A Comparative Analysis of "Winners", "Median" and "Losers" Rotation Strategies with S&P-500 Sector ETFs

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Abstract

This paper proposes a simple periodic ETF sector rotation strategy for S&P-500. Unlike most ETF rotation strategies, the proposed strategy does not predict economic cycles. The strategy involves periodic ranking of component sectors based on sector ETF returns and re-investing funds equally into the middle ("median") three sector ETFs. We show that for the S&P-500, the proposed "median" ETF rotation strategy with montly rebalancing is better than focusing on the "winners" or the "losers" sector ETFs with different frequencies of re-balancing. Using historical data from 2000, we show that the proposed "median" monthly rotation strategy significantly outperforms the other two strategies and passive index investment in terms of total return, volatility, and maximum drawdown. An average investor can easily implement the proposed ETF rotation strategy.

Keywords: sector rotation, portfolio construction, median sector strategy

1 Introduction

A sector rotation strategy involves allocating money to sectors predicted to outperform in the next investment period [1, 2, 3, 4]. Different sectors perform differently in different economic cycles. For instance, cyclical sectors like Consumer Discretionary, Financials, and Materials perform well during phases of economic expansions, whereas defensive sectors such as Consumer Staples, Utilities, and Healthcare perform better during economic downturns. Such strategies are often implemented with exchange-traded funds (ETFs) [5]

Accurate prediction of economic cycles could provide significant outperformance [6, 7, 8]. It is not surprising that many strategies have been proposed including business-cycle prediction [9, 10, 11], Momentum–Driven and Mean Reversion [12, 13, 14, 15], PCA-based methods [16], interest-rate based ([16, 17, 18, 19, 20, 21, 22, 23], to name just some). However, such a prediction is difficult. A recent detailed analysis of sector rotation strategies in [24] indicates that most such strategies cannot consistently generate excess returns.

In a recent paper [25], the authors suggested a simple rotation strategy where one ranks (by returns) the nine ETF sector funds and invest equally in the middle 3 ETFs. it was shown that such a "median" strategy outperforms S&P-500 passive investment with the best results at monthly frequency. Such median strategy was also suggested in a recent paper [26] where the authors

suggested a periodic investment in the middle performing 10 stocks in the Dow Jones Industrial Average.

But what about always investing in the best 3 ETFs ("winners") or worst 3 ETFs ("losers). When are such strategies profitable? How do they compare with the "median" rotation? We address these questions in this paper. We show that the answer to the above questions depends on the frequency of re-balancing. If re-balancing is done annually, "winners", "median" and "loser" strategies outperform passive index investing. For annual rebalancing, investing in the "Losers" rotation strategy gives the best total return (with higher volatility and drawdowns). If re-balancing is done weekly, then investing in "winners" rotation strategy outperforms all other strategies (including passive index investing) and gives the highest total return (with higher volatility and maximum drawdown). By contrast, the "median" rotation strategy outperforms all other strategies by total return, volatility, and drawdown when re-balancing is done monthly. Its outperformance over passive S&P-500 investing is significant: almost double the total return with lower volatility. As a result, the median rotation strategy is the best choice offsetting transaction costs and possible tax considerations.

The proposed median rotation strategy is purely "mechanical" and requires no specialized skills. It can be easily implemented by any self-directed investor.

2 "Winner", "Median" and "Loser" Strategies

For our rotation strategies, we consider the following nine S&P-500 industry sectors with the corresponding Select Sector SPDR Exhange Traded Funds[27]

1. **XLB** (Materials)
2. **XLE** (Energy)
3. **XLF** (Financials)
4. **XLI** (Industrials)
5. **XLK** (Technology)
6. **XLP** (Consumer Staples)
7. **XLU** (Utilities)
8. **XLV** (Healthcare)
9. **XLY** (Consumer Discretionary)

There are currently 11 such ETFs. The above list does not include the following two ETFs:

1. **XLC** (Communication Services) - created in June 2018
2. **XLRE** (Real Estate) - created - created in October 2015

These two ETFs were created at a much later date and will not be considered. By contrast, the other nine ETFs were created in 1998.

We define the following three ETF rotation strategies:

- "Winners" (W)- always (re)invest in the three ETFs with the "best" performance in the previous time period
- "Median"(M) - always invest in the middle three ETFs with the "median" performance in the previous time period
- "Losers" (L) - always invest in the three ETFs with the "worst" performance in the previous time period

The argument for the "winners" strategy is "trend momentum" or "keep the winners" argument: a belief that the momentum of these ETFs will continue in the next period. The argument for the

"losers" strategy or "buy losers" is "trend reversal" - a belief that these ETFs are oversold and that investors will switch to buying these "beaten-down" sectors. By contrast, the argument for the "median" performers is capture sectors that may not be the top performers but demonstrate consistent and stable returns. By focusing on median-performing sectors, the strategy aims to reduce exposure to highly volatile or underperforming sectors, thus potentially lowering risk while still capturing reasonable upside potential. We will show in this paper that this strategy can significantly outperfornm the "winners" and "losers" strategy as well as passive "Buy and Hold" (B&H) strategy with monthly rotation frequency.

Let us consider the following example to illustrate these strategies. Suppose that we re-balance annually, starting in 2000. We want to identify what ETFs should be included for investing in each strategy. To that end, we compute the annual returns of our nine ETFs starting in 1999 (the previous time period). These annual returns are given for all ETFs for 1999-2024 in Table 3 in the Appendix A. The annual returns for 1999 from Table 3 are:

$$\begin{array}{lllll} \mathbf{XLB} = 23.0\%, & \mathbf{XLE} = 18.0\%, & \mathbf{XLF} = 2.6\%, & \mathbf{XLI} = 21.8\%, & \mathbf{XLK} = 65.1\% \\ \mathbf{XLP} = -14.2\%, & \mathbf{XLU} = -4.4\%, & \mathbf{XLV} = 19.5\%, & \mathbf{XLY} = 19.5\% & \end{array}$$

Once we have the returns, we rank our nine ETFs by return and split them into three groups: Winners, Median, and Losers.

$$\underbrace{\mathbf{XLK} > \mathbf{XLB} > \mathbf{XLI}}_{\text{Winners}} > \underbrace{\mathbf{XLV} > \mathbf{XLY} > \mathbf{XLE}}_{\text{Median}} > \underbrace{\mathbf{XLF} > \mathbf{XLU} > \mathbf{XLP}}_{\text{Losers}}$$

Therefore, for 2000 our choices for the strategies are:

- "Winners": XLB, XLI, and XLK (Basic Materials, Industrials, and Technology)
- "Median": XLE, XLV, and XLY (Energy, Healthcare, and Consumer Discretionary)
- "Losers": XLF, XLP, and XLU (Financials, Consumer Staples, and Utilities)

In each strategy, we invest all the money from the previous investment period and invest 1/3 of the money in each of the three ETFs. In these strategies, we use returns as a performance metric. We could use other metrics such as risk-adjusted returns but these are more difficult to compete for an average investor. We note that in all of these strategies, we reinvest the same amount for each fund, regardless of the corresponding sector weights in the S&P-500 index. For example, the technology index XLK was 17% of the index in 2003, 11% in 2013, and 23% in 2023. The above strategies ignore these weights and allocate the money equally among the three sectors chosen for investment in the next investment period.

We note that with a higher frequency of rotation, we have more trades. In the worst case, we need to execute 6 transactions (sell 3 ETFs and invest in 3 different ETFs) at the end of each investment period. There are also short-term tax implications of more frequent trading. Therefore, the proposed strategy has to generate enough out-performance to make it attractive even for non tax-deferred accounts. We will demonstrate that the 'Median" monthly rotation strategy significantly outperforms other strategies, including the passive index investing, even after taking transaction costs and taxes into account.

To evaluate the effectiveness of the above strategies, we will use historical data from 1999 to 2024 to compare strategies to each other and to to the buy-and-hold (B&H) strategy for each of the 25 years. The buy-and-hold strategy can be easily implemented by investing in the "SPY" exchange-traded fund. We will evaluate the performance of the strategies over different rotation periods (weekly, monthly, quarterly, semi-annually, and annually) and provide detailed comparisons in terms of growth, returns, volatility, Sharpe's ratios, and drawdowns. Based on these comparisons,

the best strategy is the "Median" strategy with monthly rotation. This strategy seeks to capitalize on both mean reversion and momentum effects within the market. The strategy provides a balanced approach to sector rotation that mitigates the extremes and leverages the median performance. Just as in statistics, the use of the median provides a more accurate representation of central tendencies, offering a balanced view of sector performance not influenced by outliers.

This method is designed to be both straightforward in implementation and highly accessible to individual investors.

3 Results and Discussion

We start by comparing the total growth for these strategies for different re-balancing periods We consider 5 different re-balancing frequencies with corresponding periods: annual (12 months), semi-annual (6 months), quarterly (3 months), monthly (1 month) and weekly (1 week). For each rotation frequency, we examine the returns at the end of each investment period, sort ETFs by returns, and identify which ETFs will be used in the strategy for the next investment period.

The detailed annual results, including growth, returns, volatility (risk), Sharpe's ratio and Maximum Drawdowns (MDD) for each frequency are presented in Appendix C. In Table 1 we summarize the final balances yielded by each strategy at the end of 2024 after 25 years. We assume that we start with $100 at the end of 1999.

Table 1: Comparison of Strategies Final Balances for Different Rotation Frequecies

Strategy	**ROTATION FREQUENCY**				
	Annual	**Semi-Annual**	**Quarterly**	**Monthly**	**weekly**
Winners	511	862	644	469	427
Median	696	584	737	1,434	792
Losers	1,013	737	768	529	1,104
Buy & Hold	626				

From this table, we see that the performance of strategies differs significantly depending on the re-balancing frequency. This is further illustrated in Figure 1. The "Winners" outperform B&H at lower re-balancing frequency with the best result with semi-annual rotation. However, it underperforms B&H at weekly, monthly and annual re-balancing frequencies and is practically identical at quarterly frequency. "Losers" strategy does better with annual and weekly rotation. However, at most frequencies, it results in significantly higher drawdowns as shown in Figure 2. The "Losers" strategy underperforms B&H in terms of growth at Monthly rotation frequency. The "median" rotation strategy with monthly re-balancing is clearly the top winner in terms of overall growth and drawdowns, delivering more than twice the growth of passive Buy&Hold (B&H) strategy with about 50% lower maximum drawdowns. Additional details on the performance of this strategy are provided in Appendix D.

From these Figures we make the following observations:

- **Total growth and Rotation Frequency:** the monthly investment frequency stands out as the top performer using the "Median" strategy. The outperformance of the median strategy compared to "Buy-and-Hold" is very significant: more than 100% ($1,434 vs. $626). This makes the strategy attractive even in non-tax deferred accounts. The top contender is the "Losers" strategy with weekly rotation strategy. However, this us significantly lower ($1,013 vs. $1,434) than median and comes with significantly higher volatility, drawdowns and number

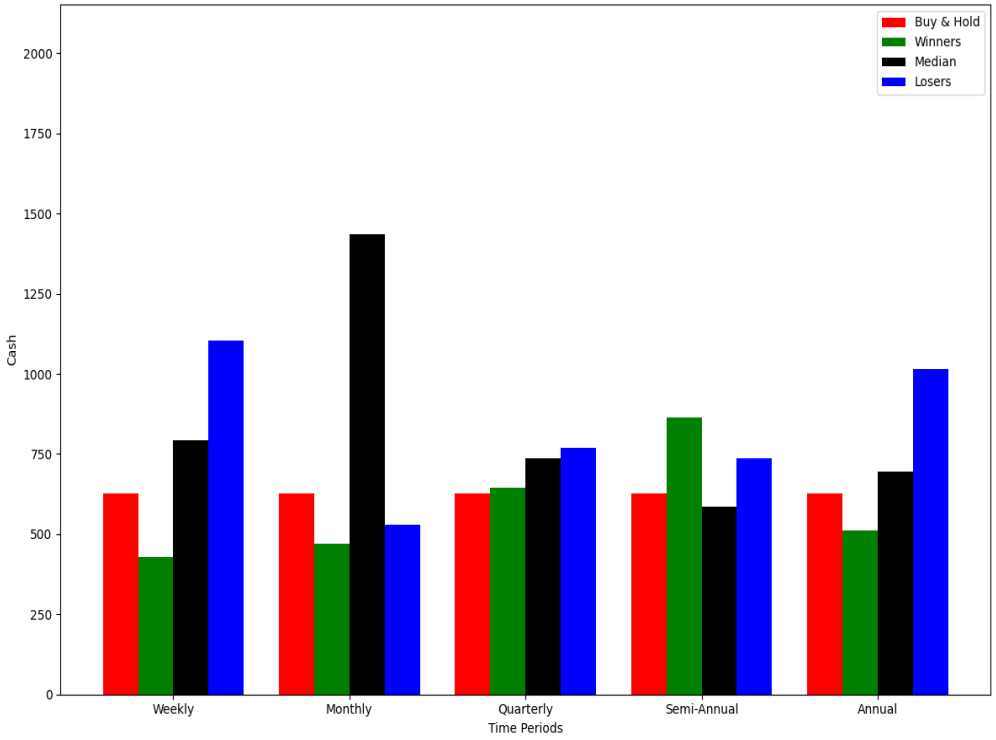

Figure 1: Comparing cash across various strategies and frequencies

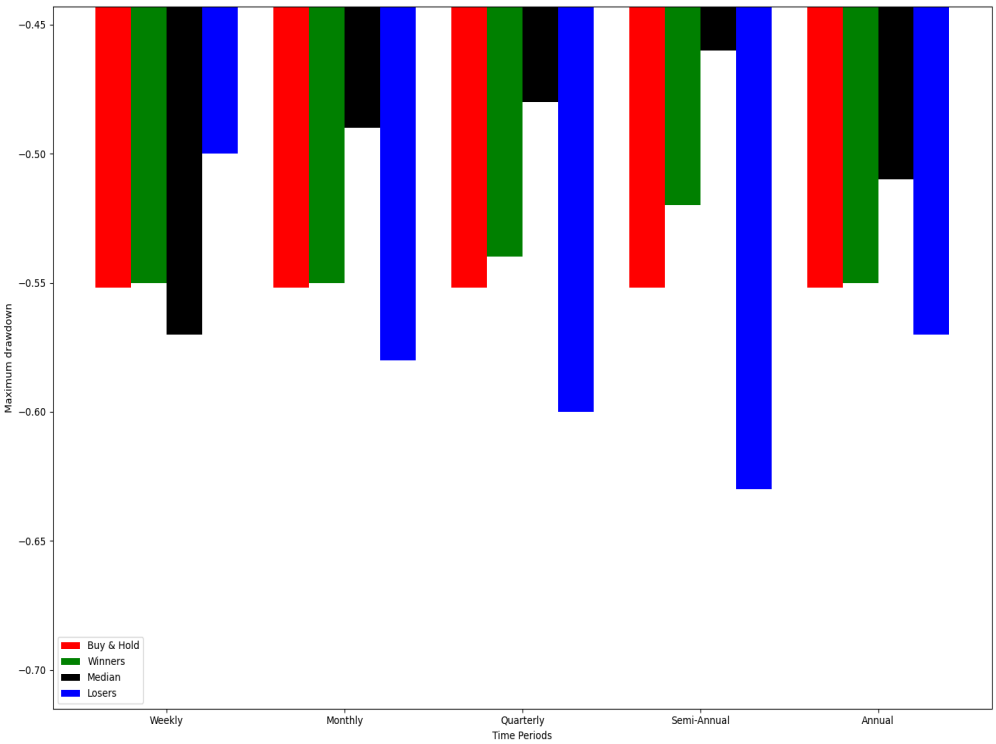

Figure 2: Comparing drawdown across various strategies and frequencies

of trades. For the monthly re-balancing, the growth by each strategy as shown in Figure 3 and additional detailed tables are given in Appendix D.

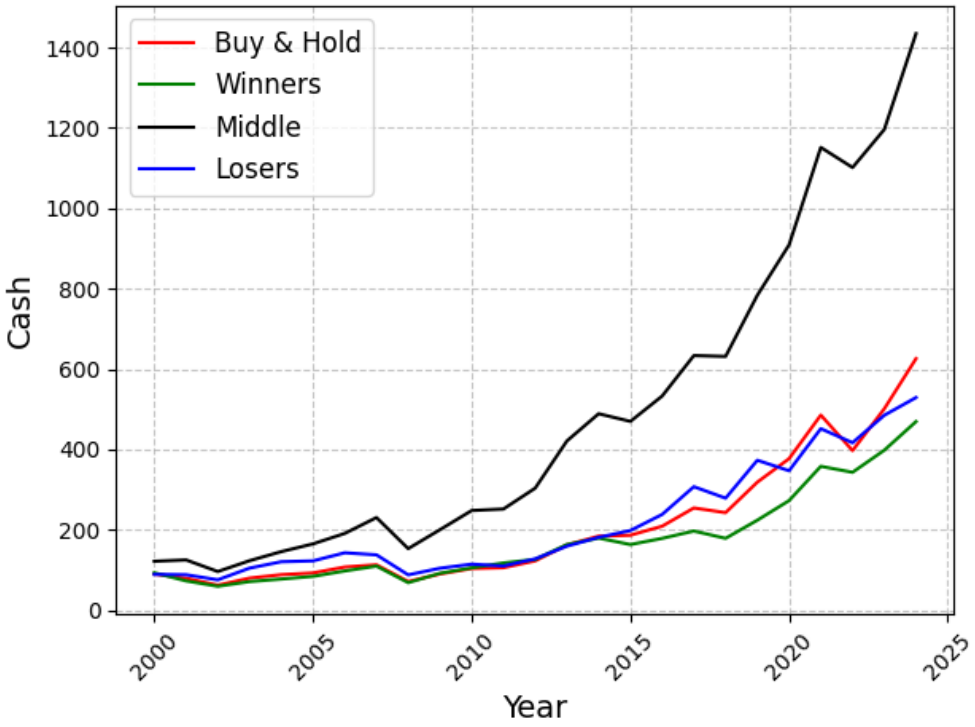

Figure 3: Comparison of Growth for Strategies with Monthly Re-balancing

What about other rotation frequencies and strategies? Consider the "Losers" strategy. For the weekly re-balancing, it clearly outperforms all other strategies. However, for weekly re-balancing, its maximum drawdown is almost twice as that of the "median" or "B&H" strategies. Interestingly, the "winners" strategy has the lowest drawdown with weekly rotation. One plausible explanation is that their ETFs growth has some inertia before investors take profits from the winning sectors and re-allocate their funds.that in the Median groups. Interestingly, "Losers" strategy performs particularly well if annual rotation is considered, delivering more than 30% more growth compared to the other strategies while exhhibiting similar drawdowns.

- **Annualized Returns:** If we examine the summary statistics for Annualized returns for different frequencie, we see that except for weekly rotation frequencies, the "Median" strategy has the lowest variability if annualized returns, delivering more stable and consistent growth compared with the other strategies. Consider the performance of the "median" strategy with monthly rotation during the market downturns in the 2001 Internet "bubble" and the 2008 financial meltdown shown in Table 11 in Appendix C. In 2001, the Median group achieved an annualized return of 1.2%, defying the broader trend, as the overall market represented by the Buy & Hold declined by – 11.8% and the growth of "Winners" strategy was −21.6%. This performance suggests that during periods of economic uncertainty, a more conservative strategy focusing on stable performers can provide better performance. Fast forward to 2008, a year synonymous with the financial crisis, the Median group's performance plummeted to

−33.5%. However, this was still better than the losses suffered by other strategies (−37.5% for "Winners", −36.2% for "losers" and −36.9% for Buy&Hold strategy).

- **Volatility:** Volatility serves as a critical metric for understanding the risk associated with various investment strategies. For Median group, volatility levels were moderate compared to other groups. Except for the quarterly re-balancing, the "Median" strategy has lower average annual volatility and lower standard deviation of these annual risk metrics. At all rotation frequencies, the "median" rotation provides lower volatility than Buy&Hold strategy. It consistently displayed a more balanced risk profile, particularly during periods of market instability.

- **Sharpe Ratio:** The Sharpe ratio, which measures risk adjusted returns, was highest for the "Median" strategy with monthly re-balancing in 11 years out of 25 compared with 3 years for the "Winners" and 7 years for the "Losers" strategy. This is shown in Table 16 in Appendix D.

- **Maximum Drawdown:** The Median group and Winners had simialr MDD with montly re-balancing and outperformed both B&H and the "Losers" strategy. This is illustrated in Table 16 in Appendix D.

- **Summary:** The best strategy is the "median" with monthly rotation frequency

Finally, it is interesting to compare the results of the strategies with B&H strategies applied to individual ETFs. The results are summarized in Table 2. The highest growth is provided by **XLY**

Table 2: Comparison of Total Growth (2000-2024)

S&P	**XLB**	**XLE**	**XLF**	**XLI**	**XLK**	**XLP**	**XLU**	**XLV**	**XLY**
626	555	606	411	698	575	618	646	645	965

(Consumer Discretionary) and the lowest by **XLF** (Financials). The results for **XLK** (Technology) are similar to that of **XLB** (Basic Materials). These results may seem counter-intuitive but we need to remember that although for many years technology and financial stocks may outperform sectors, they have much steeper losses and drawdowns. For example, financial sector **XLF** lost more than 50% of its value during the financual crisis of 2008-2009 compared with about 32% for **XLY**. Over the 25 years, the performance of the **XLY** echange-traded fund signifantly outperforms the **XLF** fund.

4 Conclusion

The results illustrate that the Median strategy, characterized by a focus on average performers rather than chasing extremes, can offer a prudent approach in managing risk while still capturing market opportunities. During challenging times, the Median group proved to be more resilient compared to the extremes of Winners and Losers. By emphasizing stability, the Median strategy not only shields investors from harsher impacts of market volatility but also positions them from favorable for recovery in the upswing of market cycles.

DECLARATIONS

Conflict of Interest: We declare that there are no conflicts of interest regarding the publication of this paper.

Author Contributions: All the authors contributed equally to the effort.

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Data Availability (including Appendices): All the relevant data, Python code for analysis, detailed annual tables and graphs are available via:

`https://github.com/traders2025/SPY_ETFs_Rotation_Trading_Strategy`

References

[1] J. Nyaradi. *Super Sectors: How to Outsmart the Market Using Sector Rotation.* Wiley, 2010.

[2] A. L. Johnson. *ETF Strategy: Sector Rotation.* Wiley, 2024.

[3] T.J. McIntosh. *The Sector Strategist: Using New Asset Allocation Techniques to Reduce Risk and Improve Investment Returns.* Wiley, 2012.

[4] S. Stovall. *Standard & Poor's guide to sector investing.* McGraw-Hill, 1996.

[5] J. Yao, Y. Jiang, and Y. Yu. Sector rotation strategy in global equity markets: Evidence from etfs. *Journal of International Financial Markets, Institutions & Money*, 2016.

[6] C. Alexiou and A. Tygi. Gauging the effectiveness of sector rotation strategies: Evidence from the u.s. and europe. *Journal of Asset Management*, 2020.

[7] C. Kai, C. Chiu, and C. Lu. Sector rotation and stock market cycles. *International Review of Financial Analysis*, 2014.

[8] M.S. Sarwar, M. Molla, and A. Pala. Sector rotation strategy and market timing: Evidence from global financial markets. *Journal of Asset Management*, 2018.

[9] A. W. Lynch, J.A. Wachter, and W.I. Boundry. Does mutual fund performance vary over the business cycle? *SSRN Electronic Journal*, 2004.

[10] N. F. Chen, R. Roll, and S.A. Ross. Economic forces and the stock market. *Journal of Business*, 1986.

[11] H. Hong, W. Torus, and R. Valkanov. Do industries lead stock markets? *Journal of Financial Economics*, 2007.

[12] H. Hong and J.C. Stein. A unified theory of underreaction, momentum trading, and overreaction in asset markets. *The Journal of Finance*, 1999.

[13] N. Jegadeesh and S. Titman. Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance*, 1993.

[14] G. Jagadisha, Gagan N, P. Raghuram, P. Poojary Praveen, and N. Pratham. Stock price movement prediction using machine learning. *International Journal of Advanced Research in Science, Communication and Technology*, 2022.

[15] D. Nadler and A.B Schmidt. Momentum strategies for etf-based portfolios. *SSRN Electronic Journal*, 2019.

[16] B. Gao and R. Ren. A new sector rotation strategy and its performance evaluation: based on a principal component regression model. *SSRN Electronic Journal*, 2015.

[17] D. Avramov and R. Wermers. Investing in mutual funds when returns are predictable. *Journal of Financial Economics*, 2006.

[18] C.J. Phillip, I. Kim, and J.J Cheh. Sector rotation and interest rate policy. *International Journal of Business and Social Research*, 2014.

[19] J.R. Block and A. Maewal. Deep sector rotation swing trading. *SSRN Electronic Journal*, 2023.

[20] J. H. Boyd, J. Hu, and R. Jagannathan. The stock market's reaction to unemployment news: Why bad news is usually good for stocks. *The Journal of Finance*, 2005.

[21] M. Conover, G.R. Jensen, R.R. Johnson, and J.M. Mercer. Sector rotation and monetary conditions. *The Journal of Investing*, 2008.

[22] G.R. Jensen, R.R. Johnson, and J.M. Mercer. Tactical asset allocation and monetary conditions. *Financial Analysts Journal*, 2002.

[23] P. Ahmed and L. Lockwood. Multistyle rotation strategies. *Journal of Portfolio Management*, 2002.

[24] A. Molchanov and J. Stangl. The myth of sector rotation. *International Journal of Finance and Economics*, 2020.

[25] Y. H. Yang and E. Pinsky. A simple rotation strategy with sector etfs. *Technical Analysis of Stocks and Commodities*, 40(12):36–40, December 2022.

[26] S.K. Valath and E. Pinsky. Sell the losers? keep the winners? none of the above – focus on the median! *Algorithmic Finance*, January 2025.

[27] Select sector spdr etfs. https://www.sectorspdrs.com/.

Appendices

A Annual Returns for S&P Sectors

Table 3: Annual Returns of S&P Sectors

Date	XLB	XLE	XLF	XLI	XLK	XLP	XLU	XLV	XLY
1999	23.0	18.0	2.6	21.8	65.1	-14.2	-4.4	19.5	19.5
2000	-16.2	24.4	25.9	6.7	-41.9	25.5	22.5	-11.8	-16.9
2001	2.1	-18.2	-9.4	-10.5	-23.3	-9.9	-13.0	-0.9	12.7
2002	-5.3	-14.7	-14.8	-24.6	-38.1	-20.1	-28.8	-0.7	-18.6
2003	37.4	25.8	30.5	31.9	38.6	11.2	26.6	14.9	37.2
2004	13.5	33.9	10.9	17.8	5.6	7.7	23.6	1.3	12.9
2005	4.1	40.2	6.2	2.8	-0.3	2.8	16.3	6.4	-6.6
2006	18.4	18.1	18.9	13.5	12.1	14.4	20.9	7.0	18.4
2007	22.1	36.9	-19.2	13.5	15.5	12.7	18.4	7.2	-13.7
2008	-44.1	-39.0	-54.9	-38.7	-41.5	-15.0	-28.9	-23.3	-33.0
2009	48.2	21.7	17.5	22.0	51.3	14.3	11.7	19.6	40.6
2010	20.5	21.8	12.0	27.8	11.4	13.8	5.3	3.3	27.5
2011	-10.9	2.8	-17.2	-1.1	2.7	14.1	19.6	12.4	6.0
2012	14.7	5.2	28.5	14.9	15.3	10.7	1.0	17.4	23.6
2013	26.0	26.3	35.5	40.6	26.2	26.3	13.0	41.4	42.7
2014	7.2	-8.7	15.0	10.4	17.9	15.7	28.7	25.1	9.4
2015	-8.7	-21.5	-1.8	-4.3	5.5	6.9	-4.9	6.8	9.9
2016	16.8	28.0	22.4	20.0	15.0	5.0	16.1	-2.8	6.0
2017	24.0	-0.9	22.0	24.0	34.3	13.0	12.1	21.8	22.8
2018	-14.9	-18.2	-13.0	-13.2	-1.7	-8.1	3.9	6.3	1.6
2019	24.1	11.7	31.9	29.1	49.9	27.4	25.9	20.5	28.4
2020	20.5	-32.7	-1.7	10.9	43.6	10.1	0.5	13.3	29.6
2021	27.4	53.3	34.8	21.1	34.7	17.2	17.7	26.0	27.9
2022	-12.3	64.3	-10.6	-5.6	-27.7	-0.8	1.5	-2.1	-36.3
2023	12.4	-0.6	12.0	18.1	56.0	-0.8	-7.2	2.1	39.6
2024	0.2	5.6	30.6	17.3	21.6	12.2	23.3	2.5	26.5
Summary Statistics									
Min	-44.1	-39.0	-54.9	-38.7	-41.9	-20.1	-28.9	-23.3	-36.3
Max	48.2	64.3	35.5	40.6	65.1	27.4	28.7	41.4	42.7
Median	14.1	14.9	12.0	14.2	15.1	10.9	12.5	6.9	15.6
Mean	9.6	10.9	8.3	10.2	13.4	7.4	8.5	9	12.2
Std Dev	19.8	25.7	21.6	18.1	29.9	12.6	15.9	13.3	22.0

B Strategy Components (Annual Rebalancing)

Table 4: Members - S&P (Alphabetical Order)

Year	Winners			Median			Losers		
2000	XLI	XLB	XLK	XLE	XLY	XLV	XLP	XLU	XLF
2001	XLE	XLP	XLF	XLU	XLI	XLV	XLB	XLK	XLY
2002	XLB	XLV	XLY	XLF	XLI	XLP	XLE	XLK	XLU
2003	XLB	XLE	XLV	XLF	XLP	XLY	XLI	XLK	XLU
2004	XLB	XLK	XLY	XLF	XLI	XLU	XLE	XLP	XLV
2005	XLE	XLI	XLU	XLB	XLF	XLY	XLK	XLP	XLV
2006	XLE	XLU	XLV	XLB	XLF	XLP	XLI	XLK	XLY
2007	XLF	XLU	XLY	XLB	XLE	XLP	XLI	XLK	XLV
2008	XLB	XLE	XLU	XLI	XLK	XLP	XLF	XLV	XLY
2009	XLP	XLU	XLV	XLE	XLI	XLY	XLB	XLF	XLK
2010	XLB	XLK	XLY	XLE	XLI	XLV	XLF	XLP	XLU
2011	XLE	XLI	XLY	XLB	XLF	XLP	XLK	XLU	XLV
2012	XLP	XLU	XLV	XLE	XLK	XLY	XLB	XLF	XLI
2013	XLF	XLV	XLY	XLB	XLI	XLK	XLE	XLP	XLU
2014	XLI	XLV	XLY	XLE	XLF	XLP	XLB	XLK	XLU
2015	XLK	XLU	XLV	XLF	XLI	XLP	XLB	XLE	XLY
2016	XLP	XLV	XLY	XLF	XLI	XLK	XLB	XLE	XLU
2017	XLE	XLF	XLI	XLB	XLK	XLU	XLP	XLV	XLY
2018	XLB	XLI	XLK	XLF	XLV	XLY	XLE	XLP	XLU
2019	XLU	XLV	XLY	XLF	XLK	XLP	XLB	XLE	XLI
2020	XLF	XLI	XLK	XLP	XLU	XLY	XLB	XLE	XLV
2021	XLB	XLK	XLY	XLI	XLP	XLV	XLE	XLF	XLU
2022	XLE	XLF	XLK	XLB	XLV	XLY	XLI	XLP	XLU
2023	XLE	XLP	XLU	XLF	XLI	XLV	XLB	XLK	XLY
2024	XLI	XLK	XLY	XLB	XLF	XLV	XLE	XLP	XLU
2025*	XLU	XLY	XLF	XLI	XLP	XLK	XLB	XLE	XLV

C Results for Different Rotation Frequencies

C.1 Annual Rotation

Table 5: Growth and Annual Returns with Annual Sector Rotation

Year	Growth				Annualized Return			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	90	83	99	125	-9.7	-17.1	-1.4	24.6
2001	80	73	91	121	-11.8	-12.5	-8.1	-2.8
2002	62	67	73	88	-21.6	-8.2	-19.8	-27.2
2003	80	84	92	117	28.2	26.0	26.3	32.4
2004	89	93	108	133	10.7	10.7	17.4	14.3
2005	93	111	109	137	4.8	19.8	1.2	3.0
2006	108	128	128	158	15.8	15.3	17.2	14.7
2007	113	122	158	176	5.1	-4.8	23.9	12.0
2008	72	77	108	111	-36.8	-37.3	-31.7	-37.1
2009	90	88	138	154	26.3	15.2	28.1	39.0
2010	104	106	163	170	15.1	19.8	17.6	10.4
2011	106	108	155	190	1.9	2.6	-4.7	11.6
2012	123	119	178	227	16.0	9.7	14.7	19.4
2013	163	166	233	277	32.3	39.9	30.9	21.9
2014	184	191	250	326	13.5	15.0	7.4	17.9
2015	187	196	251	304	1.2	2.5	0.2	-6.8
2016	209	201	299	366	12.0	2.7	19.1	20.3
2017	255	231	369	436	21.7	15.0	23.4	19.2
2018	243	208	363	404	-4.6	-9.9	-1.7	-7.5
2019	319	260	494	491	31.2	24.9	36.4	21.7
2020	377	306	561	493	18.3	17.6	13.4	0.4
2021	486	398	681	666	28.7	30.0	21.4	35.3
2022	397	433	566	655	-18.2	8.7	-16.9	-1.6
2023	501	420	627	892	26.2	-2.9	10.7	36.0
2024	626	512	696	1,014	24.9	21.8	11.1	13.7
Summary Statistics								
min	62	67	73	88	-36.8	-37.3	-31.7	-37.1
max	626	512	696	1,014	32.3	39.9	36.4	39.0
median	123	128	178	227	13.5	10.7	13.4	14.3
mean	206	191	280	329	9.3	8.2	9.5	11.4
std	158	129	206	252	18.2	17.0	16.9	18.4

Table 6: Volatility, Sharpe Ratio, and Maximum Drawdown with Annual Sector Rotation

Year	Volatility				Sharpe Ratio				MDD			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	23.9	24.9	20.2	20.3	-0.4	-0.7	-0.1	1.2	-17.1	-22.4	-15.8	-15.5
2001	22.1	17.1	18.9	28.8	-0.5	-0.7	-0.4	-0.1	-28.8	-21.1	-24.2	-31.6
2002	26.5	24.9	23.7	28.9	-0.8	-0.3	-0.8	-0.9	-33.0	-25.6	-30.2	-41.3
2003	16.5	14.4	16.7	17.4	1.7	1.8	1.6	1.9	-13.7	-10.2	-14.5	-15.8
2004	11.1	14.0	10.6	10.3	1.0	0.8	1.6	1.4	-7.5	-10.4	-7.5	-6.4
2005	10.3	14.2	12.2	9.2	0.5	1.4	0.1	0.3	-7.0	-9.9	-10.2	-5.4
2006	10.0	11.9	10.9	11.7	1.6	1.3	1.6	1.3	-7.6	-6.3	-8.5	-11.2
2007	15.9	17.5	17.5	13.7	0.3	-0.3	1.4	0.9	-9.9	-14.6	-10.8	-7.8
2008	41.3	45.0	32.4	44.5	-0.9	-0.8	-1.0	-0.8	-47.6	-49.4	-41.0	-50.3
2009	26.6	16.9	31.3	38.2	1.0	0.9	0.9	1.0	-27.1	-21.1	-30.9	-32.2
2010	17.9	20.3	19.0	16.1	0.8	1.0	0.9	0.6	-15.7	-18.0	-16.1	-11.8
2011	23.0	26.6	25.1	18.5	0.1	0.1	-0.2	0.6	-18.6	-23.8	-22.5	-13.5
2012	12.7	8.6	14.4	15.9	1.3	1.1	1.0	1.2	-9.7	-7.0	-11.2	-13.1
2013	11.1	12.1	11.9	10.8	2.9	3.3	2.6	2.0	-5.6	-5.5	-6.2	-6.9
2014	11.2	12.6	11.3	10.7	1.2	1.2	0.7	1.7	-7.3	-7.5	-8.3	-5.9
2015	15.4	15.0	15.0	17.9	0.1	0.2	0.0	-0.4	-11.9	-10.2	-10.7	-18.7
2016	13.1	11.7	14.8	15.1	0.9	0.2	1.3	1.3	-10.3	-8.9	-11.8	-9.6
2017	6.7	9.5	6.9	6.0	3.2	1.6	3.4	3.2	-2.6	-6.0	-2.9	-2.4
2018	17.0	19.2	17.3	13.1	-0.3	-0.5	-0.1	-0.6	-19.4	-22.5	-19.1	-15.1
2019	12.5	10.0	12.7	15.0	2.5	2.5	2.9	1.4	-6.6	-4.8	-6.6	-10.4
2020	33.4	39.4	31.1	39.6	0.5	0.4	0.4	0.0	-33.7	-38.7	-31.2	-42.7
2021	13.0	15.5	10.7	16.4	2.2	1.9	2.0	2.2	-5.1	-6.1	-6.3	-7.7
2022	24.2	25.3	23.6	18.1	-0.7	0.3	-0.7	-0.1	-24.5	-17.8	-22.8	-16.4
2023	13.1	13.0	12.5	16.2	2.0	-0.2	0.9	2.2	-10.0	-9.9	-10.8	-12.3
2024	12.6	16.1	10.8	10.6	2.0	1.4	1.0	1.3	-8.4	-11.2	-8.4	-8.8
Summary Statistics												
min	6.7	8.6	6.9	6.0	-0.9	-0.8	-1.0	-0.9	-47.6	-49.4	-41.0	-50.3
max	41.3	45.0	32.4	44.5	3.2	3.3	3.4	3.2	-2.6	-4.8	-2.9	-2.4
median	15.4	15.5	15.0	16.1	0.9	0.8	0.9	1.2	-10.3	-10.4	-11.2	-12.3
mean	17.7	18.2	17.3	18.5	0.9	0.7	0.8	0.9	-15.5	-15.6	-15.5	-16.5
std	8.2	8.8	7.1	9.9	1.2	1.1	1.2	1.0	11.2	10.9	9.8	12.8

C.2 Semi-Annual Rotation

Table 7: Growth and Annual Returns with Semi-Annual Sector Rotation

Year	Growth				Annualized Return			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	90	108	92	105	-9.7	8.2	-7.6	4.9
2001	80	98	83	100	-11.8	-9.4	-9.7	-4.7
2002	62	86	70	74	-21.6	-12.1	-16.3	-26.4
2003	80	108	86	100	28.2	25.7	23.7	35.6
2004	89	122	100	114	10.7	12.6	15.7	13.9
2005	93	142	102	120	4.8	16.6	1.7	5.3
2006	108	163	119	138	15.8	14.9	17.2	15.3
2007	113	188	134	140	5.1	15.0	12.6	1.6
2008	72	116	97	84	-36.8	-38.4	-27.6	-40.1
2009	90	152	119	107	26.3	31.2	22.6	27.5
2010	104	180	124	135	15.1	18.5	4.2	25.9
2011	106	195	130	130	1.9	8.0	4.5	-3.6
2012	123	229	146	148	16.0	17.6	12.5	13.6
2013	163	311	190	186	32.3	36.1	30.3	26.4
2014	184	327	224	221	13.5	5.0	17.6	18.4
2015	187	342	219	207	1.2	4.5	-1.9	-6.4
2016	209	384	247	243	12.0	12.3	12.7	17.8
2017	255	471	278	299	21.7	22.9	12.3	22.7
2018	243	408	286	274	-4.6	-13.4	3.1	-8.1
2019	319	507	376	349	31.2	24.2	31.4	27.1
2020	377	598	404	366	18.3	18.0	7.3	4.8
2021	486	751	507	499	28.7	25.6	25.5	36.3
2022	397	665	494	496	-18.2	-11.4	-2.4	-0.4
2023	501	729	532	621	26.2	9.6	7.6	25.2
2024	626	862	584	737	24.9	18.3	9.9	18.7
Summary Statistics								
min	62	86	70	74	-36.8	-38.4	-27.6	-40.1
max	626	862	584	737	32.3	36.1	31.4	36.3
median	123	229	146	148	13.5	14.9	9.9	13.9
mean	206	330	230	240	9.3	10.4	8.3	10.0
std	158	236	161	179	18.2	16.6	14.2	18.5

Table 8: Volatility, Sharpe Ratio, and MDD with Semi-Annual Sector Rotation Strategy

Year	Volatility				Sharpe Ratio				MDD			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	23.9	21.8	22.1	23.1	-0.4	0.4	-0.3	0.2	-17.1	-14.6	-18.7	-16.7
2001	22.1	20.9	19.5	26.3	-0.5	-0.5	-0.5	-0.2	-28.8	-28.3	-26.6	-26.2
2002	26.5	24.3	24.7	29.2	-0.8	-0.5	-0.7	-0.9	-33.0	-29.1	-27.3	-42.1
2003	16.5	16.7	17.3	14.5	1.7	1.5	1.4	2.5	-13.7	-13.0	-16.3	-11.5
2004	11.1	13.0	11.3	11.1	1.0	1.3	1.3	1.3	-7.5	-9.1	-7.1	-10.4
2005	10.3	14.9	10.7	10.5	0.5	1.1	0.2	0.5	-7.0	-10.2	-9.2	-9.0
2006	10.0	15.4	9.3	10.1	1.6	1.0	1.9	1.5	-7.6	-12.8	-7.6	-7.0
2007	15.9	18.8	14.1	16.1	0.3	0.8	0.9	0.1	-9.9	-12.5	-7.1	-13.1
2008	41.3	43.6	34.3	43.6	-0.9	-0.9	-0.8	-0.9	-47.6	-48.7	-41.1	-50.1
2009	26.6	22.9	23.6	39.5	1.0	1.4	1.0	0.7	-27.1	-22.6	-27.0	-34.4
2010	17.9	20.2	19.9	16.2	0.8	0.9	0.2	1.6	-15.7	-18.7	-18.2	-9.6
2011	23.0	22.6	21.3	26.8	0.1	0.4	0.2	-0.1	-18.6	-16.8	-17.5	-23.5
2012	12.7	11.1	12.3	15.2	1.3	1.6	1.0	0.9	-9.7	-8.1	-9.7	-13.1
2013	11.1	12.7	11.6	10.3	2.9	2.8	2.6	2.6	-5.6	-5.9	-5.7	-6.8
2014	11.2	12.9	11.3	10.9	1.2	0.4	1.6	1.7	-7.3	-8.1	-6.7	-7.6
2015	15.4	16.0	15.4	16.4	0.1	0.3	-0.1	-0.4	-11.9	-12.0	-13.3	-15.4
2016	13.1	12.0	14.6	16.0	0.9	1.0	0.9	1.1	-10.3	-6.2	-12.7	-11.6
2017	6.7	8.7	7.9	6.5	3.2	2.6	1.5	3.5	-2.6	-4.7	-3.0	-3.3
2018	17.0	19.9	15.4	14.1	-0.3	-0.7	0.2	-0.6	-19.4	-24.9	-12.6	-19.0
2019	12.5	12.2	12.9	13.4	2.5	2.0	2.4	2.0	-6.6	-7.3	-7.7	-10.5
2020	33.4	36.2	33.2	42.4	0.5	0.5	0.2	0.1	-33.7	-34.1	-34.2	-43.7
2021	13.0	18.0	13.5	12.1	2.2	1.4	1.9	3.0	-5.1	-10.6	-7.2	-5.1
2022	24.2	23.3	19.9	24.9	-0.7	-0.5	-0.1	0.0	-24.5	-24.6	-16.9	-19.1
2023	13.1	16.0	11.6	14.1	2.0	0.6	0.7	1.8	-10.0	-13.0	-11.5	-8.3
2024	12.6	13.4	10.6	12.8	2.0	1.4	0.9	1.5	-8.4	-9.2	-7.6	-7.7
Summary Statistics												
min	6.7	8.7	7.9	6.5	-0.9	-0.9	-0.8	-0.9	-47.6	-48.7	-41.1	-50.1
max	41.3	43.6	34.3	43.6	3.2	2.8	2.6	3.5	-2.6	-4.7	-3.0	-3.3
median	15.4	16.7	14.6	15.2	0.9	0.9	0.9	0.9	-10.3	-12.8	-12.6	-11.6
mean	17.7	18.7	16.7	19.0	0.9	0.8	0.7	0.9	-15.5	-16.2	-14.9	-17.0
std	8.2	7.8	6.9	10.4	1.2	1.0	0.9	1.2	11.2	10.5	9.7	12.8

C.3 Quarterly Rotation

Table 9: Growth and Annual Returns with Quarterly Sector Rotation

Year	Growth				Annualized Return			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	90	111	108	86	-9.7	11.1	7.9	-13.8
2001	80	87	100	94	-11.8	-21.3	-7.6	8.4
2002	62	71	83	74	-21.6	-19.0	-16.3	-20.7
2003	80	91	115	88	28.2	28.5	37.4	19.0
2004	89	107	121	105	10.7	18.0	5.1	19.3
2005	93	105	137	119	4.8	-2.1	13.2	13.1
2006	108	121	150	146	15.8	15.5	9.9	22.7
2007	113	145	167	144	5.1	19.6	11.5	-1.7
2008	72	83	120	94	-36.8	-42.9	-28.1	-34.9
2009	90	107	157	115	26.3	29.4	30.7	22.7
2010	104	128	173	137	15.1	18.9	10.0	19.3
2011	106	146	177	127	1.9	14.2	2.6	-7.2
2012	123	153	215	151	16.0	4.8	21.0	19.0
2013	163	197	295	190	32.3	29.3	37.6	25.7
2014	184	220	347	212	13.5	11.3	17.5	11.4
2015	187	218	346	205	1.2	-0.8	-0.2	-3.1
2016	209	251	392	233	12.0	15.1	13.3	13.8
2017	255	294	482	274	21.7	17.1	23.0	17.2
2018	243	280	438	260	-4.6	-4.7	-9.1	-4.9
2019	319	338	559	350	31.2	20.8	27.5	34.8
2020	377	374	523	454	18.3	10.7	-6.4	29.4
2021	486	529	673	533	28.7	41.3	28.6	17.4
2022	397	493	607	537	-18.2	-6.9	-9.9	0.8
2023	501	548	645	669	26.2	11.2	6.2	24.6
2024	626	644	738	769	24.9	17.6	14.5	14.9
Summary Statistics								
min	62	71	83	74	-36.8	-42.9	-28.1	-34.9
max	626	644	738	769	32.3	41.3	37.6	34.8
median	123	153	215	151	13.5	14.2	10.0	14.9
mean	206	234	315	247	9.3	9.5	9.6	9.9
std	158	166	211	195	18.2	18.3	16.7	16.7

Table 10: Volatility, Sharpe Ratio, and MDD with Quarterly Sector Rotation

Year	Volatility				Sharpe Ratio				MDD			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	23.9	20.9	21.0	24.6	-0.4	0.5	0.4	-0.6	-17.1	-11.3	-18.5	-25.6
2001	22.1	19.0	23.6	23.9	-0.5	-1.1	-0.3	0.4	-28.8	-30.0	-29.3	-21.2
2002	26.5	24.6	25.7	27.8	-0.8	-0.8	-0.6	-0.7	-33.0	-28.7	-31.0	-39.6
2003	16.5	18.3	15.3	15.1	1.7	1.6	2.4	1.3	-13.7	-17.3	-10.1	-13.1
2004	11.1	12.7	11.8	11.4	1.0	1.4	0.4	1.7	-7.5	-6.6	-11.8	-7.9
2005	10.3	13.9	10.4	11.3	0.5	-0.2	1.3	1.2	-7.0	-11.1	-6.4	-7.6
2006	10.0	13.1	11.3	11.2	1.6	1.2	0.9	2.0	-7.6	-13.5	-9.3	-5.7
2007	15.9	18.0	15.2	16.0	0.3	1.1	0.8	-0.1	-9.9	-10.1	-11.2	-13.3
2008	41.3	36.8	36.6	48.1	-0.9	-1.2	-0.8	-0.7	-47.6	-52.3	-43.0	-43.4
2009	26.6	23.4	28.3	36.4	1.0	1.3	1.1	0.6	-27.1	-21.1	-29.1	-34.4
2010	17.9	19.9	17.2	19.0	0.8	1.0	0.6	1.0	-15.7	-17.6	-15.5	-15.0
2011	23.0	18.5	23.9	29.2	0.1	0.8	0.1	-0.2	-18.6	-13.6	-19.3	-27.9
2012	12.7	14.0	13.7	11.2	1.3	0.3	1.5	1.7	-9.7	-12.7	-9.6	-7.7
2013	11.1	12.0	11.6	11.6	2.9	2.4	3.3	2.2	-5.6	-7.1	-5.9	-6.2
2014	11.2	12.0	11.5	11.9	1.2	0.9	1.5	1.0	-7.3	-9.0	-6.6	-7.6
2015	15.4	15.2	15.9	16.8	0.1	-0.1	0.0	-0.2	-11.9	-12.3	-14.1	-15.8
2016	13.1	13.7	14.0	14.2	0.9	1.1	1.0	1.0	-10.3	-10.6	-9.5	-8.0
2017	6.7	8.7	7.5	7.3	3.2	2.0	3.1	2.3	-2.6	-5.3	-3.1	-3.5
2018	17.0	18.9	15.9	14.3	-0.3	-0.2	-0.6	-0.3	-19.4	-20.8	-19.7	-18.5
2019	12.5	12.9	12.2	13.2	2.5	1.6	2.3	2.6	-6.6	-10.5	-5.9	-5.9
2020	33.4	35.2	38.9	38.4	0.5	0.3	-0.2	0.8	-33.7	-34.1	-46.7	-31.2
2021	13.0	16.7	14.9	12.9	2.2	2.5	1.9	1.4	-5.1	-8.5	-6.1	-7.3
2022	24.2	23.7	20.2	25.3	-0.7	-0.3	-0.5	0.0	-24.5	-17.1	-21.9	-22.5
2023	13.1	15.1	12.4	14.2	2.0	0.7	0.5	1.7	-10.0	-13.0	-11.4	-7.9
2024	12.6	12.2	11.7	11.6	2.0	1.4	1.2	1.3	-8.4	-8.3	-6.8	-7.6
Summary Statistics												
min	6.7	8.7	7.5	7.3	-0.9	-1.2	-0.8	-0.7	-47.6	-52.3	-46.7	-43.4
max	41.3	36.8	38.9	48.1	3.2	2.5	3.3	2.6	-2.6	-5.3	-3.1	-3.5
median	15.4	16.7	15.2	14.3	0.9	0.9	0.8	1.0	-10.3	-12.7	-11.4	-13.1
mean	17.7	18.0	17.6	19.1	0.9	0.7	0.8	0.8	-15.5	-16.1	-16.1	-16.2
std	8.2	6.8	8.0	10.2	1.2	1.0	1.1	1.0	11.2	10.6	11.7	11.6

C.4 Monthly Rotation

Table 11: Growth and Annual Returns with Monthly Sector Rotation

Year	Growth				Annualized Return			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	90	93	122	89	-9.7	-6.7	21.9	-10.7
2001	80	73	125	88	-11.8	-21.6	2.8	-1.0
2002	62	60	96	76	-21.6	-18.3	-23.0	-14.2
2003	80	71	123	105	28.2	19.5	27.9	38.3
2004	89	78	146	121	10.7	8.8	18.3	15.2
2005	93	84	165	123	4.8	8.5	13.2	1.7
2006	108	98	191	143	15.8	16.0	15.7	16.4
2007	113	110	231	138	5.1	12.4	20.7	-3.5
2008	72	69	153	88	-36.8	-37.5	-33.5	-36.2
2009	90	92	200	105	26.3	34.0	30.7	18.8
2010	104	106	248	115	15.1	14.8	23.8	9.6
2011	106	118	252	110	1.9	11.5	1.5	-4.0
2012	123	126	304	128	16.0	7.4	20.6	16.1
2013	163	164	421	160	32.3	29.3	38.7	24.7
2014	184	180	489	182	13.5	9.8	16.1	13.8
2015	187	164	470	198	1.2	-8.9	-3.9	9.3
2016	209	179	533	238	12.0	9.4	13.4	20.1
2017	255	197	634	307	21.7	10.2	18.9	29.0
2018	243	179	632	279	-4.6	-9.2	-0.3	-9.3
2019	319	224	784	373	31.2	25.2	24.1	33.8
2020	377	273	909	347	18.3	21.7	16.0	-7.0
2021	486	358	1,152	452	28.7	31.3	26.7	30.1
2022	397	343	1,101	417	-18.2	-4.1	-4.3	-7.7
2023	501	398	1,196	485	26.2	16.0	8.6	16.4
2024	626	469	1,435	529	24.9	17.9	19.9	9.1
Summary Statistics								
min	62	60	96	76	-36.8	-37.5	-33.5	-36.2
max	626	469	1,435	529	32.3	34.0	38.7	38.3
median	123	126	304	143	13.5	10.2	16.1	9.6
mean	206	172	485	216	9.3	7.9	12.6	8.4
std	158	113	398	141	18.2	17.3	16.4	17.5

Table 12: Volatility, Sharpe Ratio, and MDD with Monthly Sector Rotation Strategies

Year	Volatility				Sharpe Ratio				MDD			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	23.9	19.4	20.3	24.8	-0.4	-0.3	1.1	-0.4	-17.1	-21.3	-12.0	-16.2
2001	22.1	21.4	19.6	25.5	-0.5	-1.0	0.1	0.0	-28.8	-30.8	-18.6	-29.5
2002	26.5	24.8	27.3	27.0	-0.8	-0.7	-0.8	-0.5	-33.0	-28.2	-36.0	-36.0
2003	16.5	16.1	15.9	16.9	1.7	1.2	1.8	2.3	-15.6	-11.1	-14.2	-13.7
2004	11.1	11.5	11.5	12.2	1.0	0.8	1.6	1.2	-7.5	-6.3	-7.8	-8.6
2005	10.3	13.0	11.0	11.9	0.5	0.7	1.2	0.1	-7.0	-10.0	-7.3	-9.1
2006	10.0	12.0	10.7	12.5	1.6	1.3	1.5	1.3	-7.6	-8.7	-8.0	-8.1
2007	15.9	16.1	15.2	17.7	0.3	0.8	1.4	-0.2	-9.9	-10.1	-8.9	-14.8
2008	41.3	33.6	36.7	50.8	-0.9	-1.1	-0.9	-0.7	-47.6	-42.1	-45.9	-53.5
2009	26.6	30.1	27.3	30.4	1.0	1.1	1.1	0.6	-27.1	-26.7	-25.1	-31.5
2010	17.9	18.5	19.2	18.8	0.8	0.8	1.2	0.5	-15.7	-14.2	-17.1	-15.2
2011	23.0	21.7	23.0	27.0	0.1	0.5	0.1	-0.1	-18.6	-14.2	-17.8	-27.3
2012	12.7	12.3	12.8	14.3	1.3	0.6	1.6	1.1	-9.7	-8.4	-10.8	-11.8
2013	11.1	11.9	11.5	11.8	2.9	2.5	3.4	2.1	-5.6	-8.0	-6.0	-5.5
2014	11.2	10.8	12.3	12.7	1.2	0.9	1.3	1.1	-7.3	-5.4	-9.4	-8.7
2015	15.4	15.1	16.7	16.3	0.1	-0.6	-0.2	0.6	-11.9	-13.1	-15.4	-14.4
2016	13.1	12.9	13.0	16.0	0.9	0.7	1.0	1.3	-10.3	-7.3	-11.2	-12.3
2017	6.7	7.0	7.1	8.4	3.2	1.5	2.7	3.4	-2.6	-4.0	-2.6	-3.5
2018	17.0	16.9	16.7	15.9	-0.3	-0.5	0.0	-0.6	-19.4	-21.9	-16.6	-18.6
2019	12.5	12.5	12.9	12.4	2.5	2.0	1.9	2.7	-6.6	-7.9	-7.2	-8.3
2020	33.4	34.4	33.9	43.0	0.5	0.6	0.5	-0.2	-33.7	-31.6	-33.7	-46.4
2021	13.0	16.3	13.4	14.3	2.2	1.9	2.0	2.1	-5.1	-8.7	-6.2	-5.0
2022	24.2	20.7	21.9	25.9	-0.7	-0.2	-0.2	-0.3	-24.5	-20.6	-20.2	-19.7
2023	13.1	13.2	13.8	14.1	2.0	1.2	0.6	1.2	-10.0	-8.8	-12.4	-10.2
2024	12.6	11.9	11.6	12.6	2.0	1.5	1.7	0.7	-8.4	-7.5	-5.8	-10.6
Summary Statistics												
min	6.7	7.0	7.1	8.4	-0.9	-1.1	-0.9	-0.7	-47.6	-42.1	-45.9	-53.5
max	41.3	34.4	36.7	50.8	3.2	2.5	3.4	3.4	-2.6	-4.0	-2.6	-3.5
median	15.4	16.1	15.2	16.0	0.9	0.8	1.2	0.6	-10.3	-10.1	-11.2	-14.4
mean	17.7	17.4	17.4	19.7	0.9	0.6	1.0	0.8	-15.5	-15.3	-14.9	-17.6
std	8.2	7.1	7.4	10.2	1.2	1.0	1.0	1.1	11.2	10.0	10.5	12.9

C.5 Weekly Rotation

Table 13: Growth and Annual Returns with Weekly Sector Rotation

Year	Growth				Annualized Return			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	90	87	95	124	-9.7	-13.0	-5.0	24.0
2001	80	69	90	131	-11.8	-20.3	-5.6	5.8
2002	62	56	79	99	-21.6	-18.7	-11.9	-24.2
2003	80	71	102	129	28.2	25.7	29.1	30.2
2004	89	82	120	142	10.7	15.0	18.0	9.4
2005	93	87	126	158	4.8	7.0	4.5	11.5
2006	108	103	151	175	15.8	17.6	19.9	11.0
2007	113	119	153	194	5.1	16.1	1.8	10.8
2008	72	76	87	145	-36.8	-36.5	-43.1	-25.5
2009	90	88	118	194	26.3	15.9	35.4	34.3
2010	104	102	132	235	15.1	16.1	11.2	20.8
2011	106	110	129	240	1.9	8.4	-1.7	2.5
2012	123	128	145	278	16.0	15.7	12.1	15.8
2013	163	165	198	351	32.3	29.6	36.8	26.0
2014	184	165	231	438	13.5	-0.1	16.4	24.8
2015	187	160	228	438	1.2	-3.2	-1.3	0.1
2016	209	191	275	451	12.0	19.5	21.0	2.9
2017	255	228	328	535	21.7	19.5	19.3	18.6
2018	243	211	303	515	-4.6	-7.6	-7.7	-3.7
2019	319	262	385	680	31.2	24.3	26.9	32.0
2020	377	258	463	756	18.3	-1.8	20.2	11.2
2021	486	346	656	856	28.7	34.5	41.8	13.3
2022	397	323	637	801	-18.2	-6.7	-2.9	-6.5
2023	501	378	682	937	26.2	17.1	7.0	17.1
2024	626	427	793	1,104	24.9	12.9	16.3	17.8
Summary Statistics								
min	62	56	79	99	-36.8	-36.5	-43.1	-25.5
max	626	427	793	1,104	32.3	34.5	41.8	34.3
median	123	128	153	278	13.5	15.0	12.1	11.5
mean	206	172	268	404	9.3	7.5	10.3	11.2
std	158	107	214	296	18.2	17.3	18.5	15.3

Table 14: Weekly Strategy with Annual Returns: Volatility, Sharpe Ratio, and MDD

Year	Volatility				Sharpe Ratio				MDD			
	B&H	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**	**B&H**	**W**	**M**	**L**
2000	23.9	20.9	20.8	25.5	-0.4	-0.6	-0.2	0.9	-17.1	-17.4	-19.8	-22.9
2001	22.1	20.7	20.9	25.6	-0.5	-1.0	-0.3	0.2	-28.8	-35.6	-23.9	-23.9
2002	26.5	25.1	25.1	28.5	-0.8	-0.7	-0.5	-0.9	-33.0	-33.7	-28.7	-35.8
2003	16.5	16.7	16.9	15.7	1.7	1.5	1.7	1.9	-13.7	-13.6	-15.5	-11.7
2004	11.1	11.4	11.9	12.0	1.0	1.3	1.5	0.8	-7.5	-6.2	-7.1	-9.4
2005	10.3	12.4	10.8	12.7	0.5	0.6	0.4	0.9	-7.0	-11.8	-7.3	-7.5
2006	10.0	11.7	10.6	12.5	1.6	1.5	1.9	0.9	-7.6	-5.9	-9.1	-10.4
2007	15.9	16.4	16.1	17.0	0.3	1.0	0.1	0.6	-9.9	-7.7	-12.2	-9.3
2008	41.3	38.5	38.9	44.8	-0.9	-0.9	-1.1	-0.6	-47.6	-42.4	-50.9	-46.9
2009	26.6	30.1	26.2	32.1	1.0	0.5	1.4	1.1	-27.1	-30.8	-22.7	-30.4
2010	17.9	17.4	18.9	19.9	0.8	0.9	0.6	1.0	-15.7	-16.1	-14.3	-15.4
2011	23.0	21.9	23.7	26.0	0.1	0.4	-0.1	0.1	-18.6	-15.3	-23.8	-22.4
2012	12.7	13.1	12.8	13.4	1.3	1.2	0.9	1.2	-9.7	-7.9	-10.8	-10.1
2013	11.1	11.9	11.4	11.9	2.9	2.5	3.2	2.2	-5.6	-8.3	-4.7	-6.1
2014	11.2	11.3	12.2	12.0	1.2	0.0	1.3	2.1	-7.3	-8.9	-7.3	-10.0
2015	15.4	15.1	16.0	16.8	0.1	-0.2	-0.1	0.0	-11.9	-11.9	-13.8	-14.8
2016	13.1	13.6	14.3	14.6	0.9	1.4	1.5	0.2	-10.3	-6.6	-9.6	-13.0
2017	6.7	7.1	7.3	8.7	3.2	2.7	2.7	2.1	-2.6	-2.7	-3.7	-3.3
2018	17.0	14.6	16.9	18.3	-0.3	-0.5	-0.5	-0.2	-19.4	-20.1	-20.0	-18.3
2019	12.5	12.1	12.7	13.1	2.5	2.0	2.1	2.4	-6.6	-7.0	-6.7	-9.0
2020	33.4	34.2	36.3	41.1	0.5	-0.1	0.6	0.3	-33.7	-32.3	-34.0	-45.3
2021	13.0	14.8	13.0	16.2	2.2	2.3	3.2	0.8	-5.1	-7.9	-5.3	-8.6
2022	24.2	22.2	21.9	24.5	-0.7	-0.3	-0.1	-0.3	-24.5	-23.0	-17.7	-18.3
2023	13.1	14.0	13.3	14.4	2.0	1.2	0.5	1.2	-10.0	-14.6	-12.8	-11.1
2024	12.6	11.9	11.3	12.9	2.0	1.1	1.4	1.4	-8.4	-5.7	-8.3	-9.5
Summary Statistics												
min	6.7	7.1	7.3	8.7	-0.9	-1.0	-1.1	-0.9	-47.6	-42.4	-50.9	-46.9
max	41.3	38.5	38.9	44.8	3.2	2.7	3.2	2.4	-2.6	-2.7	-3.7	-3.3
median	15.4	14.8	16.0	16.2	0.9	0.9	0.6	0.9	-10.3	-11.9	-12.8	-11.7
mean	17.7	17.6	17.6	19.6	0.9	0.7	0.9	0.8	-15.5	-15.7	-15.6	-17.0
std	8.2	7.7	7.8	9.3	1.2	1.1	1.2	0.9	11.2	11.1	10.8	11.7

D Additional Details for Monthly Re-balancing

Table 15: Annualized Volatility and Tracking Errors with Monthly Re-balancing

Year	Annualized Volatility						
	B&H	Winners	Tr. Err.	Median	Tr. Err.	Losers	Tr. Err.
2000	23.9	19.0	−4.9	19.8	−4.1	24.5	−0.6
2001	22.1	21.4	0.7	19.6	−2.5	25.5	3.4
2002	26.5	24.8	1.7	27.3	−0.9	27.0	−0.5
2003	16.5	16.1	0.4	15.9	0.6	16.9	−0.3
2004	11.1	11.5	−0.3	11.5	−0.4	12.2	−1.0
2005	10.3	13.0	−2.6	11.0	−0.7	11.9	-1.5
2006	10.0	12.0	−2.0	10.7	−0.7	12.5	−2.5
2007	15.9	16.1	−0.2	15.2	0.7	17.7	−1.8
2008	41.3	33.6	7.7	36.7	4.6	50.8	−9.5
2009	26.6	30.1	-3.5	27.3	−0.7	30.4	−3.7
2010	17.9	18.5	−0.6	19.2	−1.3	18.8	−0.8
2011	23.0	21.7	1.4	23.0	0.0	27.0	−3.9
2012	12.7	12.3	0.4	12.8	0.0	14.3	−1.5
2013	11.1	11.9	−0.8	11.5	−0.4	11.8	−0.7
2014	11.2	10.8	0.4	12.3	−1.0	12.7	−1.4
2015	15.4	15.1	0.3	16.7	−1.2	16.3	−0.8
2016	13.1	12.9	0.2	13.0	0.1	16.0	−2.9
2017	6.7	7.0	−0.2	−0.2	7.1	−0.3	8.4
2018	17.0	16.9	0.2	16.7	0.4	15.9	1.1
2019	12.5	12.5	0.0	12.9	−0.4	12.4	0.0
2020	33.4	34.4	−1.0	33.9	−0.5	43.0	−9.5
2021	13.0	16.3	−3.3	13.4	−0.4	14.3	−1.3
2022	24.2	20.7	3.6	21.9	2.4	25.9	−1.6
2023	13.1	13.2	−0.1	13.8	−0.7	14.1	−1.0
2024	12.6	11.9	0.7	11.6	1.0	12.6	0.01
Summary Statistics							
min	6.7	7.0	−3.5	7.1	−1.3	8.4	−9.5
max	41.3	34.4	7.7	36.7	4.6	50.8	1.2
med	15.4	16.1	0.0	15.2	−0.4	16.0	−1.5
mean	17.6	17.5	0.1	17.5	0.1	19.8	−2.2
std	8.4	7.3	2.3	7.7	1.4	10.4	2.6

Table 16: Sharpe Ratio and Maximum Drawdowns with Monthly Rebalancing

Year	Sharpe Ratio				MDD			
	B&H	Winners	Median	Losers	B&H	Winners	Median	Losers
2000	−0.41	−0.35	1.11	−0.44	−17.1	−21.3	−12.0	−16.2
2001	−0.53	−1.01	0.14	−0.04	−28.8	−30.8	−18.6	−29.5
2002	−0.82	−0.74	−0.84	−0.53	−33.0	−28.2	−36.0	−36.0
2003	1.71	1.22	1.75	2.27	−13.7	−14.2	−11.1	−15.6
2004	0.96	0.77	1.59	1.24	−7.5	−6.3	−7.8	−8.6
2005	0.47	0.66	1.20	0.15	−7.5	−10.0	−7.3	−9.1
2006	1.58	1.33	1.47	1.31	−7.6	−8.7	−8.0	−8.1
2007	0.32	0.77	1.36	−0.20	−9.9	−10.1	−8.9	−14.8
2008	-0.89	−1.12	−0.91	−0.71	−47.6	−42.1	−45.9	−53.5
2009	0.99	1.13	1.12	0.62	−27.1	−26.7	−25.1	−31.5
2010	0.84	0.80	1.24	0.51	−15.7	−14.2	−17.1	−15.2
2011	0.08	0.53	0.07	−0.15	−18.6	−16.7	−17.8	−27.3
2012	1.26	0.60	1.61	1.13	−9.7	−8.4	−10.8	−11.8
2013	2.92	2.48	3.38	2.09	−5.6	−8.0	−6.0	−5.5
2014	1.20	0.91	1.31	1.09	−7.3	−5.4	−9.4	−8.7
2015	0.08	−0.59	−0.23	0.57	−11.9	−13.1	−15.4	−14.4
2016	0.92	0.73	1.03	1.26	−10.3	−7.3	−11.2	−12.3
2017	3.22	1.46	2.68	3.45	−2.6	−4.0	−2.6	−3.5
2018	−0.27	−0.54	−0.02	−0.58	−19.4	−21.9	−16.6	−18.6
2019	2.50	2.01	1.86	2.72	−6.6	−7.9	−7.2	−8.3
2020	0.55	0.63	0.47	−0.16	−33.7	−31.6	−33.7	−46.6
2021	2.21	1.92	1.99	2.10	−0.05	−0.09	−0.06	−0.05
2022	−0.75	−0.20	−0.20	−0.30	−24.5	−20.6	−20.2	−19.7
2023	2.00	1.22	0.62	1.16	−10.0	−8.8	−12.4	−10.2
2024	1.98	1.50	1.72	0.72	−8.4	−7.5	−5.8	−10.6
Summary Statistics								
min	−0.89	−1.12	−0.91	−0.71	−47.6	−42.1	−45.9	−53.5
max	3.22	2.48	3.38	3.45	−2.6	−4.0	−2.6	−3.5
median	0.92	0.77	1.20	0.62	−10.3	−10.1	−11.2	−14.4
mean	0.88	0.64	1.02	0.77	−0.16	−0.15	−0.15	−0.18
std	1.18	0.96	1.03	1.12	11.2	10.0	10.5	−12.9