```
Python 2.7.10 |Anaconda 2.3.0 (64-bit)| (default, May 28 2015, 16:44:52) [MSC v.1500
64 bit (AMD64)]
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IPython 3.2.0 -- An enhanced Interactive Python.
Anaconda is brought to you by Continuum Analytics.
Please check out: http://continuum.io/thanks and https://anaconda.org
?          -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help       -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.
%guiref   -> A brief reference about the graphical user interface.

In [1]: import numpy as np

In [2]: import pandas as pd

In [3]: import pandas.io.data as web

In [4]:
sp500=web.DataReader('^GSPC',data_source='yahoo',start='1/1/2000',end='4/14/2014')

In [5]: sp500.info()
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 3592 entries, 2000-01-03 to 2014-04-14
Data columns (total 6 columns):
Open        3592 non-null float64
High        3592 non-null float64
Low         3592 non-null float64
Close       3592 non-null float64
Volume      3592 non-null int64
Adj Close   3592 non-null float64
dtypes: float64(5), int64(1)
memory usage: 196.4 KB

In [6]: sp500['Close'].plot(grid=True,figsize=(8,5))
Out[6]: <matplotlib.axes._subplots.AxesSubplot at 0x152ac748>
```
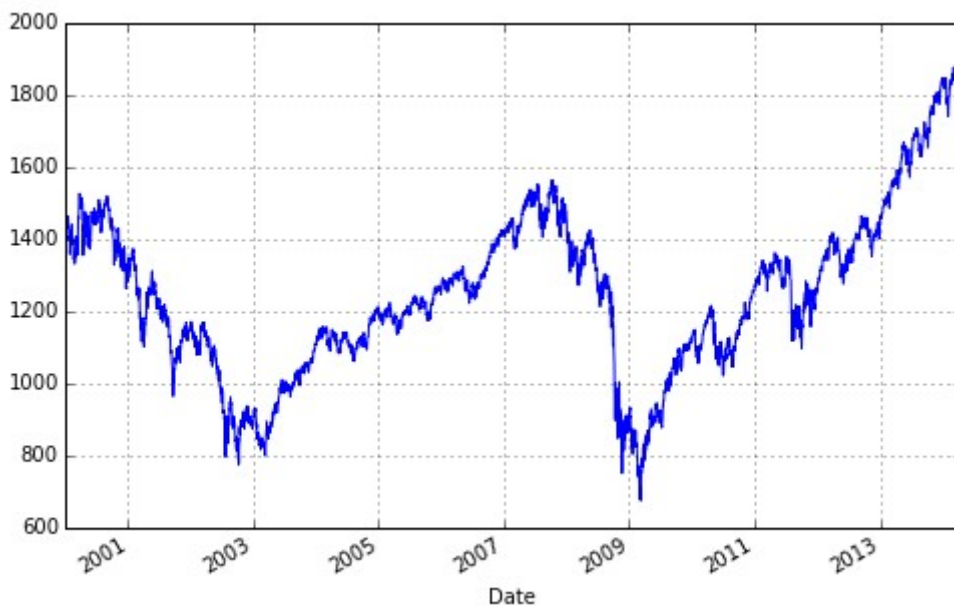


```
In [7]: sp500['42d']=np.round(pd.rolling_mean(sp500['Close'],window=42),2)

In [8]: sp500['252d']=np.round(pd.rolling_mean(sp500['Close'],window=252),2)
```
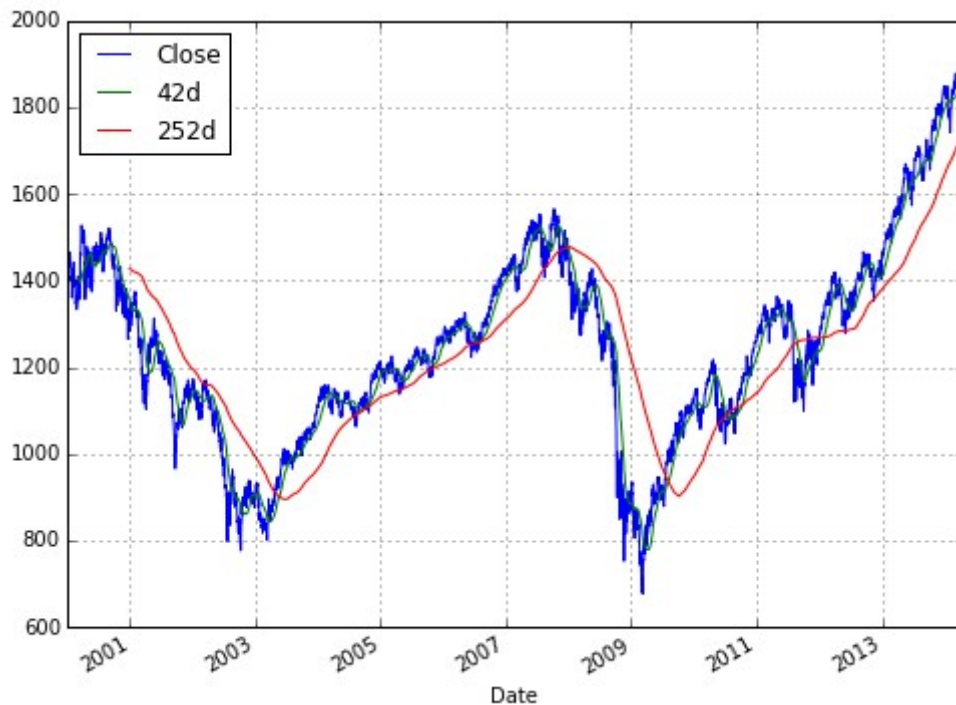
```
In [9]: sp500[['Close','42d','252d']].tail()
Out[9]:
                 Close      42d      252d
Date
2014-04-08  1851.959961  1853.88  1728.66
2014-04-09  1872.180054  1855.67  1729.79
2014-04-10  1833.079956  1856.46  1730.74
2014-04-11  1815.689941  1856.36  1731.64
2014-04-14  1830.609985  1856.63  1732.74

In [10]: sp500[['Close','42d','252d']].plot(grid=True,figsize=(8,6))
Out[10]: <matplotlib.axes._subplots.AxesSubplot at 0x153da198>
```



```
In [11]: sp500['42-252']=sp500['42d']-sp500['252d']

In [12]: sp500['42-252'].tail()
Out[12]:
Date
2014-04-08    125.22
2014-04-09    125.88
2014-04-10    125.72
2014-04-11    124.72
2014-04-14    123.89
Name: 42-252, dtype: float64

In [13]: sp500['42-252'].head()
Out[13]:
Date
2000-01-03    NaN
2000-01-04    NaN
2000-01-05    NaN
2000-01-06    NaN
2000-01-07    NaN
Name: 42-252, dtype: float64

In [14]: S0=50
```

```
In [15]: sp500['Regime']=np.where(sp500['42-252']>S0,1,0)
    ...: sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])
    ...: sp500['Regime'].value.counts()
    ...:
Traceback (most recent call last):

  File "<ipython-input-15-36cdbc6eed9d>", line 2, in <module>
    sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])

TypeError: 'DataFrame' object is not callable


In [16]: sp500['Regime']=np.where(sp500['42-252']>S0,1,0)
    ...: sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])
    ...:
Traceback (most recent call last):

  File "<ipython-input-16-d7f0758e4fa5>", line 2, in <module>
    sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])

TypeError: 'DataFrame' object is not callable


In [17]: sp500['Regime']=np.where(sp500['42-252']>S0,1,0)

In [18]: sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])
Traceback (most recent call last):

  File "<ipython-input-18-a86efccd2872>", line 1, in <module>
    sp500['Regime']=np.where(sp500('42-252')<S0,-1,sp500['Regime'])

TypeError: 'DataFrame' object is not callable


In [19]: sp500['Regime']=np.where(sp500('42-252')<-S0,-1,sp500['Regime'])
Traceback (most recent call last):

  File "<ipython-input-19-a02593bcb5af>", line 1, in <module>
    sp500['Regime']=np.where(sp500('42-252')<-S0,-1,sp500['Regime'])

TypeError: 'DataFrame' object is not callable


In [20]: sp500['Regime']=np.where(sp500['42-252']>S0,1,0)
    ...: sp500['Regime']=np.where(sp500['42-252']<-S0,-1,sp500['Regime'])
    ...: sp500['Regime'].value.counts()
    ...:
Traceback (most recent call last):

  File "<ipython-input-20-fc28d60d8f7e>", line 3, in <module>
    sp500['Regime'].value.counts()

  File "C:\Anaconda\lib\site-packages\pandas\core\generic.py", line 2150, in
__getattr__
    (type(self).__name__, name))

AttributeError: 'Series' object has no attribute 'value'


In [21]: sp500['Regime']=np.where(sp500['42-252']>S0,1,0)
    ...: sp500['Regime']=np.where(sp500['42-252']<-S0,-1,sp500['Regime'])
    ...: sp500['Regime'].value_counts()
```

```
    ...:
Out[21]:
 1    1489
 0    1232
-1     871
dtype: int64

In [22]: sp500['Regime'].plot(lw=1.5)\
    ...: plt.ylim([-1.1,1.1]]
  File "<ipython-input-22-e49ae5d5aa8c>", line 1
    sp500['Regime'].plot(lw=1.5)plt.ylim([-1.1,1.1]]
                                   ^
SyntaxError: invalid syntax


In [23]: sp500['Regime'].plot(lw=1.5)
    ...: plt.ylim([-1.1,1.1]]
  File "<ipython-input-23-b47c9a6f6a10>", line 2
    plt.ylim([-1.1,1.1]]
             ^
SyntaxError: invalid syntax


In [24]: sp500['Regime'].plot(lw=1.5)
    ...: plt.ylim([-1.1,1.1])
    ...:
```
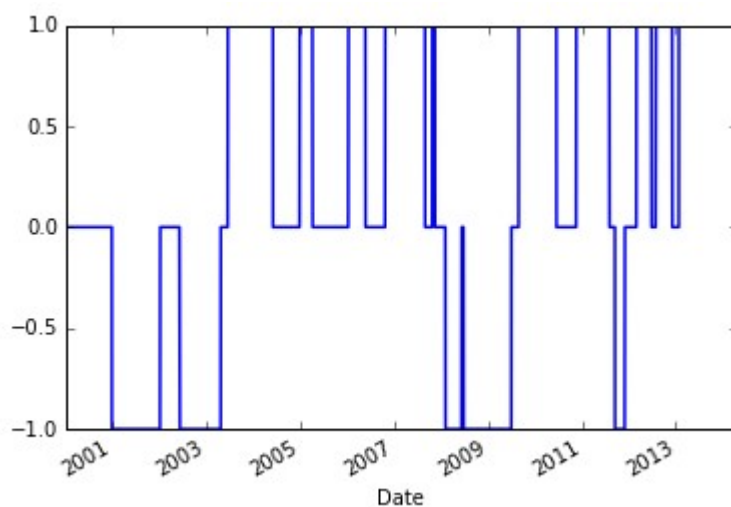


```
Traceback (most recent call last):

  File "<ipython-input-24-09b834810d38>", line 2, in <module>
    plt.ylim([-1.1,1.1])

NameError: name 'plt' is not defined


In [25]: sp500['Market']=np.log(sp500['Close']/sp500['Close'].shift(1))

In [26]: sp500['Strategy']=sp500['Regime'].shift(1)*sp500['Market']

In [27]:
sp500[['Market','Strategy']].cumsum().apply(np.exp).plot(grid=True,figsize=(8,5))
Out[27]: <matplotlib.axes._subplots.AxesSubplot at 0x15a40400>
```
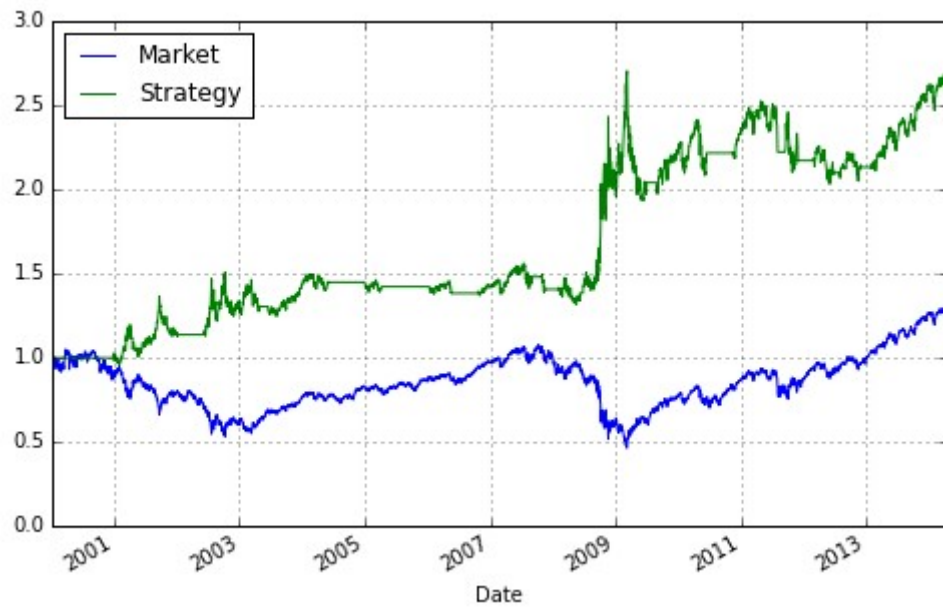
In [**28**]: