How to find and categorize Resistance/Support Levels for Back Testing and Online Trading Efficiently?

In this document you will find a basic and efficient start point for a trading strategy based on resistance/support levels. The complete source code can be found in GitHub in this link. It is an object-oriented code, so you can use each of the classes simply inside your code.

How can find resistance/support levels efficiently?

Assuming radius = 240, a resistance level is a point where its price is higher than that of its 240 neighbors on either side. And a support level is a point where its price is lower than that of its 240 neighbors on either side.

```
def is_level_suppport(back_data, i, radius):
  """ check if a level is SUPPORT level through fractal identification """
  support=True
  for r in range(radius):
    support  = support and back_data.Low.iloc[i] < back_data.Low.iloc[i +r+1]
    support  = support and back_data.Low.iloc[i] < back_data.Low.iloc[i -r-1]
  return support


def is_level_resistance(back_data, i, radius):
  """ check if a level is RESISTANCE level through fractal identification """
  resistance=True
  for r in range(radius):
    resistance  = resistance and back_data.High.iloc[i] > back_data.High.iloc[i +r+1]
    resistance  = resistance and back_data.High.iloc[i] > back_data.High.iloc[i -r-1]
  return resistance
```

However, for each point, 480 back points need to be checked. Assuming you have large amounts of minute data, processing 5 years of data will take a long time. We have a data stream, so by defining two data history window frames, we need to check only 2 back points for each current point, so the processing time is

significantly reduced. The implemented code is:

```
#find the max/min in first Radius
cur_high=cur_data.High
if self.level_window_max<cur_high:
  self.level_window_max=cur_high
  self.level_window_max_counter=0

cur_low=cur_data.Low
if cur_low<self.level_window_min:
  self.level_window_min=cur_low
  self.level_window_min_counter=0

#find next resistance/support level
if i>2*self.radius:#at the start of the program, we must have enough data
  if self.level_window_high[self.radius-1]==self.level_window_max and self.level_window_max_counter==self.radius:
      level=self.level_window_max
      self.level_window_max=0
  if self.level_window_low[self.radius-1]==self.level_window_min and self.level_window_min_counter==self.radius:#
      level=self.level_window_min
      self.level_window_min=10**10#a big number

#shift right and insert new prices
self.level_window_high=self.level_window_high[:-1] #shift right
self.level_window_high.insert(0,cur_high)
self.level_window_low=self.level_window_low[:-1] #shift right
self.level_window_low.insert(0,cur_low)

self.level_window_max_counter+=1
self.level_window_min_counter+=1
```

Save newfound levels

Then we can update our levels arrays: ‘levels’ as sorted levels and ‘levels_shape’ as sequential levels for drawing purpose.

```
#update levels history
if level:#if found new level

  if self.levels_shape.size>0:
    plevel=self.levels_shape[-1,2] #previous level
    positive_signal=level*1.003<plevel<cur_close/1.003<plevel*1.01 #can be used for trading

  # Update data for displaying Support/Resiatance levels
  self.levels_shape = np.append(self.levels_shape, [[cur_data.Time, back_data.Time, level, positive_signal]], axis=0

  # Find new level position in Dataframe levels
  i_level = np.searchsorted(self.levels['level_max'].to_numpy(dtype='float'), level)
  level_distance_min= cur_close*fee_rate
  num_levels=len(self.levels)

  #look back and check if near to previuos level
  if i_level!=0 and level-self.levels.level_min.iloc[i_level-1]<level_distance_min\
  and i_level!=num_levels and level-self.levels.level_min.iloc[i_level-1]<self.levels.level_max.iloc[i_level]-level:
    if self.levels.level_max.iloc[i_level-1]<level:
      self.levels.at[i_level-1,'level_max']=level #change the previous level max

    self.levels.at[i_level-1,'occurrences+=1
    self.levels.at[i_level-1,'last_time']=back_data.Time

  elif i_level!=num_levels and self.levels.level_max.iloc[i_level]-level<level_distance_min: #look forward and check
    if level<self.levels.level_min.iloc[i_level]:
      self.levels.at[i_level,'level_min']=level #change the next level min

    self.levels.at[i_level,'occurrences']+=1
    self.levels.at[i_level,'last_time']=back_data.Time

  else:#new channel of levels
    level_df=pd.DataFrame({'level_max':[level], 'level_min':[level], 'occurrences':1, \
                           'first_time':[back_data.Time], 'last_time':[back_data.Time]  })
    if num_levels:#if levels is not empty
      self.levels=pd.concat([self.levels.loc[:i_level-1], level_df, self.levels.loc[i_level:]], ignore_index=True) #
    else:
      self.levels=level_df

return positive_signal #levels
```

In the code above, you can even check the new found level to see if it's a good time to buy. You can expand it later:

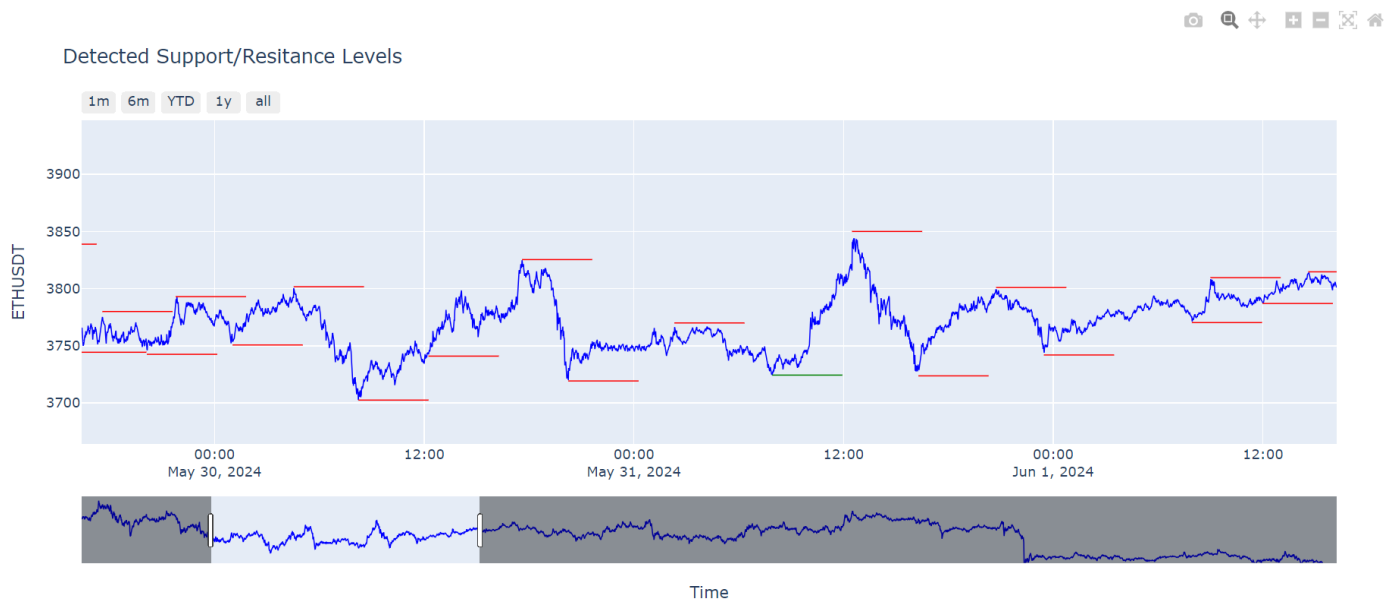
```
if self.levels_shape.size>0:
  plevel=self.levels_shape[-1,2] #previous level
  positive_signal=level*1.003<plevel<cur_close/1.003<plevel*1.01 #can be used for trading
```

Show the results

Then we can draw the levels using plotly module including a range slider:

```python
class Plot():
  """ plot Close/Time + Resitance/Support levels"""
  def __init__(self, time, close , levels, title):
    figure = go.Figure()
    figure.add_trace(go.Scatter(x=list(time), y=list(close), line=dict(color='Blue', width=1 )))#Display Close Prices

    for i in range(1,len(levels)):# Display Resistance/Support Leels
      if levels[i,3]:
        color='Green'
      else:
        color="Red"
      figure.add_shape(type='line', x0=levels[i,1], y0=levels[i,2], x1=levels[i,0], y1=levels[i,2], line=dict(color=color, width=1 ))

    # Set the title text of figure
    figure.update_layout(title_text="Detected Support/Resitance Levels", xaxis_title="Time", yaxis_title=title)

    # Add range slider
    figure.update_layout(
        xaxis=dict(rangeselector=dict(
                buttons=list([dict(count=1, label="1m", step="month", stepmode="backward"),
                              dict(count=6, label="6m", step="month", stepmode="backward"),
                              dict(count=1, label="YTD",step="year",  stepmode="todate"),
                              dict(count=1, label="1y", step="year",  stepmode="backward"),
                              dict(step="all") ])),
                rangeslider=dict(visible=True), type="date"))

    figure.update_layout(yaxis=dict(autorange=True, fixedrange=False))
    figure.show()
```

The result will be:



As you can see, the potential valuable levels for trading are shown in green color.

Naming

Inside this code the following classes have been defined:

- class **FindLevels**() for finding support/resistance levels

- class **BackData**() for loading and preparing back data from a file or directly from Binance exchange

- class **Plot**() for drawing prices and also support/resistance levels.

The following Pandas and Numpy variables have been defined:

- Pandas sorted **levels** in separated channels and Numpy **levels_shape** for drawing purpose:

```
self.levels_shape = np.empty(shape=[0, 4]) #CurrentTime, FindTime, Level
self.levels = pd.DataFrame({'level_max':[],'level_min':[],'occurrences':[],'first_time':[],'last_time':[]})
self.levels=self.levels.astype({'level_max':'float','level_min':'float','occurrences':'int','first_time':'str','last_time':'str'})
```

- pandas **trades** for storing trade results.

```
trades = pd.DataFrame({'buy_price':[],'sell_price':[],'pattern':[],'buy_stime':[],'sell_stime':[],'pL0':[],'pL1':[],'pL2':[],'pL3':[],'pL4'
trades=trades.astype({'buy_price':'float','sell_price':'float','pattern':'str','buy_stime':'str','sell_stime':'str','pL0':'float','pL1':'fl
```

It is usefull for later analysis and tuning the code performance.

Disclaimer: This document is intended for educational purposes only and shall not to be considered as trading tools

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