

ETF 均线站稳策略(日内) 5Min

一、策略基本信息

- 交易标的：各种 ETF
- 策略逻辑：
 - 5 分钟 bar 向上连续突破 MA：做多
 - 5 分钟 bar 向下突破 MA：做空
- 止损：ATR 动态止损
- 信号过滤：每日最多进行一次交易
- 数据来源：TinySoft，前赋权价格，数据期间为 2018.8.1-2020.8.1。

二、策略 Tb 代码

```
// MAHold 159915 创业板 ETF 的均线站稳策略(日内) 5Min
```

```
Params
```

```
Numeric MALength(10);  
Numeric LongHoldBars(3);  
Numeric ShortHoldBars(1);  
Numeric TrailStart1(2);  
Numeric TrailStop1(60);  
Numeric ATRK(3);  
Numeric ExitATRK(2);  
Numeric EntryLots(1);
```

```
Vars
```

```
NumericSeries TodayOpen;  
NumericSeries MA;  
NumericSeries AboveAvgCount;  
NumericSeries BelowAvgCount;  
NumericSeries UpperBand;  
NumericSeries LowerBand;  
NumericSeries TempHighest;  
NumericSeries TempLowest;  
NumericSeries ATRValue;  
NumericSeries TempHigh;  
NumericSeries TempLow;  
BoolSeries TradeTime;  
Numeric StopLine;
```

```
Begin
```

```
TodayOpen=OpenD(0);
```

```
TradeTime=Time>9.30/100 && Time<=14.0/100;
```

```

MA=Average((High+Low+Close)/3,MALength);
PlotNumeric("MA",MA,0,Blue);
ATRValue=AvgTrueRange(14);

If(BarStatus==0)
{
    AboveAvgCount=0;
    BelowAvgCount=0;
    UpperBand=99999;
    LowerBand=0;
}

If(Low>=MA)
AboveAvgCount=AboveAvgCount+1;
Else
AboveAvgCount=0;

If(High<=MA)
BelowAvgCount=BelowAvgCount+1;
Else
BelowAvgCount=0;

TempHighest=Highest(High,AboveAvgCount);
TempLowest=Lowest(Low,BelowAvgCount);

If(AboveAvgCount>=LongHoldBars)
UpperBand=TempHighest;
Else
UpperBand=99999;

If(BelowAvgCount>=ShortHoldBars)
LowerBand=TempLowest;
Else
LowerBand=0;

If(UpperBand<99999)
PlotNumeric("UpperBand",UpperBand);
If(LowerBand>0)
PlotNumeric("LowerBand",LowerBand);

If(MarketPosition!=1 && High>UpperBand[1] && High[1]<=UpperBand[1] && TradeTime)
Buy(EntryLots,Max(UpperBand[1],Open));

If(MarketPosition!=-1 && Low<LowerBand[1] && Low[1]>=LowerBand[1] && TradeTime)
SellShort(EntryLots,Min(LowerBand[1],Open));

TempHigh=Highest(High[1],BarsSinceEntry);
TempLow=Lowest(Low[1],BarsSinceEntry);

If(MarketPosition==1 && BarsSinceEntry>1)
{
    If(TradeTime)
    {
        If(TempHigh>LastEntryPrice*(1+TrailStart1*0.01))
        {
            StopLine=TempHigh-(TempHigh-LastEntryPrice)*TrailStop1*0.01;
            If(Low<StopLine)

```

```

        Sell(0,Min(StopLine,Open));
    }
    Else
    If(TempHigh<=LastEntryPrice*(1+TrailStart1*0.01))
    {
        StopLine=LastEntryPrice-ATR*ATRValue[1];
        If(Low<StopLine)
        Sell(0,Min(StopLine,Open));
    }
}
Else If(Time<=9.30/100 && Close[1]<LastEntryPrice)
{
    StopLine=Min(LastEntryPrice-ATR*ATRValue[1],TodayOpen-ExitATR*ATRValue[1]);
    If(Low<StopLine)
    Sell(EntryLots,Min(StopLine,Open));
}
}

If(MarketPosition== -1 && BarsSinceEntry>1)
{
    If(TradeTime)
    {
        If(TempLow<LastEntryPrice*(1-TrailStart1*0.01))
        {
            StopLine=TempLow+(LastEntryPrice-TempLow)*TrailStop1*0.01;
            If(High>StopLine)
            BuyToCover(0,Max(StopLine,Open));
        }
        Else
        If(TempLow>=LastEntryPrice*(1-TrailStart1*0.01))
        {
            StopLine=LastEntryPrice+ATR*ATRValue[1];
            If(High>StopLine)
            BuyToCover(0,Max(StopLine,Open));
        }
    }
}
Else If(Time<=9.30/100 && Close[1]>LastEntryPrice)
{
    StopLine=Max(LastEntryPrice+ATR*ATRValue[1],TodayOpen+ExitATR*ATRValue[1]);
    If(High>StopLine)
    BuyToCover(EntryLots,Max(StopLine,Open));
}
}

If(Time==14.55/100)
{
    If (MarketPosition==1)
    Sell(EntryLots,Open);
    If(MarketPosition== -1)
    BuyToCover(EntryLots,Open);
}

End

```

三、策略回测结果

所有策略回测期间为 20180801-20200810，共计 491 个交易日。

（一）ETF 回测结果（不同均线窗口长度）

选择部分指数、行业、主题 ETF 基金进行回测，手续费单边 2.5%，考虑交易滑点，取单边滑点 3.5%。均线窗口取 10、20、30 天以过滤信号。回测结果如下。

Table 1 回测使用的 ETF

	name	exchange	code		name	exchange	code
1	50ETF	SH	510710	10	H 股 ETF	SH	510900
2	300ETF	SH	510300	11	芯片 ETF	SZ	159995
3	500ETF	SH	510500	12	券商 ETF	SH	512000
4	创业 50	SZ	159949	13	银行 ETF	SH	512800
5	创业板	SZ	159915	14	5GETF	SH	515050
6	TMTETF	SH	512220	15	军工龙头	SH	512710
7	XFETF	SZ	159928	16	有色金属	SH	512400
8	军工 ETF	SH	512660	17	新能源车	SH	515030
9	证券 ETF	SH	512880	18	黄金 ETF	SH	518880

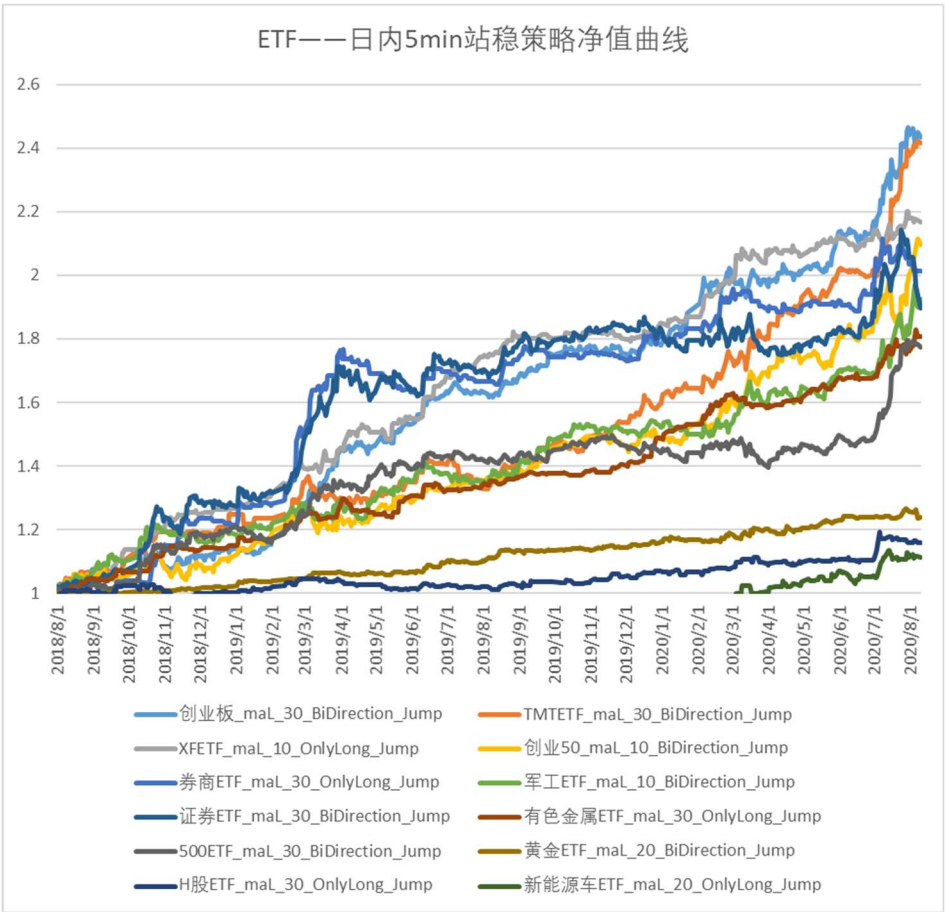


Figure 1 部分策略的策略净值

Figure 2 多空回测结果

	maLength	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总换仓次数
芯片ETF	10	102.53%	27.45%	3.73	6.17%	27.92%	124	125
芯片ETF	20	118.05%	26.17%	4.51	6.84%	25.74%	124	125
芯片ETF	30	110.52%	27.39%	4.04	9.80%	27.33%	124	125
TMTETF	10	48.85%	14.63%	3.34	9.68%	31.68%	490	411
TMTETF	20	53.33%	14.09%	3.78	6.17%	28.83%	490	402
TMTETF	30	54.64%	13.26%	4.12	6.94%	27.85%	490	393
新能源车ETF	10	104.46%	17.87%	5.84	4.67%	24.70%	107	107
新能源车ETF	20	92.46%	18.28%	5.06	4.20%	26.11%	107	104
新能源车ETF	30	89.03%	19.39%	4.59	4.15%	27.61%	107	104
创业50	10	44.09%	15.10%	2.92	7.95%	35.86%	491	477
创业50	20	40.97%	14.91%	2.75	8.02%	38.11%	491	483
创业50	30	39.47%	15.36%	2.57	8.62%	39.15%	491	478
创业板	10	49.38%	13.50%	3.66	5.24%	33.81%	491	492
创业板	20	46.05%	14.14%	3.26	5.25%	35.76%	491	492
创业板	30	55.11%	13.02%	4.23	5.61%	31.15%	491	490
军工龙头ETF	10	60.27%	17.37%	3.47	3.99%	33.88%	230	230
军工龙头ETF	20	60.00%	18.44%	3.25	4.90%	33.89%	230	229
军工龙头ETF	30	57.48%	18.30%	3.14	6.79%	34.74%	230	228
消费ETF	10	31.41%	13.70%	2.29	6.57%	49.37%	491	490
消费ETF	20	39.07%	12.91%	3.03	7.02%	43.18%	491	489
消费ETF	30	34.81%	13.33%	2.61	5.35%	46.53%	491	483
黄金ETF	10	10.79%	4.76%	2.27	2.93%	74.14%	491	458
黄金ETF	20	11.16%	4.56%	2.45	2.20%	73.04%	491	449
黄金ETF	30	14.44%	4.37%	3.31	1.93%	66.65%	491	436
300ETF	10	28.20%	11.41%	2.47	5.60%	48.65%	491	492
300ETF	20	28.25%	11.48%	2.46	5.78%	48.87%	491	491
300ETF	30	29.71%	11.36%	2.62	5.59%	47.44%	491	488
500ETF	10	25.75%	13.10%	1.97	7.12%	49.40%	491	492
500ETF	20	28.22%	12.58%	2.24	10.32%	46.87%	491	490
500ETF	30	32.71%	12.13%	2.70	6.59%	42.93%	491	489
50ETF	10	27.52%	10.25%	2.69	5.03%	50.30%	491	492
50ETF	20	31.68%	10.21%	3.10	4.16%	46.61%	491	491
50ETF	30	29.62%	10.50%	2.82	5.41%	48.43%	491	486
5GETF	10	36.01%	24.42%	1.47	16.67%	48.49%	200	200
5GETF	20	41.41%	24.66%	1.68	11.51%	44.99%	200	199
5GETF	30	15.54%	27.79%	0.56	20.05%	68.21%	200	199
军工ETF	10	38.11%	14.48%	2.63	5.36%	38.89%	491	475
军工ETF	20	33.70%	14.50%	2.32	7.08%	42.54%	491	477
军工ETF	30	32.08%	14.52%	2.21	9.76%	44.10%	491	476
券商ETF	10	35.01%	17.92%	1.95	10.23%	45.41%	491	483
券商ETF	20	37.10%	16.27%	2.28	11.23%	44.06%	491	485
券商ETF	30	35.72%	15.72%	2.27	11.73%	45.13%	491	483
银行ETF	10	24.43%	9.36%	2.61	3.56%	51.95%	491	478
银行ETF	20	24.37%	9.50%	2.56	5.30%	52.17%	491	476
银行ETF	30	23.11%	9.61%	2.40	4.14%	53.79%	491	475
有色金属ETF	10	30.07%	10.38%	2.90	4.32%	42.34%	491	486
有色金属ETF	20	32.13%	10.22%	3.14	6.05%	40.68%	491	484
有色金属ETF	30	32.30%	10.52%	3.07	5.98%	40.32%	491	480
证券ETF	10	27.81%	18.45%	1.51	11.96%	52.18%	491	487
证券ETF	20	36.25%	16.59%	2.19	9.20%	44.71%	491	486
证券ETF	30	37.11%	16.39%	2.26	11.43%	43.90%	491	480
H股ETF	10	25.17%	7.33%	3.43	2.50%	49.38%	491	478
H股ETF	20	23.57%	7.62%	3.09	3.07%	51.58%	491	481
H股ETF	30	23.48%	7.64%	3.07	3.35%	51.12%	491	471

Figure 3 多头回测结果

	maLength	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总换仓次数
芯片ETF	10	112.34%	23.05%	4.87	8.06%	20.50%	123	87
芯片ETF	20	96.56%	22.80%	4.24	5.75%	22.78%	123	88
芯片ETF	30	75.91%	23.38%	3.25	8.24%	25.15%	123	82
TMTETF	10	44.56%	11.65%	3.82	7.63%	26.60%	485	274
TMTETF	20	42.84%	10.68%	4.01	6.95%	25.87%	485	252
TMTETF	30	44.97%	10.20%	4.41	5.65%	23.57%	485	235
新能源车ETF	10	25.77%	13.13%	1.96	6.20%	44.79%	106	74
新能源车ETF	20	28.33%	12.33%	2.30	3.57%	39.56%	106	65
新能源车ETF	30	22.72%	12.62%	1.80	4.34%	43.88%	106	63
创业50	10	41.62%	12.66%	3.29	6.84%	28.31%	490	284
创业50	20	40.88%	12.77%	3.20	5.47%	29.40%	487	288
创业50	30	43.68%	12.26%	3.56	5.23%	26.24%	487	268
创业板	10	40.55%	11.57%	3.51	5.29%	32.48%	490	341
创业板	20	40.97%	11.92%	3.44	6.07%	32.23%	487	329
创业板	30	41.27%	11.24%	3.67	5.39%	30.65%	487	308
军工龙头ETF	10	39.28%	16.44%	2.39	5.18%	36.65%	230	169
军工龙头ETF	20	42.89%	16.16%	2.65	5.25%	33.28%	230	160
军工龙头ETF	30	41.00%	16.10%	2.55	5.36%	32.73%	230	148
消费ETF	10	46.59%	10.26%	4.54	3.06%	32.15%	489	352
消费ETF	20	43.43%	10.39%	4.18	4.23%	32.89%	489	335
消费ETF	30	42.94%	10.16%	4.23	3.37%	31.59%	489	312
黄金ETF	10	3.28%	3.86%	0.85	2.36%	84.97%	491	259
黄金ETF	20	5.15%	3.96%	1.30	2.28%	78.68%	491	271
黄金ETF	30	5.01%	3.79%	1.32	2.29%	77.69%	491	250
300ETF	10	19.88%	10.58%	1.88	6.06%	52.24%	487	353
300ETF	20	19.83%	10.41%	1.90	5.81%	50.72%	487	331
300ETF	30	21.96%	9.91%	2.22	5.07%	45.86%	487	304
500ETF	10	30.56%	9.95%	3.07	4.07%	38.98%	490	363
500ETF	20	27.06%	9.74%	2.78	6.00%	41.03%	489	344
500ETF	30	28.51%	9.50%	3.00	4.19%	38.32%	489	325
50ETF	10	16.48%	9.77%	1.69	6.11%	59.53%	490	377
50ETF	20	21.12%	9.26%	2.28	4.82%	49.27%	487	326
50ETF	30	20.68%	9.15%	2.26	6.17%	47.25%	487	294
5GETF	10	69.71%	16.63%	4.19	3.76%	26.50%	198	140
5GETF	20	46.20%	17.08%	2.71	6.13%	34.30%	198	137
5GETF	30	28.18%	17.78%	1.59	8.86%	45.25%	198	134
军工ETF	10	32.85%	13.24%	2.48	6.65%	34.16%	490	293
军工ETF	20	26.73%	13.78%	1.94	7.42%	39.64%	487	287
军工ETF	30	27.85%	13.57%	2.05	7.58%	37.62%	487	275
券商ETF	10	36.42%	16.68%	2.18	10.61%	31.80%	490	260
券商ETF	20	37.67%	15.65%	2.41	10.06%	31.57%	487	265
券商ETF	30	41.33%	15.10%	2.74	8.03%	27.34%	489	242
银行ETF	10	20.82%	8.32%	2.50	4.34%	42.90%	488	260
银行ETF	20	18.72%	8.53%	2.19	3.57%	45.91%	489	262
银行ETF	30	19.98%	8.41%	2.38	4.37%	43.29%	489	254
有色金属ETF	10	27.94%	9.02%	3.10	4.47%	34.10%	490	293
有色金属ETF	20	31.25%	8.72%	3.58	4.63%	30.61%	489	283
有色金属ETF	30	33.97%	8.52%	3.99	4.46%	26.81%	489	258
证券ETF	10	35.34%	16.06%	2.20	11.88%	33.31%	488	264
证券ETF	20	28.26%	16.53%	1.71	12.83%	39.77%	488	270
证券ETF	30	33.21%	15.57%	2.13	9.15%	33.06%	489	246
H股ETF	10	7.43%	6.65%	1.12	3.39%	68.02%	489	272
H股ETF	20	7.42%	6.97%	1.06	4.74%	69.05%	489	285
H股ETF	30	7.60%	6.95%	1.09	4.23%	66.76%	489	263

根据回测结果可知，多空策略中，芯片、TMT ETF、军工龙头、创业板、创业 50 的表现较好。纯多头策略中芯片、TMT、创业板、创业 50 表现依旧强劲，且收益率与多空策略相比差距不大。但新能源车 ETF 若仅做多头，则年化收益率从超过 100%下跌至 25%左右，H 股 ETF 不做空后收益率也显著下跌。而 5GETF 在多空策略中表现平平，但在纯多策略中，当 maLength=10 时，年化收益率达到 69%。maLength 参数取值对不同策略的影响也不同，ma 越长，信号发出次数越少，但减少幅度有限，多空策略基本上每日均有换仓。若后续希望进一步筛选信号则需要考虑其他方式。

(二) LongHoldBars 参数测试

当有 LongHoldBars 个 Bar 突破 MA 时，策略做多。因此测试不同 LongHoldBars 参数下的回测效果。以下为所有回测结果总结。

参数	参数值
多空方向	多空(BiDirection), 纯多(OnlyLong)
maLength	10, 20, 30
LongHoldBars	2, 3, 4, 5, 6

1. 各 ETF 平均水平

行标签	平均值项:年化收益	平均值项:收益波动比	平均值项:最大回撤	平均值项:Calmar Ratio
300ETF	0.237291965	2.203100605	0.058196688	4.208775398
500ETF	0.261160717	2.39015281	0.069417564	4.107414186
50ETF	0.252642089	2.609297934	0.046909931	5.583259172
5GETF	0.46613229	2.568781527	0.099633063	7.365001737
H股ETF	0.15786615	2.16632352	0.039075637	4.803704351
TMTETF	0.468368927	3.885082491	0.068078973	7.137077181
XFETF	0.353740683	3.153780512	0.053366272	7.627690286
创业50	0.380235352	2.783534131	0.072631961	5.662874773
创业板	0.433755738	3.4763004	0.056210391	7.856720835
黄金ETF	0.086492469	2.006620197	0.021991543	4.069971472
军工ETF	0.332583025	2.467976548	0.067596868	5.228883611
军工龙头ETF	0.529330638	3.206798556	0.051153312	10.9573012
券商ETF	0.375418872	2.381018205	0.085110128	4.741343762
芯片ETF	0.853349556	3.399381707	0.078678249	11.51783578
新能源车ETF	0.536885886	3.141660972	0.041381255	13.86554316
银行ETF	0.207120584	2.377373429	0.041083638	5.165509779
有色金属ETF	0.294909735	3.201673574	0.044793407	6.931372734
证券ETF	0.330134683	2.045271756	0.090574803	4.018833285
总计	0.364301076	2.74800716	0.060326871	6.713839595

Figure 4 各 ETF 回测平均水平

利用数据透视表汇总各 ETF 在多组参数下的平均水平。从整体水平来看，芯片、新能源车、军工龙头、创业板 ETF、TMT ETF、5G ETF 的年化收益水平位居前列，其中 TMT、军工龙头和芯片 ETF 的收益波动比均高于 3，calmar ratio 水平也位居前列。黄金 ETF 的最大回撤仅有 2.20%，但年化收益平均水平仅有 8%。

各项指标均表现较好的 ETF 为：芯片 ETF、TMT ETF、创业板 ETF、军工龙头 ETF、新能源车 ETF。

2. 具体参数测试

由回测结果看，各 ETF 的最佳参数选择差异较大。以 300ETF 和 TMT ETF 为例。

Figure 5 300ETF 回测结果

ETF	maLength	多空方向	LongBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓数	Calmar Ratio
300ETF	10	BiDirection	2	31.89%	11.13%	2.87	4.51%	45.17%	491	492	7.07
300ETF	10	BiDirection	3	28.20%	11.41%	2.47	5.60%	48.65%	491	492	5.04
300ETF	10	BiDirection	4	25.61%	11.54%	2.22	6.55%	51.24%	491	490	3.91
300ETF	10	BiDirection	5	25.39%	11.56%	2.20	5.17%	51.42%	491	489	4.91
300ETF	10	BiDirection	6	26.67%	11.41%	2.34	5.28%	50.05%	491	489	5.05
300ETF	10	OnlyLong	2	21.75%	10.80%	2.01	6.55%	52.55%	489	396	3.32
300ETF	10	OnlyLong	3	19.88%	10.58%	1.88	6.06%	52.24%	487	353	3.28
300ETF	10	OnlyLong	4	19.72%	10.12%	1.95	6.88%	49.01%	487	307	2.87
300ETF	10	OnlyLong	5	22.23%	9.36%	2.38	4.38%	41.54%	487	259	5.07
300ETF	10	OnlyLong	6	21.22%	8.94%	2.37	4.22%	38.42%	487	216	5.03
300ETF	20	BiDirection	2	28.24%	11.57%	2.44	6.87%	48.91%	491	492	4.11
300ETF	20	BiDirection	3	28.25%	11.48%	2.46	5.78%	48.87%	491	491	4.88
300ETF	20	BiDirection	4	27.04%	11.47%	2.36	6.45%	50.04%	491	490	4.19
300ETF	20	BiDirection	5	26.16%	11.53%	2.27	6.77%	50.92%	491	489	3.86
300ETF	20	BiDirection	6	25.36%	11.54%	2.20	6.18%	51.78%	491	489	4.11
300ETF	20	OnlyLong	2	16.57%	11.21%	1.48	9.59%	58.58%	487	375	1.73
300ETF	20	OnlyLong	3	19.83%	10.41%	1.90	5.81%	50.72%	487	331	3.42
300ETF	20	OnlyLong	4	18.27%	10.23%	1.79	5.93%	50.72%	487	302	3.08
300ETF	20	OnlyLong	5	16.82%	10.17%	1.65	6.01%	50.67%	487	276	2.80
300ETF	20	OnlyLong	6	18.71%	9.69%	1.93	4.90%	44.94%	487	246	3.82
300ETF	30	BiDirection	2	30.39%	11.37%	2.67	5.44%	46.86%	491	489	5.58
300ETF	30	BiDirection	3	29.71%	11.36%	2.62	5.59%	47.44%	491	488	5.32
300ETF	30	BiDirection	4	28.72%	11.20%	2.56	5.39%	48.34%	491	487	5.33
300ETF	30	BiDirection	5	28.22%	11.16%	2.53	5.34%	48.85%	491	487	5.29
300ETF	30	BiDirection	6	27.12%	11.19%	2.42	5.61%	49.80%	491	484	4.84
300ETF	30	OnlyLong	2	20.35%	10.51%	1.94	6.97%	50.41%	487	336	2.92
300ETF	30	OnlyLong	3	21.96%	9.91%	2.22	5.07%	45.86%	487	304	4.33
300ETF	30	OnlyLong	4	19.67%	9.79%	2.01	5.28%	46.59%	487	277	3.72
300ETF	30	OnlyLong	5	19.77%	9.56%	2.07	4.69%	44.72%	487	259	4.22
300ETF	30	OnlyLong	6	18.18%	9.56%	1.90	5.72%	45.50%	487	244	3.18

Figure 6 TMT ETF 回测结果

ETF	maLength	多空方向	LongBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓数	Calmar Ratio
TMTETF	10	BiDirection	2	48.51%	14.91%	3.25	9.76%	31.82%	490	412	4.97
TMTETF	10	BiDirection	3	48.85%	14.63%	3.34	9.68%	31.68%	490	411	5.05
TMTETF	10	BiDirection	4	49.46%	14.27%	3.47	8.78%	31.22%	490	408	5.64
TMTETF	10	BiDirection	5	48.50%	14.08%	3.44	7.75%	31.50%	490	403	6.26
TMTETF	10	BiDirection	6	45.30%	13.93%	3.25	7.72%	33.07%	490	399	5.87
TMTETF	10	OnlyLong	2	44.51%	12.71%	3.50	10.34%	27.65%	490	296	4.31
TMTETF	10	OnlyLong	3	44.56%	11.65%	3.82	7.63%	26.60%	485	274	5.84
TMTETF	10	OnlyLong	4	44.63%	11.18%	3.99	6.61%	24.85%	485	251	6.75
TMTETF	10	OnlyLong	5	39.86%	10.68%	3.73	6.61%	25.40%	485	226	6.03
TMTETF	10	OnlyLong	6	33.53%	9.96%	3.36	4.83%	27.49%	485	206	6.94
TMTETF	20	BiDirection	2	52.44%	14.43%	3.63	6.18%	29.35%	490	403	8.49
TMTETF	20	BiDirection	3	53.33%	14.09%	3.78	6.17%	28.83%	490	402	8.65
TMTETF	20	BiDirection	4	55.73%	13.56%	4.11	6.09%	27.52%	490	397	9.15
TMTETF	20	BiDirection	5	56.01%	13.30%	4.21	6.09%	27.07%	490	390	9.19
TMTETF	20	BiDirection	6	52.76%	13.36%	3.95	6.09%	28.30%	490	386	8.66
TMTETF	20	OnlyLong	2	43.74%	11.71%	3.74	8.53%	25.82%	490	264	5.13
TMTETF	20	OnlyLong	3	42.84%	10.68%	4.01	6.95%	25.87%	485	252	6.17
TMTETF	20	OnlyLong	4	42.89%	10.08%	4.26	5.60%	23.81%	485	226	7.66
TMTETF	20	OnlyLong	5	41.48%	9.60%	4.32	5.60%	22.97%	485	207	7.40
TMTETF	20	OnlyLong	6	37.13%	9.33%	3.98	5.60%	24.20%	485	195	6.63
TMTETF	30	BiDirection	2	55.31%	13.45%	4.11	7.41%	27.70%	490	395	7.46
TMTETF	30	BiDirection	3	54.64%	13.26%	4.12	6.94%	27.85%	490	393	7.87
TMTETF	30	BiDirection	4	55.84%	12.90%	4.33	5.85%	27.07%	490	388	9.55
TMTETF	30	BiDirection	5	54.63%	12.85%	4.25	5.18%	27.36%	490	383	10.55
TMTETF	30	BiDirection	6	52.97%	12.74%	4.16	5.27%	27.69%	490	375	10.05
TMTETF	30	OnlyLong	2	44.20%	11.45%	3.86	8.39%	24.77%	490	252	5.27
TMTETF	30	OnlyLong	3	44.97%	10.20%	4.41	5.65%	23.57%	485	235	7.96
TMTETF	30	OnlyLong	4	41.49%	9.83%	4.22	5.65%	23.77%	485	216	7.35
TMTETF	30	OnlyLong	5	39.28%	9.60%	4.09	5.65%	23.72%	485	202	6.95
TMTETF	30	OnlyLong	6	35.73%	9.28%	3.85	5.63%	24.60%	485	190	6.35

分别取每个基金空头和多头的年化收益最高的参数组合, 可以看出各个基金的最优参数组合差别较大。在 36 个最优策略组合中, 各参数出现的频数如下:

malength	频数
10	16
20	12
30	8

LongBars	频数
2	23
3	5
4	2
5	4
6	2

ETF	maLength	多空方向	LongBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总换仓次数	Calmar Rat
300ETF	10	BiDirection	2	31.89%	11.13%	2.87	4.51%	45.17%	491	492	7.07
创业50	10	BiDirection	2	47.42%	15.44%	3.07	7.40%	34.05%	491	481	6.41
军工龙头ETF	10	BiDirection	2	72.30%	16.91%	4.27	4.39%	30.50%	231	231	16.49
券商ETF	10	BiDirection	2	46.82%	16.91%	2.77	6.63%	37.35%	491	487	7.06
新能源车ETF	10	BiDirection	3	104.46%	17.87%	5.84	4.67%	24.70%	107	107	22.38
H股ETF	10	BiDirection	5	27.50%	7.31%	3.76	2.98%	46.33%	491	467	9.22
5GETF	20	BiDirection	2	61.31%	23.60%	2.60	11.10%	35.89%	200	199	5.52
XFETF	20	BiDirection	2	40.76%	12.93%	3.15	6.68%	42.03%	491	490	6.10
银行ETF	20	BiDirection	2	28.96%	9.22%	3.14	5.00%	47.70%	491	483	5.79
证券ETF	20	BiDirection	2	42.16%	16.49%	2.56	7.30%	40.45%	491	487	5.77
芯片ETF	20	BiDirection	3	118.05%	26.17%	4.51	6.84%	25.74%	124	125	17.25
50ETF	20	BiDirection	4	32.32%	10.06%	3.21	3.89%	46.04%	491	491	8.30
TMTETF	20	BiDirection	5	56.01%	13.30%	4.21	6.09%	27.07%	490	390	9.19
军工ETF	20	BiDirection	6	41.54%	13.36%	3.11	7.39%	36.24%	491	467	5.62
500ETF	30	BiDirection	2	32.88%	12.38%	2.66	6.47%	42.83%	491	490	5.08
创业板	30	BiDirection	2	55.16%	13.68%	4.03	5.50%	31.12%	491	490	10.04
有色金属ETF	30	BiDirection	2	34.70%	10.40%	3.34	5.47%	38.55%	491	484	6.34
黄金ETF	30	BiDirection	4	14.93%	4.48%	3.33	1.91%	65.52%	491	430	7.81
5GETF	10	OnlyLong	2	89.72%	17.10%	5.25	3.88%	25.41%	198	169	23.13
XFETF	10	OnlyLong	2	49.60%	10.81%	4.59	3.34%	33.29%	489	402	14.83
券商ETF	10	OnlyLong	2	48.56%	16.31%	2.98	6.06%	28.73%	490	315	8.01
芯片ETF	10	OnlyLong	2	137.14%	24.43%	5.61	7.85%	20.16%	123	102	17.46
新能源车ETF	10	OnlyLong	2	28.42%	14.46%	1.96	4.31%	46.63%	106	88	6.60
银行ETF	10	OnlyLong	2	25.58%	8.73%	2.93	4.42%	41.66%	489	310	5.79
500ETF	10	OnlyLong	3	30.56%	9.95%	3.07	4.07%	38.98%	490	363	7.51
TMTETF	10	OnlyLong	3	44.56%	11.65%	3.82	7.63%	26.60%	485	274	5.84
300ETF	10	OnlyLong	5	22.23%	9.36%	2.38	4.38%	41.54%	487	259	5.07
黄金ETF	10	OnlyLong	6	5.62%	2.79%	2.01	1.54%	64.68%	478	139	3.65
创业50	20	OnlyLong	2	47.63%	13.03%	3.66	5.06%	27.55%	489	321	9.41
创业板	20	OnlyLong	2	43.70%	12.85%	3.40	6.55%	32.81%	487	359	6.68
军工龙头ETF	20	OnlyLong	2	55.16%	16.35%	3.37	5.46%	30.75%	231	179	10.09
50ETF	20	OnlyLong	3	21.12%	9.26%	2.28	4.82%	49.27%	487	326	4.38
H股ETF	30	OnlyLong	2	9.07%	7.08%	1.28	5.23%	64.80%	489	290	1.73
有色金属ETF	30	OnlyLong	2	35.93%	8.65%	4.15	4.45%	28.38%	489	298	8.08
证券ETF	30	OnlyLong	2	43.55%	15.54%	2.80	4.74%	28.35%	489	271	9.18
军工ETF	30	OnlyLong	5	35.16%	11.36%	3.09	4.40%	27.12%	487	221	7.99

Figure 5 最优组合表现详情

3. 年化收益排名前 50 的回测结果

收益排名	ETF	maLength	多空方向	LongBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓次数	Calmar Ratio
1	芯片ETF	10	OnlyLong	2	137.14%	24.43%	5.61	7.85%	20.16%	123	102	17.46
2	芯片ETF	20	OnlyLong	2	119.82%	23.34%	5.13	5.68%	20.83%	123	95	21.10
3	芯片ETF	20	BiDirection	3	118.05%	26.17%	4.51	6.84%	25.74%	124	125	17.25
4	芯片ETF	20	BiDirection	2	117.15%	26.93%	4.35	6.50%	25.86%	124	125	18.03
5	芯片ETF	10	OnlyLong	3	112.34%	23.05%	4.87	8.06%	20.50%	123	87	13.95
6	芯片ETF	30	BiDirection	3	110.52%	27.39%	4.04	9.80%	27.33%	124	125	11.28
7	芯片ETF	30	BiDirection	2	110.22%	28.53%	3.86	8.86%	27.37%	124	125	12.44
8	新能源车ETF	10	BiDirection	3	104.46%	17.87%	5.84	4.67%	24.70%	107	107	22.38
9	新能源车ETF	10	BiDirection	6	103.86%	17.04%	6.09	2.88%	24.09%	107	103	36.01
10	芯片ETF	10	BiDirection	3	102.53%	27.45%	3.73	6.17%	27.92%	124	125	16.63
11	芯片ETF	30	OnlyLong	2	102.29%	23.89%	4.28	6.12%	22.16%	123	90	16.72
12	新能源车ETF	10	BiDirection	2	97.89%	18.45%	5.31	3.48%	25.90%	107	108	28.13
13	芯片ETF	20	BiDirection	6	96.57%	25.95%	3.72	7.42%	28.97%	124	124	13.01
14	芯片ETF	10	BiDirection	2	96.56%	29.47%	3.28	10.36%	28.97%	124	125	9.32
15	芯片ETF	20	OnlyLong	3	96.56%	22.80%	4.24	5.75%	22.78%	123	88	16.80
16	新能源车ETF	20	BiDirection	6	96.36%	17.60%	5.48	3.42%	25.10%	107	102	28.18
17	芯片ETF	20	BiDirection	4	95.10%	26.93%	3.53	8.22%	29.40%	124	125	11.57
18	芯片ETF	30	BiDirection	4	94.75%	28.05%	3.38	8.73%	30.01%	124	125	10.85
19	新能源车ETF	20	BiDirection	3	92.46%	18.28%	5.06	4.20%	26.11%	107	104	22.00
20	新能源车ETF	10	BiDirection	5	92.18%	17.41%	5.30	2.96%	26.33%	107	105	31.17
21	新能源车ETF	20	BiDirection	5	90.01%	18.07%	4.98	3.52%	26.36%	107	103	25.59
22	5GETF	10	OnlyLong	2	89.72%	17.10%	5.25	3.88%	25.41%	198	169	23.13
23	新能源车ETF	20	BiDirection	4	89.53%	18.19%	4.92	3.55%	26.45%	107	103	25.23
24	新能源车ETF	30	BiDirection	3	89.03%	19.39%	4.59	4.15%	27.61%	107	104	21.43
25	新能源车ETF	10	BiDirection	4	87.91%	17.93%	4.90	4.04%	27.31%	107	106	21.75
26	新能源车ETF	20	BiDirection	2	86.39%	19.11%	4.52	4.69%	27.59%	107	106	18.43
27	芯片ETF	20	BiDirection	5	84.54%	27.20%	3.11	8.50%	31.55%	124	125	9.95
28	芯片ETF	30	BiDirection	5	82.88%	27.71%	2.99	8.95%	32.33%	124	124	9.26
29	芯片ETF	20	OnlyLong	6	82.38%	19.87%	4.15	4.59%	19.24%	123	62	17.97
30	芯片ETF	10	BiDirection	4	79.74%	28.03%	2.84	8.01%	32.49%	124	125	9.96
31	新能源车ETF	30	BiDirection	2	78.05%	20.41%	3.82	4.76%	30.55%	107	107	16.38
32	新能源车ETF	30	BiDirection	4	77.06%	19.65%	3.92	4.26%	29.94%	107	103	18.08
33	芯片ETF	30	OnlyLong	3	75.91%	23.38%	3.25	8.24%	25.15%	123	82	9.22
34	芯片ETF	10	OnlyLong	4	74.94%	23.56%	3.18	8.64%	25.28%	123	81	8.67
35	新能源车ETF	30	BiDirection	5	74.60%	19.63%	3.80	4.11%	30.34%	107	102	18.15
36	新能源车ETF	30	BiDirection	6	73.29%	19.40%	3.78	4.43%	30.45%	107	101	16.53
37	军工龙头ETF	10	BiDirection	2	72.30%	16.91%	4.27	4.39%	30.50%	231	231	16.49
38	军工龙头ETF	10	BiDirection	4	70.78%	16.25%	4.36	3.43%	30.13%	230	227	20.64
39	5GETF	20	OnlyLong	2	70.02%	16.95%	4.13	4.41%	27.50%	199	150	15.89
40	5GETF	10	OnlyLong	3	69.71%	16.63%	4.19	3.76%	26.50%	198	140	18.54
41	军工龙头ETF	20	BiDirection	2	69.00%	18.30%	3.77	4.80%	31.40%	231	230	14.36
42	芯片ETF	30	OnlyLong	5	67.23%	22.15%	3.04	6.25%	23.76%	123	68	10.76
43	军工龙头ETF	20	BiDirection	4	66.86%	17.40%	3.84	4.86%	31.33%	230	227	13.76
44	芯片ETF	30	OnlyLong	4	66.28%	23.40%	2.83	7.33%	25.79%	123	75	9.04
45	军工龙头ETF	10	BiDirection	5	66.19%	16.32%	4.06	3.72%	31.37%	230	225	17.78
46	5GETF	20	OnlyLong	6	64.44%	13.20%	4.88	3.44%	21.75%	198	100	18.73
47	军工龙头ETF	20	BiDirection	5	63.65%	17.38%	3.66	3.96%	32.39%	230	227	16.07
48	军工龙头ETF	30	BiDirection	2	63.40%	18.10%	3.50	6.48%	32.76%	230	230	9.78
49	芯片ETF	30	BiDirection	6	63.18%	27.68%	2.28	8.43%	37.75%	124	124	7.49
50	军工龙头ETF	20	BiDirection	6	62.94%	17.24%	3.65	4.12%	32.45%	230	225	15.26

Figure 6 年化收益排名前 50 的标的回测结果

年化收益排名前 50 的结果出现在芯片 ETF、新能源车 ETF、5GETF、军工龙头 ETF 中。

4. Calmar Ratio 排名前 50 的标的回测结果

收益排名	ETF	maLength	多空方向	LongBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总换仓次数	Calmar Ratio
9	新能源车ETF	10	BiDirection	6	103.86%	17.04%	6.09	2.88%	24.09%	107	103	36.01
20	新能源车ETF	10	BiDirection	5	92.18%	17.41%	5.30	2.96%	26.33%	107	105	31.17
16	新能源车ETF	20	BiDirection	6	96.36%	17.60%	5.48	3.42%	25.10%	107	102	28.18
12	新能源车ETF	10	BiDirection	2	97.89%	18.45%	5.31	3.48%	25.90%	107	108	28.13
21	新能源车ETF	20	BiDirection	5	90.01%	18.07%	4.98	3.52%	26.36%	107	103	25.59
23	新能源车ETF	20	BiDirection	4	89.53%	18.19%	4.92	3.55%	26.45%	107	103	25.23
22	5GETF	10	OnlyLong	2	89.72%	17.10%	5.25	3.88%	25.41%	198	169	23.13
8	新能源车ETF	10	BiDirection	3	104.46%	17.87%	5.84	4.67%	24.70%	107	107	22.38
19	新能源车ETF	20	BiDirection	3	92.46%	18.28%	5.06	4.20%	26.11%	107	104	22.00
25	新能源车ETF	10	BiDirection	4	87.91%	17.93%	4.90	4.04%	27.31%	107	106	21.75
24	新能源车ETF	30	BiDirection	3	89.03%	19.39%	4.59	4.15%	27.61%	107	104	21.43
2	芯片ETF	20	OnlyLong	2	119.82%	23.34%	5.13	5.68%	20.83%	123	95	21.10
38	军工龙头ETF	10	BiDirection	4	70.78%	16.25%	4.36	3.43%	30.13%	230	227	20.64
46	5GETF	20	OnlyLong	6	64.44%	13.20%	4.88	3.44%	21.75%	198	100	18.73
40	5GETF	10	OnlyLong	3	69.71%	16.63%	4.19	3.76%	26.50%	198	140	18.54
26	新能源车ETF	20	BiDirection	2	86.39%	19.11%	4.52	4.69%	27.59%	107	106	18.43
35	新能源车ETF	30	BiDirection	5	74.60%	19.63%	3.80	4.11%	30.34%	107	102	18.15
32	新能源车ETF	30	BiDirection	4	77.06%	19.65%	3.92	4.26%	29.94%	107	103	18.08
4	芯片ETF	20	BiDirection	2	117.15%	26.93%	4.35	6.50%	25.86%	124	125	18.03
29	芯片ETF	20	OnlyLong	6	82.38%	19.87%	4.15	4.59%	19.24%	123	62	17.97
45	军工龙头ETF	10	BiDirection	5	66.19%	16.32%	4.06	3.72%	31.37%	230	225	17.78
1	芯片ETF	10	OnlyLong	2	137.14%	24.43%	5.61	7.85%	20.16%	123	102	17.46
3	芯片ETF	20	BiDirection	3	118.05%	26.17%	4.51	6.84%	25.74%	124	125	17.25
15	芯片ETF	20	OnlyLong	3	96.56%	22.80%	4.24	5.75%	22.78%	123	88	16.80
11	芯片ETF	30	OnlyLong	2	102.29%	23.89%	4.28	6.12%	22.16%	123	90	16.72
10	芯片ETF	10	BiDirection	3	102.53%	27.45%	3.73	6.17%	27.92%	124	125	16.63
36	新能源车ETF	30	BiDirection	6	73.29%	19.40%	3.78	4.43%	30.45%	107	101	16.53
37	军工龙头ETF	10	BiDirection	2	72.30%	16.91%	4.27	4.39%	30.50%	231	231	16.49
31	新能源车ETF	30	BiDirection	2	78.05%	20.41%	3.82	4.76%	30.55%	107	107	16.38
52	军工龙头ETF	10	BiDirection	6	61.41%	16.43%	3.74	3.80%	33.00%	230	225	16.16
47	军工龙头ETF	20	BiDirection	5	63.65%	17.38%	3.66	3.96%	32.39%	230	227	16.07
39	5GETF	20	OnlyLong	2	70.02%	16.95%	4.13	4.41%	27.50%	199	150	15.89
75	5GETF	30	OnlyLong	6	53.95%	13.56%	3.98	3.47%	24.69%	198	100	15.53
51	5GETF	10	OnlyLong	4	61.42%	15.75%	3.90	3.99%	26.84%	198	126	15.39
50	军工龙头ETF	20	BiDirection	6	62.94%	17.24%	3.65	4.12%	32.45%	230	225	15.26
108	消费ETF	10	OnlyLong	3	46.59%	10.26%	4.54	3.06%	32.15%	489	352	15.24
54	军工龙头ETF	10	BiDirection	3	60.27%	17.37%	3.47	3.99%	33.88%	230	230	15.12
91	消费ETF	10	OnlyLong	2	49.60%	10.81%	4.59	3.34%	33.29%	489	402	14.83
41	军工龙头ETF	20	BiDirection	2	69.00%	18.30%	3.77	4.80%	31.40%	231	230	14.36
5	芯片ETF	10	OnlyLong	3	112.34%	23.05%	4.87	8.06%	20.50%	123	87	13.95
43	军工龙头ETF	20	BiDirection	4	66.86%	17.40%	3.84	4.86%	31.33%	230	227	13.76
99	消费ETF	30	OnlyLong	2	47.75%	10.37%	4.61	3.59%	30.96%	489	343	13.31
13	芯片ETF	20	BiDirection	6	96.57%	25.95%	3.72	7.42%	28.97%	124	124	13.01
127	军工龙头ETF	10	OnlyLong	4	44.14%	15.04%	2.93	3.41%	30.47%	230	144	12.94
136	消费ETF	30	OnlyLong	3	42.94%	10.16%	4.23	3.37%	31.59%	489	312	12.75
7	芯片ETF	30	BiDirection	2	110.22%	28.53%	3.86	8.86%	27.37%	124	125	12.44
55	军工龙头ETF	20	BiDirection	3	60.00%	18.44%	3.25	4.90%	33.89%	230	229	12.25
88	军工龙头ETF	30	OnlyLong	2	50.46%	16.31%	3.09	4.15%	30.82%	230	167	12.15
109	创业50	30	OnlyLong	2	46.58%	12.56%	3.71	3.87%	26.80%	489	300	12.05
171	消费ETF	20	OnlyLong	4	40.20%	9.83%	4.09	3.38%	31.99%	489	293	11.88

Figure 7 Calmar Ratio 排名前 50 的标的回测结果

(三) 芯片 ETF、TMT ETF、创业板 ETF、军工龙头 ETF、新能源车 ETF

芯片 ETF、TMT ETF、创业板 ETF、军工龙头 ETF、新能源车 ETF 五个 ETF 的回测表现最好，因此根据各 ETF 实际交易情况调整日内滑点设置。取各个 ETF 在 2020.8.18 日的日内 tick 盘口数据，取买一至买四、卖一至卖四的价格，计算其与 price 的价差，并求得平均水平代表回测中的滑点数值。

ETF	Code	滑点水平
芯片 ETF	SZ159995	0.00201
TMT ETF	SH512220	0.00423
创业板 ETF	SZ159915	0.00204
军工龙头 ETF	SH512710	0.00220
新能源车 ETF	SH515030	0.00201

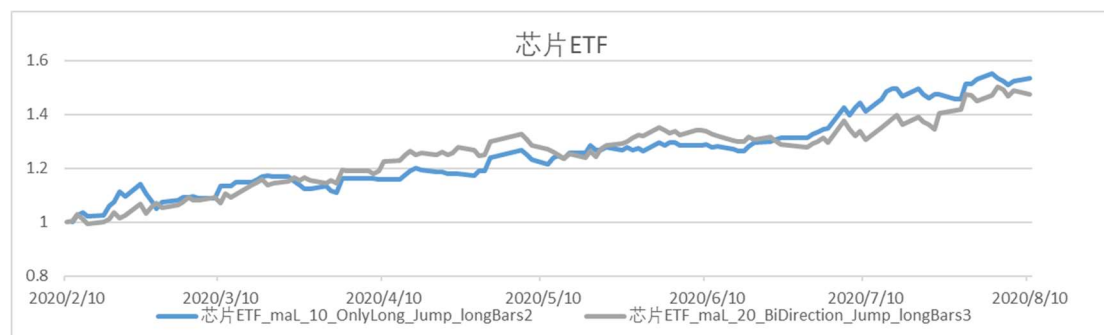
各 ETF 回测结果如下。

芯片 ETF 的纯多头策略效果好于多空策略，其余 ETF 均为多空策略表现更优。最优策略中，LongHoldBars 在 2 至 5 均有取值。MaLength 在 10、20、30 也均有取值。

芯片 ETF 2020 年 2 月 10 上市，在上市后的半年时间里多空年化收益超 100%，calmar ratio 在大多数参数组合下超过 10。推测与其波动大、趋势明显有关。

Table 2 芯片 ETF

ETF	maLength	多空	LongHoldBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓次数	Calmar Ratio
芯片ETF	10	BiDirection	2	96.56%	29.47%	3.28	10.36%	60.52%	124	125	9.32
芯片ETF	10	BiDirection	3	102.53%	27.45%	3.73	6.17%	59.29%	124	125	16.63
芯片ETF	10	BiDirection	4	79.74%	28.03%	2.84	8.01%	64.40%	124	125	9.96
芯片ETF	10	BiDirection	5	56.12%	29.01%	1.93	11.93%	71.19%	124	125	4.71
芯片ETF	10	BiDirection	6	46.86%	29.40%	1.59	12.47%	74.09%	124	123	3.76
芯片ETF	10	OnlyLong	2	137.14%	24.43%	5.61	7.85%	48.71%	123	102	17.46
芯片ETF	10	OnlyLong	3	112.34%	23.05%	4.87	8.06%	49.22%	123	87	13.95
芯片ETF	10	OnlyLong	4	74.94%	23.56%	3.18	8.64%	55.99%	123	81	8.67
芯片ETF	10	OnlyLong	5	57.14%	22.49%	2.54	8.51%	58.59%	123	71	6.72
芯片ETF	10	OnlyLong	6	49.80%	21.01%	2.37	5.18%	56.75%	123	58	9.62
芯片ETF	20	BiDirection	2	117.15%	26.93%	4.35	6.50%	56.74%	124	125	18.03
芯片ETF	20	BiDirection	3	118.05%	26.17%	4.51	6.84%	56.58%	124	125	17.25
芯片ETF	20	BiDirection	4	95.10%	26.93%	3.53	8.22%	61.02%	124	125	11.57
芯片ETF	20	BiDirection	5	84.54%	27.20%	3.11	8.50%	63.41%	124	125	9.95
芯片ETF	20	BiDirection	6	96.57%	25.95%	3.72	7.42%	60.53%	124	124	13.01
芯片ETF	20	OnlyLong	2	119.82%	23.34%	5.13	5.68%	49.73%	123	95	21.10
芯片ETF	20	OnlyLong	3	96.56%	22.80%	4.24	5.75%	52.59%	123	88	16.80
芯片ETF	20	OnlyLong	4	51.07%	24.16%	2.11	8.78%	63.75%	123	80	5.81
芯片ETF	20	OnlyLong	5	57.28%	22.77%	2.52	6.82%	59.08%	123	73	8.39
芯片ETF	20	OnlyLong	6	82.38%	19.87%	4.15	4.59%	47.26%	123	62	17.97
芯片ETF	30	BiDirection	2	110.22%	28.53%	3.86	8.86%	58.62%	124	125	12.44
芯片ETF	30	BiDirection	3	110.52%	27.39%	4.04	9.80%	58.57%	124	125	11.28
芯片ETF	30	BiDirection	4	94.75%	28.05%	3.38	8.73%	61.72%	124	125	10.85
芯片ETF	30	BiDirection	5	82.88%	27.71%	2.99	8.95%	64.24%	124	124	9.26
芯片ETF	30	BiDirection	6	63.18%	27.68%	2.28	8.43%	69.51%	124	124	7.49
芯片ETF	30	OnlyLong	2	102.29%	23.89%	4.28	6.12%	51.70%	123	90	16.72
芯片ETF	30	OnlyLong	3	75.91%	23.38%	3.25	8.24%	55.82%	123	82	9.22
芯片ETF	30	OnlyLong	4	66.28%	23.40%	2.83	7.33%	56.64%	123	75	9.04
芯片ETF	30	OnlyLong	5	67.23%	22.15%	3.04	6.25%	53.96%	123	68	10.76
芯片ETF	30	OnlyLong	6	55.10%	20.37%	2.71	7.08%	56.06%	123	62	7.79



TMT150ETF 和创业板 ETF 的年化收益水平大约在 50%。

Table 3 TMT150ETF

ETF	maLength	多空	LongHoldBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓次数	Calmar Ratio
TMTETF	10	BiDirection	2	48.51%	14.91%	3.25	9.76%	77.71%	490	412	4.97
TMTETF	10	BiDirection	3	48.85%	14.63%	3.34	9.68%	77.60%	490	411	5.05
TMTETF	10	BiDirection	4	49.46%	14.27%	3.47	8.78%	77.23%	490	408	5.64
TMTETF	10	BiDirection	5	48.50%	14.08%	3.44	7.75%	77.45%	490	403	6.26
TMTETF	10	BiDirection	6	45.30%	13.93%	3.25	7.72%	78.68%	490	399	5.87
TMTETF	10	OnlyLong	2	44.51%	12.71%	3.50	10.34%	74.06%	490	296	4.31
TMTETF	10	OnlyLong	3	44.56%	11.65%	3.82	7.63%	73.02%	485	274	5.84
TMTETF	10	OnlyLong	4	44.63%	11.18%	3.99	6.61%	71.19%	485	251	6.75
TMTETF	10	OnlyLong	5	39.86%	10.68%	3.73	6.61%	71.78%	485	226	6.03
TMTETF	10	OnlyLong	6	33.53%	9.96%	3.36	4.83%	73.91%	485	206	6.94
TMTETF	20	BiDirection	2	52.44%	14.43%	3.63	6.18%	75.63%	490	403	8.49
TMTETF	20	BiDirection	3	53.33%	14.09%	3.78	6.17%	75.16%	490	402	8.65
TMTETF	20	BiDirection	4	55.73%	13.56%	4.11	6.09%	73.94%	490	397	9.15
TMTETF	20	BiDirection	5	56.01%	13.30%	4.21	6.09%	73.49%	490	390	9.19
TMTETF	20	BiDirection	6	52.76%	13.36%	3.95	6.09%	74.68%	490	386	8.66
TMTETF	20	OnlyLong	2	43.74%	11.71%	3.74	8.53%	72.23%	490	264	5.13
TMTETF	20	OnlyLong	3	42.84%	10.68%	4.01	6.95%	72.28%	485	252	6.17
TMTETF	20	OnlyLong	4	42.89%	10.08%	4.26	5.60%	70.01%	485	226	7.66
TMTETF	20	OnlyLong	5	41.48%	9.60%	4.32	5.60%	69.02%	485	207	7.40
TMTETF	20	OnlyLong	6	37.13%	9.33%	3.98	5.60%	70.46%	485	195	6.63
TMTETF	30	BiDirection	2	55.31%	13.45%	4.11	7.41%	74.11%	490	395	7.46
TMTETF	30	BiDirection	3	54.64%	13.26%	4.12	6.94%	74.25%	490	393	7.87
TMTETF	30	BiDirection	4	55.84%	12.90%	4.33	5.85%	73.49%	490	388	9.55
TMTETF	30	BiDirection	5	54.63%	12.85%	4.25	5.18%	73.78%	490	383	10.55
TMTETF	30	BiDirection	6	52.97%	12.74%	4.16	5.27%	74.09%	490	375	10.05
TMTETF	30	OnlyLong	2	44.20%	11.45%	3.86	8.39%	71.09%	490	252	5.27
TMTETF	30	OnlyLong	3	44.97%	10.20%	4.41	5.65%	69.73%	485	235	7.96
TMTETF	30	OnlyLong	4	41.49%	9.83%	4.22	5.65%	69.96%	485	216	7.35
TMTETF	30	OnlyLong	5	39.28%	9.60%	4.09	5.65%	69.90%	485	202	6.95
TMTETF	30	OnlyLong	6	35.73%	9.28%	3.85	5.63%	70.91%	485	190	6.35

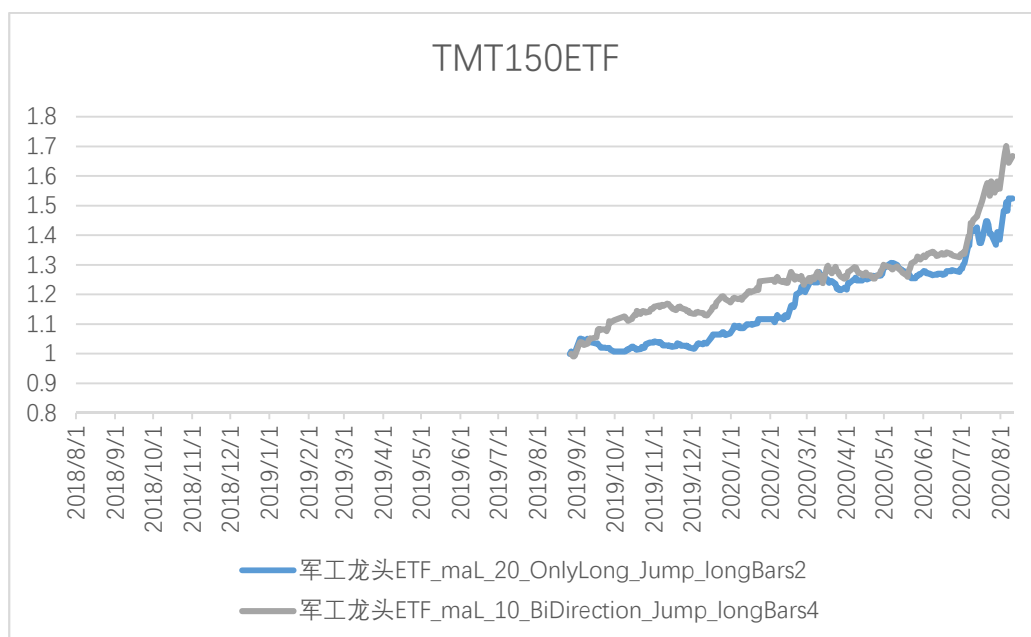
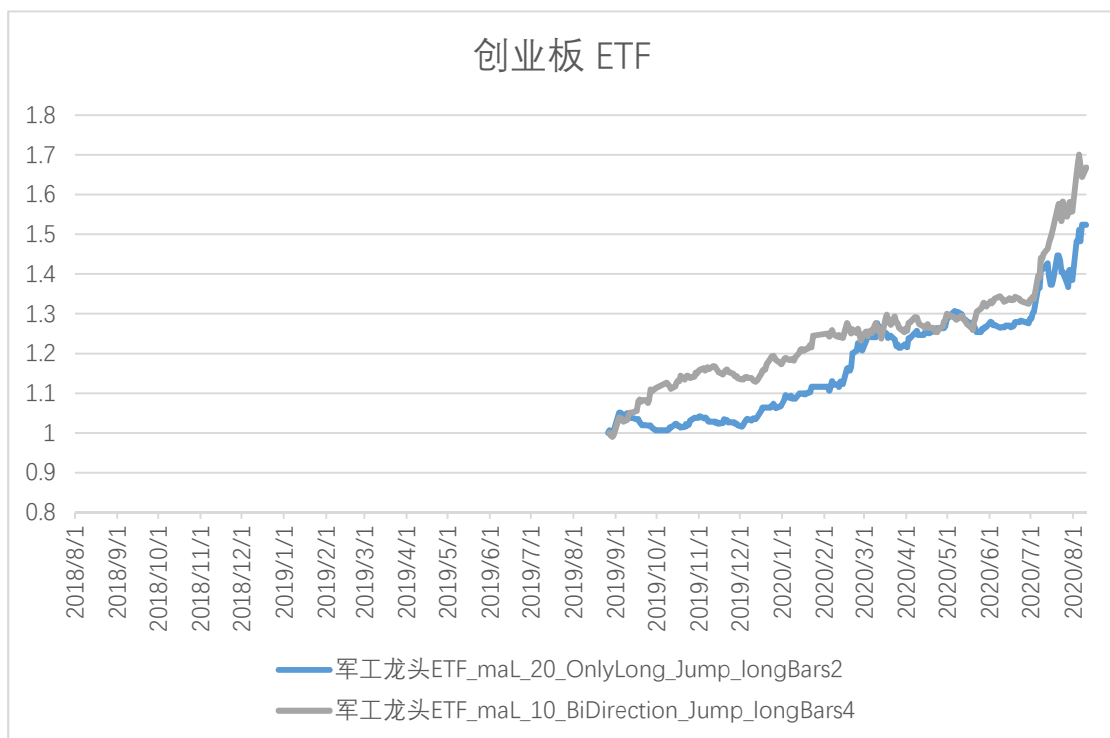


Table 4 创业板 ETF

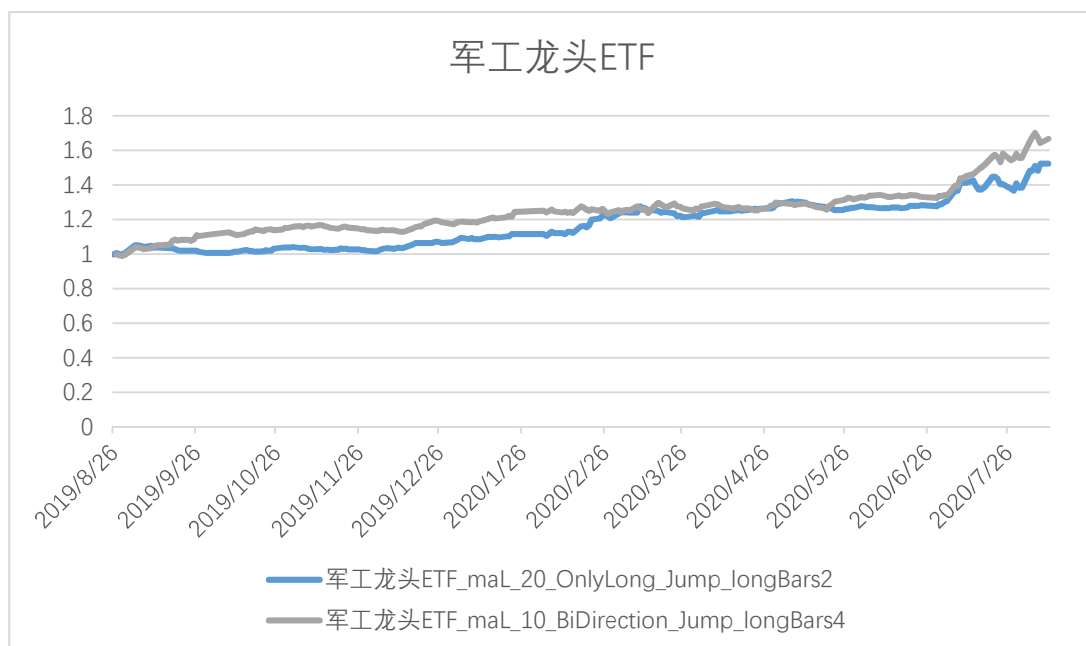
ETF	maLength 多空	LongHoldBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓次数	Calmar Ratio
创业板	10 BiDirection	2	49.84%	13.51%	3.69	4.78%	65.87%	491	492	10.43
创业板	10 BiDirection	3	49.38%	13.50%	3.66	5.24%	66.13%	491	492	9.42
创业板	10 BiDirection	4	47.72%	13.42%	3.56	5.27%	67.04%	491	492	9.05
创业板	10 BiDirection	5	44.02%	13.60%	3.24	6.28%	68.96%	491	488	7.01
创业板	10 BiDirection	6	40.99%	13.43%	3.05	5.77%	70.54%	491	484	7.11
创业板	10 OnlyLong	2	37.58%	12.82%	2.93	6.25%	69.27%	490	385	6.01
创业板	10 OnlyLong	3	40.55%	11.57%	3.51	5.29%	64.77%	490	341	7.67
创业板	10 OnlyLong	4	40.77%	11.12%	3.66	5.04%	63.02%	487	306	8.09
创业板	10 OnlyLong	5	33.16%	10.94%	3.03	4.86%	65.15%	487	264	6.83
创业板	10 OnlyLong	6	29.84%	10.05%	2.97	4.59%	65.26%	487	234	6.50
创业板	20 BiDirection	2	46.00%	14.43%	3.19	5.07%	68.05%	491	492	9.07
创业板	20 BiDirection	3	46.05%	14.14%	3.26	5.25%	68.03%	491	492	8.77
创业板	20 BiDirection	4	47.76%	13.72%	3.48	5.58%	67.07%	491	492	8.57
创业板	20 BiDirection	5	43.71%	13.93%	3.14	5.59%	69.37%	491	492	7.81
创业板	20 BiDirection	6	42.27%	14.05%	3.01	6.02%	70.11%	491	490	7.02
创业板	20 OnlyLong	2	43.70%	12.85%	3.40	6.55%	65.11%	487	359	6.68
创业板	20 OnlyLong	3	40.97%	11.92%	3.44	6.07%	64.51%	487	329	6.75
创业板	20 OnlyLong	4	40.32%	11.25%	3.58	3.57%	62.98%	487	301	11.30
创业板	20 OnlyLong	5	35.07%	11.36%	3.09	6.83%	65.01%	487	280	5.14
创业板	20 OnlyLong	6	34.81%	10.87%	3.20	5.60%	63.46%	487	259	6.22
创业板	30 BiDirection	2	55.16%	13.68%	4.03	5.50%	63.33%	491	490	10.04
创业板	30 BiDirection	3	55.11%	13.02%	4.23	5.61%	63.36%	491	490	9.82
创业板	30 BiDirection	4	54.93%	12.90%	4.26	5.63%	63.29%	491	487	9.76
创业板	30 BiDirection	5	52.53%	13.11%	4.01	6.08%	64.51%	491	486	8.65
创业板	30 BiDirection	6	53.21%	12.79%	4.16	6.09%	63.94%	491	482	8.74
创业板	30 OnlyLong	2	42.68%	12.43%	3.43	7.52%	64.08%	487	341	5.68
创业板	30 OnlyLong	3	41.27%	11.24%	3.67	5.39%	62.81%	487	308	7.65
创业板	30 OnlyLong	4	40.48%	10.77%	3.76	4.77%	61.60%	487	287	8.48
创业板	30 OnlyLong	5	35.84%	11.00%	3.26	6.84%	63.58%	487	271	5.24
创业板	30 OnlyLong	6	35.54%	10.44%	3.40	5.72%	62.13%	487	251	6.21



军工龙头 ETF 的年化收益水平大约在 60%。Calmar Ratio 水平普遍较高。

Table 5 军工龙头 ETF

ETF	maLength	多空	LongHoldBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总持仓次数	Calmar Ratio
军工龙头ETF	10	BiDirection	2	72.30%	16.91%	4.27	4.39%	64.18%	231	231	16.49
军工龙头ETF	10	BiDirection	3	60.27%	17.37%	3.47	3.99%	67.65%	230	230	15.12
军工龙头ETF	10	BiDirection	4	70.78%	16.25%	4.36	3.43%	63.77%	230	227	20.64
军工龙头ETF	10	BiDirection	5	66.19%	16.32%	4.06	3.72%	65.11%	230	225	17.78
军工龙头ETF	10	BiDirection	6	61.41%	16.43%	3.74	3.80%	66.78%	230	225	16.16
军工龙头ETF	10	OnlyLong	2	50.58%	16.45%	3.07	5.16%	68.40%	231	195	9.79
军工龙头ETF	10	OnlyLong	3	39.28%	16.44%	2.39	5.18%	70.25%	230	169	7.58
军工龙头ETF	10	OnlyLong	4	44.14%	15.04%	2.93	3.41%	64.15%	230	144	12.94
军工龙头ETF	10	OnlyLong	5	38.21%	14.93%	2.56	4.13%	63.73%	230	122	9.24
军工龙头ETF	10	OnlyLong	6	33.11%	14.76%	2.24	5.91%	63.26%	230	103	5.60
军工龙头ETF	20	BiDirection	2	69.00%	18.30%	3.77	4.80%	65.14%	231	230	14.36
军工龙头ETF	20	BiDirection	3	60.00%	18.44%	3.25	4.90%	67.66%	230	229	12.25
军工龙头ETF	20	BiDirection	4	66.86%	17.40%	3.84	4.86%	65.07%	230	227	13.76
军工龙头ETF	20	BiDirection	5	63.65%	17.38%	3.66	3.96%	66.17%	230	227	16.07
军工龙头ETF	20	BiDirection	6	62.94%	17.24%	3.65	4.12%	66.23%	230	225	15.26
军工龙头ETF	20	OnlyLong	2	55.16%	16.35%	3.37	5.46%	64.44%	231	179	10.09
军工龙头ETF	20	OnlyLong	3	42.89%	16.16%	2.65	5.25%	67.07%	230	160	8.17
军工龙头ETF	20	OnlyLong	4	46.10%	14.60%	3.16	5.60%	62.09%	230	138	8.24
军工龙头ETF	20	OnlyLong	5	39.95%	14.59%	2.74	5.25%	63.57%	230	127	7.61
军工龙头ETF	20	OnlyLong	6	38.31%	14.37%	2.67	5.03%	62.77%	230	117	7.61
军工龙头ETF	30	BiDirection	2	63.40%	18.10%	3.50	6.48%	66.54%	230	230	9.78
军工龙头ETF	30	BiDirection	3	57.48%	18.30%	3.14	6.79%	68.48%	230	228	8.46
军工龙头ETF	30	BiDirection	4	59.23%	17.78%	3.33	6.55%	67.54%	230	225	9.04
军工龙头ETF	30	BiDirection	5	57.53%	17.66%	3.26	6.62%	68.08%	230	224	8.70
军工龙头ETF	30	BiDirection	6	56.17%	17.56%	3.20	6.67%	68.41%	230	222	8.42
军工龙头ETF	30	OnlyLong	2	50.46%	16.31%	3.09	4.15%	64.52%	230	167	12.15
军工龙头ETF	30	OnlyLong	3	41.00%	16.10%	2.55	5.36%	66.51%	230	148	7.65
军工龙头ETF	30	OnlyLong	4	41.53%	15.15%	2.74	6.12%	63.90%	230	134	6.79
军工龙头ETF	30	OnlyLong	5	40.07%	14.71%	2.72	6.17%	63.04%	230	124	6.49
军工龙头ETF	30	OnlyLong	6	39.99%	14.25%	2.81	6.18%	60.83%	230	112	6.47



新能源车在 maLength=10 时，多空年化突破 100%，calmar ratio 接近 30。但若仅做多头，则收益率水平大打折扣，均低于 30%。

Table 6 新能源车 ETF

ETF	maLength	多空	LongHoldBars	年化收益	年化波动	收益波动比	最大回撤	总费率	总交易天数	总换仓次数	Calmar Ratio
新能源车ETF	10	BiDirection	2	97.89%	18.45%	5.31	3.48%	56.85%	107	108	28.13
新能源车ETF	10	BiDirection	3	104.46%	17.87%	5.84	4.67%	55.30%	107	107	22.38
新能源车ETF	10	BiDirection	4	87.91%	17.93%	4.90	4.04%	58.62%	107	106	21.75
新能源车ETF	10	BiDirection	5	92.18%	17.41%	5.30	2.96%	57.41%	107	105	31.17
新能源车ETF	10	BiDirection	6	103.86%	17.04%	6.09	2.88%	54.47%	107	103	36.01
新能源车ETF	10	OnlyLong	2	28.42%	14.46%	1.96	4.31%	76.71%	106	88	6.60
新能源车ETF	10	OnlyLong	3	25.77%	13.13%	1.96	6.20%	75.36%	106	74	4.16
新能源车ETF	10	OnlyLong	4	15.90%	11.97%	1.33	5.81%	79.69%	106	60	2.74
新能源车ETF	10	OnlyLong	5	5.84%	11.20%	0.52	5.62%	89.85%	103	47	1.04
新能源车ETF	10	OnlyLong	6	7.58%	10.79%	0.70	4.01%	84.84%	103	38	1.89
新能源车ETF	20	BiDirection	2	86.39%	19.11%	4.52	4.69%	58.96%	107	106	18.43
新能源车ETF	20	BiDirection	3	92.46%	18.28%	5.06	4.20%	57.12%	107	104	22.00
新能源车ETF	20	BiDirection	4	89.53%	18.19%	4.92	3.55%	57.55%	107	103	25.23
新能源车ETF	20	BiDirection	5	90.01%	18.07%	4.98	3.52%	57.44%	107	103	25.59
新能源车ETF	20	BiDirection	6	96.36%	17.60%	5.48	3.42%	55.82%	107	102	28.18
新能源车ETF	20	OnlyLong	2	27.80%	13.61%	2.04	4.15%	73.92%	106	74	6.69
新能源车ETF	20	OnlyLong	3	28.33%	12.33%	2.30	3.57%	71.16%	106	65	7.94
新能源车ETF	20	OnlyLong	4	22.97%	11.79%	1.95	3.95%	72.16%	106	56	5.82
新能源车ETF	20	OnlyLong	5	15.89%	12.15%	1.31	3.98%	78.58%	103	52	3.99
新能源车ETF	20	OnlyLong	6	18.69%	11.25%	1.66	3.05%	73.38%	103	45	6.12
新能源车ETF	30	BiDirection	2	78.05%	20.41%	3.82	4.76%	62.39%	107	107	16.38
新能源车ETF	30	BiDirection	3	89.03%	19.39%	4.59	4.15%	58.99%	107	104	21.43
新能源车ETF	30	BiDirection	4	77.06%	19.65%	3.92	4.26%	61.70%	107	103	18.08
新能源车ETF	30	BiDirection	5	74.60%	19.63%	3.80	4.11%	62.15%	107	102	18.15
新能源车ETF	30	BiDirection	6	73.29%	19.40%	3.78	4.43%	62.28%	107	101	16.53
新能源车ETF	30	OnlyLong	2	21.05%	13.58%	1.55	4.31%	78.56%	106	73	4.88
新能源车ETF	30	OnlyLong	3	22.72%	12.62%	1.80	4.34%	74.67%	106	63	5.24
新能源车ETF	30	OnlyLong	4	13.51%	13.13%	1.03	4.14%	81.96%	103	55	3.26
新能源车ETF	30	OnlyLong	5	12.33%	12.90%	0.96	4.24%	82.77%	103	53	2.91
新能源车ETF	30	OnlyLong	6	10.79%	12.49%	0.86	3.34%	82.91%	103	47	3.23

