
Trading The Sun

John Hampson / www.solarcycles.net / February 2012

The influence of the sun on the financial markets and the macro economy

Version 1.0

Contents

Introduction

History Of Research

Financial Trading Disciplines Overview

Natural Cycles Overview

Lunar Cycles

Geomagnetism, Stocks and Commodities

Waveform, Sentiment, Seasonality and Decennial Cycle

Sunspots and Secular Asset Cycles in Stocks and Commodities

Sunspots, Inflation, Growth and Recessions

Demographics and Solar Cycles

Astro Trading and Solar Cycles

Summary and Conclusions

References

Introduction

There is an 11-year (average) cycle of solar activity, measured in sunspots. Solar activity causes geomagnetic disturbance on Earth. The sun is also responsible for a cycle of nocturnal lunar illumination on Earth that lasts approximately a month.

Psychological and behavioural research links geomagnetism and lunar phasing with human mood, and sunspots with human excitability. Studies also link altered moods to more cautious behaviour, including financial decisions. In the last 150 years there have been several papers published demonstrating correlations between these natural phenomena and the financial markets and the macro economy. However, perhaps due a lack of scientific consensus over causality, solar phenomena remain niche disciplines in trading and economics, largely ignored by the financial and business media. In this document I will attempt to provide evidence that solar phenomena are the underlying cause of several financial and macroeconomic phenonema, and therefore deserving of a more central role in trading stocks and commodities.

The broadly accepted classification of disciplines used in trading the financial markets is four-fold: (i) fundamental analysis including macroeconomics (ii) technical analysis, (iii) financial astrology and (iv) quantitative analysis. From (i) I will demonstrate the influence of solar phenomena on growth, inflation, demographics and asset cycles (stocks and commodities), and from (ii) I will explain how solar phenomena drive sentiment, stock market seasonality and waveform. I will also demonstrate the link between financial astrology and solar phenomena, and explain the decennial cycle.

History Of Research

In 1843 the German astronomer Schwabe discovered the solar sunspot cycle. By 1875 William S Jevons published his theory (1) that business cycles were related to these sunspot cycles, arguing that sunspot activity affected weather which affected agricultural output and prices which affected overall economic activity. As his supporting evidence contained flaws, he was largely discredited. However, Garcia-Mata and Shaffner (2) reworked Jevon's theory in 1934 and concluded that there was a clear statistical correlation between the major cycles of non-agricultural business activity in the U.S. and the solar cycle.

Meanwhile, Alexander Tchijevsky wrote the paper Physical Factors of the Historical Process (3). He compared sunspots records to major historical events in 72 countries from 500BC to 1922, and found a concentration around solar maximums. He divided the solar cycle into 4 periods and found correlations between human behavior and these periods: 1) a three year period of minimum activity characterized by passivity and autocratic rule; then 2) a two year period during which masses begin to organize under new leaders and one theme; followed by 3) a three year period of maximum excitability, revolution and war; and lastly 4) a three year period of gradual decrease in excitability until the masses are apathetic. He considered these variations as Mass Human Exitability.

In 1965 Charles Collins found that, based on 93 years of data, a major stock market top is due when the average yearly number of sunspots rises to over 50 (4). Edward Dewey in 1968 found 43 activities that fluctuated with the sun's 11 year cycle, including commodity prices, stock prices, banking activity, business activity, industrial production and agricultural productivity (5). Bryan Walsh wrote an article in the Cycles magazine in 1993 (6) putting some of Dewey's claims to the test. By computing the rate of change in the geomagnetic field over the years (using the Ap index) together with the annual rates of for several measures of economic and financial performance (GNP, CPI, stock prices, gold price, bonds), he found the former led the latter by 6 to 12 months and had an average 65% correlation.

Krivelyova and Robotti found strong empirical support in favour of a geomagnetic storm effect in stock returns after controlling for market seasonals and other environmental and behavioural factors (7).

Regarding the sun's illumination of the moon and its correlation with stock market returns, there have been several recent papers written. Illia Dichev and Troy Janes (8) demonstrated that stock returns in the 15 days around a new moon were around double those in the 15 days around full moons, for all major US stock indices (100 years data) and nearly all stock indices of 24 other countries studied (30 years data). K Yuan, L Zheng and Q Zhu (9) investigated the correlation between lunar phases and stock market returns for 48 countries and found that returns are lower around full moons and higher around new moons by 3-5% per annum, factoring out volatility, volume, and other calendar related phenomena. Marco Hickey (10) found positive correlation between 5 US stock indices and returns around new moons, and the inverse for the 10 year bond (using 10 years data).

In recent years biological evidence has come to light that sunspots and solar cycles do impact humans physiologically, which are supportive of Tchijevsky's earlier social studies. William Hrushesky, in his 2011 paper (11) noted slight elevations in oral temperature, pulse rate, blood pressure, and respiration rate and a slight decrease in the man's maximum expiratory flow that peaked several months after the occurrence of solar sunspot maximum.

To bring us right up to date, there is a growing body of evidence that geomagnetic field changes and sunspot maxima affect biological systems, and increasing psychological and biological evidence that the sun's illumination of the moon affects human behaviour and mood. There are also electromagnetic theories of human consciousness – that consciousness is an electromagnetic phenomenon. However, these are areas in which there is as yet no overall scientific consensus.

Financial Trading Disciplines Overview

1. Fundamental analysis, which comprises economic analysis, industry analysis and/or company analysis. The underlying principle is that assets are sometimes mispriced and will eventually return to fair price. Macroeconomics (analysis of inflation, growth, interest rates and more) can be considered part of top down fundamental analysis or its own discipline. In this paper I will consider it part of fundamental analysis.

2. Technical analysis: price patterns, indicators, waveform (such as Elliott Waves), sentiment, business/economic cycles, stock market cycles (seasonality, moon, Presidential, secular), and more. Technical analysis employs models and rules and its guiding principles are that price moves in trends and history tends to repeat itself.
3. Financial astrology, which uses movement/alignment of celestial bodies to predict economic trends, when to buy/sell. This is less commonly practised and more controversial than fundamental and technical analysis.
4. Quantitative analysis: a mathematical, statistical approach to risk management, pricing, portfolio optimisation, trading strategy and more. Essentially, if we can make profitable trades using fundamental, technical or even astrological analysis, then we can squeeze a little bit more profit out using quantitative analysis.

In sum, is it possible that such a varied range of disciplines and sub-disciplines can *all* be statistically valid in analysing and predicting the financial markets? In this document I will demonstrate that many of these are manifestations of the same underlying solar phenomena, thus revealing unity amongst apparently disparate disciplines and sub-disciplines.

Natural Cycles Overview

Nature is dominated by cycles and human life is subservient to and synchronized to these cycles.

Seasons, tides, geysers, migrations, heart beats, wing beats, menstruation, respiration, births and deaths, sound waves, rotation of galaxies, sleep and Ice Ages are all examples of cycles in nature.

As humans we cycle relentlessly with heartbeat, respiration and other biological rhythms. But this cyclical subservience is found in all arenas and on all timescales.

Day and Night, and the cycles of sleep and activity. Weekdays and Weekend (division of time based on Earth's orbit of the sun), and the cycles of work and play. Seasons, and the cycles of agriculture, animal migration and human activities (traditions, cultural and sporting events that cycle with the Earth's orbit of the sun). Lifetimes and the cycle of reproduction.

There are lunar cycles and associated cycles of nocturnal illumination and tidal movement. There are solar cycles and associated cycles of geomagnetic storms.

Perhaps unsurprisingly therefore, we observe cycles in systems of human construction, which may be abstractions of nature but are still ultimately of nature: business cycles in economics, asset and sentiment cycles in financial markets, war and peace cycles.

No cycle lasts forever. Our sun will eventually collapse into a dwarf star. But for forecasting over months, years or decades, these cycles are effectively permanent. The dominance of cyclical phenomena in all things makes the future much more predictable than it would otherwise be.

Lunar Cycles

Roughly every 2 weeks the whole world experiences a new moon, and roughly two weeks later we all observe a full moon, in an ongoing cycle. The phase of the moon is important for one reason: nocturnal illumination. How much light there is at night time affects plants (photoperiodism - flowering) and animals (around the full moon, day animals can hunt or perform other activities, and be hunted by other day animals (subject to cloud cover)). Artificial lighting has barged its way into this cycle in the last century, but modern humans have acted on and reacted to the moon's illumination patterns for over 200,000 years. So even if its light matters less to us now, our reactions to its phases are 'hard wired' by evolution, and critically the whole global population experiences the same illumination extremes at the same time.

There is extensive psychological and biological literature demonstrating that the lunar cycle can heavily influence our moods. A full moon increases our tendency to feel depressed and pessimistic, and there is a higher rate of suicide around full moons. This may reflect the fear and tension surrounding increased nocturnal predator action, historically, or psychological issues from sleep deprivation in night light. So investors may feel more inclined to stay out of the stock market at or near that time, or to sell out of positions: emotions trumping objectivity. A correlation between stock market returns and lunar phases is indeed found by Dichev, Yuan and Hickey in three separate studies. There is a positive pressure for the stock market leading into and around new moons, and a negative pressure leading into and around full moons. A lunar cycle takes just under 30 days which means new moons and full moons do not fall at the same time each month but gradually move. This means we are not mistaking a seasonal phenomenon related to month-end or mid-month.

This first chart shows the differences in stock market returns between the days around full moons and the days around new moons in 7 countries (using 30 years data):



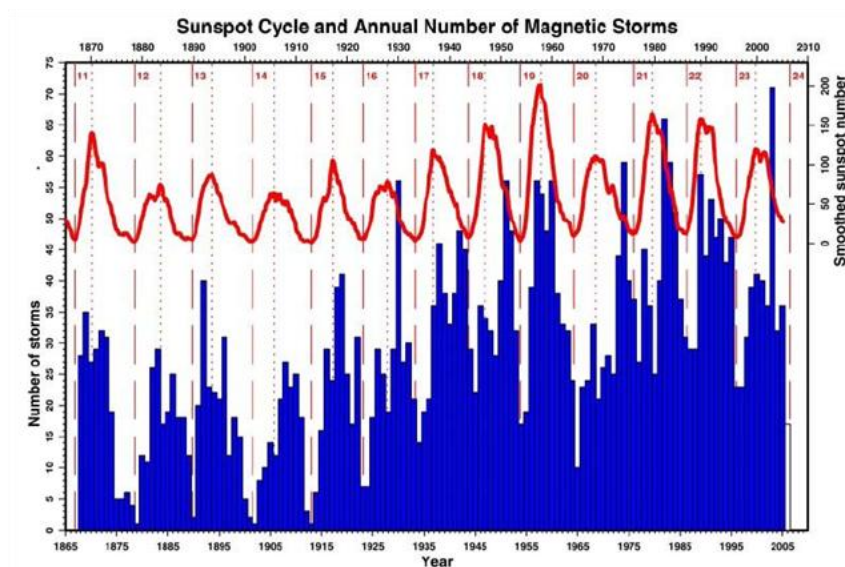
Source: Dichev/Janes

Here is a visual of the correlation between moon phase extremes and the S&P500 in 2010-2011:



Geomagnetism, Stocks and Commodities

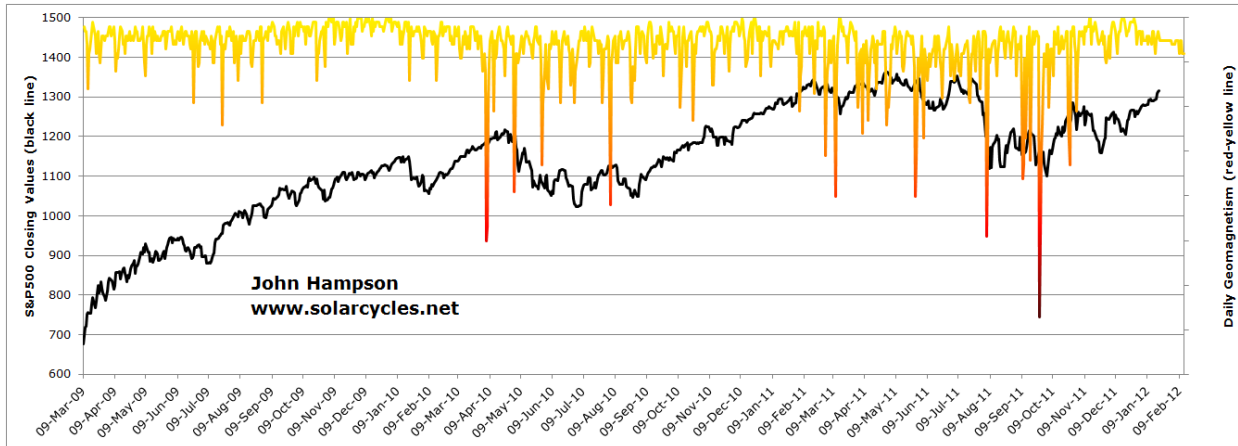
Solar activity produces geomagnetic storms on Earth and the chart below reveals that the greatest intensity of geomagnetic storms correlate with solar maximums, but with a lag. Geomagnetic storms have the potential to disrupt communications, navigation, satellites and power grids. There is also a rising trend in the number of storms over the years, but this may reflect the longer term cycling between grand solar minima and maxima.



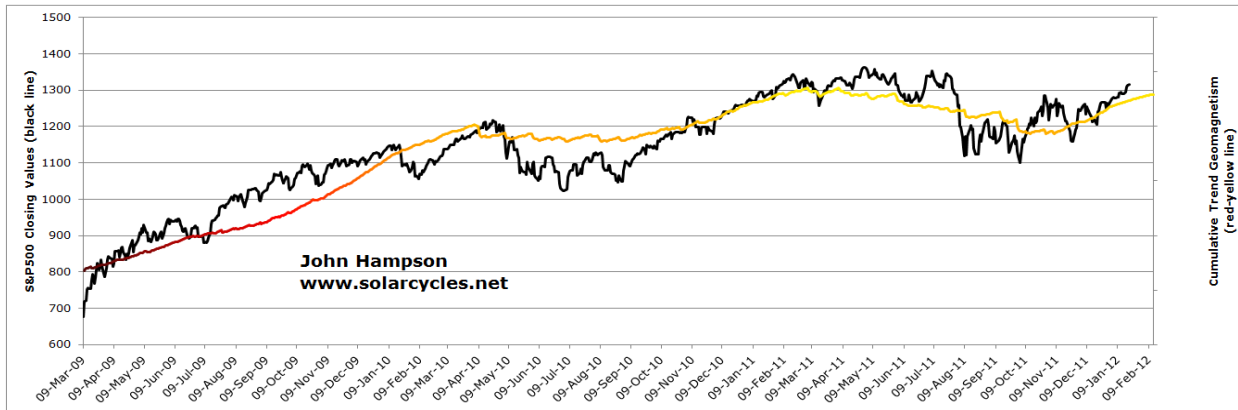
Source: Susan Macmillan, British Geological Survey

There is a correlation between geomagnetic storms and depression and suicide in humans, and an increase in psychotic episodes in individuals who already suffer from unstable psychological states. Geomagnetic activity is also shown to make people more irritable and aggressive, and can affect melatonin synthesis, blood pressure, heart disease and light sensitivity. Perhaps unsurprisingly then, we find evidence of correlation between geomagnetic activity and the financial markets, as established in a paper by Robotti and Krivelyova (7). Unusually high levels of geomagnetic activity are statistically negative for the subsequent days' stock market performance, and periods of quiet geomagnetic activity typically bolster stock indices around the world.

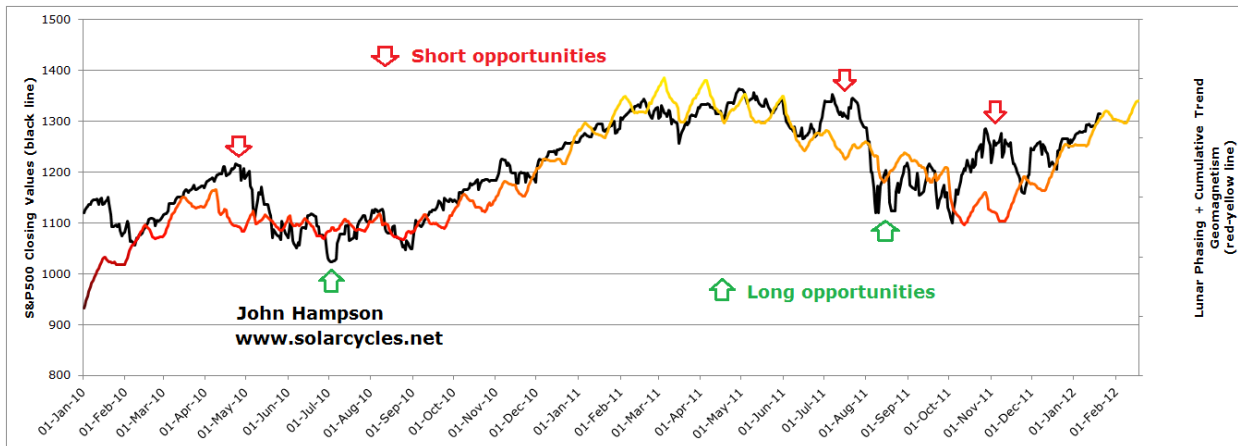
My own research argues for an even more compelling relationship. Below is daily geomagnetism versus the S&P500 stock index for the cyclical bull market that began in March 2009 to early 2012 (the time of writing). The red-yellow spikes down are high geomagnetic disturbances, and the two periods in which they are strongest correspond to correction periods in the stock market. In between and either side, stocks advance during periods of relatively benign geomagnetism.



If we make the daily geomagnetism into a cumulative trend line, out pops a route map for the market:

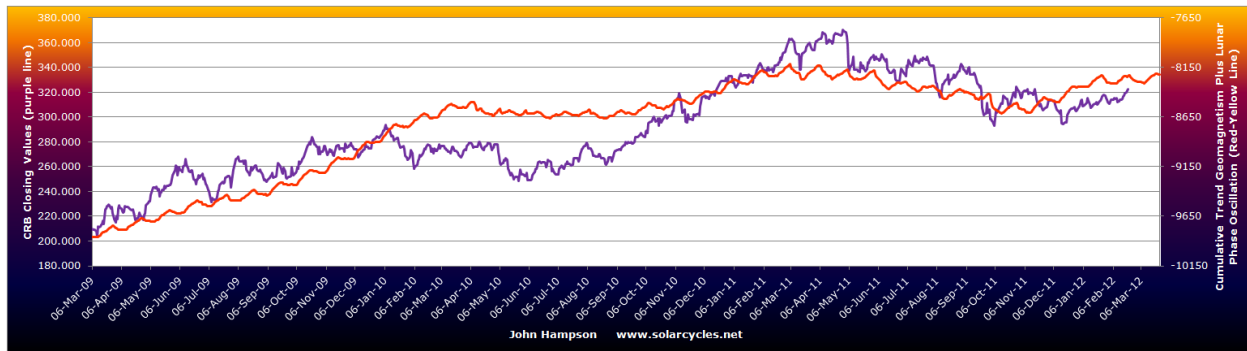


If we then combine cumulative trend geomagnetism with lunar phasing and zone in on the last two years to see detail, the result is a model that not only captures the stock market's route map but often the shorter term waves also. In addition, where the stock market strays from the model these provide good short (sell) and long (buy) opportunities, as highlighted.



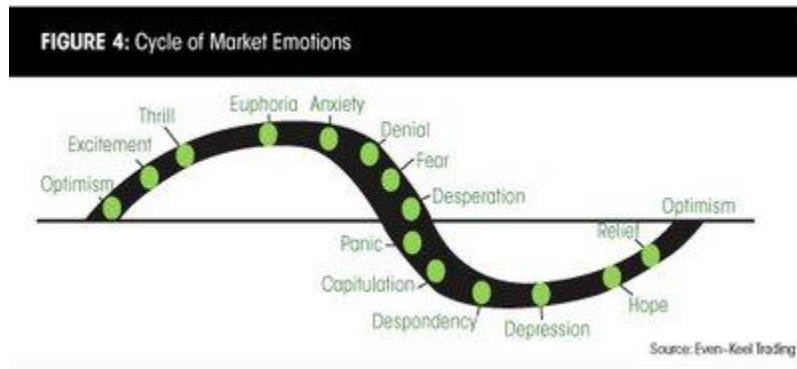
The tail on the red-yellow line that stretches several weeks into the future. We know lunar phases in advance and can predict geomagnetism up to three weeks out (but like weather forecasts, not 100% accurately). That gives us a predictive tool as we can assess the likely waveform, the trend direction, and any notable straying of the stock market from the model. Returning to the first chart above, we can also look out for high geomagnetic disturbances occurring, as there is often a lagged effect on equities.

If geomagnetism is a key driver of human behavior towards stocks, then might it also influence behaviour towards commodities? The answer is yes, as both classes are typically in favour when sentiment is pro-risk, versus pro-safe havens, and vice versa. The chart below shows the CRB commodities index (purple line) versus cumulative geomagnetism (and lunar phase oscillation) from 2009 through to 2012, with the latter again acting as overall route map:



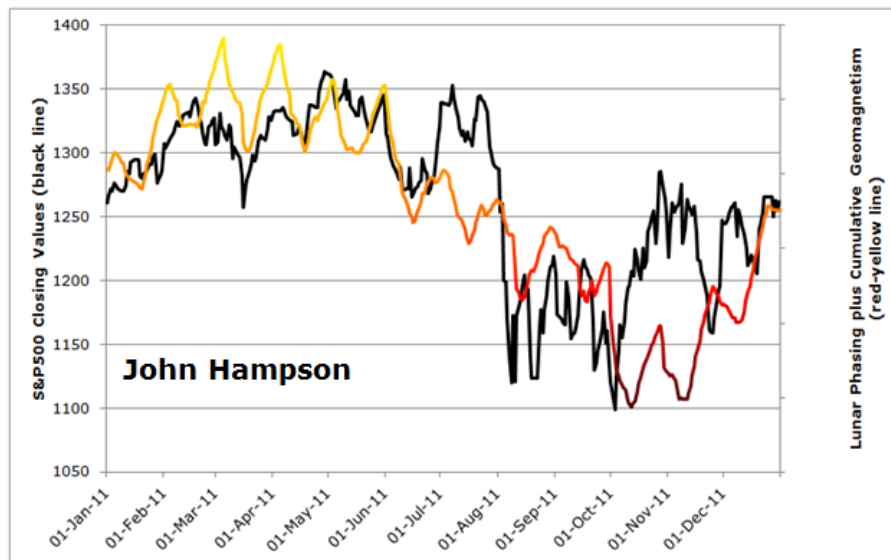
Waveform, Sentiment, Seasonality and the Decennial Cycle

The last chart above shows that from a combination of geomagnetism and lunar phasing, waveform is generated. Specifically, these waves are fluctuations in sentiment with natural causes of both geomagnetism and nocturnal illumination. Consider this idealized traders' model of a cycle of market emotions:



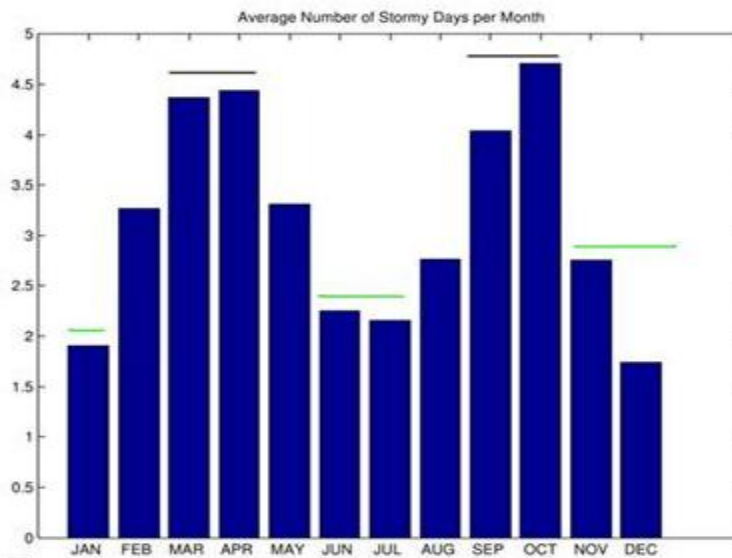
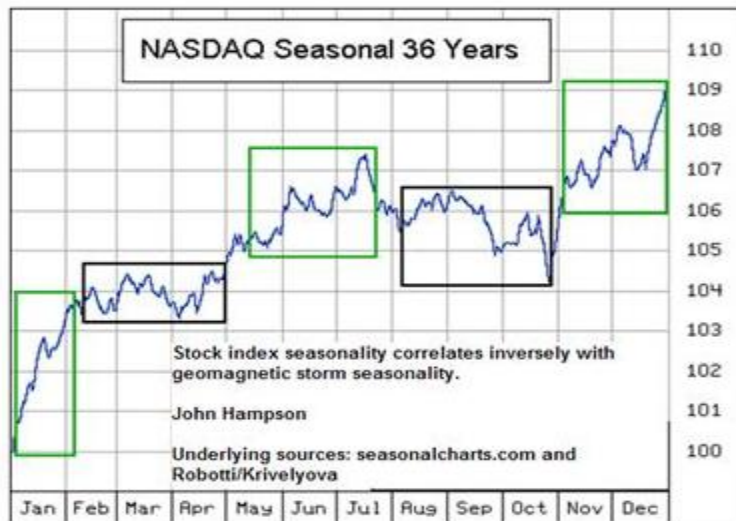
Source: Even-Keel Trading

Here's a real stock market example from 2011:



The stock market closely matches both the sentiment model and the lunar/geomagnetic natural waveform. There is common acknowledgement that sentiment can cycle and wave in the way represented by the sentiment model (the technical trading practice of Elliott Waves has waves of sentiment as its guiding principle), but there is a lack of understanding that solar phenonema are a key generator of the sentiment cycles.

Consider the sentiment cycle of stock market seasonality. It is widely accepted that the stock market performs better at certain times of year than others, on average. September and October are notoriously troublesome whereas a Christmas rally tends to occur. Why would sentiment have settled into general patterns of positivity or negativity at certain times of the year? Well, there is a semi-annual geomagnetic variability that correlates very well with stock market seasonality, as shown:



The months of greatest seasonal geomagnetic storms match the months of poorest seasonal performance on the Nasdaq, and the periods of seasonally low geomagnetism correspond to the months of greatest average returns. Again, this cycle of sentiment is the result of underlying solar phenomena, namely geomagnetism.

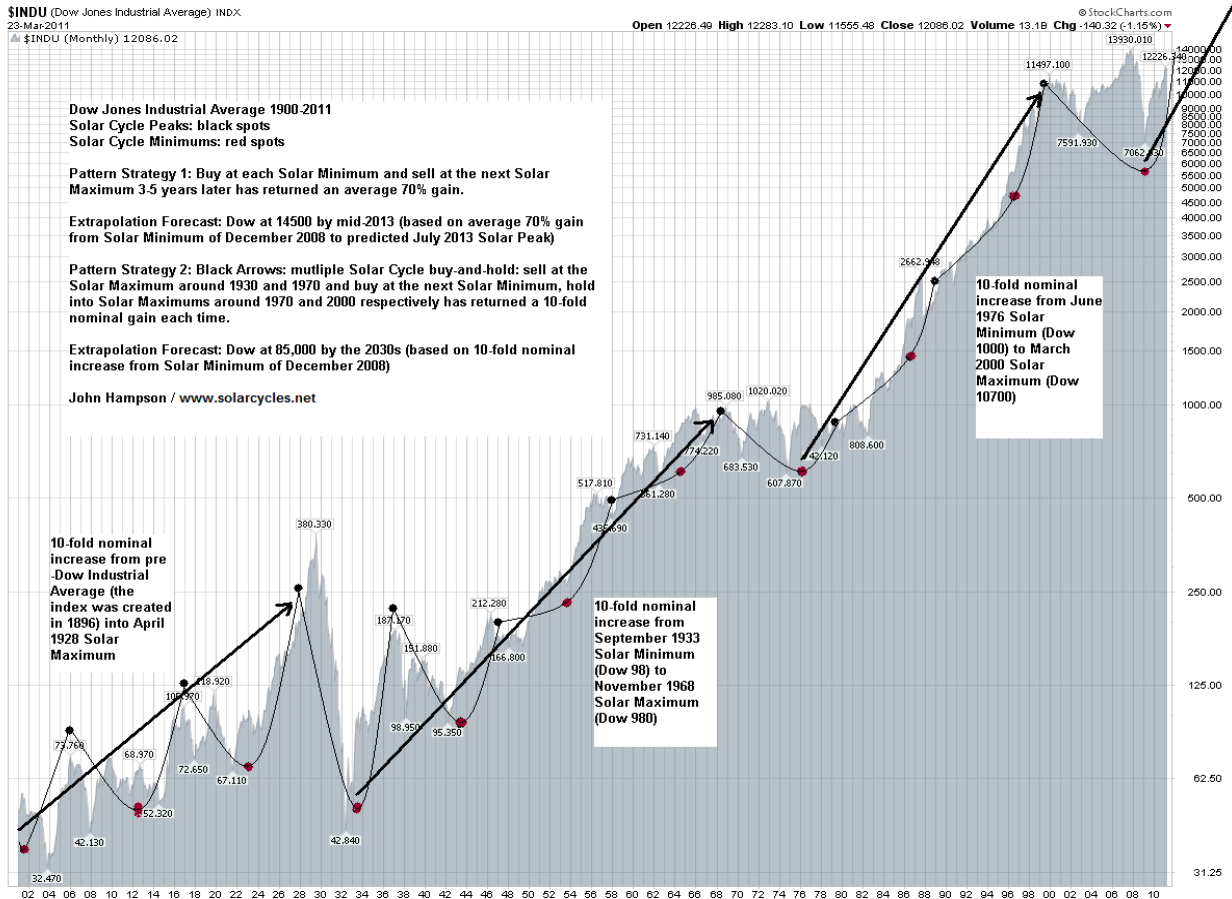
Another commonly referenced cyclical trading phenomenon is the 10 year stock market cycle, or decennial cycle. Since 1881, at opposite ends of the spectrum, years ending in 5 have produced bumper average annual returns of 28% (12 up years and just 1 down) whereas years ending in 0 have produced dreadful average annual returns of -7.2% (just 4 up years and 8 down) for the Dow Jones. Years ending in other digits all fall between these two extremes. Curiously, despite its popularity, no-one can explain this phenomenon.

Well, in that 130 year period, twice as many years ending in 5 as in 0 fell within the bullish period of solar minimum rising to solar maximum. As we will see on the next page, the 4 year period from solar minimum to solar maximum is typically one of growth and positive stock market returns. The other 7 year period in the solar cycle is typically when recessions occur and stock returns are less impressive. It just so happens that in the last 130 years, twice as many years ending in 5 as in 0 have occurred in the positive pressure periods as the negative.

Therefore, going forward, I don't believe there is any validity in being bullish leading into a year ending in 5 and bearish into a year ending in 0, per se. By my findings the 10 year stock market cycle is a reflection of solar cycles, but only in the way the solar cycles have fallen in the last 130 years. If we could extend this 130 years into the future, I would expect the returns by year ending digit to even out, whilst returns by solar cycle periods would retain correlation. That makes the decennial cycle a red herring.

Sunspots and Secular Asset Cycles in Stocks and Commodities

The 4 year period from solar minimum to solar maximum is typically one of strong stock market gains. I demonstrate this below both in chart and table form.

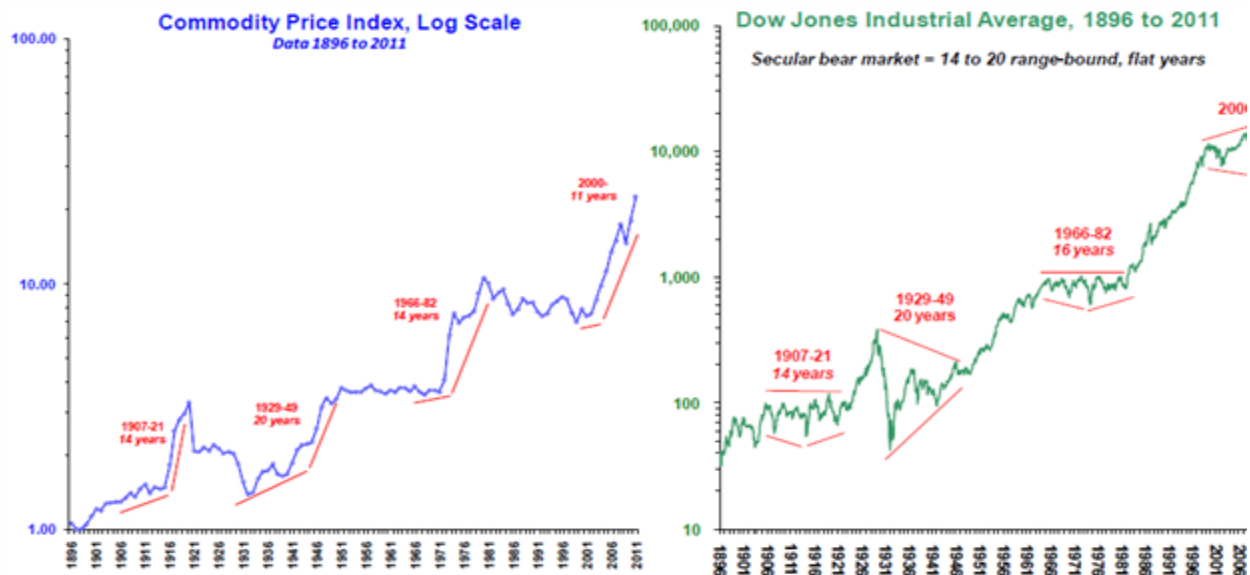


Buy at Solar Cycle Minimum, Sell at Solar Maximum (3-5 years later)			
Solar Cycle	Start Date (Solar Minimum)	Solar Maximum	Dow Jones Industrials Return
Solar Cycle 14	February 1902	February 1906	50%
Solar Cycle 15	August 1913	August 1917	40%
Solar Cycle 16	August 1923	April 1928	220%
Solar Cycle 17	September 1933	April 1937	200%
Solar Cycle 18	February 1944	May 1947	25%
Solar Cycle 19	April 1954	March 1958	40%
Solar Cycle 20	October 1964	November 1968	10%
Solar Cycle 21	June 1976	December 1979	-15%
Solar Cycle 22	September 1986	July 1989	30%
Solar Cycle 23	May 1996	March 2000	85%
Solar Cycle 24	December 2008	March 2013 (Estimated)	?
Average Gain:			70%

John Hampson www.solarcycles.net

The only negative return occurred in the period from 1976 to 1979 which was a particularly strong period of returns for commodities. In fact, what we find is that both stocks and commodities (collectively risk assets) respond to solar peaks. The mass human excitability into and around solar peaks (Tchijevsky) appears to spur people to take risks and buy risk assets. Stocks and commodities alternate popularity as targets for this risk-taking, so let's cover that relationship.

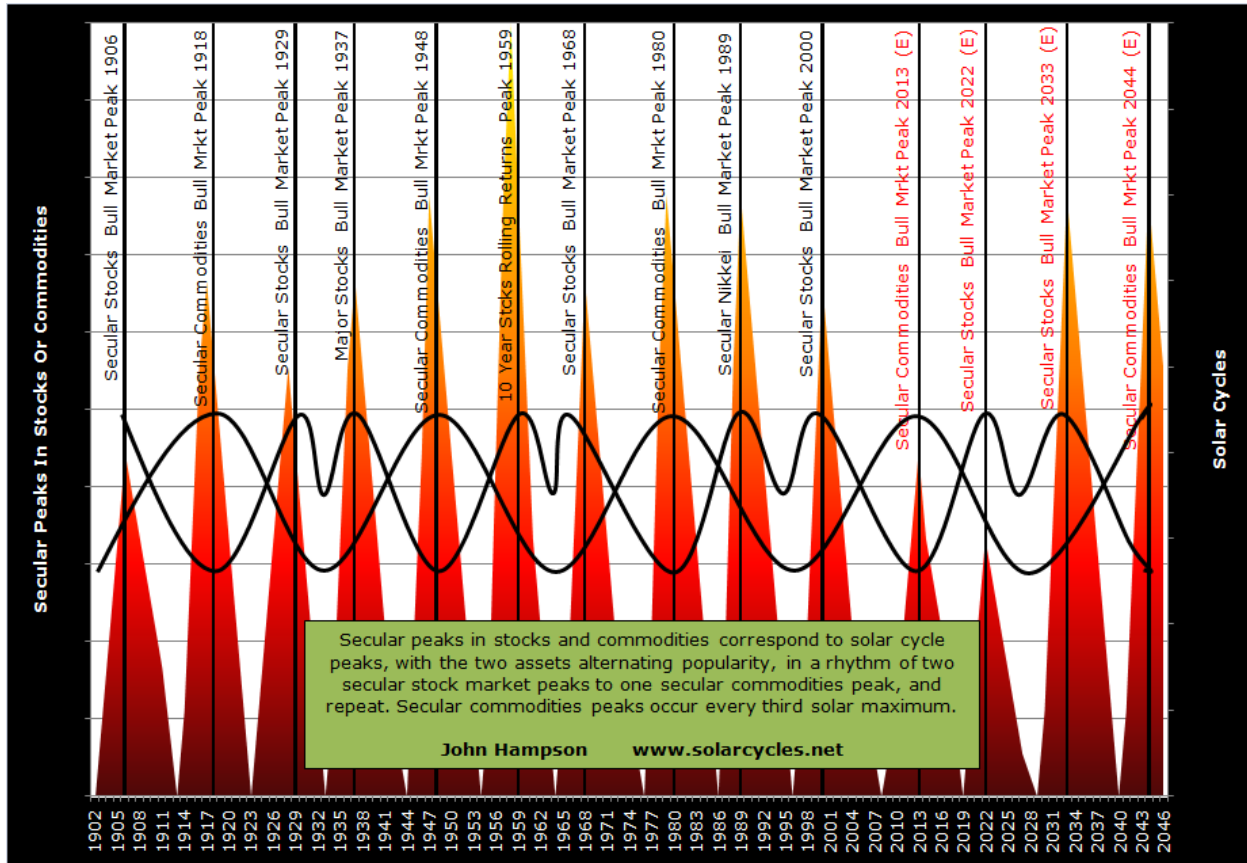
There is a long term swing between paper and hard assets. Stocks and commodities alternate in secular bull and bear markets, reportedly lasting 10-20 years, with a secular bull in stocks corresponding to a secular bear in commodities and vice versa.



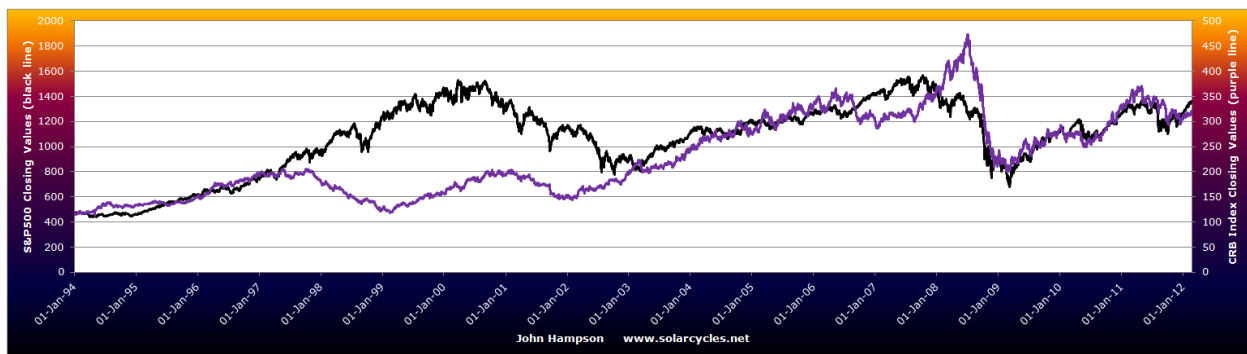
Source: Barry Bannister

Secular bear markets largely appear flat due to inflation. In real terms, price declines. There are several commonly accepted reasons for secular cycling and pendulum action between asset classes. Herd mentality and emotion bring about an overflow into a particular class, until we reach excesses of fear or greed and excesses of speculation. The result is prices shoot above and dip below the long term trend, rather than follow a stable trajectory. There is also the relative expensiveness of the two classes of assets - when the gap is large enough, money will pour out of one into the other. And there are demand/supply lags. Typically a mine or oil field can take 10 years to come into production from the initial plan. When prices for commodities are high, many new projects are funded, only for them to hit production when demand and prices have fallen some years later, causing a greater supply glut. And similarly buoyant stock prices attract new companies to market late in the game, again worsening supply/demand dynamics.

However, when we study the secular and major peaks in stocks and commodities, we find that they all fall very close to solar cycle maximums, as maximum excitability drives maximum risk-taking.



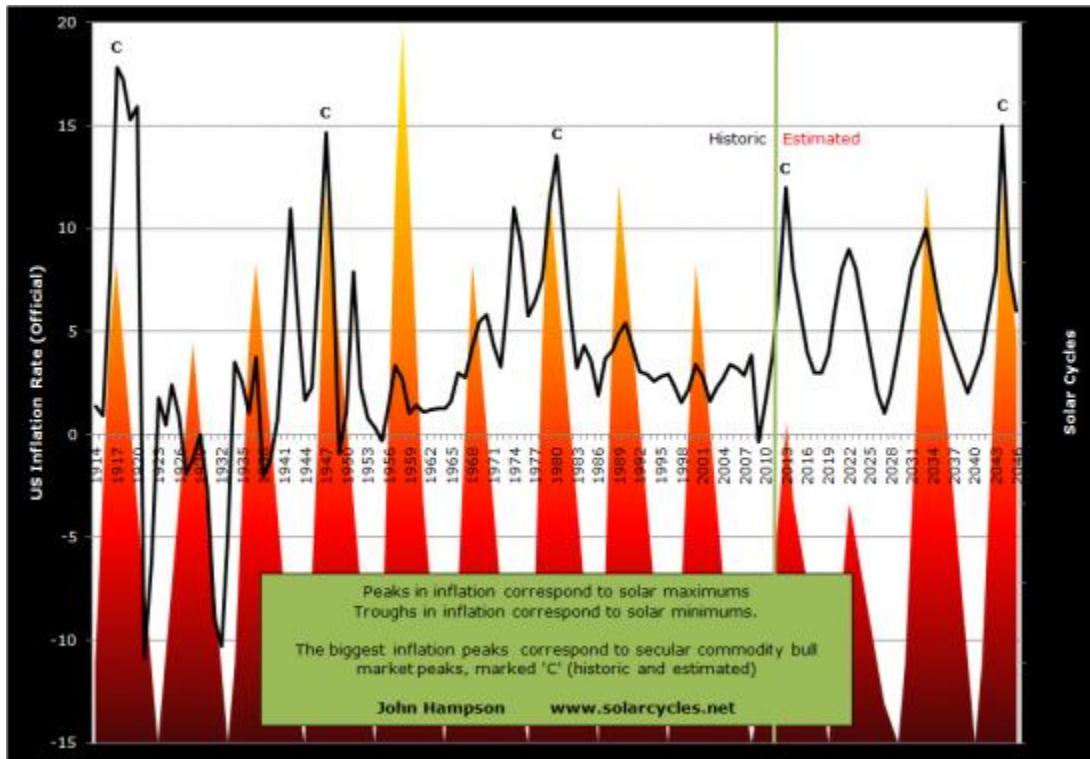
There are two relationships between stocks and commodities. They march together, when sentiment is pro-risk or anti-risk, spurring money into or out of both classes (versus safe havens of cash and bonds). But they also alternate secular manias, with stocks peaking more frequently than commodities. Below we see that twin relationship in a chart from 1994 through to 2012. Stocks (black line) and commodities (purple line) move mainly together as pro-risk, with the notable exception of the period 1998-2000, where stocks took off to make their secular mania into the solar peak of 2000, before gradually returning to march with commodities again.



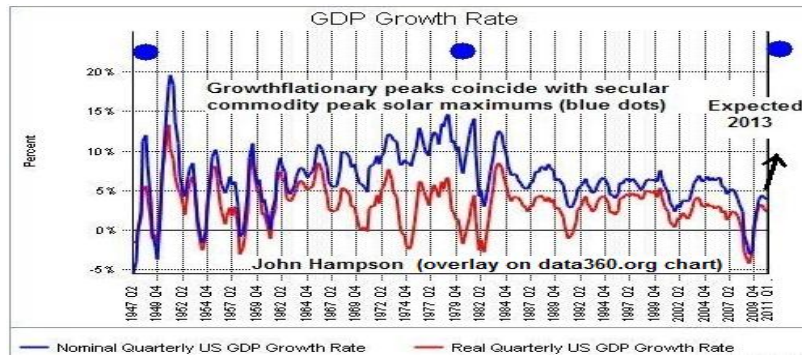
Sunspots, Inflation, Growth and Recessions

We also find a compelling relationship between solar cycles, inflation, growth and recessions.

Peaks in inflation correspond to solar maximums, troughs to solar minimums. The biggest peaks in inflation correspond to commodity bull market peaks, marked C. As commodity prices are important in price inflation levels, we might consider this a three way relationship.

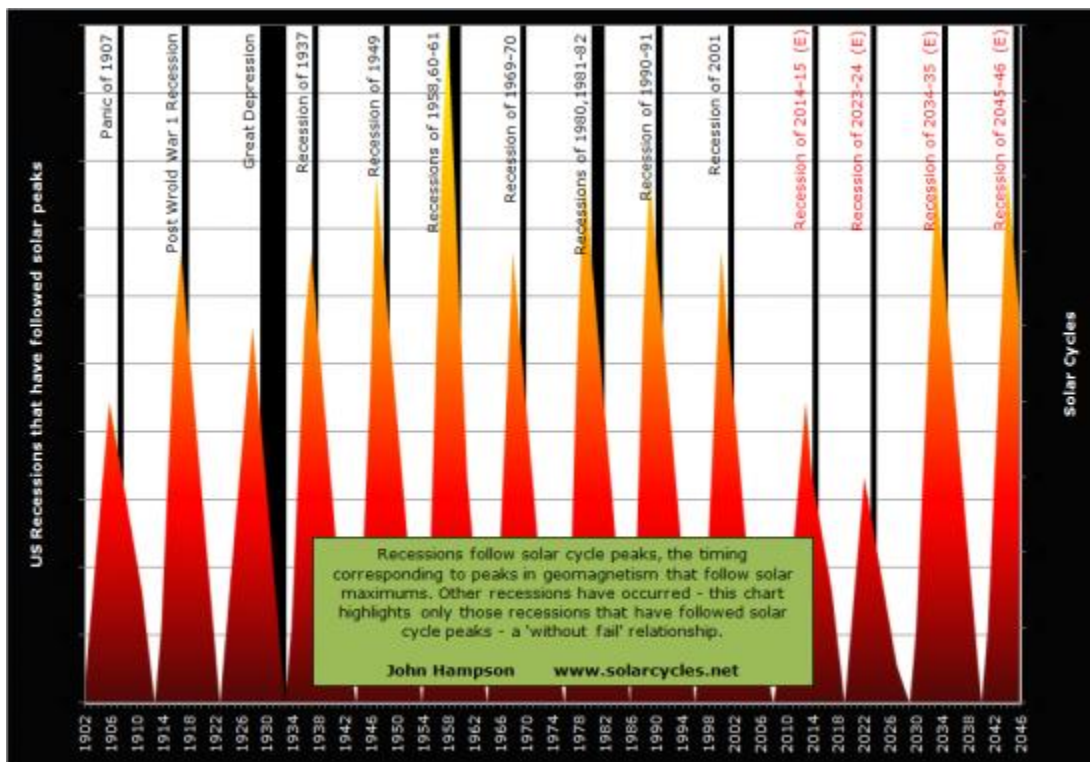


In fact, we typically experience “growthflation” into solar peaks, i.e. both inflation AND growth. Brian Walsh (1993) found that annual changes in the geomagnetic field predict annual changes in US CPI with a correlation of 0.64 and the annual rate of change in real US GNP with a correlation coefficient of 0.58.

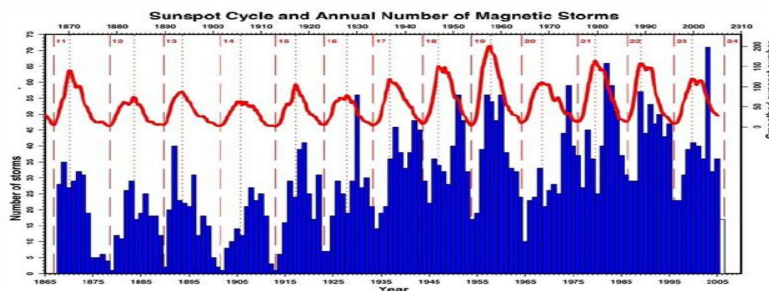


So, drawing it all together, the period of rising solar activity (sunspots) into and around the solar maximum correlates positively with economic growth, inflation and risk-asset returns. What links these is risk-taking, spending and investing, or in other words, human excitability, which leads us back to Tchijevsky's work. According to his studies, the period of declining sunspots after the solar maximum was one of change from activity to apathy. Perhaps appropriately, as the money stops circulating in the economy, this is typically a time of recession.

Recessions follow solar cycle peaks, corresponding to the peaks in geomagnetism that lag solar maximums. Note, other recessions have occurred, but this chart highlights only those that have followed solar peaks – a 'without fail' relationship.



Geomagnetism peaks (blue) follow solar peaks (red):



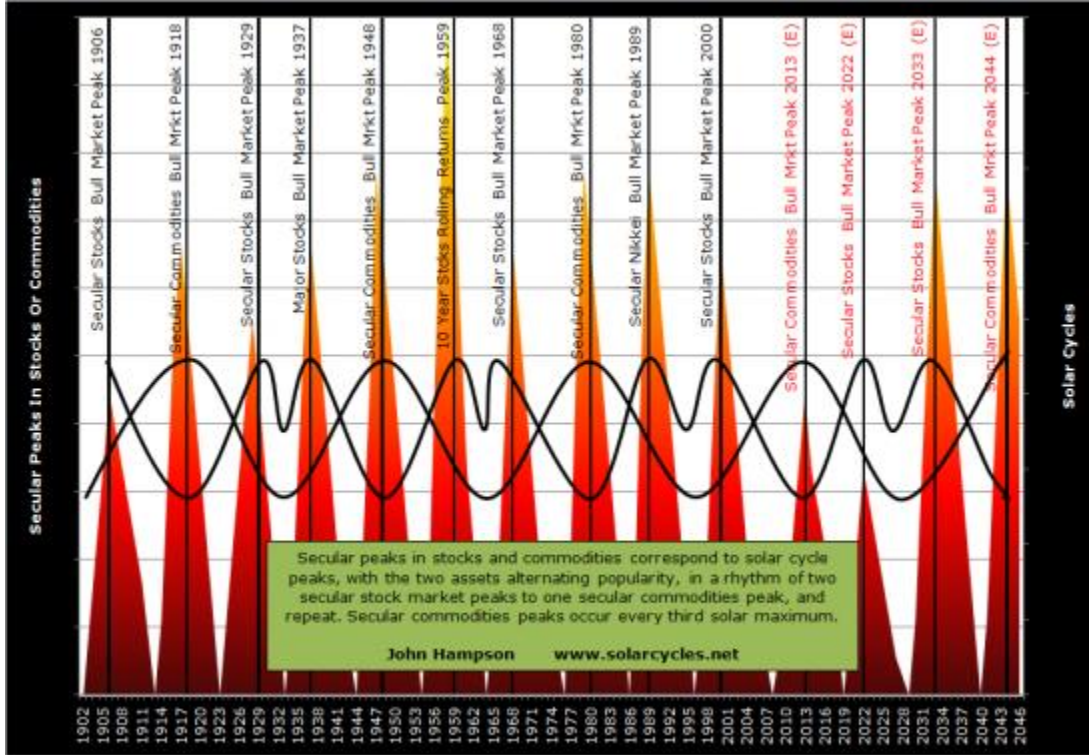
Source: Susan Macmillan, British Geological Survey

Earlier in this document we identified geomagnetism's role in human mood and stock market / commodities returns. Following a solar peak, a combination of peak geomagnetism together with declining sunspots creates a combination of increasing human apathy and anxiety. That provides the relevant inputs for shrinking growth and risk-off investment.

Earlier in the document we also saw that asset manias and inflationary peaks often occur around solar maximums. Mean reversion following asset price excesses and overtightening of interest rates or excess commodity prices following high inflation provide a feedback loop for shrinking growth and anti-risk money flows.

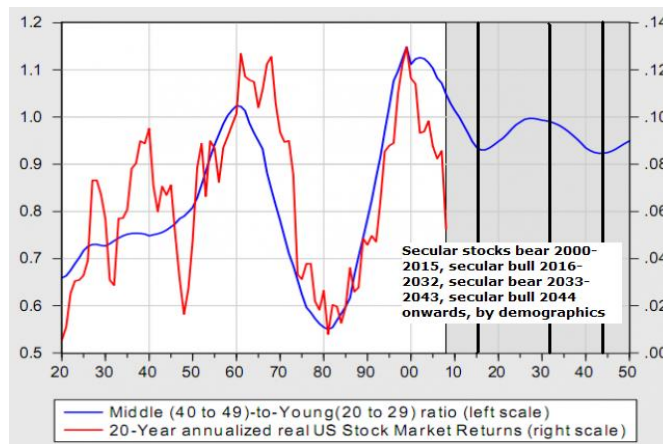
Demographics and Solar Cycles

Let's revisit the relationship chart between secular stocks and commodities peaks and solar peaks.

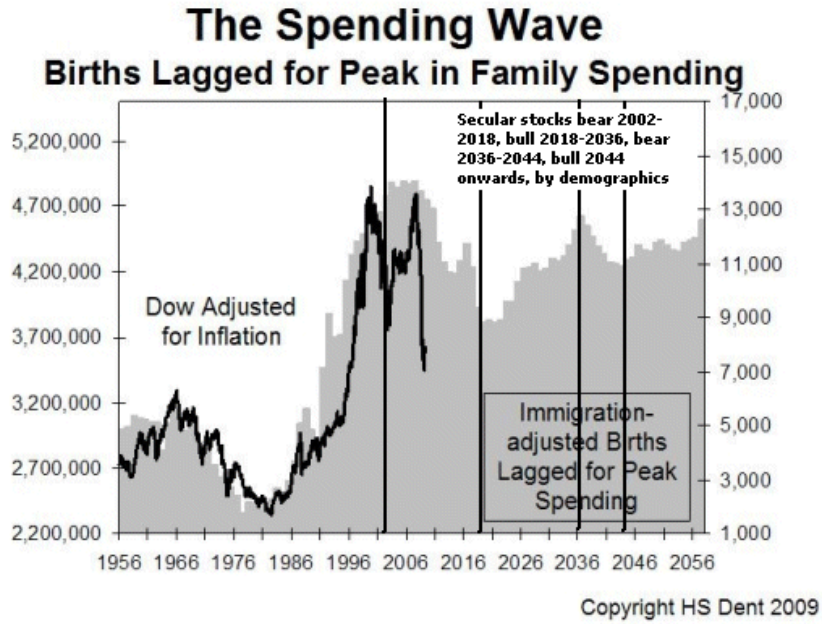


Looking out into the future, based on this model of solar cycles, I have estimated future secular commodities and stocks peaks (red text). As it happens, US Demographic models echo the secular forecasts of solar cycles: namely, a secular stocks bear circa 2000-2015, a secular stocks bull circa 2016-2034, a secular stocks bear circa 2035-2043, a secular stocks bull 2044 onwards.

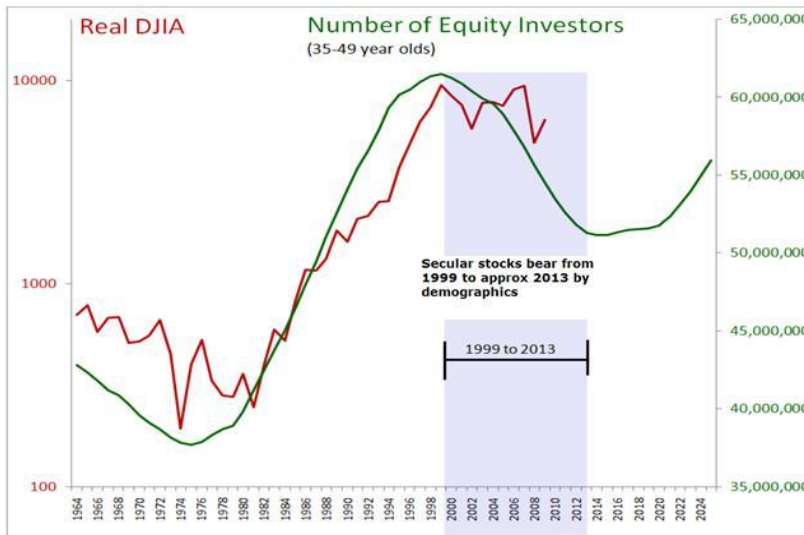
Middle To Young Ratio:



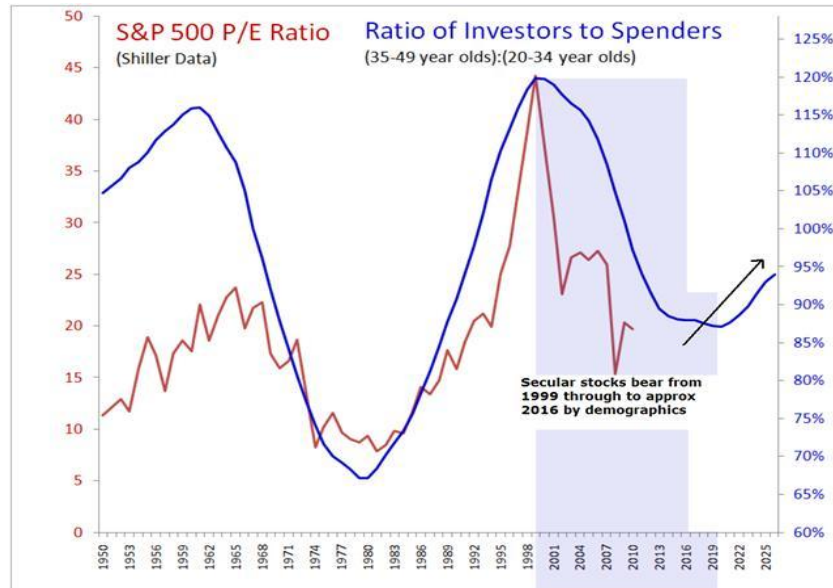
Births Lagged For Peak Spending:



Number Of Equity Investors:



Ratio Of Investors To Spenders:



How can demographic models align with sunspot cycle predictions? Well, there is no definitive answer, but there is some research that may hold the key. “Solar Activity Affects Avian Timing Of Reproduction” (13), “The solar cycle as a possible modulator of ecosystem functioning on the decadal time scale” (14) and “Can the solar cycle and climate synchronize the snowshoe hare cycle in Canada?” (15) all argue that solar cycles influence populations and demographics in other species, so might they in humans too?

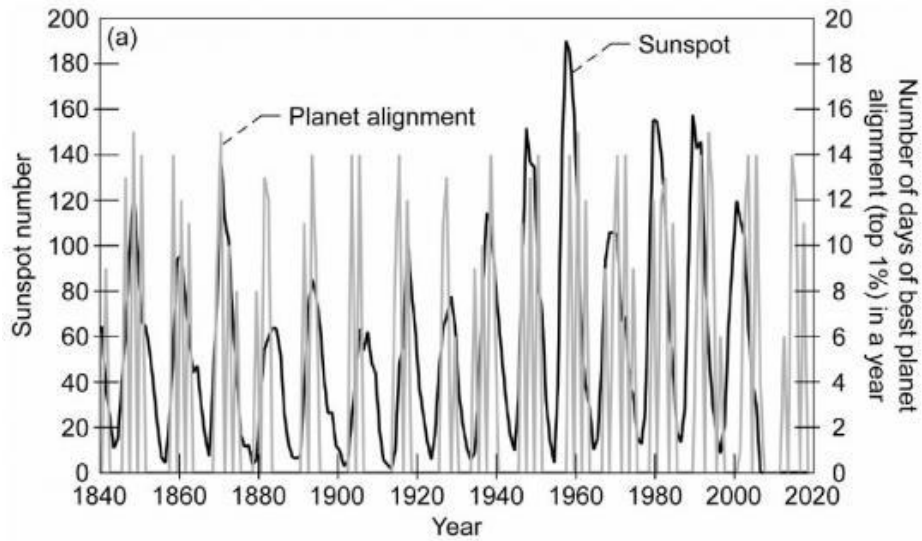
“Correlation of Human Longevity Oscillations with Sunspots Cycles” (16) and “Schumann Resonance and Sunspot Relations to Human Health Effects in Thailand” (17) correlate human longevity and mortality with solar cycles, so playing a role in shaping human populations.

In short, we see evidence of a three-way relationship between secular asset cycles, demographics and solar cycles, and the research suggests solar cycles drive the other two. Regardless, with demographic models backing up the future asset cycle predictions of solar cycles, this adds weight to the models being correct.

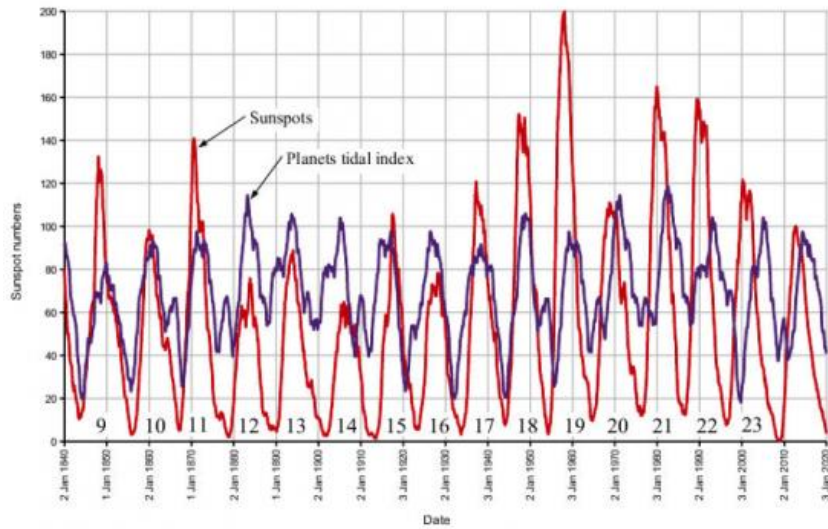
Astro Trading and Solar Cycles

Astro trading has a fundamental link with astrology, which is a field considered lacking in scientific support. However, there is one line of scientific theory that is potentially supportive, namely that planetary alignment influences solar activity.

Two studies reveal that there is a close relationship between the alignment of Venus, Earth and Jupiter, and solar activity cycles:



Source: Ching Cheh Hung (12)



Source: Roy Martin

Essentially, the most aligned days between these 3 planets correlate very well with solar cycles, suggesting these tidal planets are the key driver of the sun's known 11-year cycle of activity. NOTE: only these three tidal planets are found to be influential, not other planets. So astro-traders drawing on Mars or Saturn, for instance, do not have this scientific backing.

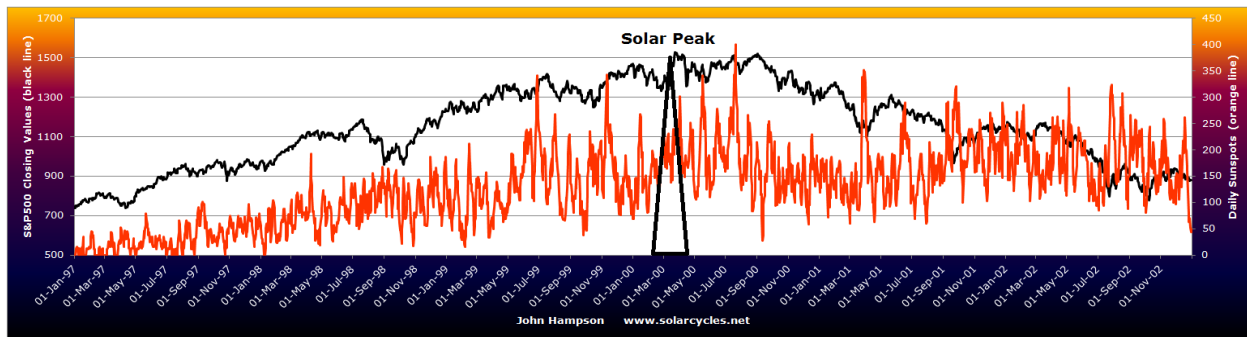
Astro-traders who forecast the financial markets by considering constellations of Jupiter, Venus and Earth potentially are one step back in the process compared to assessment of sunspots and geomagnetism, assuming they are considering most aligned days between these three planets, not other configurations or drawing in other planets.

Do traders need to go this one step further back? Well, we can predict the sunspot cycle fairly reliably without having to calculate planetary alignment (NASA forecast this). We can also predict geomagnetism using a space weather forecast up to 3 weeks out, and we can model it further out using historic seasonal geomagnetism. It is therefore questionable what additional predictiveness planetary calculations can offer.

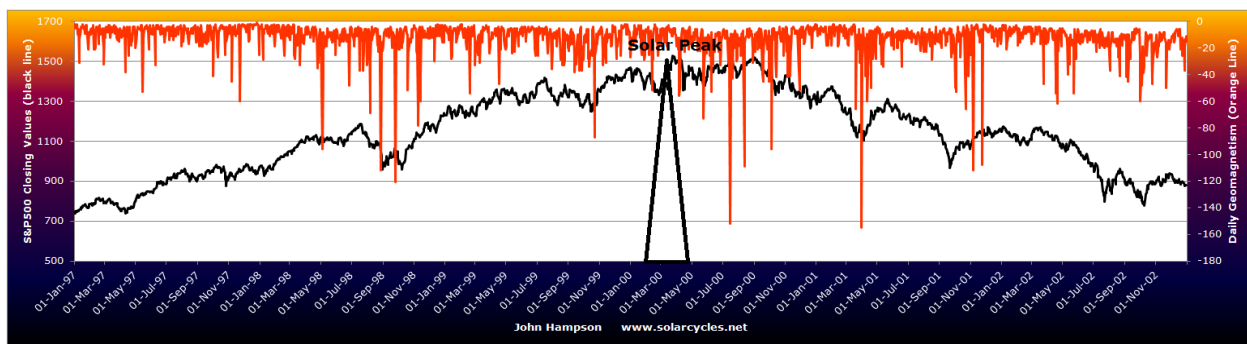
Summary and Conclusions

History sometimes repeats, history often rhymes. By studying the past, we can predict the future. These are often-quoted trading philosophies, with W.D. Gann’s work on time cycles centralizing this repetition. What I have attempted to demonstrate is that natural cycles of the sun, namely sunspots, geomagnetism and lunar illumination, are a key underlying cause of these patterns. From growth, inflation, demographics and asset cycles, to sentiment, stock market seasonality and waveform, we see solar phenomena and their influence on humans driving cyclical patterns that repeat over time.

Let me draw it all together by providing a case example from the last solar peak of March 2000, which corresponded exactly to the secular stocks peak of March 2000. Inflation also peaked in that month of that year too. Leading into that, around 1999, demographic models (that would be supportive of stocks) peaked out. In the charts below we can see that stocks rose as sunspots rose from 1997 through to 2000. There was a significant correction on the way, in 1998, that corresponded to a period of significant geomagnetism. After the solar/secular peak of March 2000, both stocks and sunspots attempted to double top, but a period of significant geomagnetism took hold again, and stocks then fell away from 2000 into late 2002. Intermittent clusters of high geomagnetism helped propel the market gradually lower, and a recession took hold from March 2001 to November 2001.



Sunspots versus stocks (SP500) 1997-2002



Geomagnetism versus stocks (SP500) 1997-2002

Lastly, and also by way of summary, here is a data table, demonstrating the relationships between solar cycles and secular stocks and commodities peaks, asset ratio extremes, stocks valuations extremes and inflation, as well as the correlation between solar peaks, recessions and geomagnetism peaks.

	Solar peak	Secular peak	Inflation Peak	Geomagnetism Peak	Recession	Stocks: Commodities Ratios	Stocks P/E Ratios
Solar cycle 23	Mar-00	Stocks secular peak March 2000 Dot com boom (Vs. solar peak: exact)	Mar-00 (Vs. solar peak: exact)	2003 (Vs. solar peak: 3 years after)	March 2001-Nov 2001 (Vs. solar peak, started 12 months after)	Secular Top 2000	Secular Top 2000
Solar cycle 22	Jul-89	Nikkei stocks secular peak December 1989 (5 months after)	Sep-90 14 months after	1989 (Same year)	July 1990-March 1991 (12 months after)		
Solar cycle 21	Dec-79	Commodities secular peak: gold January 1980, oil April 1980 (1 to 5 months after)	Mar-80 (4 months after)	1982 (3 years after)	January 1980-July 1980 and July 1981-November 1982 (1 month and 20 months after)	Secular Bottom 1980	Secular Bottom 1982
Solar cycle 20	Nov-68	Secular stocks peak S&P500 November 1968 (Exact)	Nov-69 (12 months after)	1974 (6 years after)	November 1969-November 1970 (12 months after)	Secular Top 1968	Secular Top 1968
Solar cycle 19	Mar-58	10 year rolling stocks peak 1959 (12 months after)	Apr-58 (1 month after)	1960 (2 years after)	April 1960 - February 1961 (23 months after)		
Solar cycle 18	May-47	Commodities secular peak: CCI index high Oct/Nov 1947 (5 months after)	Mar-47 (2 months before)	1951 (4 years after)	November 1948-October 1949 (18 months after)	Secular Bottom 1947	Secular Bottom 1949
Solar cycle 17	Apr-37	Secular stocks peak Dow Jones January 1937 (3 months before)	May-37 (1 month after)	1942 (5 years after)	May 1937-June 1938 (1 month after)		
Solar cycle 16	Apr-28	Secular stocks peak September 1929 (17 months after)	Apr-26 (24 months before)	1930 (2 years after)	August 1929-March 1933 (16 months after)	Secular Top 1929	Secular Top 1929
Solar cycle 15	Aug-17	Secular commodities peak: metals 1916, agri 1917, oil 1920 (Average 6 months after)	Jun-17 (2 months before)	1919 (2 years after)	August 1918 - March 1919 and January 1920-July 1921 (12 months and 30 months after)	Secular Bottom 1917	Secular Bottom 1921
Solar cycle 14	Feb-06	Secular stocks Dow Jones peak January 1906 (1 month before)	1906 (Near peak - monthly data unknown)	1907 (1 year after)	May 1907-June 1908 (15 months after)		

John Hampson www.solarcycles.net

References

1. William Jevons (1875) *Influence of the Sun-Spot Period on the Price of Corn*
 2. Carlos Garcia-Mata, Felix Shaffner (1934) *Solar and economic relationships - a preliminary report*
 3. Alexander Tchijevsky (1924) *Physical Factors of the Historical Process*
 4. Charles Collins (1965) *Effect Of Sunspots Activity On The Stock Market*
 5. Edward Dewey (1968) *Economic and Sociological Phenomena Related to Solar Activity and Influences*
 6. Bryan Walsh (1993) *Economic Cycles and Changes in the Earth's Geomagnetic Field*
 7. Anna Krivelyova, Cesare Robotti (2003) *Playing The Field: Geomagnetic Storms And The Stock Market*
 8. Iliia Dichev, Troy Janes (2001) *Lunar Cycle Effects In Stock Returns*
 9. K Yuan, L Zheng, Q Zhu (2002) *Are Investors Moonstruck? Lunar Phases and Stock Returns*
 10. Marco Hickey (2009) *The U.S. Financial Markets are Correlated with Specific Moon Phases - Accurate or Complete "Lunacy"?*
 11. William Hrushesky (2011) *Sunspot dynamics are reflected in human physiology and pathophysiology*
 12. Ching Cheh Hung (2007) *Apparent Relations Between Solar Activity and Solar Tides Caused by the Planets*
 13. Marcel Visser, Juan Jose Sanz (2009) *Solar Activity Affects Avian Timing Of Reproduction*
 14. Ilya Klvana (2002) *The solar cycle as a possible modulator of ecosystem functioning on the decadal time scale: new evidence from North American porcupine feeding scars and climatic data*
 15. ARE Sinclair (1993) *Can the solar cycle and climate synchronize the snowshoe hare cycle in Canada? Evidence from tree rings and ice cores*
 16. David Juckett, Barnett Rosenberg (1993) *Correlation of Human Longevity Oscillations with Sunspots Cycles*
 17. Neil Cherry (2002) *Schumann Resonance and Sunspot Relations to Human Health Effects in Thailand*
-