data for 1y swaps

In [217…
```
data=pd.read_excel("1 yr Swap-Swaption Implied Vols.xlsx")
data.set_index('Date', inplace=True)
data=data.reindex(index=data.index[::-1])
data=data.fillna(method="ffill")

data
```

Out[217]:

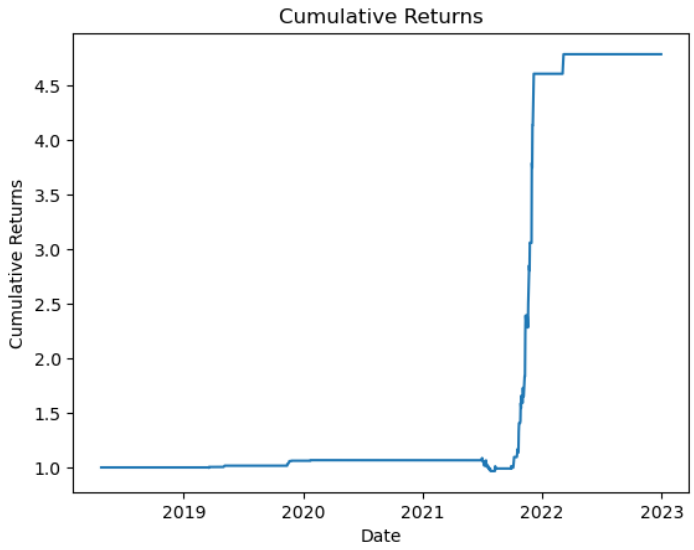
Date	1m Implied Vol	3m Implied Vol	1 yr Swap rate
2018-04-23	0.144928	0.169911	2.0960
2018-04-24	0.140990	0.164891	2.0938
2018-04-25	0.141131	0.166400	2.1031
2018-04-26	0.130362	0.159992	2.1070
2018-04-27	0.124474	0.150861	2.1054
...	...	...	...
2022-12-23	0.203641	0.229629	4.8410
2022-12-27	0.211042	0.230953	4.8901
2022-12-28	0.208031	0.232956	4.8695
2022-12-29	0.209882	0.227612	4.8741
2022-12-30	0.208813	0.233495	4.9060

1208 rows × 3 columns

using moving average 1yr

In [218…
```
#1m 1y
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED

#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["1 yr Swap rate"]

# drop rows with missing data

# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["1m Implied Vol"]


# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0

# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_1m_1y = signals * log_returns
```

```
# fill NaN values in daily returns with 0

# compute cumulative returns of trading strategy
cum_returns_1m_1y = np.exp(daily_returns_1m_1y.cumsum())

# plot cumulative returns of trading strategy
plt.plot(cum_returns_1m_1y)
plt.title('Cumulative Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')
plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_1m_1y.iloc[-1])
```



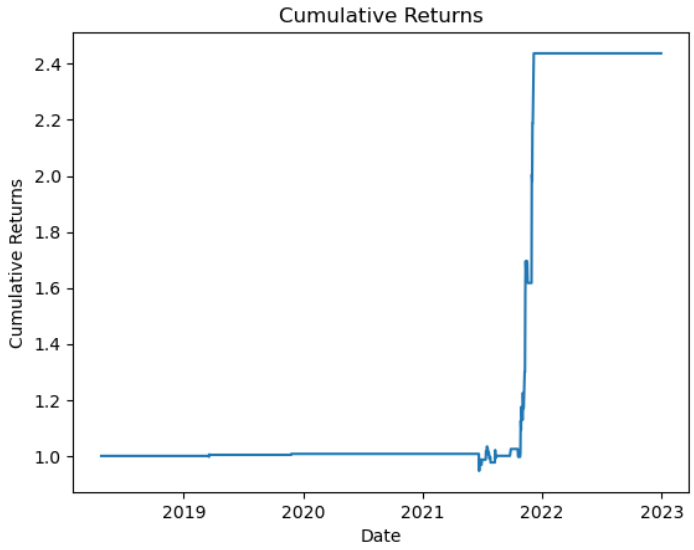

```
Final Cumulative Return: 4.7902168843484665
```

In [ ]:

In [219…
```
daily_returns_3m_1y.to_excel("test.xlsx")
```

In [220…
```
#3m1y

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED

#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["1 yr Swap rate"]

# drop rows with missing data

# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["3m Implied Vol"]


# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0

# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
```

```
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_3m_1y = signals * log_returns

# fill NaN values in daily returns with 0

# compute cumulative returns of trading strategy
cum_returns_3m_1y = np.exp(daily_returns_3m_1y.cumsum())

#plot cumulative returns of trading strategy
plt.plot(cum_returns_3m_1y)
plt.title('Cumulative Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')
plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_3m_1y.iloc[-1])
```




```
Final Cumulative Return: 2.4375899623032558
```

In [221…
```
daily_returns_3m_1y.to_excel("test.xlsx")
```

2yr swap

In [222…
```
data=pd.read_excel("2 year Implied Vols.xlsx")
data.set_index('Date', inplace=True)

data=data.ffill(axis = 1)
data=data.reindex(index=data.index[::-1])

#data["2yr Swap"]
#data["1m Implied Vol"]
data=data.dropna()
data
```

Out[222]:

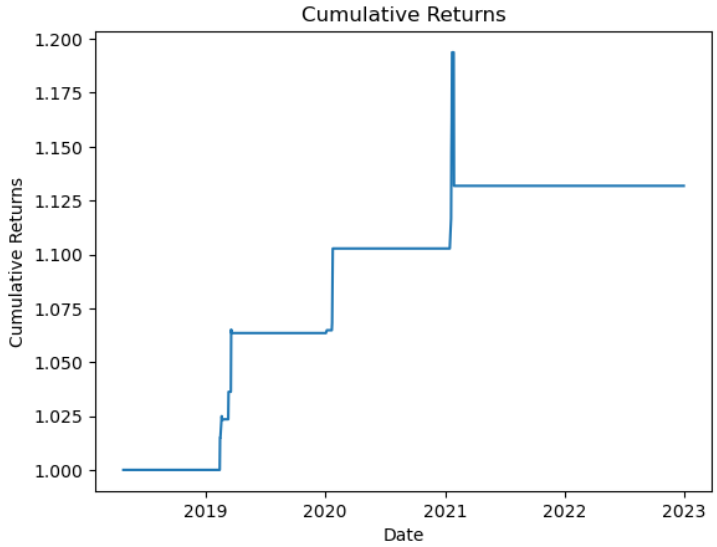
Date	1m Implied Vol	3m Implied Vol	2 Year Swap Rates
2018-04-24	0.340398	0.381207	2.3366
2018-04-25	0.334828	0.385543	2.3411
2018-04-26	0.313995	0.370068	2.3383
2018-04-27	0.294942	0.364437	2.3380
2018-04-30	0.294993	0.343473	2.3440
...	...	...	...
2022-12-23	0.510203	0.591321	4.3561
2022-12-27	0.556761	0.598744	4.4103
2022-12-28	0.534786	0.601169	4.4145
2022-12-29	0.535681	0.596111	4.4075
2022-12-30	0.536232	0.599912	4.4500

1078 rows × 3 columns

Using the moving average 2yr

In [223…

```
#1m2y
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED

#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["2 Year Swap Rates"]

# drop rows with missing data

# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["1m Implied Vol"]

# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0

# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_1m_2y = signals * log_returns

# fill NaN values in daily returns with 0

# compute cumulative returns of trading strategy
cum_returns_1m_2y = np.exp(daily_returns_1m_2y.cumsum())

# plot cumulative returns of trading strategy
plt.plot(cum_returns_1m_2y)
plt.title('Cumulative Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')
plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_1m_2y.iloc[-1])
```

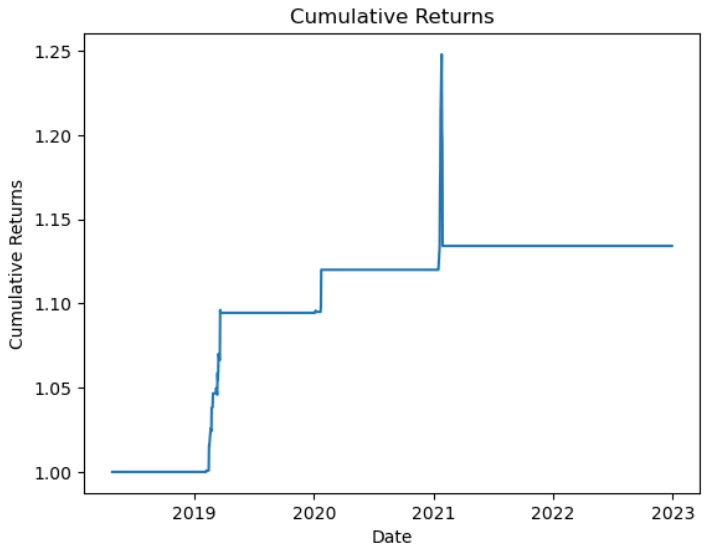



```
Final Cumulative Return: 1.13179464904834
```

In [224…

```python
#3m2y
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED
start_date = datetime(2018, 4, 23)
end_date = datetime(2022, 12, 30)
#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["2 Year Swap Rates"]

# drop rows with missing data
par_swap_rates.dropna(inplace=True)

# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["3m Implied Vol"]


# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0
volatilities.fillna(0, inplace=True)

# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_3m_2y = signals * log_returns

# fill NaN values in daily returns with 0
daily_returns_3m_2y.fillna(0, inplace=True)

# compute cumulative returns of trading strategy
cum_returns_3m_2y = np.exp(daily_returns_3m_2y.cumsum())

# plot cumulative returns of trading strategy
plt.plot(cum_returns_3m_2y)
plt.title('Cumulative Returns')
```

```
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')
plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_3m_2y.iloc[-1])
```




```
Final Cumulative Return: 1.1341310654309862
```

5yr swap

In [239…
```
data=pd.read_excel("5 year Implied Vols.xlsx")
print(data)
data.set_index('Date', inplace=True)

data=data.fillna(method='ffill')
data=data.reindex(index=data.index[::-1])

#data["2yr Swap"]
#data["1m Implied Vol"]
```

```
           Date  1m Implied Vol  3m Implied Vol  5 Year Swap Rates
0    2022-12-30        1.571649        1.714200             3.7420
1    2022-12-29        1.589110        1.713599             3.7013
2    2022-12-28        1.578554        1.702463             3.7295
3    2022-12-27        1.659759        1.709536             3.6891
4    2022-12-23        1.529695        1.692305             3.6290
...         ...             ...             ...                ...
1174 2018-04-26        1.020927        1.056979             2.5250
1175 2018-04-25        1.070361        1.102958             2.5390
1176 2018-04-24        1.033601        1.073848             2.5640
1177 2018-04-23        1.040448        1.073650             2.5450
1178        NaT             NaN             NaN             2.5380

[1179 rows x 4 columns]
```

In [240…
```
print(data)
```

```
            1m Implied Vol  3m Implied Vol  5 Year Swap Rates
Date
NaT               1.040448        1.073650             2.5380
2018-04-23        1.040448        1.073650             2.5450
2018-04-24        1.033601        1.073848             2.5640
2018-04-25        1.070361        1.102958             2.5390
2018-04-26        1.020927        1.056979             2.5250
...                    ...             ...                ...
2022-12-23        1.529695        1.692305             3.6290
2022-12-27        1.659759        1.709536             3.6891
2022-12-28        1.578554        1.702463             3.7295
2022-12-29        1.589110        1.713599             3.7013
2022-12-30        1.571649        1.714200             3.7420

[1179 rows x 3 columns]
```

In [241…
```
data.to_excel("test.xlsx")
```

Moving average 5yr

In [242…
```
#1m5y
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED
```

```
start_date = datetime(2018, 4, 23)
end_date = datetime(2022, 12, 30)
#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["5 Year Swap Rates"]

# drop rows with missing data

# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["1m Implied Vol"]

# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0
#volatilities.fillna(method='ffill', inplace=True)

# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_1m_5y = signals * log_returns

# fill NaN values in daily returns with 0
daily_returns_1m_5y.fillna(method='ffill', inplace=True)

# compute cumulative returns of trading strategy
cum_returns_1m_5y = np.exp(daily_returns_1m_5y.cumsum())

# plot cumulative returns of trading strategy
#plt.plot(cum_returns_1m_5y)
#plt.title('Cumulative Returns')
#plt.xlabel('Date')
#plt.ylabel('Cumulative Returns')
#plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_1m_5y.iloc[-1])
```

```
Final Cumulative Return: 1.1483946488953982
```

In [243…
```
cum_returns_1m_5y
```

Out[243]:
```
Date
NaT                NaN
2018-04-23    1.000000
2018-04-24    1.000000
2018-04-25    1.000000
2018-04-26    1.000000
                ...
2022-12-23    1.148395
2022-12-27    1.148395
2022-12-28    1.148395
2022-12-29    1.148395
2022-12-30    1.148395
Name: 5 Year Swap Rates, Length: 1179, dtype: float64
```

In [244…
```
#3m5y
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import datetime
import pandas_datareader.data as web

# extract 5-year par swap rates from FRED
start_date = datetime(2018, 4, 23)
end_date = datetime(2022, 12, 30)
#par_swap_rates = web.DataReader(['DGS30'], 'fred', start_date, end_date)
par_swap_rates=data["5 Year Swap Rates"]

# drop rows with missing data
#par_swap_rates.dropna(inplace=True)
```

```
# compute daily log returns of par swap rates
log_returns = np.log(par_swap_rates) - np.log(par_swap_rates.shift(1))

# compute annualized volatilities of log returns
#volatilities = log_returns.rolling(window=252).std() * np.sqrt(252)
volatilities = data["3m Implied Vol"]

# compute 50-day and 200-day moving averages
ma_50 = par_swap_rates.rolling(window=50).mean()
ma_200 = par_swap_rates.rolling(window=200).mean()

# compute 50-day and 200-day moving average volatilities
ma_vol_50 = volatilities.rolling(window=50).mean()
ma_vol_200 = volatilities.rolling(window=200).mean()

# fill NaN values in volatilities with 0


# define trading signals based on volatilities, moving averages, and stop loss
signals = np.where((par_swap_rates > ma_50) &
                   (ma_50 > ma_200) &
                   (volatilities > ma_vol_50) &
                   (volatilities > ma_vol_200) &
                   (par_swap_rates.shift(1) > ma_50.shift(1)) &
                   (par_swap_rates.shift(1) > ma_200.shift(1)) &
                   (volatilities.shift(1) > ma_vol_50.shift(1)) &
                   (volatilities.shift(1) > ma_vol_200.shift(1)) &
                   (par_swap_rates - par_swap_rates.shift(1) > -0.01), 1,
                   np.where((par_swap_rates < ma_50) &
                            (ma_50 < ma_200) &
                            (volatilities < ma_vol_50) &
                            (volatilities < ma_vol_200) &
                            (par_swap_rates.shift(1) < ma_50.shift(1)) &
                            (par_swap_rates.shift(1) < ma_200.shift(1)) &
                            (volatilities.shift(1) < ma_vol_50.shift(1)) &
                            (volatilities.shift(1) < ma_vol_200.shift(1)) &
                            (par_swap_rates - par_swap_rates.shift(1) < 0.01), -1, 0))

# compute daily returns of trading strategy
daily_returns_3m_5y = signals * log_returns

# fill NaN values in daily returns with 0
#daily_returns_3m_5y.fillna(0, inplace=True)

# compute cumulative returns of trading strategy
cum_returns_3m_5y = np.exp(daily_returns_3m_5y.cumsum())

# plot cumulative returns of trading strategy
#plt.plot(cum_returns_3m_5y)
#plt.title('Cumulative Returns')
#plt.xlabel('Date')
#plt.ylabel('Cumulative Returns')
#plt.show()

# print final cumulative return
print('Final Cumulative Return:', cum_returns_3m_5y.iloc[-1])
```

```
Final Cumulative Return: 1.1167697546124298
```

In [ ]:

In [231…
```
cum_returns_3m_5y
```

Out[231]:
```
Date
2022-12-30         NaN
2022-12-29    1.000000
2022-12-28    1.000000
2022-12-27    1.000000
2022-12-23    1.000000
                ...
2018-04-26    1.184250
2018-04-25    1.184250
2018-04-24    1.184250
2018-04-23    1.184250
NaT           1.187516
Name: 5 Year Swap Rates, Length: 1179, dtype: float64
```

In [232…
```
daily_ret= pd.DataFrame()
daily_ret['1m1y']= daily_returns_1m_1y
daily_ret['3m1y']= daily_returns_3m_1y
daily_ret['1m2y']= daily_returns_1m_2y
daily_ret['3m2y']= daily_returns_3m_2y
daily_ret['1m5y']= daily_returns_1m_5y
daily_ret['3m5y']= daily_returns_3m_5y
```

In [233…
```
daily_ret.fillna(method="ffill",inplace=True)
```

In [234…
```
daily_ret.to_csv("test.csv")
```

In [ ]:
```
cum_ret= pd.DataFrame()
cum_ret['1m1y']= cum_returns_1m_1y
cum_ret['3m1y']= cum_returns_3m_1y
cum_ret['1m2y']= cum_returns_1m_2y
cum_ret['3m2y']= cum_returns_3m_2y
cum_ret['1m5y']= cum_returns_1m_5y
cum_ret['3m5y']= cum_returns_3m_5y
```

In [ ]:
```
cum_ret
```

Out[ ]:

Date	1m1y	3m1y	1m2y	3m2y	1m5y	3m5y
2023-04-19	1.000000	1.000000	NaN	NaN	NaN	NaN
2023-04-18	1.000000	1.000000	NaN	NaN	NaN	NaN
2023-04-17	1.000000	1.000000	NaN	NaN	NaN	NaN
2023-04-14	1.000000	1.000000	NaN	NaN	NaN	NaN
2023-04-13	1.000000	1.000000	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...
2018-04-27	1.883829	1.692239	1.0	1.0	4.008678	1.18425
2018-04-26	1.882398	1.692239	1.0	1.0	4.008678	1.18425
2018-04-25	1.882398	1.692239	1.0	1.0	4.008678	1.18425
2018-04-24	1.882398	1.692239	1.0	1.0	4.008678	1.18425
2018-04-23	1.882398	1.692239	NaN	NaN	4.008678	1.18425

1278 rows × 6 columns

In [ ]:
```
import pandas as pd
```

In [ ]:
```

```

In [ ]:
```
daily_ret= pd.DataFrame()
daily_ret['1m1y']= daily_returns_1m_1y
daily_ret['3m1y']= daily_returns_3m_1y
daily_ret['1m2y']= daily_returns_1m_2y
daily_ret['3m2y']= daily_returns_3m_2y
daily_ret['1m5y']= daily_returns_1m_5y
daily_ret['3m5y']= daily_returns_3m_5y
daily_ret.head(20)
```

Out[ ]:

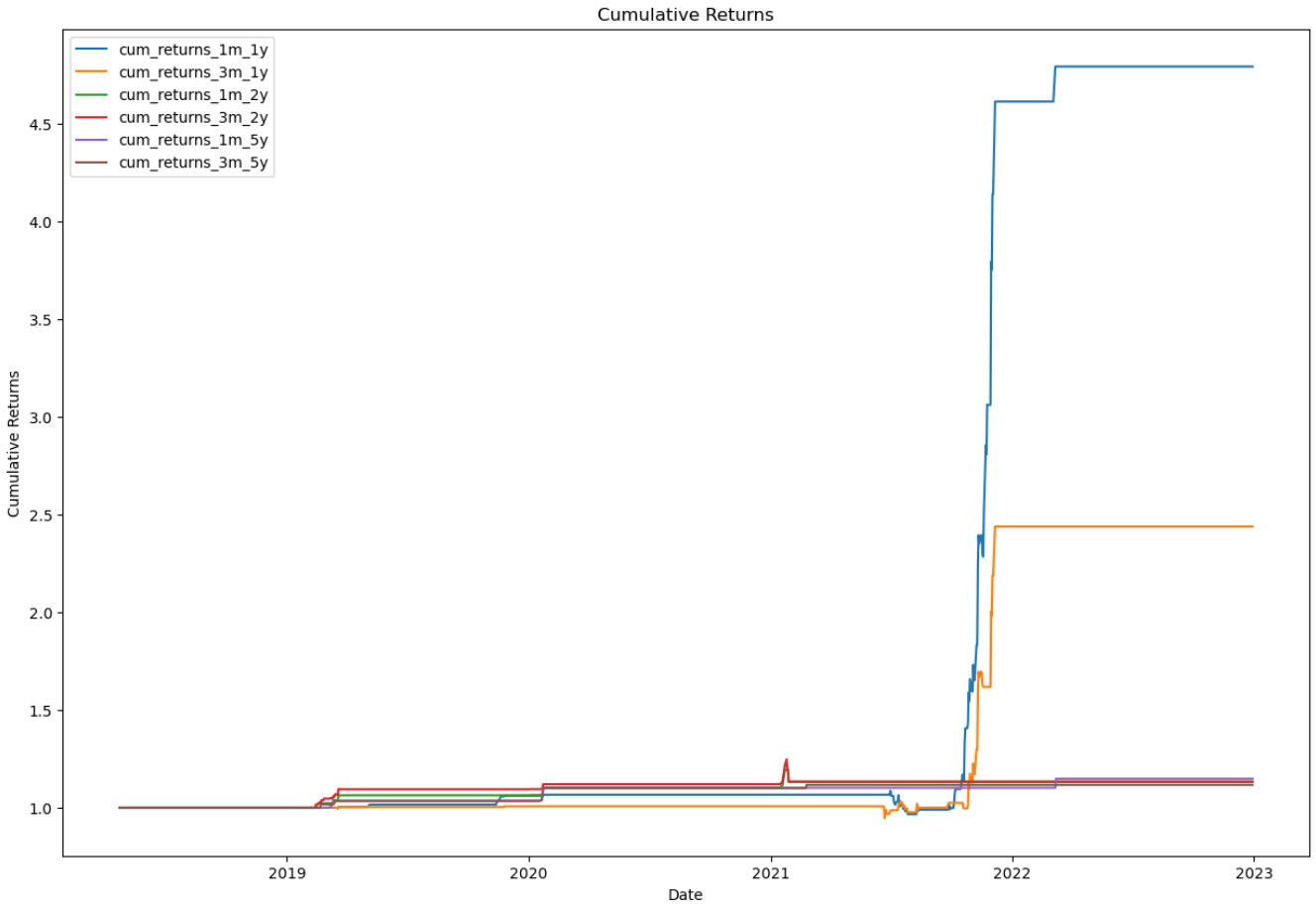
Date	1m1y	3m1y	1m2y	3m2y	1m5y	3m5y
2023-04-19	0.0	0.0	NaN	NaN	NaN	NaN
2023-04-18	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-17	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-14	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-13	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-12	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-11	0.0	0.0	NaN	NaN	NaN	NaN
2023-04-10	0.0	0.0	NaN	NaN	NaN	NaN
2023-04-07	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-06	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-05	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-04-04	0.0	0.0	NaN	NaN	NaN	NaN
2023-04-03	0.0	0.0	NaN	NaN	NaN	NaN
2023-03-31	0.0	0.0	NaN	NaN	NaN	NaN
2023-03-30	0.0	0.0	NaN	NaN	NaN	NaN
2023-03-29	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-03-28	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-03-27	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-03-24	-0.0	-0.0	NaN	NaN	NaN	NaN
2023-03-23	0.0	0.0	NaN	NaN	NaN	NaN

In [ ]:
```
daily_ret.to_excel("daily_return.xlsx")
```

In [ ]:
```

```

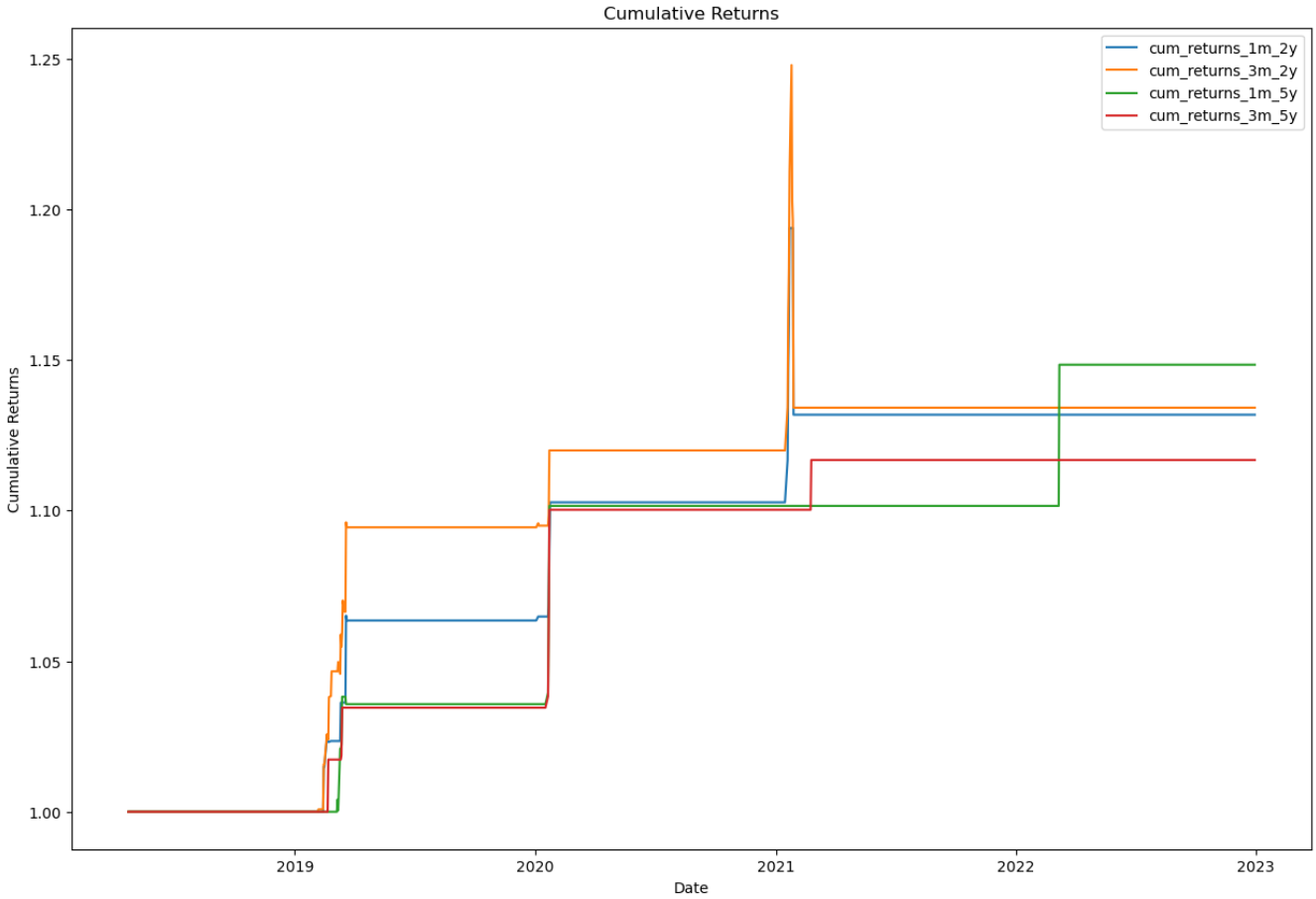
In [246…
```
plt.figure(figsize=(15, 10))
plt.plot(cum_returns_1m_1y)
plt.plot(cum_returns_3m_1y)
plt.plot(cum_returns_1m_2y)
```

```
plt.plot(cum_returns_3m_2y)
plt.plot(cum_returns_1m_5y)
plt.plot(cum_returns_3m_5y)
plt.title('Cumulative Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')

plt.legend(['cum_returns_1m_1y','cum_returns_3m_1y','cum_returns_1m_2y','cum_returns_3m_2y','cum_returns_1m_5y','cum_returns_3m_5y'])
plt.show()
```



In [247…

```
plt.figure(figsize=(15, 10))

plt.plot(cum_returns_1m_2y)
plt.plot(cum_returns_3m_2y)
plt.plot(cum_returns_1m_5y)
plt.plot(cum_returns_3m_5y)
plt.title('Cumulative Returns')
plt.xlabel('Date')
plt.ylabel('Cumulative Returns')

plt.legend(['cum_returns_1m_2y','cum_returns_3m_2y','cum_returns_1m_5y','cum_returns_3m_5y'])
plt.show()
```


Cumulative Returns
cum_returns_1m_2y
cum_returns_3m_2y
cum_returns_1m_5y
cum_returns_3m_5y
1.25
1.20
1.15
1.10
1.05
1.00
Cumulative Returns
2019
2020
2021
2022
2023
Date