Load parquet

In [1]:

```
%matplotlib widget
%matplotlib inline
```

In [2]:

```
import pandas as pd

import matplotlib.pyplot as plt
import pandas_ta as ta
```

In [3]:

```
df = pd.read_parquet("data.parquet")
```

In [4]:

```
df.head()
```

Out[4]:

	instrument_id	ts	open_price	close_price	high_price	low_price	volume
0	1	2018-01-23 21:45:00+00:00	114.02	114.02	114.02	114.02	6.0
1	1	2018-01-23 21:35:00+00:00	114.02	114.02	114.02	114.02	10.0
2	1	2018-01-23 20:55:00+00:00	114.20	114.23	114.26	114.16	76837.0
3	1	2018-01-23 20:50:00+00:00	114.37	114.21	114.39	114.19	34299.0
4	1	2018-01-23 20:45:00+00:00	114.33	114.36	114.41	114.31	27240.0

In [5]:

```
df.groupby("instrument_id").count()
```

Out[5]:

	ts	open_price	close_price	high_price	low_price	volume
instrument_id						
1	85215	85215	85215	85215	85215	85215
2	72120	72120	72120	72120	72120	72120
3	98530	98530	98530	98530	98530	98530
4	119009	119009	119009	119009	119009	119009
5	100777	100777	100777	100777	100777	100777
...	...	...	...	...	...	...
528	1588	1588	1588	1588	1588	1588
530	62633	62633	62633	62633	62633	62633
531	70902	70902	70902	70902	70902	70902
532	10349	10349	10349	10349	10349	10349
533	48080	48080	48080	48080	48080	48080

528 rows × 6 columns

Analyze single stock

Create dataset with sliding averages

In [6]:

```
sliding_window_df = df[df["instrument_id"] == 1]
```

Exclude 1-st hour and last hour

In [7]:

```
sliding_window_df.head()
```

Out[7]:

	instrument_id	ts	open_price	close_price	high_price	low_price	volume
0	1	2018-01-23 21:45:00+00:00	114.02	114.02	114.02	114.02	6.0
1	1	2018-01-23 21:35:00+00:00	114.02	114.02	114.02	114.02	10.0
2	1	2018-01-23 20:55:00+00:00	114.20	114.23	114.26	114.16	76837.0
3	1	2018-01-23 20:50:00+00:00	114.37	114.21	114.39	114.19	34299.0
4	1	2018-01-23 20:45:00+00:00	114.33	114.36	114.41	114.31	27240.0

In [8]:

```
def preprocess_data(df):
    # Sort values with ts
    df = df.sort_values("ts")
    # Reset index
    df = df.reset_index(drop=True)

    # Add MACD
    df.ta.macd(append=True)

    # Add RSI
    df.ta.rsi(append=True)

    # Rename columns
    df = df.rename(columns={
        "MACD_12_26_9": "MACD",
        "MACDs_12_26_9": "MACDs",
        "MACDh_12_26_9": "MACDh",
        "RSI_14": "RSI"})

    # Calc RSI signals
    RSI_oversold_threshold = 30
    RSI_overbouht_threshold = 70

    df["RSI_oversold"] = df["RSI"] <= RSI_oversold_threshold
    df["RSI_overbought"] = df["RSI"] >= RSI_overbouht_threshold

    df["MACD_crossover"] = (df["MACDh"] > 0) & (df["MACDh"].shift() <= 0)
    df["MACD_crossunder"] = (df["MACDh"] <= 0) & (df["MACDh"].shift() > 0)

    return df
```

In [9]:

```
sliding_window_df = preprocess_data(sliding_window_df)
sliding_window_df.head()
```

Out[9]:

	instrument_id	ts	open_price	close_price	high_price	low_price	volume	MACD
0	1	2018-01-23 11:05:00+00:00	114.50	114.50	114.50	114.50	1.0	NaN
1	1	2018-01-23 11:10:00+00:00	114.27	114.27	114.27	114.27	2.0	NaN
2	1	2018-01-23 13:40:00+00:00	114.00	114.00	114.00	114.00	18.0	NaN
3	1	2018-01-23 13:45:00+00:00	114.00	114.00	114.00	114.00	882.0	NaN
4	1	2018-01-23 13:50:00+00:00	113.82	113.82	113.82	113.82	100.0	NaN

Show MACD RSI

In [10]:

```
def color_zone(ax, points, alpha, color):
    start_point = 0
    end_point = 0
    for x in points:
        if start_point == 0:
            start_point = x
            end_point = x + 1
        else:
            if end_point == x:
                # Continue
                end_point += 1
            else:
                # Draw and reset
                ax.axvspan(start_point, end_point, alpha=alpha, color=colo
                start_point = 0
                end_point = 0

    if start_point != 0:
        # Draw and reset
        ax.axvspan(start_point, end_point, alpha=alpha, color=color)
        start_point = 0
        end_point = 0
```

In [11]:

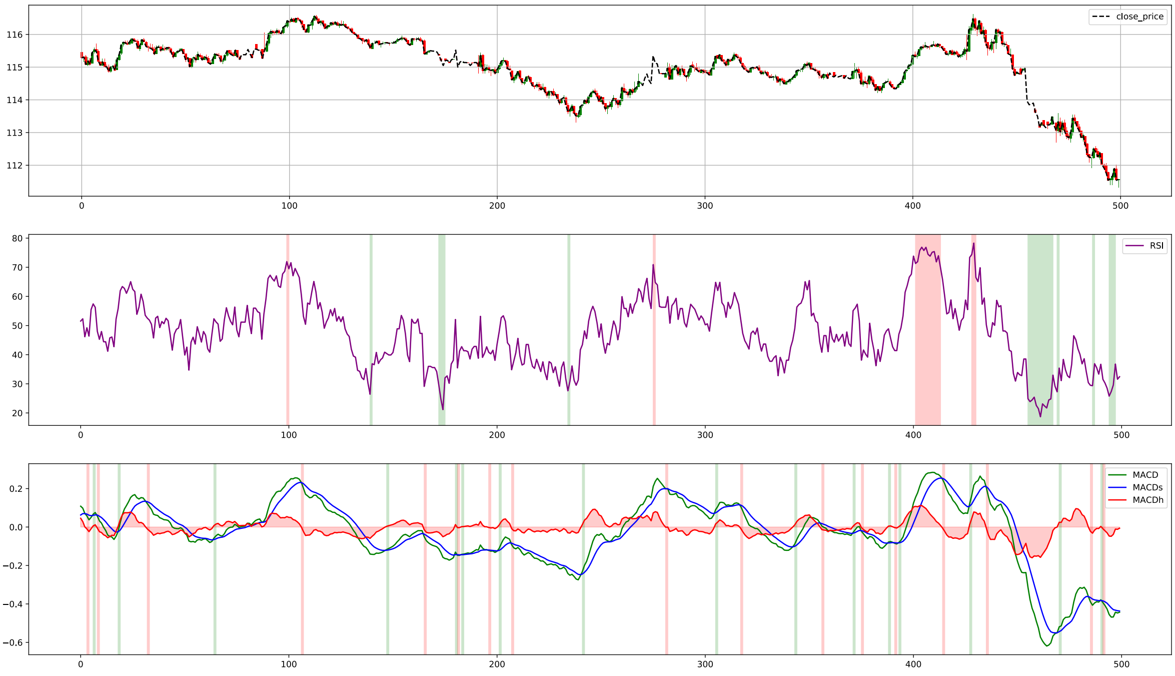
```
def plot_candles(df):
    width=1
    width2=0.2

    pricesup = df[df["close_price"] >= df["open_price"]]
    pricesdown = df[df["close_price"] < df["open_price"]]

    plt.bar(pricesup.index, pricesup["close_price"] - pricesup["open_price
    plt.bar(pricesup.index, pricesup["high_price"] - pricesup["close_price
    plt.bar(pricesup.index, pricesup["low_price"] - pricesup["open_price"]

    plt.bar(pricesdown.index, pricesdown["close_price"] - pricesdown["open_
    plt.bar(pricesdown.index, pricesdown["high_price"] - pricesdown["close_
    plt.bar(pricesdown.index, pricesdown["low_price"] - pricesdown["open_p
    plt.grid()
```

In [12]:

```
plot_df = sliding_window_df.iloc[1000:1500].reset_index()

plt.figure(figsize=(24,14))
plt.subplot(3, 1, 1)
plot_df["close_price"].plot(color="black", linestyle='--')
plot_candles(plot_df)
plt.legend()

plt.subplot(3, 1, 2)
ax1 = plot_df["RSI"].plot(color="purple")
# Show oversold zone
color_zone(ax1, plot_df[plot_df["RSI_oversold"]].index, 0.2, "green")
# Show overbought zone
color_zone(ax1, plot_df[plot_df["RSI_overbought"]].index, 0.2, "red")
plt.legend()

plt.subplot(3, 1, 3)
ax3 = plot_df["MACD"].plot(color="green")
plot_df["MACDs"].plot(ax=ax3,color="blue")
plot_df["MACDh"].plot(ax=ax3,color="red")
ax3.fill_between(plot_df.index, plot_df["MACDh"], alpha=0.2, color="red")
# Show crossover moments
for x in plot_df[plot_df["MACD_crossover"]].index:
    ax3.axvspan(x, x+1, alpha=0.2, color="green")
# Show crossunder moments
for x in plot_df[plot_df["MACD_crossunder"]].index:
    ax3.axvspan(x, x+1, alpha=0.2, color="red")
plt.legend()
```

Out[12]:

```
<matplotlib.legend.Legend at 0x7f9607141290>
```



Create manual bot

In [14]:

```
# Create dataset for bot
# Preprocess data
bot_df = preprocess_data(df[df["instrument_id"] == 1])
# Select columns
bot_df = bot_df[["ts","open_price","close_price","high_price","low_price",
bot_df.head()
```

Out[14]:

	ts	open_price	close_price	high_price	low_price	volume	MACD	RSI
0	2018-01-23 11:05:00+00:00	114.50	114.50	114.50	114.50	1.0	NaN	NaN
1	2018-01-23 11:10:00+00:00	114.27	114.27	114.27	114.27	2.0	NaN	0.0
2	2018-01-23 13:40:00+00:00	114.00	114.00	114.00	114.00	18.0	NaN	0.0
3	2018-01-23 13:45:00+00:00	114.00	114.00	114.00	114.00	882.0	NaN	0.0
4	2018-01-23 13:50:00+00:00	113.82	113.82	113.82	113.82	100.0	NaN	0.0

In [15]:

```
from bot import TradingBot

# Test bot
bot = TradingBot(stop_loss=0.02)

bot.reset()

for index, data in bot_df.iterrows():
    bot.process(data)

bot.profit * 100
```

Out[15]:

```
51.30353431414033
```

Test bot on different stocks

In [16]:

```
def test_bot_profit(df):
    # Preprocess data
    bot_df = preprocess_data(df)
    # Select columns
    bot_df = bot_df[["ts","open_price","close_price","high_price","low_pri

    # Create bot instance
    bot = TradingBot(stop_loss=0.02)
    # Reset bot
    bot.reset()
    # Run bot
    for index, data in bot_df.iterrows():
        bot.process(data)

    return bot.profit * 100
```

In [30]:

```
instruments_df = pd.read_parquet("instruments.parquet")
instruments_df.head()
```

Out[30]:

	name	id	figi
0	JPMorgan	1	BBG000DMBXR2
1	Berkshire Hathaway	2	BBG000DWG505
2	Bank of America Corp	3	BBG000BCTLF6
3	Apple	4	BBG000B9XRY4
4	AT&T	5	BBG000BSJK37

In [18]:

```
from joblib import Parallel, delayed, parallel_backend

jobs = []

def thread_func(stock_id, stock_df):
    # Check size of dataset
    if stock_df.shape[0] > 8 * 60:
        profit = test_bot_profit(stock_df)

        return {"id":stock_id,"profit":profit}

    return {}

with parallel_backend("multiprocessing", n_jobs=8):
    bot_profit_list = Parallel()(delayed(thread_func)(stock_id, stock_df)

bot_profit_df = pd.DataFrame(bot_profit_list).dropna()

bot_profit_df = pd.merge(instruments_df,bot_profit_df,on="id")

bot_profit_df
```

Out[18]:

	id	profit
0	1.0	50.903077
1	2.0	50.165367
2	3.0	80.754314
3	4.0	167.040125
4	5.0	113.396528
...	...	...
523	528.0	-5.194677
524	530.0	96.442342
525	531.0	217.014007
526	532.0	6.773616
527	533.0	72.921443

524 rows × 2 columns

In [34]:

```
bot_profit_df.sort_values("profit")
```

Out[34]:

	name	id	figi	profit
361	LG Display	363	BBG000FJ0RK9	-289.663648
197	Korea Electric Power	199	BBG000BCWG90	-256.947931
278	China Southern Airlines	280	BBG000BXQ7R1	-250.773432
266	China Southern Airlines	268	BBG000BXQ7R1	-237.478502
20	PetroChina	21	BBG000BR85F1	-151.909904
...	...	...	...	...
215	Royal Caribbean Cruises	217	BBG000BB5792	353.526732
102	Micron Technology	103	BBG000C5Z1S3	361.396604
316	Micron Technology	318	BBG000C5Z1S3	364.080361
155	Carnival	157	BBG000BF6LY3	387.398335
299	PG&E	301	BBG000BQWPC5	466.946417

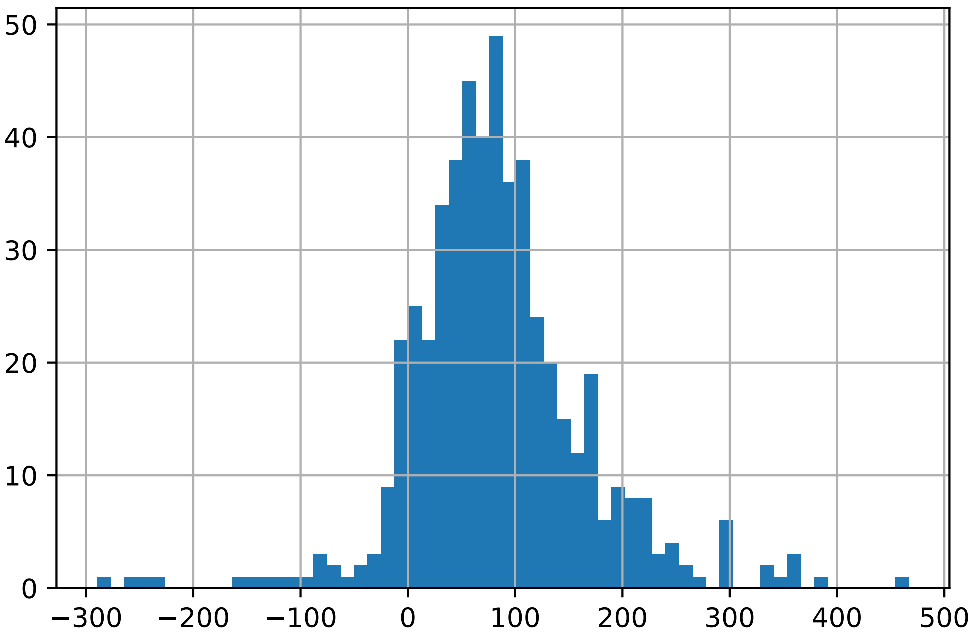
524 rows × 4 columns

In [28]:

```
bot_profit_df["profit"].hist(bins=60)
```

Out[28]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f94a053b750>
```


50
40
30
20
10
0
−300
−200
−100
0
100
200
300
400
500