Combining Smart Factors Momentum and Market Portfolio

Markets Traded	equities		Backtest period from source paper	1993-2020
Confidence in anomaly's validity	Strong		Indicative Performance	11.91%
Notes to Confidence in Anomaly's Validity			Notes to Indicative Performance	data from Table 2
Period of Rebalancing	Monthly		Estimated Volatility	10.46%
Notes to Period of Rebalancing			Notes to Estimated Volatility	data from Table 2
Number of Traded Instruments	1500		Maximum Drawdown	-16.95%
Notes to Number of Traded Instruments	Top 1500 US stocks		Notes to Maximum drawdown	data from Table 2
Complexity Evaluation	Complex strategy		Sharpe Ratio	1.14
Notes to Complexity Evaluation			Region	Global, United States
Financial instruments	ETFs, stocks			

Combining Smart Factors Momentum and Market Portfolio

Universe
(코스피/코스닥)

| 삼성전자 |
| 하이닉스 |
| ... |

Month t, Factor n

Factor 전략에 따른 수익률

Asset Growth	$r_{1,t}$
Beta	$r_{2,t}$
Book/Price	$r_{3,t}$
CF/Price	
Debt Paydown Yield	
Dividend/Price	
...	
Volatility	$r_{n,t}$

1차 전략 도출

ret_slow
ret_dyn_slow
ret_fast
ret_dyn_fast
ret_neutral
ret_dyn_neutral
ret_blended
ret_dyn_blended

$$ret_{dyn.fast,t} = \sum_{j=1}^{n} r_{j,t} \times w_{fast,i} \cdot$$

최종 전략

1차 전략 + 시장지수 조합

$$ret_{combined,t} = ret_{fport,t} \times w_{fport,t} + ret_{market,t} \times w_{market,t}$$
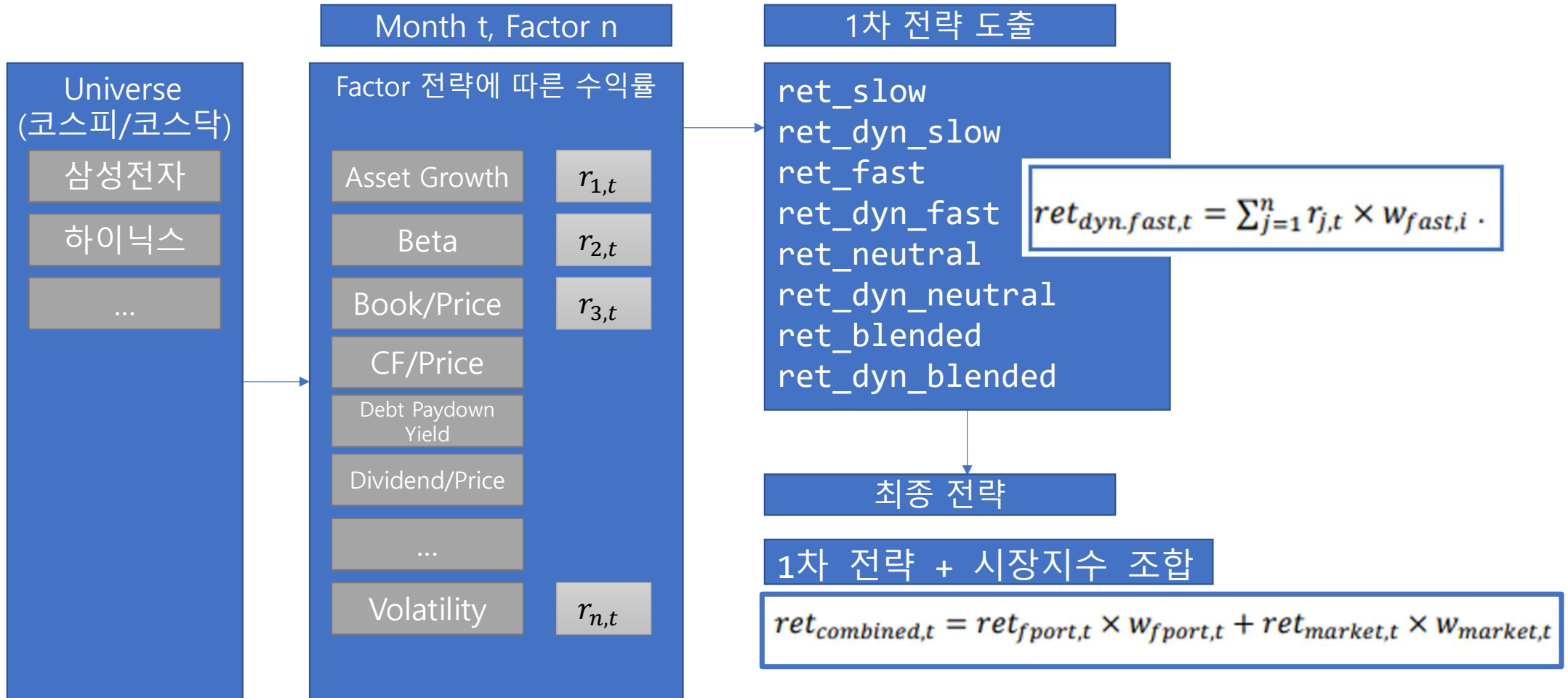
문제점

1) Factor 구성 어려움 → ETF 선정하여 ETF에 투자
2) 공매도 가능해야 포트폴리오 구성 가능
    → 공매도 제외한 전략으로 수정

Combining Smart Factors Momentum and Market Portfolio

1) ETF로 대체

Month t, Factor n → ETF로 대체

Universe (코스피/코스닥)

삼성전자

하이닉스

…

Factor 전략에 따른 수익률 (ETF)

종목코드		종목명	
314	322130	KINDEX 스마트로우볼	$r_{1,t}$
315	272220	KINDEX 스마트모멘텀	$r_{2,t}$
316	272230	KINDEX 스마트밸류	$r_{3,t}$
317	322120	KINDEX 스마트퀄리티	
318	322150	KINDEX 스마트하이베타	
213	244620	KODEX 모멘텀Plus	
231	244670	KODEX 밸류Plus	
249	244660	KODEX 퀄리티Plus	
161	217790	TIGER 가격조정	
204	279530	KODEX 고배당	
268	114800	KODEX 인버스	
253	069500	KODEX 200	$r_{n,t}$

1차 전략도출

ret_slow
ret_dyn_slow
ret_fast
ret_dyn_fast
ret_neutral
ret_dyn_neutral
ret_blended
ret_dyn_blended

[기존 1차 전략 상세]

$$ret_{slow,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \boxed{sign(s_{slow,j})} \,,$$

$$ret_{dyn.slow,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{slow,i}} \,,$$

$$ret_{fast,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \boxed{sign(s_{fast,j})} \,.$$

$$ret_{dyn.fast,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{fast,i}} \,.$$

$$ret_{neutral,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \frac{sign(s_{fast,j})+sign(s_{slow,j})}{2} = \frac{ret_{slow,t}+ret_{fast,t}}{2} \,.$$

$$ret_{dyn.neutral,t} = \sum_{j=1}^{n} r_{j,t} \times \left(\frac{1}{2}w_{fast,i} + \frac{1}{2}w_{slow,i}\right) \doteq \frac{1}{2}ret_{dyn,fast,t} + \frac{1}{2}ret_{dyn,slow,t}$$

$$ret_{blended,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \left(\frac{3}{4}sign(s_{fast,j}) + \frac{1}{4}sign(s_{slow,j})\right) \,.= \frac{3}{4}ret_{fast,t} + \frac{1}{4}ret_{slow,t}$$

$$ret_{dyn.blended,t} = \sum_{j=1}^{n} r_{j,t} \times \left(\frac{3}{4}w_{fast,i} + \frac{1}{4}w_{slow,i}\right) \doteq \frac{3}{4}ret_{dyn,fast,t} + \frac{1}{4}ret_{dyn,slow,t}$$

[참고: Weight]

$$w_{slow,i} = \frac{rank(s_{slow,i})}{\sum_j rank(s_{slow,j})} \times sign(s_{slow,i}) \,,$$

$$w_{fast,i} = \frac{rank(s_{fast,i})}{\sum_j rank(s_{fast,j})} \times sign(s_{fast,i}) \,.$$

$$s_{slow,i} = \left(\prod_{k=t-1}^{t-12} 1 + r_{i,k}\right) - 1 \,,$$

$$s_{fast,i} = r_{i,t-1} \,.$$

부호 음수 가능부분 (즉, 공매도 가능)

[1차 전략 수정(공매도 제한)]

$$ret_{slow,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \boxed{sign(s_{slow,j})} \;,\; \rightarrow ret_{slow,t} = \frac{1}{\#(S_{slow,j} \geq 0)}\sum_{j=1}^{n} r_{j,t} \times \boxed{\mathbf{1}_{s_{slow,j \geq 0}}}$$

$$ret_{dyn.slow,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{slow,i}} \;,\; \rightarrow ret_{dyn,slow,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{slow,i}}$$

$$ret_{fast,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \boxed{sign(s_{fast,j})} \;.\; \rightarrow ret_{fast,t} = \frac{1}{\#(S_{fast,j} \geq 0)}\sum_{j=1}^{n} r_{j,t} \times \boxed{\mathbf{1}_{s_{fast,j \geq 0}}}$$

$$ret_{dyn.fast,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{fast,i}} \;.\; \rightarrow ret_{dyn.fast,t} = \sum_{j=1}^{n} r_{j,t} \times \boxed{w_{fast,i}}$$

$$ret_{neutral,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \frac{sign(s_{fast,j})+sign(s_{slow,j})}{2} = \frac{ret_{slow,t}+ret_{fast,t}}{2} \; .$$

$$ret_{dyn.neutral,t} = \sum_{j=1}^{n} r_{j,t} \times \left(\frac{1}{2}w_{fast,i}+\frac{1}{2}w_{slow,i}\right) = \frac{1}{2}ret_{dyn,fast,t} + \frac{1}{2}ret_{dyn,slow,t}$$

$$ret_{blended,t} = \frac{1}{n}\sum_{j=1}^{n} r_{j,t} \times \left(\frac{3}{4}sign(s_{fast,j})+\frac{1}{4}sign(s_{slow,j})\right) \; . = \frac{3}{4}ret_{fast,t}+\frac{1}{4}ret_{slow,t}$$

$$ret_{dyn.blended,t} = \sum_{j=1}^{n} r_{j,t} \times \left(\frac{3}{4}w_{fast,i}+\frac{1}{4}w_{slow,i}\right) = \frac{3}{4}ret_{dyn,fast,t}+\frac{1}{4}ret_{dyn,slow,t}$$

[Weight 수정사항]

$$S_{slow,i,t} = \prod_{k=t-1}^{t-12}(1+r_{i,k}) - 1 \;\text{(기존 동일)}$$
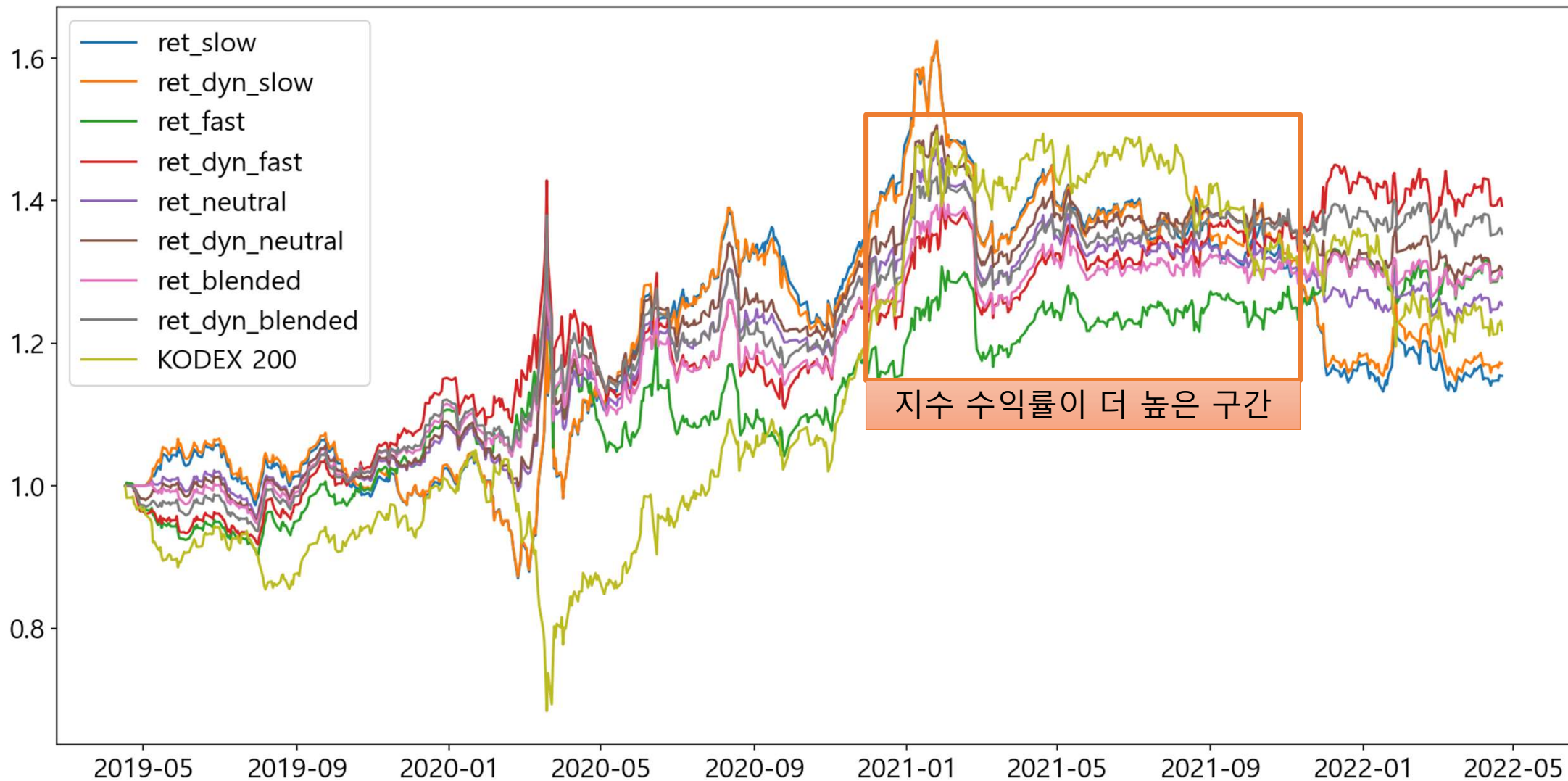
$$S_{fast,i,t} = r_{i,t-1} \;\text{(기존 동일)}$$

$$w_{slow,i,t} = \frac{rank_{s_{slow,i,t} \geq 0}(s_{slow,i,t})}{\sum_j rank_{s_{slow,j,t} \geq 0}(s_{slow,j,t})}$$

$$w_{fast,i,t} = \frac{rank_{s_{fast,j,t} \geq 0}(s_{fast,i,t})}{\sum_j rank_{s_{fast,j,t} \geq 0}(s_{fast,j,t})}$$

부호 음수 가능부분 (즉, 공매도 가능)

[1차 전략 수익률(공매도 제한)]

지수 수익률이 더 높은 구간

4. Combined strategy

$$w_{market,t} = \frac{1}{12}\sum_{j;MA_{market,j}>MA_{fport,j}} 1 \, , \tag{12}$$

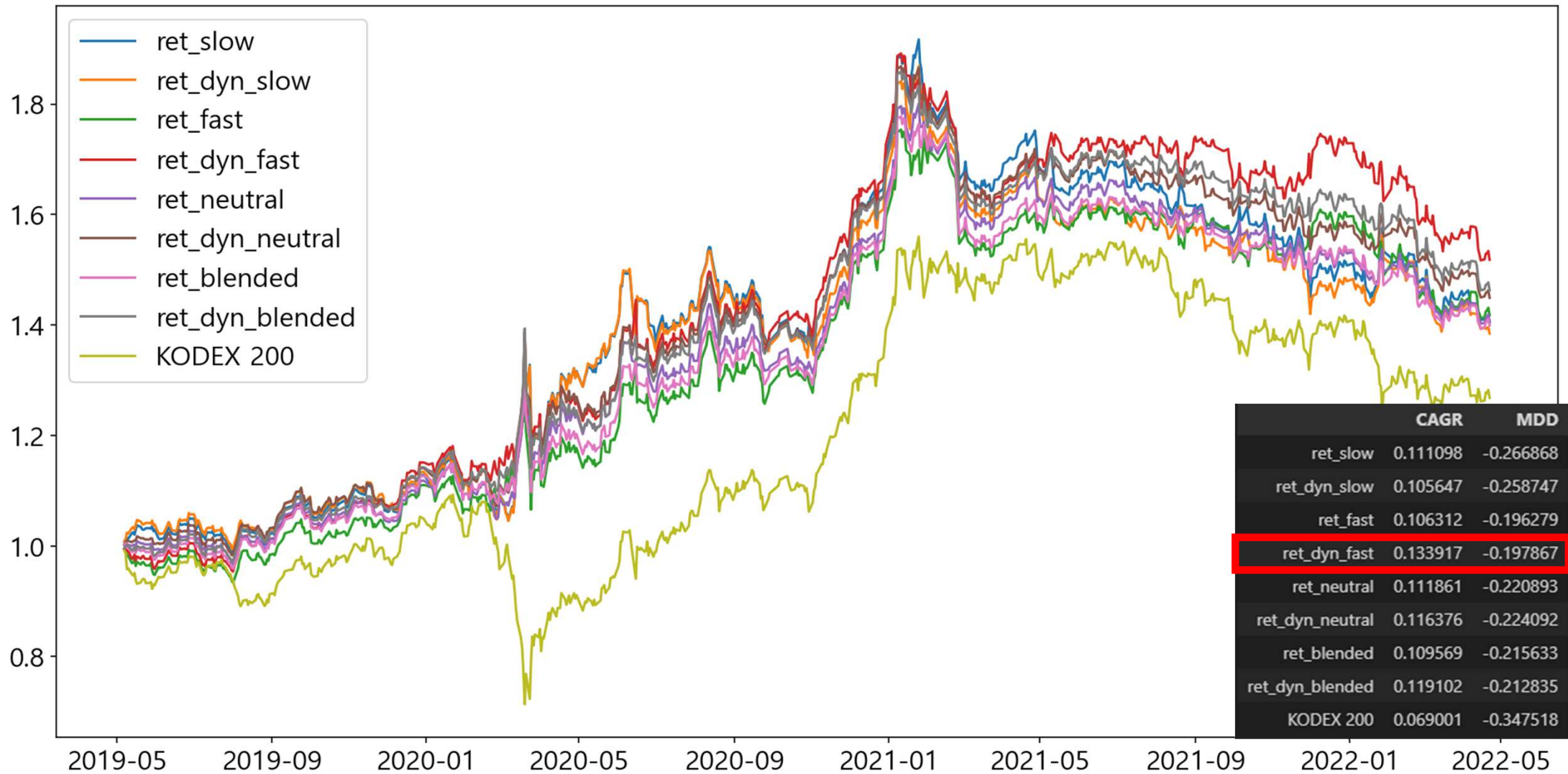$$w_{fport,t} = \frac{1}{12}\sum_{j;MA_{fport,j}>MA_{market,j}} 1 = 1 - w_{market,t} \, , \tag{13}$$

where $j = 1,2,3,\ldots,12$; $MA_{market,j} = \frac{1}{j}\sum_{k=1}^{j} ret_{market,t-k}$ and $MA_{fport,j} = \frac{1}{j}\sum_{k=1}^{j} ret_{fport,t-k}$.

Return of the combined portfolio at month t is equal to:

$$ret_{combined,t} = ret_{fport,t} \times w_{fport,t} + ret_{market,t} \times w_{market,t} \, . \tag{14}$$

통계 자료

[최종 전략 수익률(지수 + 1차전략, 공매도 제한)]

	CAGR	MDD
ret_slow	0.111098	-0.266868
ret_dyn_slow	0.105647	-0.258747
ret_fast	0.106312	-0.196279
ret_dyn_fast	0.133917	-0.197867
ret_neutral	0.111861	-0.220893
ret_dyn_neutral	0.116376	-0.224092
ret_blended	0.109569	-0.215633
ret_dyn_blended	0.119102	-0.212835
KODEX 200	0.069001	-0.347518

[MDD]

Drawdown Chart

	CAGR	MDD
ret_slow	0.111098	-0.266868
ret_dyn_slow	0.105647	-0.258747
ret_fast	0.106312	-0.196279
ret_dyn_fast	0.133917	-0.197867
ret_neutral	0.111861	-0.220893
ret_dyn_neutral	0.116376	-0.224092
ret_blended	0.109569	-0.215633
ret_dyn_blended	0.119102	-0.212835
KODEX 200	0.069001	-0.347518

Legend:
- ret_slow
- ret_dyn_slow
- ret_fast
- ret_dyn_fast
- ret_neutral
- ret_dyn_neutral
- ret_blended
- ret_dyn_blended
- KODEX 200
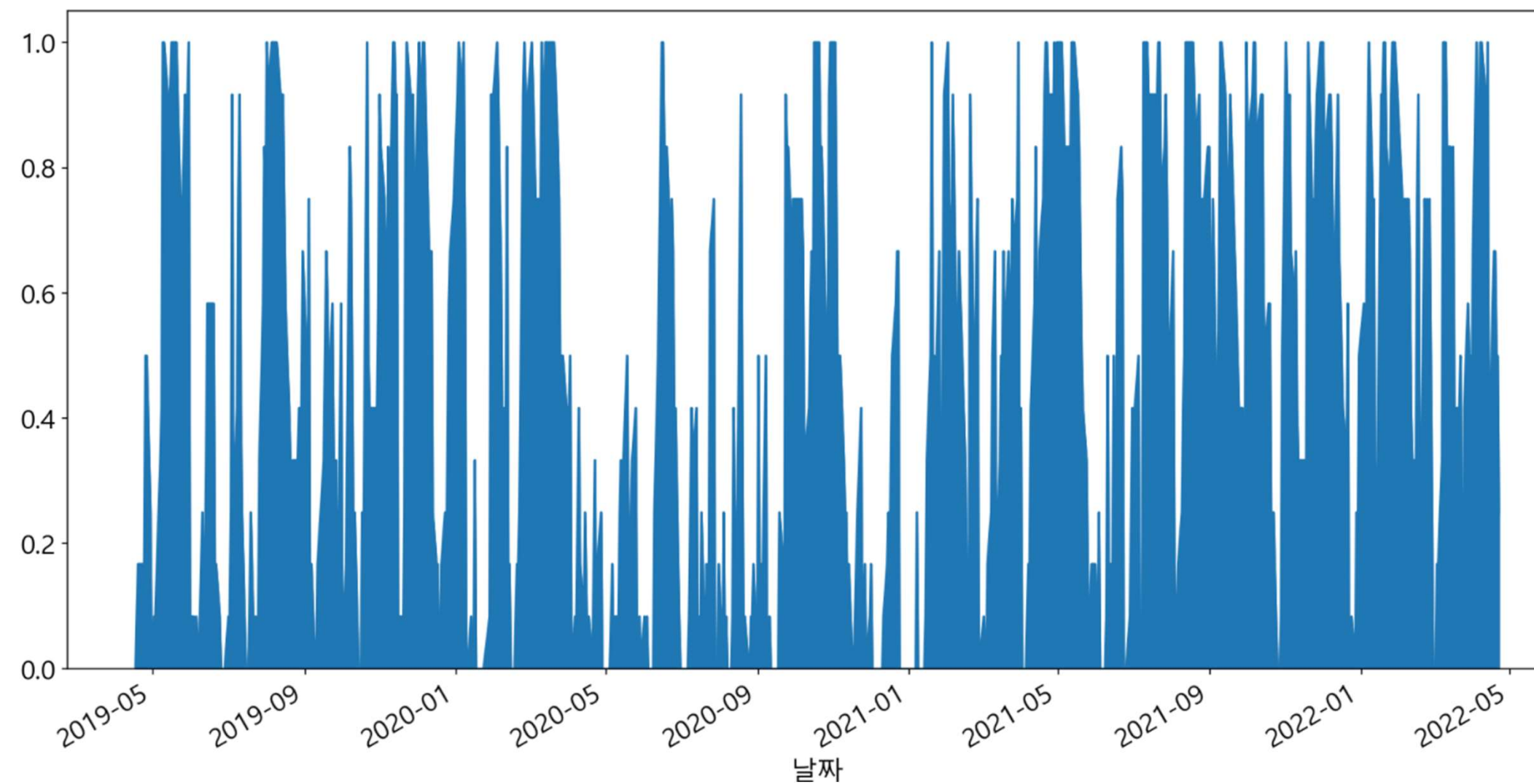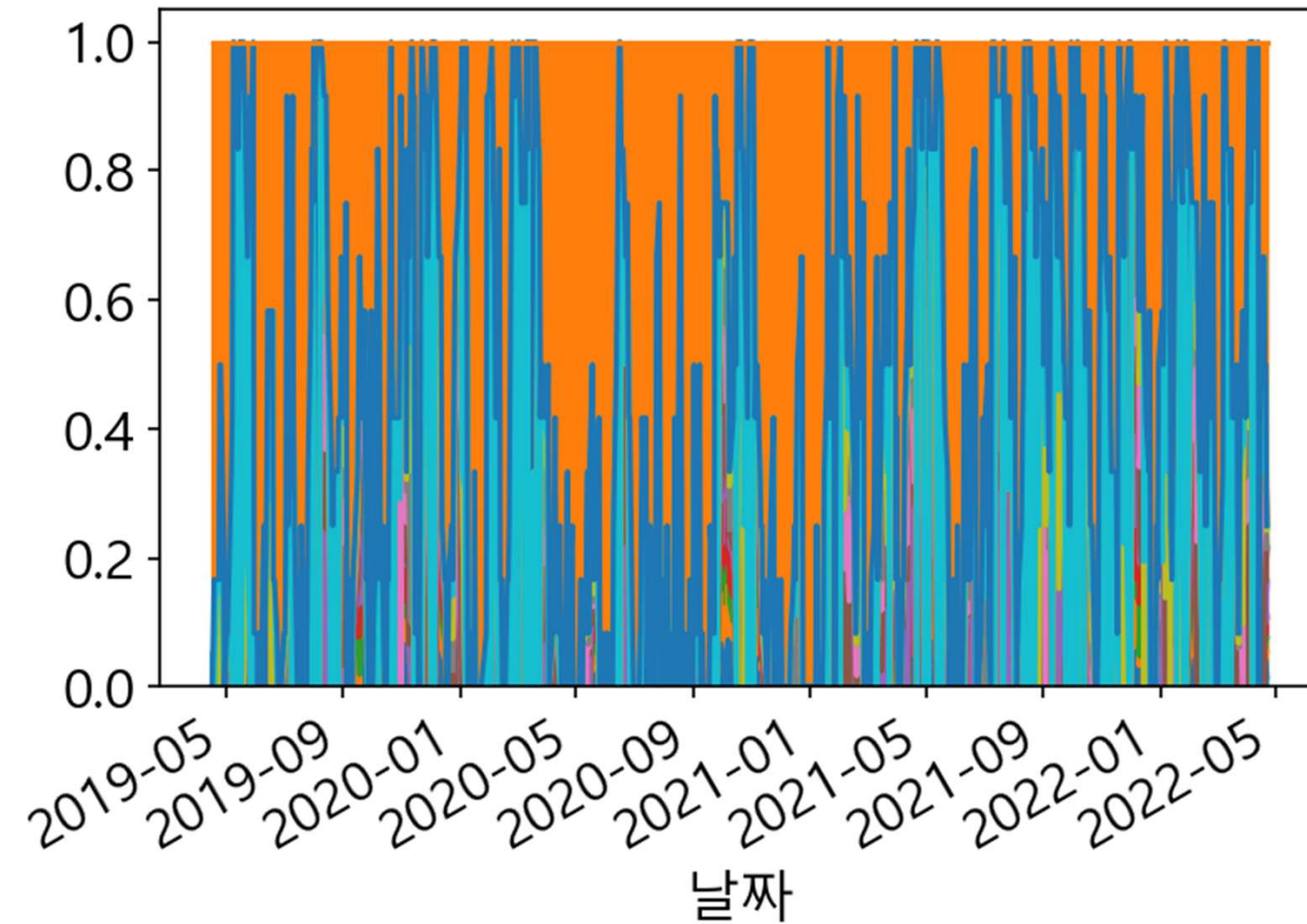
[1차전략 ↔ 지수 간 비중]

[최종 ETF별 비중(그래프)]

ETF별 비중

Legend:
- KINDEX 스마트로우볼
- KINDEX 스마트모멘텀
- KINDEX 스마트밸류
- KINDEX 스마트퀄리티
- KINDEX 스마트하이베타
- KODEX 모멘텀Plus
- KODEX 밸류Plus
- KODEX 퀄리티Plus
- TIGER 가격조정
- KODEX 고배당
- KODEX 인버스
- KODEX 200

날짜

[최종 ETF별 비중(표)]

날짜	KINDEX 스마트로우볼	KINDEX 스마트모멘텀	KINDEX 스마트밸류	KINDEX 스마트퀄리티	KINDEX 스마트하이베타	KODEX 모멘텀 Plus	KODEX 밸류 Plus	KODEX 퀄리티 Plus	TIGER 가격조정	KODEX 고배당	KODEX 인버스	KODEX 200
2019-04-17	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000
2019-04-18	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.055556	0.027778	0.916667
2019-04-19	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.166667	0.833333
2019-04-22	0.017857	0.005952	0.000000	0.029762	0.035714	0.011905	0.000000	0.041667	0.000000	0.023810	0.000000	0.833333
2019-04-23	0.000000	0.000000	0.000000	0.029762	0.023810	0.008929	0.041667	0.000000	0.035714	0.008929	0.017857	0.833333
...	...	...	...	...	...	...	...	...	...	...	...	...
2022-04-18	0.000000	0.000000	0.000000	0.000000	0.000000	0.111111	0.222222	0.000000	0.000000	0.000000	0.333333	0.333333
2022-04-19	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333	0.222222	0.000000	0.111111	0.000000	0.333333
2022-04-20	0.063636	0.081818	0.090909	0.054545	0.072727	0.045455	0.009091	0.018182	0.036364	0.027273	0.000000	0.500000
2022-04-21	0.045455	0.000000	0.027273	0.009091	0.018182	0.063636	0.090909	0.081818	0.072727	0.054545	0.036364	0.500000
2022-04-22	0.013889	0.041667	0.020833	0.034722	0.055556	0.048611	0.000000	0.000000	0.027778	0.006944	0.000000	0.750000

[공매도 제한 ↔ 가능 비교(표)]

[공매도 제한]

	CAGR	MDD
ret_slow	0.111098	-0.266868
ret_dyn_slow	0.105647	-0.258747
ret_fast	0.106312	-0.196279
ret_dyn_fast	0.133917	-0.197867
ret_neutral	0.111861	-0.220893
ret_dyn_neutral	0.116376	-0.224092
ret_blended	0.109569	-0.215633
ret_dyn_blended	0.119102	-0.212835
KODEX 200	0.069001	-0.347518

[공매도 가능]

	CAGR	MDD
ret_slow	0.134832	-0.279354
ret_dyn_slow	0.135136	-0.296964
ret_fast	0.231025	-0.179269
ret_dyn_fast	0.236067	-0.170268
ret_neutral	0.161503	-0.191690
ret_dyn_neutral	0.158564	-0.201924
ret_blended	0.199350	-0.156132
ret_dyn_blended	0.190881	-0.157722
KODEX 200	0.069001	-0.347518

[공매도 제한 ↔ 가능 비교(그래프)]

[공매도 제한(수익률)]

[공매도 가능(수익률)]