Section 6. Economic theory

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A QUANTITATIVE ANALYSIS OF ENTRY POINTS WITH THE WINNING PROBABILITY IN THE TRADING OF THE DOW JONES INDUSTRY AVERAGE (DJIA)

Abstract. The Dow Jones Industrial Average (DJIA) is the most influential and authoritative stock price index in the world. Its components are chosen by the editors of the Wall Street Journal and modified occasionally based on market condition. When a company is replaced, the individual weights will be adjusted to mitigate the direct impact on the DJIA. Since 1980, the United States has experienced five recessions, corresponding to 1980.2–1980.7, 1981.8–1982.10, 1990.8–1991.3, 2001.4–2001.11 and 2008.1–2009.6, respectively. The Dow Jones Index sets new record highs in 2019 and is attracting the attention of investors around the world. Although technical analysis offers little value in the medium-to-long-term prediction of individual stocks, it is quite valuable in prediction of DJIA. It is feasible to implement a trading strategy to improve the winning probability, in which an entry point is carefully selected based on quantitative analysis of DJIA, through the high-low-nine pattern and structural quantification of technical means.

Keyword: Winning Probability, Quantitative Trading, DJIA.

1. Introduction

1.1 40-Year Trend Analysis of DJIA

Since the beginning of 2019, the new orders in the Purchasing Managers Index (PMI) for the manufacto-

ry industry, the leading indicator of the US economy, fell to 50% from 58%. Meanwhile, the PMI index for imports, inventories, and prices have fell below the line of prosperity and decline multiple time.

Figure 1. DJI Index (1980–2019)
Data information: Bloomberg

As the economy retreats, the concerns of US recession have heated up. According to the New York Fed's Recession Probability Index, the probability to have a US recession in the next 12 months is as high as 32.9%, the highest since 2012. (Since 1960, whenever this index rose above 30%, a US economy recession occurred during the following 12 months.) Despite poor economy, the three major US stock indexes have rebounded more than 15 percents from their lows and hit record highs.

As of August 18, 2019, the overall valuation of U.S. stocks has reached an all-time single digit (75% quantile), with some top performing and heavily weighted sectors' valuations rising to record highs. At the industry level, the valuations of public utilities, essential consumption, information technology, and optional consumer industries, which have the highest increments and a combined weight of nearly 40%, rose to historical 100%, 93%, 73% and 82% of the scale, respectively.

Figure 2. New York Fed's U. S. Recession Probability Index rises to 32.9%, the highest level since 2012. **Data information:** NY Fed

1.2 The Value of DJIA Index Analysis to Investors

The trend and performance of the DJIA reflect the valuation of the major components of the U.S. stock market. It further indicates the price level and movement of the overall level of U.S. stock market, and it also reflects other information, such as stock price changes and trading volume. Therefore, it is immune to manipulation caused by short-term factors and human factors.

Through quantitative analysis of the trend of DJIA, we can grasp the general condition and changes in the overall stock market. A understanding of wave-like movement of the overall market in the medium and long-term, in combination with the price movement of individual stocks, an optimal entry point could be established to improve the winning probability of investment.

2. Method

2.1 TD Nine-turn sequence

TD Buy structure, for 9 consecutive days, the closing price is lower than their corresponding 4 days ago closing price (low-9, see Fig. 3). TD Sell structure, for 9 consecutive days, the closing price is higher than their corresponding 4 days ago closing price (high-9, see figure 4). The nine-turn sequence is about timing the buying and selling point of a stock. The appearance of a high-9 indicates that the market is currently at a relative high position and could head into an adjustment. Therefore, it is not reasonable to buy. In case an investor is eager to acquire this stock in near future, a low-9 on a finer time scale would be a good entry point. For stock buying, when a high-9 emerges from an established rising trend, the next low-9 on finer scale would be good

entry point. If a high-9 forms on a declining trend, the next low-9 on coarser time scale indicates a good entry point of stock buying.

The idea of nine-turn sequence originates from DeMak's TD sequence, which contains both nine-turn buy structure and sell structure.

Figure 3. TD Buy Structure

Figure 4. TD Sell Structure

Nine-turn sequence formula:

A1: = C > REF(C,4);

A2: = C < REF(C,4);

T1: = A2 AND REF(A1,1);

T2: = A2 AND REF(T1,1);

T3: = A2 AND REF(T2,1);

T4: = A2 AND REF(T3,1);

T5: = A2 AND REF(T4,1);

T6: = A2 AND REF(T5,1);

T7: = A2 AND REF(T6,1);

T8: = A2 AND REF(T7,1);
 T9: = A2 AND REF(T8,1);
 T10:=A2 AND REF(T9,1);
 T11: = A2 AND REF(T10,1);
 T12: = A2 AND REF(T11,1);
 T13: = A2 AND REF(T12,1);
 T14: = A2 AND REF(T13,1);
 DRAWTEXT(T1, L*0.98,'1'), colorgreen;
 DRAWTEXT(T2, L*0.98,'2'), colorgreen;
 DRAWTEXT(T3, L*0.98,'3'), colorgreen;
 DRAWTEXT(T4, L*0.98,'4'), colorgreen;
 DRAWTEXT(T5, L*0.98,'5'), colorgreen;
 DRAWTEXT(T6, L*0.98,'6'), colorgreen;
 DRAWTEXT(T7, L*0.98,'7'), colorgreen;
 DRAWTEXT(T8, L*0.98,'8'), colorgreen;
 DRAWTEXT(T9, L*0.98,'9'), colorblue;
 B1: = C < REF(C,4);
 B2: = C > REF(C,4);
 D1: = B2 AND REF(B1,1);
 D2: = B2 AND REF(D1,1);
 D3: = B2 AND REF(D2,1);
 D4: = B2 AND REF(D3,1);
 D5: = B2 AND REF(D4,1);
 D6: = B2 AND REF(D5,1);
 D7: = B2 AND REF(D6,1);
 D8: = B2 AND REF(D7,1);
 D9: = B2 AND REF(D8,1);
 D10: = B2 AND REF(D9,1);
 D11: = B2 AND REF(D10,1);
 D12: = B2 AND REF(D11,1);
 D13: = B2 AND REF(D12,1);
 D14: = B2 AND REF(D13,1);
 DRAWTEXT(D1, H*1.010,'1'), colorblue;
 DRAWTEXT(D2, H*1.010,'2'), colorblue;
 DRAWTEXT(D3, H*1.010,'3'), colorblue;
 DRAWTEXT(D4, H*1.010,'4'), colorblue;
 DRAWTEXT(D5, H*1.010,'5'), colorblue;
 DRAWTEXT(D6, H*1.010,'6'), colorblue;
 DRAWTEXT(D7, H*1.010,'7'), colorblue;
 DRAWTEXT(D8, H*1.010,'8'), colorblue;
 DRAWTEXT(D9, H*1.010,'9'), colorgreen;

2.2 Quantified structure

The structure is determined by the divergence of the stock price (stock index index) and the trend indicator MACD. The criteria to determine the formation of the structure are:

A. The desensitization established under the following two conditions: 1) the stock price (or market index) reaches a new high, while the difference value (DIF) of the Moving Average Convergence Divergence (MACD) is not a new high; 2) the stock price (or stock index) reaches a new low while the DIF of the MACD is not a new low. A desensitization refers to a specific period of time. Although it is the necessary process to generate a structure, the establishment of desensitization may not lead to a structure.

B. Desensitization's amplitude, time span, and speed are important factors in the determination of the structure.

C. With the status of sensitization, the flipping of the DIF value's positive/negative sign indicates the establishment of a structure. In other words, the unequal red-green diagonal line turns red or green.

D. The price (stock index) is determined by the closing price of each period.

E. DIF value is determined by the first two effective numbers (the first two on the left are numbers that are not equal to zero).

The contradiction between new low in stock price and not-new low in DIF, or the contradiction between new high in stock price and not-new high in DIF, indicates the desensitization phenomenon.

Desensitization is an inevitable process to form a bottom or top structure, although it is not reversible. The establishment of the top or bottom structure must undergo through the desensitization process. However, a formed desensitization may not eventually lead to a structure because desensitization could be transient and disappears swiftly.

Under the premise of desensitization, the DIF value of MACD often leads the changing trend, i.e. the top structure changes from up to down, and the bottom structure changes from down to up (only in

integer bits). Such switching indicates 75% completion of the structure.

The color switch of the MACD value of MACD (MACD has three values, DIF DEA MACD, DIF is the most important and most commonly used,

MACD value is the result of golden cross and dead cross), is a strong complement or reinforcement of the formation of the structure. When this phenomenon appears, the structure is 100% completed.

Figure 5. Quantitative Structure Formation

Generally speaking, the structure is very effective. Often the trade happens on the left side and trend is on the right side. In unilateral market, the structure is not effective, neither does the nine-turn sequence. For a fluctuating market, the structure is very effective on cycles with various size. The pattern may sometimes appear rather complex due to the interaction between multiple cycles.

Quantified structure formula

DIF:100*(EMA(CLOSE, 12)-EMA (CLOSE, 26));
 DEA: EMA(DIF, 9);
 MACD:(DIF-DEA)*2, COLORSTICK;
 Death Cross:=CROSS(DEA, DIF);
 N1:= BARSLAST(Death Cross), NODRAW;

N2:= REF(BARSLAST(Death Cross), N1 + 1), NODRAW;

N3:= REF(BARSLAST (Death Cross), N2+N1+2), NODRAW;

CL1:= LLV(C, N1+1), NODRAW;

DIFL1:= LLV(DIF, N1+1), NODRAW;

CL2:= REF(CL1, N1+1), NODRAW;

DIFL2:= REF(DIFL1, N1+1), NODRAW;

CL3:= REF(CL2, N1+1), NODRAW;

DIFL3:= REF(DIFL2, N1+1), NODRAW;

PDIFL2:= IF(DIFL2 > 0, INTPART (LOG(DIFL2))-1, INTPART(LOG(-DIFL2))-1);
 MDIFL2:= INTPART(DIFL2/POW(10, PDIFL2));

PDIFL3:= IF(DIFL3 > 0, INTPART (LOG(DIFL3))-1, INTPART(LOG(-DIFL3))-1);

MDIFL3: = INTPART(DIFL3/POW(10, PDI-
FL3));

MDIFB2: = INTPART(DIF/POW (10, PDI-
FL2));

MDIFB3: = INTPART(DIF/POW(10, PDI-
FL3));

Direct bottom deviation: = (CL1 < CL2)
AND (MDIFB2 > MDIFL2) AND (MACD < 0
AND REF(MACD, 1) < 0) AND MDIFB2 <=
REF(MDIFB2,1);

Peak Separation Bottom Deviation: = (CL1 <
CL3 AND CL3 < CL2) AND (MDIFB3 > MDI-
FL3) AND (MACD < 0 AND REF(MACD, 1) < 0)
AND MDIFB3<=REF(MDIFB3,1);

B: Direct bottom deviation OR Peak Separation
Bottom Deviation, NODRAW;

BG:((MDIFB2 > REF (MDIFB2,1))*REF (Di-
rect bottom deviation,1)) OR ((MDIFB3>REF(M
DIFB3,1))*REF(Peak Separation Bottom Devia-
tion,1)), NODRAW;

Bottom deviation disappears: = (REF(Direct
bottom deviation,1) AND DIFL1 <= DIFL2) OR
(REF(Peak Separation Bottom Deviation,1) AND
DIFL1 <= DIFL3);

STICKLINE(B OR BG, DIF, DEA, 8, 0), col-
ored;

DRAWTEXT(FILTER (B, MACD > 0,1),
(DIF+MACD),'passivation '), colored;

DRAWTEXT(FILTER (BG, MACD > 0,1),
DIF*1.1,'structure forms '), colormagenta;

DRAWTEXT(FILTER(Bottom deviation disap-
pears,B,1),(DIF+MACD),'disappears '), coloryellow;

STICKLINE(B OR BG, DIF, DEA,5,0), colored;

Golden Cross: = CROSS(DIF, DEA);

M1: = BARSLAST(Golden Cross), NODRAW;

M2: = REF(BARSLAST(Golden Cross), M1+1),
NODRAW;

M3: = REF(BARSLAST(Golden Cross), M2 +
+M1+2), NODRAW;

CH1: = HHV(C, M1+1), NODRAW;

DIFH1: = HHV(DIF, M1+1), NODRAW;

CH2: = REF(CH1, M1+1), NODRAW;

DIFH2: = REF(DIFH1, M1+1), NODRAW;

CH3: = REF(CH2, M1+1), NODRAW;

DIFH3: = REF(DIFH2, M1+1), NODRAW;

PDIFH2: = IF(DIFH2 > 0, INTPART
(LOG(DIFH2))-1,INTPART(LOG(-DIFH2))-1);

MDIFH2: = INTPART(DIFH2/POW (10,
PDIFH2));

PDIFH3: = IF(DIFH3 > 0, INTPART
(LOG(DIFH3))-1,INTPART(LOG(-DIFH3))-1);

MDIFH3: = INTPART(DIFH3/POW(10,
PDIFH3));

MDIFT 2: = INTPART(DIF/POW (10,
PDIFH2));

MDIFT3: = INTPART(DIF/POW(10,
PDIFH3));

Direct Top Deviation: = (CH1 > CH2)
AND (MDIFT2 < MDIFH2) AND (MACD >
0 AND REF(MACD,1) > 0) AND MDIFT2 >=
REF(MDIFT2,1);

Peak Separation Top Deviation: = (CH1>CH3
AND CH3>CH2) AND (MDIFT3<MDIFH3)
AND (MACD>0 AND REF(MACD,1)>0) AND
MDIFT3>= REF(MDIFT3,1);

T: Direct Top Deviation OR Peak Separation
Top Deviation, NODRAW;

TG:((MDIFT2<REF(MDIFT2,1))*REF(Dir-
ect Top Deviation,1)) OR ((MDIFT3<REF(MDI
FT3,1))*REF(Peak Separation Top Deviation,1)),
NODRAW;

Top deviation disappears: = (REF(Direct
Top Deviation,1) AND DIFH1 >= DIFH2) OR
(REF(Peak Separation Top Deviation,1) AND
DIFH1 >= DIFH3);

STICKLINE(T OR TG, DIF, DEA,8,0), color-
green;

DRAWTEXT(FILTER(T, MACD < 0,1),
(DIF+MACD),'passivation '), colorgreen;

DRAWTEXT(FILTER (TG, MACD < 0,1),
DIF*1.02,'structure forms '), colorgreen;

DRAWTEXT(FILTER(Top deviation disap-
pears, T,1), (DIF+MACD),'disappears '), coloryel-
low;

STICKLINE(T OR TG,DIF,DEA,5,0),colorgreen;

2.3 Data

Trader KK stock software is a trading software to provide market display, market analysis and market trading. It could be freely downloaded from the company's website. Basic market data is also freely

provided to investors. In this study, DJIA's stock history data (daily DJI index) from 1980–2019 was downloaded. Monthly and yearly data was used as baseline?

2.4 Statistical Analysis

Monthly-moving-average line analysis

Figure 6. DJI nine-turn sequence high and low point chart (month line) – (1980–2019)

From the KK stock trading software, the monthly K-line data from 1980 to 2019 were retrieved. Based on the analysis of nine-turn sequence formula, high-9 selling points appeared 17 times and low-9 buying

point appeared once. The specific high-9 and low-9 values and the corresponding band high (low) were summarized in (table 1).

Table 1. – DJI nine-turn sequence analysis table (month line) – (1980–2019)

No	High (Low) Nine Time Point	Nature	High (Low) Nine Index	Maximum (Low) Index in Band	Maximum (Low) Time Point	The lowest (high) index of callback	Minimum (High) Time Point	Band exponential difference	Profit Ratio
1	2	3	4	5	6	7	8	9	10
1.	1981.02	high nine selling points	908.88	1030.98	1981.04	769.98	1982.08	–138.9	–13.47%
2.	1983.04	high nine selling points	1228.04	1291.87	1984.01	1082.05	1984.07	–145.99	–11.30%
3.	1985.09	high nine selling points	1341.40	No callback					

1	2	3	4	5	6	7	8	9	10
4.	1987.08	high nine selling points	2688.78	2736.71	1987.08	1616.21	1987.01	-1072.57	-39.19%
5.	1989.08	high nine selling points	2748.10	3010.64	1990.07	2354.21	1990.10	-393.89	-13.08%
6.	1990.08	high nine selling points	3057.91	No callback					
7.	1993.08	high nine selling points	3663.83	No callback					
8.	1995.05	high nine selling points	4816.94	No callback					
9.	1997.04	high nine selling points	7057.55	No callback					
10.	1999.07	high nine selling points	11252.27	11750.28	2000.01	7197.49	2002.10	-4054.78	-34.51%
11.	2003.12	high nine selling points	10462.44	No callback					
12.	2006.03	high nine selling points	11334.96	11670.19	2006.05	10683.32	2006.07	-651.64	-5.58%
13.	2008.08	low nine buy points	11221.53	10827.71 No rise	2008.07	6469.95	2009.03	-4751.58	-42.34%
14.	2010.01	high nine selling points	10729.89	11258.01	2010.04	9614.32	2010.07	-1115.57	-10.40%
15.	2011.05	high nine selling points	12876.00	12876.00	2011.05	10404.49	2011.1	-2471.51	-19.19%
16.	2013.05	high nine selling points	15538.12	15538.12	2013.06	14515.27	2013.06	-1022.85	-6.58%
17.	2014.05	high nine selling points	16735.51	18351.16	2015.05	15370.33	2015.06	-1365.18	-8.16%
18.	2016.12	high nine selling points	19987.63	No callback					

Among those 17 high-9 sales, 7 were followed by immediate decline of DJIA more than 10%, 2 were followed by decline more than 30%, and the greatest decline was 39.19%. Six high-9 sales were not followed by decline in DJIA. The overall success rate of high-9 selling trade is 58.82%. The probability of profiting from short selling > 10% is 41.17%. The

low-9 buying trade was followed by continuing decline, not rising, in DJIA. The amplitude of decline was as high as 42.34%. The trade failed miserably with huge loss.

From the KK stock trading software, the monthly K-line data from 1980 to 2019 were retrieved.

Figure 7. DJI Quantitative Structure Chart (Month Line) (1980–2019)

Note: The side chart is a quantitative structural passivation and structural formation

Based on the analysis of quantitative structure formula, the bottom of the month desensitization buy points appeared a total of 8 times, the top desensitization selling point appeared 2 times. See

Table 2: DJI Quantitative Structure (Monthline) (1980–2019) for specific buy or sell quantitative structure values and corresponding band high (low) indices.

Table 2. – DJI Quantitative Structure (Monthline) Analysis Table – (1980–2019)

No	Structure Time Point	Nature	High (Low) Structure Index	Maximum (Low) Index in Band	Maximum (Low) Time Point	Band (Selling) Buy Index	Time Point of Selling (Buying)	Band exponential difference	Profit Ratio
1	2	3	4	5	6	7	8	9	10
1.	1982.08	passivation buy point	769.98	1291.87	1984.01	1223.2	1984.07	453.22	58.86%
2.	1985.05	passivation buy point	1240.72	2736.61	1987.08	2596.12	1987.10	1355.4	109.24%
3.	1989.08	passivation selling point	2748.10	2822.95	1990.01	2782.88	1990.02	-34.78	-1.27%
4.	1990.07	passivation selling point	3010.64	3010.64	1990.07	2905.45	1990.08	105.19	3.49%
5.	1991.05	passivation buy point	2840.34	9367.84	1987.07	8816.09	1991.11	5975.75	210.39%
6.	1999.02	passivation buy point	9099.04	11750.28	2000.01	10945.53	2000.01	1846.49	20.29%
7.	2006.01	passivation buy point	10662.15	14198.1	2007.10	13863.22	2007.12	3201.07	30.02%
8.	2011.10	passivation buy point	10912.1	10912.1	2011.10	12391.56	2011.12	1479.46	13.56%
9.	2012.10	passivation buy point	13096.46	12471.49	2012.10	17169.99	2015.02	4073.53	31.10%
10.	2016.07	passivation buy point	17924.24	26598.36	2018.10	17959.95	2016.10	8638.41	48.19%

In 8 time, following buying at the bottom of desensitization, the subsequent selling price rose more than 10%. Among these, increment > 30% 6 times, > 50% 3 times, > 100% 2 times, and highest increment was over 210.39%. Selling at the top desensitization

happened 2 times. One had selling price lower than buying price by -1.27%. The other one had price increase around 3.49%. It is a profit trade, but not very profitable.

Weekly month line analysis

Figure 8: DJI nine-turn sequence chart (weekly line) – (2009–2019)

From the KK stock trading software, the weekly K-line data from 1980 to 2019 were retrieved. Based on the analysis of nine-turn sequence formula, high-9 selling points appeared 16 times and low-9

buying point appeared 3 times. The specific high-9 and low-9 values and the corresponding band high (low) were summarized in table 3.

Table 3: DJI nine-turn sequence high and low point (weekly line) – (2009–2019)

No	High (Low) Nine Time Point	Nature	High (Low) Nine Index	Maximum (Low) Index in Band	Maximum (Low) Time Point	The lowest (high) index of callback	Minimum (High) Time Point	Band exponential difference	Profit Ratio
1	2	3	4	5	6	7	8	9	10
1.	2009.03.02	low nine buy points	6626.95	6469.95	2009.03.02	Continuous rise			
2.	2009.05.18	high nine selling points	8277.32	8877.93	2009.06.08	8067.19	2009.07.06	-210.13	-2.37%
3.	2009.09.08	high nine selling points	9649.85	9854.58	2009.09.14	9430.08	2009.09.28	-219.77	-2.23%
4.	2010.04.12	high nine selling points	11018.66	11258.01	2010.04.26	9614.32	2010.06.28	-1404.34	-12.47%
5.	2010.11.01	high nine selling points	11444.08	11451.53	2010.11.01	10992.17	2010.11.22	-451.91	-3.95%

1	2	3	4	5	6	7	8	9	10
6.	2011.01.31	high nine selling points	12092.42	12391.29	2011.01.31	11858.52	2011.03.14	-233.9	-1.89%
7.	2011.05.09	high nine selling points	12781.06	12781.06	2011.05.09	11862.53	2011.06.13	-918.53	-7.19%
8.	2012.08.08	high nine selling points	13215.97	13653.24	2012.09.10	12471.49	2012.11.12	-744.48	-5.63%
9.	2013.02.25	high nine selling points	14149.15	No call-back					
10.	2014.06.09	high nine selling points	16970.17	16775.68	2014.06.09	16333.78	2014.08.04	-636.39	-3.75%
11.	2015.09.14	low nine buy points	16330.87	17977.85	2015.11.02	17798.49	2015.11.23	1467.62	8.99%
12.	2015.11.23	high nine selling points	17798.49	17868.18	2015.11.23	15450.58	2016.01.19	-2347.91	-13.19%
13.	2016.02.08	low nine buy points	15503.01	18167.63	2014.04.18	18167.63	2014.04.18	2664.62	17.19%
14.	2016.04.11	high nine selling points	17962.1	18167.63	2014.04.18	17331.07	2016.05.18	-631.03	-3.51%
15.	2017.06.19	high nine selling points	21394.76	No call-back					
16.	2017.11.06	high nine selling points	23602.12	23602.12	2017.11.06	23242.75	2017.11.13	-359.37	-1.52%
17.	2018.06.11	high nine selling points	25090.48	25402.83	2018.06.11	23997.21	2018.06.25	-1093.27	-4.36%
18.	2018.09.10	high nine selling points	26154.67	26951.81	2018.10.01	21712.53	2019.12.24	-4442.14	-16.98%
19.	2019.07.29	high nine selling points	27174.28	27398.68	2019.07.15	25417.61	2018.08.12	-1756.67	-6.46%

Figure 9. DJI Quantitative Structure Chart (Weekly Line) (2009–2019)

Among those 16 high-9 sales, 6 were followed by immediate decline of DJIA more than 5%, 3 were followed by decline more than 10%, and the greatest decline was 16.98%. Two high-9 sales were not followed by decline in DJIA. The overall success rate of high-9 selling trade is 87.5%. The probability of profiting from short selling > 10% is 18.75%. Three low-9 buying trade was followed rising, not declining, in DJIA. All trades are successful and continue to be profitable.

From the KK stock trading software, the weekly K-line data from 1980 to 2019 were retrieved. Based on the analysis of quantitative structure formula, the bottom of the month desensitization buy points appeared a total of 7 times, the top desensitization selling point appeared 12 times. See Table 4: DJI Quantitative Structure (Weekline) (1980–2019) for specific buy or sell quantitative structure values and corresponding band high (low) indices.

Table 4. – DJI Quantitative Structure Table (Weekly Line) – (2009–2019)

No	Structure Time Point	Nature	High (Low) Structure Index	Maximum (Low) Index in Band	Maximum (Low) Time Point	Band (Selling) Buy Index	Time Point of Selling (Buying)	Band exponential difference	Profit Ratio
1	2	3	4	5	6	7	8	9	10
1.	2009.03.02	passivation buy point	6626.95	6469.95	2009.03.02	7278.38	2009.03.16		Continuous rise
2.	2010.03.29	passivation selling point	10927.07	9614.32	2010.06.28	11008.81	2010.04.28	–1394.49	–12.76%
3.	2011.02.14	passivation selling point	12391.29	11858.52	2011.03.14	12391.29	2011.02.14	–532.77	–4.30%
4.	2011.05.02	passivation selling point	12876	11862.53	2011.06.13	12521.28	2011.05.02	–658.75	–5.12%
5.	2012.01.30	passivation selling point	12869.95	12035.09	2012.04.30	12849.59	2012.04.09	–814.5	–6.33%
6.	2012.07.30	passivation selling point	13281.32	13653.24	2012.09.10	13090.84	2012.08.27	562.4	4.23%
7.	2012.09.04	passivation selling point	13306.64	12588.31	2013.12.12	13343.51	2012.10.15	–755.2	–5.68%
8.	2012.12.31	passivation buy point	12863.89	15538.52	2012.05.20	13435.21	2012.12.31	2103.31	15.66%
9.	2013.07.29	passivation selling point	15658.36	14810.31	2013.08.26	15421.44	2013.08.05	–611.13	–3.90%
10.	2013.11.04	passivation buy point	15761.78	16588.25	2013.12.30	15761.78	2013.11.04	826.47	5.24%
11.	2013.12.16	passivation selling point	16221.14	16484.51	2013.12.30	15755.36	2013.12.09	–465.78	–2.87%
12.	2014.05.27	passivation selling point	16717.17	16950.93	2014.08.04	16980.57	2017.07.21	263.4	1.58%
13.	2014.19.22	passivation selling point	17277.88	15855.12	2014.10.13	17009.89	2014.09.29	–267.99	–1.55%
14.	2014.11.03	passivation buy point	17573.93	18288.63	2015.03.02	17856.78	2015.03.02	282.85	1.61%

1	2	3	4	5	6	7	8	9	10
15.	2015.02.23	passivation selling point	18132.70	18351.36	2015.05.18	17856.78	2015.03.02	-494.58	-2.73%
16.	2015.05.18	passivation selling point	18232.02	15370.33	2015.08.24	18351.36	2015.05.18	-2981.03	-16.35%
17.	2016.06.27	passivation buy point	17063.08	18668.44	2016.08.15	18551.54	2016.08.15	1488.46	8.72%
18.	2017.07.31	passivation buy point	22092.81	26616.71	2018.01.22	25337.87	2018.02.05	3245.06	14.69%
19.	2019.06.17	passivation buy point	26108.53	27398.68	2019.07.15	26727.61	2019.06.24	671.07	2.57%

In 7 time, following buying at the bottom of desensitization, the subsequent selling price rose. Among those, increment > 5% times, > 10% 3 times. In one trade, the price after buying keeps rising with no adjustment. Selling at the top desensitization happened 12 times. Among those, decline > 5% happened 5 time, > 10% 2 times. In two trades, the prices did not show decline adjustment. In one particular, the price increased by 4.23%.

3. Validation

A successful trading is defined as escaping the top (stop loss over 10%) and buying in at the bottom (taking profit over 10%). With that, the success rate is 76.51% based on the nine-turn sequence in monthly line through the back-test of KK trader data. The success rate is 68.53% based on the nine-turn sequence in weekly line.

As comparison, the success rate is 58.65% based on quantitative structure appearing in the monthly line through the back-test of KK trader data. The success rate is 57.14% based on quantitative structure appearing in the weekly line.

4. Discussion

The nine-turn sequence originates from the TD sequence of Tom Dimack, a master of technical analysis, whose core function is to discover the inflection point of the current stock price trend and improve the success rate of buying-in at the bottom and escaping at the top.

Although the nine-turn sequence is mainly used in index research, it could also be used as a reference

for trading individual stocks. The index determines the position and the individual stocks determine the battlefield. The nine-turn sequence is best used in conjunction with MACD divergence technology, which will improve the accuracy. Nine-turn sequence is least useful in the unilateral market, particularly in the unilateral rising market. Therefore, it is not recommended as a reference for actual operations. Identifying the top and bottom generally follows a pattern. In a downward trend, if a low-9 forms in daily line, then a high-9 on the rebound would be found in 120-minutes line, with the time scale been reduced to half.

As a technical index, the nine-turn sequence cannot be used arbitrary as basis for buying and selling stocks. Instead, trading should be based on a complete analysis which also takes consideration of the fundamentals and other technical indicators. In the process of a strong rising (declining) trend, it is possible to form a rise (down) 9 structure continuously. At this time, one should change the use strategy of the nine-turn sequence, with the first rise (down) 9 structure as a signal to strengthen the market start (down). The nine-turn sequence technical indicators, superimposed the bottom divergence (top divergence) and other signals for secondary confirmation, would be able to determine the reversal of the trend better.

5. Model improvement – Addition of Macro-Political Economy in Prediction of Delinquency

The general trend of the American Stocks in the 1980s is summarized as the following: The S. P. 500 rose 227.4 percent, which mainly come from

the rising from 1982.7 to 1987.8, and had down adjustment around 30% twice at 1980.11–1982.7 and 1987.8–1987.11. The driving forces of the rising market included the Reagan New Deal, the improvement of the Plaza Accord's trade structure in the United States, and the increased risk appetite for rising interest rates. Those might account for 86% to the gains in U.S. stocks. The U. S. stock adjustment in the early 1980s related to the “high inflation, wide fiscal, tight money” economic policy mix. The stock market crash of 197 was related to high valuation and auto-programmed trading strategy.

The general trend of the American Stocks in the 1990s is summarized as the following: The S. P. 500 rose 315.7%, and had down adjustments in 1990 and 1998 with amplitude of 20.0% and 19.3% respectively. The driving forces of the rising market included the deepening global integration, the development of the information industry, and the continued improvement of U.S. competitiveness. Those might account for 28% to the gains in U.S. stocks. The major factors contributing to the two adjustments are the savings and loan crisis in 1990 and the Asian financial crisis in 1998.

The general trend of the American Stocks between 2000 to 2008 is summarized as the following: The S. P. 500 rose over 90% between 2002.9 and 2007.10, and had two down adjustments during the periods of 2000.8 to 2002.9 (–50.5%) and 2007.10 and 2008.11 (–53.0%). The driving forces of the rising market included residents leverage to boost the prosperity of the real estate industry, tax reform, China's accession to the WTO to promote global economic and trade activity. Valuation contributes negatively to the market level. The major factors contributing to the two adjustments are the bursting of the dotcom bubble and the subprime crisis.

The general trend of the American Stocks between 2009 to 2019.8 is summarized as the following: The S. P. 500 rose over 219.6%, and had three down adjustments during the periods of 2011.4 to 2011.9, 2015.8 to 2016.2, and 2018.9 to 2018.12.

The driving forces of the rising market included Federal Reserve QE, U.S. companies increasing overseas investment and the development of big data and shale oil. Valuation contributes roughly 62% of the gain to the market level between 2012 and 2017. The major factors contributing to the two adjustments are the European debt crisis; the slowdown, the Fed's interest rate hike; and the valuation bottleneck.

Two factors should be closely monitored in stock investment. The first is the expected return on investment, the second is investment psychology. Expectations represent investors' expectations of return on investment in the current macroeconomic context, and investment psychology represents investors' confidence indices. The stock market is a battle ground for human nature. After witnessing a big market rise, people tend to have an outbreak of speculative trading. After seeing a major market decline, people tend to abandon the market in stampede. Therefore, each big rise in the stock market must be over-the-top, each big fall must be overdone.

6. Conclusion

Although fear and greed can have a big impact on the market, it cannot change the market's general trend. From the perspective of the big cycle, the stock market tends to be undervalued when macro-political and economic environment is poor and when the mood is depressed, and the stock market is often overvalued when the macro situation is good and when the mood is high. Based on the cycle of market sentiment, one should buy stocks when market sentiment is low and sell stocks when market sentiment is high. The accumulation of high sentiment (low) is a long-term process, and the process of reversal can be very long. Therefore, a nine-turn sequence and quantitative structure could be used as an indicator of the highs and lows of the index, and as an indicator of top or bottom of individual stocks' price. Nevertheless, Investors must have the patience and will to buy or sell at the right point and stick to the concept of long-term investment.

The stock market, accompanied by political and economic fluctuations, will also experience the death

of a rising and birth of a recession. The death of a rising trend of the birth of a decline. The sequence goes from birth, to growth, to peaking, to decline, and death. In quantitative structure, desensitization is a quantitative criterion from the peak to the decline, and the structure is the quantitative criterion of death. From a large number of disorderly individual trading, an overall pattern will appear at a certain time. This is the cause

of the general rule the stock market price movement. However, order does not appear all the time, and the market is chaotic in most of the time. Through the analysis of DJI index, with macro trends as the basis, the nine-turn sequence as the indicator, structural quantification as operation criterion, we could help the investors to obtain stable profits by picking the winning entry point with higher probability.

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