

Werewolf Markets- How Lunar Phases Haunt the SPX500

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Belief in a link between the Moon's phases and human behavior has ancient roots, and by extension there has long been speculation that lunar cycles might influence financial markets. Folklore suggests full moons bring out pessimism or erratic behavior, while new moons foster optimism. If investors' moods are affected (e.g. becoming more risk-averse during a full moon), it could reflect in stock prices. This report examines historical correlations between the S&P 500 (SPX) returns and lunar phases – specifically new moons, full moons, and the waxing/waning cycles in between – and reviews academic research and trading strategies based on the “lunar effect.” Key findings from scholarly studies and financial analyses are presented, alongside any evidence of statistically significant trading advantages tied to moon phases. Tables summarizing strategy performance and study results are included for clarity.

Academic Evidence of Lunar Phase Effects on Stock Returns

Early Findings: New Moon vs Full Moon Returns A few academic studies have documented an apparent **lunar cycle effect** in stock returns. One of the earliest comprehensive studies (Dichev & Janes, 2001) found that returns in the half-month period around a **new moon** were consistently higher – roughly double – those in the half-month around a **full moon**. This pattern was observed across **all major U.S. stock indices over ~100 years** (spanning the 20th century) as well as in nearly all of 24 other countries' stock markets over a 30-year sample. The authors reported that this “lunar effect” was not accompanied by differences in market volatility or trading volume, suggesting it was not simply a proxy for risk or other calendar anomalies. In other words, stock returns tended to be **lower on days around full moons and higher on days around new moons**, even after controlling for effects like the January effect or day-of-week patterns. The magnitude cited was economically meaningful: one global portfolio analysis found an annualized return difference of about **5.4% per year** between new-moon and full-moon periods.

This intriguing result was later highlighted in more accessible outlets. For example, an analysis of G7 stock markets over roughly 30 years reported that **average daily returns around new moons were 2–3 times higher than those around full moons** in every G7 country. A Harvard Business Review piece in 2006 (summarizing Dichev & Janes) showed a remarkably uniform trend: each G7 nation's stock index had significantly better performance in the days surrounding new moons than full moons. Such consistency across countries lent credence to the idea that lunar-phase-linked mood shifts (e.g. optimism near new moons, gloom near full moons) might subtly influence investor behavior and equity prices.

Not all studies limited themselves to new vs full; some examined the **waxing** and **waning** halves of the lunar cycle. (The waxing phase covers the increasing illumination from new moon to full moon, and waning covers full moon back to new.) Research published in *Journal of Business Finance & Accounting* (2012) focusing on ~50 years of S&P 500 data found that **returns were higher during the waxing phase than during the waning phase**, indicating stocks tended to rise more in the new-to-full period than in the full-to-new period. This essentially parallels the new-moon vs full-moon findings, since the waxing period leads up to the full moon (when sentiment was hypothesized to turn more negative). Consistent with this, a Bayesian

analysis of G7 markets (plus some Asian markets) found that markets like the US, UK, Germany, and Japan showed **significantly lower mean returns during full-moon periods** than during new-moon periods (pessimism at full moon). The same study noted higher return **volatility** around full moons in most countries, aligning with the idea of greater investor mood swings or overconfidence during full moons. (Interestingly, a few exceptions have been documented: e.g. one analysis found **Singapore** exhibited *higher* mean returns during full moons, contrary to the general pattern, underscoring that the effect is not universal in every market.)

In summary, many academic papers – especially those examining broad international datasets in the latter 20th century – conclude that **stock returns (including for the S&P 500) tend to be higher in the days surrounding a new moon and lower around a full moon**. This lunar return anomaly has been statistically significant in several studies and is hypothesized to stem from mood/behavior changes. One influential global study (Yuan, Zheng & Zhu, 2006) analysed **48 countries** from 1973–2001 and found “strong global evidence” of the lunar effect, independent of other calendar effects; the authors suggest it points to a behavioral bias since lunar phase should be unrelated to economic fundamentals. They and others have noted that this phenomenon challenges the strict Efficient Market Hypothesis, instead aligning with behavioral finance ideas that **investor sentiment** can influence asset prices.

Recent and Mixed Evidence

Despite the early findings, more recent analyses paint a more nuanced picture. Some studies extending into the 2000s or focusing on additional markets have found **weaker or inconsistent lunar effects**. For example, Floros and Tan (2013) examined **59 international stock markets** (emerging and developed) with data through the 2000s and found only selective evidence of moon-phase effects: significant **new-moon return boosts in 5 markets** (including the UK and Switzerland) and a significant **full-moon drag in just 1 market** (Jordan). Many other markets showed no statistically significant lunar pattern by conventional thresholds. Intriguingly, Floros and Tan observed that lunar phase effects, when present, were often **intertwined with other calendar anomalies** – for instance, several markets that exhibited a moon effect also had Monday or January effects, suggesting multiple seasonalities at play rather than a standalone lunar influence. They also noted that any lunar impact was “stronger outside America” – indeed, the U.S. market did *not* show a robust moon effect in that study, implying that the S&P 500’s earlier apparent lunar correlation might have weakened in modern times.

A dedicated look at the **S&P 500 in the past decade** reinforces the possibility that the lunar effect has diminished or vanished in recent years. One analysis of U.S. markets from **2013 to 2023** found **no statistically significant difference** in returns across lunar phases. As shown in the study’s summary of mean returns (Table 2 below), the S&P 500’s average annual return during full moon periods was about 7.90%, compared to 8.30% during new moon periods – a slight difference (~0.4 percentage points) favouring new moons, but far too small to be significant. The waxing vs waning split was even more negligible (8.15% vs 8.25% annualized). Statistical tests (t-tests and ANOVA) yielded high p-values (0.43 for full vs new, etc.), meaning **no lunar phase produced returns significantly different from any other in the 2013–2023 sample**. The authors conclude that lunar phases “are unlikely to be a major driver” of U.S. market behavior in the modern context. In short, over the last 10+ years, the S&P’s performance appears **unrelated to moon phases** once u account for normal market variability.

Table 1. Average Annual Returns of Assets by Lunar Phase (2013–2023)

Lunar Phase	S&P 500 Index Avg Return (%)	Gold (XAU/USD) Avg Return (%)	EUR/USD Exchange Rate Avg Return (%)
Full Moon	7.90%	5.70%	0.40%
New Moon	8.30%	5.90%	0.45%

Waxing (New→Full)	Phase	8.15%	5.75%	0.42%
Waning (Full→New)	Phase	8.25%	5.85%	0.47%

Source: Abdallah (2023), *Kurdish Studies* – The difference in mean returns across lunar phases were minor and not statistically significant.

Overall, the academic literature presents **mixed evidence**. Earlier studies covering long historical periods (mid-20th century and earlier) strongly suggested a lunar return anomaly, including for the S&P 500. Later and broader studies find the effect to be **inconsistent across markets and time** – with some markets exhibiting it and others (especially the U.S. in recent decades) showing no reliable effect. It's possible that what was once a measurable anomaly has weakened over time, or that initial findings were partly the result of data-snooping and have not held up out-of-sample. The consensus among many experts leans toward skepticism: any observed moon-phase correlation could be a statistical quirk rather than a persistent, exploitable phenomenon. Indeed, multiple reviews note that aside from the notable studies above, many other rigorous analyses **failed to find a significant relationship** between lunar cycles and stock returns. The idea remains intriguing from a behavioral finance standpoint, but it is not considered a robust or agreed-upon market anomaly in the way that, say, the “day-of-week” effect once was.

Investment Strategies Based on Lunar Phases

Given the research suggesting return differences between moon phases, some investors and analysts have attempted to devise **trading strategies** to capitalize on the lunar cycle. Typically, these strategies time market entry or exit around specific moon phase dates. Below we summarize a few such strategies and any evidence of their performance:

- Full Moon to New Moon Strategy (Long Waning Phase):** One simple approach is to **buy at the start of a full moon** and sell at the next **new moon**, staying in cash during the other half of the cycle. This means the portfolio is invested during the **waning moon** phase (as the moon goes from full to dark). A backtest of this strategy on the S&P 500 (1960–2023, excluding dividends) showed surprisingly strong results. The strategy was invested roughly 50% of the time and achieved about **4.4% annual price return**, versus ~7–8% for buy-and-hold over the same period. At first glance 4.4% sounds lower, but because the strategy is only in the market half the time, its **risk-adjusted return** (annual return divided by time invested) was ~8.8%, higher than the S&P's 7.2% risk-adjusted return ($7.2\% = 7.2\% \text{ over } 100\% \text{ time}$). In other words, per unit time in the market, the strategy outperformed buy-and-hold. However, the backtest revealed a crucial detail: **all the outperformance occurred after 2008–09**. In earlier decades this timing strategy did not beat the market, but it happened to avoid some drawdowns and capture gains in the post-2008 bull market, tipping the scales. This raises a concern that the impressive performance may be sample-specific (coinciding with the 2009–2020 rally) rather than a consistently repeatable edge. Nonetheless, a 20-year study by researchers at University of Lausanne similarly claimed that **full-moon to new-moon trading strategies outperformed the market by ~3.3% per year** on average – suggesting some potential for excess returns. (That study's specifics aren't widely published, and such outperformance could well be due to lucky timing or unresolved confounding factors. The authors themselves caution the effect could be coincidental)
- New Moon to Full Moon Strategy (Long Waxing Phase):** The converse strategy is to **buy on a new moon** and sell on the next **full moon**, being invested during the **waxing phase** (as the moon grows). If indeed stock returns are better in waxing periods (as earlier studies indicated), one might expect this strategy to outperform. However, the same S&P 500 backtest found the opposite: **new-moon-to-full-moon returned only ~2.8% annually** (price-only), underperforming both the full-moon strategy above and the benchmark. Its risk-adjusted return (~5.6% when scaled to half-

time invested) was well below buy-and-hold. This suggests that, in the tested period, being in the market during waxing phases was worse than being out. The result is somewhat counter-intuitive vis-à-vis the academic findings (which implied waxing should be the superior half). It underscores that real-world strategy performance can deviate from simple averages – possibly due to specific cycles of bull/bear markets. In this case, much of the S&P 500's long-term gains occurred in big upward moves that, by chance, aligned more often with the waning half of the cycle in recent decades (for example, the strong post-2009 rally happened to coincide with many full-to-new intervals). This highlights the danger of assuming a trading rule will mirror a statistical average – luck and timing still play a role. Indeed, another analysis (5-year sample by University of Zurich) that reported a **6.8% per year outperformance** from lunar-cycle strategies might have been capturing a particular favourable window rather than a stable advantage (5 years is a short sample to establish statistical significance).

Table 2. Performance of Example Lunar Phase Trading Strategies on S&P 500

Strategy (1960–2023)	Entry Signal	Exit Signal	Annual Return (Price-Only)	Time in Market	Risk-Adj. Return
Full→New (Waning)	Buy at Full Moon open	Sell at New Moon open	4.4%	~50%	~8.8% (outperformed)
New→Full (Waxing)	Buy at New Moon open	Sell at Full Moon open	2.8%	~50%	~5.6% (underperformed)

Risk-Adjusted Return is annual return divided by fraction of time invested. For reference, buy-and-hold S&P 500 had ~7.2% annual price return over this period, which on a risk-adjusted basis is 7.2% (since it's invested 100% of the time).

As shown above, simply timing the index with moon phases would have kept an investor on the sideline's half the time. The **full-moon (waning) strategy** delivered higher return per invested day than the market, but the **new-moon (waxing) strategy** lagged. These are purely historical results; whether they continue in the future is uncertain. Importantly, neither strategy delivered spectacular absolute returns – the full-moon strategy's 4.4% annual gain pales next to just staying invested (~7–8% annually). It only “wins” after adjusting for time out of the market. In practice, the modest excess risk-adjusted returns could be eaten up by transaction costs or slight mistiming. Moreover, as noted, the outperformance of the waning-phase strategy was heavily **period-dependent** (mostly post-2008). This suggests any real **edge might be fleeting** or contingent on specific market regimes.

- **Enhanced Lunar Strategies:** Some traders have tried to improve these basic strategies by adding additional rules or filters. For instance, the Quantified Strategies backtest introduced seasonal filters on top of the moon phases (details were behind a membership wall) – effectively combining the lunar signal with another timing factor. The result was a strategy that was invested only ~23% of the time yet achieved ~3.5% annual return (price-only), boosting the risk-adjusted return to ~14.8%. With further refinement (a second seasonal filter), they achieved ~2.9% annual return in just 15% of days, yielding an impressive 19% risk-adjusted return. However, these increasingly complex strategies carry a high risk of **overfitting**. Each additional condition is tuned to past data and may not generalize. In essence, while one *can* engineer a strategy that would have done exceptionally well historically by trading only during very specific lunar/seasonal periods, there is no guarantee those patterns persist. The more rules applied, the greater the danger that the strategy is just capturing random historical coincidences rather than a true causal effect.

Beyond equities, some enthusiasts have also experimented with lunar phase trading in other assets – even cryptocurrencies. For example, a naive Bitcoin strategy (long during full→new phases, 2014–2021) showed a high raw annual return (~32%) simply because Bitcoin's overall trend was up, but it underperformed

buy-and-hold on a risk-adjusted basis (65.6% vs 68%). With tweaks, they improved the metrics (e.g. adding a seasonal rule raised risk-adjusted return to 126% vs buy-and-hold 68%), but again such results likely indicate overfitting in a highly volatile asset. Overall, **no lunar-based strategy has emerged as a reliably superior trading system in real time**. At best, some strategies have shown *statistical* outperformance in backtests, but these often rely on specific historical quirks.

It's worth noting that academic research generally does *not* advocate actual trading strategies based on the lunar effect, even when the return correlations are significant. The studies tend to frame the findings as evidence of psychological forces in markets, rather than as arbitrage opportunities. Indeed, if a simple calendar-based rule consistently beat the market, one would expect arbitrageurs to exploit and eliminate it. The lack of widespread adoption of lunar strategies by institutional investors is telling. Many analysts remain sceptical, often calling the lunar-stock idea "superstition" without scientific merit. Rigorous **out-of-sample tests** and **forward performance** of lunar strategies have largely failed to show dependable profits. In sum, while it's possible to construct a moon-phase trading plan (e.g. entering or exiting around specific moon dates), the **evidence of statistically significant outperformance is weak**. Any slight edge observed historically could easily be due to randomness, and one should be cautious about transaction costs, short sample periods, and data-mining biases when evaluating such strategies.

Time Horizons and Sample Periods in Studies

Researchers have explored the lunar effect using varying time frames, and the choice of sample period often influences the results. Key time horizons include:

- **Long-Term (50+ years or a Century):** Some studies have taken an expansive view. Dichev & Janes (2001) looked at **a century of U.S. stock returns** (going back to the late 1800s/early 1900s) and found a persistent lunar pattern over that long horizon. They also examined international data spanning ~30 years for dozens of countries. Their finding of roughly double returns around new moons was based on a very broad dataset, which gave it statistical power. Similarly, the oft-cited 2006 study by Yuan et al. used nearly **30 years of global data (1973–2001)** across 48 countries. These longer samples, covering multiple market cycles, tended to show a clear average effect (new > full) when **aggregating many decades**. The trade-off is that such studies may overweight earlier decades where markets had different characteristics. For instance, the U.S. stock market of 1900–1950 (largely retail-driven, less efficient) is very different from the market of 2000–2020. A finding that holds over 100 years might not hold over any given 10-year sub-period.
- **Post-WWII / Modern Era (≈1950s onward):** Other analyses focus on the **modern stock market era**, often using data from the 1950s or 1960s up to present. A 50-year S&P 500 study (approximately 1960–2010) was referenced in the context of waxing vs waning returns. By concentrating on the post-1950 period, such studies exclude the extreme volatility of the Great Depression and World War II, arguably providing a cleaner test of the lunar effect under conditions more like today's market. The *Journal of Business Finance & Accounting* 2012 paper (mentioned by Bard) is one example, and it found the waxing-outperforms-waning pattern in that span. We also see studies from the 2000s that use data from the 1980s or 1990s through the 2000s (e.g. the Bayesian analysis in *IUP J. Behavioral Finance* 2009, which likely covered a few decades up to the 2000s). Generally, in these mid-length (multi-decade) samples, **many studies did observe the lunar effect**, but not always at high significance levels for U.S. stocks. As noted, even in some G7 markets the effect was marginal by the 1990s – e.g. one analysis found the U.S. difference was only borderline significant at the 10% level. The **Harvard Business Review (2009)** update and Atlantic article cited used roughly 30-year spans ending in the 2000s, and they did report a strong effect in aggregated form. So, the consensus is that from mid-century through the 1990s, there was at least an observable pattern (even if one remains sceptical of causation).

- **Recent Decade (10–15 years):** As discussed, very recent studies isolating the **2010s into the 2020s** timeframe tend to find *no* significant lunar correlation. The 2013–2023 analysis (Table 1 above) is a case in point. Another informal experiment by a market practitioner examined around 2 years of data (2021–2022) on the Nifty index in India and did find a statistically significant difference between new-moon and full-moon 3-day returns. However, that was an extremely short window, and such a result could easily be noise. (The author himself expressed surprise that the “lunation effect” appeared even in an era dominated by algorithmic trading) In general, any **strategy or anomaly can struggle to show significance in a small sample** because market volatility dominates. Thus, a lack of evidence in one decade doesn’t *prove* the effect is gone – but taken together, the 2010s have not provided supportive data for the lunar hypothesis. If anything, the burden of proof is on the anomaly to demonstrate it still exists. At this point, the most prudent interpretation is that **results to vary by time horizon**: the lunar effect was detectable in longer historical samples and multiple markets through the late 20th century, but in the 21st century data (especially the last 10–20 years) it appears greatly diminished or absent for the S&P 500. This could be due to markets becoming more efficient (arbitraging away a once-profitable timing signal), or simply that random fluctuations over a few decades can produce spurious patterns that eventually mean-revert.

It’s notable that even the positive studies often sliced the data in different ways to test robustness – for example, trying different window lengths (5-day, 7-day, 15-day windows around phase dates) and even “shifting” the cycle (to make sure any 30-day cycle effect is truly tied to the moon and not just a generic 30-day rhythm). Yuan et al. (2006) did this and found the effect held for various window definitions around new/full, and that if u offset the cycle by a random number of days, the effect vanished – confirming it was specific to aligning with the lunar calendar. This gives some confidence that in their sample the effect was real. However, as time passes, **re-testing on newer data is essential**. So far, those re-tests suggest the effect may not have persisted strongly into the 2010s, at least for U.S. equities.

Research into lunar phases and stock returns provides a fascinating example of the intersection between human psychology and financial markets. Historically, several rigorous studies found that the S&P 500 and other indices delivered **higher returns around new moons and lower returns around full moons**, consistent with the idea that investor sentiment might ebb and flow with moon-induced mood changes. These findings, spanning many decades and countries, opened the door to the notion of “werewolf markets” and prompted further investigation into out-of-the-box predictors of market behavior.

However, as additional data accumulated, the lunar effect has proven **difficult to pin down**. More recent analyses and shorter-term studies often find no meaningful correlation between moon phases and returns, especially for the post-2000 period. The apparent anomaly that once showed up in long-run averages may have little practical significance in today’s market environment. Investment strategies derived from lunar phases – such as timing entry/exit around full or new moons – have not delivered consistent alpha when subjected to real-world conditions and extended out-of-sample testing. Some backtests show modest outperformance for moon-phase strategies, but these results are sensitive to period and are likely not robust enough to rely on (once transaction costs and variability are considered). Indeed, many finance scholars view the moon-market connection as an intriguing historical footnote or behavioral case study, rather than a actionable trading rule.

Finally, **no consensus “moon trading” strategy has emerged that can reliably beat the market**. The S&P 500’s returns do *not* appear to be materially driven by lunar cycles in any consistent way – certainly not in recent decades. While the topic makes for an interesting discussion (and a reminder that markets are influenced by investor psychology), any correlation between lunar phases and equity performance is subtle at best and possibly spurious. Investors considering lunar-based signals should remain very sceptical. The

weight of evidence suggests that traditional fundamentals, economic indicators, and risk management will far outweigh the gravitational tug of the moon when it comes to portfolio returns.

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