

# WWS

September 29, 2021

## 1 Welles Wilder's Smoothing Average (WWS)

<https://www.tradingtechnologies.com/xtrader-help/x-study/technical-indicator-definitions/welles-wilders-smoothing-average-wws/>

<http://etfhq.com/blog/2010/08/19/wilders-smoothing/>

```
[1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")

# fix_yahoo_finance is used to fetch data
import fix_yahoo_finance as yf
yf.pdr_override()
```

```
[2]: # input
symbol = 'AAPL'
start = '2018-08-01'
end = '2019-01-01'

# Read data
df = yf.download(symbol, start, end)

# View Columns
df.head()
```

[\*\*\*\*\*100%\*\*\*\*\*] 1 of 1 downloaded

```
[2]:
```

	Open	High	Low	Close	Adj Close	\
Date						
2018-08-01	199.130005	201.759995	197.309998	201.500000	199.243088	
2018-08-02	200.580002	208.380005	200.350006	207.389999	205.067123	
2018-08-03	207.029999	208.740005	205.479996	207.990005	205.660416	
2018-08-06	208.000000	209.250000	207.070007	209.070007	206.728317	
2018-08-07	209.320007	209.500000	206.759995	207.110001	204.790268	

	Volume
Date	
2018-08-01	67935700
2018-08-02	62404000
2018-08-03	33447400
2018-08-06	25425400
2018-08-07	25587400

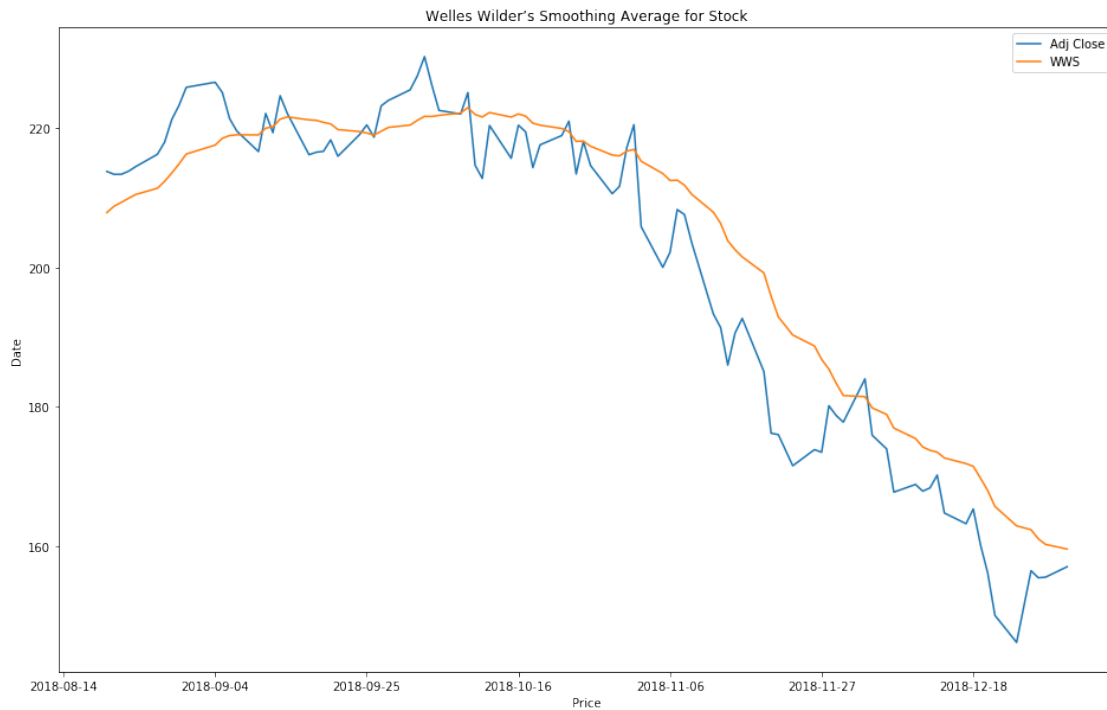
```
[3]: n = 14
df['WSMA'] = (df['Adj Close'].rolling(n).sum())/n
df['WWS'] = (df['Adj Close'].rolling(n).sum()-df['WSMA']+df['Adj Close'])/n
df = df.dropna()
df.head()
```

```
[3]:
```

	Open	High	Low	Close	Adj Close \
Date					
2018-08-20	218.100006	219.179993	215.110001	215.460007	213.793930
2018-08-21	216.800003	217.190002	214.029999	215.039993	213.377167
2018-08-22	214.100006	216.360001	213.839996	215.050003	213.387085
2018-08-23	214.649994	217.050003	214.600006	215.490005	213.823685
2018-08-24	216.600006	216.899994	215.110001	216.160004	214.488495

	Volume	WSMA	WWS
Date			
2018-08-20	30287700	207.445909	207.899339
2018-08-21	26159800	208.455486	208.807034
2018-08-22	19018100	209.049769	209.359577
2018-08-23	18883200	209.632859	209.932204
2018-08-24	18476400	210.187158	210.494396

```
[4]: plt.figure(figsize=(16,10))
plt.plot(df['Adj Close'])
plt.plot(df['WWS'])
plt.title('Welles Wilder's Smoothing Average for Stock')
plt.legend(loc='best')
plt.xlabel('Price')
plt.ylabel('Date')
plt.show()
```



## 1.1 Candlestick with WWS

```
[5]: from matplotlib import dates as mdates
import datetime as dt

df['VolumePositive'] = df['Open'] < df['Adj Close']
df = df.dropna()
df = df.reset_index()
df['Date'] = mdates.date2num(df['Date'].astype(dt.date))
df.head()
```

```
[5]:
```

	Date	Open	High	Low	Close	Adj Close \
0	736926.0	218.100006	219.179993	215.110001	215.460007	213.793930
1	736927.0	216.800003	217.190002	214.029999	215.039993	213.377167
2	736928.0	214.100006	216.360001	213.839996	215.050003	213.387085
3	736929.0	214.649994	217.050003	214.600006	215.490005	213.823685
4	736930.0	216.600006	216.899994	215.110001	216.160004	214.488495

	Volume	WSMA	WWS	VolumePositive
0	30287700	207.445909	207.899339	False
1	26159800	208.455486	208.807034	False
2	19018100	209.049769	209.359577	False
3	18883200	209.632859	209.932204	False

4 18476400 210.187158 210.494396 False

```
[6]: from mpl_finance import candlestick_ohlc

fig = plt.figure(figsize=(16,8))
ax1 = plt.subplot(111)
candlestick_ohlc(ax1,df.values, width=0.5, colorup='g', colordown='r', alpha=1.
    ↪0)
ax1.plot(df.Date, df['WWS'])
ax1.xaxis_date()
ax1.xaxis.set_major_formatter(mdates.DateFormatter('%d-%m-%Y'))
#ax1.axhline(y=dfc['Adj Close'].mean(),color='r')
ax1v = ax1.twinx()
colors = df.VolumePositive.map({True: 'g', False: 'r'})
ax1v.bar(df.Date, df['Volume'], color=colors, alpha=0.4)
ax1v.axes.yaxis.set_ticklabels([])
ax1v.set_ylim(0, 3*df.Volume.max())
ax1.set_title('Stock ' + symbol + ' Closing Price')
ax1.set_ylabel('Price')
ax1.set_xlabel('Date')
ax1.legend(loc='best')
```

[6]: <matplotlib.legend.Legend at 0x229bec4f470>

