       160     0               5  ...                 0
2       631     0              13  ...                 0
3       366    51              12  ...                 0
4         0     0               0  ...                 0
5      1062     0               0  ...                 0
6         0     0               0  ...                 0
7        68     0               0  ...                 0
8         0     0               0  ...                 0

  private_sale_handgun private_sale_long_gun private_sale_other  \
0                    9                    16                  3
1                   17                    24                  1
2                   38                    12                  2
3                   13                    23                  0
4                    0                     0                  0
5                    0                     0                  0
6                    0                     0                  0
7                   55                    34                  3
8                    0                     0                  0

  return_to_seller_handgun return_to_seller_long_gun return_to_seller_other  \
0                        0                         0                      3
1                        0                         0                      0
2                        0                         0                      0
3                        0                         2                      1
4                        0                         0                      0
5                        0                         0                      0
6                        0                         0                      0
7                        1                         2                      0
8                        0                         0                      0

    totals  year months
0   32019  2017      9
1    6303  2017      9
2   28394  2017      9
3   17747  2017      9
4  123506  2017      9
5   35873  2017      9
6   12117  2017      9
```

```
          7      3502   2017        9
          8        61   2017        9

          [9 rows x 29 columns]

In [22]: #Assig n column names to the list
         cols = ['permit', 'permit_recheck', 'handgun','long_gun','other','admin','prepawn_handg
         'prepawn_other','redemption_handgun', 'redemption_long_gun','redemption_other','returne
         'returned_other','rentals_handgun', 'rentals_long_gun', 'private_sale_handgun' , 'priva
         'private_sale_other', 'return_to_seller_handgun',  'return_to_seller_long_gun','return_

In [23]: gun.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 12485 entries, 0 to 12484
Data columns (total 29 columns):
month                     12485 non-null object
state                     12485 non-null object
permit                    12485 non-null object
permit_recheck            12485 non-null object
handgun                   12485 non-null object
long_gun                  12485 non-null object
other                     12485 non-null object
multiple                  12485 non-null int64
admin                     12485 non-null object
prepawn_handgun           12485 non-null object
prepawn_long_gun          12485 non-null object
prepawn_other             12485 non-null object
redemption_handgun        12485 non-null object
redemption_long_gun       12485 non-null object
redemption_other          12485 non-null object
returned_handgun          12485 non-null object
returned_long_gun         12485 non-null object
returned_other            12485 non-null object
rentals_handgun           12485 non-null object
rentals_long_gun          12485 non-null object
private_sale_handgun      12485 non-null object
private_sale_long_gun     12485 non-null object
private_sale_other        12485 non-null object
return_to_seller_handgun  12485 non-null object
return_to_seller_long_gun 12485 non-null object
return_to_seller_other    12485 non-null object
totals                    12485 non-null int64
year                      12485 non-null int64
months                    12485 non-null int64
dtypes: int64(4), object(25)
memory usage: 2.8+ MB
```

13

Exploartory Data Analysis
Research Question 1 : What census data is most associated with high gun per capita?
Research Questinon 2: Which states have had the highest growth in gun registrations?
Research Question 3: What is the overall trend of gun purchases?
Research Question 1 : What census data is most associated with high gun per capita?

```
In [24]: #group by state and gun
         gun_state = gun.groupby('state')
```

```
In [25]: #sum the total guns in state
         gun_state_sum = gun_state.sum()
```

```
In [26]: #gun state total
         gun_state_total = gun_state_sum['totals']
```

```
In [27]: #gun total by state
         gun_state_total.head()
```

```
Out[27]: state
         Alabama        6706079
         Alaska         1137643
         Arizona        4425714
         Arkansas       3752633
         California    19014063
         Name: totals, dtype: int64
```

```
In [28]: # sum total increasing by month from Nov 1998 to Sept 2017
         totals = gun.groupby("month")["totals"].sum()

         tick_placement = pd.np.arange(2, len(totals), 12)
         plt.style.use('seaborn')
         ax = totals.plot(kind='bar',figsize=(25,10))
         ax.set_title("Firearm Background Checks Per Capita from November 1998 to September 2017
         ax.set_yticklabels([ "{0:,.0f}".format(y) for y in ax.get_yticks() ], fontsize=14);
         plt.setp(ax.get_xticklabels(), rotation=0, fontsize=14)
         ax.set_xticks(tick_placement)
         ax.set_xticklabels([ totals.index[i].split("-")[0] for i in tick_placement ])
         ax.set_xlim(0, len(totals) - 1)
         ax.set_xlabel("")
```

```
Out[28]: Text(0.5,0,'')
```

Firearm Background Checks Per Capita from November 1998 to September 2017

In [29]: *# Check the total of each state by month and the group by and sum*
```python
checks_by_state = gun.groupby(['state', 'month'])['totals'].sum().reset_index()
state_totals = checks_by_state.groupby('state')['totals'].sum()
state_total_tick_placement = pd.np.arange(len(state_totals))
plt.style.use('seaborn')
state_ax = state_totals.plot(kind='bar',figsize=(25,10))
state_ax.set_title("Firearm Background Check Totals Per Capita (1998-2017)", fontsize=3
state_ax.set_yticklabels([ "{0:,.1f}".format(y) for y in state_ax.get_yticks() ], fonts
plt.setp(state_ax.get_xticklabels(), fontsize=12)
state_ax.set_xticks(state_total_tick_placement)
state_ax.set_xticklabels(state_totals.index)
state_ax.set_xlim(0, len(state_totals) - 1)
state_ax.set_xlabel("")
```
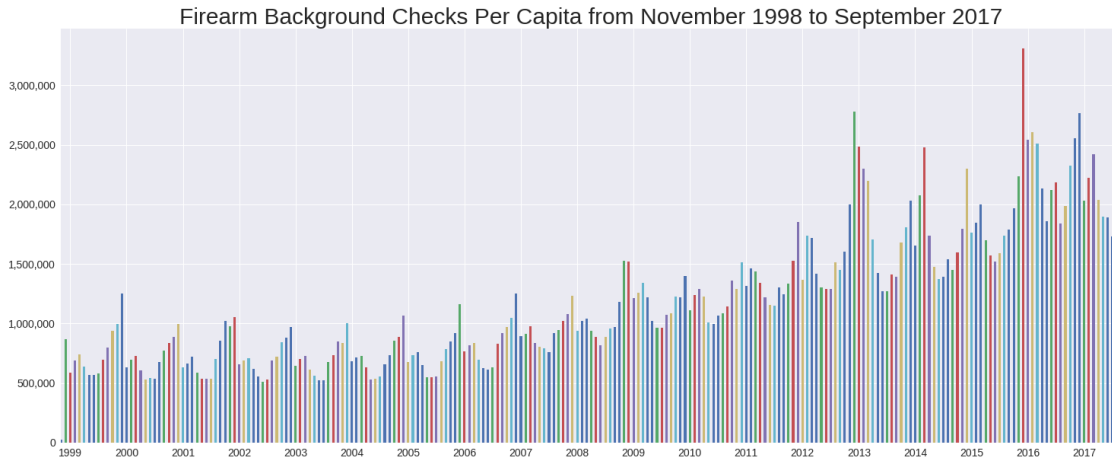
Out[29]: Text(0.5,0,'')

Firearm Background Check Totals Per Capita (1998-2017)

15
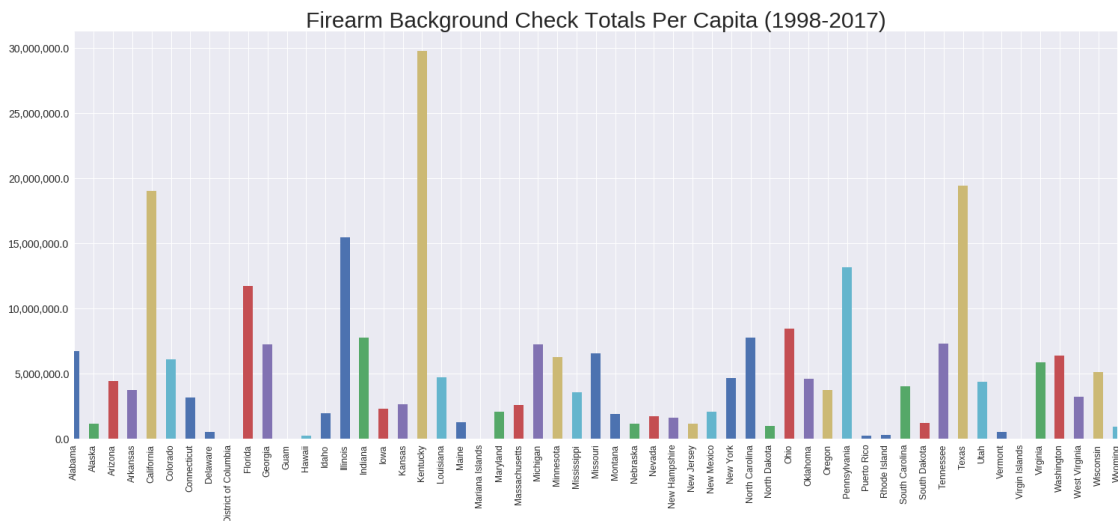
Research Question 2: Which states have had the highest growth in gun registrations?

```python
In [30]:  #group by state
          gun_alltime = gun.groupby(['month', 'state'])['totals'].sum()

In [31]:  #check registration date
          cur_date = gun['month'].max()
          year_date = gun['month'].min()

In [32]:  # The amount of registed guns
          gun_grow_tot = gun_alltime.loc[cur_date] - gun_alltime.loc[year_date]
          gun_grow_tot.idxmax()

Out[32]:  'Kentucky'

In [33]:  #The total amount in Kentucky
          gun_grow_tot.loc['Kentucky']

Out[33]:  397866
```

Research Question 3: What is the overall trend of gun purchases?

```python
In [34]:  # sum total increasing by month from Nov 1998 to Sept 2017
          totals = gun.groupby("month")["totals"].sum()
          tick_placement = pd.np.arange(2, len(totals), 12)
          plt.style.use('seaborn')
          ax = totals.plot(kind='bar',figsize=(25,10))
          ax.set_title("Firearm Background Checks Per Capita from November 1998 to September 2017
          ax.set_yticklabels([ "{0:,.0f}".format(y) for y in ax.get_yticks() ], fontsize=14);
          plt.setp(ax.get_xticklabels(), rotation=0, fontsize=14)
          ax.set_xticks(tick_placement)
          ax.set_xticklabels([ totals.index[i].split("-")[0] for i in tick_placement ])
          ax.set_xlim(0, len(totals) - 1)
          ax.set_xlabel("")

Out[34]:  Text(0.5,0,'')
```


Firearm Background Checks Per Capita from November 1998 to September 2017
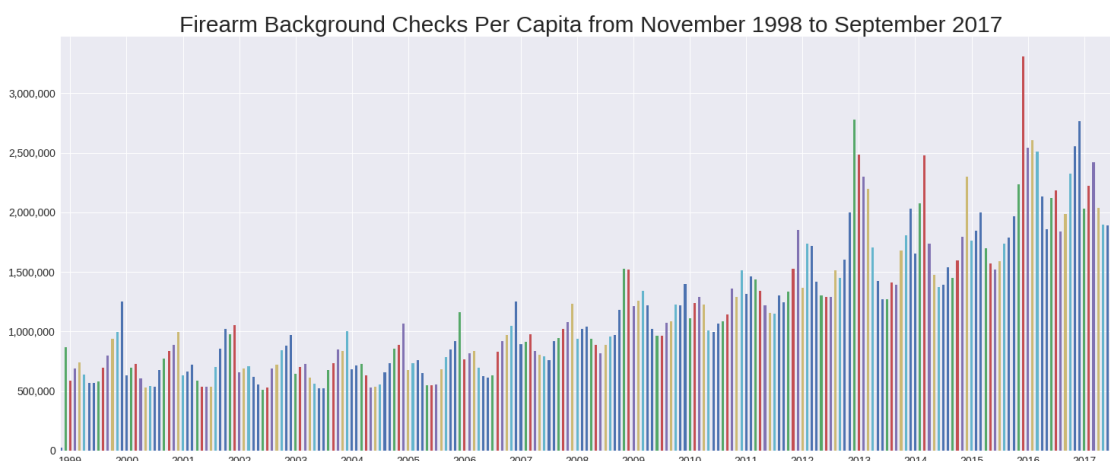
```
In [37]: #The increasing number of registered guns in each state. With Kentucky with the most re
         plt.subplots(figsize=(20,20))
         plt.xticks(rotation=60);
         plt.title('Total Number of Registered Guns per State')
         sns.swarmplot(x='state', y='totals', data=gun);
```


Total Number of Registered Guns per State
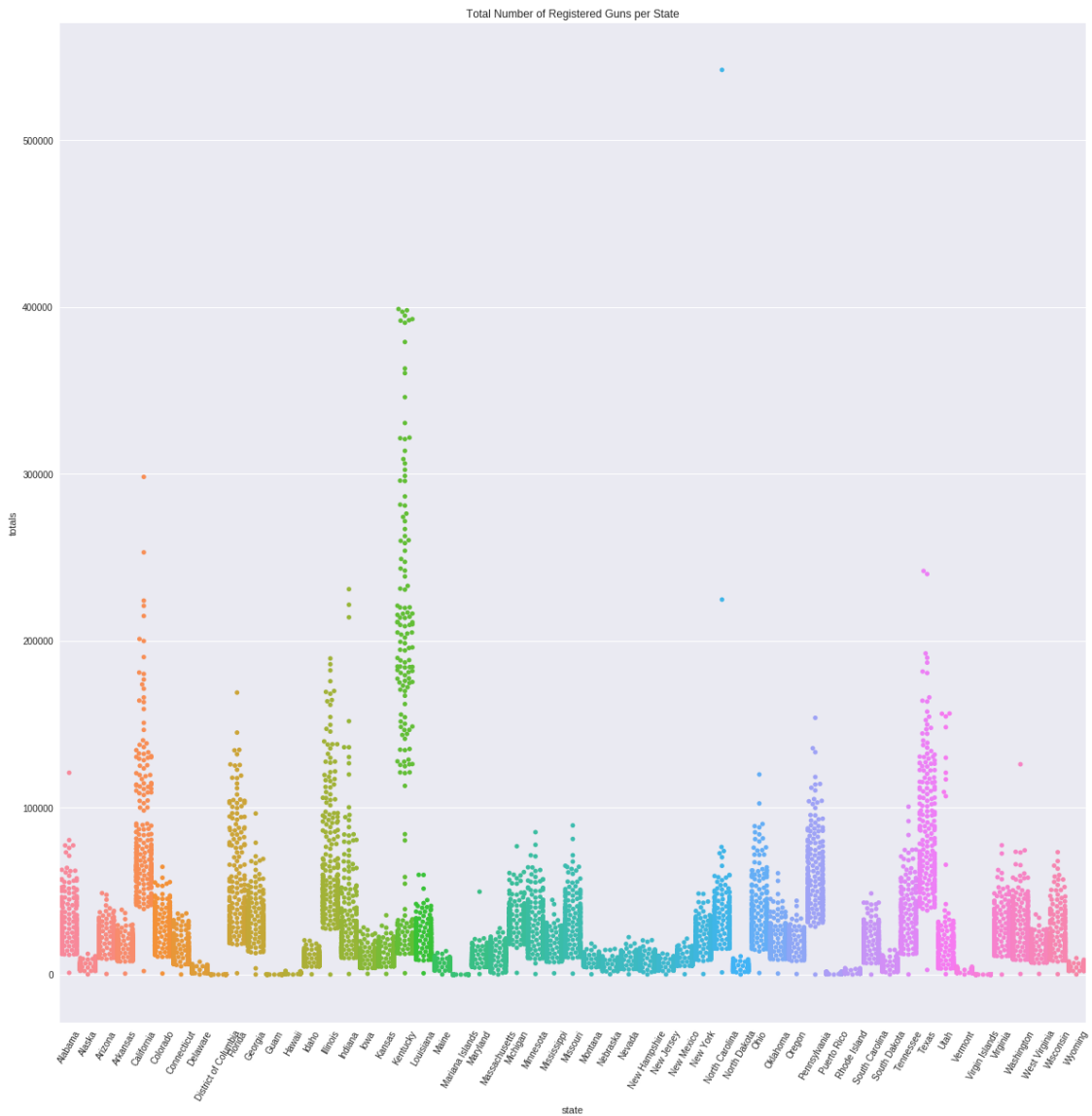
Findings

1. The dataset was from November 1998 through to September 2017 found that Kentucky has had the most activity in background checks for guns since Novmeber 1998 righ through to September 2017.

2. Through analysis, the state of kentucky had the highest growth in gun registration. The total registed number of guns was 397866.
3. As per the swarm plot diagram above, you can see that the sum of registered guns in each state with Kentucky with the increasing amount of registered guns.
4. As per the last swarm plot diagram, you can see the increasing number of registered guns in each state. With Kentucky with the most registered number of guns and increasing.
5. Kentucky, Califronia and Texas had the most registered guns per capita.

2.2 Conclusion

`In this project,the gun dataset that was supplied had data from the time period of 1998-2017. Ac`

2.3 Limiations

There were some limitations in this study, due to figuring out the calculating the total number of gun purchasing sales in this project. However, there is an increase over time of you can see the data trends from November 1998 through to September 2017 with Firearm Background Checks Per Capita from November 1998 to September 2017. According to the Guardian (2017) only one in five Americans obtain guns without background checks.

According to NICS statistics (2018) showed there were 25,235,215 background checks in 2017. Since 1998, there have been more than 230 million background checks, leading to more than 1.3 million denials.

2.4 References

- Investigate a Dataset - Data Set Options: https://video.udacity-data.com/topher/2018/July/5b57919a_data-set-options/data-set-options.pdf
- GitHub support - https://github.com/Alicelibinguo/Investigate-FBI-Gun-Data
- Stackoverflow help - https://stackoverflow.com/questions/42406233/how-to-add-title-to-seaborn-boxplot
- Adding Title - https://python-graph-gallery.com/4-add-title-and-axis-label/
- Just one in five Americans obtains gun without background check, survey finds: https://www.theguardian.com/us-news/2017/jan/02/guns-state-background-checks-study
- FBI Gun Data(2018) https://github.com/leicao-me/data-analysis-on-FBI-GUN-DATA
- Wikipeda Permits: https://en.wikipedia.org/wiki/Gun_laws_in_Kentucky
- https://github.com/BuzzFeedNews/nics-firearm-background-checks/blob/master/README.md
- How Many Guns Were Sold In The US In 2017 And 2018?https://www.ibtimes.com/how-many-guns-were-sold-us-2017-2018-2731175