

# Algorithm Trading Model: Backtesting and Rebalancing ETF Portfolio

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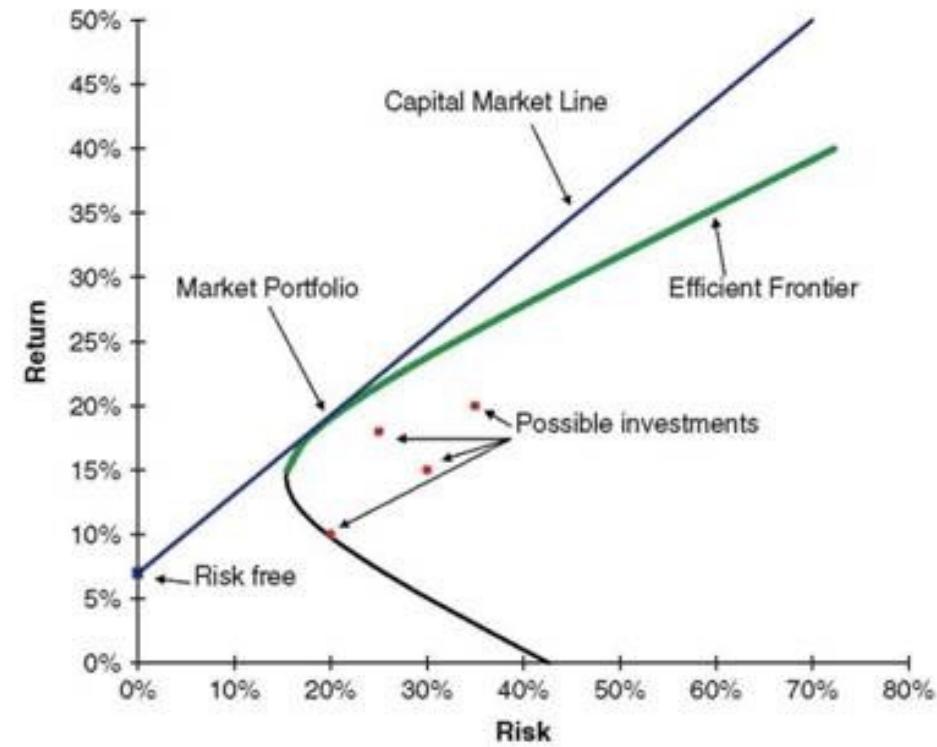
Backtesting

# Project Overview



# Algorithm Trading is a combination of finance and coding skills.

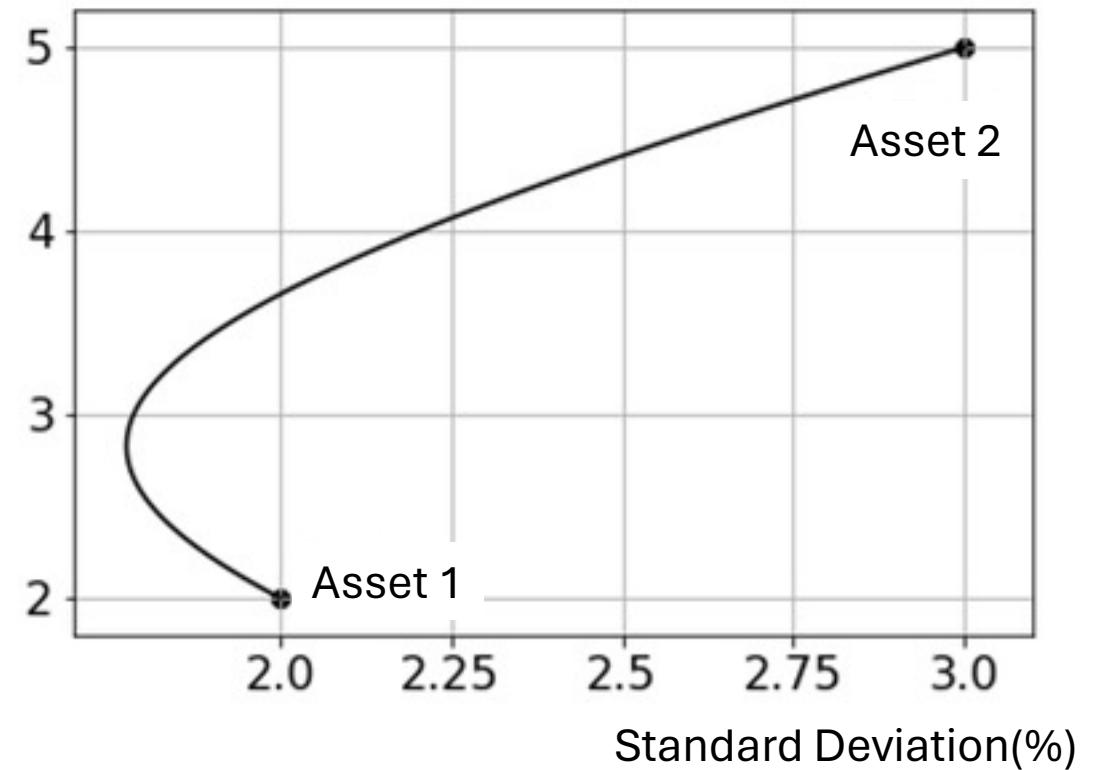
- Build a portfolio by selecting ETF assets.
- Utilize fintech technologies for trading.



# Portfolio Theory

- Portfolio theory is used to **explore rational investors' choices** and **acquire skills for constructing a portfolio rationally**.

Expected Return (%)



# ETF Selection



# ETF Selection and Criteria

- ETF Selection
  - ETF revised stock price Excel (TIGER US NASDAQ 100, KODEX Gold Futures (H))
  - Monthly Returns (2017.05. ~ 2019.04.)
  - Risk-Free Asset (KOSEF short-term fund average return)
- Selection Criteria
  - **Low volatility**: Large-cap stocks have low volatility.
  - **Low correlation**
  - **Gold-related stocks**: Currency value is expected to fall due to quantitative easing to alleviate the economic shock caused by COVID-19.
  - **India-related stocks**: India is the second largest China.

# ETF Overview

## TIGER US NASDAQ 100

100 stocks listed on NASDAQ OMX Group  
and US NASDAQ stock market

Computer hardware/software, communications, wholesale  
and retail trade, biotechnology, etc.

Modified market capitalization weighted average method and  
quarterly rebalancing (Mar/Jun/Sep/Dec)

1985.01.31. 125pt

## KODEX Gold Futures (H)

A gold fund that manages investment trust assets according  
to the rate of change of the S&P GSCI Gold Total Return index.

Gold

Rollover must be performed every time maturity occurs  
(5 times a year)

1978.01.06. 100pt

# ETF Overview

	TIGER US NASDAQ 100	KODEX Gold Futures (H)
Size	₩191 billion	₩159 billion
Listing Date	2010.10.18.	2010.10.01
Underlying Index	NASDAQ-100 Index	S&P GSCI Gold Index Total Return
Stocks and Weight	<p>Microsoft Corp(11.86%), Apple Inc(10.99%)</p> <p>Amazon Inc(10.48%)</p> <p>Facebook Inc(3.93%)</p> <p>Alphabet Inc(3.88%)</p> <p>Intel Inc(2.99%)</p> <p>Netflix Inc(2.11%)</p> <p>PepsiCo Inc(2.11%)</p> <p>...</p>	<p>GOLD 100oz F2006(92.60%)</p> <p>SPDR GOLD SHARES(6.83%)</p>

# Portfolio Construction

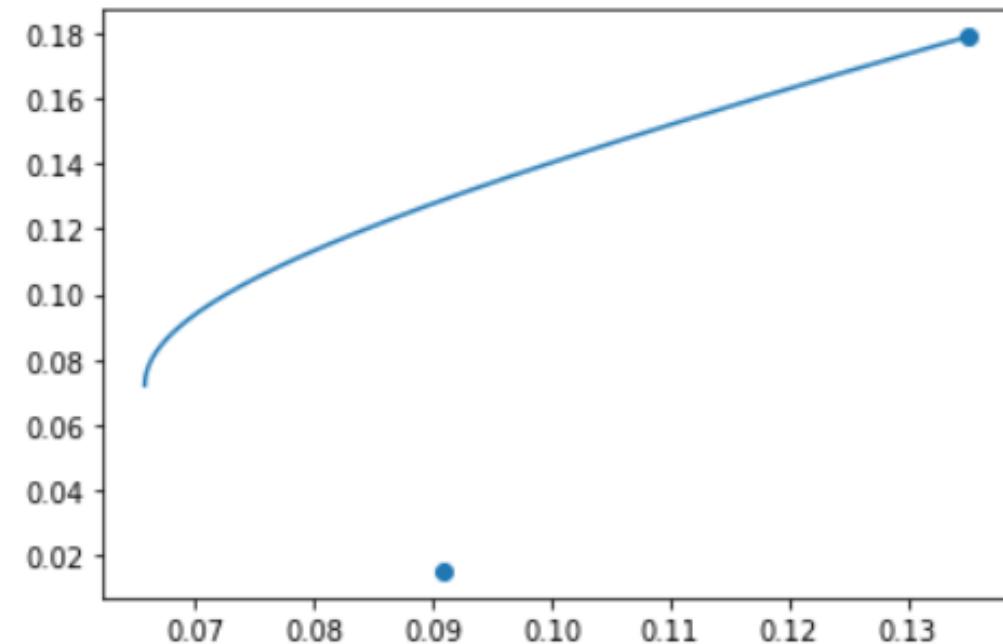
LOREM	234.67	↑ 0.234
IPSUM	123.07	↓ 0.134
DOLOR	2245.0	↑ 1.654
AMET	12.066	↑ 0.934
VENIAM	131.77	↓ 1.566



# Efficient Frontier

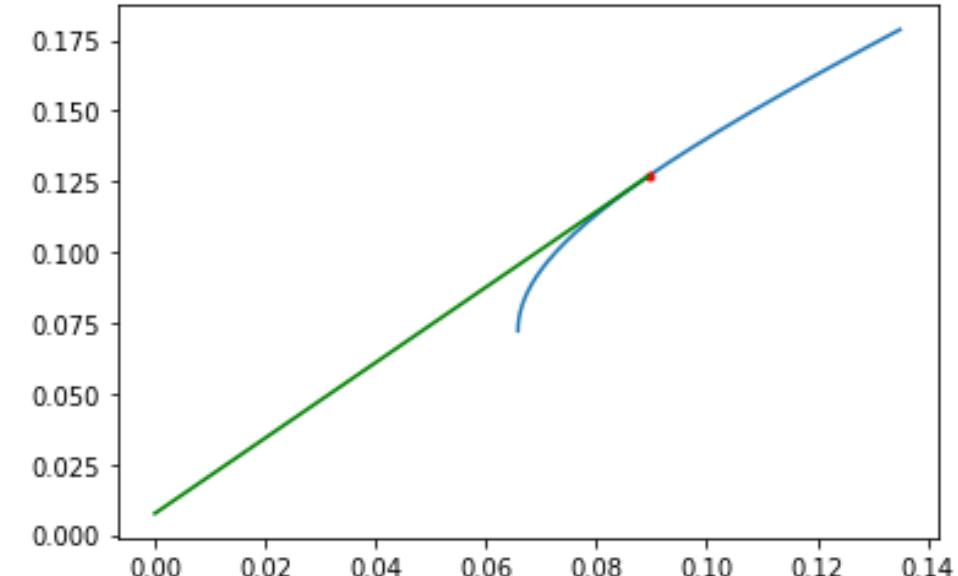
- Minimum Variance Portfolio

Risk	Return	Weight	
		TIGER US NASDAQ 100	KODEX Gold Futures (H)
0.0658	0.0721	0.3470	0.6530



# Tangency Portfolio

- Duration: 2017.01.01 ~ 2019.04.26.
- Holding Periods = 20
- N terms = 12
- Risk-free interest rate = 0.75%



Risk	Return	Sharpe Ratio	Weight	
			TIGER US NASDAQ 100	KODEX Gold Futures (H)
0.0895	0.1269	1.3346	0.6826	0.3174



# **Backtesting is an effective tool to determine a trading strategy's superiority or effectiveness.**

- Backtesting: Testing the developed algorithm with past data
- Backtesting existing algorithms can help understand them accurately.
  - : If a strategy has performed poorly in the past, it is statistically very difficult to expect that this strategy will perform well in the future.
- Improvements to existing algorithms can be found and applied to algorithmic trading systems.

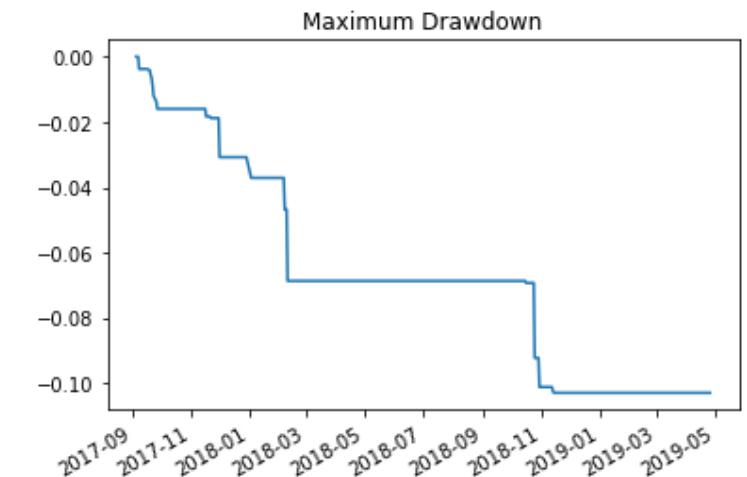
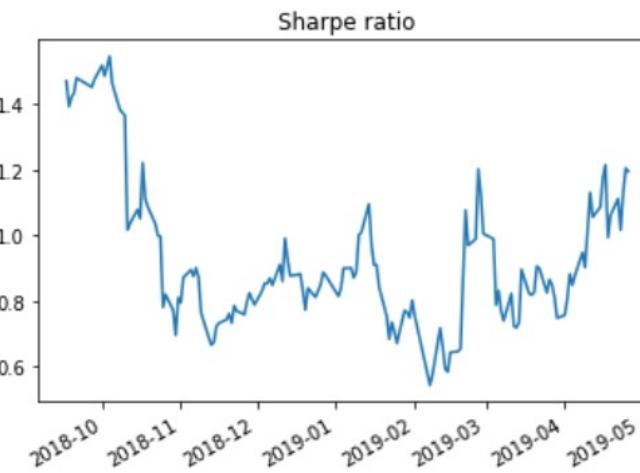
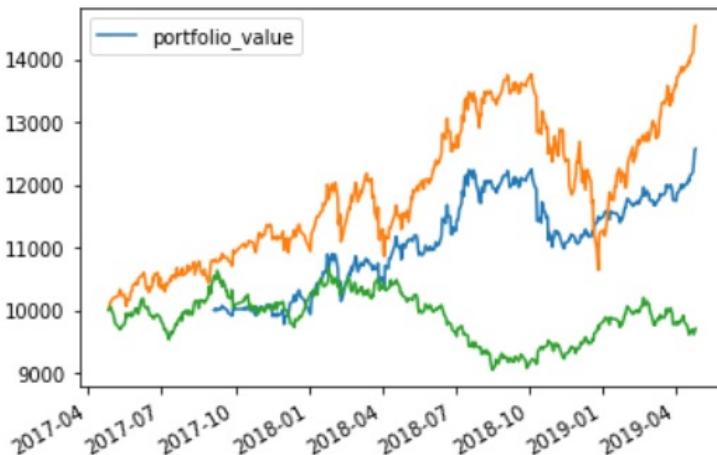
# Backtesting Conditions

- Rebalancing occurs **every month**.
- A tangency portfolio is constructed at the time of rebalancing based on **data from the previous three months**.
- Backtesting period is 2017.04.26. ~ 2019.04.26.
- Backtesting **risk-free assets are calculated using KOSEF short-term funds**.

# Backtesting Performance Analysis

- Results (Annual Average)

Returns	Max_Returns	Std	Sharpe ratio	MDD
0.1275	0.2203	0.0317	0.9194	-0.0673



**Thank you**