PORTFOLIO MANAGEMENT RESEARCH
By With Intelligence

the journal of PORTFOLIO management

MULTI-ASSET STRATEGIES

volume 49 number 4
MARCH 2023
jpm.pm-research.com

Tactical Asset Allocation, Risk Premia, and the Business Cycle:
A Macro Regime Approach

Alessio de Longis and Dianne Ellis

Invesco

Invesco Ltd. is a global independent investment management firm dedicated to delivering an investment experience that helps people get more out of life. With offices in more than 20 countries, Invesco managed over $1.4 trillion in assets on behalf of clients worldwide as of December 31, 2022. For more information, visit www.invesco.com.

Alessio de Longis

Alessio de Longis is Head of Investments and Senior Portfolio Manager for the Invesco Solutions team. In this role, he leads portfolio management responsibilities, and the investment process for asset allocation and manager selection across the platform. Between 2019-2023, Mr. de Longis led the group's global tactical asset allocation and factor rotation capabilities, focusing on the development, implementation, and management of macro regime-based strategies across asset classes.

Mr. de Longis joined Invesco in 2019 when the firm combined with OppenheimerFunds, where he was team leader and senior portfolio manager of the Global Multi-Asset team. Between 2004 and 2013, he was a member of the OppenheimerFunds Global Debt team, where he served as currency portfolio manager and global macro strategist. He is a published author in the field of macro-based systematic tactical asset allocation, factor investing and currency overlay strategies, and he is regularly featured across financial media outlets.

Mr. de Longis earned an MSc in financial economics and econometrics from the University of Essex, as well as an MA and a BA degree in economics from the University of Rome Tor Vergata. He is a Chartered Financial Analyst® (CFA) charter holder.

Dianne Ellis

Dianne Ellis is a Senior Research Analyst at Invesco for the Investment Solutions Group, based in Singapore. She is responsible for quantitative investment research and development of tactical asset allocation strategies across equity, fixed income, currency and commodity markets. Ms. Ellis joined Invesco when the firm combined with OppenheimerFunds in 2019, where she was research analyst for the Global Multi-Asset Group (GMAG) in New York since 2015. Prior to that, she served as equity derivatives sales trader at Phatra Securities Plc in Bangkok, Thailand. Ms. Ellis earned a BA degree in Economics from Chulalongkorn University in Bangkok and an MS in Financial Engineering from New York University.

Practical Applications of

Tactical Asset Allocation, Risk Premia, and the Business Cycle: A Macro Regime Approach

Practical Applications
Portfolio Management Research

Overview

In ***Tactical Asset Allocation, Risk Premia, and the Business Cycle: A Macro Regime Approach***, from the March 2023 issue of ***The Journal of Portfolio Management***, **Alessio de Longis** and **Dianne Ellis** of **Invesco** propose a tactical asset allocation methodology based on identifying key phases of the business cycle and tilting portfolios toward risk premiums that outperform during each phase. They provide a rules-based approach for predicting phases of the business cycle based on leading economic indicators and the global risk appetite. They focus on three risk premiums as the key elements for implementing the methodology: the term premium, the credit premium, and the equity premium. The authors demonstrate the use of their methodology with multiasset and fixed-income portfolio examples. The examples show a potential to generate excess returns, compared to a buy-and-hold benchmark, while maintaining an equivalent level of risk over the long term.

Practical Applications

- **Risk premiums exhibit distinct performance characteristics in the different stages of the business cycle.** Equity and credit premiums outperform when growth is accelerating during the stages of recovery and expansion. By contrast, term premiums outperform during slowdown and contraction phases, when growth is decelerating.
- **A regime-based tactical asset allocation approach outperforms a buy-and-hold strategic allocation approach for both a long-only multiasset portfolio and a fixed-income portfolio.** This works by adapting to expected changes in the macro environment and repositioning portfolio allocations.
- **A rules-based methodology for predicting phases of the business cycle using leading economic indicators and global risk appetite can be effective for implementing a tactical asset allocation strategy.**

Authors: Alessio de Longis and Dianne Ellis
Source: *The Journal of Portfolio Management*, Vol. 49, No. 4
Date of Article: March 2023
Report Written By: Susan Grigsby
Date of Report: Feb 7, 2023
Keywords: tactical asset allocation, risk premiums, regime-based asset allocation, business cycle

Discussion

Institutional and retail investors are faced with the common dilemma of how to manage asset-allocated portfolios over time. With strategic asset allocation (SAA), investors build portfolios anchored to long-term expected outcomes. Even though many investors have a long-term horizon, they also care about performance and risk over the short and medium term. Tactical asset allocation (TAA) is a means of addressing short-term fluctuations in the market and the economy by repositioning portfolio allocations in response to changes in the macro environment.

> "Tactical asset allocation (TAA) solutions have emerged to address these issues, which have become more prominent in recent decades because of more-pronounced market fluctuations, larger economic shocks, and meaningful economic policy responses."
>
> ***—Tactical Asset Allocation, Risk Premia, and the Business Cycle: A Macro Regime Approach***

DEFINING THE MACRO REGIMES

The authors combine US leading economic indicators (US LEI) with a global risk appetite cycle indicator (GRACI) to identify predictive economic regimes. Each regime is a different stage of the business cycle and is based on the level and change in economic growth. The constructed LEI assesses whether growth is above or below its long-term trend, while the GRACI indicator assesses whether growth is expected to accelerate or decelerate. The authors explain that cyclical fluctuations in global risk premiums can be used to forecast subsequent variation in economic growth and future risk premiums. In constructing the GRACI, they define global risk appetite as the incremental return received by investors for taking an incremental unit of risk in global financial markets.

The effectiveness of using a TAA framework with defined macroeconomic regimes has been previously documented. The authors define four predictive regimes. In the recovery stage, growth is below trend and accelerating. In the expansion stage, growth is above trend and accelerating. In the slowdown stage, growth is above

trend and decelerating. In the contraction period, growth is below trend and decelerating.

RISK PREMIUMS

Having identified four distinct regimes, the authors next explore the time-varying performance of different risk premiums in each stage of the business cycle. They focus on three traditional risk premiums in their regime-dependent analysis.

The *term premium* (TRP) is the additional compensation investors receive for duration risk. This risk is taken when one moves from short-dated to long-dated government bonds. The additional compensation received is for assuming risk by locking in an expected real rate and inflation rate over the life of the asset. The authors' regime-dependent analysis of TRP looks at data from 1988 to 2021. They find that the bulk of returns have come during slowdown and contraction regimes. When growth is decelerating, investors are compensated to take duration risks.

The *credit risk premium* (CRP) is the additional compensation received for taking default risks. This risk is assumed when one moves from government bonds to corporate bonds. The *equity risk premium* (ERP) is the additional compensation received when one moves from fixed income to equities. The authors' regime-dependent analysis finds that investors are compensated to take equity and credit risk when growth is accelerating in the recovery and expansion stages. When growth is decelerating, investors receive limited or negative compensation for credit and equity risk.

In order to properly evaluate the performance of asset classes in each macro regime, it is essential to go one step further and decompose the asset returns by their underlying risk premiums, the authors say. They use a building-blocks approach to show the risk premium composition of asset returns. This approach offers quantifiable insights into the economic drivers of asset returns that might not be apparent when looking at overall performance. It also makes it possible to compare the absolute and relative performance among the different regimes. For example, the analysis of overall asset returns shows a return on equities of 10.8% in the expansion regime, when growth is accelerating, and 17.5% in the slowdown regime, when growth is decelerating. This observation could lead to a counterintuitive conclusion that equity risk performs better in times of decelerating growth. However, the risk premium decomposition reveals that this outperformance of equity actually is driven by duration risk.

> “...understanding the risk premia composition of asset returns and mapping them to macro regimes allows investors to understand when they are compensated to take risk, what type of risk, and where to source that risk in each stage of the business cycle.”
>
> ***—Tactical Asset Allocation, Risk Premia, and the Business Cycle: A Macro Regime Approach***

INVESTMENT IMPLICATIONS

The authors provide a detailed visual chart that maps risk premiums to asset classes by macro regime; this information can support a process of tactical allocation among asset classes and within asset classes. They provide a discussion of risk premiums in each regime and how one might apply a TAA strategy. And they offer suggestions for multiasset and fixed-income investors. For example, a slowdown regime provides a chance for multiasset investors to reduce overall portfolio volatility, decrease exposure in credit or equities relative to allocations in the expansion regime, and increase exposure to long-term government bonds. For fixed-income investors, the results suggest tilting the portfolio toward long-dated government bonds and short-dated credit.

Using a standard strategic 60/40 multiasset benchmark, the authors provide an example of a regime-based TAA process. The stated goal is to outperform the static benchmark by increasing portfolio risk when growth is improving and reducing portfolio risk when growth is decelerating, while maintaining the same level of risk as the static allocation over a full market cycle. The results are positive, with an average annual excess return of 0.80% for the TAA portfolio, with a 1.00% tracking error relative to the benchmark.

Exhibit 1 shows the repositioning of asset holdings under each regime. Across the four regimes, the portfolio allocations are in a range of 57%–66% for equities, 3%–20% for risky credit, and 11%–27% for government bonds.

Exhibit 1: Regime-Based Asset Allocation Adjustments for a Multiasset Portfolio (%)					
	Benchmark	Recovery	Expansion	Slowdown	Contraction
MSCI All Country World Idx	60	+4.0	+6.0	+1.8	–3.0
Bloomberg US Treasury Idx	20	–3.0	–8.5	+6.1	+6.5
Bloomberg US IG Corp. Idx	10	–7.0	–7.8	–4.0	+3.3
Bloomberg US HY Corp. Idx	5	+6.3	+5.6	+0.7	–1.8
CS Leveraged Loan Idx	5	–0.3	+4.6	–4.7	–5.0
Total	100	0.0	0.0	0.0	0.0

The macro regime framework also can be applied to a single asset class. Detailed examples are provided for a US fixed-income portfolio. The benchmark portfolio consists of 60% government bonds (of which 10% are in Treasury Inflation Protected Securities) and 40% investment-grade corporate credit. The authors include a discussion of allocation decisions relevant to inflation risk. Results are positive for the TAA portfolio, with an average annual excess return of 0.62%, with a tracking error of 0.81%, compared to the static benchmark portfolio.

Alessio de Longis

alessio.delongis@invesco.com

Alessio de Longis is a senior portfolio manager at Invesco and head of global tactical asset allocation within the company's investment solutions group. He leads the research, development, and portfolio management of tactical allocation strategies across asset classes and factors, including currency overlay strategies. Mr. de Longis joined Invesco in 2019 when the firm combined with OppenheimerFunds, where he was a team leader and senior portfolio manager for the global multiasset group. From 2004 to 2013, he served as a currency portfolio manager and macro research analyst for the global debt team. He has published several articles on macro-based factor investing and asset allocation and is regularly featured across financial media outlets. Mr. de Longis earned an MSc in financial economics and econometrics from the University of Essex, as well as MA and BA degrees in economics from the University of Rome Tor Vergata. He is a CFA charterholder.

Dianne Ellis

dianne.ellis@invesco.com

Dianne Ellis is a senior research analyst in Invesco's investment solutions group, based in Singapore. She is responsible for quantitative investment research and development of tactical asset allocation strategies across equity, fixed-income, currency, and commodity markets. Ms. Ellis joined Invesco when the firm combined with OppenheimerFunds in 2019, where she was a research analyst for the global multiasset group in New York since 2015. Prior to that, she served as an equity derivatives sales trader at Phatra Securities Plc in Bangkok. Ms. Ellis earned a BA degree in economics from Chulalongkorn University in Bangkok and an MS in financial engineering from New York University.

Tactical Asset Allocation, Risk Premia, and the Business Cycle: A Macro Regime Approach

Alessio de Longis and Dianne Ellis

Alessio de Longis
is head of GTAA Solutions and a senior portfolio manager at Invesco in New York, NY.
alessio.delongis@invesco.com

Dianne Ellis
is a senior research analyst at Invesco in Singapore.
dianne.ellis@invesco.com

KEY FINDINGS

- Asset classes exhibit distinct performance characteristics between the different stages of the business cycle, driven by their underlying risk premia return composition.
- Equity, credit, and term premia display statistically significant regime-dependent performance, suggestive of when investors are compensated to take each type of risk.
- The authors provide examples of regime-dependent tactical asset allocation strategies with statistically significant excess returns for multi-asset and fixed-income portfolios.

ABSTRACT

Market conditions change over the course of the business cycle. When are investors compensated to take risk? And what type of risk? This article proposes a practical regime-based framework for tactical asset allocation (TAA), combining leading economic indicators and global risk appetite to identify four macro regimes: recovery, expansion, slowdown, and contraction. The authors document distinct performance characteristics across regimes for traditional asset classes and their underlying risk factors, focusing on the term premium, credit premium, and equity premium. They provide simple and practical examples of TAA strategies for long-only multi-asset and fixed-income portfolios with the potential to generate attractive excess returns. Results are statistically significant and economically relevant after transaction costs, with information ratios between 0.70 and 0.80.

Institutional and retail investors face the common dilemma of how to manage asset allocated portfolios over time. Should allocations be strategic and stable or should they be actively managed in response to changing investment opportunities and market environments? Asset allocation research and portfolio management practices have evolved over time to address these questions.

Strategic asset allocation (SAA) solutions typically incorporate forward-looking return, risk, and correlation estimates as inputs to portfolio construction. These inputs tend to focus on expectations over long-term (10+ year) investment horizons. Return forecasts that are aligned with these longer horizons are often developed using a "building blocks" approach, where different components of expected returns are added together to arrive at the total return estimate for each asset class (Jacobs and Kobor 2021; Invesco Investment Solutions 2021). For example, expected returns on equities might consider dividends, earnings growth, and expectations for changes in valuation relative to some mean level. While strategic asset allocation return expectations might consider such relevant elements as valuations (Campbell and

Shiller 1998; Dahlquist and Harvey 2001) and other structural changes, they remain anchored to long-term expected outcomes.

Over the short and medium term, business cycle fluctuations and investor sentiment tend to exert a large influence on asset prices, leading to meaningful divergence between realized medium-term returns (i.e., 1–3 years) and long-term expected returns (i.e., 10 years). While most investors have a long-term investment horizon, they often care about performance and risks over the medium term, as investment results over one-year, three-year, and five-year periods may alter financial plans, affect behavioral investment biases, and influence future investment decisions (Remolona et al. 1997; Friesen and Sapp 2007). Tactical asset allocation (TAA) solutions have emerged to address these issues, which have become more prominent in recent decades because of more pronounced market fluctuations, larger economic shocks, and meaningful economic policy responses.

This article explores the efficacy and benefits of a regime-based TAA framework that repositions portfolio exposures by adapting to changes in the macro environment. Using a forward-looking framework to identify the four stages in the business cycle—recovery, expansion, slowdown, and contraction—we document the performance of traditional risk premia by macro regime, focusing on the term premium, credit premium, and equity premium. The equity and credit premium are cyclical and tend to outperform (underperform) when growth improves (deteriorates), while the term premium is countercyclical and tends to outperform (underperform) when growth is deteriorating (improving). It is essential to decompose asset returns by their underlying risk premia to properly evaluate the performance of asset classes in each macro regime and to understand when investors are compensated to assume each type of risk. Finally, we provide examples of regime-based TAA strategies for multi-asset and fixed-income portfolios with the potential to generate attractive excess returns, while maintaining the same risk as the benchmark over the long term. This framework is applicable to both long-only investors with no access to derivatives and to those with long–short mandates with ample flexibility to calibrate risk premia exposures via unfunded instruments.

This research contributes to the literature in two ways. First, we expand on the contribution from Polk, Haghbin, and de Longis (2020) who combined leading economic indicators and global risk appetite to identify macro regimes predictive of differentiated performance between equity factors (value, size, quality, low volatility, and momentum). Our analysis extends their conclusions to a multi-asset and multi-sector fixed-income perspective. Second, we provide an ex post decomposition of asset returns into their risk premia across the different stages of the cycle, offering a transparent, intuitive, and consistent link between economic growth and the pricing of growth risk within each asset class, a link not immediately visible in overall asset class returns typically reported in most studies.

TIME-VARYING RISK PREMIA AND THE BUSINESS CYCLE

Analyzing asset classes by their underlying risk premia building blocks provides a more accurate understanding of the economic drivers of returns. Sophisticated investors have increasingly moved beyond traditional asset class diversification toward macro factor diversification, calibrating a portfolio to target a diversified exposure to these return drivers. The benefits of this approach in the construction of SAA solutions have been documented by Bender et al. (2010), Asl and Etula (2012), and Swade et al. (2022). Many studies have explored the time variation of risk premia and documented the large influence of macroeconomic factors. Time variation in risk premia is not a violation of market efficiency but rather a manifestation that rewards for taking risk, as well as the level of risk, in the different stages of the business cycle.

Several macro factors have been found to have significant explanatory power, but generally speaking, growth is found to be the most important driver of traditional fixed-income and equity premia (Fama and French 1989, 1993; Rapach, Strauss, and Zhou 2009; Asvanunt and Richardson 2016), equity style premia (Hodges et al. 2017; Polk, Haghbin, and de Longis 2020; Chousakos and Giamouridis 2020), and alternative style premia (Scherer and Apel 2020; Swade et al. 2021). In addition to the growth factor, such variables as inflation (Chen, Roll and Ross 1986), volatility, and leverage (Bansal et al. 2014; Campbell et al. 2018) have been found to carry additional explanatory power of asset performance.

Several approaches have documented the effectiveness of TAA frameworks that use macroeconomic information. These can be broadly classified into two categories. In one category, proposed methodologies score each asset class based on its sensitivity to a selected macro variable, such as growth or inflation, and develop ranking systems or dashboards to inform asset allocation decisions (Chong and Phillips 2014; Clewell et al. 2017; Chousakos and Giamouridis 2020; Schnetzer 2020). In a second category, asset or risk premia performance is analyzed conditional on the prevailing macroeconomic regime and different portfolios are constructed considering regime-dependent return and risk characteristics (Kritzman, Page, and Turkington 2012; Ilmanen, Maloney, and Ross 2014; Van Vliet and Blitz 2011; Scherer and Apel 2020; Polk, Haghbin, and de Longis 2020).

Our methodology aligns with this regime-based approach to tactical asset allocation, which presents several advantages. It is fundamentally intuitive, easily applicable, and it generates transparent regime-based allocation scenarios, facilitating consistency and integration of portfolio allocations across asset classes, style, and factor premia.

DEFINING MACRO REGIMES

Following the regime methodology from Polk, Haghbin, and de Longis (2020),[1] we combine leading economic indicators and global risk appetite to identify predictive economic regimes. We classify the different stages of the business cycle based on the level and change in economic growth and define four regimes:

1. *Recovery*: growth below trend and accelerating.
2. *Expansion*: growth above trend and accelerating.
3. *Slowdown*: growth above trend and decelerating.
4. *Contraction*: growth below trend and decelerating.

Exhibit 1, Panel A, provides a *stylized* plot of these regimes. To forecast the evolution of the economic cycle along these regimes, we construct a macro framework based on the interaction between a US leading economic indicator (US LEI) and a global risk appetite cycle indicator (GRACI) using the following rules:

$$Recovery_{t+1}: US\ LEI_t < LT\ LEI\ trend_t\ \&\ GRACI_t \geq MA(GRACI)_t$$

$$Expansion_{t+1}: US\ LEI_t \geq LT\ LEI\ trend_t\ \&\ GRACI_t \geq MA(GRACI)_t$$

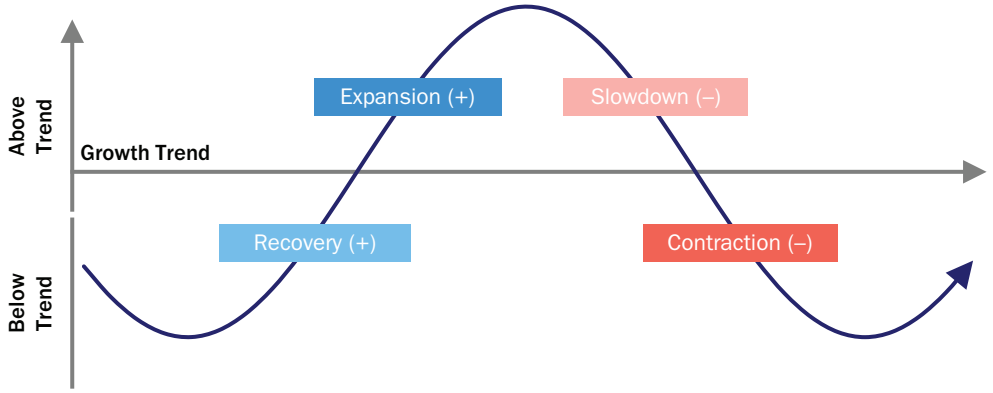
$$Slowdown_{t+1}: US\ LEI_t \geq LT\ LEI\ trend_t\ \&\ GRACI_t < MA(GRACI)_t$$

[1] Their research documented the cyclicality of equity factors (value, size, low volatility, quality, and momentum), with consistent results across geographies and market-capitalization segments.

EXHIBIT 1

Defining Macro Regimes

Panel A: Stylized Business Cycle Regimes



Panel B: Model-Based Regime Classification

GRACI Accelerating	Recovery	Expansion
GRACI Decelerating	Contraction	Slowdown
	US LEI below Long-Term Trend	**US LEI above Long-Term Trend**

SOURCE: For illustrative purposes only.

$$Contraction_{t+1}: US\ LEI_t < LT\ LEI\ trend_t\ \&\ GRACI_t < MA(GRACI)_t$$

where $LT\ LEI\ trend_t$ stands for long-term trend in the US LEI at time t, and $MA\ (GRACI)_t$ indicates a moving average in the GRACI at time t. In other words, the forecasting rule of the four regimes is driven by whether a) the US LEI is above or below its long-term trend and b) whether GRACI is above or below its short-term moving average (i.e., accelerating or decelerating). These rules are also summarized in Panel B of Exhibit 1, where the four macro regimes are mapped to their model-based forecast rules.

First, we construct a US leading economic indicator to determine whether growth is likely to be above or below trend, using a panel of variables similar to the OECD US composite leading indicator.[2] To eliminate well-known issues of look-ahead bias in statistical filtering techniques, we use a simple z-scoring procedure to de-trend, normalize, and smooth each variable. First vintage economic data are used as far back as possible, to ensure a realistic use of information available at the time.[3] Finally, these normalized variables are equally weighted into a composite index.

Second, we estimate future directional changes in economic growth from cyclical fluctuations in global risk appetite. Financial markets contain information about

[2] Information on the OECD composite leading indicators is available at https://www.oecd.org/sdd/leading-indicators/oecdcompositeleadingindicatorsreferenceturningpointsandcomponentseries.htm.

[3] We source first vintage economic statistics from the Alfred database of the Federal Reserve.

future economic activity, as market participants discount information affecting future fundamentals in real time. Notably, asset prices can reflect a broader set of fundamental news, such as changes in monetary conditions, fiscal policy announcements, corporate news, global financial shocks, and so on. While these fundamental drivers affect economic activity with a lag, market participants continuously revisit their economic outlook and adjust their propensity to take risk accordingly. Indeed, in almost all models, market premia and risk aversion are tied to the amount of risk in the economy, and both of these have been shown to be negatively correlated with business conditions (Campbell and Cochrane 1999 for the former; Black 1976 for the latter). Thus, cyclical fluctuations in global risk premia can be used to forecast subsequent variation in economic growth and future risk premia. In a related fashion, we define global risk appetite as the incremental return received by investors for taking an incremental unit of risk in global financial markets and construct it using cross-sectional regressions of risks and returns on country-level equity, government bond, and corporate bond indices across both developed and emerging markets.[4] Consistent with the literature, this indicator has a strong and statistically significant correlation with several proxies of the global business cycle (de Longis and Ellis 2019).[5] Our US LEI and GRACI indicators are illustrated in Exhibit 2.

Our final composite macro regime framework combines the US leading economic indicator and global risk appetite to forecast the four stages of the business cycle, as illustrated in Exhibit 1, Panel B. The output of our model is illustrated in Exhibit 3, where estimated macro regimes are plotted through time and visually compared with realized GDP growth. Exhibit 3 is suggestive of the predictive content of this model-based regime classification versus directional changes in realized GDP growth.

RISK PREMIA DEFINITIONS AND DATA DESCRIPTION

For a comprehensive review of the literature, we refer readers to Ilmanen (2011, 2012), including an in-depth discussion of ex ante risk premia measures across traditional and alternative asset classes. We limit our discussion to traditional risk premia, with a brief description of the theoretical rationale, economic characteristics, and ex post performance measurement.

The *term premium* (TRP) refers to the additional compensation received by investors for duration risk (or horizon risk), assumed when moving from short-dated to long-dated government bonds (default risk free). It is measured ex post as the excess returns of long-dated government bonds over short-term government bonds or bills. The term premium provides compensation for duration extension, or "locking-in" the expected real rate and inflation rate over the life of the asset. Its performance tends to be countercyclical, or defensive, as yields tend to rise (fall) when economic growth is accelerating (decelerating), leading to lower (higher) bond returns.[6]

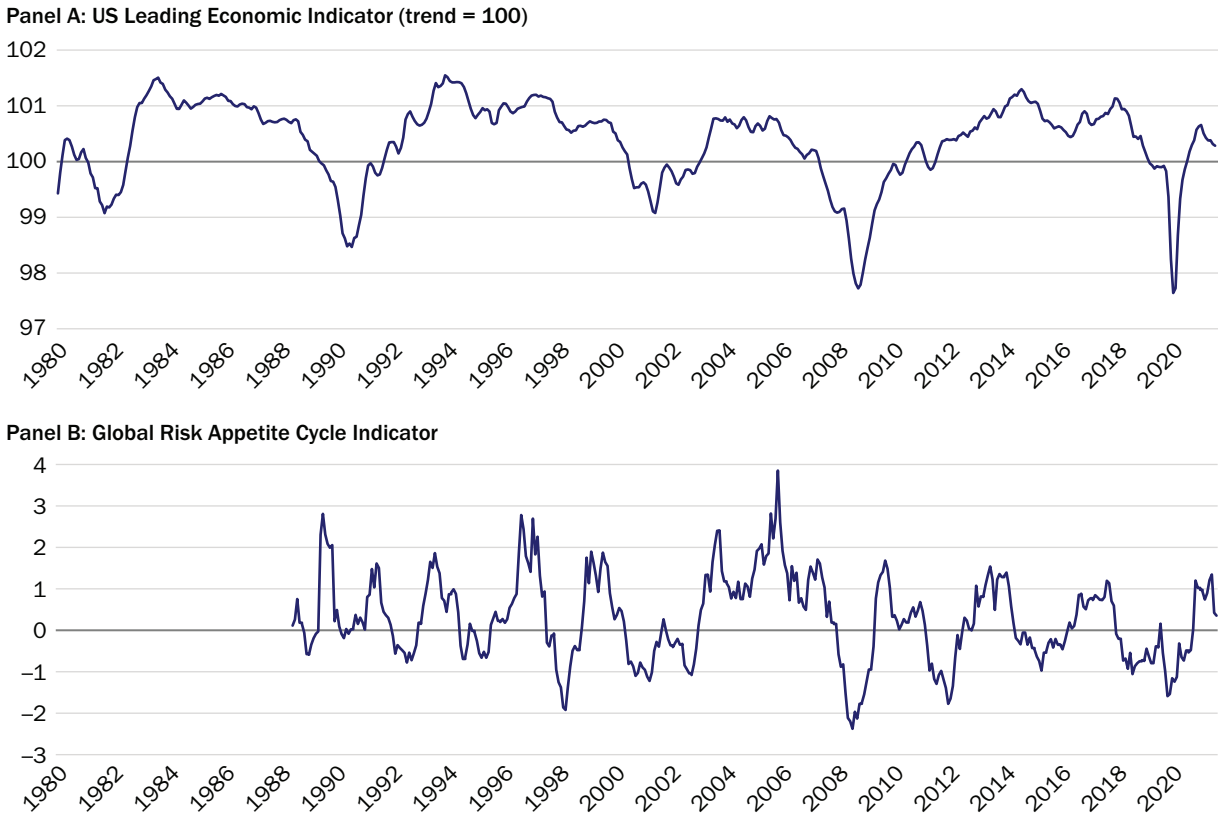
[4] Polk, Thompson, and Vuolteenaho (2006) show how cross-sectional techniques can be used to forecast time variation in the market risk premium. Similarly, Kumar and Persaud (2002) use cross-sectional regressions of risks and returns to extract investor behavior and risk appetite, emphasizing the increasing importance of global financial markets, in addition to domestic fundamentals, given the exponential increase in trade linkages, cross-border capital flows, and portfolio contagion channels.

[5] For example, our global risk appetite indicator has correlations ranging between 0.70 and 0.75 with such indicators as the Global Manufacturing PMI survey, the Global Employment PMI Manufacturing survey, and global industrial production growth. These correlations are all statistically significant at the 99% confidence level. In addition, risk appetite exhibits leading properties in the identification of cyclical turning points in these variables by 2–3 months. See also de Longis and Ellis (2019).

[6] Since the late 1990s, this defensive characteristic has increased given the negative correlation between equity and government bond markets, with the safe-haven role of Treasuries arguably justifying a smaller term premium on average.

EXHIBIT 2

Business Cycle Regime Indicators (LEI and GRACI)



SOURCES: For Panel A, Bloomberg L.P., OECD, Federal Reserve, Bureau of Economic Analysis (June 30, 1980–December 31, 2021). For Panel B, Bloomberg, FTSE Russell, MSCI Inc., JPMorgan (December 31, 1988–December 31, 2021). Authors' calculations. Sample time period dictated by data availability.

EXHIBIT 3

Model-Predicted Business Cycle Regimes versus Realized GDP Growth

SOURCES: US GDP from the Bureau of Economic Analysis (January 1989–December 2021). Business cycle regimes are computed by the authors, based on the composite business cycle regime model outlined in the text, using a combination of US leading economic indicators and the global risk appetite indicator. US GDP data do not contribute to the calculation of the regimes, and they are illustrated for reference purposes only. Sample time period dictated by data availability.

We define the US term premium for short, intermediate, and long-term maturities as follows:

- US TRP (3–5Y) = FTSE US Treasury 3–5Y Total Return Index – US 3M T-bill
- US TRP (7–10Y) = FTSE US Treasury 7–10Y Total Return Index – US 3M T-bill
- US TRP (10Y+) = FTSE US 10Y+ Treasury Total Return Index – US 3M T-bill

The *credit risk premium* (CRP) refers to the additional compensation received by investors for default risk, assumed when moving from government bonds to corporate bonds, and it is measured ex post as the excess returns of a corporate bond index relative to a duration-matched government bond index. The credit premium can be measured for different sectors, such as investment grade, high yield, leveraged loans, as well as sovereign default risk such as in emerging markets hard currency debt. The CRP tends to be cyclical, with default risk being positively correlated with economic risk. As growth expectations improve (deteriorate), default risk tends to decline (increase) resulting in higher (lower) excess returns for credit assets. We define the CRP for multiple asset classes as follows:[7]

- Investment Grade (IG) CRP = Bloomberg US Corporate Bond Excess Returns Index
- High Yield (HY) CRP = Bloomberg US Corporate High Yield Excess Returns Index
- Emerging Markets Debt (EMD) CRP = Bloomberg Emerging Markets USD Aggregate Excess Return Index
- Leveraged Loans (LL) CRP = Credit Suisse Leveraged Loan Total Return Index – US 3M T-bill

The *equity risk premium* (ERP) refers to the additional compensation received by investors for the incremental risk assumed when moving from fixed income to equities. The ERP tends to be cyclical, exhibiting positive exposure to the economic cycle. As growth expectations improve (deteriorate), earnings or cash flow expectations improve (deteriorate). Different ERP measures have been used in the literature such as equity excess returns over cash, over a long-term Treasury bond (which is a better horizon/duration match for equities), or over a long-term corporate bond to account for the incremental risk assumed by equity investors relative to senior claims of bond holders on the firm's assets. While the ERP can be more appropriately defined as this last term, the most common approach in the literature is to measure the ERP as excess returns over long-dated government bonds.[8] We present results for these last two measures and define them as follows:

- US ERP-GB = SP500 Total Return Index – FTSE US Treasury 10Y+ Total Return Index

[7] For historical data on the credit premium, we limit the analysis to these benchmark indices that provide accurate duration/maturity matching between credit and T-bonds. Many studies in the literature offer longer times-series estimates of the credit premium using the difference in long-term corporate bonds and long-term government bonds from Ibbotson's "Stocks, Bonds, Bills and Inflation" dataset. However, these estimates of the credit premium are flawed, as the corporate and sovereign bond return series are not duration/maturity matched, retaining meaningful residual interest rate risk (Hallerbach and Houweling 2013).

[8] For examples of empirical estimates of equity duration, see Schroder and Esterer (2011) and Blitzer et al. (2010). Our decomposition of equity returns into the risk-free rate + TRP + CRP + ERP provides a simple but effective intuition behind the different sources of returns in the asset class and how their risks vary during the business cycle. From a theoretical standpoint, it is debatable whether the equity risk premium over corporate bonds ERP-CB can be seen strictly as the residual of total equity returns minus the CRP, TRP, and the risk-free rate. Equities may have different durations than the underlying assumed sovereign and corporate bonds. Equities also embed different issuer risk than corporate bonds, as volatility tends to hurt debt holders relative to equity holders, with the former having effectively sold upside risk to the latter; that is, debt holders have written a call option to equity holders.

- US ERP-CB = SP500 Total Return Index – Bloomberg US Corporate Bond 10Y+ Total Returns Index

Finally, we calculate the global equity risk premium relative to long-dated government bonds as follows:

- Global ERP-GB = MSCI ACWI Total Return Index – FTSE US Treasury 10Y+ Total Return Index

RESULTS

Exhibit 4 reports both unconditional and regime-dependent returns, volatilities, and information ratios, along with their statistical significance. Results are consistent with economic intuition and meet standard significance thresholds. Investors are compensated to take equity and credit risk when growth is accelerating (recovery and expansion), while receiving limited or negative compensation when growth is decelerating (slowdown and contraction), in which case investors are compensated to harvest term premium risk and increase duration.[9]

Term Premium

Unconditional returns are statistically significant over the long term across maturities. Regime-dependent analysis indicates the bulk of returns has come during slowdown and contraction regimes. Investors are compensated to increase duration risk when growth is decelerating as yields decline. Recoveries still experience positive returns on average, but insignificant, as monetary policy typically remains accommodative in this regime. Conversely, the term premium tends to experience negative returns in expansionary regimes, although not statistically significantly, as bond yields rise during periods of above trend and accelerating growth, usually accompanied by rising inflation and monetary policy tightening.

Credit Premium

Unconditional returns for the investment-grade credit premium have been positive but statistically insignificant, consistent with prior literature (Ilmanen 2011, 2012),[10] while returns for lower quality credit premia, such as high yield, levered loans, and emerging markets debt, have been positive and significant over the long term. Regime analysis indicates all credit premia outperform in the recovery phase, with strong and significant returns in all credit sectors driven by meaningful spread compression. In the first phase of the cycle credit assets benefit from both high income and capital appreciation, resulting from spreads above their long-term average. In expansions, returns are still positive and significant for lower-quality credit premia. IG credit delivers marginal and insignificant compensation for growth risk. In this regime, credit

[9] Results are confirmed under a global business cycle regime framework, derived from the interaction of the global risk appetite cycle indicator and a global leading economic indicator which aggregates regional LEIs for the US markets, developed markets ex-US, and emerging markets (results in Appendix).

[10] While historical average IG spreads have exceeded default rates, the *ex-post* IG credit premium has been poor. Ilmanen (2011, 2012) argues that one possible explanation is that index investors constrained by rating requirements, unlike buy-and-hold investors, are forced to sell bonds that are downgraded from IG to HY status, that is, BB rated "fallen angels." As is well known, the BB rated sector has historically provided the best long-term performance of any bond rating category, partially resulting from this market segmentation and the rating constraints under which much of the fixed-income industry operates.

EXHIBIT 4

Regime-Dependent Risk Premia Performance (US regimes)

	Buy & Hold	Recovery	Expansion	Slowdown	Contraction	Growth Accelerating Recovery & Expansion	Growth Decelerating Slowdown & Contraction
Term Premium (TRP), 1988–2021, obs:	401	55	140	146	60	195	206
UST 3–5Y							
Average Annualized Returns	2.38%***	2.33%	–0.25%	3.2%***	6.58%***	0.47%	4.18%***
Standard Deviation	3.32%	3.68%	3.08%	3.00%	3.82%	3.27%	3.28%
Information Ratio	0.72	0.64	–0.08	1.07	1.72	0.15	1.28
UST 7–10Y							
Average Annualized Returns	3.63%***	1.28%	–0.66%	6.47%***	8.94%***	–0.11%	7.19%***
Standard Deviation	6.02%	6.61%	5.75%	5.12%	7.45%	5.99%	5.89%
Information Ratio	0.60	0.19	–0.12	1.26	1.20	–0.02	1.22
UST 10Y+							
Average Annualized Returns	5.41%***	–0.19%	–0.95%	11.48%***	10.65%*	–0.73%	11.24%***
Standard Deviation	10.03%	10.40%	9.90%	8.63%	12.19%	10.02%	9.77%
Information Ratio	0.54	–0.02	–0.10	1.33	0.87	–0.07	1.15
Credit Premium (CRP)							
Investment Grade (1988–2021) obs:	401	55	140	146	60	195	206
Average Annualized Returns	0.74%	6.62%***	0.34%	0.47%	–3.02%	2.11%***	–0.54%
Standard Deviation	4.24%	4.84%	1.98%	2.57%	8.44%	3.16%	5.04%
Information Ratio	0.18	1.37	0.17	0.18	–0.36	0.67	–0.11
High Yield (1988–2021), obs:	401	55	140	146	60	195	206
Average Annualized Returns	2.85%*	15.68%***	2.68%*	1.13%	–4.34%	6.35%***	–0.46%
Standard Deviation	9.27%	10.68%	5.18%	6.39%	17.23%	7.34%	10.72%
Information Ratio	0.31	1.47	0.52	0.18	–0.25	0.87	–0.04
Leveraged Loans (1992–2021), obs:	360	44	131	137	48	175	185
Average Annualized Returns	3.19%***	14.02%***	3.14%***	2.73%***	–5.29%	5.87%***	0.64%
Standard Deviation	5.45%	6.14%	2.31%	2.52%	12.02%	3.89%	6.53%
Information Ratio	0.59	2.28	1.36	1.09	–0.44	1.51	0.10
EM External Debt (1993–2021), obs:	348	42	131	129	46	173	175
Average Annualized Returns	4.47%**	12.68%**	7.35%***	1.78%	–3.68%	8.64%***	0.34%
Standard Deviation	11.45%	9.14%	7.56%	12.83%	16.94%	7.97%	13.99%
Information Ratio	0.39	1.39	0.97	0.14	–0.22	1.08	0.02
Equity Risk Premium (ERP), 1988–2021, obs:	401	55	140	146	60	195	206
US ERP-GB (vs. UST 10Y+)							
Average Annualized Returns	3.56%	16.43%*	8.39%*	3.23%	–18.72%	10.66%***	–3.15%
Standard Deviation	18.62%	19.61%	14.78%	16.45%	27.57%	16.27%	20.46%
Information Ratio	0.19	0.84	0.57	0.20	–0.68	0.66	–0.15
US ERP-CB (vs. US Corp 10y+)							
Average Annualized Returns	3.58%	6.26%	8.32%**	5.11%	–13.64%	7.74%**	–0.35%
Standard Deviation	14.47%	15.74%	12.24%	12.69%	20.34%	13.28%	15.46%
Information Ratio	0.25	0.40	0.68	0.40	–0.67	0.58	–0.02
Global ERP–GB (vs. UST 10Y+)							
Average Annualized Returns	0.92%	13.95%	7.36%*	–0.09%	–23.56%*	9.22%**	–6.93%
Standard Deviation	19.39%	20.72%	14.50%	17.69%	28.62%	16.46%	21.60%
Information Ratio	0.05	0.67	0.51	–0.01	–0.82	0.56	–0.32

NOTES: Risk premia definitions are outlined in the section "Risk Premia Definitions and Data Description." The sample period is August 1988–December 2021 or since index inception if it is a later date, as reported in the exhibit. Sample time period is dictated by data availability on credit risk premium for IG and HY excess return indices. US ERP-CB stands for ERP versus corporate bonds (IG); US ERP-GB stands for ERP versus government bonds (UST). *, **, and *** denote rejection of the null hypothesis that returns are equal to zero for a two-tailed p-value at the 10%, 5%, and 1% significance levels, respectively.

SOURCES: Bloomberg, authors' calculations using US business cycle regimes as defined in the text.

excess returns are generally limited to higher income over government bonds, with marginal spread compression. In the slowdown phase, returns are still positive but generally insignificant, except for leveraged loans, indicating decreasing compensation for risk. Finally, credit premia have experienced negative returns during the contraction phase, with larger underperformance for lower-quality assets.

Equity Premium

Realized unconditional returns for the US equity premium have been positive (~3.6% per annum) but statistically insignificant over the period 1988–2021, whether measured versus long-term government bonds or corporate bonds. These results are consistent with studies using data going back to the early 1900s, documenting that the ERP tends to be larger and statistically significant when measured against cash or intermediate Treasuries but smaller and less significant when measured against 20Y+ Treasuries (Ilmanen 2011, 2012). From a regime-dependent perspective, investors have been compensated for taking equity risk during recoveries and expansions, when growth is accelerating, with positive and statistically significant returns. In slowdown regimes, when growth is above trend but decelerating, returns have been positive but not significant. In contraction regimes, returns have been negative and approaching statistical significance, indicating investors have been penalized, on average, for assuming equity risk when growth is below trend and decelerating. In line with the literature, empirical evidence of the global ERP is weaker, with lower returns relative to the US ERP and statistically insignificant (Dimson, Marsh, and Staunton 2021). However, regime analysis confirms positive and statistically significant returns when growth is improving (i.e., recoveries and expansions), positive but insignificant returns in slowdowns, and statistically significant negative returns in contractions.

MAPPING RISK PREMIA TO ASSET CLASSES AND MACRO REGIMES

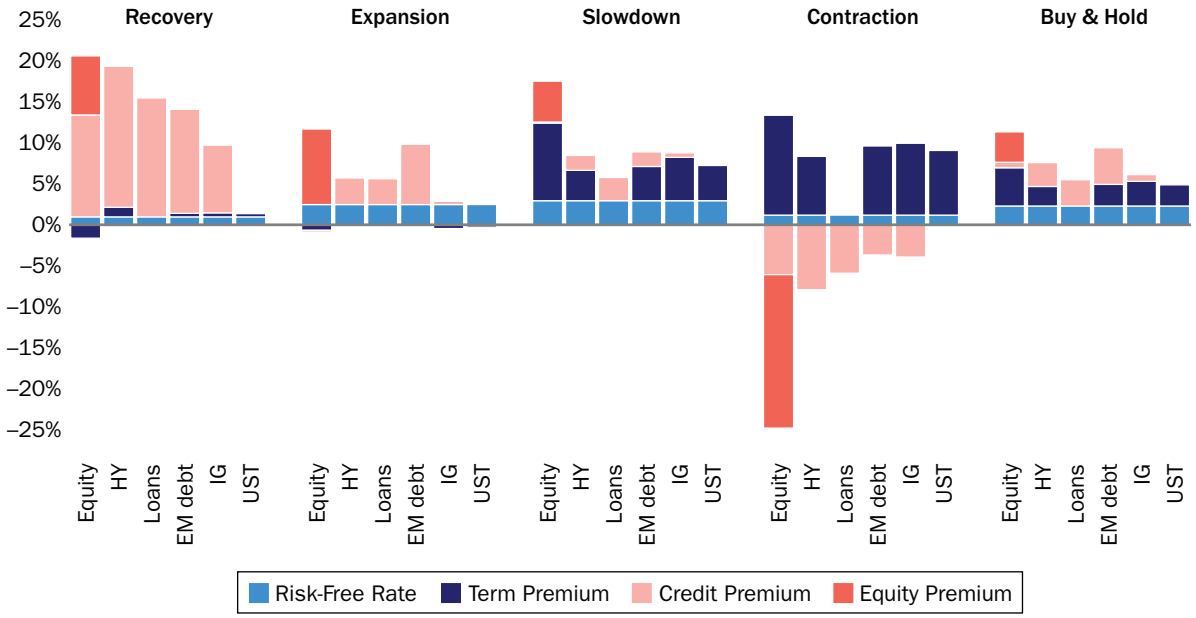
Exhibit 5 reports total returns across asset classes and their risk premia contributions over the risk-free rate. This “building blocks” approach offers quantifiable insights into the economic drivers of asset returns, not immediately visible in overall asset performance, and the ability to compare absolute and relative performance between different macro regimes. For example, comparing the overall return of HY credit between expansion and slowdown (~5.5% versus ~8.5%) or, similarly, comparing the return of equities between expansion and slowdown (~10.8% versus ~17.5%) may lead to the counterintuitive conclusion that “credit risk” and “equity risk” perform better during periods of decelerating growth rather than accelerating growth. Instead, a risk premia decomposition clearly reveals the outperformance in the slowdown regime is driven by returns from the term premium, or duration risk, while returns from credit and equity premia have historically been lower in slowdowns relative to expansions. In other words, understanding the risk premia composition of asset returns and mapping them to macro regimes allows investors to understand when they are compensated to take risk, what type of risk, and where to source that risk in each stage of the business cycle.

Exhibit 6 reports asset class volatilities and correlations by macro regime. In line with economic intuition, risk tends to be lower when growth is above trend (expansion and slowdown) and higher when growth is below trend (recovery and contraction), with the lowest and highest volatilities experienced in expansion and contraction, respectively. There is meaningful dispersion in the minimum/maximum volatility range across macro regimes, with a 50% relative increase for US Treasuries between

EXHIBIT 5

Risk Premia Mapping and Conditional Performance

Panel A: Risk Premia by Asset Class and Macro Regime



Panel B: Asset Class Total Returns (January 1993–December 2021)

	Recovery	Expansion	Slowdown	Contraction	Buy & Hold
Equity	18.97%	10.79%	17.51%	–11.44%	11.33%
HY	19.33%	5.47%	8.46%	0.42%	7.58%
Loans	15.47%	5.61%	5.76%	–4.74%	5.49%
EM debt	14.08%	9.61%	8.89%	5.92%	9.39%
IG	9.71%	2.40%	8.76%	6.00%	6.11%
UST	1.34%	2.17%	7.23%	9.06%	4.86%

NOTES: The sample period is January 1993–December 2021; the sample time period is dictated by data availability. Risk premia definitions are outlined in the section "Risk Premia Definitions and Data Description." Equity premium = US ERP-CB = SP 500 total return index – Bloomberg US Corporate 10Y+ total return index. Credit premium for each asset class represented by respective excess return indices as listed in the text. Term premium for each asset class calculated as Total Return Index – Excess Return Index – US 3M T-bill. For equities, the credit and term premia components are sourced from Bloomberg US Corporate 10Y+ index; risk-free rate = US 3M T-bill yield; equity = SP 500 total return index; HY = Bloomberg US HY Corporate total return index; loans = Credit Suisse Leveraged Loans total return index; EM debt = Bloomberg EM USD Aggregate total return index; IG = Bloomberg US Corporate Investment Grade total return index; UST = Bloomberg US Treasury total return index.

SOURCES: Bloomberg, authors' calculations using US business cycle regimes as defined in the text.

slowdown and contraction, a twofold increase for equities, and up to fourfold or fivefold increase in lower quality credit assets between expansion and contraction. Correlations between riskier and safer asset classes are also noticeably different across regimes. In particular, the long-term negative correlation between equities and government bonds increases to zero in expansions. The correlation between risky credit and government bonds is positive in expansions while negative in other regimes. These changing correlations at the asset class level are a result of changing risk premia performance between regimes.

EXHIBIT 6

Risk and Correlations by Macro Regime

Panel A: Selected Correlations

	Unconditional	Recovery	Expansion	Slowdown	Contraction
Equities vs. Risky Credit	0.55	0.55	0.41	0.52	0.64
Equities vs. Government Bonds	–0.20	–0.20	0.00	–0.30	–0.31
Risky Credit vs. Government Bonds	–0.09	–0.08	0.12	–0.18	–0.17
IG Credit vs. Risky Credit	0.48	0.49	0.36	0.33	0.66

Panel B: Volatilities

	Unconditional	Recovery	Expansion	Slowdown	Contraction	Max/Min
US Equities	15%	16%	11%	12%	24%	2.2
Global Equities	15%	17%	10%	13%	25%	2.4
HY	8%	10%	4%	6%	16%	3.7
Loans	5%	6%	2%	3%	12%	5.5
EMD	11%	8%	9%	12%	16%	2.1
IG	5%	6%	5%	4%	9%	2.4
UST 10y+	10%	11%	10%	9%	13%	1.5

NOTES: The sample period is January 1993–December 2021. Correlation for risky credit refers to the average correlation of HY, leveraged loans, and EM hard currency debt to government bonds and investment-grade credit, using the Bloomberg indices listed in the section "Risk Premia Definitions and Data Description."

SOURCES: Bloomberg, authors' calculations using US business cycle regimes as defined in the text.

INVESTMENT IMPLICATIONS

A regime-based approach can support a transparent and intuitive risk budgeting process for tactical allocation between asset classes and within each asset class. Investors can target different combinations of asset classes or risk premia depending on the expected macro regime. Polk, Haghbin, and de Longis (2020) discussed investment implications from an equity factor perspective. Our analysis extends their conclusions to a multi-asset and multi-sector fixed-income perspective, with key investment implications outlined in the following discussion and summarized in Exhibit 7.

Recovery

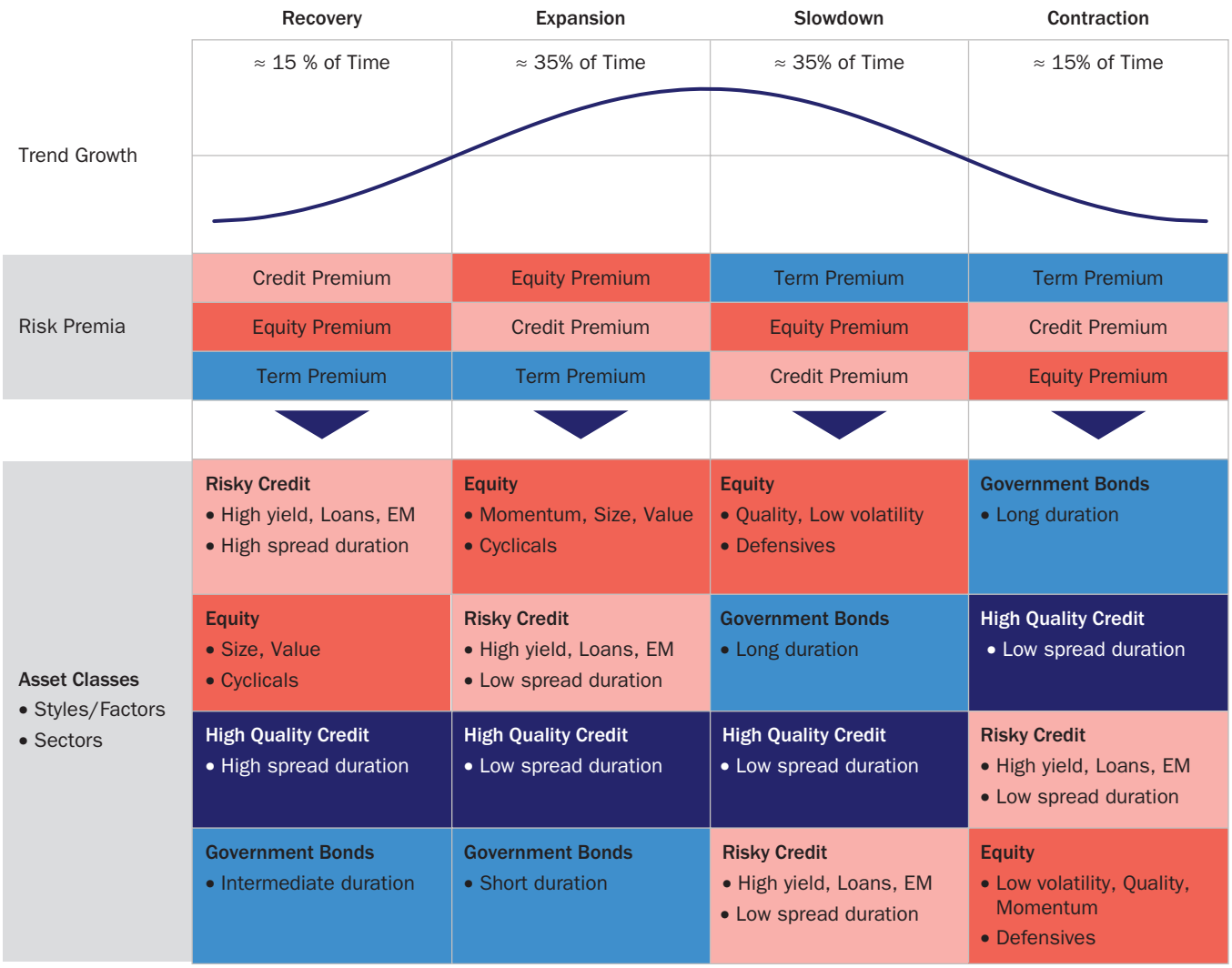
Investors are typically compensated to increase portfolio risk. Risky assets tend to outperform safer asset classes. Credit tends to experience strong outperformance in this regime, via both capital appreciation and high income, due to above-average spreads and meaningful spread compression. For multi-asset investors, higher exposure to risky credit, such as high yield, emerging markets debt, or bank loans, has the potential to deliver equity-like returns with lower volatility than equity markets. Equities also provide significant upside potential over bonds. For fixed-income investors, increasing spread duration can generate higher upside potential, while maintaining average duration risk.

Expansion

Investors are typically compensated to increase portfolio risk. Risky assets tend to outperform safer asset classes. Equities tend to be the best-performing asset class, supported by strong earnings growth. Credit spreads are typically stable and

EXHIBIT 7

Mapping Risk Premia to Asset Classes by Macro Regime



NOTES: For illustrative purposes only. Term Premium = Long-term government bonds – T-bills; Credit Premium = Corporate bonds – Government bonds (duration matched); Equity Premium = Equities – Long-term fixed income. Risk premia composition of each asset class may vary over time and across cycles, depending on characteristics such as duration, spread duration, and so on. For discussion on equity factors, sectors and the business cycle, see Polk, Haghbin, and de Longis (2020), de Longis, Zanin, and Ellis (2022).

below their long-term average. Hence, credit assets provide stable income but limited potential for capital appreciation. Government bonds underperform as yields increase. For multi-asset investors with a total return focus, equities represent the main source of capital appreciation, while credit still offers a stable source of income despite the potential drag from duration risk. For fixed-income investors, reducing spread duration can lead to higher income per unit of risk, while reducing interest rate duration has the potential to mitigate short-term losses from rising bond yields.

Slowdown

Investors are typically compensated to decrease portfolio risk toward a more neutral stance, as the dispersion in returns across asset classes is more muted.

Returns on equity and credit premia decrease, and risky assets no longer outperform safer asset classes in a significant way. The bulk of overall performance can be attributed to compensation for duration risk, which can be sourced directly via long-dated government bonds. For multi-asset investors, this regime represents an opportunity to reduce overall portfolio volatility, decrease exposure in credit or equities relative to allocations in the expansion regime, and increase exposure to long-term government bonds. For fixed-income investors, our results suggest increasing duration while reducing spread duration, defensively tilting the portfolio toward long-dated government bonds and short-dated credit.

Contraction

Investors are typically rewarded to take below-average portfolio risk. Long-dated government bonds tend to be the best-performing asset class. The term premium has historically offered positive return contributions across asset classes. Equity and credit premia underperform, with equities experiencing the largest downside risk. Within credit assets, duration provides an important offset to underperforming credit risk. Multi-asset investors may consider reducing portfolio volatility, underweighting equities and risky credit to fund overweight exposures in long-term government bonds or high-quality credit assets. Fixed-income investors can increase duration via long-term sovereign bonds while maintaining lower spread duration in short-dated credit.

Sophisticated investors with access to derivatives have ample flexibility to calibrate risk premia exposures via bond and equity futures, credit default swaps (CDS), total return swaps, and so on, and can efficiently deploy TAA overlays on a cash-funded portfolio. In addition, exchange-traded funds (ETFs) with broad index exposures across asset classes, sectors, styles, and maturity segments provide retail and institutional investors effective tools to implement a TAA process without use of derivatives. Under this more restrictive scenario, using only cash-funded instruments, we provide examples of TAA implementation for a representative multi-asset 60/40 portfolio and a high-quality core fixed-income portfolio. These examples can be easily and broadly expanded to other asset classes and investment instruments.

Example 1. Multi-asset 60/40 portfolio: tactical allocation *between* asset classes. Using a standard 60/40 multi-asset benchmark (SAA), we deploy a regime-based TAA process that seeks to outperform this static SAA by increasing portfolio risk when growth is improving and reducing portfolio risk when growth is deteriorating, while maintaining the same level of risk as the SAA over a full market cycle. Our benchmark includes 60% global equities, 20% US Treasuries, 10% US IG corporates, 5% US HY corporates, and 5% US bank loans. Because of the limited number of observations for each regime, an expanding sample optimization followed by out-of-sample tests would be impractical. Alternately, an in-sample return maximization would inflate performance results. We follow a simple approach that is agnostic to return assumptions and only assume a directional position (overweight/underweight/neutral) that is consistent with our findings and economic intuition. The exercise is calibrated to generate a 1% tracking error (TE) over the full period. As risk and return opportunities change in the different stages of the cycle, however, we allow tracking error and its relative contributions to vary between regimes, so to capture these time-varying market conditions. TE contributions are set arbitrarily and for illustrative purpose only, in line with the discussion in the previous section:

- *Recovery*
  - overweight credit and equity premia with equal (50%/50%) TE contributions
  - neutral term premium risk

EXHIBIT 8

Multi-Asset 60/40 TAA Portfolio (Part 1)

Panel A: Benchmark and Active Allocations

	Benchmark	Recovery	Expansion	Slowdown	Contraction
MSCI All Country World Idx	60.0%	4.0%	6.0%	1.8%	–3.0%
Bloomberg US Treasury Idx	20.0%	–3.0%	–8.5%	6.1%	6.5%
Bloomberg US IG Corp. Idx	10.0%	–7.0%	–7.8%	–4.0%	3.3%
Bloomberg US HY Corp. Idx	5.0%	6.3%	5.6%	0.7%	–1.8%
CS Leveraged Loan Idx	5.0%	–0.3%	4.6%	–4.7%	–5.0%
Total	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Panel B: Returns and Risk

	Benchmark	TAA Portfolio	Recovery	Expansion	Slowdown	Contraction
Excess Returns	–	0.80%***	1.37%**	0.85%**	0.26%***	1.63%**
Tracking Error	–	1.00%	1.22%	1.08%	0.26%	1.64%
Information Ratio	–	0.80	1.13	0.79	1.00	0.99
Total Returns	6.24%	7.04%	16.95%	5.73%	9.54%	–5.27%
Standard Deviation	9.49%	9.57%	11.73%	7.38%	8.11%	14.59%
Risk Ratio	–	1.01	1.10	1.08	1.02	0.92
Beta	–	1.00	1.10	1.07	1.02	0.92
Frequency (%, monthly)	100%	100%	12%	38%	37%	13%

NOTES: Sample period is January 1993–December 2021. Sample time period dictated by data availability. Risk ratio refers to ratio between portfolio volatility and benchmark volatility. *, **, and *** denote rejection of the null hypothesis that returns are equal to zero for a two-tailed p-value at the 10%, 5%, and 1% significance levels, respectively.

SOURCES: MSCI, Bloomberg, authors' calculations.

- *Expansion*
  - overweight equity and credit premia with 50% and 25% TE contributions, respectively
  - underweight term premium risk with 25% TE contribution
- *Slowdown*
  - overweight term premium and equity premium with 50% and 25% TE contributions, respectively
  - underweight credit premium risk with 25% TE contribution
- *Contraction*
  - overweight term premium with one-third TE contribution
  - underweight credit premium and equity premium with one-third TE contribution each

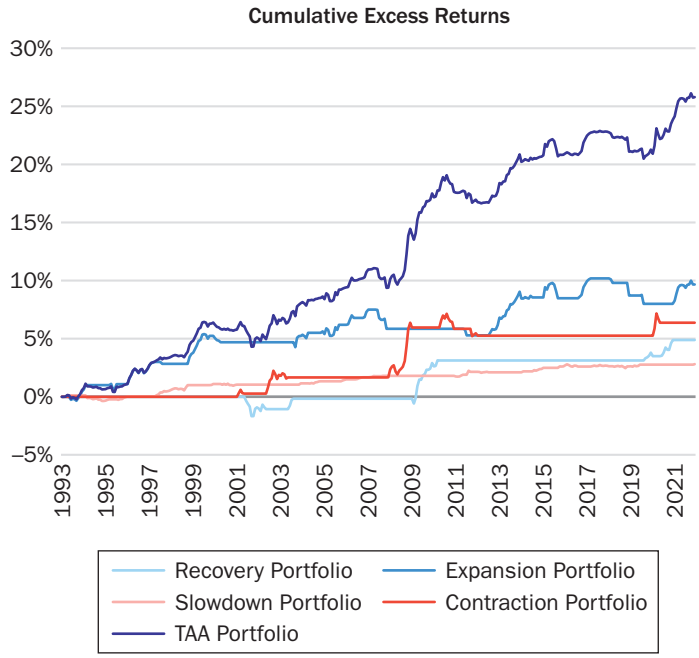
Benchmark indices are used as proxies of asset classes, easily accessible via ETFs, and weights are constrained to be non-negative. Exhibit 8 and Exhibit 9 report inputs and results of this exercise. The macro regime signal is updated monthly using only information available at that point in time, and portfolio returns are calculated for the following month.

Results suggest this approach has the potential to generate attractive excess returns over a reference benchmark or SAA, using reasonable levels of tracking error, allocation ranges, and portfolio turnover. Average annual excess returns around 0.80% are statistically significant at the 99% confidence level, resulting in an information ratio of 0.80 and a Sharpe ratio of 0.50 versus 0.42 for the benchmark. Portfolio allocations are in the range of 57%–66% for equities, 3%–20% for risky credit, and 11%–27% for government bonds across the four regimes, delivering a portfolio risk ratio and beta between 0.92 and 1.10 relative to the benchmark. Excess returns

EXHIBIT 9

Multi-Asset 60/40 TAA Portfolio (Part 2)

	Benchmark	TAA Portfolio
Total Returns	6.24%	7.04%
Standard Deviation	9.49%	9.57%
Sharpe Ratio	0.42	0.50
Maximum Drawdown	–37.5%	–35.5%
Skewness	–0.83	–0.67
Risk Ratio	–	1.01
Beta	–	1.00
Turnover (%, one-way)	–	33.00%



are positive and statistically significant for all four regime portfolios. The slowdown portfolio delivers the lowest excess returns and tracking error, consistent with the narrow dispersion in asset class returns experienced in this regime. The contraction portfolio delivers the highest tracking error, driven primarily by higher market volatility in this regime. With an average annual portfolio turnover of 33% and bid–ask spreads in the low single-digit basis points (bps) for a 100% portfolio turnover, these results are economically significant also after transaction costs.

Example 2. Core fixed-income portfolio: tactical allocation *within* asset classes. This macro regime framework can also inform top-down risk premia allocations within a single asset class. In a multi-sector fixed-income portfolio, for example, investors subject to fixed capital allocations between asset classes (i.e., credit vs. government bonds), and no access to derivatives, can calibrate credit and duration risk moving between long and short maturities within credit and sovereign curves.[11]

For illustrative purposes, we provide an example of regime-dependent risk allocations for a representative core US fixed-income portfolio benchmarked to 60% government bonds/40% investment-grade corporate credit. As in the previous multi-asset exercise, we are agnostic to risk premia return assumptions and only assume a directional position (overweight/underweight/neutral) that is consistent with our findings. We arbitrarily set active interest rate duration tilts to an absolute target of approximately 0.5 years and active spread duration x spread (DTS) tilts to approximately 1.00.

- *Recovery*
  - Overweight spread duration: underweight short maturities (0–5Y) and overweight long-term maturities (10Y+) in the credit curve with a target active DTS = 1.00

[11] Alternatively, as in the example provided with the multi-asset portfolio, risk premia exposures can be adjusted by moving between the two asset classes. Investors with access to derivatives can calibrate their risk exposures with more flexibility.

- Neutral interest rate duration: adjust exposures in the Treasury curve to offset the increased duration from the credit curve, that is, overweight 0–5Y Treasuries and underweight 10Y+ Treasuries.

- *Expansion*
  - Underweight spread duration: underweight long maturities (10Y+) and overweight short maturities (0–5Y) in the credit curve with a target active DTS = –1.00
  - Underweight interest rate duration: target -0.5Y in active duration, adjusting exposures between short (0–5Y) and long-term (10Y+) Treasuries.
- *Slowdown*
  - Underweight spread duration: underweight long maturities (10Y+) and overweight short maturities (0–5Y) in the credit curve with a target active DTS = –1.00
  - Overweight interest rate duration: target +0.5Y in active duration, underweighting short (0–5Y) Treasuries and overweighting long-term (10Y+) Treasuries.
- *Contraction*
  - Underweight spread duration: underweight long maturities (10Y+) and overweight short maturities (0–5Y) in the credit curve with a target active DTS = –1.00
  - Overweight interest rate duration: target +0.5Y in active duration, underweighting short (0–5Y) Treasuries and overweighting long-term (10Y+) Treasuries.

To increase the number of active levers in the portfolio, we include Treasury Inflation-Protected Securities (TIPS) and introduce allocation decisions to inflation risk, defined as the relative value between nominal and inflation-protected government bonds with the same maturity profile (i.e., breakeven inflation). To inform these allocations we introduce an indicator of US inflation momentum, which measures the average change in inflation statistics on a trailing three-month basis in a panel of 20 variables covering core and headline CPI, core and headline PPI, inflation expectations from business and consumer surveys, energy prices, import prices, and labor costs.[12] This indicator is illustrated in Exhibit 10, where a positive (negative) reading indicates rising (falling) inflation. When inflation is rising (falling), we overweight (underweight) TIPS relative to nominal US Treasuries with similar maturities and duration. We assume a 10% benchmark allocation to TIPS, with symmetrical max/min active allocations at ±10%:

Inflation Signal (t)	*Active Allocation (t + 1)*
▪ *if* $IMI_t > 0$	–10% *US Treasuries* + 10% *US TIPS*
▪ if $IMI_t < 0$	+10% *US Treasuries* – 10% *US TIPS*

Portfolio allocations, performance, and risk statistics are reported in Exhibit 11 and Exhibit 12. Results suggest this framework has the potential to generate attractive excess returns using levels of tracking error, allocation ranges, and portfolio turnover in line with mainstream active management standards.[13] Average annual

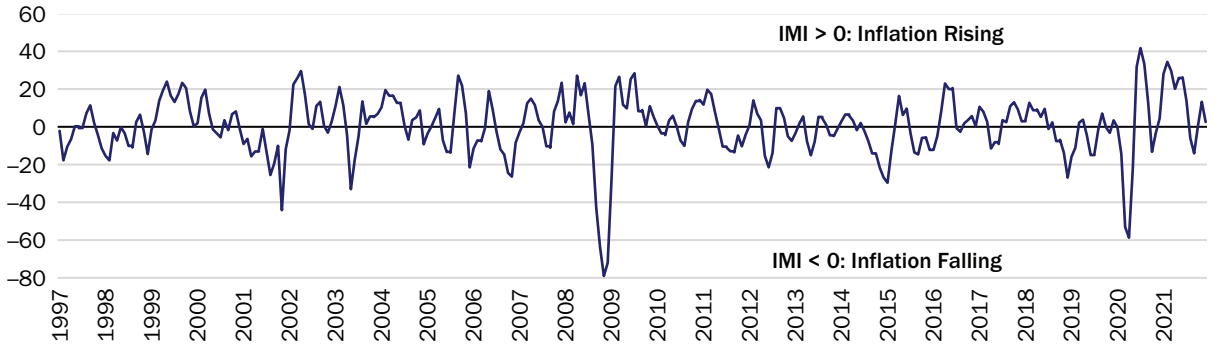
[12] Variables are z-scored on an expanding sample basis. At each point in time, we include z-scores for each variable on a trailing three-month basis, exponentially weighting observations to place more weight on latest data releases. We control for the release date of each indicator, ensuring no look-ahead bias, and use first-vintage data from Bloomberg and the Alfred database of the Federal Reserve.

[13] Risk allocation targets have been set arbitrarily, and for illustrative purposes. These parameters can be easily adapted to deliver higher or lower duration, DTS, and tracking-error outcomes, conditional on starting benchmark allocations.

excess returns around 0.62% are statistically significant at the 99% confidence level, resulting in an information ratio of 0.76 and a Sharpe ratio of 0.88 versus the custom benchmark at 0.75. Total portfolio risk is also in line with benchmark risk, as indicated by a risk ratio of 1.02 and beta of 1.00. Excess returns are positive in all four macro regimes and are statistically significant in the recovery, expansion, and

EXHIBIT 10

US Inflation Momentum Indicator (IMI)



NOTES: Sample period is January 1997–December 2021. Sample time period dictated by data availability. US inflation momentum indicator (IMI) measures the change in inflation statistics on a trailing three-month basis, covering indicators across consumer and producer prices, business surveys of pricing conditions, inflation expectation surveys house prices, import prices, wages, and energy prices. A positive (negative) reading indicates inflation has been rising (falling) on average over the past three months.

SOURCES: Bloomberg, authors' calculations.

EXHIBIT 11

Core US Fixed-Income TAA Portfolio (Part 1)

Panel A: Benchmark and Active Allocations

	Benchmark	Recovery	Expansion	Slowdown	Contraction	Rising Inflation	Falling Inflation
Bloomberg US Corporate Credit	**40.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	–	–
0–5 Years	13.1%	–5.5%	7.0%	5.5%	5.5%	–	–
5–10 Years	11.1%	–	–	–	–	–	–
10+ Years	15.7%	5.5%	–7.0%	–5.5%	–5.5%	–	–
Bloomberg US Treasury	**50.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**–10.0%**	**10.0%**
0–5 Years	26.8%	5.5%	–1.0%	–9.5%	–10.5%	–4.6%	4.6%
5–10 Years	12.5%	–	–	–	–	–3.6%	3.6%
10+ Years	10.7%	–5.5%	1.0%	9.5%	10.5%	–1.8%	1.8%
Bloomberg US TIPS	**10.0%**	–	–	–	–	**10.0%**	**–10.0%**
0–5 Years	4.6%	–	–	–	–	4.6%	–4.6%
5–10 Years	3.6%	–	–	–	–	3.6%	–3.6%
10+ Years	1.8%	–	–	–	–	1.8%	–1.8%
Total	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

(continued)

EXHIBIT 11 *(continued)*

Core US Fixed-Income TAA Portfolio (Part 1)

Panel B: Returns and Risk

	Benchmark	TAA Portfolio	Recovery	Expansion	Slowdown	Contraction	Rising Inflation	Falling Inflation
Excess Returns	–	0.62%***	0.84%***	0.27%*	0.79%***	0.85%	0.55%***	0.70%**
Tracking Error	–	0.81%	0.51%	0.46%	0.75%	1.48%	0.52%	1.07%
Information Ratio	–	0.76	1.66	0.59	1.05	0.58	1.07	0.65
			Active Risk				Active Risk	
Duration	6.58	6.65	–0.08	–0.57	0.59	0.58	0.03	0.11
OAS	0.62	0.59	0.02	–0.05	–0.04	0.00	–0.03	–0.03
DTS	4.89	4.13	1.01	–1.14	–1.00	–1.10	–0.70	–0.84
Frequency (%, monthly)	100%	100%	15%	36%	32%	17%	56%	44%

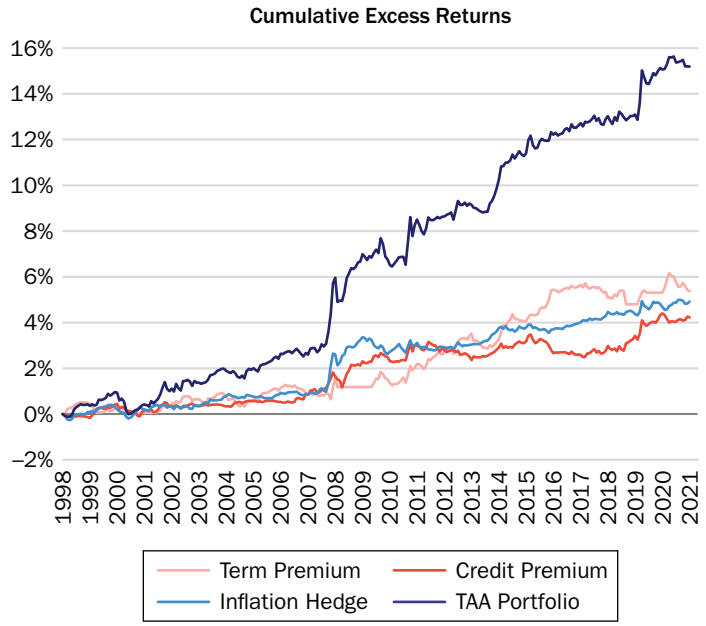
NOTES: Sample period is January 1999–December 2021. Sample time period dictated by data availability. Benchmark maturity breakdown as of December 2021. DTS = spread duration x spread; OAS = option-adjusted spread. *, **, and *** denote rejection of the null hypothesis that returns are equal to zero for a two-tailed p-value at the 10%, 5%, and 1% significance levels, respectively.

SOURCES: Bloomberg, authors' calculations.

EXHIBIT 12

Core US Fixed-Income TAA Portfolio (Part 2)

	Benchmark	TAA Portfolio
Total Returns	5.03%	5.67%
Standard Deviation	4.46%	4.57%
Sharpe Ratio	0.75	0.88
Maximum Drawdown	–7.51%	–6.13%
Skewness	–0.12	0.24
Risk Ratio	–	1.02
Beta	–	1.00
Turnover (%, one-way)	–	74.18%
Tracking-Error Contributions		
Term Premium	–	0.28%
Credit Premium	–	0.25%
Inflation Hedge	–	0.27%
Total Tracking Error		0.81%



NOTES: Sample period is January 1999–December 2021. Sample time period dictated by data availability. Risk ratio refers to ratio between portfolio volatility and benchmark volatility.

SOURCES: Bloomberg Indices, authors' calculations.

slowdown regimes. Excess returns are positive and statistically significant in both rising and falling inflation environments. This tactical framework also contributes to significant reduction in historical downside risk as indicated by positive portfolio skewness and less negative maximum drawdown relative to the benchmark. Tracking-error contributions are relatively balanced between credit premium, term premium, and inflation risk hedge, and the strategy does not exhibit a structural overweight bias to either duration or credit risk. With an average annual portfolio turnover of 74% and bid–ask spreads at low single-digit basis points for a 100% portfolio turnover, these results are economically significant also after transaction costs.[14]

CONCLUSIONS

Risk and return opportunities change over the course of the business cycle. We propose a regime-based TAA framework that seeks to reposition portfolio exposures by adapting to expected changes in the macro environment. Using a rules-based, forward-looking framework to identify the four stages in the cycle—recovery, expansion, slowdown, and contraction—we document the regime-dependent performance of traditional asset classes and their underlying risk factors, focusing on the term premium, credit premium, and equity premium. We show this risk premia decomposition is essential to properly evaluate the performance of asset classes in each macro regime and to understand when investors are compensated to increase or decrease risk. We provide examples of how investors can deploy a TAA process in long-only multi-asset and fixed-income portfolios, with the potential to generate attractive excess returns. Results are statistically significant and economically relevant after transaction costs, with information ratios between 0.70 and 0.80. Our framework is applicable to both long-only investors with no access to derivatives, as well as more flexible mandates with the ability to calibrate exposures via unfunded instruments.

[14] In this example, the bulk of turnover is generated by the inflation signal for the TIPS allocation, which has a higher average frequency (~4 times per year) than the macro regime signal (~2 times per year). Assuming no tactical asset allocation on TIPS, average portfolio turnover would be around 24% per year.

APPENDIX

EXHIBIT A1

Regime-Dependent Risk Premia Performance (global regimes)

	Buy & Hold	Recovery	Expansion	Slowdown	Contraction	Growth Accelerating Recovery & Expansion	Growth Decelerating Slowdown & Contraction
Term Premium (TRP), ***1988–2021, obs:***	401	63	132	139	67	195	206
UST 3–5Y							
Average Annualized Returns	2.38%***	2.98%	–0.76%	3.17%***	6.48%***	0.47%	4.18%***
Standard Deviation	3.32%	3.76%	3.00%	2.94%	3.77%	3.27%	3.28%
Information Ratio	0.72	0.80	–0.26	1.08	1.72	0.15	1.28
UST 7–10Y							
Average Annualized Returns	3.63%***	2.87%	–1.53%	6.19%***	9.46%***	–0.11%	7.19%***
Standard Deviation	6.02%	6.80%	5.59%	5.16%	7.07%	5.99%	5.89%
Information Ratio	0.60	0.42	–0.27	1.20	1.34	–0.02	1.22
UST 10Y+							
Average Annualized Returns	5.41%***	3.13%	–2.51%	11.07%***	11.86%**	–0.73%	11.24%***
Standard Deviation	10.03%	11.31%	9.35%	8.92%	11.39%	10.02%	9.77%
Information Ratio	0.54	0.28	–0.27	1.24	1.04	–0.07	1.15
Credit Premium (CRP)							
Investment Grade (1988–2021) obs:	401	63	132	139	67	195	206
Average Annualized Returns	0.74%	6.06%***	0.23%	0.09%	–1.88%	2.11%***	–0.54%
Standard Deviation	4.24%	4.62%	1.95%	2.66%	8.00%	3.16%	5.04%
Information Ratio	0.18	1.31	0.12	0.04	–0.24	0.67	–0.11
High Yield (1988–2021), obs:	401	63	132	139	67	195	206
Average Annualized Returns	2.85%*	14.44%***	2.55%*	0.5%	–2.65%	6.35%***	–0.46%
Standard Deviation	9.27%	10.10%	5.24%	6.78%	16.14%	7.34%	10.72%
Information Ratio	0.31	1.43	0.49	0.07	–0.16	0.87	–0.04
Leveraged Loans (1992–2021), obs:	360	54	121	125	60	175	185
Average Annualized Returns	3.19%***	12.19%***	3.06%***	1.94%**	–2.06%	5.87%***	0.64%
Standard Deviation	5.45%	5.71%	2.33%	2.79%	10.75%	3.89%	6.53%
Information Ratio	0.59	2.14	1.32	0.70	–0.19	1.51	0.10
EM External Debt (1993–2021), obs:	348	52	121	125	50	173	175
Average Annualized Returns	4.47%**	13.38%***	6.61%***	0.37%	0.25%	8.64%***	0.34%
Standard Deviation	11.45%	8.84%	7.53%	12.92%	16.50%	7.97%	13.99%
Information Ratio	0.39	1.51	0.88	0.03	0.02	1.08	0.02
Equity Risk Premium (ERP), 1988–2021, obs:	401	63	132	139	67	195	206
US ERP-GB (vs. UST 10Y+)							
Average Annualized Returns	3.56%	11.15%	10.37%**	1.99%	–14%	10.66%***	–3.15%
Standard Deviation	18.62%	19.97%	14.15%	17.11%	26.11%	16.27%	20.46%
Information Ratio	0.19	0.56	0.73	0.12	–0.54	0.66	–0.15
US ERP-CB (vs. US Corp 10y+)							
Average Annualized Returns	3.58%	2.8%	10.07%***	4.29%	–10.1%	7.74%**	–0.35%
Standard Deviation	14.47%	15.85%	11.79%	13.28%	19.16%	13.28%	15.46%
Information Ratio	0.25	0.18	0.86	0.32	–0.53	0.58	–0.02
Global ERP–GB (vs. UST 10Y+)							
Average Annualized Returns	0.92%	12.83%	7.93%*	–2.17%	–17.95%	9.22%**	–6.93%
Standard Deviation	19.39%	20.59%	14.10%	18.25%	27.24%	16.46%	21.60%
Information Ratio	0.05	0.62	0.56	–0.12	–0.66	0.56	–0.32

SOURCE: Bloomberg, authors' calculations using global business cycle regimes as defined in the text. Risk premia definitions outlined in the text. Sample August 1988–December 2021, or since index inception if later date, as reported in the exhibit. Sample time period dictated by data availability on credit risk premium for IG and HY excess return indices. US ERP-CB stands for ERP vs. corporate bonds (IG), US ERP-GB stands for ERP vs. government bonds (UST). *, ** and *** denote rejection of the null hypothesis that returns are equal to zero for a two-tailed p-value at the 10%, 5%, and 1% significance levels, respectively.

ACKNOWLEDGMENT

The authors thank Kenneth Blay for helpful comments and suggestions.

REFERENCES

Andrew, A. C. 1982. "The Stochastic Behavior of Common Stock Variances Value, Leverage and Interest Rate Effects." *Journal of Financial Economics* 10 (4): 407–432.

Asl, F. M., and E. Etula. 2012. "Advancing Strategic Asset Allocation in A Multi-Factor World." *The Journal of Portfolio Management* 39 (1): 59–66.

Asvanunt, A., and S. Richardson. 2016. "The Credit Risk Premium." *The Journal of Fixed Income* 26 (3): 6–24.

Bansal, R., D. Kiku, I. Shaliastovich, and A. Yaron. 2014. "Volatility, the Macroeconomy, and Asset Prices." *The Journal of Finance* 69 (6): 2471–2511.

Bender, J., R. Briand, F. Nielsen, and D. Stefek. 2010. "Portfolio of Risk Premia: A New Approach to Diversification." *The Journal of Portfolio Management* 36 (2): 17–25.

Black, F. 1976. "Studies of Stock Price Volatility Changes." *Proceedings of the 1976 Meetings of the Business and Economics Statistics Section, American Statistical Association*: 177–181.

Blitzer, D. M., S. Dash, and A. M. Soe. 2010. "Equity Duration: Updated Duration of the S&P 500." *S&P Indices Research and Design* (September).

Campbell, J. Y., and J. H. Cochrane. 1999. "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior." *Journal of Political Economy* 107 (2): 205–251.

Campbell, J. Y., S. Giglio, C. Polk, and R. Turley. 2018. "An Intertemporal CAPM with Stochastic Volatility." *Journal of Financial Economics* 128: 207–233.

Campbell, J. Y., and R. J. Shiller. 1998. "Valuation Ratios and the Long-Run Stock Market Outlook." *The Journal of Portfolio Management* 24 (2): 11–26.

Chen, N.-F., R. Roll, and S. A. Ross. 1986. "Economic Forces and the Stock Market." *The Journal of Business* 59 (3): 383–403.

Chong, J., and G. M. Phillips. 2014. "Tactical Asset Allocation with Macroeconomic Factors." *The Journal of Wealth Management* 17 (1): 58–69.

Chousakos, K., and D. Giamouridis. 2020. "Harvesting Macroeconomic Risk Premia." *The Journal of Portfolio Management* 46 (6): 93–109.

Clewell, D., C. Faulkner-Macdonagh, D. Giroux, S. Page, and C. Shriver. 2017. "Macroeconomic Dashboards for Tactical Asset Allocation." *The Journal of Portfolio Management* 44 (2): 50–61.

Dahlquist, M., and C. R. Harvey. 2001. "Global Tactical Asset Allocation." *Journal of Global Capital Markets* (Spring): 6–14.

de Longis, A. 2019. "Dynamic Asset Allocation through the Business Cycle: A Macro Regime Approach." Manuscript, Invesco Investment Solutions.

de Longis, A., and D. Ellis. 2019. "Market Sentiment and the Business Cycle: Identifying Macro Regimes through Investor Risk Appetite." Manuscript, Invesco Investment Solutions.

de Longis, A., D. Zanin, and D. Ellis. 2022. "Measuring Sector Cyclicality: A Factor-Based Approach." *The Journal of Beta Investment Strategies* 13 (4): 147–162.

Dimson, E., P. Marsh, and M. Staunton. 2021. *Credit Suisse Global Investment Returns Yearbook 2021*. Credit Suisse.

Fama, E. F., and K. R. French. 1989. "Business Conditions and Expected Returns on Stocks and Bonds." *Journal of Financial Economics* 25 (1): 23–49.

——. 1993. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics* 33 (1): 3–56.

Friesen, G. C., and T. R. A. Sapp. 2007. "Mutual Fund Flows and Investor Returns: An Empirical Examination of Fund Investor Timing Ability." *Journal of Banking & Finance* 31 (9): 2796–2816.

Hallerbach, W. G., and P. Houweling. 2013. "Ibbotson's Default Premium: Risky Data." *The Journal of Investing* 22 (2): 95–105.

Hodges, P., K. Hogan, J. R. Peterson, and A. Ang. 2017. "Factor Timing with Cross-Sectional and Time-Series Predictors." *The Journal of Portfolio Management* 44 (1): 30–43.

Ilmanen, A. 2011. *Expected Returns: An Investor's Guide to Harvesting Market Rewards*. West Sussex, UK: Wiley Finance, John Wiley & Sons Ltd.

——. 2012. "Expected Returns on Major Asset Classes." *CFA Institute Research Foundation* 2012 (1). https://www.cfainstitute.org/en/research/foundation/2012/expected-returns-on-major-asset-classes.

Ilmanen, A., T. Maloney, and A. Ross. 2014. "Exploring Macroeconomic Sensitivities: How Investments Respond to Different Economic Environments." *The Journal of Portfolio Management* 40 (3): 87–99.

Invesco Investment Solutions. 2021. "2021 Long-Term Capital Market Assumptions." *Quarterly Outlook and Annual Methodology*, Invesco.

Jacobs, K. E., and A. Kobor. 2021. "Strategic Asset Allocation for Endowment Funds." *The Journal of Portfolio Management* 47 (5): 114–127.

Kothe, J., H. Lohre, and C. Rother. 2020. "Rates Factors and Global Asset Allocation." *The Journal of Fixed Income* 30 (3): 6–25.

Kritzman, M., S. Page, and D. Turkington. 2012. "Regime Shifts: Implications for Dynamic Strategies (Corrected)." *Financial Analysts Journal* 68 (3): 22–39.

Kumar, M. S., and A. Persaud. 2002. "Pure Contagion and Investors' Shifting Risk Appetite: Analytical Issues and Empirical Evidence." *International Finance* 51 (3): 401–436.

Polk, C., M. Haghbin, and A. de Longis. 2020. "Time-Series Variation in Factor Premia: The Influence of the Business Cycle." *Journal of Investment Management* 18 (1): 69–89.

Polk, C., S. Thompson, and T. Vuolteenaho. 2006. "Cross-Sectional Forecasts of the Equity Premium." *Journal of Financial Economics* 81 (1): 101–141.

Rapach, D. E., J. K. Strauss, and G. Zhou. 2009. "Out-of-Sample Equity Premium Prediction: Combination Forecasts and Links to the Real Economy." *The Review of Financial Studies* 23 (2): 821–62.

Remolona, E., P. Kleiman, and D. Gruenstein. 1997. "Market Returns and Mutual Fund Flows." *Economic Policy Review,* Federal Reserve Bank of New York (July).

Scherer, B., and M. Apel. 2020. "Business Cycle–Related Timing of Alternative Risk Premia Strategies." *The Journal of Alternative Investments* 22 (4): 8–24.

Schnetzer, M. 2020. "How Good Is Tactical Asset Allocation Using Standard Indicators?" *The Journal of Portfolio Management* 46 (6): 120–134.

Schroder, D., and F. Esterer. 2011. "A New Measure of Equity Duration: The Duration-Based Explanation of the Value Premium Revisited." EDHEC–Risk Institute, December.

Swade, A., H. Lohre, M. Shackleton, S. Nolte, S. Hixon, and J. Raol. 2022. "Macro Factor Investing with Style." *The Journal of Portfolio Management* 48 (2): 80–104.

Van Vliet, P., and D. Blitz. 2011. "Dynamic Strategic Asset Allocation: Risk and Return across the Business Cycle." *Journal of Asset Management* 12 (5): 360–375.

Hypothetical simulated performance

Performance shown is simulated. The simulation presented here was created to consider possible results of a research strategy not previously managed by Invesco for any client. Simulated performance is hypothetical. It does not reflect trading in actual accounts and is provided for informational purposes only to illustrate these strategies during specific periods. There is no guarantee the simulated results will be realized in the future. Invesco cannot assure the simulated performance results shown for these research strategies would be similar to the firm's experience had it actually been managing portfolios using these strategies. In addition, the results actual investors might have achieved would vary because of differences in the timing and amounts of their investments. Returns shown for this simulation would be lower when reduced by the advisory fees and any other expenses incurred in the management of an investment advisory account. Simulated performance results have certain limitations. Such results do not represent the impact of material economic and market factors might have on an investment advisor's decision-making process if the advisor were actually managing client money. Simulated performance also differs from actual performance because it is achieved through retroactive application of a model investment methodology and may be designed with the benefit of hindsight.

Investment risks

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested.

Important information

This document is intended only for Professional Investors in Hong Kong, for Institutional Investors and/or Accredited Investors in Singapore, for certain specific sovereign wealth funds and/or Qualified Domestic Institutional Investors approved by local regulators only in the People's Republic of China, for certain specific Qualified Institutions and/or Sophisticated Investors only in Taiwan, for Qualified Professional Investors in Korea, for certain specific institutional investors in Brunei, for Qualified Institutional Investors and/or certain specific institutional investors in Thailand, for certain specific institutional investors in Malaysia upon request, for certain specific institutional investors in Indonesia and for qualified buyers in Philippines for informational purposes only. This document is not an offering of a financial product and should not be distributed to retail clients who are resident in jurisdiction where its distribution is not authorized or is unlawful. Circulation, disclosure, or dissemination of all or any part of this document to any unauthorized person is prohibited.

This document may contain statements that are not purely historical in nature but are "forward-looking statements," which are based on certain assumptions of future events. Forward-looking statements are based on information available on the date hereof, and Invesco does not assume any duty to update any forward-looking statement. Actual events may differ from those assumed. There can be no assurance that forward-looking statements, including any projected returns, will materialize or that actual market conditions and/or performance results will not be materially different or worse than those presented.

All material presented is compiled from sources believed to be reliable and current, but accuracy cannot be guaranteed. Investment involves risk. Please review all financial material carefully before investing. The opinions expressed are based on current market conditions and are subject to change without notice. These opinions may differ from those of other Invesco investment professionals.

The distribution and offering of this document in certain jurisdictions may be restricted by law. Persons into whose possession this marketing material may come are required to inform themselves about and to comply with any relevant restrictions. This does not constitute an offer or solicitation by anyone in any jurisdiction in which such an offer is not authorised or to any person to whom it is unlawful to make such an offer or solicitation.

This document is issued in the following countries:

- in Hong Kong by Invesco Hong Kong Limited景順投資管理有限公司, 45/F, Jardine House, 1 Connaught Place, Central, Hong Kong and has not been reviewed by the Securities and Future Commission.
- in Singapore by Invesco Asset Management Singapore Ltd, 9 Raffles Place, #18-01 Republic Plaza, Singapore 048619.
- in Taiwan by Invesco Taiwan Limited, 22F, No.1, Songzhi Road, Taipei 11047, Taiwan (0800-045-066). **Invesco Taiwan Limited is operated and managed independently.**