In [1]:

```
import pandas as pd
from pandas import concat
from sklearn.metrics import mean_squared_error
from statsmodels.tsa.arima_model import ARIMA
from matplotlib import pyplot
from pandas import DataFrame
```

```
C:\Users\Laptop\Anaconda3\lib\site-packages\statsmodels\tools\_testing.py:1
9: FutureWarning: pandas.util.testing is deprecated. Use the functions in th
e public API at pandas.testing instead.
  import pandas.util.testing as tm
```

In [2]:

```
#zaciągnięcie danych, podział na "train" i "test"
dane = pd.read_csv('C:/Users/Laptop/Desktop/Grypa/Dane/total.csv', index_col=['data'])
dane = dane['Total']
dane_test_train = dane[(dane.index > '2012-08-23' ) & (dane.index < '2020-03-16')]

train_87 = dane_test_train[0:314]
series_train_87 = train_87.values
test_13 = dane_test_train[314:]
series_test_13 = test_13.values

series_dane_test_train = dane_test_train.values
```

In [3]:

```
series_dane_test_train
```

Out[3]:

```
array([ 10530,  14375,  23150,  27864,  34232,  45357,  43668,  56433,
        46712,  50854,  47865,  58867,  58130,  61968,  62147,  78779,
       134358, 213906, 209903, 219511, 150439, 135150, 109313,  77151,
        87372, 100518, 101205,  91358,  75947,  81863,  60122,  44866,
        30305,  33372,  28421,  33776,  31103,  28628,  28363,  26616,
        22480,  24834,  18950,  18614,  12487,  10904,  11055,  15220,
        16193,  29241,  39036,  60162,  62488,  60656,  59200,  63941,
        52107,  56003,  56685,  57562,  61116,  63501,  64135,  60608,
        43479,  62851,  68099,  94506,  82817,  86595,  93722,  96752,
       111154, 116170, 114440, 114874,  88122,  80139,  55673,  49849,
        47169,  48287,  43147,  49070,  43614,  40674,  34892,  42247,
        35353,  32122,  25750,  24170,  18664,  17615,  17962,  18911,
        22063,  48622,  57551,  70439,  72470,  82198,  79154,  97754,
        73896,  79554,  81710,  86446,  87006, 108325,  86331,  82144,
        57315,  69312,  75211, 112753, 128321, 139877, 148640, 174015,
       178988, 170181, 150372, 164030,  97544, 101467,  78583,  81764,
        54968,  61028,  58977,  55195,  47921,  53452,  45721,  44090,
        38012,  33610,  26178,  27551,  19668,  17407,  20332,  22427,
        24242,  49761,  59232,  71385,  78697,  88680,  86273, 100990,
        90190,  80998,  79420,  94722,  92158,  96107,  86764,  85575,
        62716,  87752,  98326, 118525, 152666, 211636, 212660, 187092,
       184161, 188978, 157726, 142650, 119413,  99740,  80891,  70594,
        64116,  55706,  53407,  60008,  44097,  43085,  40342,  40443,
        34510,  31888,  28019,  24929,  25156,  22804,  25887,  34234,
        33441,  55296,  67034,  86575,  79616,  82498,  95030, 109214,
        93899, 102172,  98342, 111852, 108593, 121618, 114838, 145900,
       132030, 160476, 228451, 363583, 290771, 249600, 192655, 150952,
       135087, 136308, 118299, 129640,  94008,  76877,  72926,  75138,
        54882,  69869,  60316,  72326,  58069,  48161,  49848,  48470,
        41274,  35955,  32931,  36527,  28523,  24447,  27948,  36759,
        38033,  75685, 101105, 107609, 105347, 115232, 105491, 132239,
       103003, 118552, 112558, 126522, 121174, 137784, 119744,  90103,
       120543, 155734, 162975, 259405, 242959, 271777, 269682, 248016,
       255812, 264781, 206028, 187665, 126320, 103570,  89880,  81043,
        50979,  59938,  48789,  51251,  55843,  53833,  46153,  45217,
        42697,  36178,  32440,  34364,  24946,  21560,  22428,  32946,
        33942,  54848,  73468,  81860,  91078, 106831,  95948, 106851,
        96062,  95589,  99355, 125794, 117370, 125159, 124773, 104905,
       115901, 142768, 158756, 227951, 236454, 250131, 199472, 158698,
       155213, 157867, 133758, 119224, 102173, 113081,  68094,  80861,
        45834,  59157,  58583,  77873,  60809,  49088,  40785,  39564,
        37794,  36789,  31368,  35254,  27541,  23819,  25164,  28457,
        29553,  54216,  87589, 115689, 111154, 117374, 112264, 129806,
        93602, 110629, 106546, 112575, 115623, 124181, 130460, 138171,
        89211, 122430, 127696, 204726, 193482, 200194, 211983, 215994,
       211572, 158677], dtype=int64)
```

In [ ]:

```
history = [x for x in series_train_87]
predictions=list()
for t in range(len(series_test_13)):
    model= ARIMA(history, order=(48,0,0))
    model_fit = model.fit(disp=0)
    output = model_fit.forecast()
    yhat = output[0]
    predictions.append(yhat)
    obs=series_test_13[t]
    history.append(obs)
    print('predicted=%f, expected=%f' % (yhat, obs))
error = mean_squared_error(series_test_13, predictions)
print('Test MSE: %.3f' % error)
```

In [4]:

```
forecast = model_fit.forecast(steps=6)[0]
```

In [5]:

```
forecast
```

Out[5]:

```
array([207943.34167709, 188116.0086552 , 180544.06356929, 159199.73338848,
       152182.07887437, 132279.161179  ])
```

In [22]:

```
predictions
```

Out[22]:

```
[array([154182.03057097]),
 array([124574.13001351]),
 array([106622.18888384]),
 array([95493.996329]),
 array([109039.12995621]),
 array([64567.71064398]),
 array([70202.6073245]),
 array([50635.5419622]),
 array([51617.10275569]),
 array([68233.61224037]),
 array([79801.91963773]),
 array([65936.49045592]),
 array([43690.23027866]),
 array([42379.1361774]),
 array([41677.16774546]),
 array([41804.45403669]),
 array([40339.6691846]),
 array([35061.82931509]),
 array([39049.90941988]),
 array([32794.08778773]),
 array([25858.91603893]),
 array([30579.75230669]),
 array([34531.17485871]),
 array([35302.98920831]),
 array([61731.18017676]),
 array([100806.28669901]),
 array([125643.09424622]),
 array([113525.11650636]),
 array([113126.01982623]),
 array([112062.83349633]),
 array([126979.82461072]),
 array([91469.75455357]),
 array([99285.45844203]),
 array([112805.1318793]),
 array([106802.88872375]),
 array([116229.79244166]),
 array([122378.60897066]),
 array([129950.65570451]),
 array([135975.45785435]),
 array([81581.26416427]),
 array([110376.5444219]),
 array([138764.12727847]),
 array([203732.23152551]),
 array([205641.75113941]),
 array([179088.22261803]),
 array([209982.97321721]),
 array([207585.57275554]),
 array([200319.75140822])]
```

In [20]:

```
print(model_fit.summary())
```

```
                              ARMA Model Results                              
==============================================================================
==
Dep. Variable:                      y   No. Observations:                    3
61
Model:                     ARMA(5, 0)   Log Likelihood               -4071.5
75
Method:                       css-mle   S.D. of innovations          19075.3
79
Date:                Sun, 30 Aug 2020   AIC                           8157.1
51
Time:                        23:25:28   BIC                           8184.3
73
Sample:                             0   HQIC                          8167.9
74

==============================================================================
==
                 coef    std err          z      P>|z|      [0.025      0.97
5]
------------------------------------------------------------------------------
--
const       8.793e+04   1.14e+04      7.722      0.000    6.56e+04     1.1e+
05
ar.L1.y        1.0913      0.052     20.826      0.000       0.989       1.1
94
ar.L2.y        0.1078      0.077      1.394      0.164      -0.044       0.2
59
ar.L3.y       -0.3899      0.075     -5.221      0.000      -0.536      -0.2
44
ar.L4.y        0.1554      0.077      2.012      0.045       0.004       0.3
07
ar.L5.y       -0.0514      0.053     -0.975      0.330      -0.155       0.0
52
                                    Roots                                    
==============================================================================
=
                  Real          Imaginary           Modulus         Frequenc
y
------------------------------------------------------------------------------
-
AR.1           -1.4809           -0.0000j            1.4809           -0.500
0
AR.2            1.3142           -0.0510j            1.3151           -0.006
2
AR.3            1.3142           +0.0510j            1.3151            0.006
2
AR.4            0.9383           -2.5920j            2.7566           -0.194
7
AR.5            0.9383           +2.5920j            2.7566            0.194
7
------------------------------------------------------------------------------
-
```

In [25]:

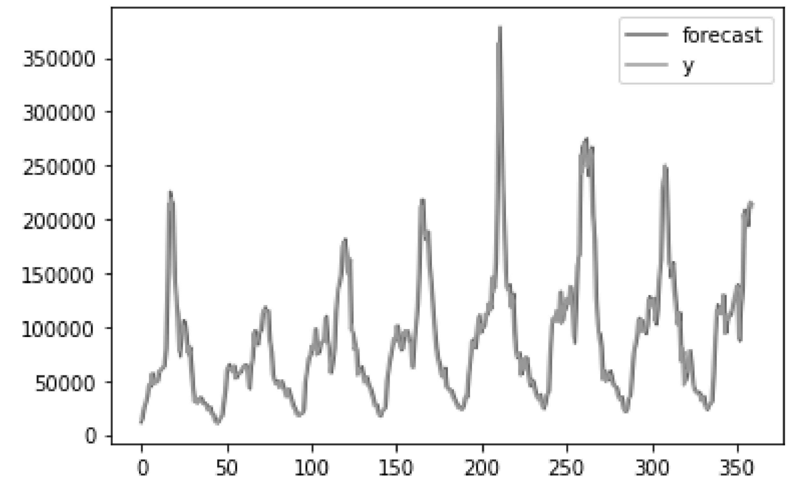
```
model.plot_diagnostics(figsize=(7,5))
plt.show()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-25-78c964cf6b9d> in <module>
----> 1 model.plot_diagnostics(figsize=(7,5))
      2 plt.show()

AttributeError: 'ARMA' object has no attribute 'plot_diagnostics'
```

In [42]:

```
model_fit.plot_predict(dynamic=False)
plt.show()
```

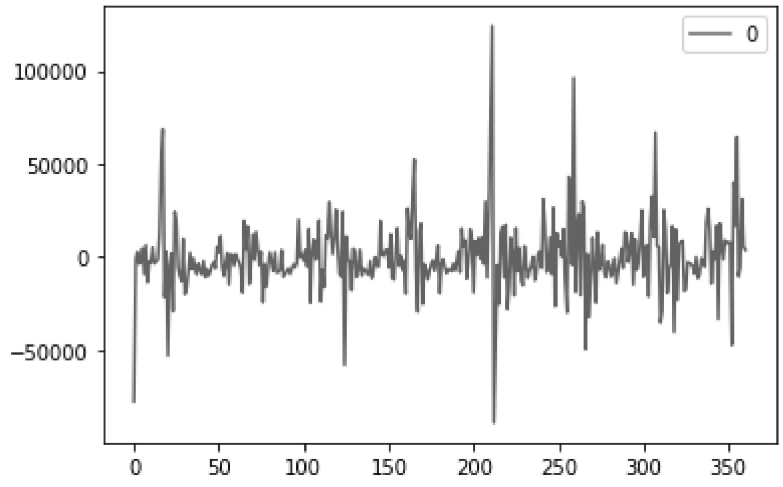
```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-42-e6e523091cdc> in <module>
      1 model_fit.plot_predict(dynamic=False)
----> 2 plt.show()

NameError: name 'plt' is not defined
```

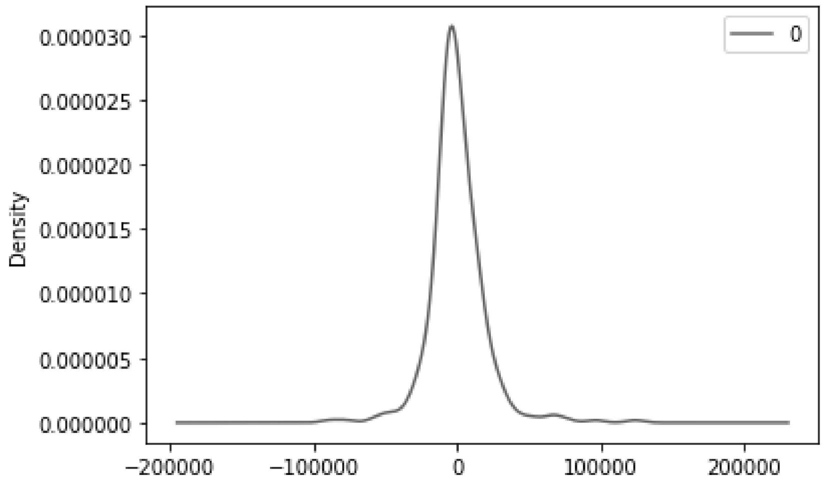


In [21]:

```
residuals = DataFrame(model_fit.resid)
residuals.plot()
residuals.plot(kind='kde')
print(residuals.describe())
```

```
                   0
count     361.000000
mean       89.622906
std     19489.017034
min    -88722.281118
25%     -8078.057863
50%     -2286.829153
75%      8209.652679
max    124048.535376
```



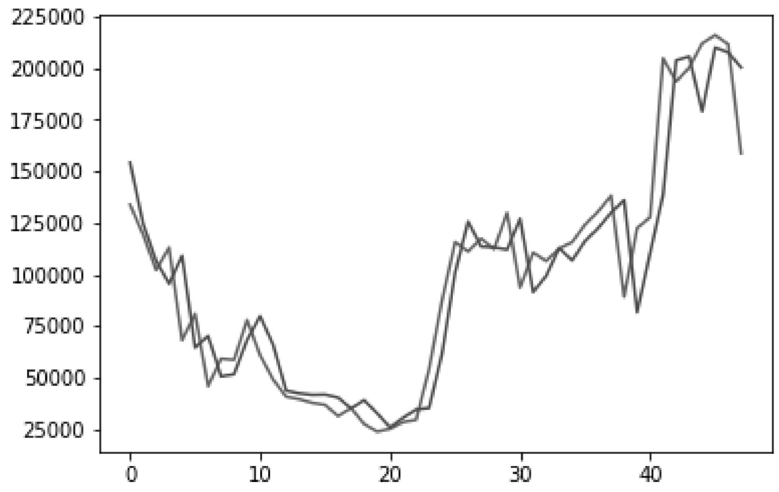


In [19]:

```
pyplot.plot(series_test_13)
pyplot.plot(predictions, color='red')
```

Out[19]:

```
[<matplotlib.lines.Line2D at 0x2c2bb594288>]
```



In [9]:

```
model2 = ARIMA(series_dane_test_train, order=(5,0,2))
model_fit2 = model2.fit(disp=0)
```

In [10]:

```
forecast2 = model_fit2.forecast(steps=6)[0]
```

In [11]:

```
forecast2
```

Out[11]:

```
array([129095.47385079, 116793.47226887,  96674.00625315,  92866.36468451,
        77583.20366889,  77502.78522839])
```