

SCMA 451 - Investment Science I

Portfolio Optimization



Nuttachai Pattaya 6005628

Nattapong Rittichai 6005519



Pongphon Tantiwutthiphat 6005640



MEMBERS

keefer Lek-aree Svensson 6005509



Phonphitcha Saengphenphrao 6005641



Scenario 1

Question: You are an actuary working at Social Security Office (SSO). The organization asked you to advise them regarding investment strategies. The target return of the organization is at 2%.

1. In your opinion, what would be the suitable investment objectives in this case?
2. Select assets which match the recommended investment objectives. Note that your portfolio should contain at least two assets.
3. Find the optimal portfolio under the selected assets in Question 2.

สำนักงานประกันสังคม

Executive Summary: Scenario 1

- The Objective is to give advice to the organization on Investment Strategies for Social Security Funds.
- To select at least 2 assets that would match the target return on investment of 2%
- The selected assets are 3 low volatile stocks and 1 Government Bond of which consist of CP All PLC (CPALL), TMT Steel PLC (TMT), and BTS Group Holdings PCL (BTS), and 1-year treasury bill (TBILL1Y).



สำนักงานประกันสังคม

Scenario 1

In your opinion, what would be the suitable investment objectives in this case?



Suitable investment objectives:

1. **Target (acceptable) return of 2%**
2. **Minimum risk (volatility)**

Scenario 1

Select assets which match the recommended investment objectives

Assets we have selected:

- 3 stocks: CP All PLC (CPALL), TMT Steel PLC (TMT), and BTS Group Holdings PCL (BTS), all of which are traded in the Stock Exchange of Thailand (SET).
- 1 government bond: 1 Year Thai Treasury Bill (T-BILL1Y)

Scenario 1

Select assets which match the recommended investment objectives

CP All PLC(CPALL)-Retail Company

- First convenience store in Thailand
- 70% market share in the convenience store category (10,000+ branches)
- Sustained earnings for many years



Scenario 1

Select assets which match the recommended investment objectives

TMT Steel PLC(TMT)-Steel Company

- Material needed for construction
- Essential to country's development



Scenario 1

Select assets which match the recommended investment objectives

BTS Group Holdings PLC(BTS)-Transportation Company

- Operates BTS Skytrains
- High barriers to entry
- Monopoly position



Scenario 1

Select assets which match the recommended investment objectives

1-Year Treasury Bill (TBILL-1Y)

- Very low risk investments



Scenario 1

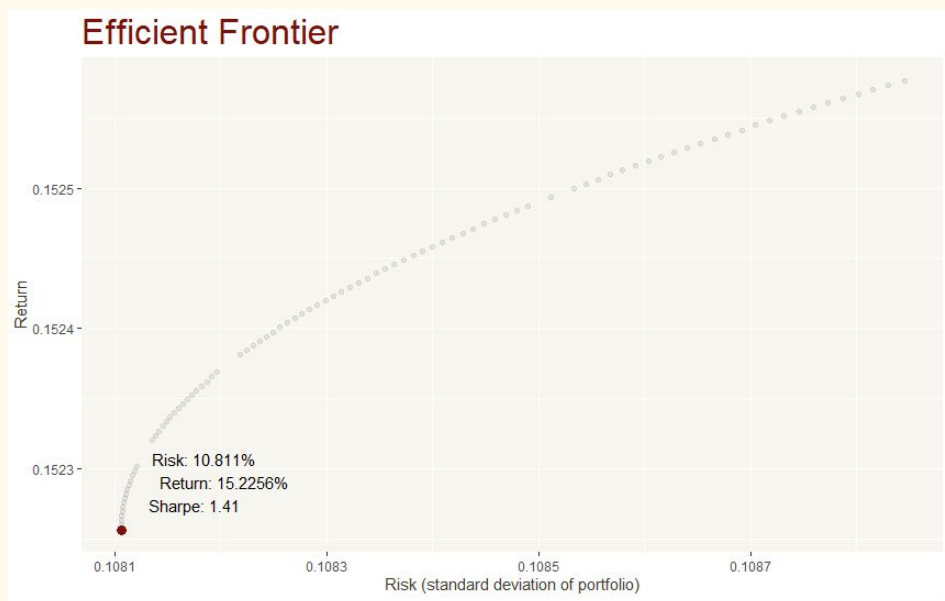
Find the optimal portfolio under the selected assets in Question 2.

	CPALL	TMT	BTS
2014-12-30	0.08534952	0.06632643	0.235172975
2015-12-30	-0.05885847	-0.01564020	0.001335442
2016-12-30	0.62395820	1.17168489	0.013100830
2017-12-29	0.25219661	0.22864227	0.010423935
2018-12-28	-0.08406150	-0.06900751	0.197091416
2019-12-30	0.06743717	-0.38915150	0.435699131

	CPALL	TMT	BTS
CPALL	0.043922373	0.005876569	0.007512939
TMT	0.005876569	0.038939432	0.004409777
BTS	0.007512939	0.004409777	0.031652372

Scenario 1

Find the optimal portfolio under the selected assets in Question 2.

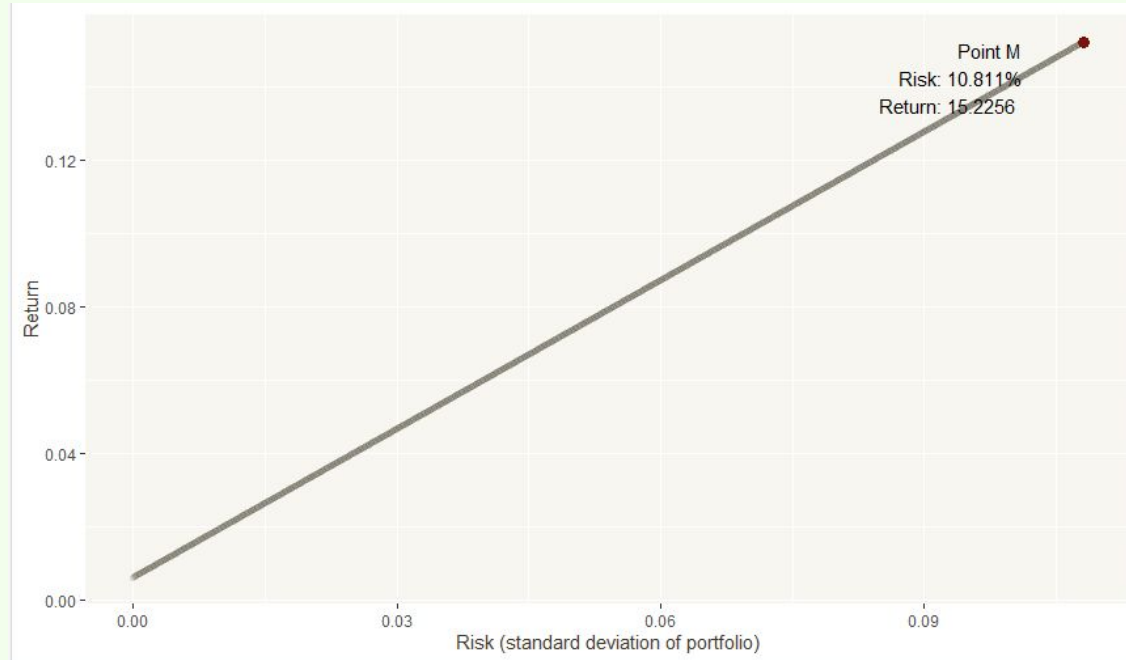


Efficient Frontier, without including the 1-Year Treasury Bill

Scenario 1

Find the optimal portfolio under the selected assets in Question 2.

Plot of the Capital Market Line



Scenario 1

Find the optimal portfolio under the selected assets in Question 2.

To find the optimal portfolio under the selected assets in Question 2, we fix the target return to be 2% and maintain a low standard deviation, in order to minimise risk.

Optimal Portfolio

```
> Answer
      CPALL      TMT      BTS  T.BILL1Y      Std.Dev  Exp.Return
1      0 0.01936926 0.07416729 0.9064635 0.01011189      0.02
```

0% invested in CPALL, 1.9369% invested in TMT, 7.4167% invested in BTS, and 90.6464% invested in the 1-year Treasury Bill.

Executive Summary: Scenario 2

- Objective is creating an **Equity fund** for investors to have an opportunity to **invest in a situation like Covid-19**
- Selecting stocks which have **potential to perform well** in COVID-19 situation.
- The optimal portfolio contain **CPALL.BK, ADVANC.BK, BDMS.BK and EGCO.BK** with **expected return 9.77%** and **SD (Volatility) 7.75%**

Scenario 2

In your opinion, what would be the suitable investment objectives in this case?

Suitable investment objectives:

- The risk margin (volatility) is **at most 8%**
- The return margin is **at least 6%**
- Efficient in **COVID-19 situation**

Scenario 2 : Select assets which match the fund characteristics.

Assets which we selected :

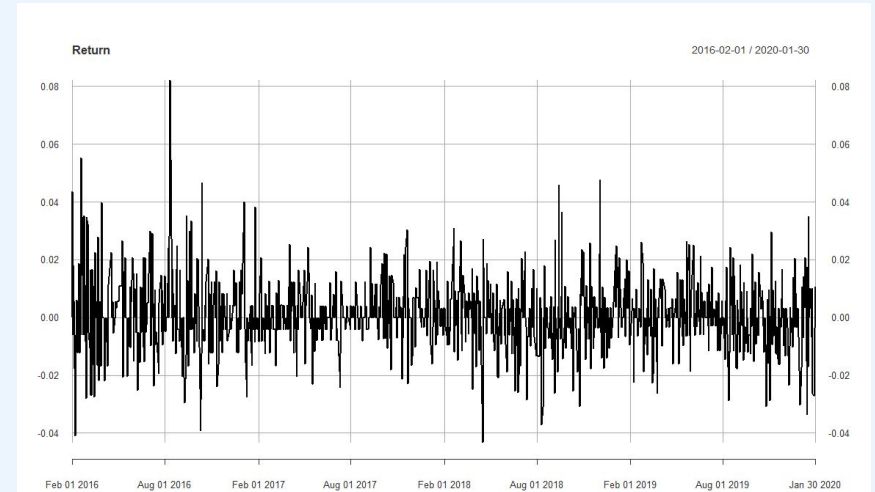
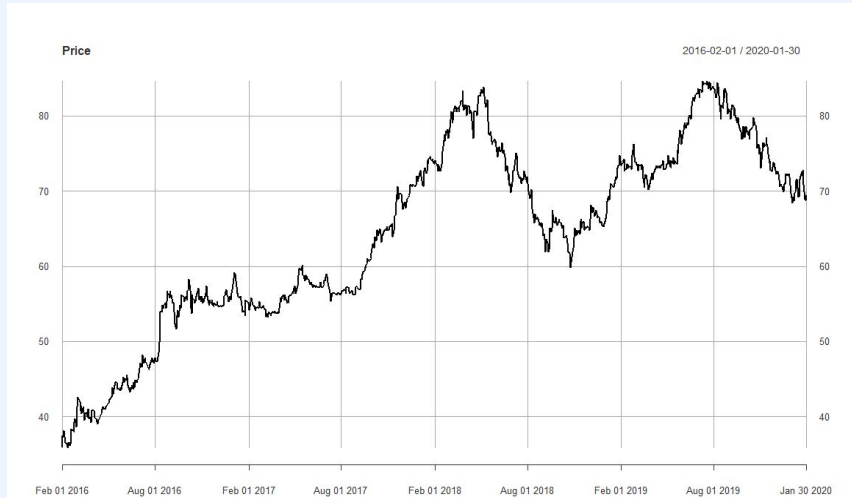
- CPALL.BK (COMM / CP All - Convenience store company)
- ADVANC.BK (ICT / Advanced Info Service (AIS) - Mobile phone operator company)
- BDMS.BK (HEALTH / Bangkok Dusit Medical Services - private healthcare company)
- EGCO.BK (ENERG / Electricity Generating PCL - Electric services company)



Scenario 2 :

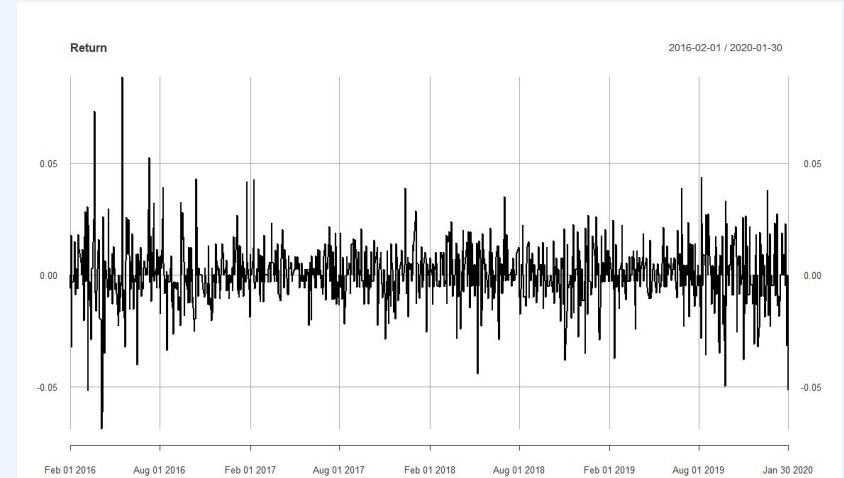
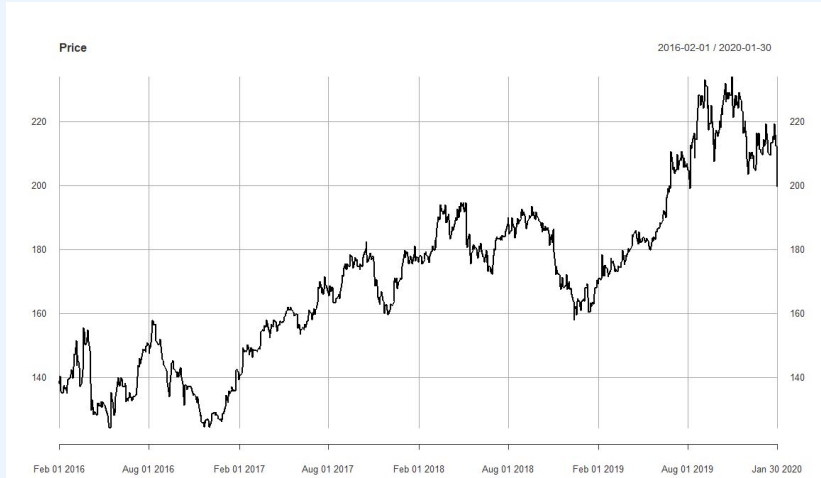
Select assets which match the fund characteristics. By Plot of Adjusted close price and Daily return of each stocks
(4 years period from 2016-02-01 to 2020-01-30)

CPALL.BK (COMM / CP All - Convenience store company)



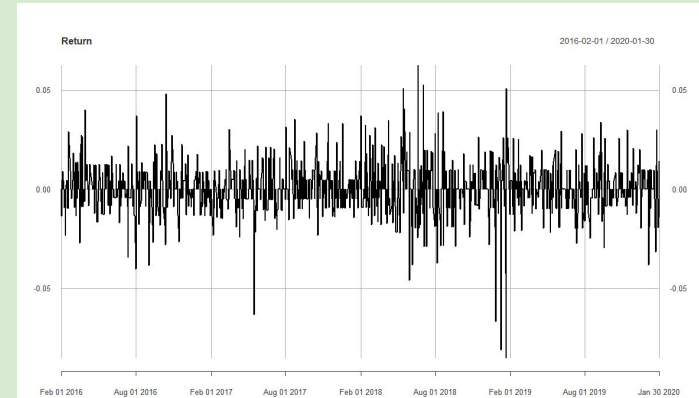
Scenario 2 : Select assets which match the fund characteristics. By Plot of Adjusted close price and Daily return of each stocks (4 years period from 2016-02-01 to 2020-01-30)

ADVANC.BK (ICT / Advanced Info Service (AIS) - Mobile phone operator company)



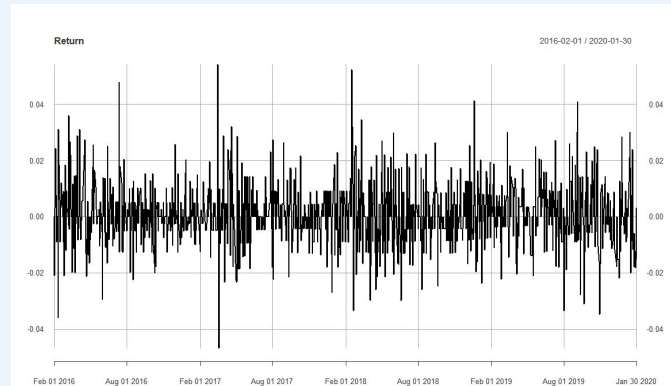
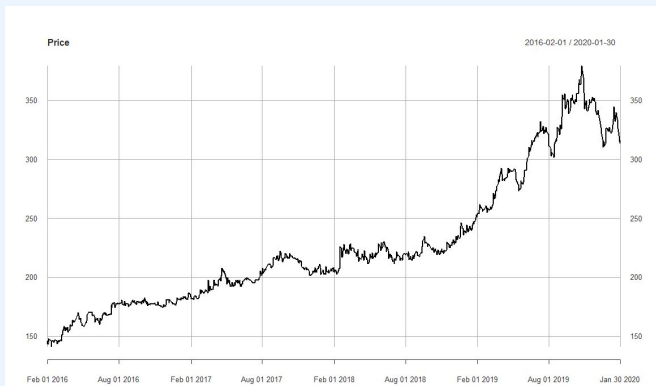
Scenario 2 : Select assets which match the fund characteristics. By Plot of Adjusted close price and Daily return of each stocks (4 years period from 2016-02-01 to 2020-01-30)

BDMS.BK (HEALTH / Bangkok Dusit Medical Services - private healthcare company)



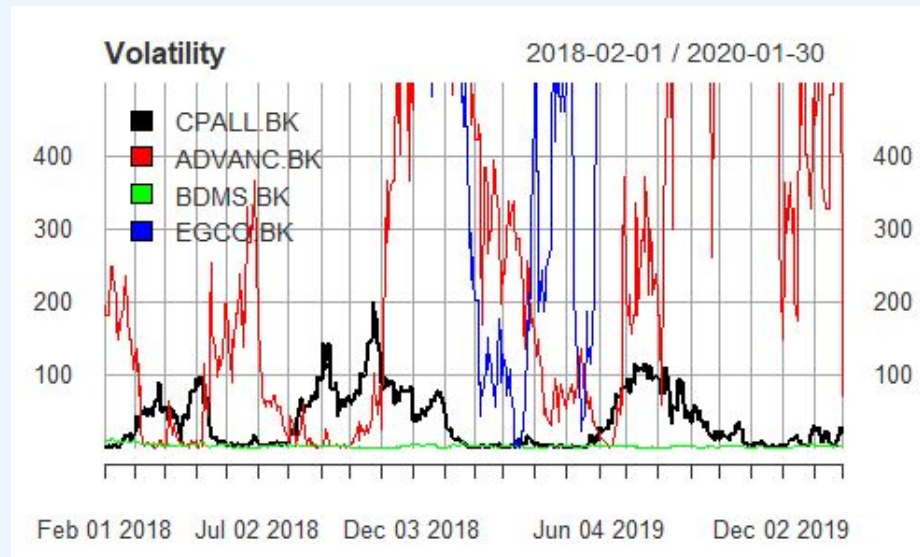
Scenario 2 : Select assets which match the fund characteristics. By Plot of Adjusted close price and Daily return of each stocks (4 years period from 2016-02-01 to 2020-01-30)

EGCO.BK (ENERG / Electricity Generating PCL - Electric services company)



Scenario 2 : Select assets which match the fund characteristics.

Plot of volatility of each stocks (2 years period from 2018-02-01 to 2020-01-30)



Scenario 2 : Select assets which match the fund

Statistics of stocks (is obtained by using 4 years period from 2016-02-01 to 2020-01-30)

Mean of annualized return of each stocks

CPALL.BK	ADVANC.BK	BDMS.BK	EGCO.BK
0.2664175	0.2098909	0.1095628	0.1432848

Covariance matrix of annualized return of stocks

	CPALL.BK	ADVANC.BK	BDMS.BK	EGCO.BK
CPALL.BK	0.0709783012	-0.0004265459	-0.007245439	0.009547561
ADVANC.BK	-0.0004265459	0.0440541860	-0.012014934	0.008948390
BDMS.BK	-0.0072454388	-0.0120149343	0.012004012	0.007370264
EGCO.BK	0.0095475609	0.0089483895	0.007370264	0.020530531

SD (Volatility) of annualized return of each stocks

CPALL.BK	ADVANC.BK	BDMS.BK	EGCO.BK
0.16245267	0.09092937	0.04688052	0.17204338

Scenario 2 : Find the optimal portfolio under the selected assets in Question 2.

The optimal portfolio is obtained from find maximizing Sharpe ratio of portfolio on Efficient frontier for given target Return at least 6% and Volatility at most 8%.

```
> port.stat.mat.w.optiaml.M[max.target.sharpe,]  
      CPALL.BK ADVANC.BK  BDMS.BK  EGCO.BK  Std.Dev Exp.Return  sharpe  
13 0.1612611 0.2124235 0.4436248 0.1826906 0.07747719 0.0977409 1.261544
```

we use bond yield as risk free rate which equal to

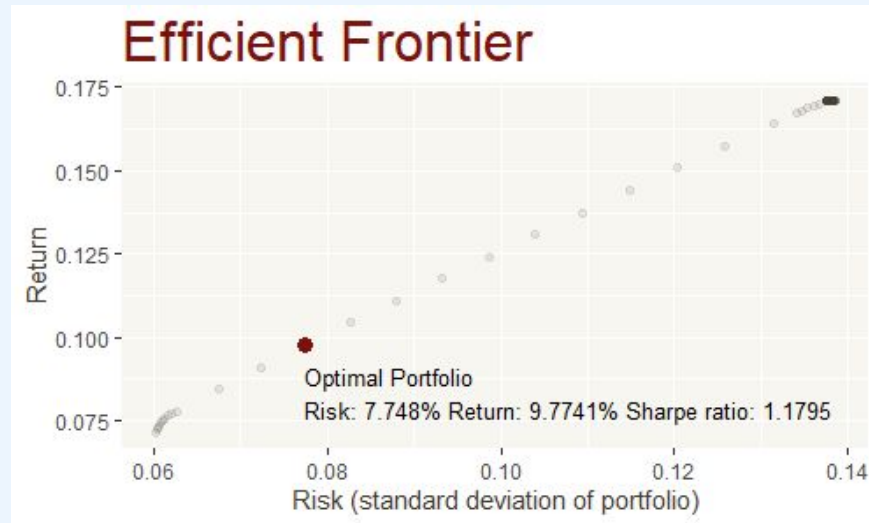
```
> bond.yield  
[1] 0.00635268
```

The sharpe ratio of optimal portfolio :

```
> tan.theta[max.target.sharpe]  
[1] 1.17955
```

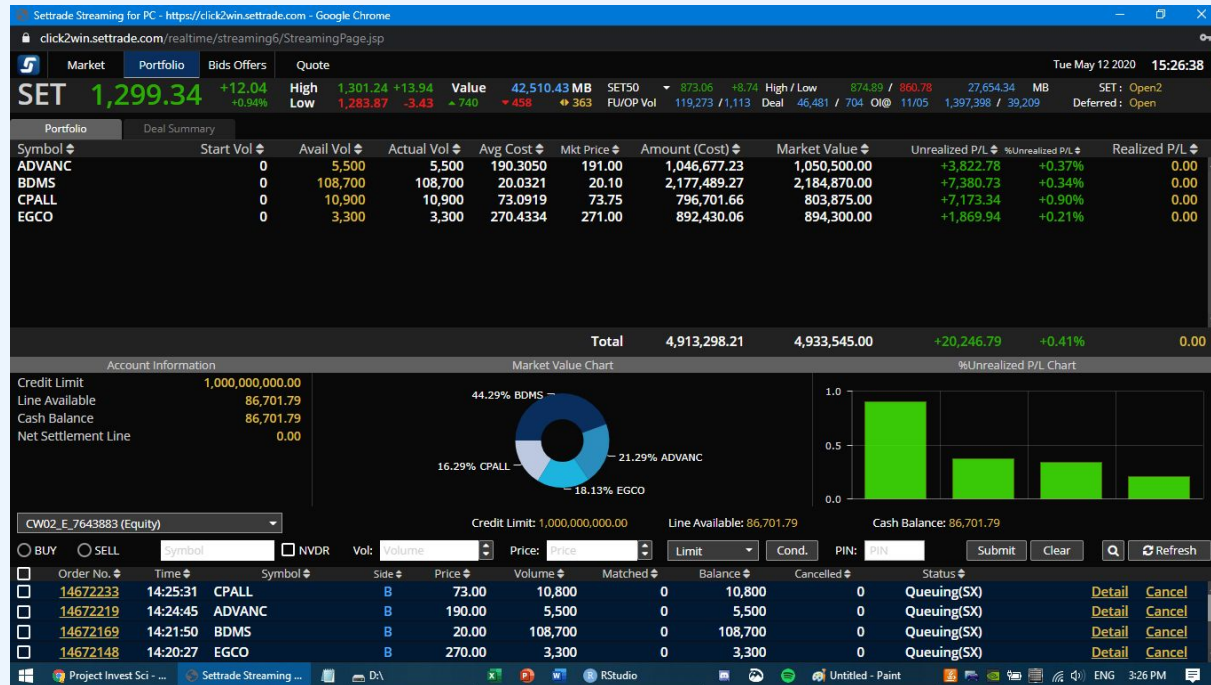
Scenario 2 : Find the optimal portfolio under the selected assets in Question 2.

Plot of Efficient Frontier of the portfolio and point of the optimal portfolio.



Scenario 2 :

Find the optimal portfolio under the selected assets in Question 2.



Scenario 3



- ❖ The strategy is long-term investing via stocks with undervalued prices.
- ❖ The technique we use is Benjamin Graham's methods + graph interpretation

Scenario 3



Scenario 3

Scenarios \ Stocks 'name	BDMS	CPALL	CPF	KBANK	SCB	TOP	VGI
Not technology	✓	✓	✓	✓	✓	✓	✓
SET 50	✓	✓	✓	✓	✓	✓	✓
Current assets/Current liability > 2				N	N	✓	
Long liability < Current assets		✓		N	N		✓
EPS growth > 10% over 10 years		✓		✓			
Not net loss over 5 years	✓	✓	✓	✓	✓	✓	✓
P/E Ratio < 15			✓	✓	✓	✓	
(P/E Ratio * P/BV) < 22.5			✓	✓	✓	✓	
D/E Ratio < 1 for industrial D/E Ratio < 2.3 for others	✓						✓
Providing consistent dividends	✓	✓	✓	✓	✓	✓	✓
	5	6	7	7	6	7	6

Note

1. The analyzed information refers to settrade.com and finomena.com.
2. N in the table means it can be analyzed, because they don't have that kind of asset in the bank's financial statements.

Scenario 3

The figures show the direction of the stocks 'price during the part 6 months to this time:

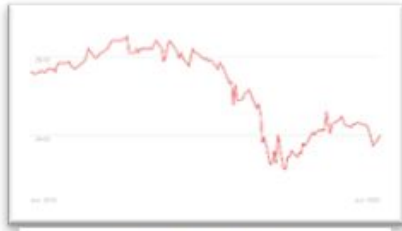


Figure 1 - BDMS

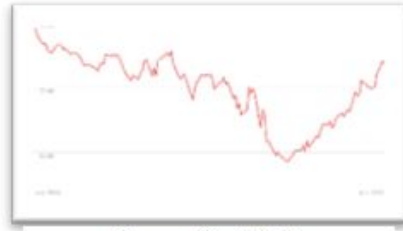


Figure 2 - CPALL



Figure 3 - CPF

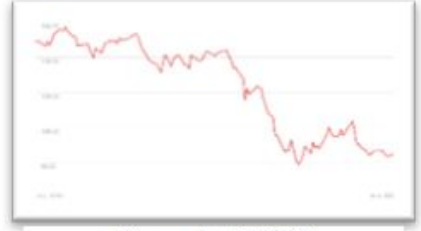


Figure 4 - KBANK

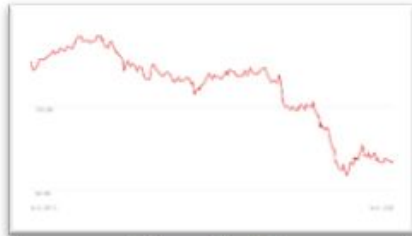


Figure 5 - SCB

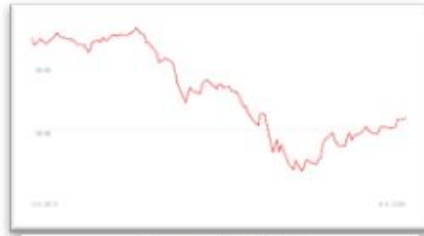


Figure 6 - TOP

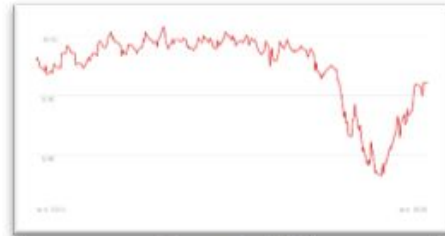


Figure 7 - VGI

Scenario 3

Last Login: 03 May 2020 21:48:22 click2win

Portfolio		Order		
View All A/C		Sort by Symbol ▲		
Symbol	Avail Vol	Avg	Market	%U.PL
Total				
Amount				
Market Val				
Unrealized P/L				
Realized P/L				
Trading A/C	Line Available	Cash Balance		
FDMA_E_BONOMO (E)	5,000,000.00	5,000,000.00		

Created a portfolio on 3rd May 2020

Last Login: 13 May 2020 14:26:36 click2win

Portfolio		Order		
View All A/C		Sort by Symbol ▲		
Symbol	Avail Vol	Avg	Market	%U.PL
BDMS	25,000	20.31	19.90	-2.03
CPALL	0	69.36	71.75	0.00
CPF	0	26.54	28.25	0.00
KBANK	8,000	85.70	85.25	-0.52
SCB	5,000	67.36	68.00	+0.95
TOP	0	43.32	42.25	0.00
VGI	0	8.31	8.35	0.00
Total				
Amount			1,530,202.04	
Market Val			1,519,500.00	
Unrealized P/L			-10,702.04 (-0.70%)	
Realized P/L			+40,046.09	
Trading A/C	Line Available	Cash Balance		
FDMA_E_BONOMO (E)	3,509,844.06	3,509,844.06		

The value of portfolio on 13th May 2020

