In [15]:

```
import matplotlib
import matplotlib.pyplot as plt
import io, base64, os, json, re
import pandas as pd
import numpy as np
import datetime
from pandas.plotting import register_matplotlib_converters
register_matplotlib_converters()

#EJERCICIO DE SAVIO KERBER

#CORRELACIÓN SP500 VS VIX(indice de volatilidad)

gspc_df = pd.read_csv('^GSPC.csv')
gspc_df['Date'] = pd.to_datetime(gspc_df['Date'])
vix_df = pd.read_csv('^VIX.csv')
vix_df['Date'] = pd.to_datetime(vix_df['Date'])
vix_df.tail()
```

Out[15]:

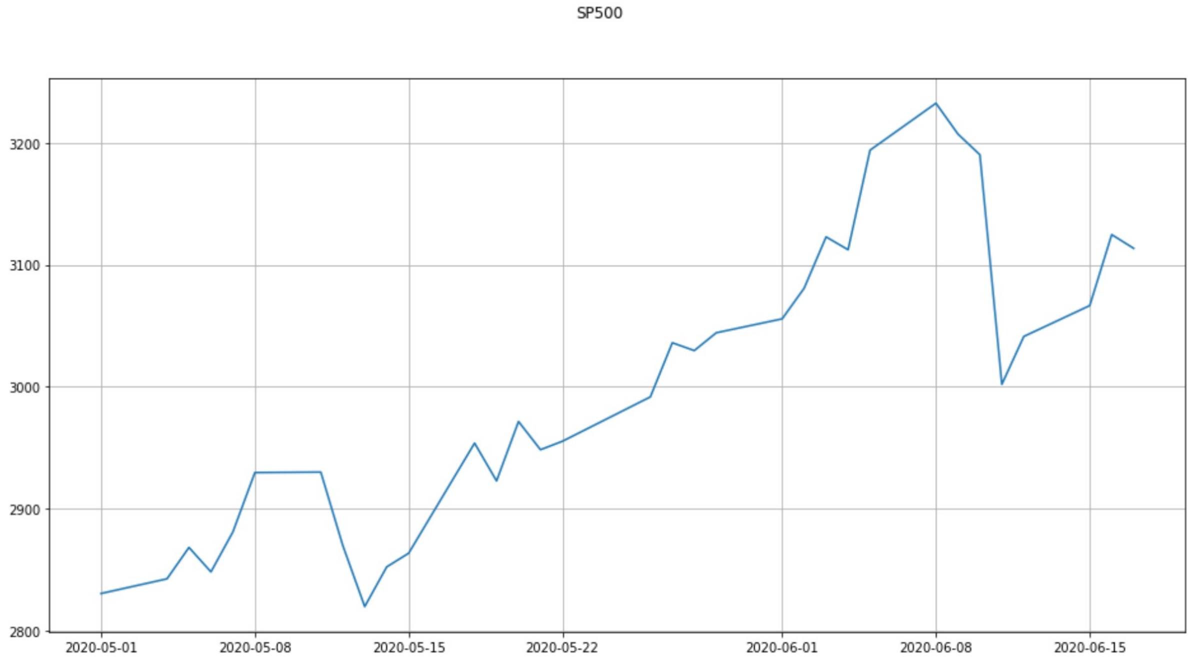
	Date	Open	High	Low	Close	Adj Close	Volume
1254	2020-06-11	30.450001	42.580002	29.490000	40.790001	40.790001	0
1255	2020-06-12	37.680000	44.160000	34.970001	36.090000	36.090000	0
1256	2020-06-15	44.090000	44.439999	34.279999	34.400002	34.400002	0
1257	2020-06-16	34.279999	37.450001	31.730000	33.669998	33.669998	0
1258	2020-06-17	33.279999	35.169998	32.250000	33.470001	33.470001	0

In [16]:

```
#cut_off_date = max(min(vix_df['Date']),min(gspc_df['Date']))
cut_off_date = '2020-05-01'

gspc_df = gspc_df[gspc_df['Date'] >= cut_off_date]
vix_df = vix_df[vix_df['Date'] >= cut_off_date]
```

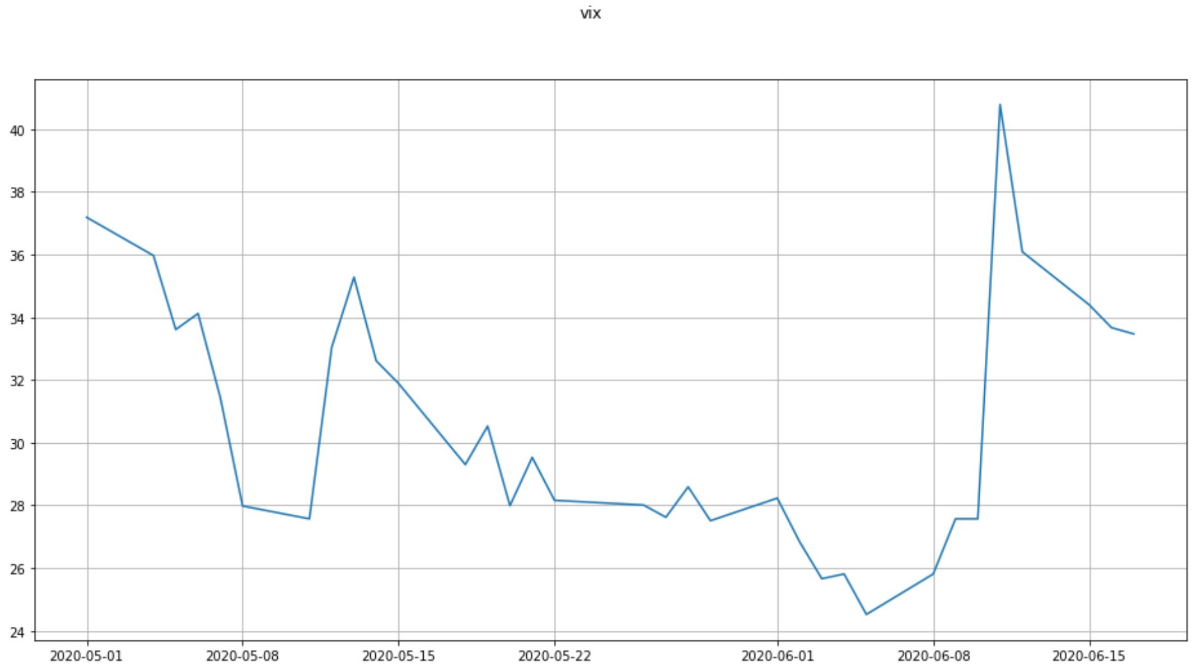
In [17]:

```
fig = plt.figure(figsize=(16, 8))
plt.plot(gspc_df['Date'],gspc_df['Adj Close'])
plt.suptitle('SP500')
plt.grid()
plt.show()
```



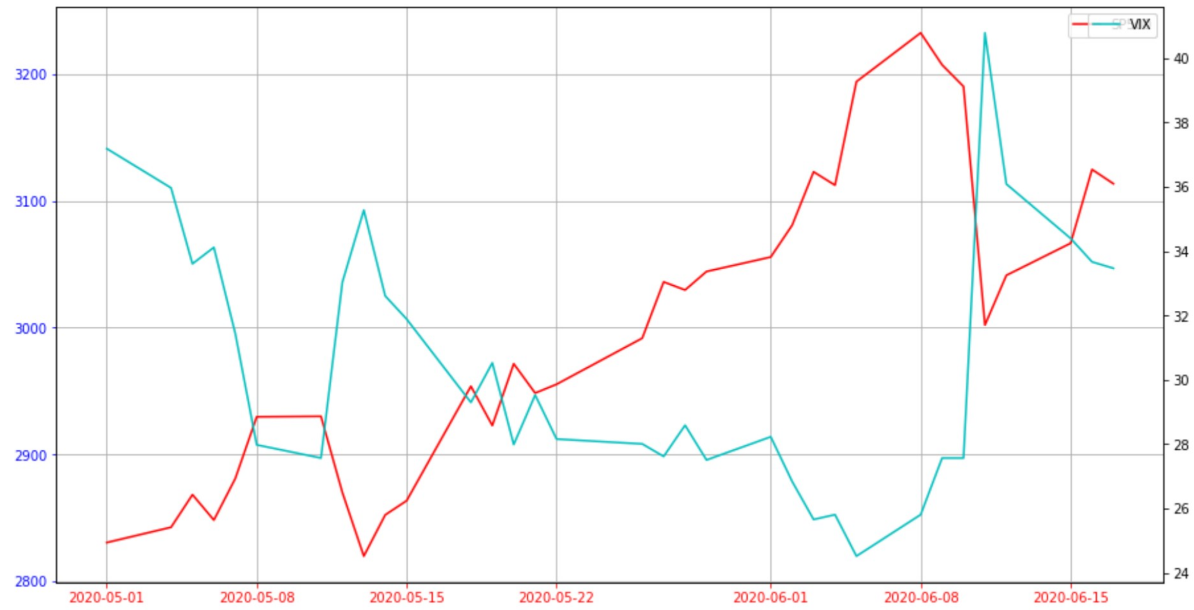
In [18]:

```
fig = plt.figure(figsize=(16, 8))
plt.plot(vix_df['Date'],vix_df['Adj Close'])
plt.suptitle('vix')
plt.grid()
plt.show()
```



In [20]:

```
fig, ax = plt.subplots(figsize=(15, 8))
plt.plot(gspc_df['Date'],gspc_df['Adj Close'], '-r', label='SP500')
plt.legend()
plt.grid()
ax.tick_params('x', colors='r')

# Get second axis
ax2 = ax.twinx()
#plt.plot(df['c'], 'b', label='Line c')
plt.plot(vix_df['Date'], vix_df['Adj Close'], 'c', label='VIX')
plt.legend()
ax.tick_params('y', colors='b')
```



In [21]:

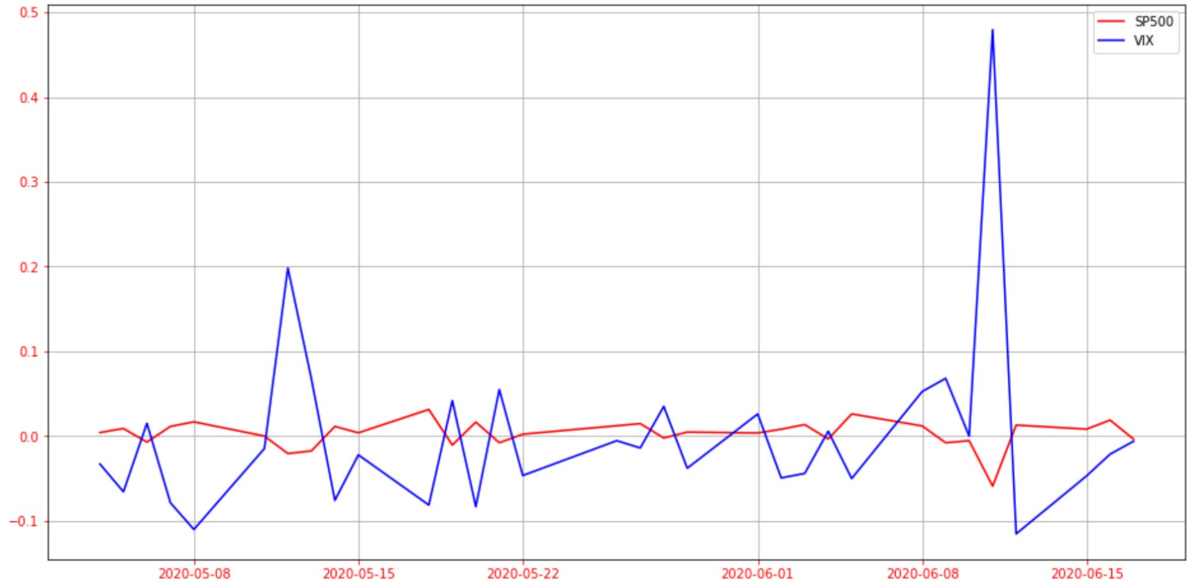
```
# correlation between both
np.corrcoef( vix_df['Adj Close'],  gspc_df['Adj Close'])
```

Out[21]:

```
array([[ 1.        , -0.5281329],
       [-0.5281329,  1.        ]])
```

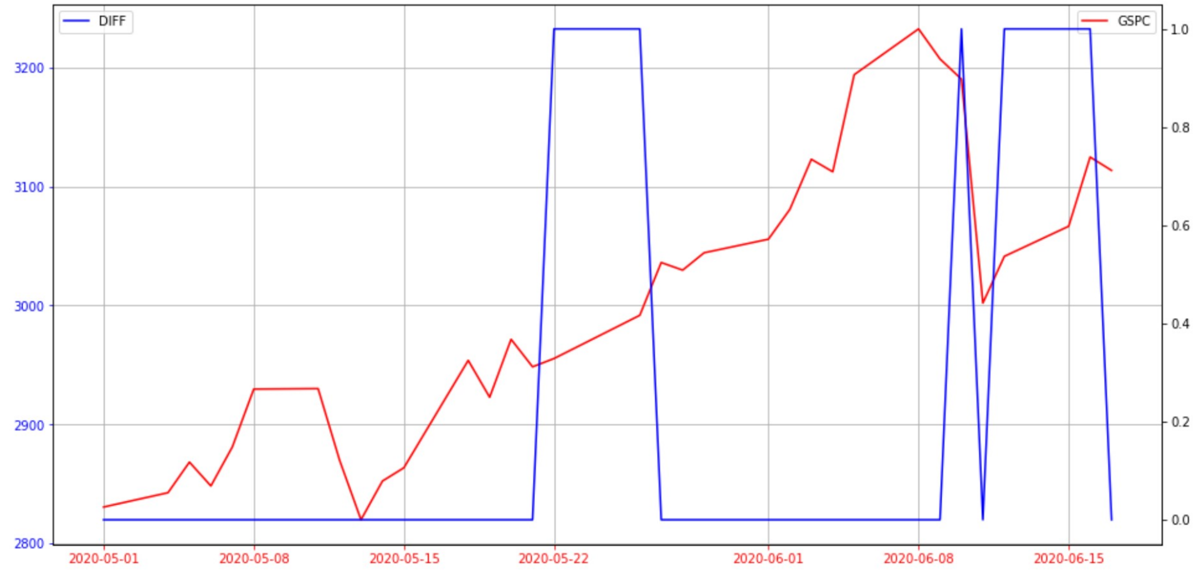
In [22]:

```
# apply percent change to timeseries data
vix_df['PctChange_Close'] = vix_df['Adj Close'].pct_change().rolling(window=1).mean
().values
gspc_df['PctChange_Close'] = gspc_df['Adj Close'].pct_change().rolling(window=1).me
an().values


fig, ax = plt.subplots(figsize=(16, 8))
plt.plot(gspc_df['Date'],gspc_df['PctChange_Close'], '-r', label='SP500')
plt.plot(gspc_df['Date'],vix_df['PctChange_Close'], '-b', label='VIX')
plt.legend()
plt.grid()
ax.tick_params('both', colors='r')
```



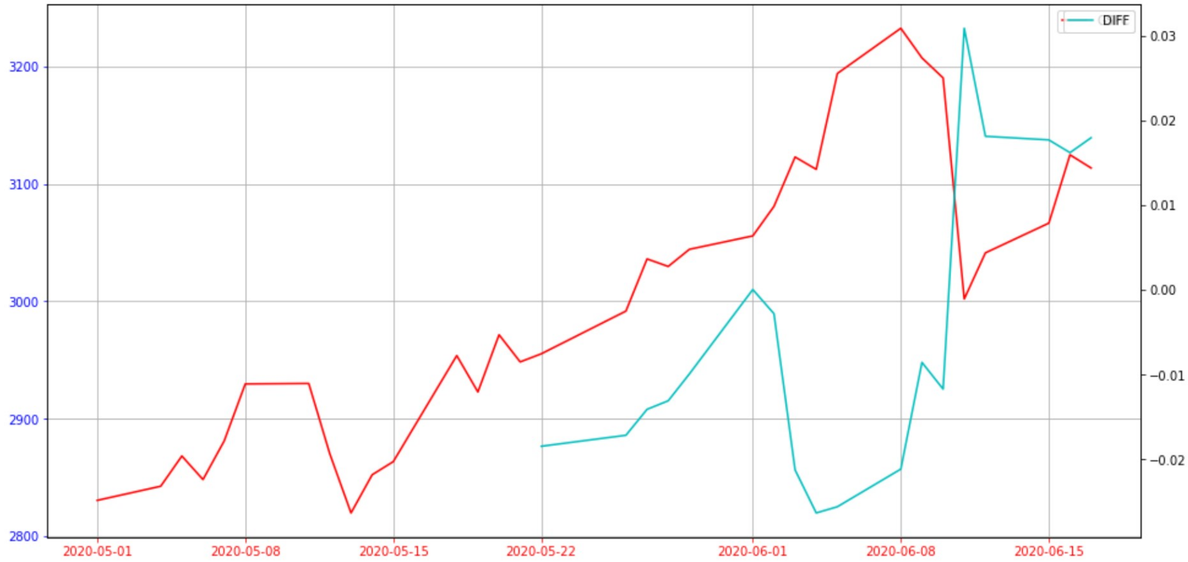
In [23]:

```
# apply percent change to timeseries data
vix_df['PctChange_Close'] = vix_df['Adj Close'].pct_change().rolling(window=10).mean().values
gspc_df['PctChange_Close'] = gspc_df['Adj Close'].pct_change().rolling(window=10).mean().values



gspc_df['together'] = [1 if (v>0 and g>0) else -1 if (v<0 and g<0)  else 0 for v,g in
                       zip(vix_df['PctChange_Close'].values, gspc_df['PctChange_Close'].values)]


fig, ax = plt.subplots(figsize=(16, 8))
plt.plot(gspc_df['Date'],gspc_df['Adj Close'], '-r', label='GSPC')
plt.legend()
plt.grid()
ax.tick_params('x', colors='r')



# Get second axis
ax2 = ax.twinx()
#plt.plot(df['c'], 'b', label='Line c')
plt.plot(gspc_df['Date'],gspc_df['together'], '-b', label='DIFF')

plt.legend()
ax.tick_params('y', colors='b')
```



In [24]:

```
fig, ax = plt.subplots(figsize=(16, 8))
plt.plot(gspc_df['Date'],gspc_df['Adj Close'], '-r', label='GSPC')
plt.legend()
plt.grid()
ax.tick_params('x', colors='r')

vix_df['pct_diff'] = (vix_df['Adj Close'].pct_change().values - gspc_df['Adj Close'].pct_change().values)


# Get second axis
ax2 = ax.twinx()
#plt.plot(df['c'], 'b', label='Line c')
plt.plot(gspc_df['Date'], vix_df['pct_diff'].rolling(window=15).mean().values, 'c', label='DIFF')
plt.legend()
ax.tick_params('y', colors='b')
```



In [1]:

```
#obs:los datos son descargados y de cierre diario apenas, quedaria pendiente alguna forma de actualizar intradiario
# y la automatizacion de este proceso tambien
#substiuir la descarga de datos por alguna conexion a API
```

In [ ]:

In [ ]:

In [ ]:

In [ ]: