State Population Median-Media Line: Georgia

Data Retrieval

In[1]:=

georgia usa population since 1900

Georgia, United States ADMINISTRATIVE DIVISION [

population Interval[{ Year: 1900 , Day: Thu 1 Nov 2018 }]]

Out[1]=
```
{{{1900, 1, 1, 0, 0, 0.}, 2 216 331},
 {{1910, 1, 1, 0, 0, 0.}, 2 609 121}, {{1920, 1, 1, 0, 0, 0.}, 2 895 832},
 {{1930, 1, 1, 0, 0, 0.}, 2 908 506}, {{1940, 1, 1, 0, 0, 0.}, 3 123 723},
 {{1950, 1, 1, 0, 0, 0.}, 3 444 578}, {{1960, 1, 1, 0, 0, 0.}, 3 943 116},
 {{1970, 1, 1, 0, 0, 0.}, 4 587 930}, {{1980, 1, 1, 0, 0, 0.}, 5 462 982},
 {{1990, 1, 1, 0, 0, 0.}, 6 478 216}, {{2000, 1, 1, 0, 0, 0.}, 8 230 161},
 {{2001, 1, 1, 0, 0, 0.}, 8 419 594}, {{2002, 1, 1, 0, 0, 0.}, 8 585 535},
 {{2003, 1, 1, 0, 0, 0.}, 8 735 259}, {{2004, 1, 1, 0, 0, 0.}, 8 913 676},
 {{2005, 1, 1, 0, 0, 0.}, 9 097 428}, {{2006, 1, 1, 0, 0, 0.}, 9 330 086},
 {{2007, 1, 1, 0, 0, 0.}, 9 533 761}, {{2008, 1, 1, 0, 0, 0.}, 9 697 838},
 {{2009, 1, 1, 0, 0, 0.}, 9 829 211}, {{2010, 1, 1, 0, 0, 0.}, 9 687 653},
 {{2011, 1, 1, 0, 0, 0.}, 9 813 201}, {{2012, 1, 1, 0, 0, 0.}, 9 919 000},
 {{2013, 1, 1, 0, 0, 0.}, 9 994 759}, {{2014, 1, 1, 0, 0, 0.}, 10 097 343}}
```

In[2]:=
```
listRawData = {{{1900, 1, 1, 0, 0, 0.`}, 2 216 331},
    {{1910, 1, 1, 0, 0, 0.`}, 2 609 121}, {{1920, 1, 1, 0, 0, 0.`}, 2 895 832},
    {{1930, 1, 1, 0, 0, 0.`}, 2 908 506}, {{1940, 1, 1, 0, 0, 0.`}, 3 123 723},
    {{1950, 1, 1, 0, 0, 0.`}, 3 444 578}, {{1960, 1, 1, 0, 0, 0.`}, 3 943 116},
    {{1970, 1, 1, 0, 0, 0.`}, 4 587 930}, {{1980, 1, 1, 0, 0, 0.`}, 5 462 982},
    {{1990, 1, 1, 0, 0, 0.`}, 6 478 216}, {{2000, 1, 1, 0, 0, 0.`}, 8 230 161},
    {{2001, 1, 1, 0, 0, 0.`}, 8 419 594}, {{2002, 1, 1, 0, 0, 0.`}, 8 585 535},
    {{2003, 1, 1, 0, 0, 0.`}, 8 735 259}, {{2004, 1, 1, 0, 0, 0.`}, 8 913 676},
    {{2005, 1, 1, 0, 0, 0.`}, 9 097 428}, {{2006, 1, 1, 0, 0, 0.`}, 9 330 086},
    {{2007, 1, 1, 0, 0, 0.`}, 9 533 761}, {{2008, 1, 1, 0, 0, 0.`}, 9 697 838},
    {{2009, 1, 1, 0, 0, 0.`}, 9 829 211}, {{2010, 1, 1, 0, 0, 0.`}, 9 687 653},
    {{2011, 1, 1, 0, 0, 0.`}, 9 813 201}, {{2012, 1, 1, 0, 0, 0.`}, 9 919 000},
    {{2013, 1, 1, 0, 0, 0.`}, 9 994 759}, {{2014, 1, 1, 0, 0, 0.`}, 10 097 343}};
```

Data Order

In[3]:=
```
listDataX = Table[listRawData[[i]][[1]][[1]], {i, 25}]
```

Out[3]=
```
{1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970, 1980, 1990, 2000, 2001,
 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014}
```

In[4]:=
```
listDataY = Table[listRawData[[i]][[2]], {i, 25}]
```

Out[4]=
```
{2 216 331, 2 609 121, 2 895 832, 2 908 506, 3 123 723, 3 444 578, 3 943 116, 4 587 930, 5 462 982,
 6 478 216, 8 230 161, 8 419 594, 8 585 535, 8 735 259, 8 913 676, 9 097 428, 9 330 086,
 9 533 761, 9 697 838, 9 829 211, 9 687 653, 9 813 201, 9 919 000, 9 994 759, 10 097 343}
```

In[5]:=
```
listPopData = Transpose[{listDataX, listDataY}]
```

Out[5]=
```
{{1900, 2 216 331}, {1910, 2 609 121}, {1920, 2 895 832}, {1930, 2 908 506}, {1940, 3 123 723},
 {1950, 3 444 578}, {1960, 3 943 116}, {1970, 4 587 930}, {1980, 5 462 982}, {1990, 6 478 216},
 {2000, 8 230 161}, {2001, 8 419 594}, {2002, 8 585 535}, {2003, 8 735 259}, {2004, 8 913 676},
 {2005, 9 097 428}, {2006, 9 330 086}, {2007, 9 533 761}, {2008, 9 697 838}, {2009, 9 829 211},
 {2010, 9 687 653}, {2011, 9 813 201}, {2012, 9 919 000}, {2013, 9 994 759}, {2014, 10 097 343}}
```

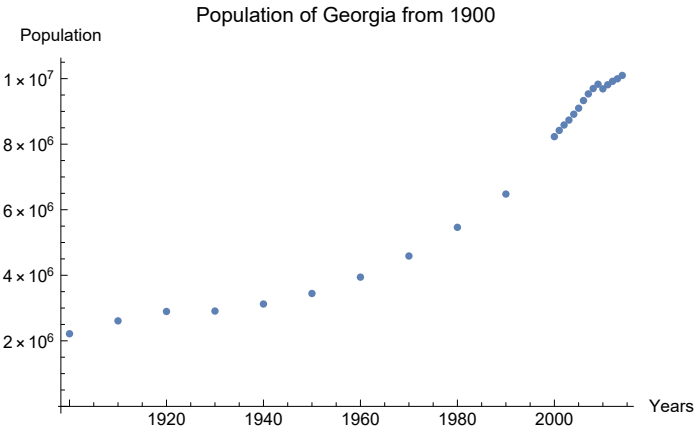
In[6]:=
```
table1 = Prepend[listPopData, {"Year", "Population"}];
Grid[table1, Frame → All]
```

Out[7]=

Year	Population
1900	2 216 331
1910	2 609 121
1920	2 895 832
1930	2 908 506
1940	3 123 723
1950	3 444 578
1960	3 943 116
1970	4 587 930
1980	5 462 982
1990	6 478 216
2000	8 230 161
2001	8 419 594
2002	8 585 535
2003	8 735 259
2004	8 913 676
2005	9 097 428
2006	9 330 086
2007	9 533 761
2008	9 697 838
2009	9 829 211
2010	9 687 653
2011	9 813 201
2012	9 919 000
2013	9 994 759
2014	10 097 343

In[8]:=
```
lp = ListPlot[listPopData,
  PlotLabel → "Population of Georgia from 1900", AxesLabel → {"Years", "Population"} ]
AbsoluteOptions[lp, {PlotRange}]
```

Out[8]=



Out[9]= $\{\text{PlotRange} \to \{\{1900., 2014.\}, \{0., 1.00973 \times 10^7\}\}\}$

Median-Median Line

In[10]:=
```
firstX = Table[listPopData[[i]][[1]], {i, 8}]
```

Out[10]= {1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970}

In[11]:=
```
firstMedX = Median[firstX]
```

Out[11]= 1935

In[12]:=
```
firstY = Table[listPopData[[i]][[2]], {i, 8}]
```

Out[12]= {2 216 331, 2 609 121, 2 895 832, 2 908 506, 3 123 723, 3 444 578, 3 943 116, 4 587 930}

In[13]:=
```
firstMedY = Median[firstY]
```

Out[13]= $\frac{6\,032\,229}{2}$

In[14]:=
```
sumPoint1 = {firstMedX, firstMedY}
```

Out[14]= $\left\{1935, \frac{6\,032\,229}{2}\right\}$

In[15]:=
```
secondX = Table[listPopData[[i + 8]][[1]], {i, 9}]
```

Out[15]= {1980, 1990, 2000, 2001, 2002, 2003, 2004, 2005, 2006}

In[16]:=
```
secondMedX = Median[secondX]
```

Out[16]= 2002

In[17]:=
```
secondY = Table[listPopData[[i + 8]][[2]], {i, 9}]
```

Out[17]= {5 462 982, 6 478 216, 8 230 161, 8 419 594, 8 585 535, 8 735 259, 8 913 676, 9 097 428, 9 330 086}

In[18]:=
```
secondMedY = Median[secondY]
```
Out[18]= 8 585 535

In[19]:=
```
sumPoint2 = {secondMedX, secondMedY}
```
Out[19]= {2002, 8 585 535}

In[20]:=
```
thirdX = Table[listPopData[[i + 17]][[1]], {i, 8}]
```
Out[20]= {2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014}

In[21]:=
```
thirdMedX = Median[thirdX]
```
Out[21]= $\frac{4021}{2}$

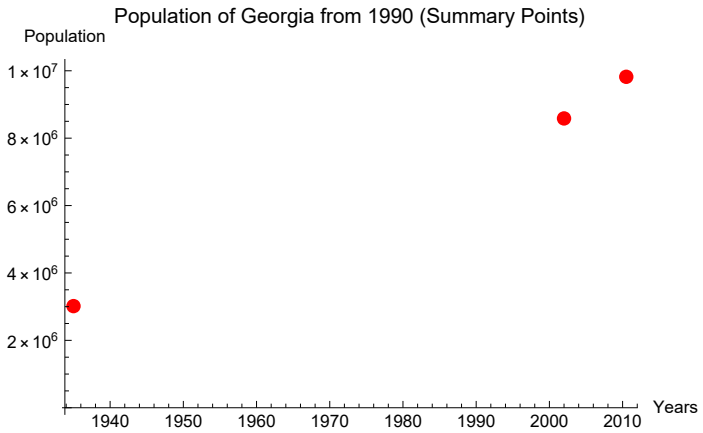
In[22]:=
```
thirdY = Table[listPopData[[i + 17]][[2]], {i, 8}]
```
Out[22]= {9 533 761, 9 697 838, 9 829 211, 9 687 653, 9 813 201, 9 919 000, 9 994 759, 10 097 343}

In[23]:=
```
thirdMedY = Median[thirdY]
```
Out[23]= 9 821 206

In[24]:=
```
sumPoint3 = {thirdMedX, thirdMedY}
```
Out[24]= $\left\{\frac{4021}{2}, 9\,821\,206\right\}$

In[25]:=
```
listSumPoints = {sumPoint1, sumPoint2, sumPoint3}
```
Out[25]= $\left\{\left\{1935, \frac{6\,032\,229}{2}\right\}, \{2002, 8\,585\,535\}, \left\{\frac{4021}{2}, 9\,821\,206\right\}\right\}$

In[26]:=
```
SumPointPlot =
 ListPlot[listSumPoints, PlotLabel → "Population of Georgia from 1990 (Summary Points)",
  AxesLabel → {"Years", "Population"} , PlotStyle → {Red, PointSize[.025]}]
```
Out[26]=



In[27]:=
```
slopeMed1 = (9 821 206 - 6 032 229 / 2) / (4021 / 2 - 1935)
```
Out[27]= $\frac{13\,610\,183}{151}$

In[28]:=
```
line1[x_] := slopeMed1 * (x - 4021/2) + 9 821 206
```

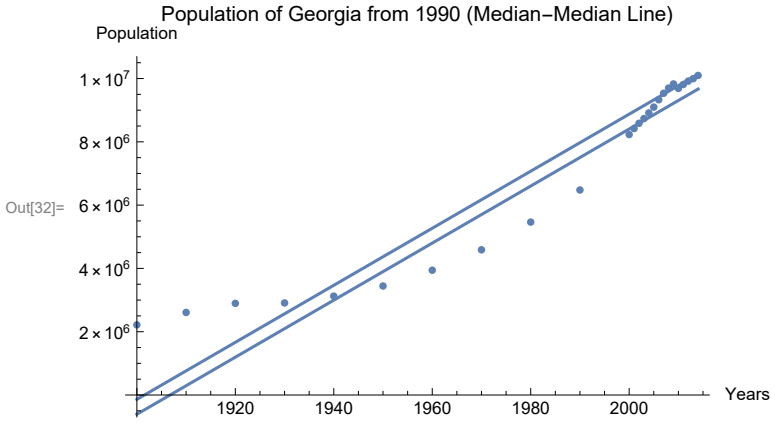
In[29]:=
```
line2[x_] := slopeMed1 * (x - 2002) + 8 585 535
```

In[30]:=
```
lp1 = Plot[line1[x], {x, 1900, 2014}];
```

In[31]:=
```
lp2 = Plot[line2[x], {x, 1900, 2014}];
```

In[32]:=
```
Show[{lp1, lp2, lp}, PlotLabel → "Population of Georgia from 1990 (Median-Median Line)",
 AxesLabel → {"Years", "Population"}]
```

Out[32]=



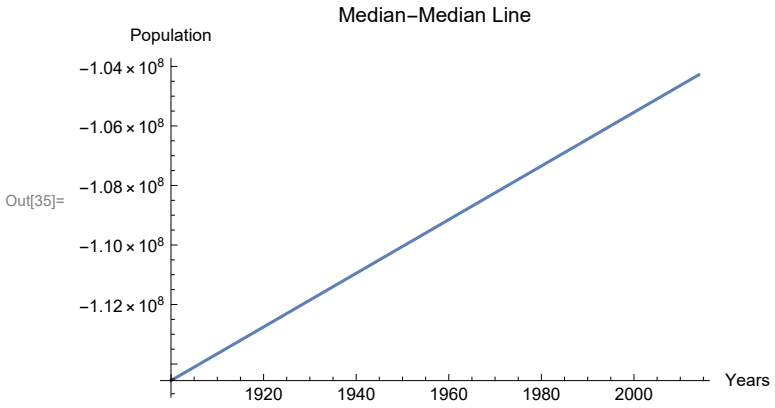
In[33]:=
```
(line1[0] + line2[0]) / 3
```

Out[33]=
$$-\frac{103\,662\,882\,793}{906}$$

In[34]:=
```
medline1[x_] := slopeMed1 * (x - 2010.5) + 9 821 206 - 103 662 882 793/906
```

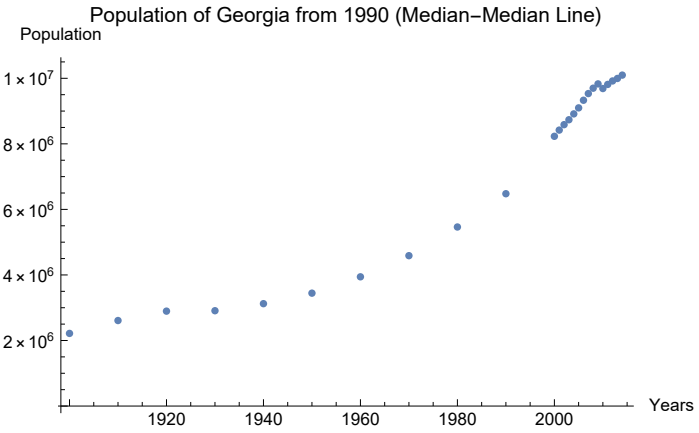
In[35]:=
```
lp3 = Plot[medline1[x], {x, 1900, 2014},
  PlotLabel → "Median-Median Line", AxesLabel → {"Years", "Population"}]
```

Out[35]=



In[36]:=
```
Show[{lp, lp3}, PlotLabel → "Population of Georgia from 1990 (Median-Median Line)",
 AxesLabel → {"Years", "Population"}]
```

Out[36]=



In[37]:=
```
listX = Transpose[listPopData] [[1]]
```

Out[37]=
```
{1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970, 1980, 1990, 2000, 2001,
 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014}
```

In[38]:=
```
listy = Transpose[listPopData] [[2]]
```

Out[38]=
```
{2 216 331, 2 609 121, 2 895 832, 2 908 506, 3 123 723, 3 444 578, 3 943 116, 4 587 930, 5 462 982,
 6 478 216, 8 230 161, 8 419 594, 8 585 535, 8 735 259, 8 913 676, 9 097 428, 9 330 086,
 9 533 761, 9 697 838, 9 829 211, 9 687 653, 9 813 201, 9 919 000, 9 994 759, 10 097 343}
```

In[39]:=
```
listY1 = medline1[listX]
```

Out[39]=
```
{-1.14557 × 10^8, -1.13655 × 10^8, -1.12754 × 10^8, -1.11853 × 10^8, -1.10951 × 10^8,
 -1.1005 × 10^8, -1.09149 × 10^8, -1.08247 × 10^8, -1.07346 × 10^8, -1.06445 × 10^8,
 -1.05543 × 10^8, -1.05453 × 10^8, -1.05363 × 10^8, -1.05273 × 10^8, -1.05183 × 10^8,
 -1.05093 × 10^8, -1.05003 × 10^8, -1.04912 × 10^8, -1.04822 × 10^8, -1.04732 × 10^8,
 -1.04642 × 10^8, -1.04552 × 10^8, -1.04462 × 10^8, -1.04372 × 10^8, -1.04282 × 10^8}
```

In[40]:=
```
listResiduals = listy - listY1
```

Out[40]=
```
{1.16773 × 10^8, 1.16265 × 10^8, 1.1565 × 10^8, 1.14761 × 10^8, 1.14075 × 10^8,
 1.13495 × 10^8, 1.13092 × 10^8, 1.12835 × 10^8, 1.12809 × 10^8, 1.12923 × 10^8,
 1.13774 × 10^8, 1.13873 × 10^8, 1.13949 × 10^8, 1.14008 × 10^8, 1.14097 × 10^8,
 1.1419 × 10^8, 1.14333 × 10^8, 1.14446 × 10^8, 1.1452 × 10^8, 1.14561 × 10^8,
 1.1433 × 10^8, 1.14365 × 10^8, 1.14381 × 10^8, 1.14366 × 10^8, 1.14379 × 10^8}
```

In[41]:=
```
list6 = Transpose[{listX, listResiduals}]
```

Out[41]=
```
{{1900, 1.16773 × 10^8}, {1910, 1.16265 × 10^8}, {1920, 1.1565 × 10^8},
 {1930, 1.14761 × 10^8}, {1940, 1.14075 × 10^8}, {1950, 1.13495 × 10^8},
 {1960, 1.13092 × 10^8}, {1970, 1.12835 × 10^8}, {1980, 1.12809 × 10^8},
 {1990, 1.12923 × 10^8}, {2000, 1.13774 × 10^8}, {2001, 1.13873 × 10^8}, {2002, 1.13949 × 10^8},
 {2003, 1.14008 × 10^8}, {2004, 1.14097 × 10^8}, {2005, 1.1419 × 10^8}, {2006, 1.14333 × 10^8},
 {2007, 1.14446 × 10^8}, {2008, 1.1452 × 10^8}, {2009, 1.14561 × 10^8}, {2010, 1.1433 × 10^8},
 {2011, 1.14365 × 10^8}, {2012, 1.14381 × 10^8}, {2013, 1.14366 × 10^8}, {2014, 1.14379 × 10^8}}
```

In[42]:=
```
ResidualSumMed = Total[listResiduals]
```

Out[42]= 2.85625×10^9

In[43]:=
```
residualM1 = ListPlot[list6,
  PlotLabel → "Median-Median Line Residuals", AxesLabel → {"Year", "Residual"}]
```

Out[43]=