Drawdowns

In [1]:
```
import pandas as pd
import numpy as np
```

In [2]:
```
portfolio = pd.read_csv("Portfolios_Formed_on_ME_monthly_EW.csv", header=0, index
_col=0,
                                parse_dates=True, na_values=-99.99)
```

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

Out[3]:

	<= 0	Lo 30	Med 40	Hi 30	Lo 20	Qnt 2	Qnt 3	Qnt 4	Hi 20	Lo 10	Dec 2	Dec 3	Dec 4	Dec 5	Dec 6	Dec 7
192607	NaN	-0.43	1.52	2.68	-0.57	0.59	1.60	1.47	3.33	-1.45	0.29	-0.15	1.33	1.24	1.98	1.55
192608	NaN	3.90	3.04	2.09	3.84	3.59	3.71	1.61	2.33	5.12	2.59	4.03	3.15	2.72	4.72	1.60
192609	NaN	-1.08	-0.54	0.16	-0.48	-1.40	0.00	-0.50	-0.09	0.93	-1.87	-2.27	-0.53	0.07	-0.07	-1.64
192610	NaN	-3.32	-3.52	-3.06	-3.29	-4.10	-2.89	-3.36	-2.95	-4.84	-1.77	-3.36	-4.83	-2.98	-2.80	-3.45
192611	NaN	-0.46	3.82	3.09	-0.55	2.18	3.41	3.39	3.16	-0.78	-0.32	-0.29	4.65	3.24	3.57	3.82

In [4]:
```
rets = portfolio[['Lo 10', 'Hi 10']]
rets.columns = ['SmallCap', 'LargeCap']
rets.head()
```

Out[4]:

	SmallCap	LargeCap
192607	-1.45	3.29
192608	5.12	3.70
192609	0.93	0.67
192610	-4.84	-2.43
192611	-0.78	2.70

In [5]:
```
#convert to raw data
rets = rets/100
rets.head()
```

Out[5]:

	SmallCap	LargeCap
192607	-0.0145	0.0329
192608	0.0512	0.0370
192609	0.0093	0.0067
192610	-0.0484	-0.0243
192611	-0.0078	0.0270

In [6]:
```
rets.plot.line(figsize=(12,8))
```

Out[6]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1165c6128>
```

In [7]:
```
rets.index
```

Out[7]:
```
Int64Index([192607, 192608, 192609, 192610, 192611, 192612, 192701, 192702,
            192703, 192704,
            ...
            201803, 201804, 201805, 201806, 201807, 201808, 201809, 201810,
            201811, 201812],
           dtype='int64', length=1110)
```

In [8]:
```
# index not showing up as date. Convert to data
rets.index = pd.to_datetime(rets.index, format='%Y%m')
rets.head()
```

Out[8]:

	SmallCap	LargeCap
1926-07-01	-0.0145	0.0329
1926-08-01	0.0512	0.0370
1926-09-01	0.0093	0.0067
1926-10-01	-0.0484	-0.0243
1926-11-01	-0.0078	0.0270

In [9]:
```
rets.tail()
```

Out[9]:

	SmallCap	LargeCap
2018-08-01	0.0241	0.0234
2018-09-01	-0.0168	0.0087
2018-10-01	-0.1002	-0.0657
2018-11-01	-0.0365	0.0253
2018-12-01	-0.1531	-0.0890

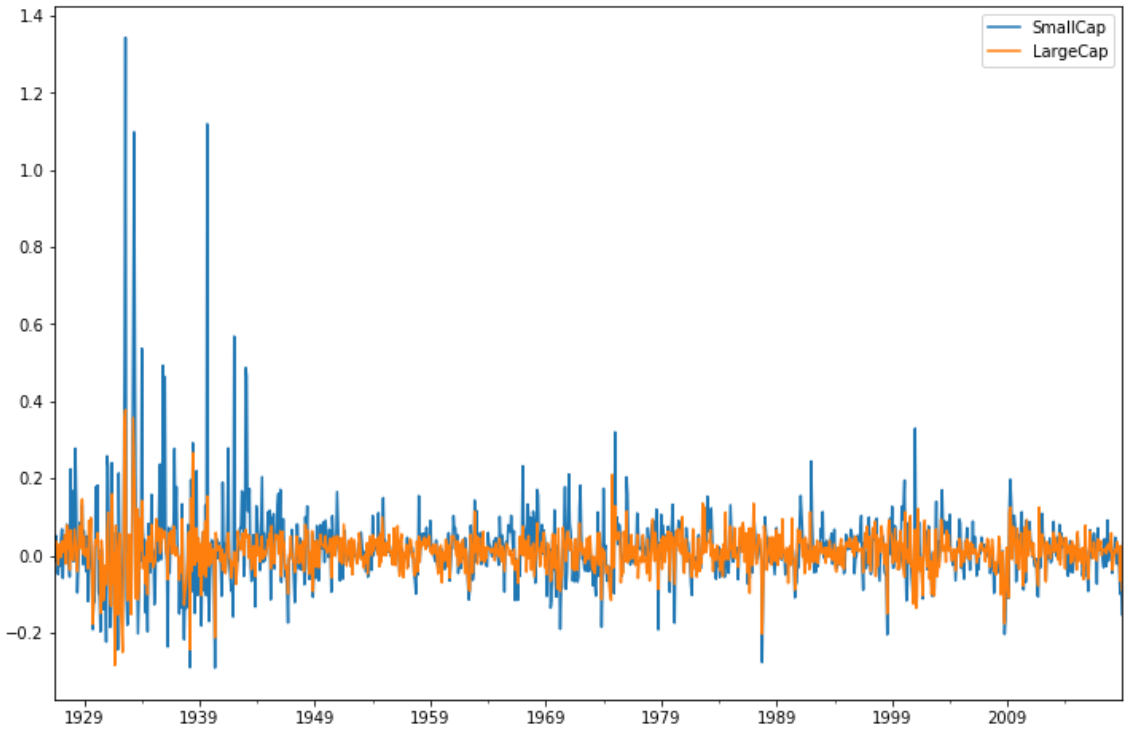
In [10]:
```
#Month not showing up as a period. Change to a month period.
rets.index =rets.index.to_period('M')
rets.head()
```

Out[10]:

	SmallCap	LargeCap
1926-07	-0.0145	0.0329
1926-08	0.0512	0.0370
1926-09	0.0093	0.0067
1926-10	-0.0484	-0.0243
1926-11	-0.0078	0.0270

In [11]:
```
rets.plot.line(figsize=(12,8))
```

Out[11]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x116c50be0>
```



Compute Drawdowns

1. Compute a wealth index
2. Compute previous peaks
3. Compute drawdown -- which is the wealth value as a percentage of the previous peak

In [12]:
```
# Calculate the wealth index. Use 1000 as the starting amount
wealth_index = 1000*(1 + rets['LargeCap']).cumprod()
wealth_index.head()
```

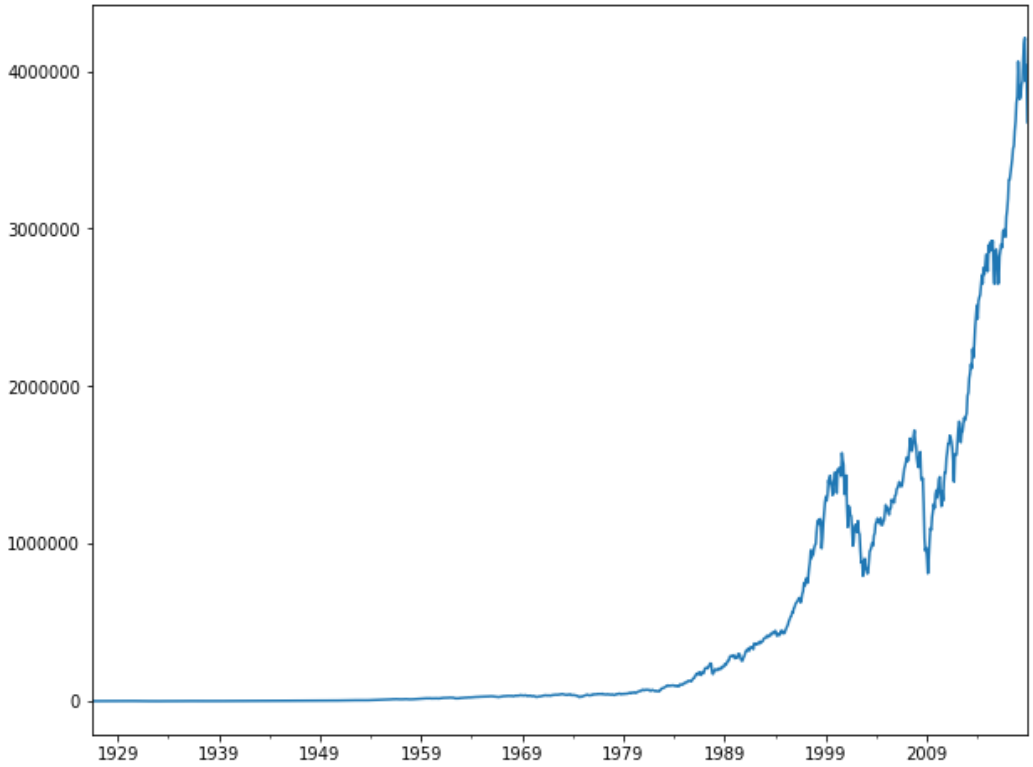
Out[12]:
```
1926-07    1032.900000
1926-08    1071.117300
1926-09    1078.293786
1926-10    1052.091247
1926-11    1080.497711
Freq: M, Name: LargeCap, dtype: float64
```

In [13]:
```
wealth_index.tail()
```

Out[13]:
```
2018-08    4.175915e+06
2018-09    4.212246e+06
2018-10    3.935501e+06
2018-11    4.035069e+06
2018-12    3.675948e+06
Freq: M, Name: LargeCap, dtype: float64
```

In [14]:
```
wealth_index.plot.line(figsize=(10,8))
```

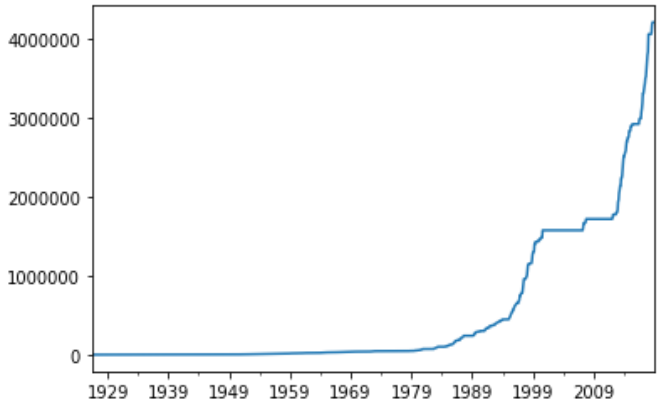
Out[14]: <matplotlib.axes._subplots.AxesSubplot at 0x116d21550>



In [15]:
```
#Compute previous peaks
previous_peaks = wealth_index.cummax()
```

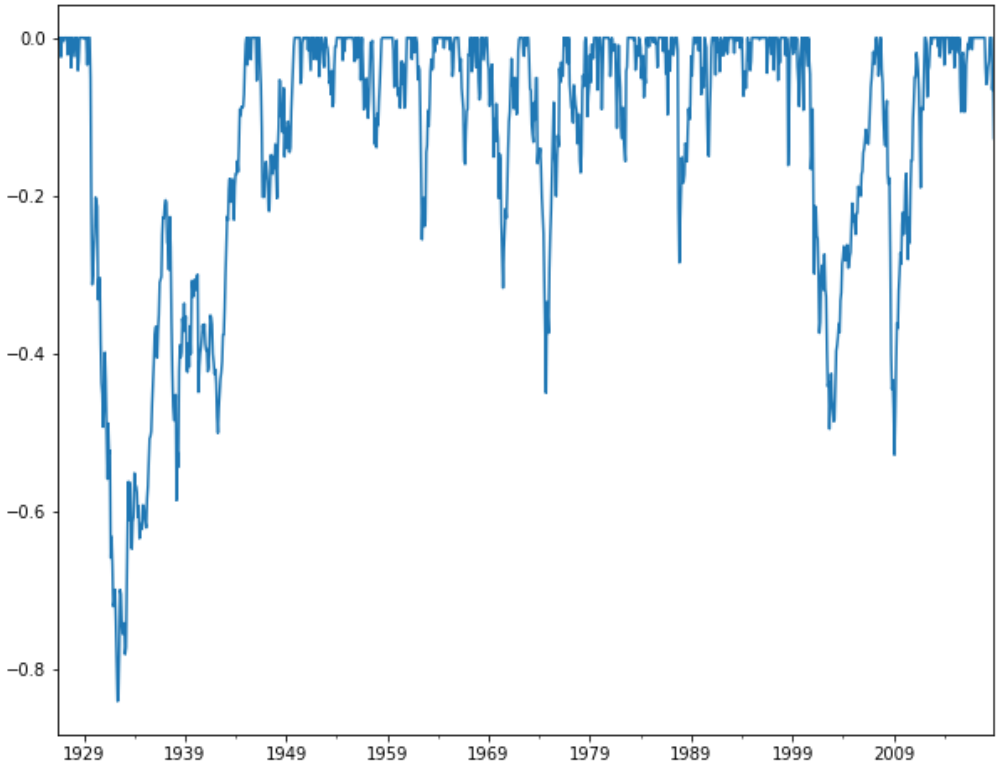
In [16]:
```
previous_peaks.plot()
```

Out[16]: <matplotlib.axes._subplots.AxesSubplot at 0x117441240>



In [17]:
```
#Compute Drawdown
drawdown = (wealth_index - previous_peaks) / previous_peaks
drawdown.plot(figsize=(10,8))
```

Out[17]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1177df6a0>
```



In [18]:
```
drawdown.min()
```

Out[18]:
```
-0.8400375277943123
```

In [19]:
```
# Create Drawdown Function

def Drawdown(return_series: pd.Series):

    """
    Takes a time series of asset returns
    Computes and returns a Dataframe that contains:
    the Wealth index
    the previous peaks
    percent drawdowns
    """
    wealth_index = 1000*(1 + return_series).cumprod()
    previous_peaks = wealth_index.cummax()
    drawdowns = (wealth_index - previous_peaks) / previous_peaks

    return pd.DataFrame({
        "Wealth": wealth_index,
        "Peaks": previous_peaks,
        "Drawdown": drawdowns
    })
```

In [20]:
```
#check to see if functioning
Drawdown(rets['LargeCap']).head()
```

Out[20]:

	Wealth	Peaks	Drawdown
1926-07	1032.900000	1032.900000	0.0000
1926-08	1071.117300	1071.117300	0.0000
1926-09	1078.293786	1078.293786	0.0000
1926-10	1052.091247	1078.293786	-0.0243
1926-11	1080.497711	1080.497711	0.0000

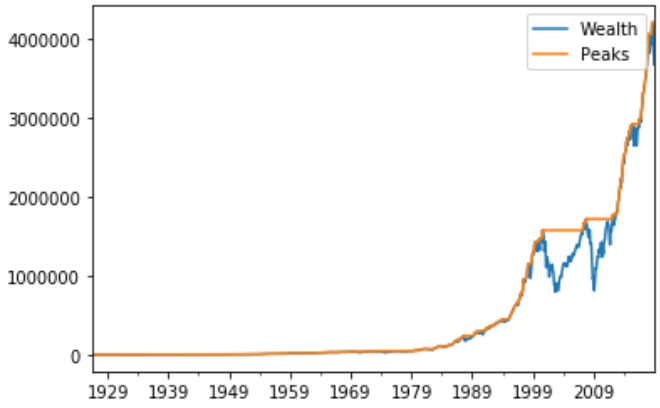
In [21]:
```
#Look at two columns
Drawdown(rets['LargeCap'])[['Wealth', 'Peaks']].head()
```

Out[21]:

	Wealth	Peaks
1926-07	1032.900000	1032.900000
1926-08	1071.117300	1071.117300
1926-09	1078.293786	1078.293786
1926-10	1052.091247	1078.293786
1926-11	1080.497711	1080.497711

In [22]:
```
Drawdown(rets['LargeCap'])[['Wealth', 'Peaks']].plot()
```

Out[22]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x1178f9a90>
```

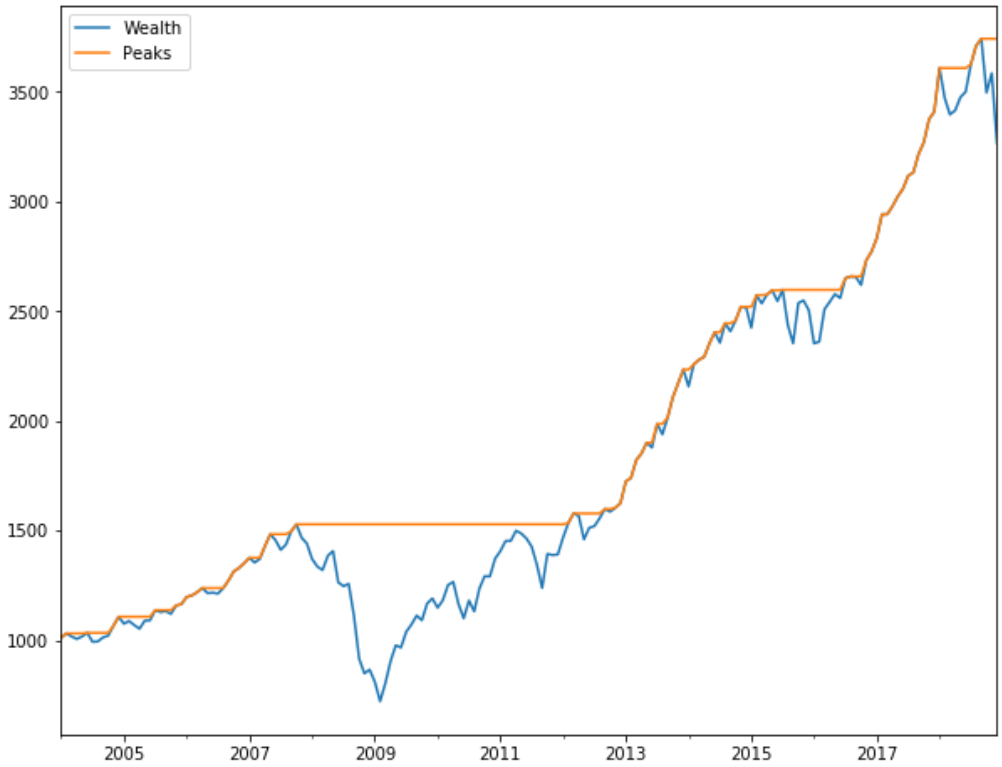


In [23]:
```
# Look at up to 1950
Drawdown(rets[:'1950']['LargeCap'])[['Wealth', 'Peaks']].plot(figsize=(10,8))
```

Out[23]: <matplotlib.axes._subplots.AxesSubplot at 0x117b01dd8>

In [24]:
```
#Look at 2004 to 2018
Drawdown(rets['2004':]['LargeCap'])[['Wealth', 'Peaks']].plot(figsize=(10,8))
```

Out[24]: <matplotlib.axes._subplots.AxesSubplot at 0x117c34828>



In [25]:
```
Drawdown(rets['LargeCap'])['Drawdown'].min()
```

Out[25]: -0.8400375277943123

In [26]:
```
Drawdown(rets['SmallCap'])['Drawdown'].min()
```

Out[26]: -0.8330007793945303

In [27]:
```
Drawdown(rets['LargeCap'])['Drawdown'].idxmin()
```

Out[27]: Period('1932-05', 'M')

In [28]:
```
Drawdown(rets['SmallCap'])['Drawdown'].idxmin()
```

Out[28]: Period('1932-05', 'M')

In [29]:
```
Drawdown(rets['1940':]['LargeCap'])['Drawdown'].idxmin()
```

Out[29]: Period('2009-02', 'M')

In [30]:
```
Drawdown(rets['1940':]['SmallCap'])['Drawdown'].idxmin()
```

Out[30]: Period('1974-12', 'M')

In [31]:
```
Drawdown(rets['1975':]['SmallCap'])['Drawdown'].idxmin()
```

Out[31]: Period('2009-02', 'M')

In [32]:
```
Drawdown(rets['1975':]['LargeCap'])['Drawdown'].idxmin()
```

Out[32]:
```
Period('2009-02', 'M')
```

In [ ]:

In [ ]: