Seasonal Effects and Other Anomalies

Blair Hull, Petra Bakosova, Alexander Kment

Summary

This study revisits popular stock market anomalies, including seasonal, announcement, and momentum effects, evaluates their statistical significance and persistence, and proposes investment strategies to leverage this information. We develop a Seasonal Anomaly and Trend Model (SATM) incorporating the Sell in May (SIM), Turn of the Month (TOM), Federal Open Market Committee (FOMC) pre-announcement drift, and State Dependent Momentum (SDM). Utilizing S&P 500 data from 1975 onwards, we estimate model parameters annually using an expanding window, optimizing the model in a walk-forward manner. The strategy produced a 9.10% annualized return with 5.2% volatility and a Sharpe ratio of 0.84, more than double that of a Buy-and-Hold strategy over the same period. Combining this model with Hull and Qiao's previous market-timing models further enhances performance, achieving a Sharpe ratio of 1.26 with 18.07% annual returns and 13.26% volatility from 2003-2017.

Introduction

The landscape of financial markets is punctuated by patterns and anomalies that offer intriguing opportunities for investors. Among these, seasonal anomalies, announcement effects, and momentum trends stand out due to their persistence and potential for exploitation. The academic literature on stock market anomalies is extensive, documenting various patterns that seem to contradict the efficient market hypothesis. However, practical applications that combine these findings into cohesive investment strategies are relatively scarce.

We address this gap by integrating multiple well-documented anomalies into a single, robust model. Our Seasonal Anomaly and Trend Model (SATM) combines the Sell in May (SIM) effect, Turn of the Month (TOM) effect, Federal Open Market Committee (FOMC) pre-announcement drift, and State Dependent Momentum (SDM) strategy. Each of these components has been extensively studied and validated in financial literature.

Sell in May (SIM): This effect, also known as the Halloween effect, posits that stock returns are significantly higher from November to April compared to May to October. This phenomenon has been documented across various markets and time periods. Researchers such as Bouman and Jacobsen (2002) and Jacobsen and Zhang (2014) have traced this effect back several decades, citing behavioral finance theories and risk premia explanations.

Turn of the Month (TOM): The TOM effect observes that stock returns tend to be higher during the turn of the month—the last few trading days of one month and the first few trading days of the next. Studies by Hensel and Ziemba (1996) and Ogden (1990) attribute this pattern to liquidity effects and the timing of corporate cash flows.

FOMC Pre-Announcement Drift: This anomaly highlights the abnormal returns in the stock market during the 24 hours preceding Federal Open Market Committee announcements. Lucca and Moench (2015) demonstrated that this drift accounts for a significant portion of the annual equity premium, suggesting that investors may be pricing in anticipated monetary policy decisions.

State Dependent Momentum (SDM): Momentum strategies, particularly those based on the 200-day moving average, have been popular among investors. The SDM strategy refines this approach by adjusting for market regimes, thereby capturing momentum in both bull and bear markets. This strategy is supported by studies such as those by Jegadeesh and Titman (1993) and Moskowitz et al. (2012).

Despite the well-documented nature of these anomalies, integrating them into a practical, real-time trading strategy poses challenges. Traditional return predictability models often rely on continuous indicators, whereas our approach utilizes discrete variables and deterministic models. This distinction is crucial as it allows us to build a robust, easy-to-implement trading system that outperforms the Buy-and-Hold strategy on a risk-adjusted basis.

First, we provide a comprehensive analysis of the statistical significance and persistence of these anomalies using up-to-date data. Second, we propose a novel market-timing strategy that combines these anomalies into a unified model. We then evaluate the performance of this model in real-time, walk-forward tests, ensuring that our findings are not artifacts of overfitting or data snooping.

Methodology

Data and Variables

Our dataset spans from 1975 to 2017 and includes the total return S&P 500 index and the three-month Treasury bill rate. We utilize the following anomalies and effects:

1. **Turn of the Month (TOM):** Historically significant increases in stock prices around the turn of the month.
2. **Sell in May (SIM):** The phenomenon where stock prices perform better in the November-April period compared to May-October.
3. **FOMC Pre-Announcement Drift:** Significant stock price increases in the 24 hours preceding Federal Open Market Committee (FOMC) announcements.
4. **State Dependent Momentum (SDM):** A momentum strategy dependent on the state of the market, specifically whether the S&P 500 is above or below its 200-day moving average.

Statistical Model

We employ a walk-forward optimization approach with an expanding window to estimate parameters and optimize our models annually. This method ensures that each year's parameters are based on all available historical data up to that point, enhancing out-of-sample robustness.

1. **TOM Strategy:** Long positions are taken starting a few days before the last trading day of the month and held for several days into the new month.
2. **SIM Strategy:** Positions are liquidated on May 1 and reinvested on October 31, based on the traditional Sell in May adage, with some adjustments for optimal start and end dates.
3. **FOMC Strategy:** Long positions are taken at the market close the day before an FOMC announcement and sold at the market close on the day of the announcement.
4. **SDM Strategy:** The strategy goes long when the S&P 500 is above its 200-day moving average and adjusts positions based on market state-dependent momentum signals.

Results

Individual Strategies

Turn of the Month (TOM): The TOM strategy consistently outperforms non-TOM periods, demonstrating higher average returns and lower volatility. The optimal TOM period generally begins zero to three days before the month's end and extends three to seven days into the new month.

Sell in May (SIM): The SIM strategy shows significant seasonal effects, with the optimal entry typically around late April to early May and exit from early to late October. The SIM strategy outperforms the Buy-and-Hold approach on a risk-adjusted basis.

FOMC Pre-Announcement Drift: The FOMC strategy capitalizes on the significant positive returns observed in the 24 hours before FOMC announcements, achieving substantial excess returns with low volatility.

State Dependent Momentum (SDM): The SDM strategy effectively captures momentum in different market states, outperforming simple moving average strategies by adjusting to the market's regime.

Combined Strategies

We combine the individual strategies using mean-variance optimization, grid search for optimal signal weights, and equal weighting. Each approach is evaluated on its ability to outperform the Buy-and-Hold strategy both in terms of returns and risk-adjusted performance.

Equal Weight Portfolio: This portfolio allocates equal weight to each strategy, achieving a higher Sharpe ratio than Buy-and-Hold due to lower volatility and drawdowns.

Mean-Variance Optimization: This approach optimizes the weights of each strategy to maximize the Sharpe ratio, resulting in improved risk-adjusted returns compared to the Buy-and-Hold strategy.

Grid Search Optimization: This method dynamically allocates weights based on historical performance, yielding the highest Sharpe ratio among the combined strategies.

Performance Analysis

Cumulative Wealth: The combined strategies consistently outperform the Buy-and-Hold approach, particularly during periods of market turbulence, as evidenced by lower drawdowns and faster recovery times.

Sharpe Ratio and Volatility: The optimized strategies achieve Sharpe ratios significantly higher than Buy-and-Hold, indicating superior risk-adjusted performance. Volatility is also substantially lower, enhancing the strategies' appeal for risk-averse investors.

Drawdown Analysis: The combined strategies exhibit reduced drawdowns compared to Buy-and-Hold, particularly during major market downturns in 2002, 2007, and 2011. This indicates effective risk management and capital preservation.

Conclusion

The Seasonal Anomaly and Trend Model (SATM) effectively leverages well-documented market anomalies to achieve superior investment performance compared to traditional Buy-and-Hold strategies. By combining multiple strategies and optimizing their implementation, we demonstrate significant improvements in risk-adjusted returns, reduced volatility, and enhanced drawdown management. This model offers a robust framework for investors seeking to capitalize on predictable market patterns while mitigating downside risk.

The potential for future research in this domain is vast. While this paper focuses on a few well-documented anomalies, numerous other patterns and signals warrant exploration. Integrating additional anomalies, such as the January effect or weekend effect, could further enhance the robustness and performance of the SATM. Moreover, expanding the dataset to include international markets would provide insights into the global applicability of these strategies.

Another promising avenue is the application of machine learning techniques. Advanced algorithms could identify complex patterns and interactions among various predictors, potentially uncovering new insights and enhancing predictive accuracy. However, it is crucial to balance model complexity with interpretability, ensuring that the resulting strategies remain actionable for investors.

In conclusion, our research demonstrates that incorporating well-known market anomalies into a cohesive trading model can yield substantial economic benefits. The SATM provides a viable alternative to traditional investment strategies, offering superior risk-adjusted returns and effective drawdown management. As financial markets continue to evolve, the ability to adapt and integrate new information will be key to maintaining a competitive edge. We invite further exploration and refinement of these strategies, with the goal of continually enhancing investment performance in an ever-changing market landscape.

References

Bouman, S., & Jacobsen, B. (2002). "The Halloween Indicator, 'Sell in May and Go Away': Another Puzzle." American Economic Review, 92(5), 1618-1635.

Chan, W. S., & Marsh, T. A. (2017). "Investor Sentiment, Political Uncertainty, and Stock Market Risk Premium." Journal of Financial Markets, 34, 27-43.

Faber, M. T. (2007). "A Quantitative Approach to Tactical Asset Allocation." Journal of Wealth Management, 9(4), 69-79.

Hull, B., Qiao, X., & Bakosova, P. (2017). "A Practitioner's Defense of Return Predictability." Journal of Portfolio Management, 43(6), 37-52.

Jegadeesh, N., & Titman, S. (1993). "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency." Journal of Finance, 48(1), 65-91.

Lucca, D. O., & Moench, E. (2015). "The Pre-FOMC Announcement Drift." Journal of Finance, 70(1), 329-371.

Markowitz, H. (1952). "Portfolio Selection." Journal of Finance, 7(1), 77-91.

Swinkels, L., & Van Vliet, P. (2012). "An Anatomy of Calendar Effects." Journal of Asset Management, 13(3), 210-228.

Welch, I., & Goyal, A. (2008). "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction." Review of Financial Studies, 21(4), 1455-1508.