Universität St.Gallen
Universität St. Gallen – Hochschule für Wirtschafts-, Rechts- und Sozialwissenschaften (HSG)

SMI Stock Analysis

Skills: Programming with Advanced Computer Languages at University of St. Gallen

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Python

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Task and outline of the program

This program lets users choose a Swiss Market Index (SMI) company to analyze the performance over an ex post time period of choice and illustrate it in two plots and a table consisting of stocks from Yahoo Finance. The SMI stock is made up of 20 of the largest and most liquid Swiss Performance Index (SPI) large- and mid-cap stocks. Investors use it as the benchmark of the overall market, to which all other investments are compared. Generally speaking, the SMI companies are attractive for investors as they are comparatively safe.

First, users can select, what stock they want to be visualized in a plot. The plot shows the 20 days rolling mean, the 200 days rolling mean and the adjusted closing price over time. Rolling means (short and long term) are used in technical analysis as an indicator that helps to smooth the price action by filtering the «noise» from random short-term price fluctuations. The adjusted closing price amends the closing price of a share to accurately reflect the value of the share after taking into account capital measures. It is considered the true price of that share.
After seeing the first plot, users have the option to change the selected SMI company or go on to see further information.
Secondly, further information such as a day's open, high and low stock price, the volume and the adjusted close over a chosen amount of days ending today is illustrated in a table. This information help investors to see increasing or decreasing dynamics. If the opening and closing are far apart, it shows strong dynamics, and if the opening and closing are close together, it shows indecision or weak dynamics. The high and low show the entire price range of the period, which is helpful in assessing volatility.
Finally, a chart showing the company in perspective of risk and expected return is shown to users to help them making a well-founded buying decision.

Code

```
#before starting the code we entered the following:
#pip install matplotlib
#pip install --user --upgrade matplotlib
#pip install pandas
#pip install pandas-datareader
#pip install numpy
#pip install datetime
from pandas_datareader import data
from pandas_datareader._utils import RemoteDataError
#for graphs
import matplotlib.pyplot as plt
from matplotlib import style
import pandas as pd
import pandas_datareader.data as web
import numpy as np
from datetime import datetime as dt
from IPython.display import display


#first, we define the functions needed

#we will devide the code in four functions

#This definition get the statistics and returns a dictionary of the
selected data
def get_stats(stock_data):
    return {
        'last': np.mean(stock_data.tail(1)),
        'short_mean': np.mean(stock_data.tail(20)),
        'long_mean': np.mean(stock_data.tail(200)),
        'short_rolling': stock_data.rolling(window=20).mean(),
        'long_rolling': stock_data.rolling(window=200).mean()
    }

#This definition cleans all the data that are not numbers in certain
columns
def clean_data(stock_data, col):
    #We use pandas to get a daterange (only weekdays)
    weekdays = pd.date_range(start=START_DATE, end=END_DATE)
    #cleans the data
    clean_data = stock_data[col].reindex(weekdays)
```

```
    #Propagates last valid observation forward, is used to fill the
missing values in the dataframe
    return clean_data.fillna(method='ffill')

#This definition creates a plot
def create_plot(stock_data, ticker):
    stats = get_stats(stock_data)
    plt.subplots(figsize=(12,8))
    plt.plot(stock_data, label=ticker)
    plt.plot(stats['short_rolling'], label='20 day rolling mean')
    plt.plot(stats['long_rolling'], label='200 day rolling mean')
    #Following lables are added to the plot to vizualize the meaning of
each line
    plt.xlabel('Date')
    plt.ylabel('Adj Close price')
    plt.legend()
    plt.title('Stock Price over Time')
    plt.show()
    #nicer style
    style.use('ggplot')

#This definition gathers all the data of the selected SMI ticker,
starting from the entered start date and ending today
def get_data(ticker):
    try:
        #We get back the open, the close, the high and the low, the
volume and the adjusted close from the selected stock
        stock_data = data.DataReader(ticker,
                                     'yahoo',
                                     START_DATE,
                                     END_DATE)
        #here, the date is cleaned using the clean_data definition
        adj_close = clean_data(stock_data, 'Adj Close')
        #here, the plot is created using the create_plot definition
        create_plot(adj_close, ticker)


#expection if no data was found
    except RemoteDataError:
        print('No data found for {t}'.format(t=ticker))


# Additionally, this definition will show the high, low, open, close,
volume and adjusted close for a second selected SMI stock
def STOCK_INFOS():
```

```
    try:
        df = web.DataReader(response2, 'yahoo', START_DATE, END_DATE)
        pd.set_option('display.max_columns', 6)
        pd.set_option('display.max_rows', None)
        display(df.tail(n_columns))

    except RemoteDataError:
        print('No data found.')


#This definition will show the expected return and the risk
def BUY_SELL():
    try:
        plt.scatter(retscomp.mean(), retscomp.std())
        plt.xlabel('Expected returns')
        plt.ylabel('Risk')
        for label, x, y in zip(retscomp.columns, retscomp.mean(),
retscomp.std()):
            plt.annotate(
                label,
                xy = (x, y), xytext = (20, -20),
                textcoords = 'offset points', ha = 'right', va =
'bottom',
                bbox = dict(boxstyle = 'round,pad=0.5', fc = 'yellow',
alpha = 0.5),
                arrowprops = dict(arrowstyle = '->', connectionstyle =
'arc3,rad=0'))
        plt.show()


    except RemoteDataError:
        print('No data found.')


#step 1: onboarding

print("This program lets you choose a SMI stock from Yahoo Finance to
evaluate the performance over a chosen time period. \nFirst, we will
show a plot that illustrates the 20 days rolling mean, the 200 days
rolling mean and the stock price. \nSecond, a table will show
additional information about a selected SMI stock for the chosen
period. \nEventually, a chart showing the risk and expected returns
will be illustrated.")
```

```
#The end date of the stock analyisis is always today
END_DATE = str(dt.now().strftime('%Y-%m-%d'))

#Here, the "big" loop starts - in the end, the user can choose if he
wants to restart the program. If he chooses 'yes', it will start again
from here
run_again = ("yes")
while run_again == ("yes"):

    while True:
            #here, we let the user pick a date where the stock
analyisis should start
        START_DATE = str(input('What start date do you want? Please
enter a date in the past in the following format YYYY-MM-DD: '))

        try:
            #here, we perform a check if the date was entered in the
correct format
            dt.strptime(START_DATE, '%Y-%m-%d')
            print('The date {} is valid.'.format(START_DATE))
            break
        except ValueError:
            print('The date {} is invalid'.format(START_DATE))
            continue

      #here is the second, "small" loop (inside the big one)  - if the
user wants to change the SMI company before proceeding, he has the
chance to do so here.
    run_again1 = ("no")
    while run_again1 == ("no"):


        #pre-entered SMI stocks including the abbreviation to fill in
get_data
        while True:
            # The comparison works regardeless of capital or lower
letters
            stock_data = str.upper(input("What SMI stock are you
interested in? "))

            if stock_data == 'NESTLE':
                get_data('NESN.SW')
```

```
            break
        elif stock_data == 'ROCHE':
            get_data('ROG.SW')
            break
        elif stock_data == 'NOVARTIS':
            get_data('NOVN.SW')
            break
        elif stock_data == 'UBS':
            get_data('UBSG.SW')
            break
        elif stock_data == 'ABB':
            get_data('ABBN.SW')
            break
        elif stock_data == 'RICHEMONT':
            get_data('CFR.SW')
            break
        elif stock_data == 'ZURICH':
            get_data('ZURN.SW')
            break
        elif stock_data == 'CREDIT SUISSE':
            get_data('CSGN.SW')
            break
        elif stock_data == 'SWISSRE':
            get_data('SREN.SW')
            break
        elif stock_data == 'LAFARGE HOLCIM':
            get_data('LHN.SW')
            break
        elif stock_data == 'LONZA':
            get_data('LONN.SW')
            break
        elif stock_data == 'GIVAUDAN':
            get_data('GIVN.SW')
            break
        elif stock_data == 'SIKA':
            get_data('SIKA.SW')
            break
        elif stock_data == 'GEBERIT':
            get_data('GEBN.SW')
            break
        elif stock_data == 'SGS':
            get_data('SGSN.SW')
            break
        elif stock_data == 'ALCON':
```

```
                get_data('ALC.SW')
                break
            elif stock_data == 'SWISSCOM':
                get_data('SCMN.SW')
                break
            elif stock_data == 'ADECCO':
                get_data('ADEN.SW')
                break
            elif stock_data == 'SWATCH':
                get_data('UHR.SW')
                break
            elif stock_data == 'SWISSLIFE':
                get_data('SLHN.SW')
                break


            else:
                #if users enteres a non-SMI stock / wrong spelling,
they can try again
                print("Please enter a valid SMI stock. Try Again: ")
                continue

        run_again1 = input("Do you want to see additional information
for this stock? If 'no', you can choose another one. \n(yes/no) ")

        if run_again1 == ("no"):
            print ("Alright, let's choose another stock!")
            continue

        elif run_again1 == ("yes"):
            print ("The table will show you the open, high and low
stock price,\nthe volume and the adjusted close over a chosen amount of
days ending today.")


    while True:
           #Users can choose how many days they want to see
        n_columns = int(input("How many days do you want to be showed?
"))


        if stock_data == 'NESTLE':
            response2 ='NESN.SW'
            STOCK_INFOS()
```

```
        break
    elif stock_data == 'ROCHE':
        response2 ='ROG.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'NOVARTIS':
        response2 ='NOVN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'UBS':
        response2 ='UBSG.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'ABB':
        response2 ='ABBN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'ZURICH':
        response2 ='ZURN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'CREDITSUISSE':
        response2 ='CSGN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'SWISSRE':
        response2 ='SREN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'LAFARGEHOLCIM':
        response2 ='LHN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'LONZA':
        response2 ='LONN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'GIVAUDAN':
        response2 ='GIVN.SW'
        STOCK_INFOS()
        break
    elif stock_data == 'SIKA':
        response2 ='SIKA.SW'
        STOCK_INFOS()
```

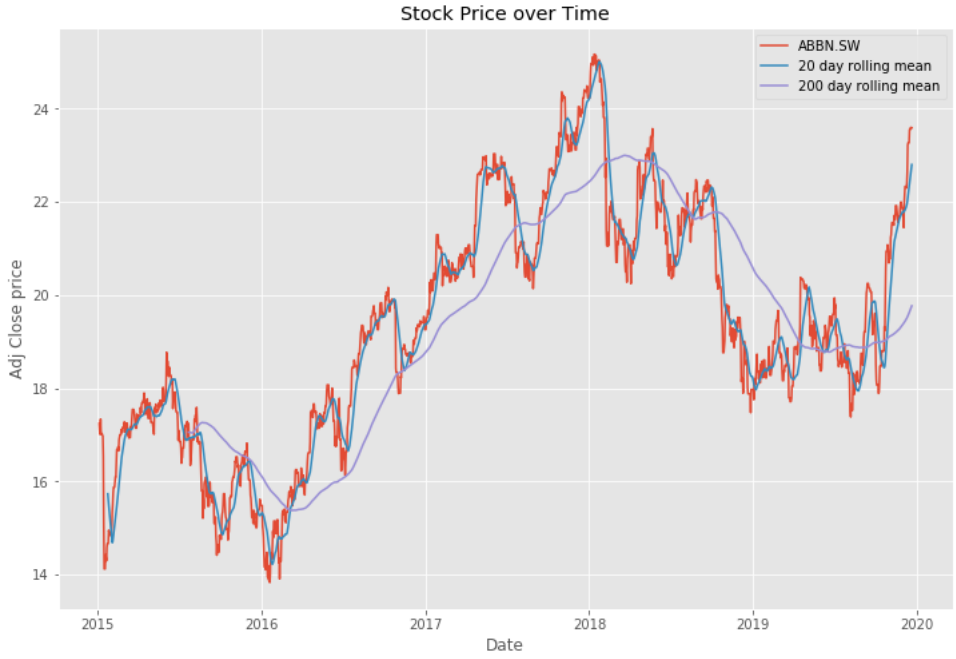
```
            break
        elif stock_data == 'GEBERIT':
            response2 ='GEBN.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'SGS':
            response2 ='SGSN.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'ALCON':
            response2 ='ALC.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'SWISSCOM':
            response2 ='SCMN.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'ADECCO':
            response2 ='ADEN.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'SWATCH':
            response2 ='UHR.SW'
            STOCK_INFOS()
            break
        elif stock_data == 'SWISSLIFE':
            response2 ='SLHN.SW'
            STOCK_INFOS()
            break

#chart for the seleced company within the chosen time will be
illustrated
    print("\nLet's now look at buying opportunities. The following plot
illustrates the risk and expected return of a chosen SMI stock. ")
    dfcomp=web.DataReader([response2],'yahoo', start = START_DATE, end
= END_DATE)['Adj Close']
    retscomp = dfcomp.pct_change()
    corr = retscomp.corr()
    BUY_SELL()
```

```
    run_again = input("Would you like to start the program all over
again? (yes/no) ")
    if run_again == ("yes"):
        print ("Alright, let ´s start over!")

    elif run_again == ("no"):
            print ('\nOkay, hope you enjoyed our program - goodbye!
\n\nKind regards \n\nColette and Carla')
```

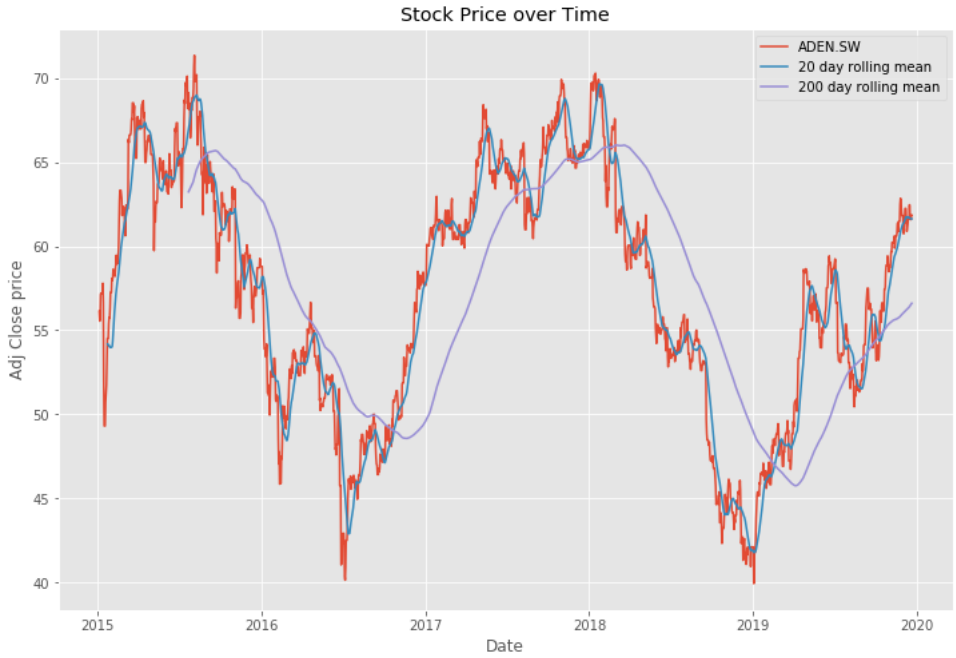
Example: input and output

**** User Input is illustrated in blue ****

```
This program lets you choose a SMI stock from Yahoo Finance to evaluate the
performance over a chosen time period.
First, we will show a plot that illustrates the 20 days rolling mean, the
200 days rolling mean and the stock price.
Second, a table will show additional information about a selected SMI stock
for the chosen period.
Eventually, a chart showing the risk and expected returns will be
illustrated.


What start date do you want? Please enter a date in the past in the
following format YYYY-MM-DD: 2015-01-01
The date 2015-01-01 is valid.

What SMI stock are you interested in? abb
```

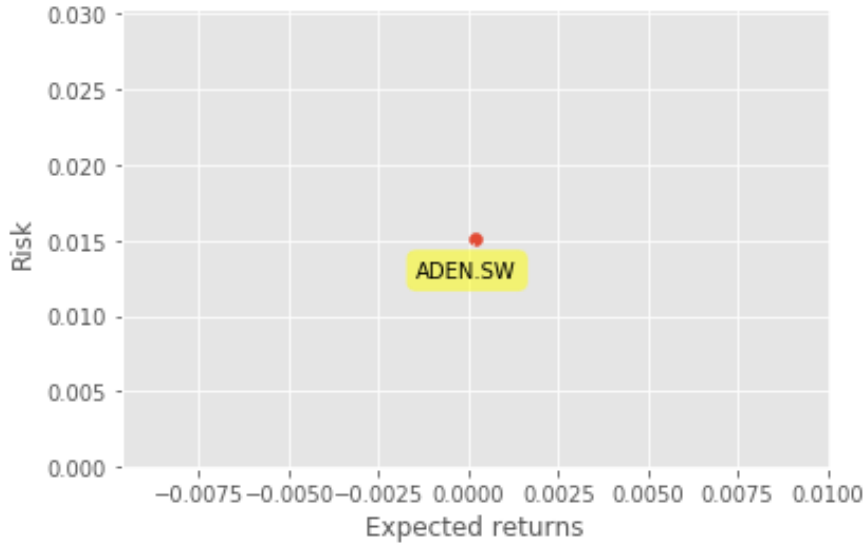



```
Do you want to see additional information for this stock? If 'no', you can
choose another one
(yes/no) no
Alright, let's choose another stock!

What SMI stock are you interested in? adecco
```




```
Do you want to see additional information for this stock? If 'no', you can
choose another one.
(yes/no) yes

The table will show you the open, high and low stock price,
the volume and the adjusted close over a chosen amount of days ending
today.

How many days do you want to be showed? 8

                 High        Low       Open      Close     Volume  Adj
Close
Date
2019-12-11  61.180000  60.459999  60.799999  61.099998   770290.0
61.099998
2019-12-12  61.639999  60.680000  60.900002  61.279999   759611.0
61.279999
2019-12-13  62.820000  61.619999  61.720001  61.619999  1126352.0
61.619999
2019-12-16  62.520000  61.840000  61.840000  62.459999   787960.0
62.459999
2019-12-17  62.700001  61.900002  62.480000  61.900002   914941.0
61.900002
2019-12-18  62.400002  61.680000  61.779999  61.840000   764970.0
61.840000
2019-12-19  61.880001  61.259998  61.880001  61.580002   613707.0
61.580002
2019-12-20  62.139999  61.540001  62.139999  61.840000  1197820.0
61.840000
```

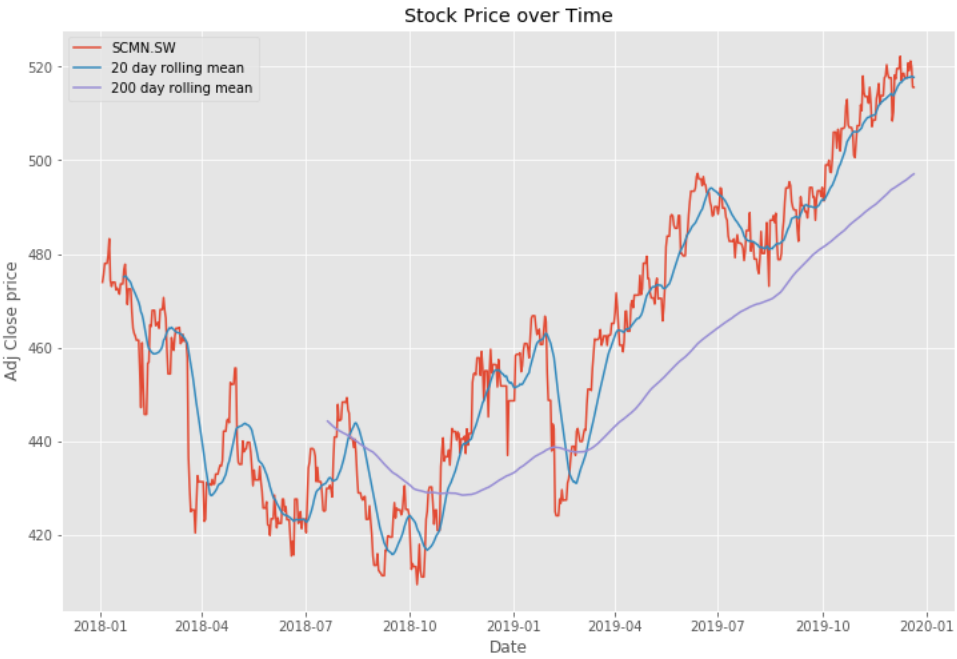
Let's now look at buying opportunities. The following plot illustrates the risk and expected return of a chosen SMI stock.



Would you like to start the program all over again? (yes/no) yes
Alright, let' ´s start over!

What start date do you want? Please enter a date in the past in the following format YYYY-MM-DD: 2018-01-01
The date 2018-01-01 is valid.

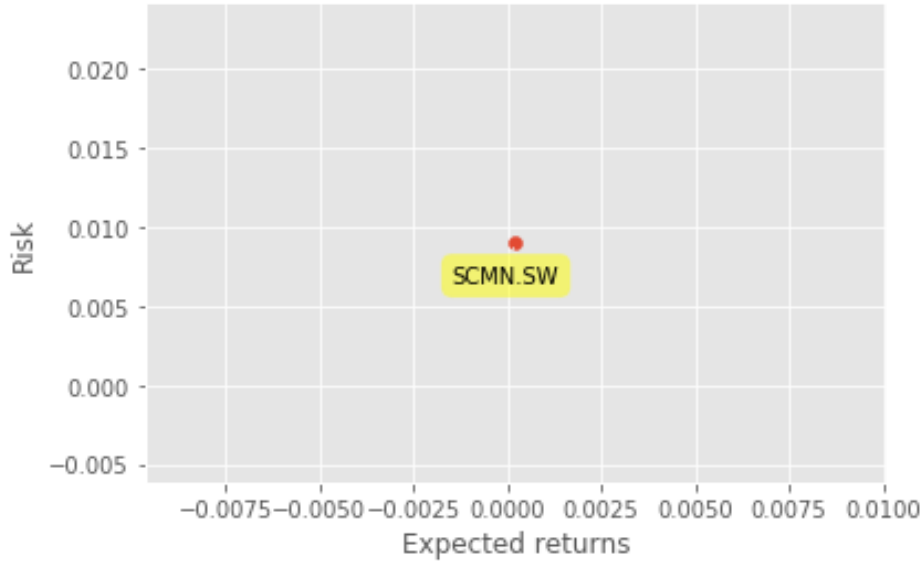
What SMI stock are you interested in? swisscom



Do you want to see additional information for this stock? If 'no', you can choose another one
(yes/no) yes

The table will show you the open, high and low stock price,
the volume and the adjusted close over a chosen amount of days ending today.

```
How many days do you want to be showed? 5

                 High         Low        Open       Close    Volume  \
Date
2019-12-16  521.400024  518.799988  518.799988  520.799988  142458.0
2019-12-17  522.599976  517.000000  522.000000  519.200012  160948.0
2019-12-18  523.400024  518.200012  519.400024  521.200012  191162.0
2019-12-19  521.799988  516.400024  521.599976  520.000000  139574.0
2019-12-20  518.000000  514.200012  518.000000  515.599976  418335.0

             Adj Close
Date
2019-12-16  520.799988
2019-12-17  519.200012
2019-12-18  521.200012
2019-12-19  520.000000
2019-12-20  515.599976

Let's now look at buying opportunities. The following plot illustrates the
risk and expected return of a chosen SMI stock.
```




```
Would you like to start the program all over again? (yes/no) no

Okay, hope you enjoyed our program – goodbye!

Kind regards

Colette and Carla
```