An Empirical Study of the industry momentum effect in the Chinese stock market

Sun Yufei, Zhao Zhe, Anvesh Kotturi

2022/6/05

- What is the performance result of **industry momentum strategy** in China's stock market according to the Jegadeesh and Titman (1993)?
- Concepts explanation:
    - **Momentum strategy:** Momentum investing is a system of buying stocks or other securities that have had high returns over the past three to twelve months, and selling those that have had poor returns over the same period. *(https://en.wikipedia.org/wiki/Momentum_investing)*
    - **Industry momentum strategy:** buy stocks from past winning industries and sell stocks from past losing industries. *(Do Industries Explain Momentum? Tobias J. Moskowitz and Mark Grinblatt, 1999)*

- What is the industry momentum strategy according to Jegadeesh and Titman (1993)?
  - According to their strategy, we can build the investment portfolio by holding the stock portfolio with excellent short-term return **(3 to 12 month, "winner" portfolio)** and selling the stock portfolio with poor short-term return **(3 to 12 month, "loser" portfolio)**, so as to obtain considerable excess return.
- Why industry momentum strategy works?
  - Industry momentum effect is a certain trend. The historical outstanding performance of the industry will **continue to maintain a high rate of return** over the next period of time, and historical poor performance of the industry will continue to **maintain the low yields** over the next period of time. If the industry momentum effect exists, it is possible to build industry momentum trading strategy by **holding a "winners" and "losers"**, in order to obtain excess returns.

Data

- In our research, we adopt Shenwan industry classification standard (Shenyin Wanguo Securities Research Institute industry classification standard). all China's stock market listed companies are divided into 31 specific industries.
- On this basis, this research selects the daily close price from January 1, 2005 to January 1, 2021, with a total of 832 weeks in sixteen years.
- The Shanghai and Shenzhen 300 index (CSI 300) as the market benchmark index.

Date	Agriculture forestry animal husbandry and fishery	Architectural decoration	Automobile	Bank	Building material	Catering tourism	Chemical industry	Commercial trade	Comprehensive	Computer	Electrical equipment	Electronic components	Electronics	Extractive
2021/1/18 0:00	3996.31	1947.64	5911.14	4018.47	8286.99	4274.06	3941.68	3144.74	2321.29	5181.75	8891.34	1463.85	5256.35	2486.8
2021/1/15 0:00	3929.65	1943.45	5909.47	3931.19	8229.02	4178.8	3823.44	3135.51	2312.75	5053.15	8752.9	1520.11	5073.5	2454.48
2021/1/14 0:00	3943.25	1954.18	5892.51	3821.72	8242.11	4067.73	3785.18	3106.37	2283.95	5082.67	8674.97	1542.09	5137.39	2411.02
2021/1/13 0:00	4054.64	1919.93	6035.98	3826.59	8313.96	4165.09	3832.98	3114.75	2324.82	5030.97	8924.38	1541.62	5173.78	2442.26
2021/1/12 0:00	4135.45	1892.12	6033.14	3831.14	8304.27	4122.86	3854.07	3143.34	2384.57	5100.79	9110.35	1566.82	5123.69	2436.48
2021/1/11 0:00	4091.76	1869.53	6022.91	3775.58	8118.73	4113.07	3793.05	3140.93	2323.28	5044.49	8863.79	1580.57	5005.85	2415.41
2021/1/8 0:00	4285.38	1901.9	5930.68	3732.77	8137.62	4130.25	3854.73	3196.23	2379.03	5060.32	9250.07	1626.17	4961.47	2512.2
2021/1/7 0:00	4374.91	1886.72	5855.83	3713.91	8130.85	4096.3	3864.28	3156.38	2408.75	4969.85	9405.81	1578.88	4931.92	2507.44
2021/1/6 0:00	4345.4	1932.75	5786.67	3672.97	8172.99	4093.59	3814.63	3231.47	2424.13	5137.49	9140.64	1569.08	4915.12	2485.83
2021/1/5 0:00	4335.03	1920.58	5848.74	3583.58	7962.07	4106.68	3812	3242.43	2444.61	5255.44	9152.1	1609.16	4992.09	2487.06
2021/1/4 0:00	4181.35	1923.51	5850.33	3627.68	7960.53	4142.4	3739.94	3227.76	2436.44	5227.08	9103.18	1607.69	4806	2531.37

Figure 1: 31 industries daily close price

- Brief introduction:
    - This strategy is that selects stocks on the basis of returns over the past **J months** and holds them for **K months** (we will refer to this as a J-month/K-month strategy).
    - At the beginning of each month t the securities are ranked in ascending order on the basis of their returns in the past J months.
    - Based on these rankings, ten decile portfolios are formed that equally weight the stocks contained in the top decile, the second decile, and so on. The top decile portfolio is called the **"winners" decile** and the bottom decile is called the **"losers" decile**.
    - In each month t, the strategy buys the winner portfolio and sells the loser portfolio, holding this position for K months.
    - The sample industries with the "winner portfolio" of the industry and the "loser portfolio" of the industry are given **the same weight**. The **transaction cost** is 0.13%.
    - To be specific, all China's stock market listed companies are divided into **31 specific industries** according to Shenwan class industry classification standard, so we regard the industry portfolio with **the top three** returns as the "winners" of the industry, and the industry portfolio with **the bottom three** returns as the "losers" of the industry.

- J-month/K-month strategy:
    - Select a certain length of time interval as the observation period of industry stock portfolio, and record it as J.
    - According to the rate of return of each industry index in the observation period J, the industry "winner portfolio" (W) and the industry "loser portfolio" (L) are constructed by the tenth method.
    - After the observation period J is determined, a certain time interval is taken as the holding period of "winner portfolio" and "loser portfolio", which is recorded as K. Accordingly, this trading strategy is recorded as strategy (J, K).

1,1	1,3	1,6	1,12
3,1	3,3	3,6	3,12
6,1	6,3	6,6	6,12
12,1	12,3	12,6	12,12

Figure 2: 16 (J, K) strategies

- Data processing:
  - There are three different operations for "winner" and "loser", which are **long, short, and long-short**.
  - Use (3,6) strategy as an example.

2005/1/1	2005/2/1	2005/3/1	2005/4/1	2005/5/1	2005/6/1	2005/7/1	2005/8/1	2005/9/1	2005/10/1	2005/11/1	2005/12/1	2006/1/1	2006/2/1
			0.11%	0.21%	0.32%	0.41%	0.12%	-0.56%					
				0.11%	0.21%	0.32%	0.41%	0.12%	0.56%				
					0.11%	0.21%	0.32%	-0.41%	0.12%	0.56%			
						0.11%	0.21%	0.32%	0.41%	0.12%	0.56%		
			0.11%				0.11%	0.21%	0.32%	-0.41%	0.12%	0.56%	
				0.16%				0.11%	0.21%	0.32%	0.41%	0.12%	0.56%
					0.21%				0.11%	0.21%	0.32%	0.41%	-0.12%
						0.26%				0.11%	0.21%	0.32%	0.41%
							0.23%				0.11%	0.21%	0.32%
								-0.04%				0.11%	0.21%
									0.29%				0.11%
										0.15%			
											0.29%		
												0.29%	
													0.25%

Figure 3: monthly return

- Data processing:
    - We will have **whole period return, annual return, whole period maximum drawdown and annual maximum drawdown**.
    - Use long strategy as an example. (See Table)

Whole Period Return Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	3440.0515%	2065.5655%	1355.1207%	1440.2388%	580.3791%
3	3179.1654%	1837.5222%	1555.4806%	1763.0119%	
6	998.7904%	917.5327%	1164.4403%	1586.8964%	
12	1655.8180%	1348.5384%	1837.5222%	1196.3771%	

Figure 4: whole period return

- Data processing:
    - We will have the graph **for long, short, long-short, and CSI 300 Index monthly returns**.
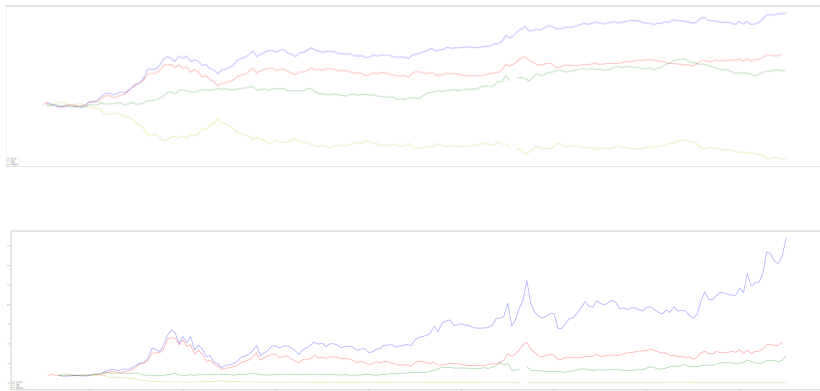   - Use (3,3) strategy as an example.

Figure 5: whole period return

- Excess return for long:
  - we can clearly see that **buying "winners"** can obtain significant excess returns.

Whole Period Return Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	3440.05%	2065.57%	1355.12%	1440.24%	580.38%
3	3179.17%	1837.52%	1555.48%	1763.01%	
6	998.79%	917.53%	1164.44%	1586.90%	
12	1655.82%	1348.54%	1837.52%	1196.38%	

Figure 6: whole period return for long

Yearly Return	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	210.7158%	193.1648%	191.6728%	189.9654%	245.2514%	226.9111%	200.6143%	200.0843%	194.6614%	192.1859%	187.0441%	202.5075%	226.1636%	221.1653%	226.9111%	229.8551%	198.0631%
2007	337.9413%	307.7488%	268.2238%	269.1571%	289.7093%	251.3306%	231.7138%	252.5461%	241.8688%	213.5074%	232.3643%	237.4347%	223.2761%	204.1928%	251.3306%	257.8043%	276.0009%
2008	54.6832%	47.5622%	44.3662%	44.6211%	54.2274%	44.8971%	42.4796%	43.6905%	44.3401%	41.5526%	42.5193%	42.0549%	41.3720%	38.9779%	44.8971%	35.2995%	39.0600%
2009	226.6969%	218.8927%	219.5101%	217.3534%	206.5166%	208.4921%	207.3896%	212.1575%	203.3744%	207.4531%	196.1309%	203.6688%	152.0843%	163.1513%	208.4921%	186.2554%	191.0107%
2010	94.8540%	98.4666%	101.2493%	99.5039%	97.7883%	104.8721%	109.2646%	104.8784%	103.8510%	107.3133%	106.2832%	105.2150%	97.4286%	99.2053%	104.8172%	110.7718%	88.0700%
2011	75.3384%	85.6623%	83.9012%	84.3983%	93.5823%	88.6163%	82.7988%	83.7091%	80.0980%	80.6647%	79.6044%	82.1125%	76.6595%	77.1455%	88.6163%	79.2012%	82.3850%
2012	83.1433%	92.5486%	90.0610%	95.3133%	107.5364%	108.1808%	107.3836%	107.8517%	104.1568%	104.0224%	105.8950%	106.6416%	149.6090%	145.6528%	108.1808%	142.6681%	81.6241%
2013	159.9125%	150.3731%	140.8604%	139.4819%	163.1172%	156.4151%	155.6077%	156.6875%	149.4138%	153.0867%	154.1959%	154.0233%	141.2019%	138.3390%	156.4151%	138.2559%	114.6970%
2014	134.8855%	125.5029%	121.6245%	123.2158%	114.1712%	114.6841%	122.1903%	119.1241%	132.9078%	129.9277%	131.8527%	119.5792%	197.2101%	164.4999%	114.6841%	129.6488%	116.5795%
2015	191.7399%	135.8062%	138.2174%	146.7616%	160.0514%	104.5055%	116.8823%	133.7871%	99.6842%	88.3463%	115.6641%	143.0510%	122.0063%	133.2223%	104.5055%	134.4664%	127.3736%
2016	116.5463%	110.7676%	117.3969%	114.1072%	112.0769%	118.1471%	128.0998%	119.7327%	136.5265%	127.8258%	127.3688%	119.8923%	130.5225%	132.3783%	118.1471%	106.5921%	99.2577%
2017	100.1149%	88.4360%	93.9804%	93.2236%	85.3482%	88.2118%	91.7513%	91.7929%	98.5412%	94.2483%	100.6954%	94.8007%	114.3655%	106.6118%	88.2118%	89.0622%	112.1486%
2018	97.8528%	93.5457%	85.0697%	83.1222%	96.1162%	92.2200%	86.1139%	78.6409%	78.6954%	82.5014%	77.2440%	76.2193%	66.6928%	70.4956%	92.2200%	71.0616%	81.5618%
2019	85.8422%	116.2751%	119.3771%	120.8522%	104.2854%	129.5449%	130.2800%	128.0547%	100.1244%	128.2364%	125.9488%	125.9687%	137.6493%	139.4042%	129.5449%	150.8826%	117.6362%
2020	158.0057%	156.2349%	133.3382%	134.5988%	136.9304%	145.1865%	133.3556%	143.8326%	144.1459%	128.6212%	122.2089%	165.4544%	134.5897%	129.4524%	145.1865%	132.3125%	132.0913%

Figure 7: annual return for long

- Excess return for short:
  - we can clearly see that **selling "losers"** can not obtain significant excess returns.

Whole Period Return Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	2.83%	2.33%	1.88%	1.93%	580.38%
3	5.76%	4.22%	2.56%	2.08%	
6	7.01%	4.04%	2.42%	1.82%	
12	6.14%	4.06%	4.22%	2.11%	

Figure 8: whole period return for short

Yearly Return	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	49.9192%	48.9589%	49.0110%	51.5752%	49.0230%	50.5811%	48.9210%	51.0556%	56.3447%	51.9727%	53.2062%	52.5147%	49.3333%	47.0389%	50.5811%	47.0815%	198.0631%
2007	33.1697%	27.7245%	25.0535%	24.8520%	27.9475%	23.9127%	24.0375%	23.9974%	27.0389%	22.5132%	21.9134%	22.2709%	19.5175%	17.9601%	23.9127%	21.6514%	276.0009%
2008	160.0855%	154.1005%	147.1660%	146.2449%	153.6108%	160.2031%	144.4577%	144.2491%	128.8474%	132.5796%	137.4962%	142.1850%	191.5456%	179.7567%	160.2031%	170.3987%	39.0600%
2009	33.4601%	35.4364%	36.5132%	36.1354%	37.5242%	38.0032%	36.4189%	34.3312%	40.3631%	33.5280%	33.0620%	31.6885%	35.7400%	34.9358%	38.0032%	32.5309%	191.0107%
2010	86.7032%	89.7582%	91.4045%	89.3448%	88.9926%	92.3082%	94.6440%	90.7037%	105.2742%	101.2606%	96.1646%	97.2560%	94.8407%	98.9891%	92.3082%	106.0773%	88.0700%
2011	111.2919%	120.7340%	113.8450%	113.3096%	119.2813%	110.2875%	108.1716%	109.7153%	106.7260%	105.7337%	106.9898%	109.8294%	139.3572%	133.4118%	110.2875%	131.8386%	82.3850%
2012	94.8774%	104.5886%	101.4937%	108.3376%	112.6419%	111.0902%	115.1783%	119.7667%	110.1527%	116.9786%	119.0339%	122.5897%	87.5172%	92.2161%	111.0902%	92.7143%	81.6241%
2013	84.0489%	78.7681%	76.9780%	74.9788%	88.9704%	84.1863%	81.0787%	81.3483%	90.8593%	87.6613%	87.6613%	81.4605%	119.7226%	114.8080%	84.1863%	102.1673%	114.6970%
2014	106.6034%	102.5298%	102.5924%	101.0611%	110.1953%	105.3825%	104.0868%	95.4146%	114.0909%	118.8441%	115.5361%	97.9409%	95.0236%	89.1047%	105.3825%	70.4279%	116.5795%
2015	75.5054%	54.3520%	52.3147%	54.0503%	94.4894%	62.1139%	53.6191%	52.0233%	84.8946%	66.2772%	52.4834%	49.4177%	87.6078%	74.6854%	62.1139%	65.1928%	127.3736%
2016	92.3691%	85.1288%	87.3749%	85.1959%	86.9129%	92.7214%	95.0539%	89.3824%	94.9493%	98.1198%	97.9516%	87.7991%	80.7097%	80.6011%	92.7214%	76.3342%	99.2577%
2017	100.1309%	103.6854%	110.9352%	112.6378%	102.9593%	114.6067%	117.7645%	118.2199%	123.9672%	124.8244%	121.0934%	113.5994%	118.1036%	123.4722%	114.6067%	111.3436%	112.1486%
2018	143.9287%	138.6449%	122.8995%	117.5454%	126.8505%	129.2409%	117.2387%	110.2170%	120.7124%	120.7454%	104.3890%	103.5797%	111.2493%	111.1484%	129.2409%	103.1533%	81.5618%
2019	58.8023%	72.8120%	74.0823%	76.2259%	76.5887%	90.6504%	85.0288%	82.3620%	69.5933%	83.5060%	80.4090%	80.3850%	76.2042%	74.3795%	90.6504%	70.1127%	117.6362%
2020	65.8623%	70.9422%	73.8792%	73.1767%	75.7785%	73.7480%	69.3992%	74.3247%	82.1862%	78.5921%	70.4645%	80.4287%	81.2783%	80.1797%	73.7480%	89.9435%	132.0913%

Figure 9: annual return for short

- Excess return for long-short:
  - we can clearly see that **buying "winners" and selling "losers"** can not obtain significant excess returns.

Whole Period Return Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	367.72%	218.93%	121.89%	132.59%	580.38%
3	508.79%	297.47%	177.07%	168.30%	
6	213.15%	156.53%	130.33%	126.44%	
12	320.81%	219.74%	297.47%	121.39%	

Figure 10: whole period return for long-short

Yearly Return	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	114.9329%	103.4043%	102.7604%	107.3594%	132.7327%	125.9542%	107.1675%	111.5861%	117.6100%	107.4665%	106.9290%	115.8524%	123.1263%	114.5910%	125.9542%	119.8320%	198.0631%
2007	153.8193%	117.9741%	94.7495%	94.2640%	113.9002%	83.3245%	78.1790%	85.0227%	88.0419%	66.5853%	72.1554%	74.5218%	60.3941%	52.0654%	83.3245%	79.2992%	276.0009%
2008	123.2253%	106.9454%	95.5916%	95.8891%	121.9663%	106.1116%	90.5394%	93.3991%	83.7306%	80.3226%	85.2400%	89.2044%	111.5961%	99.5241%	106.1116%	84.7002%	39.0600%
2009	93.4816%	93.8795%	96.6196%	94.0083%	91.7202%	94.3874%	90.8452%	87.6170%	96.2935%	84.7695%	77.8817%	77.4792%	63.1163%	65.9481%	94.3874%	71.4669%	191.0107%
2010	89.7716%	57.4008%	102.3827%	98.7782%	95.0220%	105.8353%	113.2329%	104.4087%	119.3958%	117.7436%	110.8597%	111.2849%	100.3350%	106.6841%	105.8353%	127.6425%	88.0700%
2011	85.7653%	106.2152%	98.2046%	98.5297%	113.6395%	99.9446%	91.7878%	94.4303%	87.4720%	87.1960%	87.0612%	92.5159%	110.9374%	106.8537%	99.9446%	108.3780%	82.3850%
2012	83.4767%	100.4989%	95.3115%	107.7327%	125.8242%	124.4210%	128.1525%	133.9812%	119.4338%	126.6037%	131.1785%	135.8427%	138.1627%	141.7011%	124.4210%	139.6790%	81.6241%
2013	143.6559%	127.5932%	116.7478%	112.6783%	154.4702%	140.6367%	134.7539%	136.2123%	144.0207%	142.5338%	143.5443%	133.7089%	173.8603%	183.6130%	140.6367%	145.9430%	114.6970%
2014	145.2426%	129.9356%	126.9128%	126.6154%	125.5762%	121.5058%	128.8987%	115.4738%	133.6592%	156.6244%	154.0305%	119.1853%	197.3756%	153.0133%	121.5058%	96.3810%	116.5795%
2015	139.1154%	81.0526%	81.8509%	89.6625%	106.8340%	62.1338%	68.7467%	77.1558%	64.2541%	66.1230%	73.8038%	77.3049%	87.9829%	101.5721%	62.1338%	95.7352%	127.3736%
2016	113.0486%	99.6179%	107.4164%	102.0562%	105.0310%	116.5091%	127.0080%	112.2709%	132.5855%	128.5164%	128.2921%	109.4485%	119.2454%	120.8579%	116.5091%	98.4306%	99.2577%
2017	101.3955%	92.6513%	105.3362%	106.1500%	89.0343%	102.2766%	109.4564%	109.9063%	124.1871%	119.4820%	123.7378%	108.9074%	135.6111%	132.1001%	102.2766%	99.4556%	112.1486%
2018	140.6398%	130.2799%	105.4792%	98.8023%	120.6863%	120.0272%	101.0852%	87.5351%	94.4440%	91.3665%	80.8039%	79.6290%	74.2655%	78.9803%	120.0272%	74.1696%	81.5618%
2019	53.0009%	89.0982%	92.9458%	96.7872%	84.3052%	123.5078%	115.6572%	110.1839%	74.1461%	112.2865%	105.3237%	105.5401%	109.8419%	108.3429%	123.5078%	111.6999%	117.6362%
2020	113.2743%	115.4222%	105.1381%	104.5960%	112.2955%	114.6477%	93.4037%	113.6221%	124.8417%	106.2845%	91.1598%	122.7715%	127.3454%	115.4128%	112.6783%	112.8787%	132.0913%

Figure 11: annual return for long-short

- What is a Maximum Drawdown (MDD)?
    - A maximum drawdown (MDD) is the maximum observed loss from a peak to a trough of a portfolio, before a new peak is attained. Maximum drawdown is an indicator of downside risk over a specified time period.
    - The Formula for Maximum Drawdown:

$$MDD = \frac{Trough\ Value - Peak\ Value}{Peak\ Value}$$
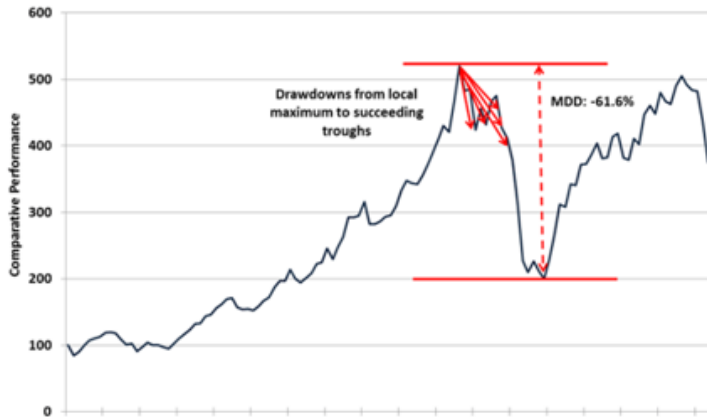
- Maximum drawdown for long:
  - we can clearly see that **buying "winners"** has an relatively stable maximum drawdown compare to CSI 300.

Whole Period Maxmium Drawdown Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	64.55%	69.47%	71.55%	70.36%	70.75%
3	67.30%	71.35%	72.92%	70.87%	
6	71.97%	73.78%	72.85%	72.12%	
12	73.85%	75.66%	71.35%	73.65%	

Figure 13: whole period maximum drawdown for long

Yearly Maxmium Drawdown	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	7.3800%	7.9425%	7.3883%	7.7524%	7.0111%	7.4161%	7.8852%	7.5523%	7.6186%	7.6186%	8.0796%	7.4531%	7.6186%	7.6186%	7.4161%	6.6707%	9.7351%
2007	21.9567%	23.6970%	24.6409%	20.9479%	27.4808%	25.5624%	25.3820%	20.9399%	25.4002%	26.5451%	24.5284%	21.0384%	25.4002%	26.5486%	25.5624%	19.4561%	15.5748%
2008	64.1964%	67.3516%	67.5329%	68.0148%	64.7042%	67.2542%	67.9009%	68.4878%	65.4133%	67.1436%	67.5217%	69.5704%	67.7273%	69.4893%	67.2542%	71.5885%	69.2941%
2009	28.6207%	26.6200%	24.6722%	21.7870%	31.7179%	27.0875%	25.1245%	20.2949%	28.2370%	27.8629%	24.6858%	19.4105%	28.2370%	23.6585%	27.0875%	14.2268%	24.9096%
2010	30.6698%	26.2077%	27.1710%	26.8807%	23.0621%	23.4272%	23.9114%	24.3410%	29.0703%	24.2042%	23.1929%	24.7882%	25.2007%	27.9872%	23.4272%	24.3519%	28.5458%
2011	21.1519%	17.2215%	19.9933%	17.9706%	10.3152%	17.6366%	19.5282%	16.6739%	24.7871%	23.8444%	19.2422%	17.3584%	16.1800%	15.8437%	17.6366%	14.8244%	21.8670%
2012	17.3379%	8.8084%	13.6333%	10.2771%	7.7189%	7.4057%	7.5030%	7.7234%	8.2909%	8.1600%	8.2384%	7.8801%	8.4279%	8.4279%	7.4057%	8.1810%	21.4138%
2013	12.4447%	11.9728%	12.4203%	13.3210%	9.5591%	9.5591%	11.1661%	11.1855%	9.5591%	10.6129%	12.2638%	11.5148%	9.5591%	10.5187%	9.5591%	11.3258%	19.3199%
2014	4.1385%	5.6591%	6.7670%	7.6564%	13.3218%	7.3792%	6.9731%	10.4934%	6.0425%	4.6528%	6.5109%	11.8146%	1.8950%	6.6929%	7.3792%	13.9577%	7.4101%
2015	21.9732%	30.9808%	33.1687%	34.4425%	28.2468%	36.7186%	34.9392%	36.5691%	40.9381%	39.7715%	40.1609%	37.1679%	38.8907%	35.3203%	36.7186%	34.4877%	35.0598%
2016	12.8841%	16.6523%	13.0008%	15.4569%	23.2613%	21.3817%	12.4013%	15.2834%	6.5233%	7.2441%	6.8164%	13.5649%	11.1914%	9.9662%	21.3817%	16.2799%	16.3738%
2017	8.7494%	8.2874%	7.3050%	8.3255%	9.2072%	12.2175%	10.4996%	9.3962%	10.3421%	12.3829%	9.6764%	8.0112%	6.6485%	9.1673%	12.2175%	14.9059%	2.2066%
2018	10.5023%	8.6440%	13.5782%	14.8157%	13.6192%	11.3457%	17.1334%	20.8896%	23.8589%	20.7588%	25.7500%	24.5154%	36.3174%	33.8738%	11.3457%	27.7317%	25.1740%
2019	31.1289%	11.7827%	8.9097%	7.4851%	15.6862%	8.8768%	5.9187%	5.3779%	23.3877%	5.4016%	4.9640%	5.5023%	11.7497%	7.2478%	8.8768%	4.5673%	8.6940%
2020	14.4917%	10.9803%	9.9038%	8.7385%	21.4405%	11.5587%	10.0137%	7.1686%	7.8450%	8.3422%	10.4501%	9.6742%	11.5968%	12.0387%	11.5587%	10.6842%	11.4917%

Figure 14: annual maximum drawdown for long

- Maximum drawdown for short:
  - we can clearly see that **selling "losers"** has an relatively high maximum drawdown compare to CSI 300.

Whole Period Maxmium Drawdown Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	96.98%	97.55%	98.03%	98.00%	70.75%
3	94.27%	95.76%	97.31%	97.79%	
6	92.83%	95.69%	97.43%	98.07%	
12	95.00%	96.72%	95.76%	98.12%	

Figure 15: whole period maximum drawdown for short

Yearly Maxmium Drawdown	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	46.7243%	48.6109%	48.2858%	45.4450%	48.6579%	46.8224%	47.9740%	45.7404%	40.8092%	44.4623%	43.4981%	44.2324%	45.2545%	47.1720%	46.8224%	46.0336%	9.7351%
2007	70.1822%	73.7453%	75.8960%	76.5899%	74.1415%	77.4846%	76.7836%	77.1209%	73.4019%	77.6189%	78.0904%	78.6799%	76.2690%	77.9506%	77.4846%	76.7814%	15.5748%
2008	23.9819%	23.6512%	21.5649%	20.0709%	24.9853%	19.9157%	21.3639%	19.7911%	24.9853%	23.8711%	21.9657%	21.0699%	17.8906%	20.0409%	19.9117%	18.9215%	69.2941%
2009	65.9864%	63.5030%	62.5432%	63.2593%	61.4337%	60.6845%	62.7713%	65.1768%	58.7833%	65.7195%	66.6056%	67.9402%	64.7206%	65.5144%	60.6845%	67.4338%	24.9096%
2010	32.1687%	34.0932%	34.8089%	35.3564%	32.5907%	34.5475%	33.6488%	35.7669%	37.9776%	30.3589%	33.0304%	32.3219%	29.4165%	29.1285%	34.5475%	25.9117%	28.5458%
2011	10.7615%	8.1360%	7.9187%	8.1300%	7.9306%	7.6039%	8.0600%	9.3977%	9.1644%	7.9457%	9.3907%	10.0058%	11.4674%	11.8038%	7.6039%	11.2518%	21.8670%
2012	25.0542%	20.9001%	20.3034%	18.5692%	22.9410%	20.4336%	17.6696%	16.7707%	22.1679%	18.2595%	17.0495%	15.5108%	18.4984%	15.2536%	20.4336%	13.6533%	21.4138%
2013	14.7292%	12.4013%	12.6402%	13.1045%	8.9325%	8.8096%	9.5560%	11.3642%	8.8014%	8.6290%	8.5634%	13.8447%	8.8303%	10.4715%	8.8096%	16.5117%	19.3199%
2014	12.1304%	14.2914%	12.3363%	10.2221%	12.1304%	14.2914%	11.7018%	12.8733%	12.1304%	9.4938%	8.7323%	12.5503%	8.8969%	12.1371%	14.2914%	22.1917%	7.4101%
2015	39.6082%	41.5389%	43.3472%	40.6849%	16.5921%	30.0440%	39.0912%	40.6074%	11.4848%	22.8612%	41.1494%	43.4143%	12.3922%	25.3146%	30.0440%	41.5071%	35.0598%
2016	27.0134%	28.8375%	28.3138%	27.0015%	30.6695%	24.0591%	23.6220%	24.2633%	25.5612%	22.2282%	20.4446%	23.5469%	94.1687%	96.1854%	24.0591%	97.4843%	16.3738%
2017	16.0546%	9.3307%	5.2815%	5.9409%	11.4895%	6.0900%	3.9513%	5.2415%	7.9913%	7.8472%	6.2699%	6.8566%	8.2383%	6.3946%	6.0900%	9.2481%	2.2066%
2018	7.4479%	6.4797%	6.7532%	4.5068%	10.8320%	8.9096%	7.8294%	8.0149%	11.5818%	10.8695%	14.7378%	14.1141%	13.4157%	12.4802%	8.9096%	12.4123%	25.1740%
2019	39.8871%	30.2342%	29.9712%	30.1599%	31.1796%	27.7616%	28.4513%	29.6020%	35.1820%	30.4935%	32.2746%	39.5459%	31.1319%	31.5598%	27.7616%	29.5186%	8.6040%
2020	33.1407%	28.0309%	27.7823%	28.1644%	23.4131%	29.6800%	32.7682%	27.5578%	23.9847%	24.5176%	32.7153%	21.3783%	28.5738%	29.1909%	29.6800%	20.3986%	11.4917%

Figure 16: annual maximum drawdown for short

-Maximum drawdown for long-short: - we can clearly see that **buying "winners" and selling "losers"** has an relatively low maximum drawdown compare to CSI 300.

Whole Period Maxmium Drawdown Observation Period (Column) Holding Period (Row)	1	3	6	12	CSI
1	58.07%	34.81%	27.44%	22.15%	70.75%
3	37.89%	47.69%	48.76%	37.25%	
6	47.55%	65.09%	62.57%	54.14%	
12	65.57%	73.76%	47.69%	60.65%	

Figure 17: whole period maximum drawdown for long-short

Yearly Maxmium Drawdown	1,1	1,3	1,6	1,12	3,1	3,3	3,6	3,12	6,1	6,3	6,6	6,12	12,1	12,3	12,6	12,12	CSI 300
2006	12.4306%	13.0822%	11.5185%	5.9127%	15.4041%	14.6513%	16.8995%	6.7482%	16.3671%	16.6811%	13.2440%	7.7193%	9.7438%	15.6429%	14.6513%	12.6926%	9.7351%
2007	11.7219%	15.5183%	12.6973%	6.1163%	24.9235%	28.6217%	23.1177%	15.8671%	20.5512%	34.8218%	28.5079%	25.4305%	27.7284%	36.5465%	28.6217%	17.0463%	15.5748%
2008	11.2287%	8.5081%	4.0479%	2.2526%	8.1788%	6.1334%	5.4747%	2.4821%	7.2273%	12.3700%	11.9026%	6.8167%	9.3441%	10.3330%	6.1334%	18.7935%	69.2941%
2009	17.3499%	14.5421%	6.9950%	9.4176%	24.9002%	15.1886%	13.7655%	18.6138%	15.4300%	22.9917%	30.2344%	29.4453%	43.6648%	38.8115%	15.1886%	35.2017%	24.9096%
2010	17.4296%	6.3345%	2.7694%	2.6980%	11.7564%	5.5237%	3.8270%	6.0100%	8.3063%	4.3179%	8.1397%	6.4379%	8.5603%	6.9458%	5.5237%	3.1133%	28.5458%
2011	10.9031%	4.1951%	5.5030%	1.7140%	4.9360%	8.6202%	9.9611%	6.2310%	19.0596%	16.7116%	13.0890%	8.9843%	13.8025%	15.3490%	8.6202%	11.7968%	21.8670%
2012	23.8592%	9.0199%	6.3581%	1.6803%	13.7805%	11.7050%	8.6863%	2.7347%	10.8009%	8.4060%	5.9036%	0.8519%	7.0461%	4.5080%	11.7050%	0.5173%	21.4138%
2013	4.1464%	3.3140%	3.9594%	3.6461%	5.4058%	7.0141%	7.4082%	7.4203%	8.5540%	8.2475%	6.5366%	10.2658%	6.0141%	7.6457%	7.0141%	12.4593%	19.3199%
2014	4.0349%	9.3014%	6.1064%	2.7738%	12.4618%	11.5652%	6.6703%	9.9454%	9.4059%	4.1596%	3.9730%	11.4196%	1.6082%	7.0575%	11.5652%	18.9873%	7.4101%
2015	27.8502%	30.0697%	22.9443%	20.7284%	24.8817%	42.7813%	32.7228%	32.0546%	47.5531%	40.0541%	37.2421%	37.3651%	63.8217%	37.8293%	42.7813%	32.6730%	35.0598%
2016	7.7119%	8.4303%	8.0432%	2.5308%	14.8528%	9.5187%	9.3473%	7.0011%	12.0357%	9.3832%	7.2600%	7.3564%	8.1612%	8.7655%	9.5187%	33.1878%	16.3738%
2017	12.7373%	8.7473%	2.5168%	3.4184%	11.3722%	6.0000%	2.5658%	3.3344%	6.3263%	6.4919%	4.2057%	5.0356%	7.4861%	7.5585%	6.0000%	16.9630%	2.2066%
2018	13.1305%	9.3523%	9.5436%	8.3854%	21.8168%	15.5954%	17.5454%	21.1700%	24.0242%	26.4246%	34.7127%	31.1588%	39.5005%	36.1175%	15.5954%	29.5576%	25.1740%
2019	43.1142%	12.3908%	10.3604%	5.8990%	15.5323%	2.2724%	4.5886%	5.7169%	29.3967%	7.6190%	13.3602%	7.8799%	9.4458%	10.8894%	2.2724%	6.5341%	8.6040%
2020	16.7464%	7.3124%	7.0394%	0.5689%	21.8543%	14.3399%	12.4576%	8.1707%	7.7803%	9.6280%	18.7254%	9.3637%	19.0561%	21.6039%	14.3399%	3.8791%	11.4917%

Figure 18: annual maximum drawdown for long-short

- Buying "winners" can obtain more than 10% of the excess return. In addition, the trading strategy to obtain the highest excess return is (1,1).
- Selling "losers" can not obtain any excess return. People will lose almost everything by short them.
- Buying "winners" and selling "losers" can not obtain any excess return as well.
- Buying "winners" have an relatively stable maximum drawdown compare to CSI 300, while selling "losers" has an relatively high maximum drawdown compared to CSI 300.
- Buying "winners" and selling "losers" has an relatively low maximum drawdown compare to CSI 300.

Thanks for your attention!