

### Contents

Topic

Base Strategy

Basic Concep

Methods

Result

1. Topic

2. Base Strategy

3. Basic Concept

4. Methods

5. Result

## Topic

Topic

Base Strategu

Basic Concep<sup>-</sup>

Methods

Result

#### **Motivation**

기본 트레이딩 전략의 성능을 향상시킬 수 있는 다양한 방안을 탐색하겠다.

**Base Strategy** 

Data
Pre-processing

Machine Learning

#### **Data**

Topic

Base

Strategy

Kospi 200 Dollar bars C D E F G H I

			T-	50	-			15	**	,	150
1	date_time	tick_num	open	high	low	close	volume	cum_buy_	cum_ticks	cum_dollar_value	cum_buy_dollar_value
2	2021-01-04 10:00:01.899669	81	389.15	389.2	388.65	389.05	500	317	80	194552.7	123357.35
3	2021-01-04 10:00:03.907859	217	389.05	389.6	388.95	389.55	500	251	136	194694.3	97737.4
4	2021-01-04 10:00:08.327160	357	389.55	389.7	389.4	389.5	500	290	140	194772.25	112967.35
5	2021-01-04 10:00:12.859526	486	389.5	389.6	389.25	389.6	500	316	129	194699.15	123053.35
6	2021-01-04 10:00:21.659149	624	389.55	389.85	389.55	389.85	500	348	138	194836.1	135606.6
7	2021-01-04 10:00:24.959423	723	389.85	390.15	389.8	390.1	500	334	99	194969.45	130241.8
8	2021-01-04 10:00:28.823400	864	390.15	390.5	390.15	390.25	500	210	141	195157.3	81961.05
9	2021-01-04 10:00:34.588086	1015	390.25	390.25	389.7	389.7	500	243	151	194999.85	94775.15
10	2021-01-04 10:00:38.339601	1149	389.75	389.75	389.1	389.1	500	185	134	194693.75	72040.3
11	2021-01-04 10:00:44.131202	1288	389.1	389.5	389.05	389.25	500	262	139	194676.15	102012.6
12	2021-01-04 10:00:51.523688	1459	389.25	389.3	389	389.15	500	222	171	194571.85	86389.75
13	2021-01-04 10:01:00.187167	1613	389.15	389.35	389	389.35	500	314	154	194583.5	122201.6
14	2021-01-04 10:01:03.023159	1755	389.4	389.8	389.35	389.8	500	323	142	194796.45	125845
15	2021-01-04 10:01:07.555161	1884	389.75	389.95	389.45	389.5	500	240	129	194844.15	93534.75
16	2021-01-04 10:01:12.863176	2027	389.45	389.75	389.45	389.65	500	258	143	194827.1	100535.7
17	2021-01-04 10:01:18.371779	2119	389.65	390	389.6	389.8	500	356	92	194919.45	138785.7
18	2021-01-04 10:01:26.335787	2261	389.8	390.1	389.75	389.8	500	246	142	194989.15	95935.7
19	2021-01-04 10:01:35.319351	2412	389.75	389.95	389.7	389.8	500	244	151	194912.2	95119.2
20	2021-01-04 10:01:42.543167	2539	389.8	389.9	389.45	389.5	500	209	127	194823.5	81442.8
21	2021-01-04 10:01:52.279149	2673	389.55	389.9	389.5	389.8	500	323	134	194843.3	125866.4
22	2021-01-04 10:02:01.531209	2788	389.8	390	389.75	389.9	500	297	115	194935.95	115796.25
	Kp200F_volume_bar	s_500	+					-	-		<b> </b>

#### **Data**

2 2021-01-04 10:00:01.899669

3 2021-01-04 10:00:03.907859

4 2021-01-04 10:00:08.327160

5 2021-01-04 10:00:12.859526

6 2021-01-04 10:00:21.659149

7 2021-01-04 10:00:24.959423

8 2021-01-04 10:00:28.823400

9 2021-01-04 10:00:34.588086

10 2021-01-04 10:00:38.339601

11 2021-01-04 10:00:44.131202

12 2021-01-04 10:00:51.523688

13 2021-01-04 10:01:00.187167

14 2021-01-04 10:01:03.023159

15 2021-01-04 10:01:07.555161

16 2021-01-04 10:01:12.863176

17 2021-01-04 10:01:18.371779

18 2021-01-04 10:01:26.335787

19 2021-01-04 10:01:35.319351

20 2021-01-04 10:01:42.543167

21 2021-01-04 10:01:52.279149

22 2021-01-04 10:02:01.531209

Kosda	q 150 Time	bars
	1 1 1 11	27. 1

			4	2016-01-04 10:02	1093	1093	1093	1093	
			5	2016-01-04 10:03	1093	1093	1093	1093	
ars	C	D	6	2016-01-04 10:04	1092.7	1092.7	1092.5	1092.5	
_num	open	high	7	2016-01-04 10:05	1092.7	1092.7	1092.6	1092.7	alue
81	389.15	389	8	2016-01-04 10:06	1092.9	1093.3	1092.9	1093.3	7.35
217			9	2016-01-04 10:07	1093.3	1093.7	1093.3	1093.7	37.4
357 486			40	2016-01-04 10:09	1093.3	1093.3	1093.1	1093.1	7.35 3.35
624				2016-01-04 10:11	1093	1093.6	1093	1093.6	06.6
723	389.85	390.		2016-01-04 10:15	1093.6	1093.6	1093.6	1093.6	41.8
864	390.15		12						1.05
1015	390.25	390.	13	2016-01-04 10:16	1092.6	1092.6	1092.5	1092.6	5.15
1149		389.	14	2016-01-04 10:18	1092.5	1092.5	1092.5	1092.5	40.3
1288		389	15	2016-01-04 10:19	1092.5	1092.5	1092.3	1092.3	12.6
1459 1613			10	2016-01-04 10:20	1092.3	1092.3	1091.8	1091.8	9.75
1755				2016-01-04 10:22	1091.2	1091.2	1091.2	1091.2	845
1884	389.75	389.	18	2016-01-04 10:23	1091.4	1091.4	1091	1091	4.75
2027	389.45	389.							35.7
2119	389.65	3	19	2016-01-04 10:25	1091.1	1091.1	1091	1091	85.7
2261	389.8	390	20	2016-01-04 10:26	1091.5	1091.5	1091.5	1091.5	35.7
2412			Z I	2016-01-04 10:27	1091.6	1092	1091.6	1092	19.2
2539			22	2016-01-04 10:28	1092	1092	1092	1092	42.8
2673									56.4
2788		3	4	KQ150 (1)	+				5.25

В

1090

1092

Open

C

1092

1093

High

Α

2016-01-04 10:00

2016-01-04 10:01

Date-Time

2

3

Ε

1092

1093

Close

D

1090

1092

Low

Topic

Base Strategy

Basic

#### **Motivation**

**Topic** 

Base

Basic

Strategy

매도세가 약해지고 매수세가 강하게 이어졌을 때를 포착하여 매수를 하겠다.

$$f_T = \frac{c_T - o_t}{\max\limits_{s \in [t, T]} H_s - \min\limits_{s \in [t, T]} L_s}$$

 $C_T$ : Close Price at the end of window (종가)

 $O_t$ : Open Price at the start of window (시가)

 $\max_{s \in [t,T]} H_s$ : Highest Price in the window scope (고가)

 $\min_{s \in [t,T]} L_s$ : Lowest Price in the window scope (저가)

#### signal

$$= \min_{b \in \{s,m\}} \{ b : f_t \leq thres \ and \ f_{t+b} \geq 0 \ \}$$

s: scope length

m: max length (daily length)

Topic

Base Strategy

Basic Concept

Methods

Recult

#### Motivation



#### 이상 시그널 발생 case1



-> parkinson volatility를 이용하여 변동성이 낮은 구간에서의 진입 시그널 제거

#### case2



-> 기준치 아래로 local minimum을 2번 찍은 후 진입

Topic

Base Strategy

Basic Concept

Methods

Resul

### **Parkinson Volatility:**

$$\sigma_{parkinson} = \sqrt{\frac{1}{4\ln(2)*n} \sum_{i=1}^{n} \ln\left(\frac{H_i}{L_i}\right)^2}$$

→ 변동성이 낮은 구간에서 진입 시그널을 제거

#### Topic

Base Strategy

Basic Concept

Methods

Recult

#### 이상 시그널 발생 case1



-> parkinson volatility를 이용하여 변동성이 낮은 구간에서의 진입 시그널 제거

#### case2



-> 기준치 아래로 local minimum을 2번 찍은 후 진입

Topic

Base Strategy

Basic Concep

Methods

Racult

전략 평가 방법: pnl = (청산시점 - 진입시점 - slippage) / 진입시점

```
2021-11-11 10:21:00 2021-11-11 10:23:00 2021-11-11 10:26:00 0.9993066561846508
Cumlative PNL: 1.4965101292438205
Process 1440 Done

Sharpe: 7.008737819704887
Total Entrance: 950
Win Ratio: 0.5889387144992526
```

기본 전략 - 샤프비율: 7.01, 승률: 59%

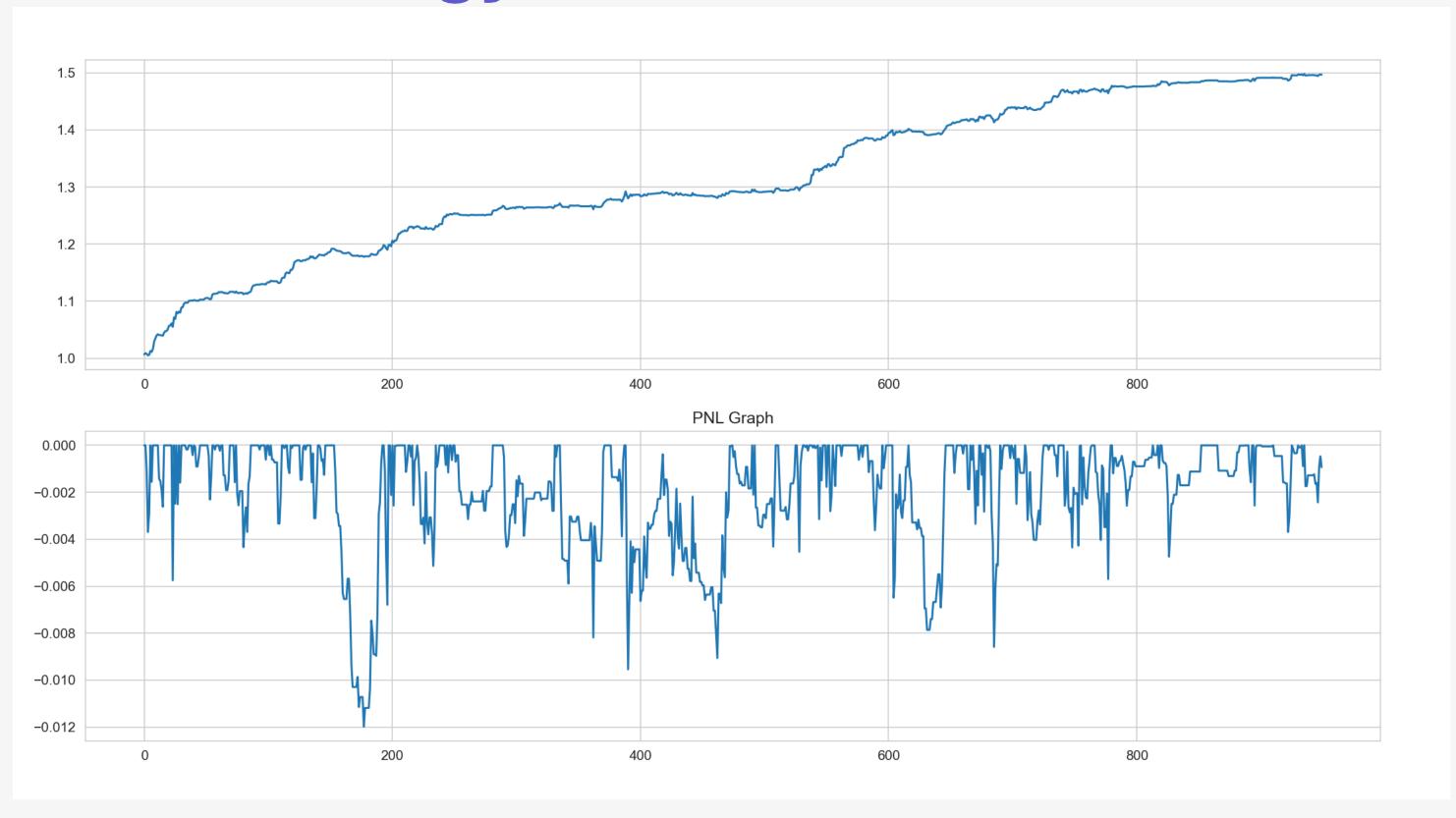
Topic

Base Strategy

Basic Concept

Methods

Result



## **Basic Concept**

Topic

Base Strategy

Basic Concept

Methods

Recult

### **Triple Barrier Method**



## **Basic Concept**

Topic

Base Strategi

Basic Concept

Methods

Racult

### **Meta-Labeling Method**

: 생성한 시그널이 진짜 수익률을 가져다 줄 수 있는지 이차검증

### Methods

Topic

Basic

Methods

#### 기본 전략을 통해 얻은 매수/매도 시그널을 이용하여 진입(1), 손절(-1) 값 삽입

	А	В	С	D	Е	F
1	Date-Time	Open	High	Low	Close	side 📭
137960	2018-01-03 14:07	1447.9	1450.4	1447.9	1450	1
137963	2018-01-03 14:10	1449.9	1454.4	1449.9	145	-1
138006	2018-01-03 14:53	1455.2	1457.6	1455.2	145	1
138009	2018-01-03 14:56	1459.2	1460.6	1458.8	1460	-1
138069	2018-01-04 9:20	1459.6	1459.9	1456.7	1459	1
138072	2018-01-04 9:23	1463.1	1463.4	1461.8	1463	-1
138181	2018-01-04 11:12	1456.9	1456.9	1456.2	1450	1
138184	2018-01-04 11:15	1458.2	1458.5	1458	1458	-1
138428	2018-01-04 15:19	1422.6	1423.5	1422.2	1423	1
138431	2018-01-04 15:22	1421.1	1421.8	1421.1	142 <sup>-</sup>	-1
138519	2018-01-05 10:14	1446.3	1446.5	1444.2	1444	1
138522	2018-01-05 10:17	1444.4	1444.5	1443.3	144	-1

### Methods

Topic

Basic

Methods

Triple barrier labeling

수익률을 내는 구간 샘플링 (t1: vertical barrier) & 예상 수익률 (trgt)

	Α	В	С	
1	t <b>1</b>	trgt	side 📭	
14355	2018-01-03 14:10	0.001389	1	
14358	2018-01-03 14:11	0.001356	-1	
14401	2018-01-03 14:55	0.000768	1	
14404	2018-01-03 14:58	0.000886	-1	
14456	2018-01-04 9:21	0.001251	1	
14459	2018-01-04 9:25	0.001477	-1	
14540	2018-01-04 11:15	0.000552	1	
14543	2018-01-04 11:16	0.000579	-1	
14653	2018-01-04 15:23	0.001595	1	
14656	2018-01-04 15:25	0.00148	-1	
14742	2018-01-05 10:15	0.0011	1	
14745	2018-01-05 10:20	0.001092	-1	
14809	2018-01-05 13:35	0.000881	1	
14812	2018-01-05 13:41	0.001022	-1	
15060	2018-01-08 13:41	0.001894	1	
15062	2018-01-08 13:54	0.001924	-1	
15229	2018-01-09 10:03	0.000642	1	

### Methods

Meta labeling

시그널에 따라 실제 수익률 계산했을 때, 수익률이 음수면 가짜 시그널(0), 양수면 진짜 시그널(1)로 표시.

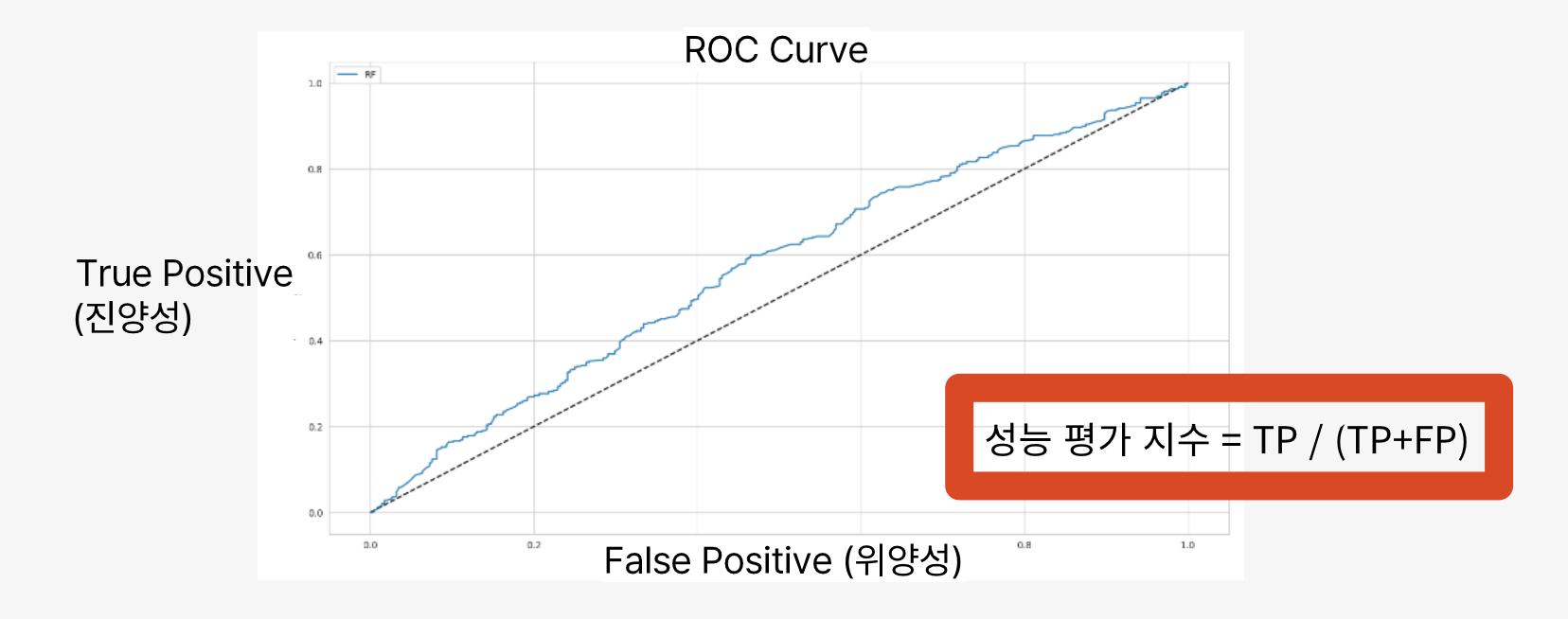
Methods

Topic

Basic

	Α	В	С	
1		ret 📭	bin	
14355	2018-01-03 14:07	0.002068	1	
14358	2018-01-03 14:10	-0.00296	0	
14401	2018-01-03 14:			
14404	2018-01-03 14:	0.001917	1	
14456	2018-01-04 9:			
14459	2018-01-04 9:23	-0.00157	0	
14540	2018-01-04 11:12	0.001098	1	
14543	2018-01-04 11:			
14653	2018-01-04 15:	-0.00225	0	
14656	2018-01-04 15:			
14742	2018-01-05 10:14	0.001177	1	
14745	2018-01-05 10:17	0.001246	1	
14809	2018-01-05 13:31	0.000893	1	
14812	2018-01-05 13:34	0.001099	1	
15060	2018-01-08 13:39	-0.00193	0	
15062	2018-01-08 13:41	-0.00227	0	
15229	2018-01-09 9:59	-0.00066	0	

### Result



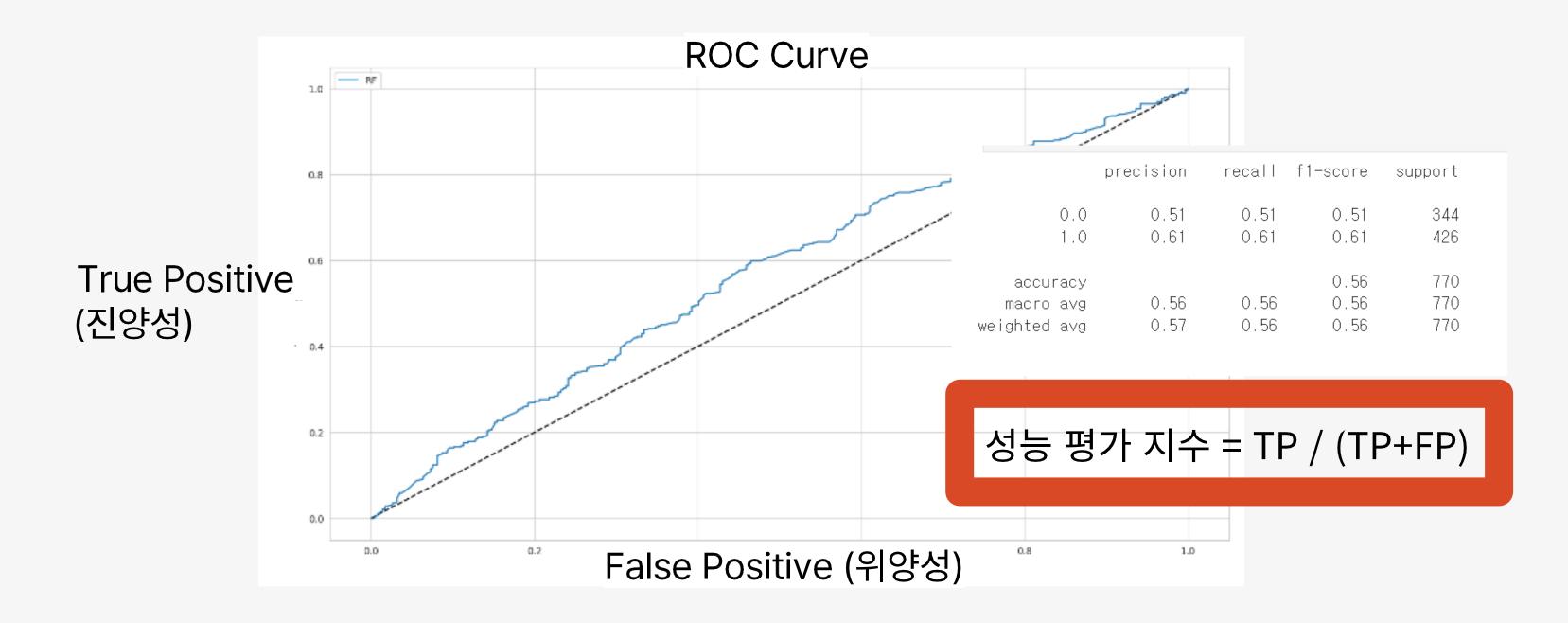
TP = True Positive = 수익률이 오를 것이라 예상해서 진입했을 때 실제로 오를 확률 FP = False Positive = 수익률이 오를 것이라 예상해서 진입했지만 실제로 내릴 확률

Result

Topic

Basic

### Result



TP = True Positive = 수익률이 오를 것이라 예상해서 진입했을 때 실제로 오를 확률 FP = False Positive = 수익률이 오를 것이라 예상해서 진입했지만 실제로 내릴 확률

Basic Concep

Topic

Result

# Thank You

CONTACT

john1408@yonsei.ac.kr