Does a Lunar Cycle Affect Market Averages?

by Bill Meridian

1.Introduction

This is an abridged version of a study that was conducted in 1994. The purpose of this paper is to derive a cycle relating the lunar cycle to an equity average. This cycle will then be evaluated for its profitability versus a buy-and-hold strategy. The results may be of interest to short-term traders with an interest in cyclic analysis.

Those who seek a causative link might consider the following. Serotonin is the substance in the brain of a homing pigeon that sensitizes the bird to the earth's magnetic field, allowing the pigeon to 'home in.' The field itself has been shown to fluctuate with lunar and solar influences. Nelson's work demonstrates a relationship between all of the planets and solar activity. Serotonin exists in the human body. The substance was neglected until biotechnology companies recently took an interest. Perhaps this is the link.

The Link to Markets in John Murphy's text, *Technical Analysis of the Futures Markets*

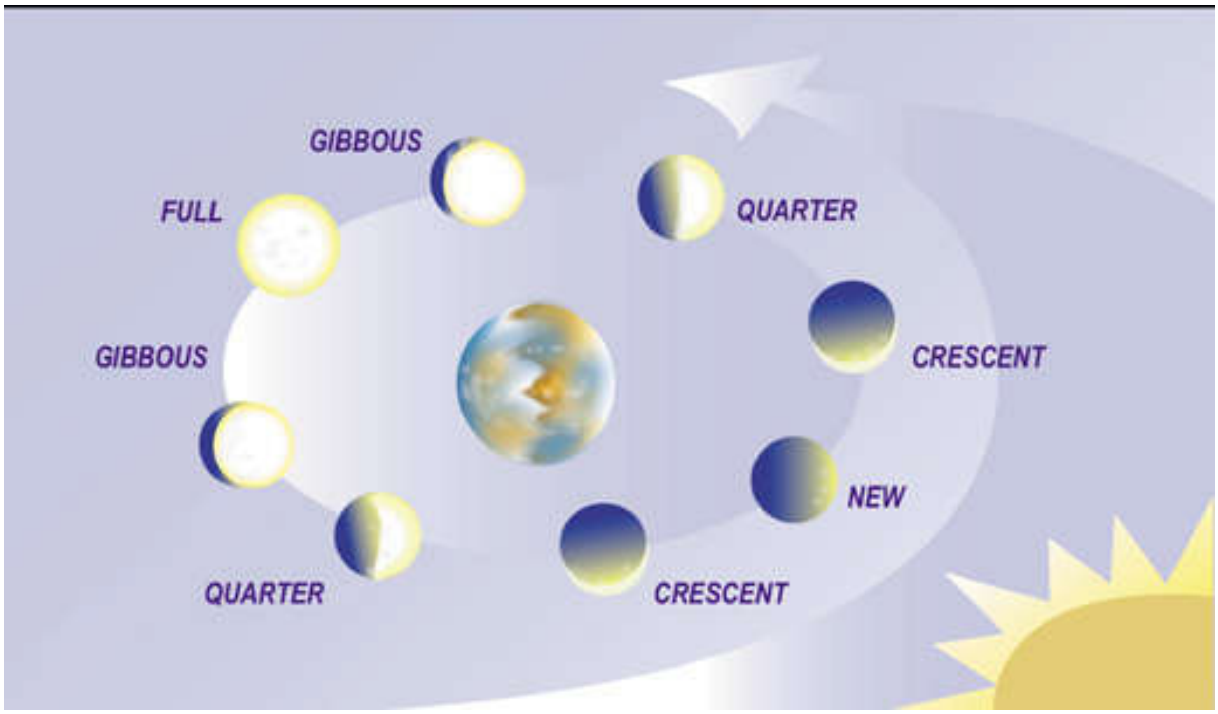
He writes, *"There is another important short-term cycle that tends to influence most commodity markets- the 28-day trading cycle. In other words, most markets have a tendency to form a trading low every 4 weeks. One possible explanation for this strong cyclic tendency throughout all commodity markets is the lunar cycle. Burton Pugh studied the 28-day cycle in the wheat market in the 1930s and concluded that the moon had some influence on market turning points. His theory was that wheat should be bought on a full moon and sold on a new moon. Pugh acknowledged, however, that the lunar effects were mild and could be overriden by the effects of longer cycles or important news events."*

John McGinley, writing in *Technical Trends*, once mentioned that Arthur Merrill conducted a study of market behavior around full and new moons and found no strong correlation. More recently, the February 27,1994 issue of Mark Liebovit's *Volume Reversal Survey* stated that he had noted a correlation between the lunar cycle and Federal Reserve actions. Chris Carolan, noted for his work with the Spiral Calendar, has achieved some success with a lunar-based forecasting system. Indeed, many older societies utilize a lunar calendar. Our own calendar year is based upon the movement of the earth around the sun. Those technicians who rely upon the annual cycle (the average percentage change in the DJIA from January 1 to December 31) are looking at an astronomically based cycle.

2. Methodology

The lunar cycle is defined by astrono- mers by the period beginning and ending with the conjunction of the sun and the moon. The two bodies are conjunct when they are zero degrees apart. The faster moon then races ahead of the sun, makes a 360-degree arc, and then conjoins the sun again, com- pleting a cycle. This process takes

a mean time of 29 days, 12 hours, 44 minutes, and 2.78 seconds. This period may vary by as much as 13 hours.



The 29-day lunar cycle was related to the DJIA on a day-by-day basis. This calculation was performed by PC as any other cycle computation would. The difference between this cycle and any other, such as the annual or 1-year cycle, is the method of choice of starting date. The starting date was the day of the new moon. The ending date is the date of the next new moon. Indeed, there may be no causal relation between the moon and prices, but the time series that will be utilized to define the cycle will be determined by lunar motion, just as the annual cycle is determined by our calendar which is derived from the solar cycle.

The cycle study is conducted through a series of steps:

1. A list of dates of all lunar cycles from 1915 through 1994 was calculated. See *table 1* as an example.

Table 1 - Lunar Cycle Database Example

	SUNMOON1.PRN				Line 1		Col 1	Byte 1				Insert		Indent
1	16	1885	Su...	(Tr)	0.00	Mo...	(Tr)	8:30	ET.	:	Su...	26Cp27	Mo...	26Cp27
2	15	1885	Su...	(Tr)	0.00	Mo...	(Tr)	2:10	ET.	:	Su...	26Aq37	Mo...	26Aq37
3	16	1885	Su...	(Tr)	0.00	Mo...	(Tr)	17:23	ET.	:	Su...	26Pi19	Mo...	26Pi19
4	15	1885	Su...	(Tr)	0.00	Mo...	(Tr)	5:46	ET.	:	Su...	25Ar25	Mo...	25Ar25
5	14	1885	Su...	(Tr)	0.00	Mo...	(Tr)	15:08	ET.	:	Su...	28Ta56	Mo...	28Ta56
6	12	1885	Su...	(Tr)	0.00	Mo...	(Tr)	22:37	ET.	:	Su...	22Ge02	Mo...	22Ge02
7	12	1885	Su...	(Tr)	0.00	Mo...	(Tr)	5:19	ET.	:	Su...	19Cn58	Mo...	19Cn58
8	10	1885	Su...	(Tr)	0.00	Mo...	(Tr)	12:20	ET.	:	Su...	17Le58	Mo...	17Le58
9	8	1885	Su...	(Tr)	0.00	Mo...	(Tr)	20:57	ET.	:	Su...	16Vi20	Mo...	16Vi20
0	8	1885	Su...	(Tr)	0.00	Mo...	(Tr)	7:39	ET.	:	Su...	15Li11	Mo...	15Li11
1	6	1885	Su...	(Tr)	0.00	Mo...	(Tr)	21:05	ET.	:	Su...	14Sc39	Mo...	14Sc39
2	6	1885	Su...	(Tr)	0.00	Mo...	(Tr)	15:24	ET.	:	Su...	14Sg39	Mo...	14Sg39
1	5	1886	Su...	(Tr)	0.00	Mo...	(Tr)	7:49	ET.	:	Su...	14Cp58	Mo...	14Cp58
2	4	1886	Su...	(Tr)	0.00	Mo...	(Tr)	3:14	ET.	:	Su...	15Aq17	Mo...	15Aq17
3	5	1886	Su...	(Tr)	0.00	Mo...	(Tr)	21:56	ET.	:	Su...	15Pi17	Mo...	15Pi17
4	4	1886	Su...	(Tr)	0.00	Mo...	(Tr)	14:19	ET.	:	Su...	14Ar44	Mo...	14Ar44
5	4	1886	Su...	(Tr)	0.00	Mo...	(Tr)	5:39	ET.	:	Su...	15Ta55	Mo...	15Ta55
6	2	1886	Su...	(Tr)	0.00	Mo...	(Tr)	13:45	ET.	:	Su...	11Ge54	Mo...	11Ge54
7	1	1886	Su...	(Tr)	0.00	Mo...	(Tr)	21:56	ET.	:	Su...	9Cn54	Mo...	9Cn54
7	31	1886	Su...	(Tr)	0.00	Mo...	(Tr)	5:25	ET.	:	Su...	7Le53	Mo...	7Le53
8	29	1886	Su...	(Tr)	0.00	Mo...	(Tr)	12:53	ET.	:	Su...	6Vi04	Mo...	6Vi04
9	27	1886	Su...	(Tr)	0.00	Mo...	(Tr)	21:26	ET.	:	Su...	4Li41	Mo...	4Li41
0	27	1886	Su...	(Tr)	0.00	Mo...	(Tr)	7:23	ET.	:	Su...	25c49	Mo...	25c49

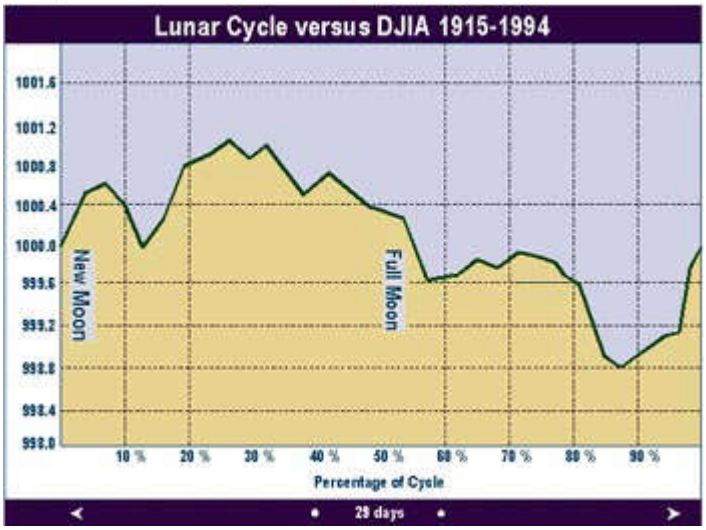
2. This database of dates is then instructed to access a daily DJIA quotes from the price database. The program then selected the DJIA price on the day of the first new moon in 1915. In the next cell, the DJIA for the following day was inserted, and so on, through to the day of the next new moon. The PC used the Friday close when it encountered a weekend. The result was a row of prices. This process was repeated for each year, 1915 through 1994. There are about 13 such cycles per year. The sample size was over 1,000 cycles.
3. The resultant array of prices was smoothed.
4. Individual cycles were then combined to obtain a composite cycle through vector addition. This depicts the average percent change in the DJIA from new moon to new moon from 1915 through 1994.
5. Fourier least squares approximation was utilized to determine the equation of the line of this cycle. This cycle line can be projected backward or forward. The result is ***graph 1.***
6. This cycle line was tested versus a buy-and-hold strategy from 1960 through 1993 to determine its predictive value.

3. Discussion of the Results:

Graph 1 summarizes the results. The horizontal axis represents the 29-day cycle. The gradations denoted by the dashed vertical lines are 10% of the cycle, or 2.9 days. The vertical axis represents the average percentage price change in the DJIA. For example, the DJIA has risen an average of 0.1% from the new moon to the cycle peak about 7 days later. The DJIA has then dropped 0.22 from this cycle peak to the cycle trough.

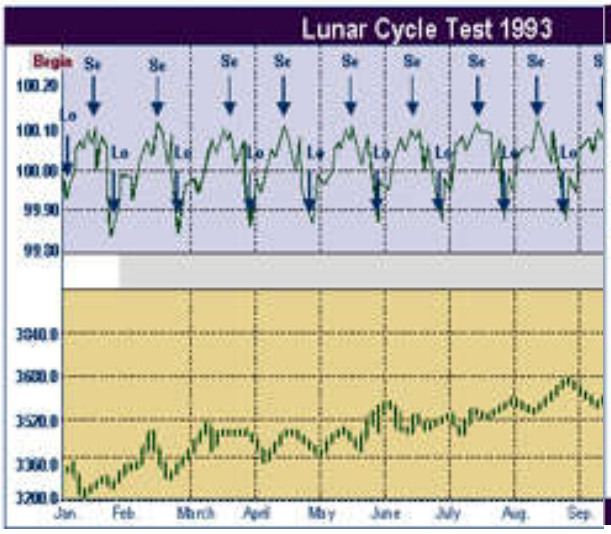
Graph 1 reveals that the DJIA has, on average, risen from the new moon for about 7 days. The DJIA then has bottomed about 4 days before the next new moon. The price slide seems to accelerate after the occurrence of the full moon. (This would explain why Arthur Merrill did not find turning points near the actual lunations; the top and bottom of the cycle tend top fall between the two phenomena.)

Graph 1

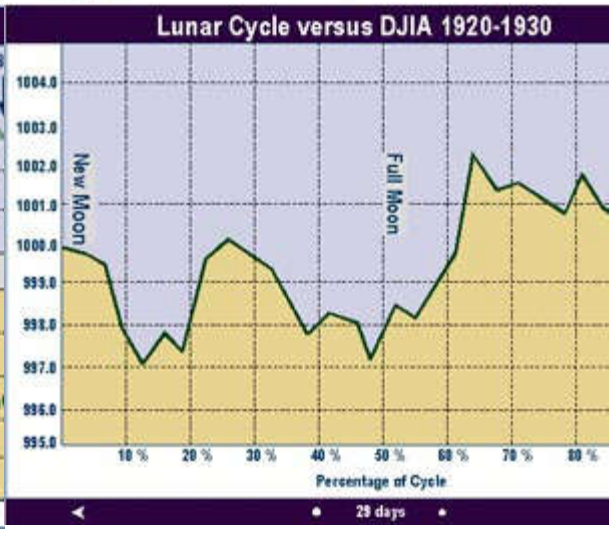


Graphs 2 through 9 depict the same relationship broken into time segments. Graph 3 shows the same relationship from 1915 to 1920 only. *Graph 4* represents the cycle for the decade 1920 to 1930 only. *Graphs 5 through 9* depict the cycle by decade through 1990. The period 1920-1930 (*Graph 3)* shows the greatest difference from the average in *Graph 1*. The 1960 decade in *Graph 7* is similar to the average, but shows a higher peak 1 to 2 days after the full moon. In the 1970s (Graph 8) the cycle bottom occurred much earlier then in the average cycle in *Graph 1*. In the remaining decades, the relationship was fairly consistent with the average overall cycle. The cycle in the 1980s was consistent with average.

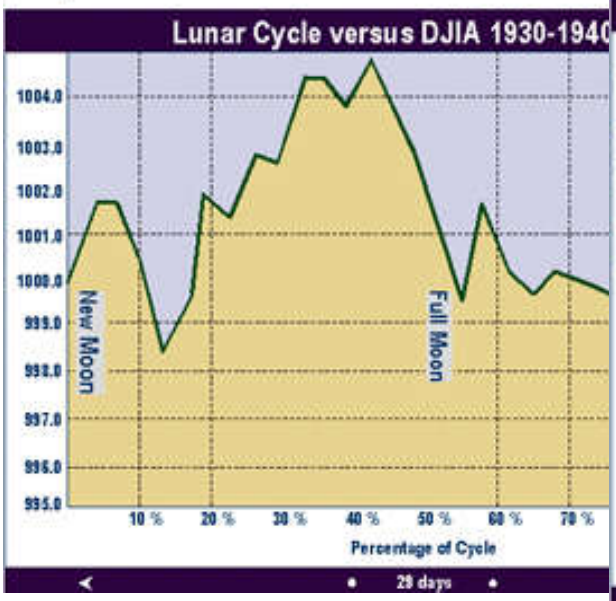
Chart 2



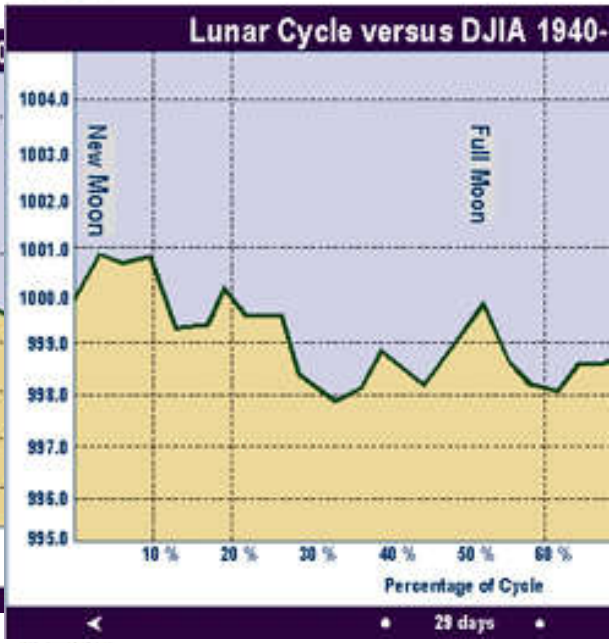
Graph 3



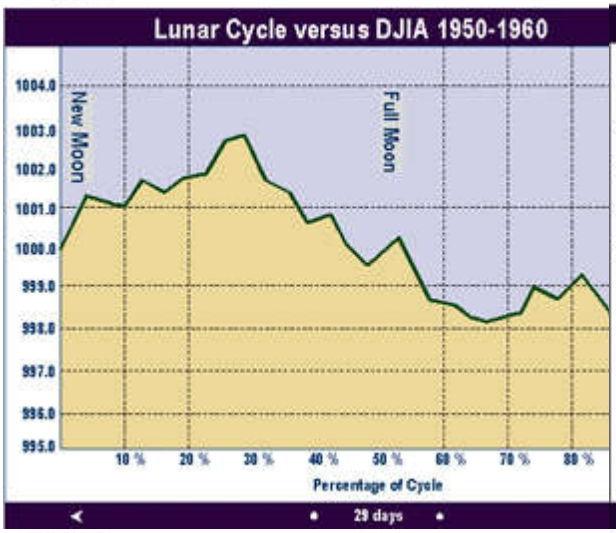
Graph 4



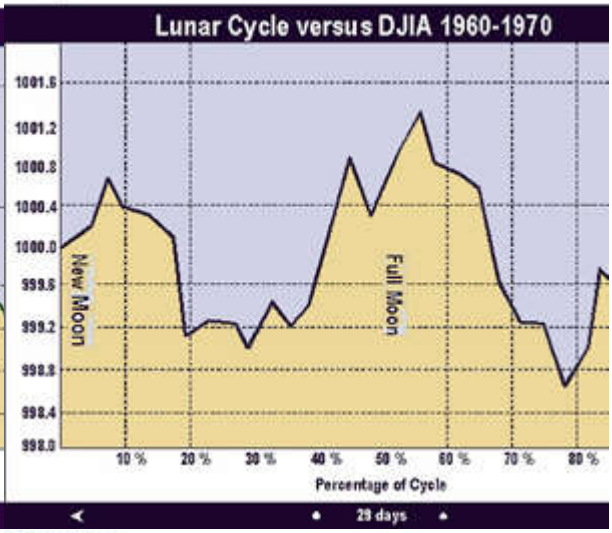
Graph 5



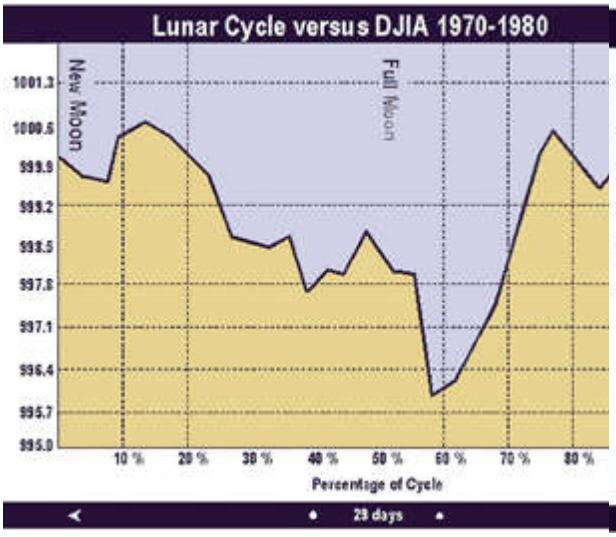
Graph 6



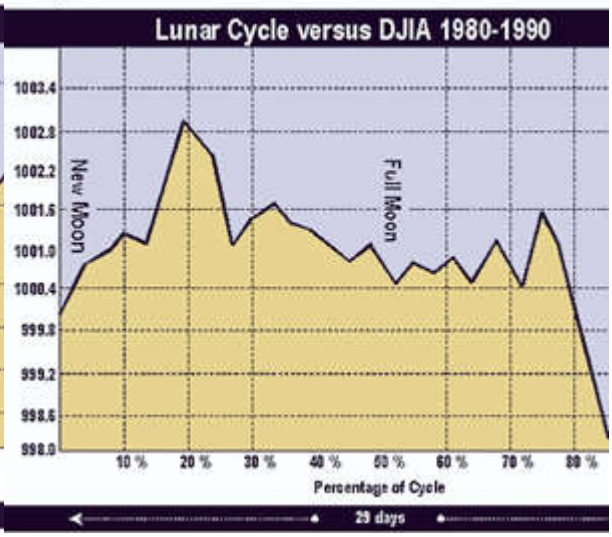
Graph 7



Graph 8



Graph 9



Graph 10 is the same study applied to the S&P 500 from 1950 through 1994.The shape of the curve is roughly the same.
This study was added to demonstrate that there was little variation in the effect of the cycle in relationship to these two popular

Graph 10

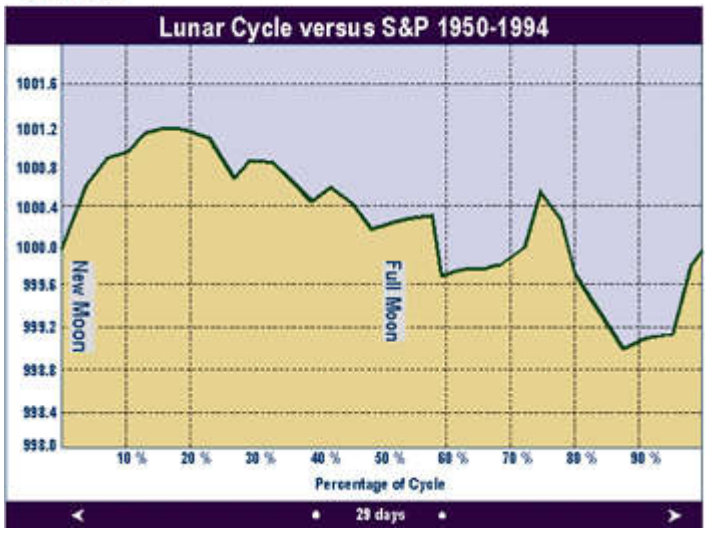


Table 2 - Sample Buy-Sell Report

Profitability Report Using Model NEWMOON and Price Database DAILY						
Tran.	First Date	Second Date	Start Amnt.	First Price	Second Price	Final Amnt.
Long	Jan. 5, 1993	Jan. 13, 1993	$1000.00	$3307.87	$3263.56	$986.60
Long	Jan. 26, 1993	Feb. 11, 1993	$986.60	$3298.95	$3422.69	$1023.61
Long	Feb. 26, 1993	Mar. 12, 1993	$1023.61	$3370.81	$3427.82	$1040.92
Long	Mar. 27, 1993	Apr. 11, 1993	$1040.92	$3440.00	$3396.48	$1027.75
Long	Apr. 25, 1993	May 11, 1993	$1027.75	$3413.80	$3468.75	$1044.30
Long	May 25, 1993	June 9, 1993	$1044.30	$3516.63	$3511.90	$1042.89
Long	June 23, 1993	July 9, 1993	$1042.89	$3466.80	$3521.10	$1059.23
Long	July 23, 1993	Aug. 8, 1993	$1059.23	$3546.74	$3569.43	$1063.32
Long	Aug. 21, 1993	Sep. 6, 1993	$1063.32	$3615.48	$3633.90	$1068.73
Long	Sep. 19, 1993	Oct. 6, 1993	$1068.73	$3613.25	$3598.99	$1064.52
Long	Oct. 18, 1993	Nov. 5, 1993	$1064.52	$3642.31	$3643.43	$1064.84
Long	Nov. 17, 1993	Dec. 4, 1993	$1064.84	$3704.35	$3704.07	$1064.76
Long	Dec. 16, 1993	Dec. 31, 1993	$1064.76	$3726.14	$3754.09	$1072.75
% of Increase Following Buy and Sell Signals = 7.3. 8 transactions were profitable of 13 total transactions			% of Increase Using a Buy and Hold Strategy = 14.4. 5 transactions were unprofitable of 13 total transactions			

Buy and Sell Test Versus a Buy and Hold Strategy
The cycle was tested as a short-term timing aid. The program was instructed to buy the DJIA at every cycle bottom and to sell (move to cash) at every cycle high.The program bought at every "long" arrow (marked by 'lo' on the graph).*Table 2* summarizes the results for 1993

The test began in 1960 and concluded with 1993.The yearly results depicted in *Table 2* are summarized in annual form in *Table 3.*

Table 3

Summary of New Moon Cycle Buy and Sell Tests

Year	Amount	$	Year	Amount	$
1960	1.078	1078	1977	0.829	701.116
1961	1.089	1173.942	1978	0.916	642.2222
1962	0.85	997.8507	1979	1.064	683.3244
1963	1.143	1140.543	1980	1.08	737.9904
1964	1.075	1226.084	1981	0.889	656.0735
1965	1.043	1278.806	1982	1.018	667.8828
1966	0.809	1034.554	1983	1.127	752.7039
1967	1.029	1064.556	1984	0.966	727.112
1968	1.08	1149.72	1985	1.098	798.3689
1969	0.976	1122.127	1986	1.208	964.4297
1970	0.877	984.1054	1987	1.21	1166.96
1971	1.141	1122.864	1988	1.154	1346.672
1972	1.018	1143.076	1989	1.134	1527.126
1973	0.77	880.1684	1990	1.107	1690.528
1974	0.809	712.0562	1991	1.194	2018.491
1975	1.109	789.6704	1992	0.987	1992.25
1976	1.071	845.737	1993	1.073	2137.685

Three Attempts to Improve the Results
Attempts were made to improve the batting average of the cycle by confirming the buy signals with a 14-day oscillator such as an RSI or a stochastic. These tests did not significantly improve the results

1. This strategy underperformed both the first strategy and the buy-and-hold strategy. It returned only $1,416.

2. Of the 420 buy signals, 239 or 57 were profitable.

3. Trading by the cycle exceeded the buy-and-hold in 11 of the 34 years tested.

4. Cycle trading yielded the best return in 1975 (19%), but underperformed a buy-and-hold (38.3%).

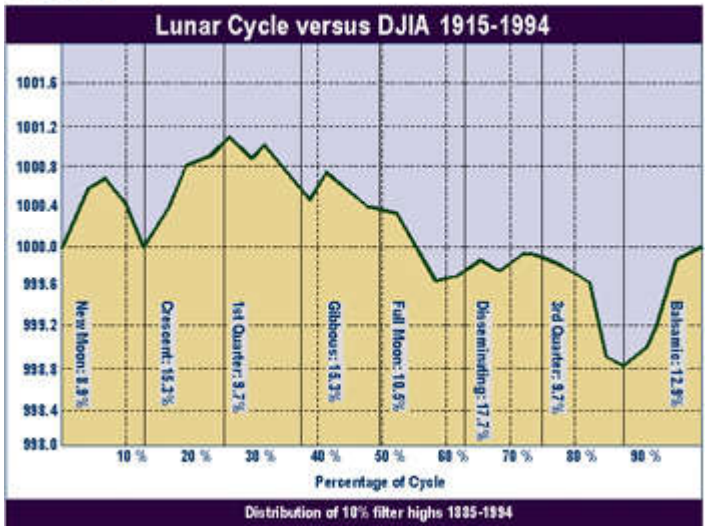
5. Cycle trading returns were poorest in 1990 (18% loss versus a 4.5% loss).

One more attempt was made to improve the results. The buy-sell test was repeated as in the first test. That is, the cycle lows were bought and the cycle highs were sold. However, this time the buy signals were accepted only if the annual cycle pointed up.

The annual change in the DJIA was computed on a daily basis. (The annual cycle is based upon the calendar, which is derived from the relationship of the earth and the sun. So, a solar cycle was calculated. The methodology for the determination of the annual cycle was the same as that for the lunar cycle.) The relationship is shown as *Graph 11,* and will likely be familiar to any technician who employs the seasonal cycle. This cycle rises, on average, in the following time periods every year:

So a lunar cycle buy signal was accepted if it fell in one of these time periods. These were times when both the lunar and the annual cycle pointed up. Buy signals that fell 1 day before any of the above time periods were accepted. I felt that the annual cycle upturn only 1 day later would be sufficient reason to initiate a long position. Buy signals that occurred 1 day before the end of any of these time periods were rejected. This was done because the shorter lunar cycle would have to 'swim upstream' versus the stronger annual cycle which was only 1 day away from topping. One possible criticism is that the annual cycle may have had a different shape in the 1960s or the 1970s. This would then change the time periods above. But seasonality appears to be consistent enough, especially in the post-WW2 years, that the analysis was conducted.
The results did not enhance the trading record. The number of trades dropped from 420 to 182. The number of profitable trades was 102, or 56% of the total. The theoretical portfolio of $1,000 increased to only $1,875.

Graph 12

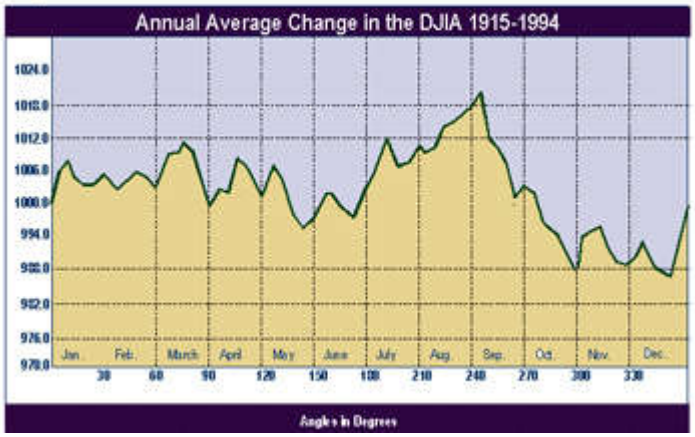


DJIA Highs and Lows in Relation to the Cycle another test was devised in order to determine if there is any consistency to the cycle. A list of highs was generated utilizing a 10% filter rule from Arthur Merrill's books, Behavior of Prices on Wall Street and Filtered Waves. That is, all moves of less than 10% were filtered out of the DJIA from 1885 through 1994. This produced a list of 249 highs and lows. These dates

were then sorted to determine where they occurred in the 29-day cycle. For these purposes, the cycle was divided into its 8 astronomic phases as in *Chart 1*. These 8 divisions are marked on the cycle graph as 8 vertical solid lines in *Graph 12.* The name of the phase appears at the bottom of the graph. The percentages represent the percent of 10% filter highs that fell in that phase historically. For example, 8.9% of all highs determined by the 10% filter method from 1885 to 1994 fell in the new moon phase.

Jan. 26-Feb. 9
Feb. 23-March 12
April 1-18
May 28-June 12
June 24-July 15
July 29-Sept. 5
Sept. 30-Oct.
5 Oct. 26-Nov. 6
Nov.24- Dec.3
Dec.18- Jan.11

Graph 11

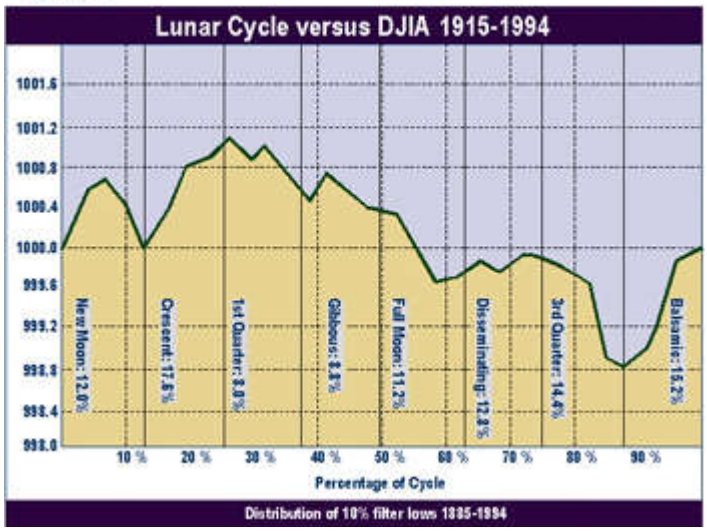


If the highs were evenly distributed, one would expect an average of 12.5% of the highs to fall in any one phase. If the cycle is indeed operative, then the highs would tend to cluster around the cycle high, the crescent, 1st quarter, and gibbous phases. Fewer cycle highs would be anticipated at the cycle bottom, the 3rd quarter phase.

The results reveal a somewhat higher probability for 10% highs in the crescent and gibbous phases (2 of the 3 phases around the cycle top) and a lower probability of highs in the cycle bottom, or 3rd quarter phase.

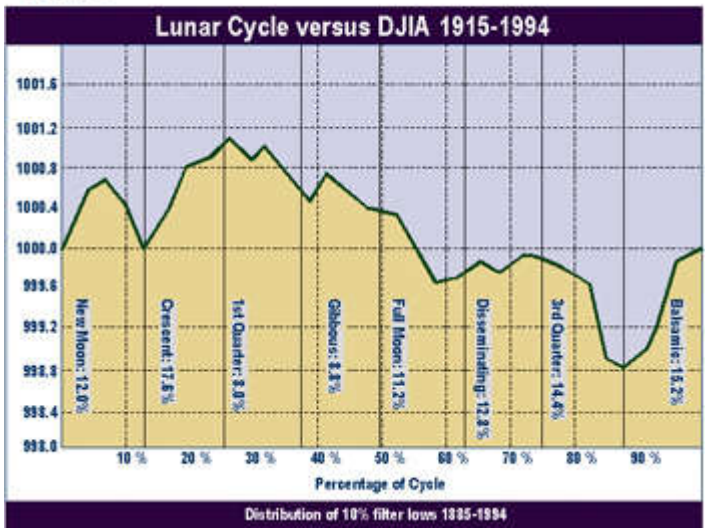
This process was repeated for 10% lows (see Graph 13). Few lows (16.8%) fell in the 2 phases around the projected cycle high. Most of the lows (29.6%) fell in the last 2 phases, near the projected cycle low.

Graph 13

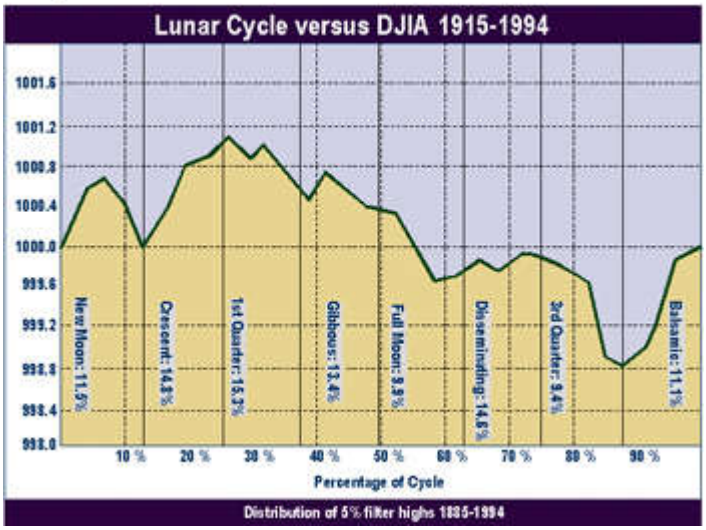


The same test was conducted for a 5% filter set of highs and lows from 1885 to 1994. This produced 851 turning points. This was done because the 29-day cycle is a short one, and the use of a 10% filter produced an average of only 2.5 turning points per year. *Graph 14* depicts the distribution of 5% highs. There has been a greater percentage of highs in the second, third, and fourth (crescent, 1st quarter, gibbous) phases, the high phases of the cycle line. *Graph 15* demonstrates the same graph for the 5%lows. This gave a less definitive picture of than did that for the highs. The lows tended to be somewhat more evenly distributed than the highs. There tended to be more lows in the crescent and the balsamic phases, the latter phase being the bottom in the cycle line.

Graph 13



Graph 14


Lunar Cycle versus DJIA 1915-1994
1001.6
1001.2
1000.8
1000.4
1000.0
999.6
999.2
998.8
998.4
998.0
New Moon: 11.9%
Crescent: 14.8%
1st Quarter: 15.3%
Gibbous: 13.4%
Full Moon: 9.9%
Disseminating: 14.8%
3rd Quarter: 9.4%
Balsamic: 11.1%
10 %
20 %
30 %
40 %
50 %
60 %
70 %
80 %
90 %
Percentage of Cycle
Distribution of 5% filter highs 1885-1994