



SEASONS CHANGE

A FRAMEWORK FOR RISK ATTENTIVE INVESTING

Abstract

This paper introduces a new framework for what we term “Risk Attentive Investing” for investors seeking to optimize their portfolio strategy around goal attainment.

We discuss the concept of risk regimes which are found at the intersection of a fragile macro-economic environment and periods of elevated stock-market volatility. Prior research indicates risk regimes in the equity markets; our construct offers a view of the market conditions that have historically accompanied the more dramatic drawdowns in the financial markets.

Risk Attentive Investing impacts wealth management decisions from cash deployment strategies and concentrated position management to portfolio duration targeting and supports the importance of multi-style factor exposure across cycles.

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OUR FRUSTRATIONS ARE TEMPERED BY WHAT WE UNDERSTAND WE CAN EXPECT FROM THE WORLD, BY OUR EXPERIENCE OF WHAT IT IS NORMAL TO HOPE FOR. OUR GREATEST FURIES SPRING FROM EVENTS WHICH VIOLATE OUR SENSE OF THE GROUND RULES OF EXISTENCE.

– ALAIN DE BOTTON, *THE CONSOLATIONS OF PHILOSOPHY*

SUMMARY

At Resource Planning Group, we believe that long-term disciplined investing presents the most reliable path to investment success, retained portfolio growth, and ultimately personal financial security. To that end, we take the time to know our clients and build well-diversified, evidence-based portfolios around their need, ability, and appetite to pursue growth in their portfolios.

A growing set of academic, industry, and our own proprietary research supports the idea that a single efficient frontier upon which to base asset allocation decisions and establish expectations may leave investors on their heels during certain periods. In [The Consolations of Philosophy](#), Alain de Botton identifies “It is when our expectations are shattered, that we question the ground rules and become captive to our emotions.” Being captive to emotions is a dangerous place for investors and practitioners, alike.

This paper introduces a framework for establishing higher levels of risk awareness, ultimately aiding our advisors to set appropriate expectations across market environments and to be aware of the risk paradigm in which wealth management decisions are being made. First, we will introduce the concept of regimes, or market seasons. We will then review indications of these seasons in the equity markets, ultimately identifying consistent multi-factor exposure as a critical element of disciplined portfolio management.

INTRODUCTION

Dr. Harry Markowitz’s work on the efficient frontier in the early 1950s, *efficient diversification* as he referred to it, earned him the 1990 Nobel Prize in Economics and revolutionized the landscape of investment advisory practices. With the efficient frontier, long-term investors and advisors have a reliable methodology to use what we know about asset classes, their return distributions, and their correlations to connect personal financial goals to investor tolerance for risk to long-term asset allocation models.

During the more tumultuous times in the markets, investors rely upon these efficient frontiers and seek comfort in “discipline” and “weathering the storm.” As advisors, we encourage clients to “stay the course” to avoid making emotional decisions at the worst times. We help clients find confidence in long-term plans, which contemplate swings in the markets. The healthy question should always be, can we do more to prepare for these periods? We believe the work is not done.



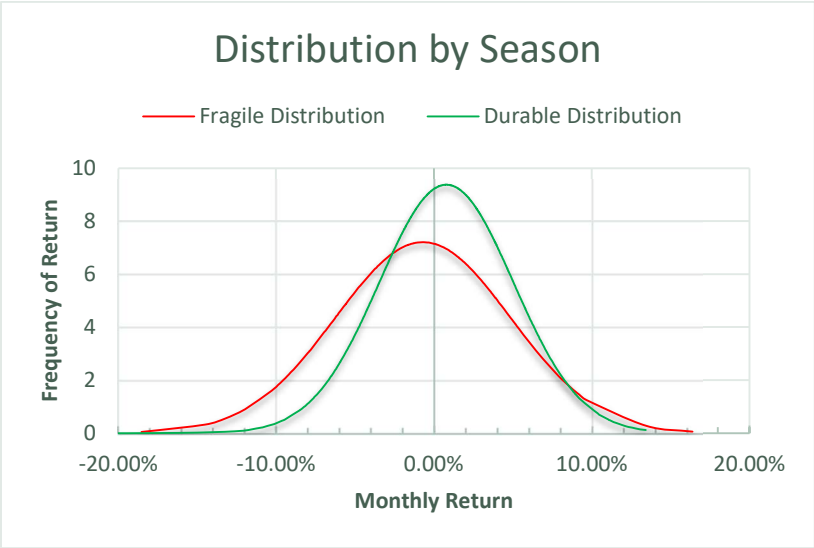
Academic and industry research presents a compelling case that the ideal portfolio allocation – i.e., a portfolio that properly balances risk and return for a specific client across their financial lifecycle – is not static. Not only do “goal-risk” and client “risk appetite” change over the course of client engagements, but the long-term data sets upon which we base portfolio asset allocations obscure an essential element of the markets: market risk is not spread evenly through time... risk clusters.

MARKET RISK IS NOT SPREAD EVENLY THROUGH TIME... RISK CLUSTERS.

Advisors and investors alike recognize this powerful truth, but we have lacked a reliable framework for understanding shifting portfolio risks. In this paper, we identify Fragile and Durable regimes which are driven by the interaction of the macroeconomic environment with the financial markets and which impact price volatility, financial market returns, and optimal advisor guidance.

FIGURE 1 highlights the characteristics of these distinct risk regimes. Each line represents the distribution of monthly stock market returns from 1965 through December 2022. The differences in monthly returns between these two regimes are statistically significant and consistent through multiple cycles, suggesting that our framework effectively identifies two unique periods within the dataset.

FIGURE 1 NORMAL DISTRIBUTIONS OF MONTHLY RETURNS OF CRSP INDEX LESS RISK-FREE RATE OF RETURN; DATA COURTESY OF AQR. TWO SAMPLE T-TEST WITH UNEQUAL VARIANCE: $T(159) = 2.83, P = .005$.



Importantly, at RPG our use case for Risk Attentive investing does not include dramatic portfolio changes, but rather, rests in optimizing wealth management opportunities and multi-factor investment strategies while recognizing the risk environment.

How do we identify upon which line we rest (i.e., our risk season) at any given time? Rather than improving our forecasts and prognostications, we believe that the key to recognizing seasonal changes lies in the power of observation.

RATHER THAN IMPROVING OUR FORECASTS AND PROGNOSTICATIONS, WE BELIEVE THAT THE KEY TO RECOGNIZING SEASONAL CHANGES LIES IN THE POWER OF OBSERVATION.

THE POWER OF OBSERVATION

If we are interested in knowing the weather in a couple of hours, our best bet is to step outside, make some observations, and ultimately have a pretty good idea for what to expect later in the day. Occasionally, hot summer afternoons will usher in moments of thunderstorms and downpours that contrast with present conditions; however, these deviations tend to be short lived. Before long, we return to what we have come to expect as normal for the season. In fact, we can even count the afternoon thunderstorms as part of the normal uncertainty that goes with the summer.

Similarly, long-term investors recognize that ups and downs are part of the normal market climate, and investors should reasonably expect some uncomfortable days, weeks, and months in the financial markets.

Do certain periods in time present a more tenuous risk-reward environment, though? We believe so. As with weather patterns, seasons in the market provide investors important context. Before we dive into the research, consider for a moment the importance of seasonal context when planning a family camping trip. The average annual temperature in Atlanta is 65°, perfect for an outing. If one were singly to use the long-term average temperature to plan a family camping trip in January, though, there is a high probability that the family camping trip is not going to proceed as planned.

Spouses will be frustrated, children cold and restless. More damaging, family camping will be an activity of the past. Upon considering the season, though, one has new context to filter information and make decisions.

To be sure, family campers may still experience a snowstorm in April or May or October. Those deviations, though, are fewer and further between and bring little in the way of second guessing, as prudence tempers regret.

While seasons do not provide us with knowledge of the weather tomorrow or next week, they do *provide us context for reasonable expectations – context which may reduce frustration and facilitate thoughtful decision making.*



Investing is not camping, though. What should investors observe in order that those observations can relieve the unreasonable burden of prognostication of what pension manager First Quadrant refers to as the “winters” in the markets? A little history, before we dive into the framework.

REGIME CHANGE BACKGROUND

Investment offices teem with daily data releases and economic news bites. Afternoon market round-ups attribute whatever the day’s movements to whatever data points best fit the narrative of the day or week. Traders crave the narrative, eagerly awaiting the next market moving release. The casual investor is left with the reasonable assumption that the financial markets and the economy are tied at the hip.

Not so fast. Most of the weekly economic data dumps provide little more than noise and confusion for the long-term investor. Many authors and practitioners have attempted to link macroeconomic data and trends to financial market returns and volatility. Most have found virtually no relationship.

Claims of zero relationship between the economy and financial markets, though, also miss the mark. Researchers consistently find that stock market returns and volatility are dependent upon the phase of the business cycle.

CLAIMS OF ZERO RELATIONSHIP BETWEEN THE ECONOMY AND FINANCIAL MARKETS, THOUGH, ALSO MISS THE MARK. RESEARCHERS CONSISTENTLY FIND THAT STOCK MARKET RETURNS AND VOLATILITY ARE DEPENDENT UPON THE PHASE OF THE BUSINESS CYCLE.

A deep dive into the literature presents a compelling case that business cycles provide a valid, reliable explanation of the “conditional” volatility and return distributions present in the equity markets.

In a seminal paper on the topic, William Schwert writes:

“Estimates of the standard deviation of monthly stock returns vary from two to twenty percent per month during the 1857 to 1987 period. Tests strongly reject the hypothesis of constant variance.”¹

Schwert continues to analyze many potential factors in stock market volatility, ultimately finding “...the percentage increases in volatility [of stocks] in recessions compared with expansions are large... up to 277 percent in 1920-1952 using daily estimates of volatility.”

¹ Schwert, G. W., & Schwert, G. W. (1989)



In their 1996 article in the *Journal of Applied Econometrics*, Hamilton & Lin write, “stock returns are difficult to forecast, but squared stock returns are not. Scores of studies have documented... that stocks are much riskier investments at some times than others.”²

Hamilton & Lin ultimately provide further support for Schwert, concluding:

“Even though recessionary periods account for only about 16% of the observations, they account for 68% of the total variability in stocks.”

These findings regarding stock return variability and business cycles resonate with us. Stock prices represent an amount an investor is willing to pay for a stream of cashflows. When the economy is growing, companies have decent visibility into their businesses, lending resources are available, and company leaders can provide reasonable guidance. Forecasts generally provide investors with confidence and markets find equilibrium among buyers and sellers. Investors are comfortable that the weather outside the window is reliable and indicative of the season, so we transact... markets are liquid.

Where growth slows and turns to contraction, though, earning forecasts lose relevance. Future revenues, profits, customer demand, inflation (deflation) create uncertainties that make the fair value of a company debatable and difficult to decipher. Banks are hesitant to lend. Growth investors are no longer interested in buying. Trend investors pause. Value investors may be priced out of the markets. Volatility increases and liquidity dissipates.

EVEN THOUGH RECESSIONARY PERIODS ACCOUNT FOR ONLY ABOUT 16% OF THE OBSERVATIONS, THEY ACCOUNT FOR 68% OF THE TOTAL VARIABILITY IN STOCKS.

Research on volatility regimes often utilize recession dates established by the National Bureau of Economic Research (NBER) in their analyses – *and the NBER dates recessions in-arrears, most often months, sometimes years. Such a lag creates a problem for risk attentive investors.*

Indeed. The question arises, “can we reliably observe the seasons of financial markets in real time having recognized that the seasons likely are linked with the macroeconomic environment?”

THE SEASONS

Identifying regime change in the macro-environment presents numerous challenges:

- Economic data is backward looking and tends to lag by months or quarters, making it difficult to obtain information that describes current conditions.

² Hamilton, J. D., & Lin, G. (1996)



- *Data revisions* are common, particularly with respect to economic series' that provide the most direct observations into the current economy. Furthermore, revisions tend to increase around turning points in the business cycle.
- Data mining (manipulating time periods or specific markets to obtain desired results) and data fitting (manipulating the models to “fit” historical outcomes) represent the Siren calls to the cliffs of spurious relationships.

We mitigate the above challenges by utilizing a simple framework comprised of a modest 4 inputs. Two of our inputs are market based, available with little to no lag, and represent real-time observations of the respective markets. The remaining inputs observe the macro-economy with high-availability, short lag times, and minimally revised data points.

We examine multiple equity styles and time periods. Our original research used monthly returns through 2010, and we have confirmed the results using data through 2022.

Furthermore, our framework makes intuitive sense. Rather than looking for weakness in the macro-environment, our framework finds periods where economic growth is strong, but unsustainably so. Unsustainable growth concurrent with a shift in market volatility represent the storm clouds of Fragile seasons.

The four inputs that comprise our construct:

- Yield Curve
- Inflation
- Unemployment
- Dynamic Volatility measure utilizing daily price returns of the S&P 500

Each month these four data points are calculated and the output conditionally assigns the following to month to the Durable or Fragile regime.

THE MACRO ECONOMIC ELEMENT OF THE FRAMEWORK SERVES TO IDENTIFY CONDITIONS THAT ARE ASSOCIATED WITH UNSUSTAINABLE GROWTH AND WHICH TYPICALLY ONLY EVER REVERT TO “NORMAL” WITH A CONTRACTION IN THE US ECONOMY.

We rely only on information that was known at the time of input, and data is lagged for publication delays. For clarity, unemployment and inflation numbers are delayed two months to ensure that the framework is utilizing information that is available and known at the start of each month.

The Macro Economic element of the construct serves to identify conditions that are associated with unsustainable growth and which typically only ever revert to “normal” with a contraction in the US economy.



During the observation period of June 1964 through December 2022:

Durable seasons account for approximately 82% of monthly observations and represent approximately 125% of the summed excess returns (returns over the risk-free rate).

Fragile seasons account for 18% of the periods and summed monthly returns of -88% across the observation period.

Figure 2 shows average monthly returns in excess of the risk-free rate. As reported in Figure 1, differences between Fragile and Durable periods are statistically significant in aggregate and consistent when analyzed by cycle as shown in Figure 3.

FIGURE 2 CRSP MONTHLY RETURNS EXCEEDING RISK-FREE RATE (MONTHLY RETURN DATA COURTESY OF AQR)

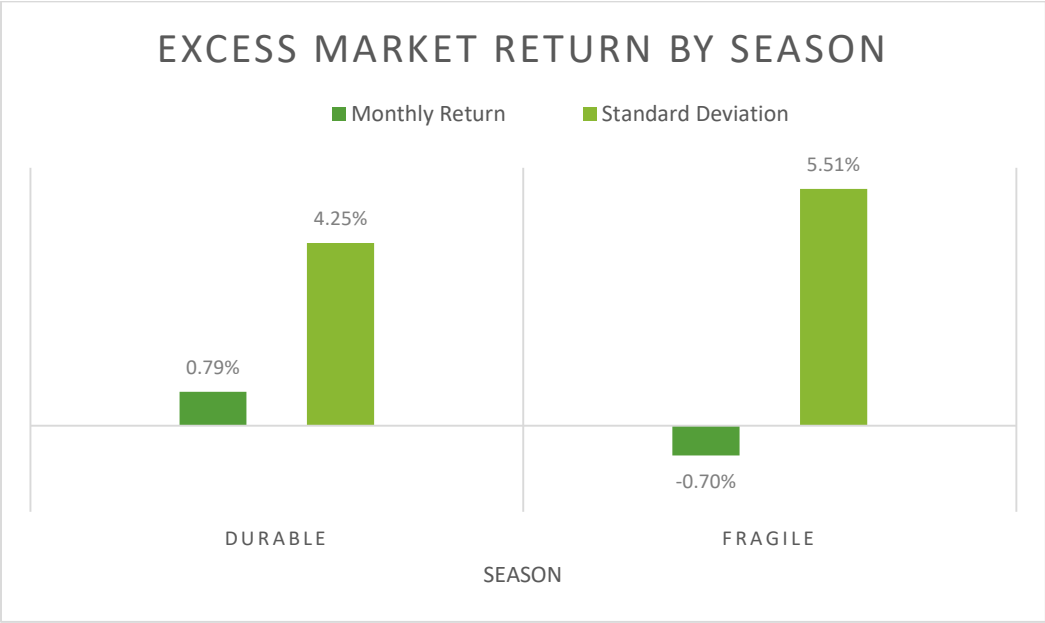


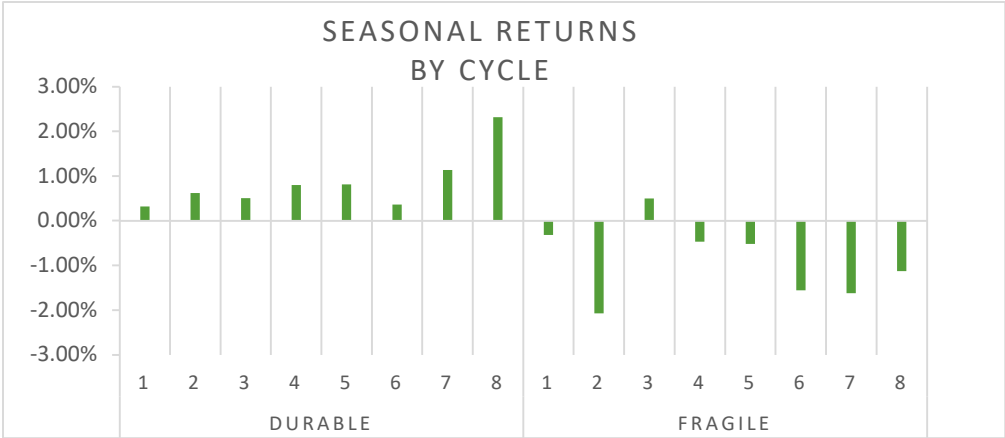
Figure 3 represents an important acid test for our construct. One may find results that appear significant or notable in the aggregate, only to discover that the results lack consistency when viewed in smaller sets across time. Figure 3 shows excess monthly returns in Durable months on the left of the chart and during Fragile months on the right of the chart. The cycles represent NBER dated business cycles from June 1964 through December 2022 (Cycle 8 is not yet dated by NBER).

Our Risk Attentive construct tends to capture low return, high volatility periods through time and across macro landscapes, including during the out of sample period from 2010 to 2022.

There is more work to do, but our results suggest a framework that can facilitate meaningful, Risk Attentive conversations with clients through the good, the bad, and the ugly of financial markets and economic landscapes.

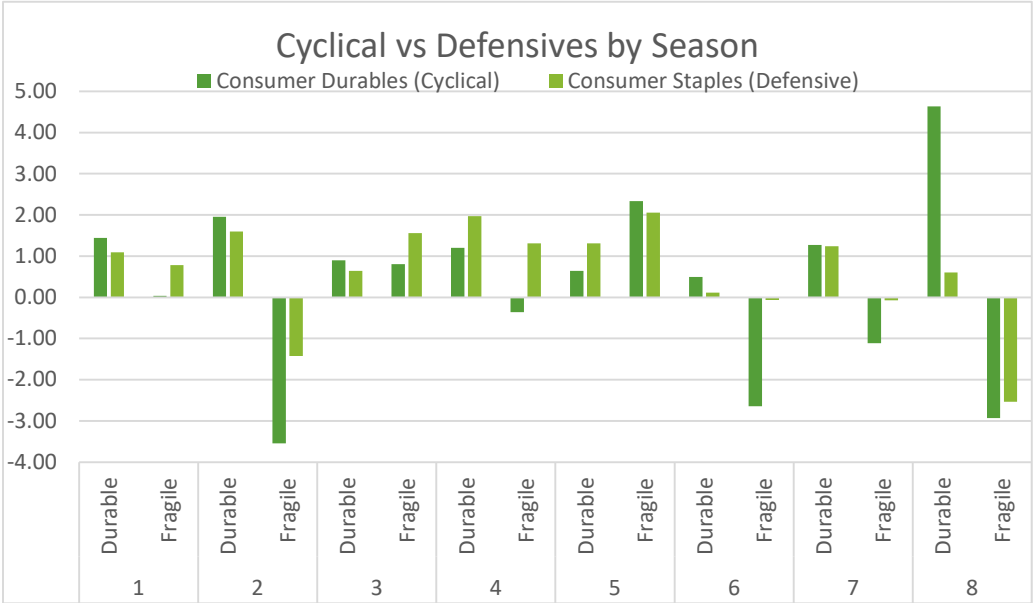


FIGURE 3 CRSP AVERAGE MONTHLY RETURN IN EXCESS OF RISK-FREE RATE PER NBER DEFINED BUSINESS CYCLES FROM JUNE 1964 THROUGH DECEMBER 2022 (MONTHLY RETURN DATA COURTESY AQR)



Since we believe that the Fragile periods are related to changes in the economic environment, we would expect to see investor preferences displayed towards or away from Defensive stocks in conjunction with the Fragile and Durable seasons. This is precisely what we see in Figure 4: a consistent preference for cyclical over defensive stocks during Durable months and for defensive over cyclical stocks during Fragile months.

FIGURE 4 AVERAGE MONTHLY RETURN CONSUMER DURABLES AND CONSUMER STAPLES PER SEASON WITHIN NBER DATED CYCLES (MONTHLY RETURN DATA COURTESY KENNETH FRENCH DATA LIBRARY)



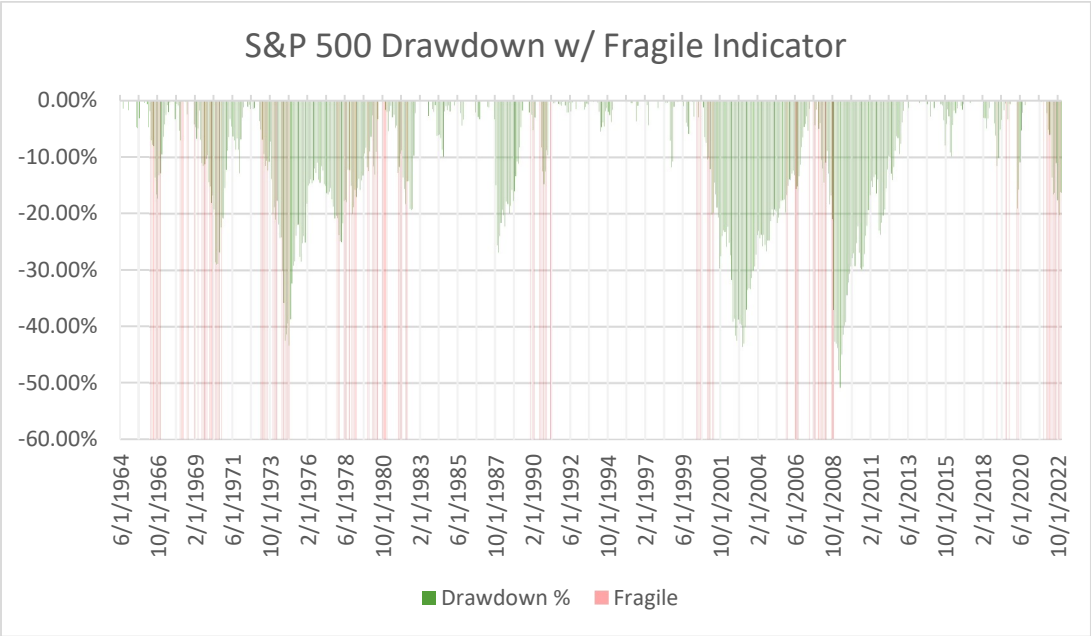
An important question arises. Are these seasons clustered in a way that creates a helpful framework, or are Fragile months sporadic through time? If we are identifying shifts in the seasons, much like the weather, we would like to see these seasons be largely contiguous. **Figure 5** shows the drawdown in the S&P 500 from June 1964 through December 2022 with a Fragile season overlay. We find that 68% of Fragile



months follow a prior Fragile month. If we look at entries into Fragile months on a quarterly basis, 83% of entries into Fragile months were preceded by Fragile months in one of the prior three months, a nice indication of clustering amid naturally volatile periods.

Not all drawdowns in the markets are associated with Fragile periods as we identify them; however, the more enduring drawdowns tend to take place around turning points in the economy. Figure 5 provides a visual of these drawdowns and seasons.

FIGURE 5 S&P 500 MONTHLY RETURNS WITH SEASONAL INDICATOR (RETURN DATA VIA YCHARTS)



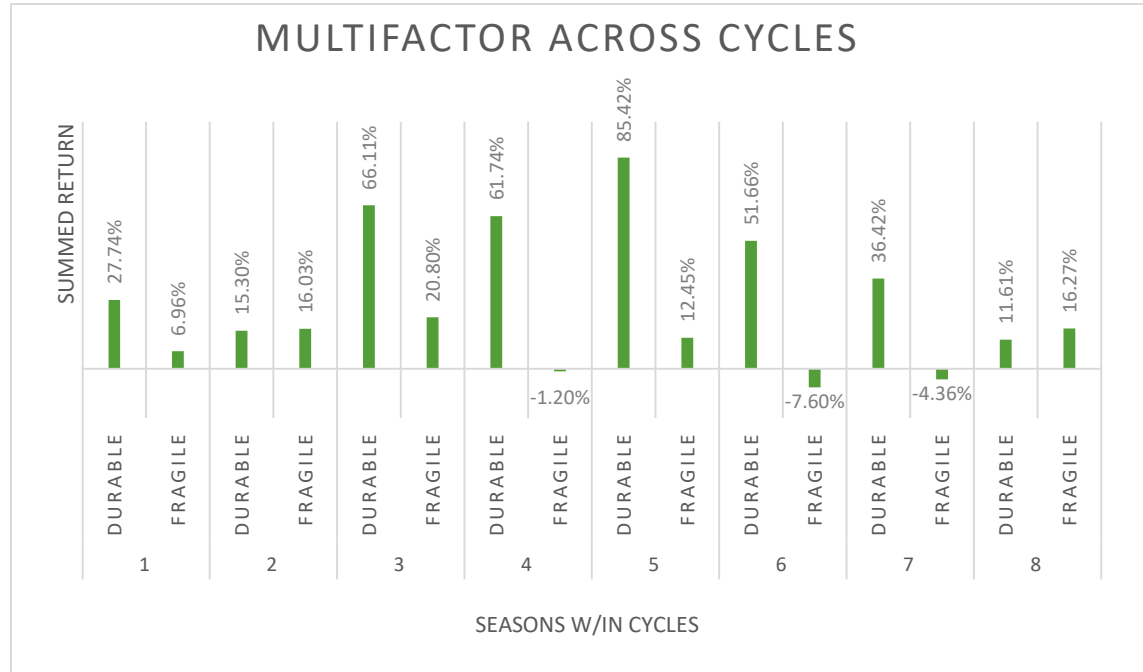
Ultimately, we must ask, “how do we navigate these seasons, where can investors find their proverbial umbrella and rain slickers?”

On one hand, wealth management decisions made in view of risk context may enhance decision making around retirement withdrawal strategies, concentration / diversification considerations, leverage utilization, and other balance sheet and income generation decision points.

From an investment perspective, Figure 6 offers important and encouraging direction. Multi-style factor investing strategies appear to experience more durable returns across full cycles than the market. Below is multi-style factor index, constructed and reported in AQR’s data library, and we report summed monthly returns of this index, delineated by our seasonal framework.



FIGURE 6 LONG-SHORT MULTIFACTOR³ SUMMED MONTHLY RETURNS PER NBER DATED BUSINESS CYCLES
(PORTFOLIO CONSTRUCTION AND MONTHLY DATA PROVIDED COURTESY OF AQR)



Our research supports the important role that factor investing plays in helping to reduce portfolio risk through time, particularly across risk cycles in the market and economy. How correlations among asset classes, individual factors, sectors and the market change through time and regime remain an interesting and important next step in our research.

CONCLUSION

Regime shifting models have been the subject of significant research over the last two plus decades. Our framework based on macro-economic and realized market risk provides our wealth management teams a meaningful way to describe the risk environment. Periods of change in the market and economy tend to be volatile in and of themselves with direction difficult to decipher. Nevertheless, our Risk Attentive construct offers relevant context for making important decisions about wealth management strategies and goal security for our clients.

Managing portfolio additions via lump sum or dollar cost averaging; increasing portfolio allocations to low-correlation investment strategies; tactically reducing duration exposure, transition planning for existing, concentrated portfolios; tactical and strategic increases to factor allocations; revisiting personal and investment risk tolerance: these are all potential use cases for our framework.

³ Multifactor portfolio represents “US stock selection multi-style” research portfolio and applies equal notional weights across the Value, Momentum and Defensive styles. Portfolio construction and monthly data provided courtesy of AQR and detailed in “Century of Factor Premia Monthly” Dataset.

All or nothing speculative moves into and out of the market are NOT a use case, as the dispersion of returns is wide in every regime and such a strategy would run contrary to our core belief that we reliably can forecast neither recessions nor returns.

At Resource Planning Group, we are committed to well-researched, evidence-based, disciplined strategies. We build portfolios with the goals of reducing internal fund expenses, managing appropriate risks, creating tax-efficiencies, and rebalancing allocations in a disciplined manner.

For more information regarding this paper or to learn more about RPG's approach to wealth management, please contact Alan Thomson at alan@rpgplanner.com, or simply schedule time for a discussion with one of our team via this [scheduling link](#).

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All investing involves risk, including the possible loss of principal. Diversification, asset allocation, and rebalancing do not ensure a profit or guarantee against loss. Historical performance results for investment indexes and/or categories do not reflect the deduction of transaction and/or custodial charges or the deduction of an investment-management fee, the incurrence of which would have the effect of decreasing historical performance results. **Performance quoted is past performance and is not indicative of future results.**

Factor investing is an investment strategy in which securities are chosen based on certain characteristics and attributes that may explain differences in returns. There can be no assurance that performance will be enhanced, or risk will be reduced for funds that seek to provide exposure to certain factors. Exposure to such investment factors may detract from performance in some market environments, perhaps for extended periods. Factor investing may underperform non-factor weighted benchmarks and increase portfolio risk.

The Standard and Poor's 500 index (S&P 500) is a stock market index tracking the stock performance of 500 largest companies listed on stock exchanges in the United States.

CRSP Market Indexes capture broad U.S. equity market coverage and include securities traded on NYSE, NYSE American, NYSE ARCA, NASDAQ, Bats Global Markets, and the Investors Exchange. Nearly 4,000 constituents across mega, large, small and micro capitalizations, representing nearly 100 percent of the U.S. investable equity market, comprise the CRSP US Total Market Index. **Some of the index and factor data provided may include back-tested performance. Back-tested performance is NOT an indicator of future actual results.**

The risk-free rate of return is the interest rate an investor can expect to earn on an investment that carries zero risk. The risk-free rate is a theoretical number since technically all investments carry some form of risk.

APPENDIX 1: CRSP TOTAL MARKET SUMMARY JUNE 1964 - DECEMBER 2022 (MONTHLY RETURN AND RISK-FREE RATE COURTESY AQR)

	Count of Season	Average of Risk-Free Rate	Sum of Excess Market Return	Average of Excess Market Return	Std Dev of Excess Market Return
1	79	0.41%	6.63%	0.08%	3.88%
Durable	50	0.37%	15.82%	0.32%	3.38%
Fragile	29	0.48%	-9.19%	-0.32%	4.58%
2	52	0.47%	-10.86%	-0.21%	5.30%
Durable	36	0.41%	22.31%	0.62%	4.61%
Fragile	16	0.60%	-33.17%	-2.07%	6.19%
3	92	0.71%	46.22%	0.50%	4.64%
Durable	65	0.66%	32.81%	0.50%	4.66%
Fragile	27	0.85%	13.41%	0.50%	4.60%
4	100	0.62%	67.36%	0.67%	4.72%
Durable	90	0.62%	72.03%	0.80%	4.74%
Fragile	10	0.61%	-4.67%	-0.47%	4.39%
5	128	0.38%	91.79%	0.72%	4.27%
Durable	119	0.38%	96.46%	0.81%	4.14%
Fragile	9	0.44%	-4.67%	-0.52%	5.57%
6	91	0.20%	-1.50%	-0.02%	4.66%
Durable	73	0.18%	26.51%	0.36%	4.31%
Fragile	18	0.28%	-28.01%	-1.56%	5.61%
7	130	0.05%	133.86%	1.03%	4.17%
Durable	125	0.04%	141.97%	1.14%	3.75%
Fragile	5	0.13%	-8.11%	-1.62%	9.73%
8	32	0.05%	32.73%	1.02%	5.44%
Durable	20	0.02%	46.27%	2.31%	4.66%
Fragile	12	0.11%	-13.54%	-1.13%	5.94%
Grand Total	704	0.37%	366.24%	0.52%	4.54%

APPENDIX 2: FAMA-FRENCH FACTORS THROUGH CYCLES JUNE 1964 - DECEMBER 2022 (MONTHLY RETURN DATA COURTESY KENNETH FRENCH DATA LIBRARY)

Row Labels	Average of SMB	Average of HML	Average of RMW	Average of CMA
1	0.67	0.32	0.07	0.21
Durable	1.19	0.40	(0.05)	0.07
Fragile	(0.22)	0.18	0.29	0.45
2	(0.16)	0.64	(0.02)	0.53
Durable	0.02	0.34	0.52	0.02
Fragile	(0.56)	1.32	(1.22)	1.66
3	0.97	0.42	0.05	0.29
Durable	0.90	0.64	0.03	0.38
Fragile	1.12	(0.12)	0.10	0.07
4	(0.25)	0.30	0.52	0.37
Durable	(0.16)	0.40	0.50	0.39
Fragile	(1.09)	(0.59)	0.73	0.18
5	0.08	0.54	0.39	0.41
Durable	(0.04)	0.37	0.32	0.32
Fragile	1.59	2.85	1.39	1.61
6	0.46	0.14	0.48	0.20
Durable	0.78	0.26	0.40	0.24
Fragile	(0.85)	(0.32)	0.81	0.01
7	(0.07)	(0.31)	0.13	0.01
Durable	0.00	(0.24)	0.11	(0.02)
Fragile	(2.03)	(1.97)	0.58	0.84
8	0.44	1.31	0.93	1.02
Durable	0.80	0.64	0.67	0.17
Fragile	(0.14)	2.43	1.37	2.43

The Fama/French factors are constructed using the 6 value-weight portfolios formed on size and book-to-market, the 6 value-weight portfolios formed on size and operating profitability, and the 6 value-weight portfolios formed on size and investment. SMB (Small Minus Big) is the average return on the nine small stock portfolios minus the average return on the nine big stock portfolios, HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios, RMW (Robust Minus Weak) is the average return on the two robust operating profitability portfolios minus the average return on the two weak operating profitability portfolios, CMA (Conservative Minus Aggressive) is the average return on the two conservative investment portfolios minus the average return on the two aggressive investment portfolios.

APPENDIX 3: AQR CONSTRUCTED FACTORS JUNE 1964 - DECEMBER 2022 (MONTHLY RETURNS COURTESY AQR)

	Average of BAB	Average of Value	Average of Momentum (AQR)	Average of Quality (P10-P1)	Average of Multifactor
1	0.52%	0.13%	0.67%	0.22%	0.44%
Durable	0.73%	0.21%	0.73%	-0.35%	0.55%
Fragile	0.16%	-0.01%	0.57%	1.20%	0.24%
2	0.11%	0.86%	0.84%	0.61%	0.60%
Durable	0.34%	0.46%	0.47%	0.89%	0.43%
Fragile	-0.42%	1.78%	1.65%	-0.03%	1.00%
3	1.20%	0.47%	1.17%	-0.34%	0.94%
Durable	1.36%	0.68%	1.01%	-0.30%	1.02%
Fragile	0.80%	-0.02%	1.53%	-0.45%	0.77%
4	0.92%	0.34%	0.56%	0.77%	0.61%
Durable	1.16%	0.51%	0.39%	0.57%	0.69%
Fragile	-1.30%	-1.16%	2.10%	2.66%	-0.12%
5	1.07%	0.12%	1.11%	0.93%	0.76%
Durable	0.99%	-0.14%	1.31%	0.90%	0.72%
Fragile	2.09%	3.60%	-1.56%	1.32%	1.38%
6	0.87%	0.45%	0.13%	0.48%	0.48%
Durable	1.45%	0.83%	-0.15%	0.13%	0.71%
Fragile	-1.46%	-1.07%	1.28%	1.88%	-0.42%
7	0.60%	-0.24%	0.38%	0.60%	0.25%
Durable	0.71%	-0.24%	0.40%	0.55%	0.29%
Fragile	-2.07%	-0.33%	-0.18%	1.91%	-0.87%
8	0.77%	1.56%	0.28%	0.07%	0.87%
Durable	1.14%	1.22%	-0.63%	-0.77%	0.58%
Fragile	0.14%	2.12%	1.80%	1.59%	1.36%

BAB factors are portfolios that are long low-beta securities and that short-sell high-beta securities.

Value factor portfolios buy securities with low price-to-fundamental ratios while simultaneously short-selling securities with high price-to-fundamental ratios.

Momentum factor portfolios purchase securities that have had strong price changes over a defined time period while simultaneously short-selling securities that have had weak price changes over the time period.

Quality factor portfolios involve buying companies with strong balance sheets, stable earnings, and low debt while simultaneously short-selling companies with weak balance sheets, unstable earnings, and high debt.

Multifactor portfolio represents AQR "US stock selection multi-style" research portfolio and applies equal notional weights across the Value, Momentum and Defensive styles.

Portfolio construction and monthly data provided courtesy of AQR and detailed in "Betting Against Beta Equity Factors Data (Monthly)", "Century of Factor Premia (Monthly)", "Quality Minus Junk: 10 Quality Sorted Portfolios (Monthly)"

APPENDIX 4(1): CRSP TOTAL MARKET RETURNS IN EXCESS OF RISK-FREE RATES (COURTESY AQR).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1964					1.42%	1.34%	1.70%	-1.38%	2.77%	0.56%	0.09%	0.23%
1965	3.47%	0.37%	-1.50%	3.17%	0.60%	5.33%	1.31%	2.69%	2.98%	2.59%	-0.20%	0.84%
1966	0.56%	-1.32%	-2.42%	2.09%	5.58%	1.43%	1.62%	-7.89%	-1.04%	3.90%	1.33%	0.12%
1967	7.77%	0.63%	3.99%	3.96%	4.50%	2.23%	4.58%	-1.02%	3.11%	-3.07%	0.40%	2.81%
1968	-4.27%	-3.70%	0.14%	8.83%	1.99%	0.64%	2.67%	1.34%	3.86%	0.35%	5.42%	-3.98%
1969	-1.24%	-5.72%	2.77%	1.58%	0.01%	7.10%	6.95%	4.67%	-2.98%	4.94%	-3.68%	-2.49%
1970	-7.99%	5.12%	-1.03%	10.88%	6.82%	5.59%	6.91%	4.45%	4.10%	-2.15%	4.65%	5.63%
1971	4.65%	1.37%	4.18%	3.06%	3.92%	0.04%	4.43%	3.82%	-0.85%	-4.45%	-0.46%	8.80%
1972	2.46%	2.93%	0.65%	0.27%	1.42%	2.33%	0.69%	3.35%	-1.08%	0.48%	4.60%	0.80%
1973	-3.12%	-4.79%	-1.18%	-5.60%	2.82%	1.29%	5.05%	-3.58%	4.66%	-0.67%	12.64%	0.64%
1974	-0.40%	-0.33%	-2.88%	-5.27%	4.87%	2.82%	7.86%	-9.30%	11.97%	16.39%	-4.65%	-3.37%
1975	13.42%	5.51%	2.69%	4.31%	5.11%	4.82%	6.63%	-2.80%	-4.32%	5.12%	2.72%	-1.60%
1976	12.15%	0.27%	2.36%	-1.46%	1.29%	4.06%	1.12%	-0.62%	2.04%	-2.52%	0.05%	5.73%
1977	-4.13%	-1.96%	-1.33%	0.08%	1.48%	4.75%	1.77%	-1.80%	-0.31%	-4.48%	4.03%	0.33%
1978	-6.09%	-1.44%	2.89%	7.81%	1.81%	1.65%	5.16%	3.63%	-1.32%	11.75%	2.75%	0.97%
1979	4.12%	-3.43%	5.79%	0.02%	2.20%	3.87%	0.71%	5.74%	-0.66%	-8.07%	5.39%	1.85%
1980	5.77%	-0.68%	13.23%	3.90%	5.16%	3.14%	6.44%	1.65%	2.20%	1.10%	9.65%	-4.80%
1981	-5.11%	0.37%	3.37%	-2.28%	0.09%	2.29%	1.49%	-6.89%	-7.67%	4.74%	3.52%	-3.68%
1982	-3.57%	-6.16%	-2.04%	3.27%	3.87%	3.31%	3.10%	11.11%	0.94%	11.22%	4.49%	0.81%
1983	3.49%	2.33%	2.84%	6.70%	0.58%	3.13%	3.90%	-0.39%	0.86%	-3.52%	2.27%	-1.79%
1984	-2.17%	-4.71%	0.52%	-0.56%	6.19%	1.44%	2.90%	10.37%	-0.91%	-0.88%	-1.88%	1.61%
1985	7.89%	0.95%	-0.96%	-0.92%	4.72%	1.03%	0.66%	-1.19%	-4.61%	3.83%	6.31%	3.69%
1986	0.35%	6.60%	5.00%	-1.32%	4.61%	0.90%	6.48%	6.16%	-8.34%	4.45%	1.07%	-3.09%
1987	12.40%	4.29%	1.89%	-2.13%	0.02%	3.88%	3.96%	3.25%	-2.66%	23.11%	-7.72%	6.70%
1988	3.95%	4.72%	-2.15%	0.63%	0.43%	4.62%	1.30%	-3.42%	3.14%	1.13%	-2.26%	1.45%
1989	5.94%	-2.53%	1.46%	4.11%	3.25%	1.34%	7.18%	1.58%	-0.81%	-3.62%	1.11%	1.18%
1990	-7.70%	0.97%	1.77%	-3.48%	8.37%	1.14%	1.68%	-9.88%	-6.04%	-1.98%	6.08%	2.46%
1991	4.46%	7.20%	2.45%	-0.14%	3.69%	4.91%	4.26%	2.26%	-1.62%	1.37%	-4.25%	10.47%
1992	-0.45%	1.06%	-2.73%	0.99%	0.30%	2.31%	3.72%	-2.37%	0.98%	1.01%	3.90%	1.51%

APPENDIX 4(2): CRSP TOTAL MARKET RETURNS IN EXCESS OF RISK-FREE RATES. COURTESY AQR WEBSITE.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1994	2.93%	-2.59%	-4.81%	0.63%	0.62%	-3.16%	2.73%	3.97%	-2.16%	1.17%	-4.20%	0.87%
1995	1.51%	3.52%	2.25%	2.00%	2.95%	2.70%	3.67%	0.52%	3.23%	-1.59%	3.92%	1.06%
1996	2.36%	1.29%	0.72%	2.18%	2.32%	-1.29%	5.87%	2.82%	4.92%	1.02%	6.15%	-1.58%
1997	4.99%	-0.59%	-4.97%	3.81%	6.82%	3.99%	7.28%	-4.03%	5.45%	-3.82%	2.66%	1.36%
1998	0.04%	6.93%	4.76%	0.66%	-3.02%	3.01%	2.62%	16.24%	5.98%	7.08%	5.86%	5.93%
1999	3.62%	-4.13%	3.52%	4.55%	-2.55%	4.73%	3.56%	-1.45%	-2.69%	5.95%	3.42%	7.87%
2000	-4.21%	2.74%	5.31%	-6.49%	-4.59%	4.79%	2.31%	7.01%	-5.51%	-3.05%	10.88%	1.58%
2001	3.93%	10.28%	-7.58%	8.11%	0.60%	-2.03%	2.17%	-6.26%	-9.63%	2.62%	7.91%	1.72%
2002	-1.99%	-2.36%	4.38%	-5.18%	-1.12%	-7.24%	8.33%	0.65%	10.25%	7.47%	6.06%	-5.53%
2003	-2.52%	-1.74%	0.93%	8.23%	6.32%	1.57%	2.30%	2.41%	-1.06%	6.00%	1.57%	4.49%
2004	2.24%	1.51%	-1.17%	-2.36%	1.35%	2.09%	3.91%	0.11%	1.93%	1.61%	4.72%	3.33%
2005	-2.85%	2.07%	-1.86%	-2.75%	3.55%	0.93%	4.11%	-0.91%	0.77%	-2.35%	3.80%	0.01%
2006	3.65%	-0.51%	1.54%	0.91%	-3.51%	-0.42%	0.64%	2.09%	1.55%	3.28%	1.94%	0.64%
2007	1.52%	-1.84%	0.86%	3.66%	3.54%	-1.91%	3.59%	0.74%	3.73%	2.27%	-5.31%	-0.72%
2008	-6.53%	-2.46%	-1.23%	5.05%	2.22%	-8.06%	1.36%	1.08%	-9.88%	18.53%	-8.47%	2.14%
2009	-7.87%	10.11%	8.94%	11.04%	6.60%	-0.31%	8.22%	3.19%	4.49%	-2.77%	5.74%	2.83%
2010	-3.73%	3.56%	6.45%	2.14%	-8.00%	-5.39%	7.18%	-4.48%	9.34%	3.99%	0.65%	6.84%
2011	2.06%	3.84%	0.30%	2.83%	-1.45%	-1.88%	2.32%	-5.93%	-8.50%	11.62%	-0.62%	0.49%
2012	5.42%	4.25%	2.56%	-0.67%	-6.64%	3.81%	0.99%	2.70%	2.65%	-1.47%	0.59%	1.23%
2013	5.56%	0.94%	3.69%	1.53%	2.13%	-1.40%	5.43%	-2.61%	3.77%	4.07%	2.65%	2.70%
2014	-3.03%	4.68%	0.42%	0.10%	2.03%	2.88%	2.08%	4.13%	-2.51%	2.23%	2.21%	-0.28%
2015	-2.91%	5.78%	-1.02%	0.88%	1.10%	-1.88%	1.14%	-6.08%	-3.45%	7.44%	0.28%	-2.32%
2016	-5.94%	0.09%	7.13%	1.20%	1.49%	0.23%	3.87%	0.29%	0.28%	-2.22%	4.40%	1.86%
2017	2.16%	3.25%	0.13%	0.81%	0.78%	1.01%	1.91%	0.02%	2.41%	1.85%	2.77%	1.08%
2018	4.98%	-4.07%	-2.04%	0.40%	2.60%	0.45%	3.01%	3.09%	-0.08%	-7.67%	1.65%	-9.55%
2019	8.86%	3.28%	1.08%	3.67%	-6.52%	6.84%	1.02%	-2.31%	1.46%	1.77%	3.54%	2.77%
2020	-0.33%	-8.16%	14.50%	13.47%	5.52%	2.63%	5.59%	7.10%	-3.57%	-2.23%	12.77%	4.63%
2021	-0.21%	2.89%	3.16%	4.82%	0.61%	2.53%	1.07%	2.71%	-4.23%	6.60%	-1.78%	3.36%
2022	-6.18%	-2.32%	3.16%	-9.06%	-3.5%	-8.67%	9.22%	-3.77%	-9.48%	7.91%	4.71%	-6.41%

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