ONERIVER
ASSET MANAGEMENT

Regime Change Resilience

REBOOTING RISK MITIGATION WITH STRUCTURAL CORRELATION

SEPTEMBER 2021

A dichotomy of correlation classifications – transitory and structural correlation.

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Executive Summary

Is your portfolio able to withstand a regime shift?

The most prudent response to uncertainty is diversification. In order to achieve diversification, allocators seek to combine uncorrelated risks. As such, correlation matrices are a central input to allocation models. If the underlying correlation inputs to an allocation scheme are reliable, then the allocation can be resilient enough to navigate dynamic market environments. If these correlations are spurious and fragile, however, then the opposite may indeed be true.

Here, we highlight a dichotomy of correlation classifications – transitory and structural correlation.

We define transitory correlation as a relationship that is the byproduct of a confluence of macro risks or dynamic conditions. It is an artifact of history and path dependency. This could include macro policy actions, geopolitical pressures, and booms/busts of the market cycle, to name a few.

We define structural correlation as a relationship that is resilient to changes in these factors. This is a relationship that is either the byproduct of something endogenous to either the exposure itself (e.g., market risk and volatility), or to direct linkages through pricing mechanisms (e.g., inflation-linked bonds). This paper will provide examples of both.

We believe that the success experienced by allocators who have leaned heavily on transitory correlations over the last few decades is less likely to persist through significant economic change without sources of structural correlation in their portfolios.

This paper explores the recent relationship between stocks and bonds as a prime example of a transitory correlation that may not be as reliable as statistical models suggest, and also discusses why mis-estimating correlations can significantly impact allocation risk and return objectives.

Further, the below highlights examples of structural correlation that we believe are more likely to weather significant market events and potential economic regime shifts. Lastly, the paper discusses why the legacy asset management industry and allocators alike are so hesitant to acknowledge structural correlation frameworks.

By adding structurally uncorrelated risk to a portfolio, the foundation of diversification can be strengthened, and regime change susceptibility can be mitigated.

Part I: Why Many Cross-Asset Correlations are Unreliable

Many existing diversified portfolio allocations likely use long-term statistical observations of asset returns to support their assumptions and provide inputs to their risk models.

The conviction that allocators place on these risk estimates is in part driven by statistical models that suggest the standard error of the prevailing cross-asset correlation estimates is very small – in other words, the consistency of correlations between asset classes over the last few decades has led to what appears to be robust relationships that can be relied upon in portfolio construction.

The below will demonstrate, however, that using large samples of high frequency data can yield observations that appear significant not because the relationship is particularly stable, but because the sheer size of the sample suggests that any result must be robust through the lens of a standard error. [1]

The longer history instead suggests that even statistically sound relationships reinforced by thousands of observations can transform and even invert as macroeconomic conditions shift. Further, these departures from "normal" correlations can persist if there are sufficient changes in the fundamental backdrop.

The U.S. economic environment of the last few decades has been characterized by monetary policy actions that have intentionally reduced volatility, kept many markets range-bound, supported corporate solvency, propped up risk asset valuations, and reinforced transitory correlations between major macro assets by providing a consistent policy backdrop. One such example is the prevailing negative correlation between equities and bonds since the late 1990s. This correlation assumption, while integral to many assumed allocation models in place today, is a prime example of a transitory correlation that may not be resilient to regime changes.

TRANSITORY CORRELATION CASE STUDY: S&P 500 AND U.S. BONDS

To illustrate the potentially misleading statistical conclusions you can reach using historical asset relationships, we can examine a univariate regression of daily changes of the US 10yr bond proxy [2] versus daily changes in the S&P 500. Exhibit 1 below examines a rolling 1-year correlation of daily returns, where you can observe a clear regime shift in the equity/bond relationship in the late 1990s that has persisted through the present.

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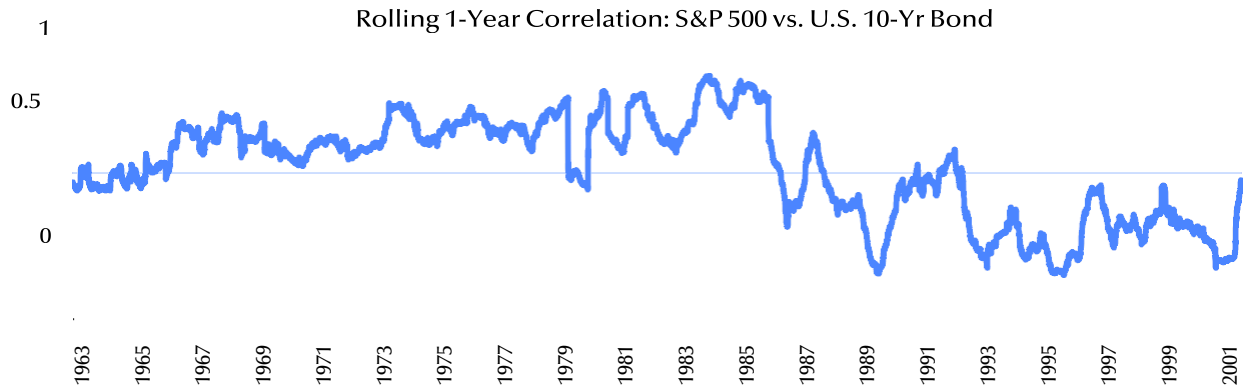
[1] While the t-statistics quoted in the case study below are elevated partially as the result of using daily data, the observations do not lose statistical significance if one switches to monthly observations. Daily data is used for the purpose of replicating the statistical approach that may be commonly deployed by risk models that seek to maximize estimate certainty through increasing the number of observations.

[2] The U.S. 10-yr bond proxy is a negated time series of daily U.S. 10-year rates (normal percent change multiplied by -1 for each observation), adjusting the yield change for 10-year duration to approximate a bond return, and scaling the full sample volatility to match the full sample volatility of the Bloomberg US Treasury Total Return Index going back to inception in 1973 (LUATTRUU Index). U.S. rates are used instead of an actual bond return index because of data availability, in order to extend the daily frequency analysis back further in time.

Exhibit 1:

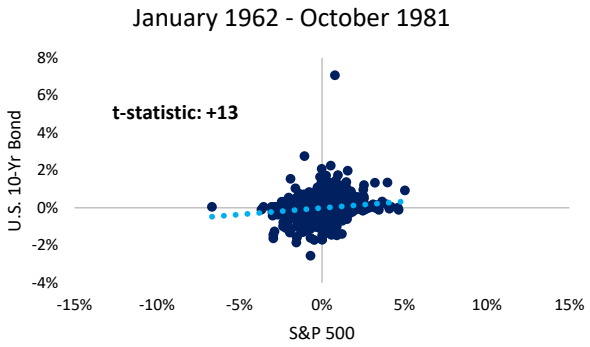


Source: Bloomberg, One River

Beginning in 1962 when the daily bond time series is available and going through today, you get an unsurprising full sample result – the correlation between stocks and bonds is slightly negative (-0.1 correlation). The t-statistic, or level of reliability of that full sample observation, is highly statistically significant with a -7 t-stat, where a t-statistic of approximately +/- 2.5 or larger is typically considered statistically significant. The t-stat being much larger than that makes it very unlikely to be a spurious finding over the sample period. Exhibit 2 (right) demonstrates this relationship[3] .

However, if you divide this timeframe into different periods, the apparent consistency and reliability of this observation changes drastically. From 1962-1981, when US interest rates went from historic norms to record highs, the correlation between fixed income and equities inverts and is actually positive (+0.2 correlation). Thus, in October of 1981 when interest rates had reached their secular peak, if you had used a backward-looking risk model to estimate cross-asset correlations or build a risk mitigation portfolio, you would have assumed that equities and fixed income were positively correlated, and indeed the significance of that relationship would have been entirely supported through a statistical lens (+13 t-stat). This relationship can be observed in Exhibit 3.

Exhibit 3 (Positive Correlation, Rising Rates):



Source: Bloomberg, One River

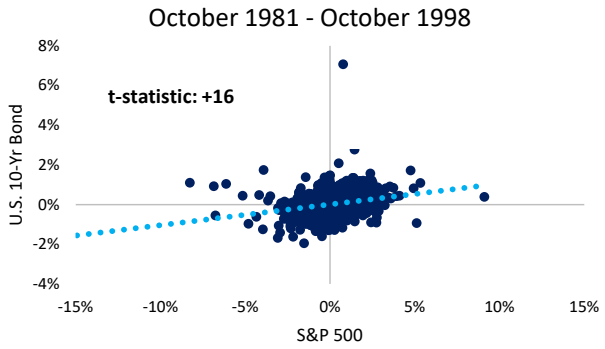
[3] October 19, 1987 has been excluded from the visual and subsequent visuals that include this date (but not the computation of the statistics), for the sake of not over-stretching the x-axis.

Naturally, you might be tempted to look at these results and conclude that the relationship between equities and fixed income is indeed reliable, as long as you control for the rising or falling rate environment. However, the relationship and changes to it are not as easily predicted by a single factor such as the general drift of interest rates over time. To illustrate this, from Oct 1981 – Oct 1998 when rates collapsed from highs, the relationship between stocks and bonds was also positive with a higher level of consistency (+0.2 correlation, with a +16 t-stat) as can be seen in Exhibit 4.

Lastly, the 1998-present period resulted in a -0.4 correlation between stocks and bonds, with a highly significant -30 t-stat, as shown in Exhibit 5 (right).

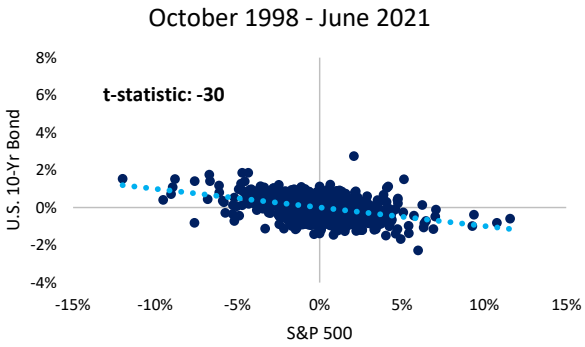
What we have not explored here, but is also worth highlighting at least in passing, is the potentially undesirable conditional correlation that can accompany transitory relationships. Even an assumed relationship that holds on average over longer time frames can break down in extreme risk-off events and lead to deeper drawdowns and more short-term pain. March of 2020 was a such a case of risk assets concurrently declining and transitory correlations breaking down when they were needed most.[4]

Exhibit 4 (Positive Correlation, Falling Rates):



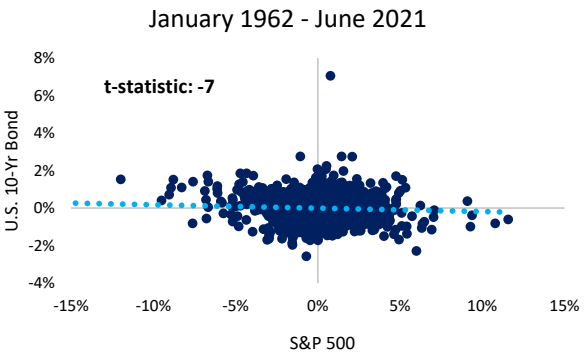
Source: Bloomberg, One River

Exhibit 5 (Negative Correlation, Falling Rates):



Source: Bloomberg, One River

Exhibit 2 (Full Period):



Source: Bloomberg, One River

In summary, using backward-looking returns to justify cross-asset correlation expectations might yield convincing statistics, but ultimately this approach has not proven to be a fully reliable method of sourcing correlation estimates essential for proper risk mitigation and diversification. Indeed, without properly matching a statistical observation with an intuitive linkage, you run the risk of relying on ephemeral relationships for stability.

[4] During the second and third weeks of March 2020 when the crisis reached its peak and liquidity fell significantly (March 9-20), the S&P 500 was down -22.5%, and the Bloomberg U.S. Treasury Total Return Index was down -1.6%.

This raises a question to allocators: if forward-looking allocation models based on historical returns are only valid in a world of relatively static cross-asset relationships, how does an allocator find reliable sources of diversification in the face of regime changes? The answer is rooted in finding and adding sources of structural correlation that are resilient to such impacts.

Part II: Why Cross-Asset Correlations Are Important

A question that might rise from such an investigation is: what is the real cost of mis-estimating a major cross-asset correlation for a broader portfolio? You could rightly point out that even when higher-frequency return observations (e.g. – daily or weekly) can yield negative correlations, overall returns can still align negatively or positively. For instance, the negative correlation between stocks and bonds observed post 1998 to present has also resulted in a period over which both asset classes have performed well. Since 1998, we have observed for the major asset classes: an approximately +0.4 Sharpe for stocks, a +0.6 Sharpe for Bonds, and a 0.0 Sharpe for Commodities [5].

As a study, if we were to take the recent realized cross-asset risks and use those to construct a simplistic risk parity portfolio [6] in order to achieve an equal risk exposure to equities, bonds, and commodities over different historical periods, the adverse effects of misestimating correlations are apparent. In order to achieve a roughly equal contribution to risk from each of these asset classes using the prevailing correlations and volatilities using historical returns back to 1998, the relative capital weights today would be an approximate

16.5% weight to equities, 70.0% to bonds, and 13.5% to commodities.

Table 1 shows the risk outcome of such a portfolio. Here, we examine how these recent assumptions would have fared from a risk perspective if applied to the 1973-1981 and 1981-1998 periods (the same periods as used in the prior section, shortened to match return index data availability [7]). Using recent correlation assumptions back then would have resulted in an approximately 73-96% contribution to risk from stocks and bonds, with the vast majority of that overshoot coming from bonds. The risk balance isn't the only aspect of the allocation that would have been thrown for a loop, however. So too would have the resulting volatility of the combined portfolio. In this particular example, the correlation mis-estimation would meaningfully increase the realized volatility versus its target (a margin that scales up as leverage increases) because of less realized diversification.

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[5] Source: One River, Bloomberg. Returns from October 1998-June 2021. Using monthly returns for the S&P 500 (SPX Index) for equities, the Bloomberg Barclays U.S Treasury Index (LUATTRUU Index) for bonds, and the Bloomberg Commodities Index (BCOM Index) for Commodities.

[6] Recent correlations here are those realized from Oct 1998- June 2021. The simplistic risk parity portfolio uses the same indices for the major macro assets as outlined in the prior footnote, and uses the approximate realized correlations and volatilities between the macro assets, which are disclosed in the appendix.

[7] The US bond index (LUATTRUU Index) data begins in 1973 vs generic 10y yield data beginning in 1962.

Table 1: Risk Outcomes- Simple Risk Parity Using Recent Correlation Assumptions

	Relative Weight to Asset Classes			Realized Risk Contribution			Volatility
Realized Correlation Regime	Stocks	Bonds	Commodities	Stocks	Bonds	Commodities	Portfolio
Feb 1973 - Oct 1981 (Mis-Estimation)	17%	70%	14%	25%	48%	27%	6.1%
Oct 1981 - Oct 1998 (Mis-Estimation)	17%	70%	14%	34%	63%	4%	5.2%
Oct 1998 - June 2021 (In-Sample)	17%	70%	14%	33%	33%	33%	4.1%
Relative Risk Realization Error (versus Target)				-26.3%	+45.3%	-19.1%	+46.6%
Relative Risk Realization Error (versus Target)				+0.6%	+88.2%	-88.9%	+24.9%

Source: Bloomberg, One River. Using Oct 1998- June 2021 correlation assumptions. Using period-specific realized volatilities.

What does this mean for return outcomes? Of course, this depends on how the sleeves of the portfolio perform relative to one another, but if correlations break down as major asset classes concurrently decline, then previously well-diversified portfolios may amplify both risk concentration and aggregate volatility precisely when the opposite would be most beneficial to the portfolio. In Table 2 you can see how over-realizing both aggregate risk and bond-specific risk was incidentally a favorable return outcome from 1981-1998, but a costly one from 1973-1981.

Table 2: Annualized Return Outcomes- Simple Risk Parity Using Recent Correlation Assumptions

	Relative Weight to Asset Classes			Realized Risk Contribution			Excess return
Realized Correlation Regime	Stocks	Bonds	Commodities	Stocks	Bonds	Commodities	Portfolio
Feb 1973 - Oct 1981 (Mis-Estimation)	17%	70%	14%	-1.0%	-1.3%	1.4%	-1.0%
Oct 1981 - Oct 1998 (Mis-Estimation)	17%	70%	14%	1.3%	3.3%	-0.9%	3.8%
Oct 1998 - June 2021 (In-Sample)	17%	70%	14%	1.0%	1.8%	0.0%	2.7%

Source: Bloomberg, One River, Fama French Data Library. Using Oct 1998- June 2021 correlation assumptions. Assuming monthly rebalance. Contributions and aggregate real return are in excess of the Fama French risk-free rate.

This is a simplified example of how couplings and de-couplings of risks can impact a seemingly diversified allocation. However, each portfolio will have a unique set of considerations as it relates to potential transitory correlation vulnerabilities.

Part III: Examples of Structural Correlations

If finding structural correlation is the objective, how can we tell if a given relationship is truly robust, and not just an observation in need of a larger sample, or one that has been consistently influenced by other confounding factors?

You can conduct a series of tests to help evaluate whether a certain correlation is structural or transitory. If data is available, evaluating different computation horizons and data frequency is an easy means of spotting a potentially fragile relationship. Does the relationship break down if you use weekly instead of monthly data? Does it yield different conclusions if you use rolling observation windows of different lengths (e.g., 3-month / 1-year / multiple-year windows)? Has the relationship experienced sustained lengthy periods above and below the sample correlation being used as an input? These evaluation methods and others can help allocators test such relationships with more empirical rigor.

Further, true structural correlations should also be subjected to a qualitative assessment as to why such relationships should persist indefinitely. Some examples of these qualitative evaluations are discussed below:

VOLATILITY AND MARKET RISK:

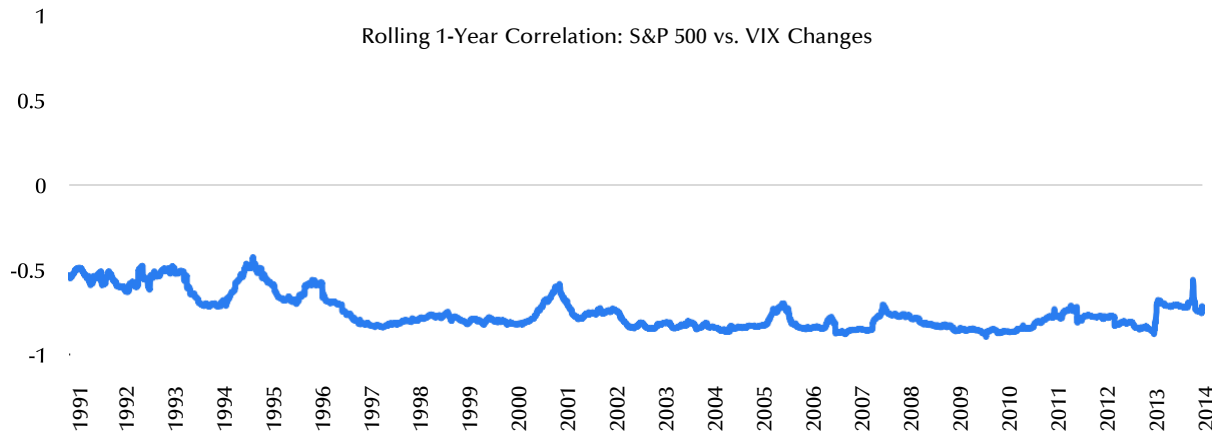
The negative correlation between volatility and market risk (specifically equities and implied volatility indices such as the VIX and VSTOXX) is well known and most likely intuitive for most. Here, we see there being two main factors that drive this consistent negative correlation.

The first is behavioral - investors turn to options when the uncertainty of the future is uncomfortably high, and they would like to transfer risk. They usually tend to do so by replacing cash exposures with option exposures to have finite downside exposure. The well-studied heuristic of loss aversion gives us confidence that this sort of behavior is unlikely to be time varying.

The second, and what makes this relationship between equities and volatility structural, is a byproduct of the long-biased nature of the average market participant. Market risk can be defined by volatility: the standard deviation of price movements over some defined horizon using some periodicity of return. Since the intention of equity markets is to participate in the growth of corporate cash flows over time, the clear bias of the average participant is for markets to drift upward. When markets de-risk, they tend to do so in a far more abrupt manner, which leads to larger standard deviation moves, and (definitionally) higher volatility. Further, market cycle impacts, such as increases in aggregate leverage as positive market trends develop, can also lead to structurally more abrupt corrections downward as the loss tolerance decreases as leverage increases.

Exhibit 6 below demonstrates how stable this correlation has been historically. Especially when compared to transitory correlations such as stocks and bonds explored above, the difference is jarring. One River's Volatility strategies leverage dislocations in volatility markets to provide an efficient means of achieving volatility exposures for those looking to hedge market risk or generate alpha.

Exhibit 6:



Source: Bloomberg, One River

SYSTEMATIC TREND AND MACRO RISKS:

Systematic Trend (trend) following strategies are another distinct source of structural correlation. While the realized correlations of trend to major macro risks are by design strongly time-varying, the correlation is taken to be structural, and not transitory. This is because the resulting correlations of a trend strategy to these risks are a result of the systematic investment model used to establish and modulate long and short positioning over time. Accordingly, the investment strategy will participate in prevailing price trends as and when they occur.

Further, trend can work as a successful risk mitigant, as it stands to benefit equally from rising and falling asset prices. Traditional sources of risk, however, are typically heavily biased to benefit from rising asset prices.

By examining daily returns of the SG Trend Index going back to January 2000, trend as an investment strategy has indeed managed to realize a negative correlation to equities, and low correlations to fixed income and commodity risks [8]. Our recent paper, *Improving the Performance and Higher Order Return Properties of the Industry's Dominant Portfolios* (One River whitepaper, April 2020), further spells out how One River's expression of trend is able to trade in and out of trends in a manner we consider to be advantageous – both from a Sharpe ratio and macro asset correlation perspective. We aim to participate in prevailing trends across asset classes more nimbly and precisely than do other players in the trend industry.

[8] Source: Bloomberg, Daily returns from Jan 2000 – June 2021. January 2000 is the inception of the SG Trend index. SG Trend index used for trend, S&P 500 for equities (-0.1 correlation), the same U.S. 10yr bond as used in the prior case study for bonds (+0.2 correlation), and the Bloomberg Commodity Index used for commodities (+0.1 correlation). There are significant variations in these observations, which for trend is an expectation given it is a dynamic beta strategy.

LINKED SECURITIES AND INFLATION RISK:

For a myriad of reasons, chiefly concerning the recent unprecedented monetary and fiscal policy actions, but also extending to global supply chain dynamics and other considerations, inflation risk has become increasingly central in broader allocation discussions. However, here we observe many investors falling into the same transitory versus structural correlation tendency in their chosen expression of inflation hedges as we have seen in market risk hedges. Historical regressions suggest that commodities, particularly precious metals such as gold, are sufficient inflation hedges (and even crisis hedges). However, studies examining the relationship between such hedges and a loss in consumer purchasing power (e.g., CPI) and other inflationary measures presents a very limited time sample over which to draw significant conclusions.

For gold in particular, when examining the most meaningful inflation observation period during the 1970s, it is extremely difficult to disentangle the gold pricing impacts of an abandonment of the Bretton Woods gold standard in 1971 from the inflationary protection it appeared to deliver in the latter half of the decade.

We believe it is also prudent to pursue align portfolios with inflation outcomes by focusing exposures in assets whose pricing mechanism is directly linked to the economic data that measures the phenomenon. Here, inflation-linked securities (e.g., TIPS) can provide just that. Particularly when implemented in strategy that is able to actively manage the duration-risk independently from the income associated with inflation-linked securities, these assets can provide portfolios with a source of structural correlation to inflation risks. Accordingly, One River's Inflation strategy, which is designed to benefit both from volatility in inflation markets and the rising waters of inflation over time, primarily trades inflation-linked instruments.

Part IV: The Hesitancy to Adopt Structural Correlation Frameworks

A natural question that may arise from an investigation into the unreliability of transitory correlations is why this concept of structural correlation is not a prevalently explored topic by asset managers. Making extensive use of transitory cross-asset correlations to achieve diversification has historically provided investors with methods of achieving highly liquid, inexpensive, and readily accessible risk mitigation without having to venture into lower capacity and perhaps lesser-known asset classes and strategies.

Further adding to allocators' reticence to consider alternative risk mitigants over the past decades has been that rates have been continually viewed as low, but able to fall further. With global consensus policy choices invariably marked by accommodation, it has been difficult not to have a positive outlook on continued bond strength. Combining this tailwind with an assumed negative correlation between stocks and bonds, investors could achieve portfolio nirvana: a positive carry hedge. Thus, even if the correlation assumption was off, the resulting portfolio could deliver great return outcomes. The rational allocator, even if uncertain of the stability of that correlation assumption, would consider bonds a valued diversifier. However, with real rates today meaningfully negative, at historic lows[9], and requiring unprecedented policy action to remain that way or drop lower yet, the tailwind to duration has weakened sufficiently to the point where correlation assumptions have become more impactful to portfolio outcomes.

In lieu of sourcing more reliable correlations, the prevailing retort among asset managers who are reliant on a continuation of recent transitory correlations is that their risk models are calibrated to adjust to such changes if they should ever occur. However, the horizons over which these risk models compute risk mode inputs are often similarly data-mined processes that yielded the very conclusions we called into question at the onset of this piece. These slow-moving risk models (that typically use multi-year return horizons to compute correlation inputs) also may rely too strongly on transitory relationships to make future inferences about relative asset returns.

Many of the largest managers of capital today have achieved their scale by pursuing strategies that have relied on these relatively stable cross-asset relationships that have persisted over the last 20+ years. The substantial legacy businesses that would stand to benefit from a continuation of recent transitory correlations of the last few decades are directly incentivized to promote the continuation of such correlations and thus may largely dismiss the probability of meaningful changes to these assumptions.

[9] Source: Bloomberg. July 2021 10-year real rates (USGGT10Y Index) measured at -1.18%, which is the lowestrecorded rate going to the inception of the index.

Conclusion

Our belief, as we have written about extensively over the years (e.g., *The Case for Quantum Change (One River Weekend Notes, September 2021), In Math We Trust* (One River Whitepaper, 2021), *The Case for Digital Assets* (One River Whitepaper, 2021*), Improving the Performance and Higher Order Return Properties of the Industry's Dominant Portfolios* (One River whitepaper, April 2020*), Observations on Post-COVID Inflation Data* (One River Whitepaper, 2020*), False Assumptions and Inconvenient Truths* (One River Whitepaper, 2019), etc.) is that the next few decades are unlikely to provide a market environment that closely resembles that of the last market cycle. Whether this shift is brought about by changes in monetary policy, fiscal programs, geopolitical crosscurrents, reactions to the resulting macroeconomic conditions such as inflation, social turmoil, the introduction of digital assets, climate change effects, ageing demographics, or likely some combination of the above, we believe that the period ahead is unlikely to mirror the previous few.

By leaning on allocations that have more reliable correlation assumptions, allocators may create portfolios that behave in a more predictable manner – particularly during regime shifts. Importantly, while we favor finding sources of structural correlation and layering in such exposures to portfolios, we do not believe it would be wise (nor do we suggest) to entirely overlook or dismiss transitory relationships in allocation decisions. Indeed, such frameworks have led to great outcomes for many allocators because major shifts in relative macro asset relationships are rare. We instead encourage allocators to re-underwrite their existing allocations to understand how portfolio risks might evolve as cross-asset correlations inevitably shift over time.

Our Solutions practice at One River is focused on identifying which relationships in a portfolio are transitory versus structural, such that the effects of an economic regime change can be properly measured and mitigated through allocation decisions.

By introducing sources of structural correlation that do not rely solely on historical return observations to drive convictions in correlation to a portfolio, more resilient risk mitigation can be achieved. We have been working with a number of institutions, ranging from sovereign wealth funds, public state plans, to family offices, on helping them navigate the myriad of considerations that accompany setting up a new risk mitigation program. We welcome such discussions with allocators as they grapple with setting allocation schemes to weather the market cycle ahead.

With inquiries on this piece or any general questions on One River's investment strategies, please reach out to: Patrick Kazley, Investment Strategist - Patrick.Kazley@oneriveram.com

Appendix

RISK PARITY PORTFOLIO ASSUMPTIONS:

Assumed correlation matrices for the simple Risk Parity Portfolios (1973-Present Realizations):

Oct 1998- June 2021

Correlations	Stocks	Bonds	Commodities
Stocks	1.0	-0.3	0.4
Bonds	-0.3	1.0	-0.1
Commodities	0.4	-0.1	1.0

Oct 1981- Oct 1998

Correlations	Stocks	Bonds	Commodities
Stocks	1.0	0.3	0.0
Bonds	0.3	1.0	-0.2
Commodities	0.0	-0.2	1.0

Feb 1973- Oct 1981

Correlations	Stocks	Bonds	Commodities
Stocks	1.0	0.2	-0.1
Bonds	0.2	1.0	-0.1
Commodities	-0.1	-0.1	1.0

The assumed volatilities are:

Volatilities	Oct 1998-June 2021	Oct 1981-Oct 1998	Feb 1973-Oct 1981
Stocks	15.1%	14.9%	16.7%
Bonds	4.3%	5.5%	5.9%
Commodities	15.9%	11.5%	26.0%

These two assumptions come together to form a covariance matrix that is used to fuel the relative weights of a risk parity portfolio, that simply seeks to achieve an equal risk contribution from each asset class.

About One River

Founded in 2013 by Eric Peters, One River Asset Management is an innovative investment manager dedicated to delivering high-conviction absolute-return strategies that help our clients build superior portfolios. We see the world in a period of major economic and political transition, with the investment landscape shifting in ways that will make the coming five years look profoundly different from the past five. Our strategies are built to profit from this dynamic environment while providing strong diversification benefits to traditional investment portfolios. Each is developed and managed in-house by our diverse team of investment professionals with deep expertise in thematic macro, digital assets, volatility, systematic, and inflation trading/investing. The strategies are delivered at sensible fees via commingled funds, and/or in bespoke combinations for large institutions via fund-of-one structures, managed accounts, swaps or UCITS compliant structures. Our commingled funds are as follows.

Volatility Relative Value: The discretionary market-neutral strategy takes long/short positions across global equity index, foreign exchange, interest rate and commodity volatility markets. The strategy is dynamic and can generate positive returns in both bullish and bearish equity environments. Since its September 2018 inception it has generated over a +3 Sharpe with 0% correlation to the HFRX Volatility RV Index - profiting during both the sharp equity market decline in Q4 2018 and the powerful rebound in H1 2019. Our expertise in finding ways to be long vol while minimizing negative carry is a distinct advantage when constructing a Vol RV book that can generate strong, differentiated returns and is built to withstand market dislocations.

Discretionary Long Volatility: The strategy is structured to profit from a rise in cross-asset volatility that is typical at cycle turns and we believe will be a historical outlier in the transition ahead. We take a value-oriented approach to portfolio construction, looking for the best risk-reward opportunities to be long volatility across the globe, with a dominant allocation to equity and high-beta volatility. The highly convex strategy is built to minimize negative carry, and partially crystalize profits through rebalancing and asset class rotation. It has outperformed a wide range of competing long-only volatility strategies since its inception in September 2014.

Dynamic Convexity: This highly convex systematic strategy trades VIX futures, VIX options, and straddles on major global equity indexes and ETFs from the long-side only. It codifies several discrete trading strategies developed and honed through years of trading these markets on a discretionary basis and combines them into a systematic portfolio. Risk is adjusted automatically using a range of signals and measures of value. Profit-taking is embedded into the algorithm, relieving investors of the pressure to time their exit. The strategy has produced positive net returns since its inception in April 2015 even prior to February 2020, with strong returns during crisis periods. We know of no other long-only volatility strategy with this performance profile.

Systematic Trend: The pure trend strategy is informed by deep quantitative research combined with our discretionary macro and volatility expertise. It is sensibly constructed, using a limited number of parameters to improve robustness, and trades 60 of the world's most liquid equity index, fixed income, foreign exchange and commodity markets. We embed common-sense risk management logic into our unique algorithm, combining the attractive attributes of medium to longer-term signals with the nimbleness to get out of positions quickly if needed. The strategy has consistently outperformed the SocGen Trend Index since its inception in December 2014.

Systematic Alternative Markets Trend: The strategy applies One River's existing systematic pure trend algorithm to 104 more esoteric global markets which include developed and emerging market interest rate

swaps, emerging market foreign exchange, credit indexes, equity market sectors, European power and emissions markets, etc. One River has traded these global macro markets for years and has developed the systems to price, trade, and quantify/manage the risks. The fund is the first of its kind to offer a management fee-only share class.

Inflation Alpha: The inflation alpha strategy is an inflation-oriented absolute return, benchmark agnostic strategy that targets a consistent level of active risk. The strategy seeks to benefit from inflation exposure long term, while capitalizing on inflation volatility and dislocations short-and-medium term. Strong and diversifying sources of alpha within the inflation-sensitive markets traded should further improve the strategy's risk-adjusted return. The fund takes risk along three thematic dimensions: Macro Opportunities, Micro Opportunities, and Relative Value Opportunities. These three themes each typically occupy a third of the strategy's active risk. While we believe this approach has an ability to generate outperformance in different market environments, we believe that the current tailwinds to inflation driven by unprecedented Monetary and Fiscal Policy represent a favorable macroeconomic backdrop for such a strategy. The strategy employs a discretionary trading approach, where risk management is integral to every step in the process.

Digital Assets: One River Digital Asset Management is committed to providing investors with access to an emerging digital asset class that includes cryptocurrencies. We seek to provide best-in-class digital investment strategies across liquid and illiquid opportunities. One River Digital's investment platform is supported by the One River Academic and Regulatory Advisory Committee, which is led by Jay Clayton, former Chairman of the Securities and Exchange Commission. We invest today, cognizant of the risks of the asset class, and the requirements of our clients. We expect blockchain technology will re-make the asset management industry, and we seek to leverage that potential.

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