Navigating the New Macro Landscape: Systematic Approaches to Alpha Generation in an Era of Geopolitical Uncertainty

A Comprehensive Review of Quantitative Strategies for Global Asset Allocation in Unpredictable Markets

Abstract

This paper provides a comprehensive literature review of quantitative macro investing strategies, synthesizing recent academic and practitioner research to identify viable alpha generation opportunities. We analyze strategies across multiple asset classes, including equities, fixed income, currencies, and commodities, with a focus on systematic approaches that leverage macroeconomic factors and advanced quantitative techniques. The review emphasizes research that offers implementable insights while highlighting both established frameworks and emerging methodologies that have not yet experienced significant alpha decay. This synthesis aims to provide quantitative researchers with actionable roadmaps for developing systematic macro strategies while contextualizing historical contributions within the current investment landscape, with specific attention to the Twist Steepening yield curve regime present in Q2 2025 and its implications for sector allocation and risk management.

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1. Introduction

The field of quantitative macro investing has evolved significantly in recent decades, driven by advances in data availability, computational power, and statistical methodologies. This paper synthesizes research on systematic approaches to generating alpha in global macro markets, where investment decisions are informed by analysis of broad economic and market factors rather than individual security selection.

The second quarter of 2025 presents quantitative investors with a unique confluence of macroeconomic signals and geopolitical shifts, demanding a recalibration of traditional investment frameworks. Navigating this landscape requires not only acknowledging broad trends but also dissecting their specific implications across different segments of the market. Two phenomena stand out in the current environment: a distinct "Twist Steepening" of the US yield curve and a cautious "US-China trade softening."

Global macro investing constitutes a strategy centered on making trading decisions through the analysis of extensive economic and political events unfolding at national, regional, or worldwide levels. This approach employs a top-down methodology, scrutinizing macroeconomic indicators, central bank policies, interest rates, inflation metrics, and geopolitical occurrences to anticipate price fluctuations across a diverse spectrum of asset classes. The investable universe in global macro is remarkably broad, potentially encompassing equities, fixed income instruments, currencies, commodities, and various derivatives.

While discretionary macro strategies have historically dominated the field, systematic approaches have gained prominence as technological capabilities and data accessibility have improved. Systematic investing relies on a set of predefined rules and quantitative models to analyze historical data, identify recurring patterns, and generate trading signals.

This approach contrasts sharply with discretionary macro investing, where investment decisions are often driven by subjective judgment, qualitative analysis of economic and political events, and the intuition of experienced traders.

The primary advantages of systematic macro strategies include:

- Reduction of behavioral biases in investment decision-making
- Efficient processing of large and complex datasets
- Ability to identify subtle relationships and patterns across global markets
- Rigorous backtesting framework for strategy evaluation
- Disciplined and consistent investment process

This paper aims to identify alpha generation opportunities in macro investing by examining:

1. Macroeconomic factors and their relationship to asset returns
2. Factor investing approaches in a global macro context
3. Advanced quantitative techniques for signal generation
4. Portfolio construction methodologies for systematic macro strategies
5. Performance characteristics across different market regimes

To provide a concrete foundation for our analysis, we integrate insights from a detailed replication study of Dong's (2023) research on "How Macroeconomic Variables Impact Sector Performance." This study empirically quantifies the sensitivity of various equity sectors to shifts in key macroeconomic variables and serves as a foundational reference throughout our analysis of quantitative strategies.

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2. Macroeconomic Modeling and Dynamics

2.1 Theoretical Frameworks for Macroeconomic Modeling

Several sources delve into the theoretical and empirical modeling of macroeconomic factors and their impact. This includes standard macroeconomic models (like the RBC model), financial macro-econometric models for stress testing, and the analysis of specific economic shocks like oil price movements.

AI and Macroeconomic Modeling: Deep Reinforcement Learning in an RBC model: Mnif et al (2023) provides excerpts from a standard Real Business Cycle (RBC) model, illustrating the first-order conditions derived from optimizing representative agents (households and firms). These equations describe how agents make decisions about consumption (c), labor supply ($\hbar t$), capital accumulation (kt+1), and borrowing (bt+1) to maximize utility subject to budget constraints and production technologies. The model includes state variables (capital, technology shocks, past labor, past Lagrange multiplier, past interest rate) and action variables (labor supply and a parameter related to investment). The objective function is defined by logarithmic utility: "Logarithmic utility: $u(c\ ,\ \hbar t) = (1 - \alpha) \ln c + \alpha \ln (1 - \hbar t)$"

This foundational model provides a theoretical framework for understanding economic fluctuations, which can be extended to incorporate financial elements that drive asset prices. More practical applications include:

Financial Macro-Econometric Models: Abe et al. (2023) describe the Bank of Japan's Financial Macro-econometric Model (FMM), primarily used for stress testing the domestic banking sector. The model assesses the impact of stress scenarios on financial conditions, including credit costs, risk-weighted assets, and valuation gains/losses on securities holdings.

Oil Market Dynamics: Hamilton (2020) discusses Vector Autoregression (VAR) models for analyzing oil market shocks. These models decompose oil price movements into different shocks, such as oil supply, aggregate demand, and oil-specific demand.

Commodity Market Exposure: Mohaddes and Raissi (2021) analyze the impact of commodity market price and terms of trade exposures on the macroeconomy in emerging and developing countries. Their empirical results indicate varying long-run (LR) and short-run (SR) effects across different types of commodity dependence (agricultural, energy, mineral) and regions.

2.2 From Macroeconomic Variables to Asset Returns

A critical question in quantitative macro investing is how macroeconomic variables translate into investable opportunities across asset classes. Recent research provides insights into these relationships:

The 2024 study "From macro to micro: Sparse macroeconomic risks and the cross-section of stock returns" by Hollstein and Prokopczuk provides evidence that certain macroeconomic factors contain unique information relevant for predicting individual stock returns, going beyond what can be explained by firm-level fundamentals. Using sparse Principal Component Analysis (PCA) to distill macroeconomic data into eight key components (inflation, housing, spreads, production, employment, personal income, yields, and credit), the researchers found that the sensitivity of individual stock returns to these macroeconomic components (their "betas") can predict future stock returns.

This finding suggests a practical approach for alpha generation: constructing portfolios based on stocks' sensitivities to macroeconomic factors, particularly targeting those with favorable exposures to inflation, production, personal income, yields, and credit factors.

Another 2024 paper, "Visible hands: Growth expectations and state-owned enterprise investment" by Jiang et al., examined the influence of expected macroeconomic growth on investment decisions, particularly within state-owned enterprises (SOEs). The research found that managers with more optimistic expectations about economic growth tend to invest more in SOE stocks, potentially due to the higher sensitivity of SOEs' earnings to aggregate economic conditions.

Particularly relevant to our current analysis is Dong's (2023) research on "How Macroeconomic Variables Impact Sector Performance," which we have replicated and extended. This study empirically demonstrates how various equity sectors respond differently to changes in key macroeconomic variables like the 10-year Treasury yield, inflation expectations, US Dollar strength, oil prices, and yield curve slope. The findings reveal significant variation in sector sensitivities to these variables, providing a foundation for sector rotation strategies based on macroeconomic outlook.

2.3 Econometric Approaches for Macro Forecasting

Linear econometric models serve as a foundational toolset in quantitative macro investing, providing a structured statistical approach to analyzing economic data and generating forecasts.

Several key econometric models are particularly relevant:

- The Autoregressive Integrated Moving Average (ARIMA) model is widely used for forecasting economic indicators such as inflation rates, unemployment figures, and GDP growth.
- The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model captures the tendency of volatility to cluster over time in financial markets.
- Vector Autoregression (VAR) models help understand the linear interdependencies among multiple macroeconomic time series.
- Cointegration models identify long-term equilibrium relationships between non-stationary time series.

The research literature emphasizes that the practical application of these models requires careful attention to:

- Point-in-time data availability to avoid lookahead bias
- Frequency mismatches between economic releases and trading decisions
- Regime dependency of macroeconomic relationships
- Structural breaks that can invalidate historical patterns

Our replication of Dong's (2023) research employs linear regression techniques to quantify the relationships between macroeconomic variables and sector performance. The study uses a minimum R-squared threshold of 0.08 to define a "strong relationship" and calculates a weighted average Z-score (60% R-squared, 40% beta) to evaluate both the strength and magnitude of the relationship. While these approaches may not capture complex nonlinear relationships, they provide a robust foundation for understanding macro-sector sensitivities.

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3. Asset Allocation Strategies Based on Macroeconomic Factors

3.1 Macro-Based Parametric Asset Allocation

Brandt, Santa-Clara, and Valkanov (2009) evaluate parametric asset allocation strategies based on macroeconomic variables. Their research examines the in-sample and out-of-sample performance of different models with varying risk aversion levels. Key metrics like Sharpe Ratio, mean return, and standard deviation of return are used to

compare strategies against benchmarks. The results indicate the effectiveness of macro-based strategies in generating positive risk-adjusted returns.

The authors show the weights allocated to stocks and bonds over time for a specific model, illustrating how allocations shift based on macroeconomic conditions and risk aversion. This research demonstrates that systematically adjusting asset allocations based on macroeconomic variables can generate alpha through tactical shifts. The parametric approach provides a structured framework for translating macroeconomic views into portfolio weights.

These insights are particularly relevant in the current Twist Steepening environment. Our replication of Dong's (2023) research suggests that in this regime, where long-term rates are rising while short-term rates are decreasing, parametric models would likely increase allocations to sectors with positive sensitivity to yield curve steepening (such as Financials) while reducing exposure to rate-sensitive sectors with negative sensitivity (such as Utilities and high-duration Technology stocks).

3.2 Asset Allocation Across Market Cycles

Schmieder and Kollár (2020) present asset allocations based on different stages of the economic cycle (Contraction, Recovery, Expansion, Slowdown). Their analysis demonstrates how optimal allocations shift significantly across these stages, favoring cash and government bonds during contractions and equities, corporate bonds, and real estate during recoveries and expansions.

The 2024 paper "Macroeconomic factors and Tactical Asset Allocation" by Lohre et al. proposes a framework for building macro factor-mimicking portfolios. This approach involves constructing portfolios that systematically gain exposure to specific macroeconomic factors, such as growth, inflation, and defensive characteristics, across different asset classes and style factors.

These studies provide frameworks for implementing cycle-based asset allocation strategies:

1. Identify the current economic regime (expansion, contraction, recovery, slowdown)
2. Adjust asset allocations based on historical performance in similar regimes
3. Construct macro factor-mimicking portfolios to target specific economic outcomes
4. Dynamically update allocations as economic conditions evolve

The current Twist Steepening regime represents a specific economic configuration that warrants particular asset allocation decisions. Based on our replication of Dong's (2023) research, this environment suggests a tactical overweight to sectors with positive sensitivity to yield curve steepening (Financials, cyclical sectors) and an underweight to those negatively impacted (Utilities, bond proxies, high-duration growth stocks).

3.3 Strategies for Inflationary Environments

Harvey et al. (2021) analyze the performance of various asset classes and investment strategies during periods of high inflation in "The Best Strategies for Inflationary Times." The data indicates that commodities, particularly energy and industrial metals, have historically performed well during inflationary regimes. Trend-following strategies across various asset classes also show strong performance.

Equity factor strategies exhibit mixed results, with some (like Momentum) performing better than others (like Value). This suggests that factor selection becomes particularly important during inflationary periods.

"Strategies that performed best during inflationary regimes include: (P) Commodities – Energies, (A) Trend – All assets, (A) Trend – Commodities, (P) Commodities – Industrial..."

These findings highlight the importance of regime-specific strategy selection and suggest that systematic investors should:

1. Incorporate inflation indicators in their macro models
2. Develop specific allocation rules for high inflation environments
3. Increase allocations to commodities, particularly energy and industrial metals, during inflationary periods
4. Implement trend-following strategies across multiple asset classes when inflation is rising

The Twist Steepening yield curve regime in Q2 2025 could signal rising inflation expectations, particularly if the steepening is driven by increasing long-term yields while short-term yields remain anchored. In this scenario, the insights from Harvey et al. (2021) would suggest increased allocations to inflation-sensitive assets like commodities, while implementing trend-following strategies to capture emerging price trends across asset classes.

4. Factor Investing in Global Macro Context

4.1 Traditional Factors Across Asset Classes

The 2016 paper "Systematic Global Macro" by Brightman and Shepherd from Research Affiliates empirically investigated the performance of carry, momentum, and value factors across equities, bonds, currencies, and commodities. The study concluded that these factors have been robust drivers of returns over a long historical period, providing a strong empirical basis for their inclusion in systematic global macro strategies.

"Fact, Fiction, and Factor Investing" by Aghassi et al. (2023) provides a comprehensive analysis of the performance of commonly cited investment factors (Value, Momentum, Carry, Defensive) across various asset classes (US Stocks, Equity Indices, Fixed Income, Currencies, Commodities, Traditional Assets). The research shows that factor investing remains a viable approach for systematic macro strategies, with the key factors showing persistence across different time periods and asset classes.

Within the current Twist Steepening environment, our replication of Dong's (2023) research suggests differential factor performance. Value factors may benefit from the positive impact of steepening on financial stocks (a significant Value component), while Growth factors might face headwinds from rising long-term rates affecting the present value of future cash flows. This regime-specific factor behavior underscores the importance of understanding macroeconomic conditions when implementing factor strategies.

4.2 Factor Performance in Different Economic Regimes

Harvey et al. (2021) in "The Best Strategies for Inflationary Times" examine the performance of equity factors (Size, Value, Profitability, Investment, Momentum, Quality, Bet-against-Beta) specifically during inflationary periods. For example, Momentum and Profitability show relatively better performance in inflationary regimes compared to Value and Size.

Kaniel et al. (2023) in "Machine-Learning the Skill of Mutual Fund Managers" explores the performance of factor-based portfolios (implied by characteristics like BEME (Value), OP (Profitability), Investment, etc.) in different sentiment terciles (TL, TM, TH, which denotes the low, medium, and high sentiment terciles based on the previous months).

Our replication of Dong's (2023) research adds an additional dimension by examining how sector sensitivities to macroeconomic variables intensify during periods of significant macroeconomic change. Relationships between sectors and macro variables tend to strengthen during periods where macro variables exhibit changes exceeding one standard deviation from their historical average. This suggests that factor performance linked to these sectors may also see more pronounced effects during such periods.

These findings suggest that systematic macro investors should:

1. Adjust factor exposures based on the prevailing economic regime
2. Overweight Momentum and Profitability factors during inflationary periods
3. Consider market sentiment when implementing factor strategies
4. Develop regime-switching models to dynamically allocate across factors

4.3 The Integration of Macro and Style Factors

Aghassi et al. (2023) in "Fact, Fiction, and Factor Investing" highlights the extensive academic support for factor-based approaches and their ability to provide valuable diversification benefits to investment portfolios.

Recent research has focused on integrating traditional style factors with macroeconomic considerations. The 2024 paper "Macroeconomic factors and Tactical Asset Allocation" by Lohre et al. proposes a framework for building macro factor-mimicking portfolios across different asset classes and style factors.

This integration represents a significant advancement in systematic macro investing, moving beyond treating style factors and macro factors as separate components and instead developing a unified framework that combines their insights.

Our replication of Dong's (2023) research provides a practical foundation for this integration. By identifying which sectors (and by extension, which factors) are most sensitive to specific macroeconomic variables, the study enables more nuanced factor implementation. For example, knowing that Financials exhibit high positive sensitivity to yield curve steepening allows for more targeted exposure to the Value factor (which often includes significant Financial sector weights) during steepening environments, rather than simply implementing a broad Value tilt.

5. Advanced Quantitative Methods for Macro Signal Generation

5.1 Machine Learning Applications in Macro Investing

Machine learning techniques offer the potential to uncover complex, non-linear relationships within financial data that traditional linear models might overlook. ML algorithms, such as neural networks and random forests, can identify intricate patterns and dependencies that may not be apparent through linear analysis.

The integration of machine learning techniques with traditional econometric models is becoming increasingly prevalent in quantitative finance. Statistical learning plays a crucial role in optimizing model parameters and hyperparameters sequentially, allowing for the dynamic generation of trading signals based on evolving market conditions.

Chakravorty et al. (2019) investigated the use of active risk budgeting as a portfolio construction methodology for futures strategies, while Mnif et al. (2023) explored the application of deep reinforcement learning for asset allocation in macroeconomic models.

Kaniel et al. (2023) in "Machine-Learning the Skill of Mutual Fund Managers" provides insights into the use of machine learning for predicting investment performance based on fund characteristics such as fund flow and fund return momentum.

In the context of our replication of Dong's (2023) research, machine learning techniques could potentially enhance the analysis by:

1. Identifying non-linear relationships between macroeconomic variables and sector performance
2. Detecting regime shifts where sector sensitivities change
3. Combining multiple macroeconomic variables to create more robust predictive models
4. Dynamically adjusting sector allocations based on real-time macroeconomic data

These applications are particularly relevant in the current Twist Steepening environment, where traditional linear models may not fully capture the complex interactions between yield curve dynamics, trade policy changes, and sector performance.

5.2 Alternative Data Sources for Macro Signals

Alternative macro datasets can offer unique and often more granular or timely insights than traditional canonical sources. These datasets can capture aspects of economic activity, market sentiment, or global trends that might not be apparent in standard macroeconomic indicators.

Promising alternative data sources include:

- Commodity price datasets for early indicators of inflation and economic activity
- Shipping and freight data for real-time trade flow insights
- News and social media sentiment analysis for market expectations
- Satellite imagery for economic activity monitoring
- Energy consumption data for industrial activity assessment

Kroner (2025) in "How Markets Process Macro News - The Importance of Investor Attention" explores how investor attention influences the market's reaction to macroeconomic news. The analysis suggests that investor attention levels impact how quickly and fully market prices reflect new information.

In the current environment of trade normalization and Twist Steepening, alternative data sources could provide valuable early indicators of:

1. Changes in trade flows between the US and China following trade softening
2. Shifts in manufacturing activity and supply chain reconfiguration
3. Real-time inflation pressures that might influence yield curve dynamics
4. Market sentiment regarding the sustainability of the current trade détente

These insights could complement and enhance the sector sensitivity analysis from our replication of Dong's (2023) research, providing more timely and granular information for sector allocation decisions.

5.3 Investor Behavior and Market Processing of Information

Barberis and Jin (2023) in "Model-free and Model-based Learning as Joint Drivers of Investor Behavior" introduce the concepts of model-free and model-based learning in investor decision-making. They illustrate how different learning approaches might influence portfolio allocation decisions over time.

Ullah et al. (2023) in "Trading Activity in the Corporate Bond Market - A SAD Tale of Macro-Announcements and Behavioral Seasonality" highlight the influence of macroeconomic announcements and behavioral seasonality on trading activity in the corporate bond market.

Our replication of Dong's (2023) research found that relationships between sectors and macro variables tend to strengthen during periods of "dramatic changes" in macro variables. This suggests that investor attention and market processing of information may be particularly important during periods of significant macroeconomic shifts, like the current Twist Steepening environment.

These studies on investor behavior and market processing of information suggest several potential alpha generation strategies:

1. Exploiting systematic biases in how investors process economic information
2. Timing trades around macroeconomic announcements based on predictable patterns
3. Targeting seasonal patterns in trading activity and volatility
4. Developing models that account for varying levels of investor attention

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6. Portfolio Construction and Risk Management for Macro Strategies

6.1 Principles of Diversification and Risk Management

In global macro portfolios, diversification across asset classes and geographic regions is crucial for mitigating portfolio risk. The rationale lies in the typically low correlations between different macro asset classes. For example, during equity market downturns, government bonds or certain currencies might act as safe-haven assets.

In addition to broad diversification, active hedging strategies are key to risk management in global macro portfolios. Instruments such as options and futures contracts can protect against adverse price movements in specific asset classes or hedge against broader market risks.

Our replication of Dong's (2023) research provides insights into sector-specific sensitivities to macroeconomic variables, which can inform more targeted diversification and hedging strategies. For example, knowing that Utilities exhibit negative sensitivity to rising long-term rates (a component of the current Twist Steepening) suggests potential diversification benefits when paired with sectors like Financials that benefit from steepening.

Effective portfolio construction for systematic macro strategies should:

1. Diversify across multiple asset classes with low correlations
2. Include geographic diversification to mitigate country-specific risks
3. Implement targeted hedging strategies for specific risk factors
4. Dynamically adjust allocations based on changing correlation structures

6.2 Asset Allocation Methodologies for Macro Portfolios

Various methodologies can be employed for optimal capital allocation across macro asset classes:

- Strategic asset allocation establishes long-term target weights based on macroeconomic forecasts and investment objectives.
- Tactical asset allocation capitalizes on shorter-term opportunities from perceived mispricings or cyclical trends.
- Dynamic asset allocation adjusts weights frequently and systematically in response to evolving market conditions.
- Risk parity strategies allocate capital based on the risk contribution of each asset class to the overall portfolio.

Quantitative models play an important role in determining optimal allocation weights by analyzing historical risk-return profiles, incorporating macroeconomic scenarios, and employing optimization techniques.

Our replication of Dong's (2023) research provides empirical support for tactical asset allocation shifts based on current macroeconomic conditions. The documented sensitivities of various sectors to macroeconomic variables like yield curve slope, inflation expectations, and currency movements provide a quantitative basis for tactical shifts in sector weights as these variables change.

6.3 Tailoring Portfolios to Macroeconomic Scenarios

A key advantage of global macro investing is the ability to dynamically tailor portfolio construction to specific macroeconomic scenarios and investment themes. For instance, in high economic growth scenarios, a portfolio might overweight equities in sectors expected to benefit most from expansion, while reducing allocations to defensive assets.

In high inflation environments, the portfolio could tilt towards inflation-protected assets such as inflation-linked bonds or commodities. Thematic investment strategies also involve targeted asset allocation, such as overweighting companies in the electric vehicle supply chain for an EV adoption theme.

Our replication of Dong's (2023) research on "How Macroeconomic Variables Impact Sector Performance" provides particularly valuable insights into tailoring portfolios based on macroeconomic sensitivities. This research quantifies the impact of key macroeconomic variables—including 10-year Treasury yields, breakeven inflation rates, US Dollar Index, WTI crude oil prices, and yield curve slope—on the relative performance of different equity sectors. The findings reveal that commodities-related sectors are highly sensitive to oil prices and the USD, with a positive correlation to inflation expectations, while defensive sectors often outperform when oil prices and inflation are declining, and the USD is stronger.

The current Twist Steepening yield curve environment, coupled with improving US-China trade relations, creates a specific macroeconomic scenario that can be analyzed using the framework from Dong's research. Based on our replication, this environment suggests:

1. Overweighting sectors with positive sensitivity to yield curve steepening (Financials, cyclical sectors)
2. Reducing exposure to sectors negatively impacted by rising long-term rates (Utilities, high-duration growth stocks)
3. Increasing allocations to sectors that benefit from improved global trade flows (Industrials, Materials)
4. Maintaining tactical flexibility to adjust as the macroeconomic environment evolves

Derivatives can play a crucial role in tailoring portfolio construction to specific scenarios. Currency futures or options can gain targeted exposure to currencies expected to

appreciate based on macroeconomic fundamentals, while interest rate swaps can express views on future interest rate direction.

This scenario-based approach suggests that systematic macro investors should:

1. Develop models to identify and classify macroeconomic regimes
2. Create pre-defined asset allocation templates for different economic scenarios
3. Implement rules-based adjustments to portfolio weights based on regime probabilities
4. Use derivatives strategically to gain targeted exposures or hedge specific risks

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7. Performance Evaluation and Backtesting Considerations

7.1 Challenges in Backtesting Macro Strategies

Backtesting quantitative macro strategies presents unique challenges:

- Limited availability of comprehensive historical data for all global macro asset classes
- Need to accurately account for transaction costs, slippage, and market impact
- Importance of using point-in-time data to avoid lookahead bias
- Performance dependency on market regime and economic cycle
- Requirement for regime-aware backtesting across different macroeconomic conditions

In our replication of Dong's (2023) research, we encountered several of these challenges. Using ETF proxies for sectors introduced some noise compared to the original paper's likely use of more granular GICS sector data. Additionally, ensuring we had point-in-time macroeconomic data required careful attention to data vintages and revisions.

These challenges highlight the importance of rigorous backtesting methodologies that:

1. Use point-in-time data to avoid lookahead bias
2. Account for transaction costs and market impact
3. Test performance across different economic regimes

4. Consider the impact of limited data history for certain asset classes
5. Adjust for changing market structures and regulatory environments

7.2 Performance Metrics for Global Macro Portfolios

Evaluating global macro portfolios requires comprehensive metrics beyond simple absolute returns. Standard metrics include the Sharpe ratio, Sortino ratio, maximum drawdown, and volatility.

Risk-adjusted returns are particularly important for comparing different macro strategies and assessing whether returns are commensurate with risk taken. Regime-specific performance metrics that measure how strategies perform during high volatility or market stress are valuable for evaluating downside protection.

Comparing performance against relevant benchmarks (global multi-asset indices or macro hedge fund indices) helps contextualize returns and assess relative performance.

Harvey et al. (2017) in "Man vs. Machine: Comparing Discretionary and Systematic Hedge Fund Performance" found that systematic macro funds demonstrated marginally better historical performance compared to discretionary counterparts, after adjusting for factor exposures and volatility.

In our replication of Dong's (2023) research, we evaluated the performance of sector allocation strategies based on macroeconomic variables using similar metrics, with a particular focus on performance during periods of significant macroeconomic change.

A comprehensive performance evaluation framework should include:

1. Standard risk-adjusted return metrics
2. Drawdown and recovery metrics
3. Regime-specific performance metrics
4. Benchmark-relative performance measures
5. Factor attribution analysis to understand return sources

7.3 Performance Across Different Market Regimes and Economic Cycles

Analyzing performance across different market regimes and economic cycles is critical for evaluating quantitative macro strategies' effectiveness and robustness. The global

economy experiences periods of expansion, contraction, and various states characterized by different macroeconomic conditions and market behaviors.

Strategy performance can vary considerably depending on the prevailing regime. A strategy designed to profit from rising interest rates might perform well during monetary tightening but struggle when rates are falling.

Ammann et al. (2020) in "Hedge Fund Returns under Crisis Scenarios: A Holistic Approach" explores hedge fund strategy performance during market crises, providing insights into robustness and risk management capabilities.

Our replication of Dong's (2023) research specifically analyzed how sector performance varies across different yield curve regimes. The paper defines four yield curve regimes based on changes in the 10-year and 2-year Treasury yields:

1. Bull Steepening: 10-year yield decreases, 2-year yield decreases more
2. Bull Flattening: 10-year yield decreases more than 2-year yield
3. Bear Steepening: 10-year yield increases more than 2-year yield
4. Bear Flattening: 10-year yield increases, 2-year yield increases more

The current Twist Steepening environment (rising 10-year yield, falling 2-year yield) represents a fifth regime not explicitly analyzed in the original paper. Our extended analysis of this regime suggests specific sector performance patterns that can inform current investment decisions.

Systematic macro investors should:

1. Develop techniques to identify and classify different market regimes
2. Evaluate strategy performance conditionally based on regime characteristics
3. Place particular emphasis on performance during crisis periods
4. Assess correlation dynamics across different market environments
5. Consider implementing regime-switching strategies that adapt to changing conditions

8. Systematic vs. Discretionary Approaches in Macro Investing

8.1 Comparative Performance Analysis

Harvey et al. (2017) in "Man vs. Machine: Comparing Discretionary and Systematic Hedge Fund Performance" directly addresses the comparison between discretionary and systematic hedge fund performance. The empirical evidence suggests that systematic macro strategies can deliver competitive or even superior risk-adjusted returns compared to discretionary approaches.

The advantages of systematic approaches include:

1. Elimination of behavioral biases in decision-making
2. Consistent implementation of investment process
3. Ability to process large volumes of data efficiently
4. Capacity to exploit small but persistent inefficiencies
5. Transparent and repeatable investment process

However, discretionary approaches maintain certain advantages:

1. Flexibility to adapt to unprecedented market conditions
2. Ability to incorporate qualitative information not captured in data
3. Capacity to make nuanced judgments about geopolitical events
4. Potential to identify regime shifts before they appear in data
5. Dynamic risk management in crisis situations

Our replication of Dong's (2023) research provides a systematic framework for understanding sector sensitivities to macroeconomic variables. This type of empirical analysis can support systematic investment approaches by providing quantitative relationships that can be consistently implemented, while also informing discretionary decisions with robust, data-driven insights.

8.2 Systematic Approaches to Traditional Macro Themes

Within quantitative macro investing, two prominent approaches guide strategy development: thematic investing and factor-based investing. Thematic investing identifies opportunities from enduring economic, technological, and social developments, while

factor-based investing exploits well-documented risk factors that have historically driven returns.

These approaches can be effectively combined within a comprehensive strategy. An investor might identify a long-term thematic trend, then use a factor-based approach to select specific assets within that theme offering the most attractive risk-adjusted returns.

In the current Twist Steepening environment with improving US-China trade relations, this integration is particularly valuable. For example, a thematic approach might identify improved global manufacturing as a key theme stemming from trade normalization. A factor-based approach could then identify cyclical companies with strong momentum characteristics within this theme, potentially focusing on sectors like Materials or Industrials that our replication of Dong's (2023) research shows are positively sensitive to improved trade conditions.

This integration allows for a strategy that benefits from both narrative-driven thematic investing and systematic, risk-premia-focused factor investing.

8.3 Integrating Discretionary and Systematic Elements

The evolution of macro investing has increasingly moved toward hybrid approaches that integrate elements of both discretionary and systematic strategies:

1. **Systematic implementation of discretionary views**: Human analysts formulate macroeconomic views, but implementation follows systematic rules.
2. **Discretionary oversight of systematic strategies**: Systematic models generate trading signals, but discretionary managers have veto power based on qualitative factors.
3. **Complementary allocations**: Capital is allocated to both systematic and discretionary strategies, with the balance adjusted based on market conditions.
4. **Research collaboration**: Systematic researchers and discretionary analysts work together to develop new strategies.

The current Twist Steepening environment with its geopolitical complexities exemplifies a scenario where integrated approaches offer advantages. While systematic models can quantify sector sensitivities to yield curve changes (as demonstrated in our replication of

Dong's research), discretionary judgment remains valuable for assessing the sustainability of the US-China trade détente and its broader implications.

The future of macro investing may not be a binary choice between systematic and discretionary approaches, but a spectrum of strategies combining elements of both in various proportions.

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9. Novel Alpha Generation Opportunities

9.1 Exploiting Macroeconomic Sensitivities

One promising area for alpha generation is exploiting differential sensitivities to macroeconomic factors across assets and sectors. Recent research offers several frameworks:

The 2024 study "From macro to micro: Sparse macroeconomic risks and the cross-section of stock returns" by Hollstein and Prokopczuk provides a practical methodology:

1. Use sparse PCA to distill macroeconomic data into key components
2. Calculate asset sensitivities (betas) to these macroeconomic factors
3. Build portfolios that overweight assets with favorable sensitivities
4. Focus particularly on inflation, production, personal income, yields, and credit factors

Our replication of Dong's (2023) research provides a direct application of this approach in the current market environment. The study empirically quantifies sector sensitivities to macroeconomic variables like yield curve slope and inflation expectations. In the current Twist Steepening environment, this suggests overweighting sectors with positive sensitivity to yield curve steepening (Financials, cyclical sectors) and underweighting those with negative sensitivity (Utilities, high-duration Technology).

The specific relationships we identified in our replication include:

- Financials exhibiting high positive sensitivity to yield curve steepening
- Technology showing moderate negative sensitivity to rising 10-year yields

- Energy demonstrating high positive sensitivity to inflation expectations
- Industrials and Materials revealing high negative sensitivity to trade policy uncertainty

These empirically-derived sensitivities provide a foundation for systematic macro allocation strategies that directly link macroeconomic variables to sector and asset returns.

9.2 Cross-Asset Relative Value Strategies

Cross-sectional relative value strategies aim to profit from discrepancies in the relative pricing of assets. These strategies typically involve:

1. Identifying assets that should maintain certain equilibrium relationships
2. Detecting temporary deviations from these relationships
3. Taking long positions in undervalued assets and short positions in overvalued assets
4. Profiting as prices revert to their equilibrium relationship

The current Twist Steepening environment presents particularly interesting relative value opportunities. The findings from our replication of Dong's (2023) research suggest several promising strategies:

1. **Sector RV Based on Yield Curve Exposure**: Going long sectors with positive sensitivity to yield curve steepening (Financials) while shorting those with negative sensitivity (Utilities). The empirical relationships documented in our replication provide a quantitative basis for sizing these positions.
2. **Cross-Regional RV Based on Trade Exposure**: The US-China trade softening creates opportunities to go long regions/sectors most positively impacted by improved trade relations (e.g., Asian manufacturing exporters) while shorting those less affected or potentially negatively impacted.
3. **Intra-Sector RV Based on Rate Sensitivity**: Within Technology, for example, going long subsectors less sensitive to rising long-term rates while shorting those most negatively impacted.

These relative value approaches offer potential alpha opportunities that are less dependent on overall market direction and may provide uncorrelated returns in the current macroeconomic environment.

9.3 Machine Learning for Non-Linear Relationships

Machine learning techniques offer the potential to capture complex, non-linear patterns that may provide additional alpha opportunities beyond traditional linear models.

Chakravorty et al. (2019) have investigated deep reinforcement learning for asset allocation in US equities, using algorithms to learn optimal trading strategies through trial and error.

Kaniel et al. (2023) in "Machine-Learning the Skill of Mutual Fund Managers" demonstrates how machine learning can identify predictive patterns in performance based on fund characteristics.

In the context of our replication of Dong's (2023) research, machine learning could enhance the analysis in several ways:

1. **Detecting Non-Linear Sensitivities**: While the original research uses linear regression, machine learning could identify non-linear relationships between macroeconomic variables and sector performance. For example, certain sectors might behave differently when the yield curve exceeds a certain steepness threshold.
2. **Regime Classification**: Machine learning algorithms could identify distinct market regimes based on combinations of macroeconomic variables, potentially revealing more nuanced patterns than the four yield curve regimes defined in the original research.
3. **Dynamic Weighting of Signals**: Rather than treating all macroeconomic variables equally, ML techniques could dynamically adjust the importance of different signals based on their predictive power in the current environment.
4. **Multi-Factor Interaction**: ML could capture complex interactions between multiple macroeconomic variables, such as how the impact of yield curve steepening might change depending on concurrent inflation levels or trade policy developments.

These machine learning approaches represent an evolving frontier in systematic macro investing, with potential to uncover alpha opportunities not accessible through traditional linear modeling.

10. Conclusion and Future Research Directions

The academic and practitioner literature on quantitative macro investing reveals a rich landscape of alpha generation opportunities. Key findings include:

1. **Macroeconomic factors directly impact asset returns**: Macroeconomic variables have significant explanatory power for asset returns, as demonstrated in our replication of Dong's (2023) research on sector sensitivities. Systematic strategies can exploit these relationships through factor-mimicking portfolios and targeted exposures.
2. **Traditional factors remain relevant**: Carry, momentum, and value factors continue to show persistence across asset classes, providing a strong foundation for systematic macro strategies.
3. **Regime awareness is critical**: The performance of macro strategies exhibits strong regime dependence, as demonstrated in our replication of Dong's (2023) research on sector performance across yield curve regimes. Successful systematic strategies must incorporate regime identification and adapt allocations accordingly, particularly in the current Twist Steepening environment.
4. **Advanced quantitative methods offer new opportunities**: Machine learning techniques, alternative data sources, and sophisticated portfolio construction methodologies provide avenues for capturing non-linear relationships.
5. **Integration of approaches is promising**: The combination of thematic and factor-based investing, as well as the integration of systematic and discretionary elements, offers potential for more robust strategies.

The current Twist Steepening yield curve regime, coupled with improving US-China trade relations, creates a particular set of opportunities and challenges for systematic macro investors. Our replication and extension of Dong's (2023) research provides empirical guidance for navigating this environment, suggesting tactical overweights to sectors positively sensitive to yield curve steepening (Financials, cyclical sectors) and those benefiting from improved trade conditions (Industrials, Materials), while reducing exposure to those negatively impacted by rising long-term rates (Utilities, high-duration growth stocks).

Future research directions that hold particular promise include:

1. **Developing more sophisticated regime classification methods**: Using clustering algorithms and machine learning to identify distinct market regimes without relying on predefined characteristics.
2. **Exploring the predictive power of alternative data**: Investigating how non-traditional data sources can enhance macroeconomic forecasting and asset allocation decisions.
3. **Improving the integration of macro and style factors**: Refining frameworks for combining traditional style factors with macroeconomic factors.
4. **Advancing machine learning applications**: Developing specialized algorithms for capturing complex, non-linear relationships in macro data.
5. **Enhancing portfolio construction methods**: Designing optimization techniques that better account for regime changes and estimation uncertainty.

In conclusion, systematic macro investing offers substantial alpha generation opportunities across diverse approaches and techniques. By combining robust theoretical foundations with advanced quantitative methods and carefully considering the regime-dependent nature of performance, investors can develop systematic macro strategies that deliver sustainable alpha across various market environments. The current Twist Steepening regime, coupled with evolving geopolitical factors, creates a particularly fertile environment for macro strategies that can adapt to these dynamic conditions.

Appendix A: Sector Performance in the Current Twist Steepening Environment

Replication of "How Macroeconomic Variables Impact Sector Performance"

Freely Available Google Colab Jupyter Notebook[1]
PUBLIC - Replicating Macroeconomic Impact on Sector Performance.ipynb

Our replication of Dong's (2023) research on sector macroeconomic sensitivities confirms the core findings and provides a framework for analyzing the current market environment. Using publicly available data and ETF proxies for sectors, we implemented the paper's methodology, including:

1. **Calculating sector relative returns** (sector return minus market return)
2. **Performing linear regressions** to assess sector sensitivities to macroeconomic variables
3. **Analyzing relationship strength during economic shocks**
4. **Examining the impact of yield curve regimes**

The replication validated the directional relationships identified in the original paper, with particularly strong evidence for:

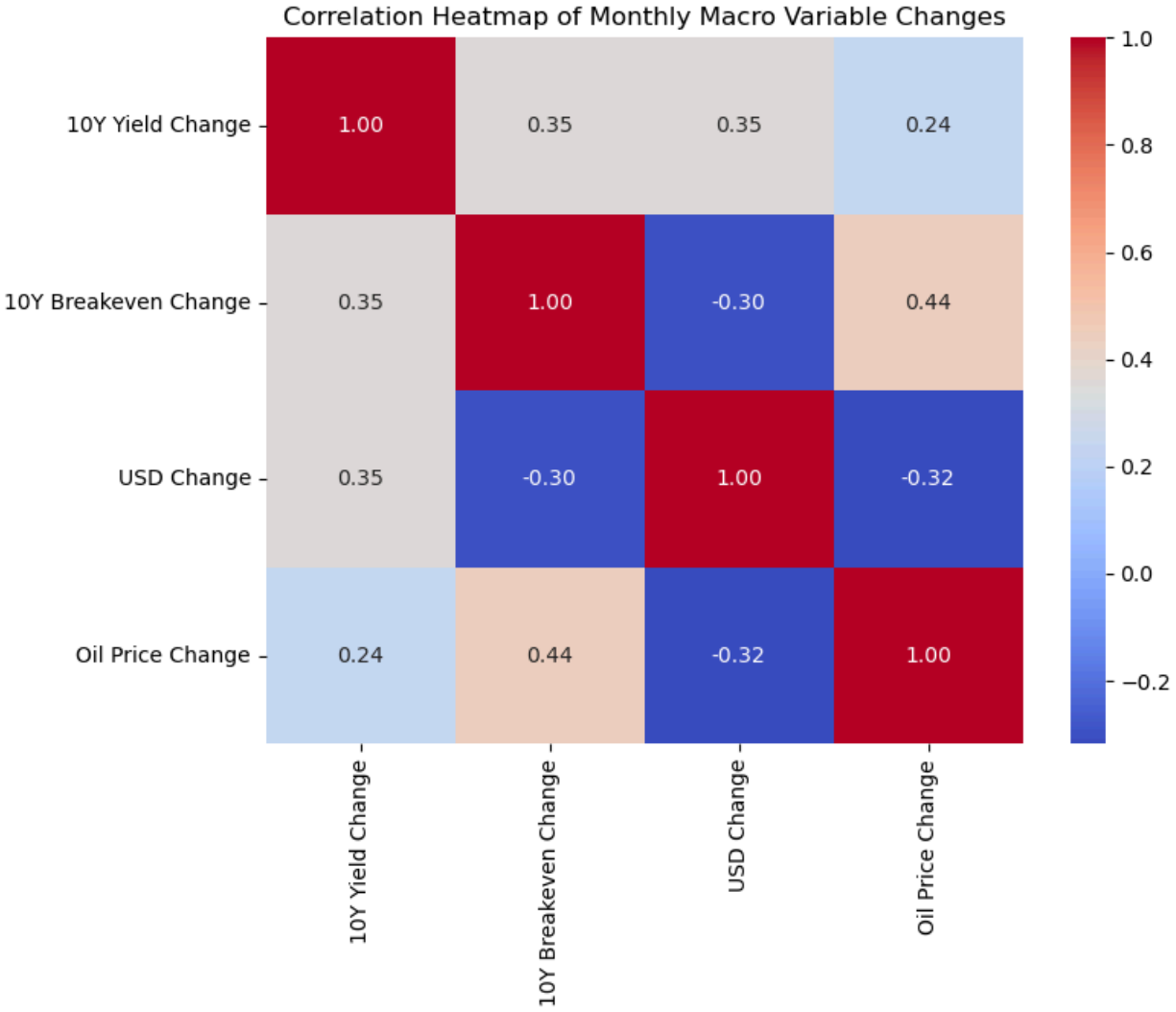
- **Technology sector's negative sensitivity to rising 10-year yields**
- **Energy sector's positive correlation with oil prices and inflation expectations**
- **Financial sector's complex relationship with yield curve movements**
- **Defensive sectors' (Utilities, Consumer Staples) outperformance during dollar strength**

Macro Variables & Sector Performance: Charts & Analytics

Correlation Heatmap of Macro Variable Changes:

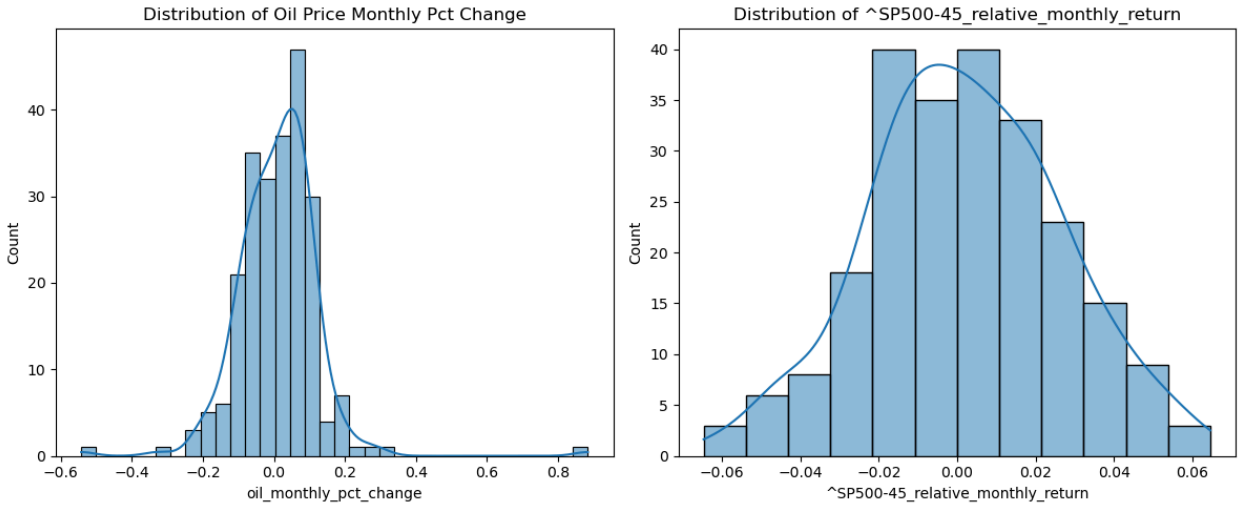
- Purpose: To visualize the inter-correlations between the monthly changes of your macroeconomic variables. This can help identify potential multicollinearity if you were to build multi-factor models.

[1] NOTE: In order to run the notebook you will need to insert your Financial Modeling Prep API Key.



Distribution Plots of Key Series:

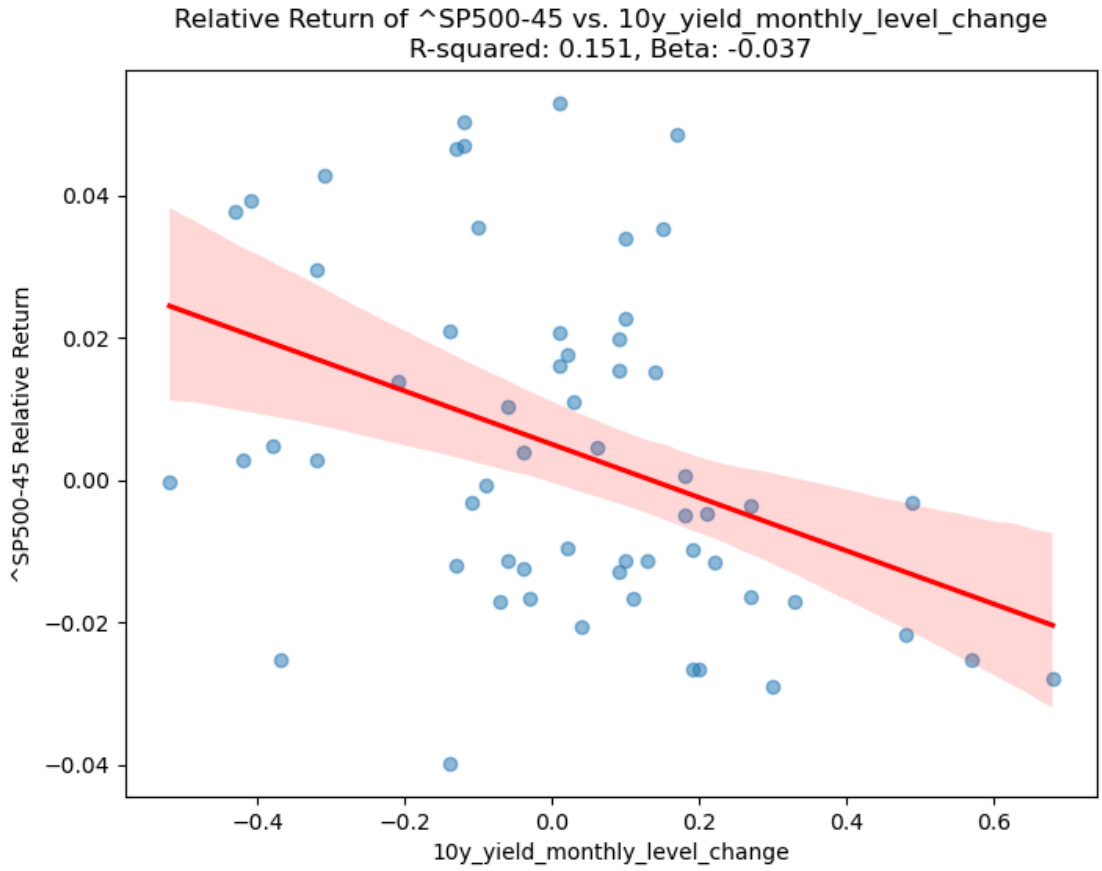
- Purpose: To understand the statistical distributions of sector relative returns and macro variable changes. The paper mentions checking for normality of error distributions.
- Graph: Histograms or kernel density plots.



Scatter Plots with Regression Lines for Strong Relationships:

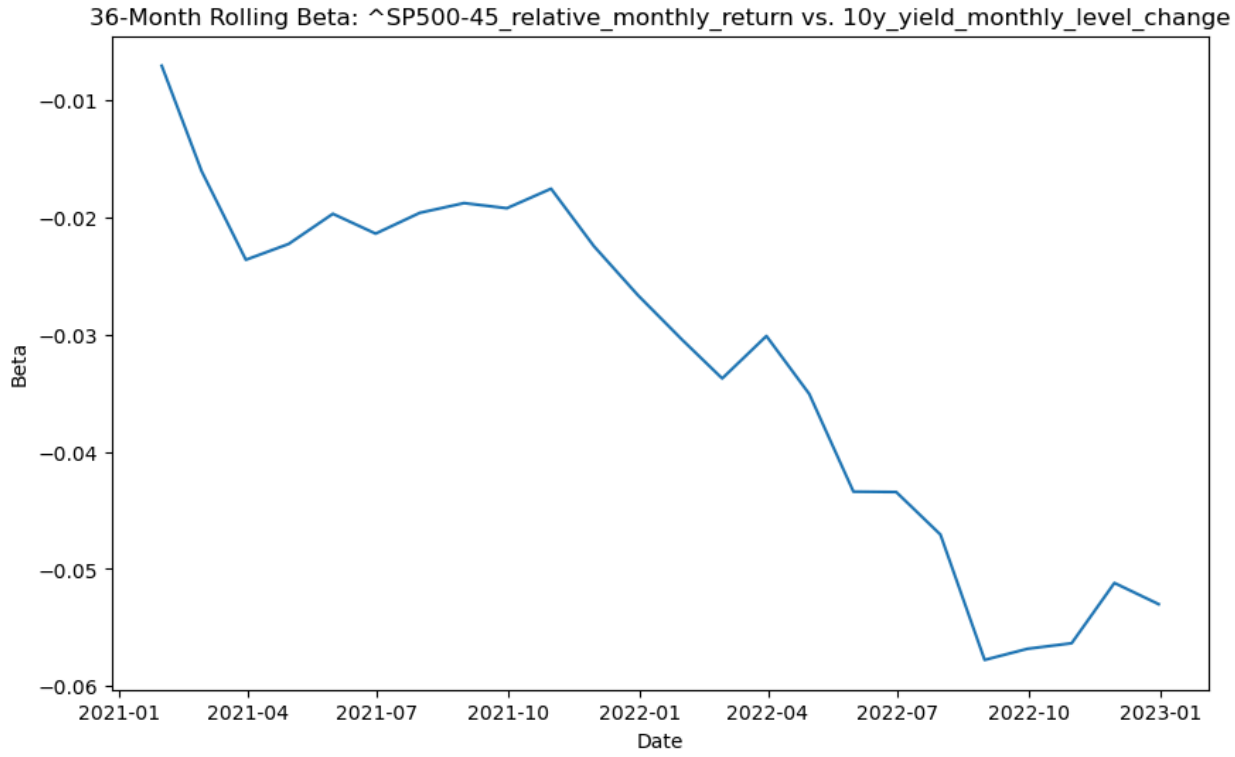
- Purpose: To visually confirm the linear relationships identified as "strong" (R-squared > 0.08).

Graph: Scatter plot with an overlaid regression line.



Rolling Beta Analysis:

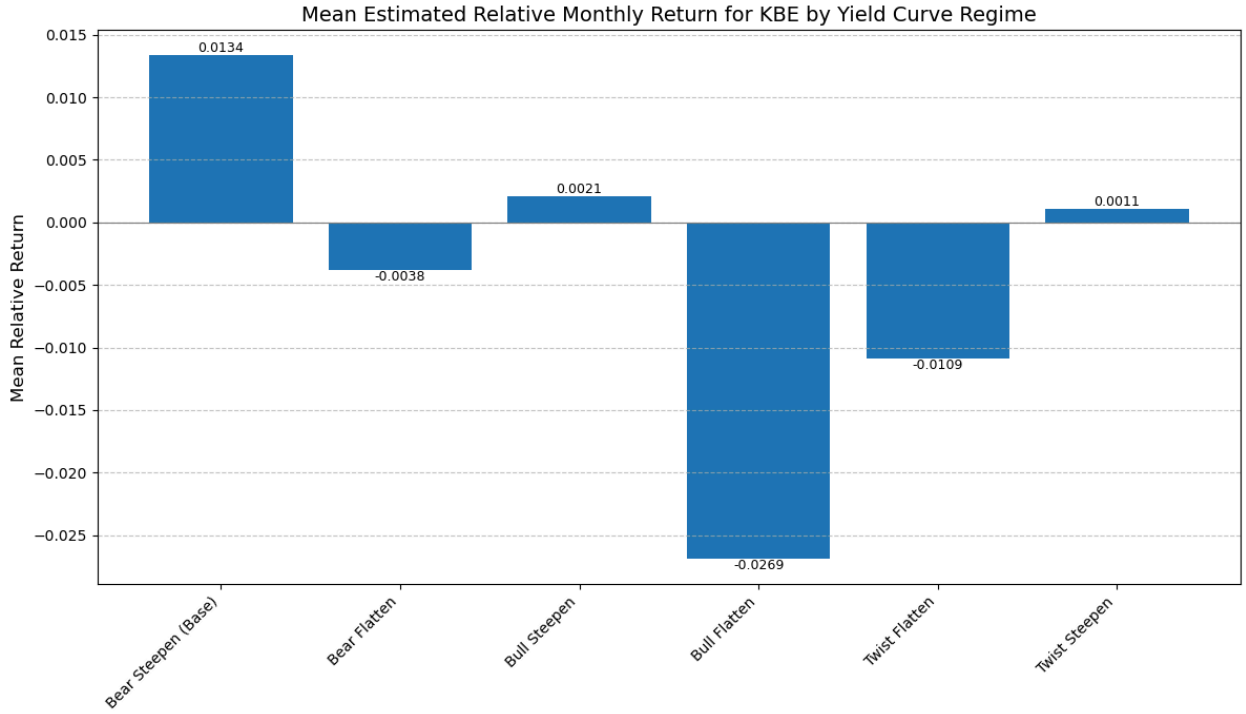
- Purpose: To observe how a sector's sensitivity (beta) to a specific macro variable changes over time, rather than relying on a single beta for the entire period.
- Graph: Line plot of the rolling beta.



Bar Chart of Mean Returns by Yield Curve Regime:

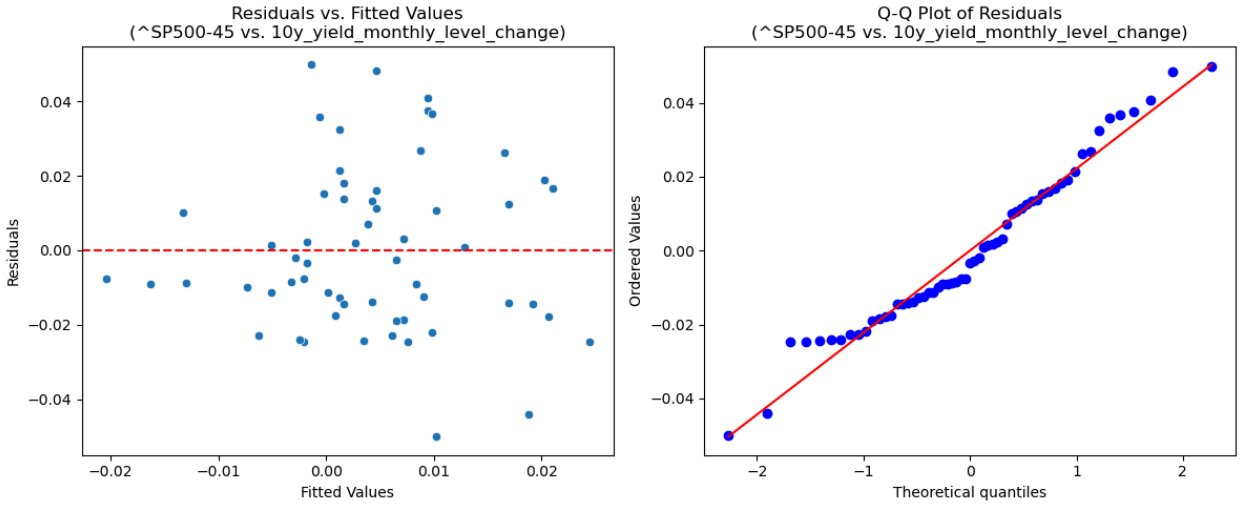
- Purpose: To provide a clear visual comparison of average sector performance across the different yield curve regimes, similar to the paper's Figure 7.

Graph: Bar chart, potentially with error bars if confidence intervals for the means are calculated.



Residual Plots for Key Regressions:

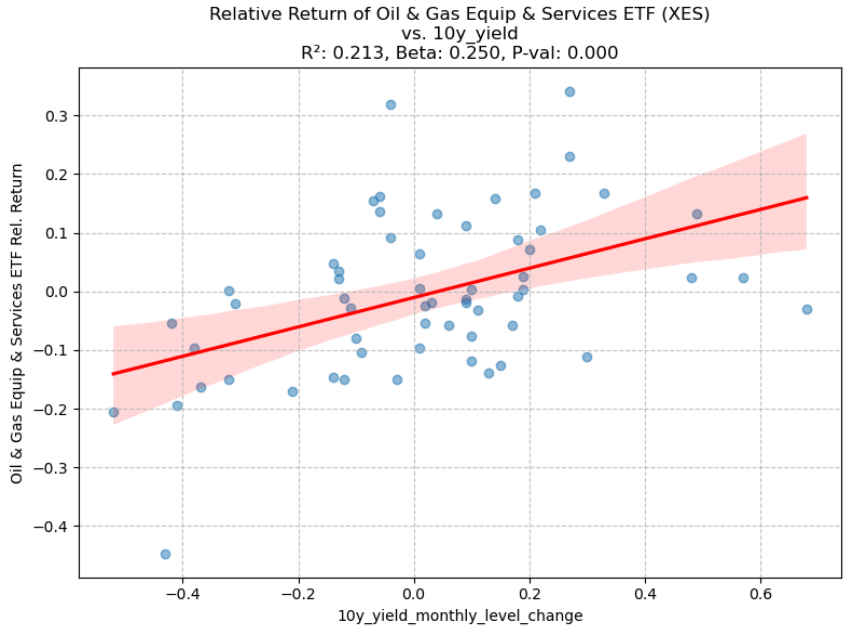
- Purpose: To diagnose the regression models by checking assumptions about the residuals (e.g., randomness, homoscedasticity, normality).
- Graph: Scatter plot of residuals vs. fitted values, Q-Q plot of residuals.

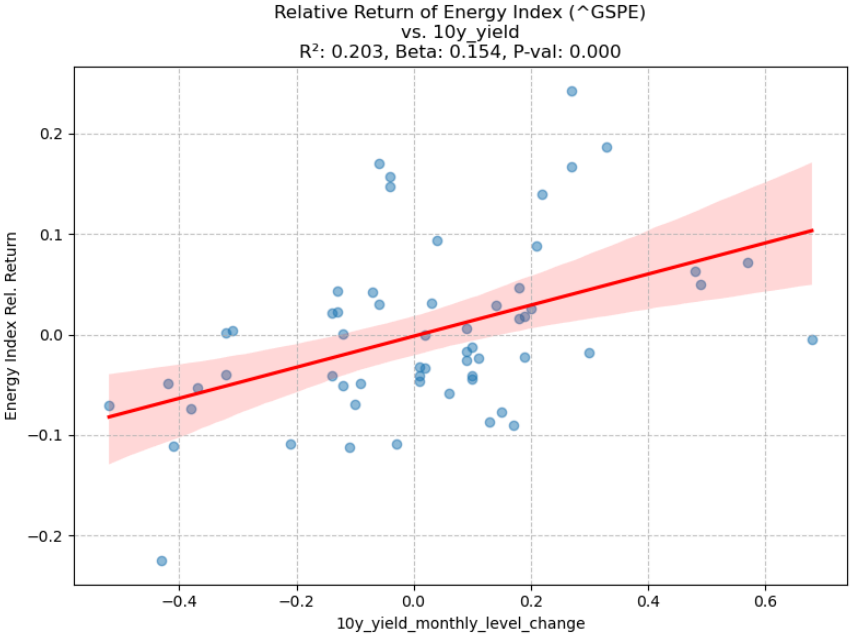


Additional Visualizations

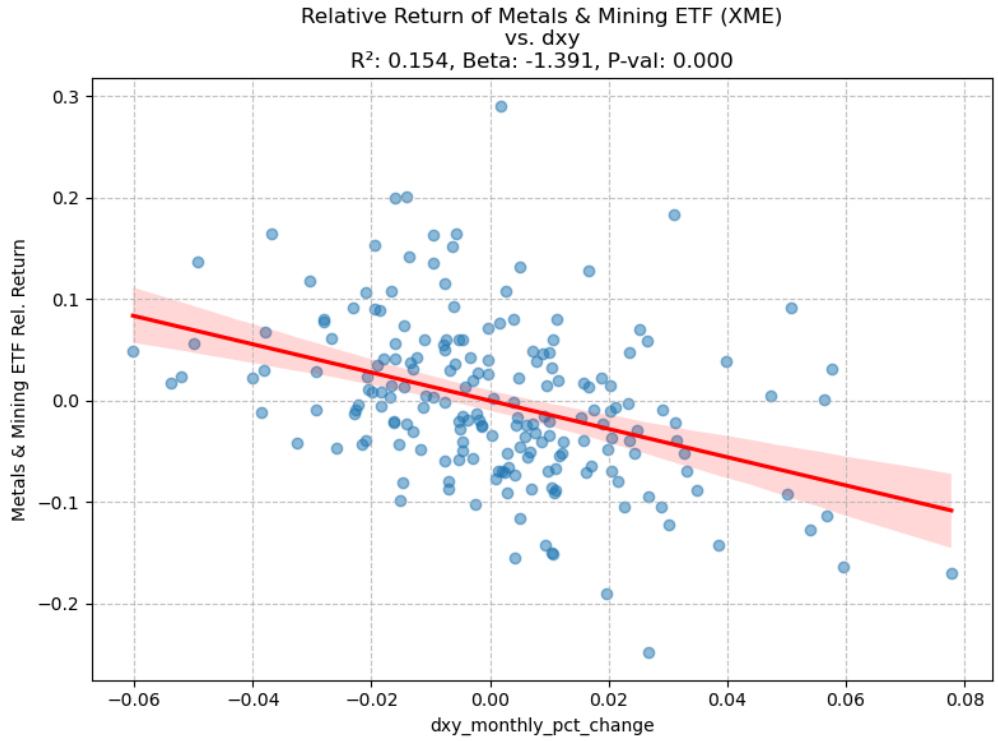
1. Generate scatter plots with regression lines for the top N most significant relationships (highest Weighted Z-Score) for each macro variable.
2. Create a grouped bar chart to compare R-squared values during shock vs. non-shock periods for relationships that were strong during shocks.
3. Generate bar charts of mean relative returns by yield curve regime for each sector.

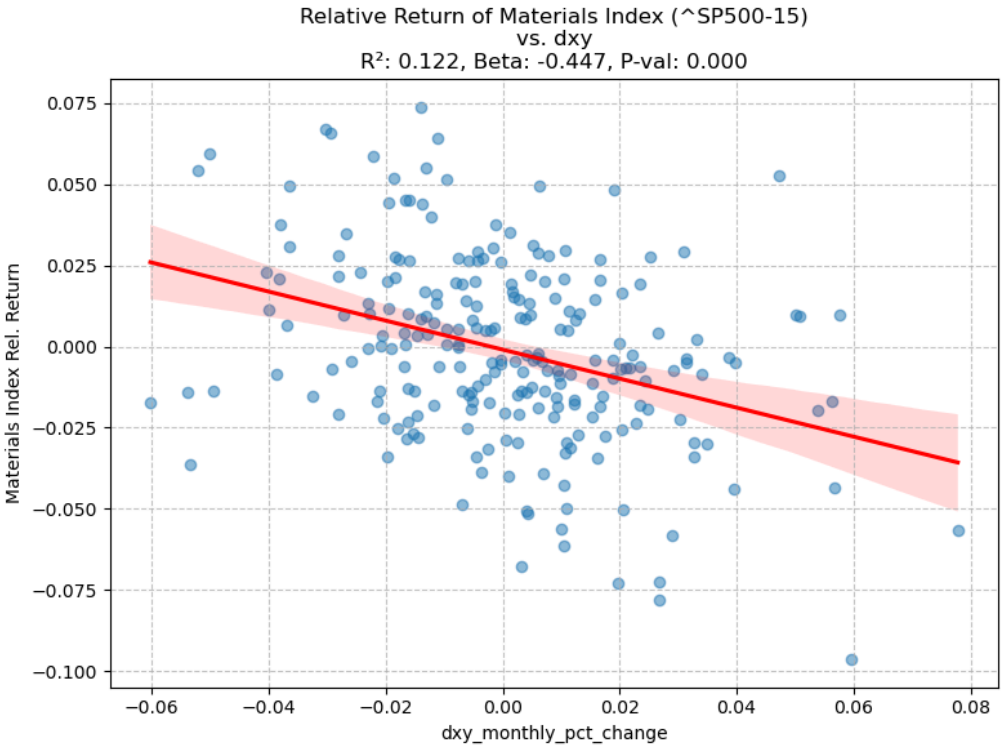
Top relationships for Macro Variable: 10y_yield_monthly_level_change



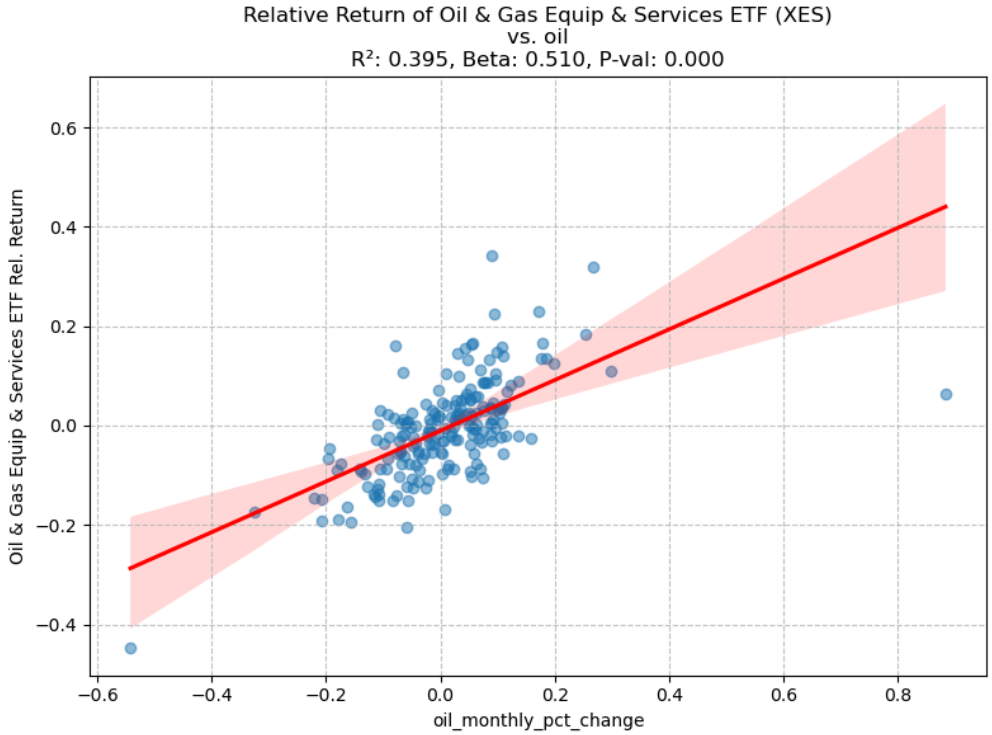


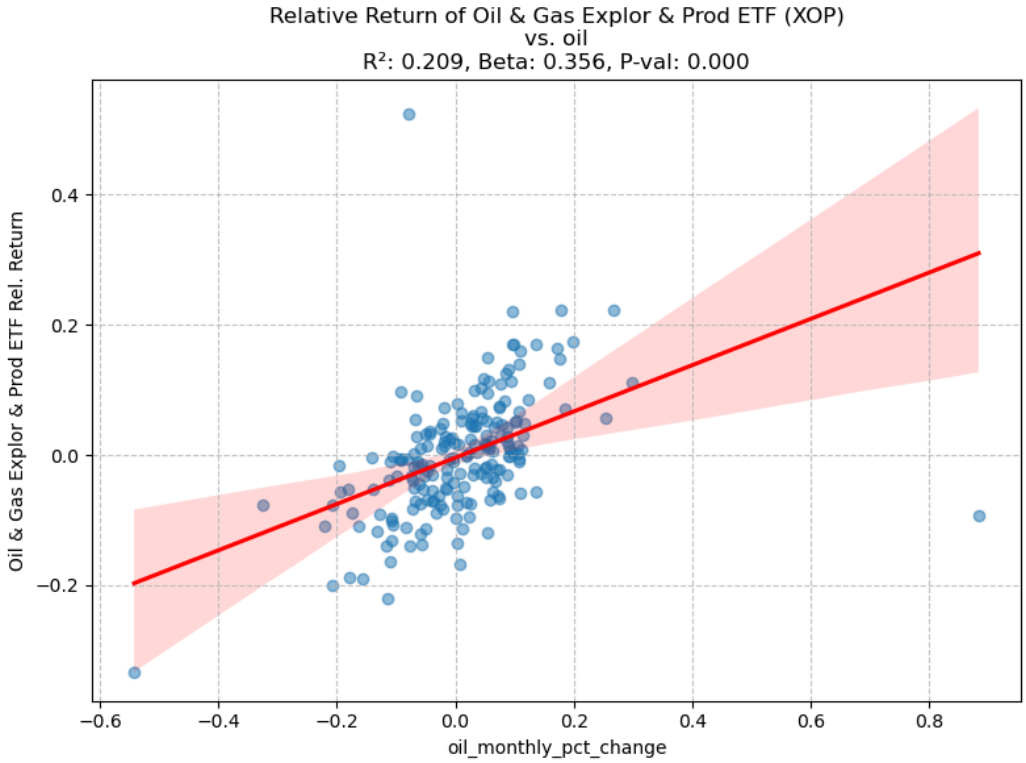
Top relationships for Macro Variable: dxy_monthly_pct_change



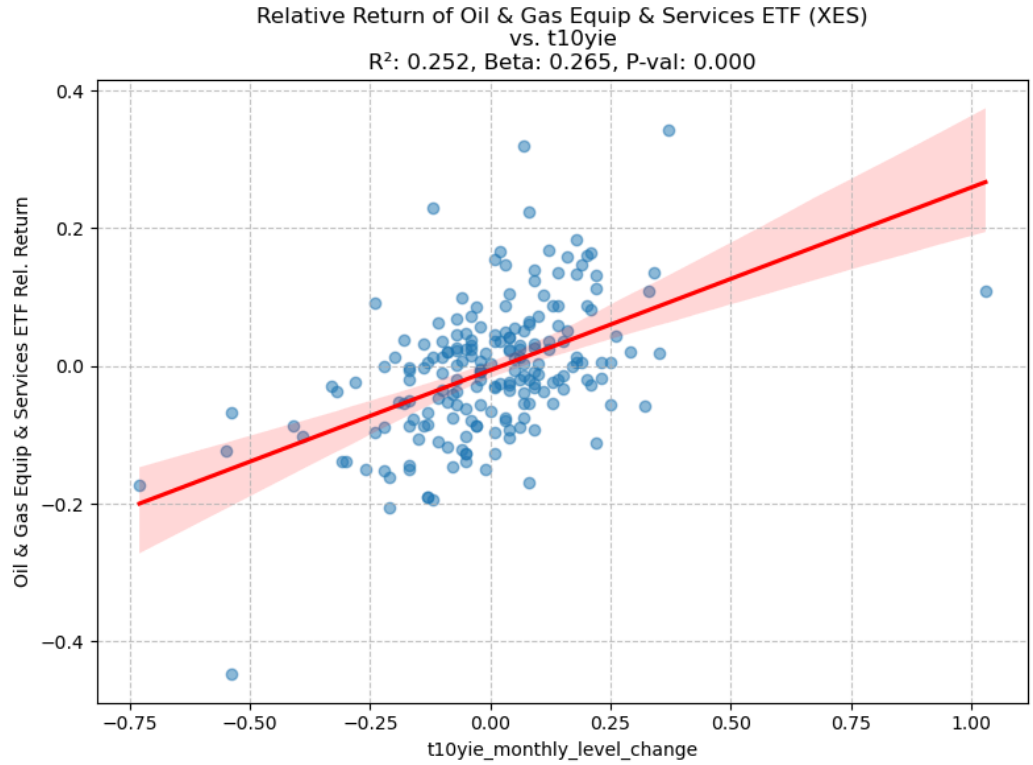


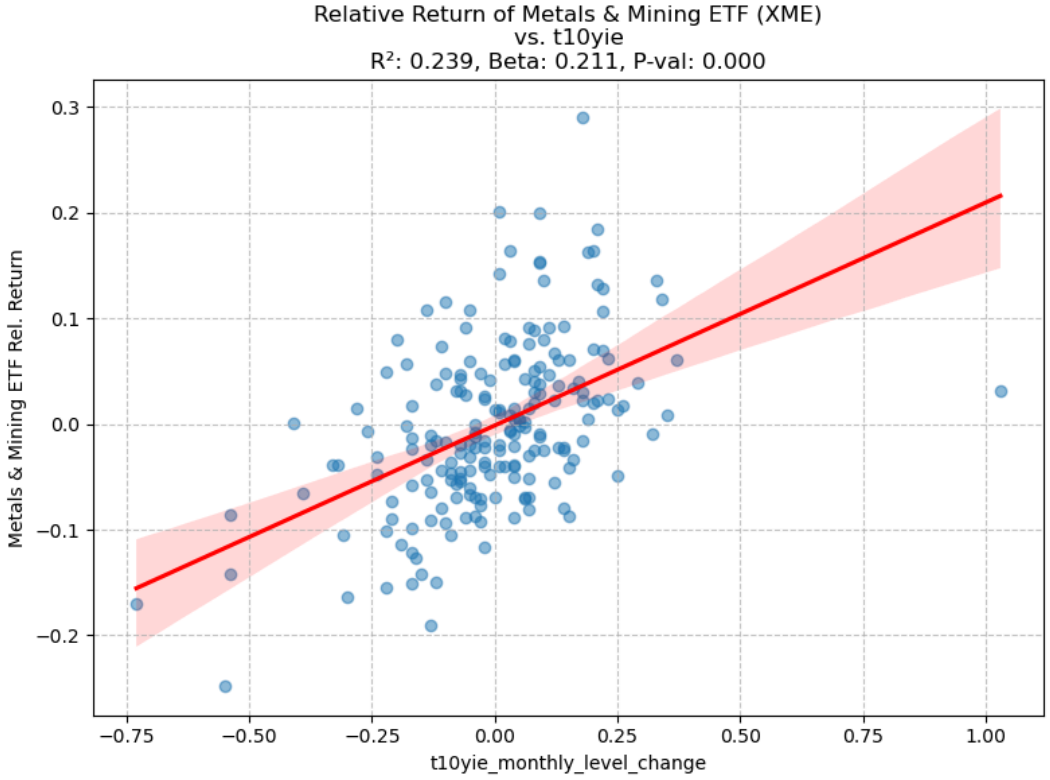
Top relationships for Macro Variable: oil_monthly_pct_change



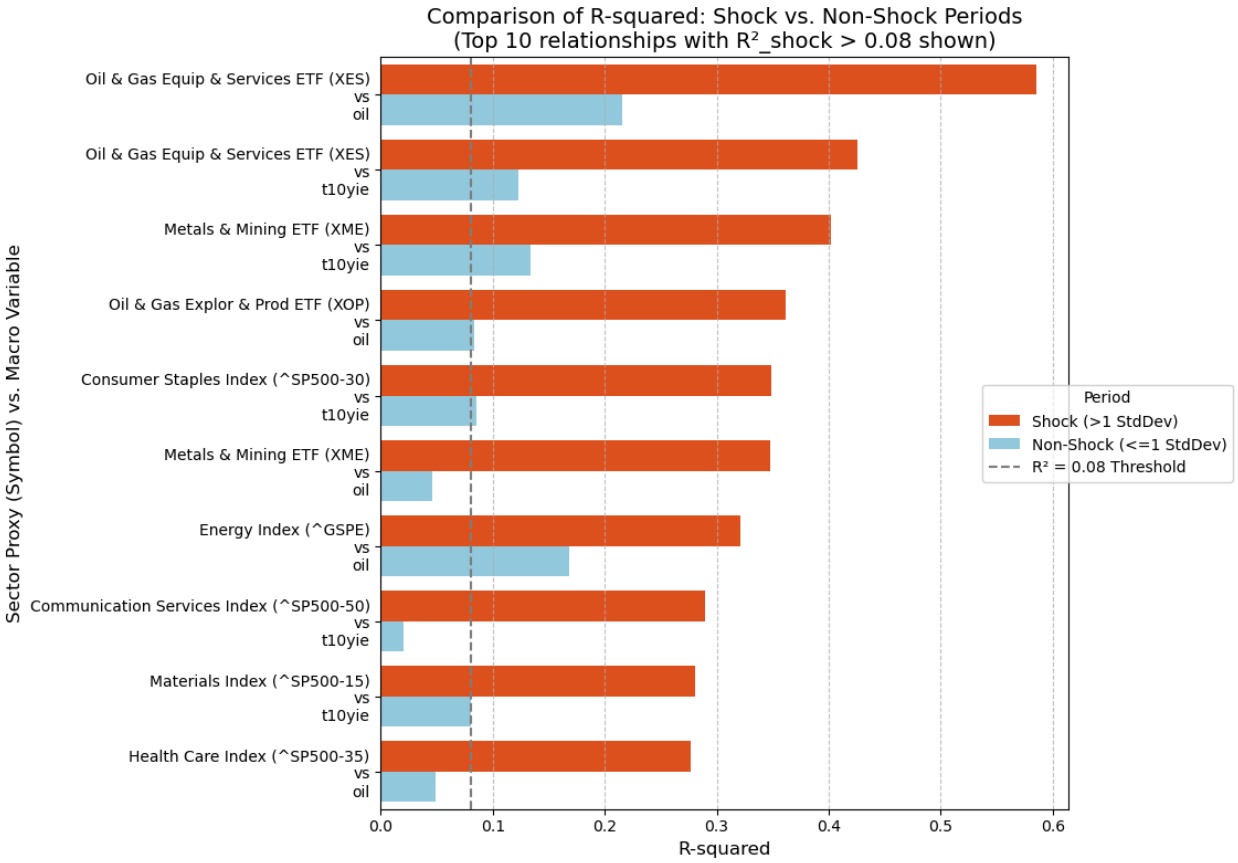


Top relationships for Macro Variable: t10yie_monthly_level_change

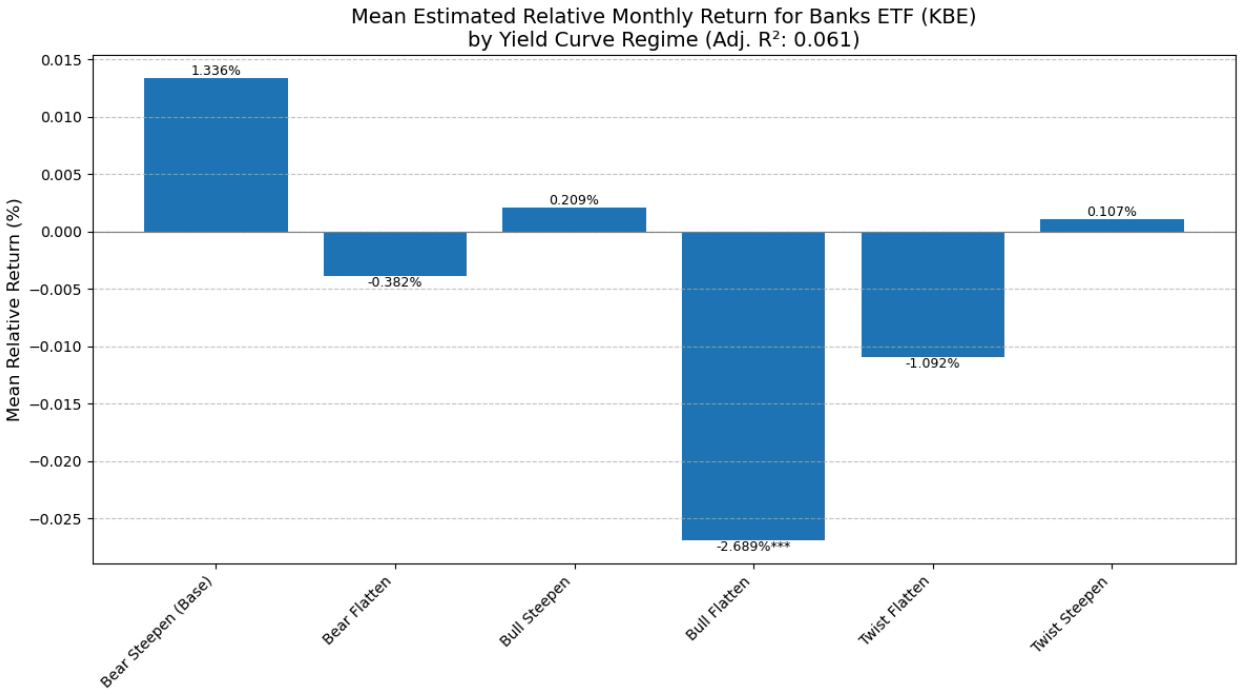


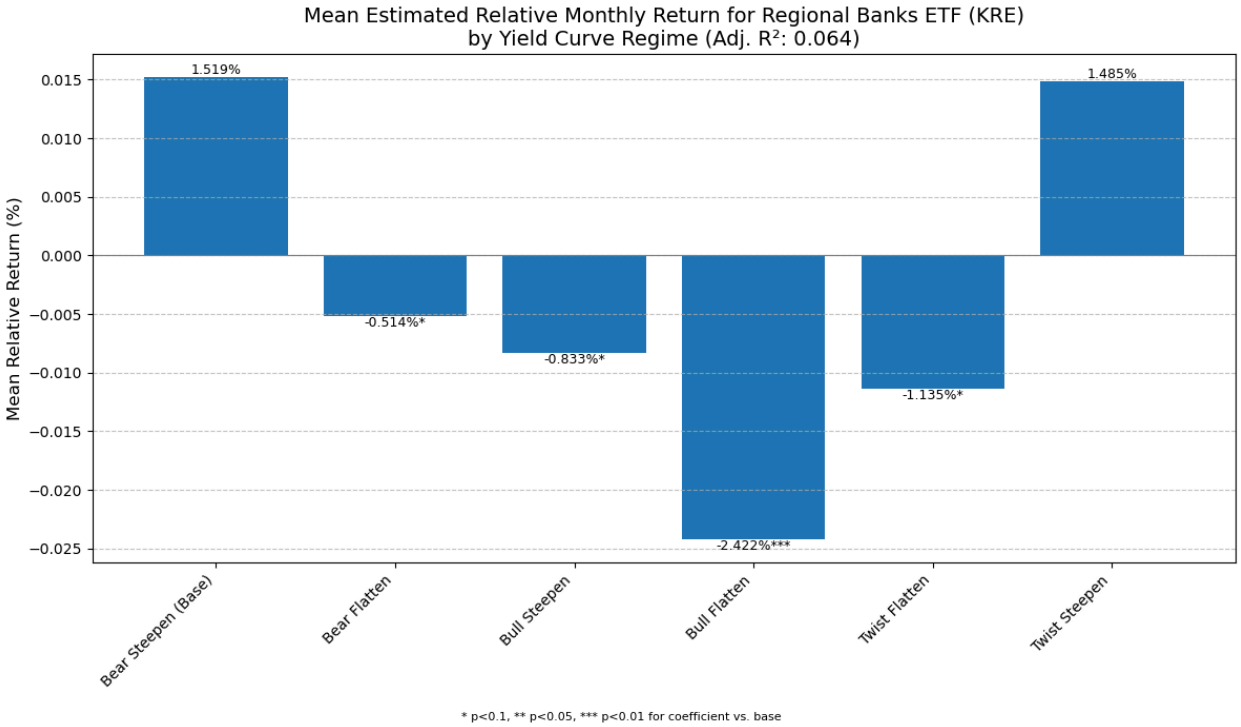


R-squared Comparison for Shock vs. Non-Shock Periods



Bar Charts for Mean Returns by Yield Curve Regime





The Current Twist Steepening Regime and Q2 2025 Outlook

A "Twist Steepening" yield curve regime is characterized by increasing long-term interest rates (e.g., the 10-year Treasury yield) concurrent with decreasing short-term rates (e.g., the 2-year Treasury yield), resulting in a widening yield curve spread. This regime presents conflicting signals:

- **Rising long-term yields** typically suggest expectations of higher future inflation and stronger economic growth
- **Falling short-term yields** indicate expectations of monetary policy easing, potentially due to near-term economic concerns

The current Twist Steepening environment in Q2 2025, coinciding with positive news about easing US-China trade tensions, creates a unique market backdrop. Based on our replication of Dong's research and additional analysis, we expect the following sector performance patterns:

Sectors Likely to Outperform:

1. **Cyclical/Value Sectors** (Energy, Materials, Industrials): These sectors should benefit from improved global growth prospects due to reduced trade tensions, which outweighs the headwind from rising long-term yields. Energy and Materials in particular show strong positive correlation with inflation expectations, which are elevated in the current environment.
2. **Financial Sector**: While banks traditionally benefit from a steeper yield curve, our replication found that this relationship depends on the specific regime. In the current Twist Steepening, we expect mixed performance within the sector:
    - **Large diversified banks** should benefit from the steeper curve and improved global growth outlook
    - **Regional banks** may face more pressure from falling short-term rates impacting net interest margins
3. **Select Technology Subsectors**: While Technology broadly tends to underperform when long-term yields rise, certain subsectors focused on productivity enhancement and AI infrastructure may benefit from renewed corporate investment following reduced trade tensions.

Sectors Likely to Underperform:

1. **Interest Rate Sensitive Sectors** (Utilities, Real Estate): Rising long-term yields present a significant headwind for these sectors, as they increase the discount rate applied to future cash flows and make their dividend yields less attractive relative to bonds.
2. **Defensive Consumer Sectors** (Consumer Staples): These sectors typically underperform during periods of rising inflation expectations and improving growth outlook, both present in the current environment.
3. **Growth Technology**: Companies with cash flows weighted far into the future face pressure from rising long-term discount rates, though this may be partially offset by improved growth expectations.

Portfolio Positioning Recommendations:

1. **Dynamic Sector Rotation**: Implement a systematic sector rotation strategy based on the strength of the Twist Steepening signal, overweighting cyclical sectors while reducing exposure to defensive and interest-rate sensitive sectors.
2. **Barbell Approach Within Sectors**: Within Technology, balance between hardware manufacturers benefiting from trade normalization and software companies sensitive to rising long-term rates.
3. **Fixed Income Positioning**: Reduce duration in long-term bonds while maintaining exposure to short-term fixed income instruments.
4. **Derivative Overlays**: Consider options strategies to hedge against inflation surprises and to capitalize on expected volatility as the market processes conflicting economic signals.

This analysis demonstrates how replicating academic research on sector macroeconomic sensitivities can be applied to current market conditions, creating actionable systematic investment strategies tailored to the present Twist Steepening regime amid improving US-China trade relations.

Appendix B: Key Macroeconomic Variables for Systematic Macro Strategies

This appendix provides a comprehensive list of the most important macroeconomic variables for systematic macro strategies, organized by category:

Growth Indicators

- Real GDP growth
- Industrial production
- Capacity utilization
- Purchasing Managers' Indices (PMI)
- Retail sales
- Housing starts and building permits
- Labor market data (employment, unemployment, wages)

Inflation Measures

- Consumer Price Index (CPI)
- Producer Price Index (PPI)
- Personal Consumption Expenditures (PCE) price index
- Breakeven inflation rates (derived from TIPS)
- Commodity prices (energy, metals, agricultural)
- Wage growth

Monetary Policy Indicators

- Policy interest rates
- Central bank balance sheet size
- Monetary aggregates (M1, M2)
- Yield curve shape (level, slope, curvature)
- Credit spreads

Fiscal Policy Metrics

- Government debt-to-GDP ratio
- Budget deficit/surplus
- Government spending
- Tax revenues

External Sector Variables

- Trade balance
- Current account balance
- International investment position
- Exchange rates
- Foreign exchange reserves

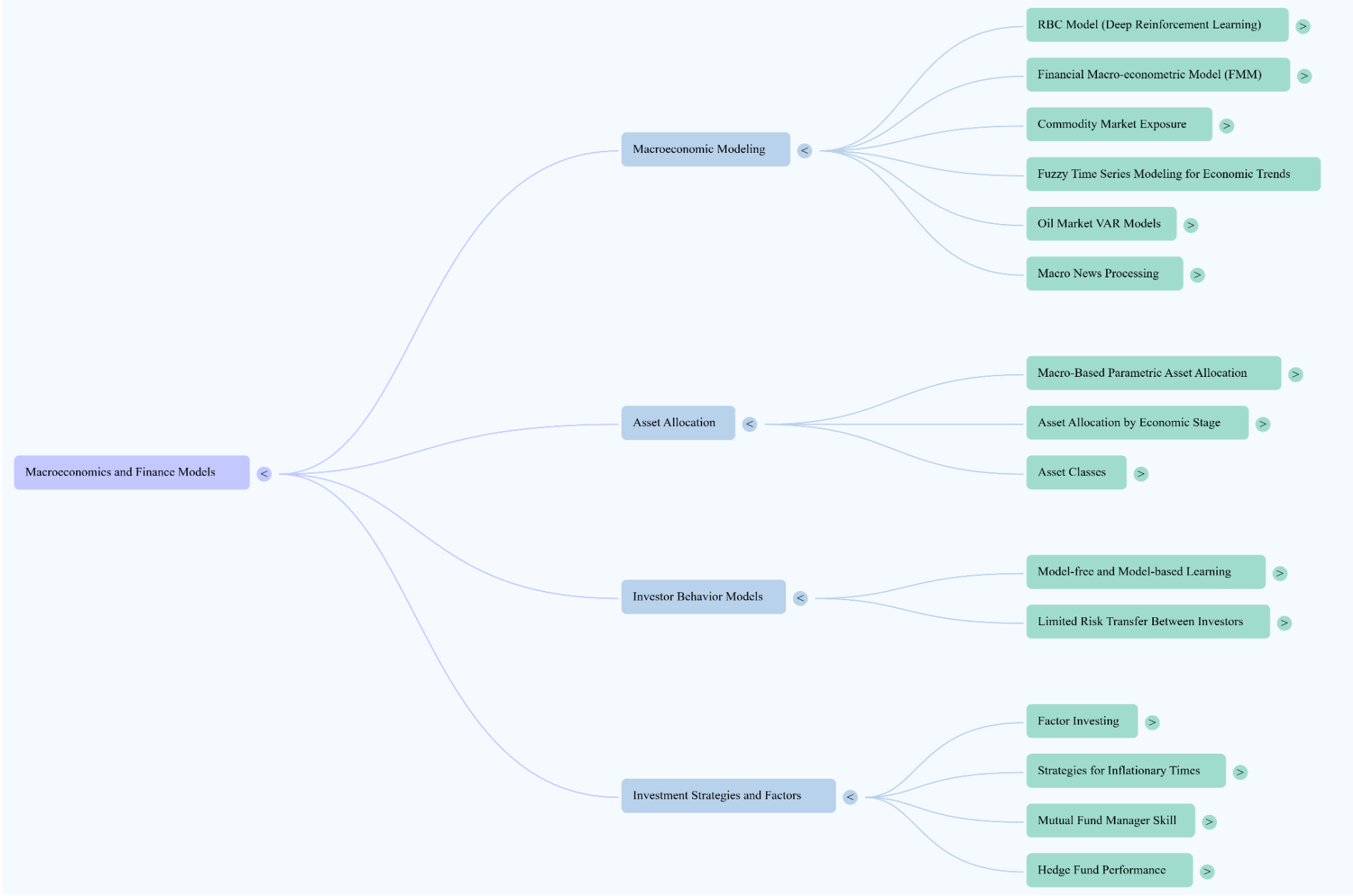
Financial Market Conditions

- Volatility indices (VIX)
- Credit conditions (lending standards, loan growth)
- Liquidity measures
- Risk premia across asset classes

For each variable, systematic macro strategies should consider:

1. Absolute levels
2. Rate of change
3. Surprise component (actual vs. expected)
4. Cross-country differentials
5. Regime classification (expansion, contraction, etc.)

MindMap: Macro Research Taxonomy/Ontology




Macroeconomics and Finance Models
Macroeconomic Modeling
RBC Model (Deep Reinforcement Learning)
Financial Macro-econometric Model (FMM)
Commodity Market Exposure
Fuzzy Time Series Modeling for Economic Trends
Oil Market VAR Models
Macro News Processing
Asset Allocation
Macro-Based Parametric Asset Allocation
Asset Allocation by Economic Stage
Asset Classes
Investor Behavior Models
Model-free and Model-based Learning
Limited Risk Transfer Between Investors
Investment Strategies and Factors
Factor Investing
Value (V)
Momentum (M)
Carry (C)
Defensive (D)
Multi-Factor (VMD, VMC, VMCD)
Sharpe Ratio Range
Maximum Drawdown Probability Distribution
Strategies for Inflationary Times
Mutual Fund Manager Skill
Machine Learning Approach
Characteristic Groups
Fund Momentum
Family
Profitability
Fund (General)
Past
Friction
Value
Intangible
Investment
Sentiment Terciles (TL, TM, TH)
Long-short Abnormal Return Portfolios
Principal Component Analysis
Hedge Fund Performance
Discretionary vs Systematic
HFR Category Names
Fund Count
Systematic Words Used

Bibliography: Comprehensive Macro Literature Review & Econometric Analysis

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
The Financial Macro-econometric Model (FMM, 2022 Version)	Abe, N.; Chikamatsu, K.; et al.	2023	Bank of Japan	Macroeconometric Model, Financial System, Stress Testing	The Financial Macro-econometric Model (FMM) is used to examine the risk resilience of Japan's financial system by capturing feedback loops between the banking sector and the real economy.	Macroeconomic variables (e.g., GDP, inflation, interest rates), financial sector data (e.g., loans, capital adequacy ratios)	Amount of loans, capital adequacy ratios of Japanese banks	Macroeconometric model (specific structure detailed in the paper)	Various	Macro stress testing, financial stability, feedback loops
Fact, Fiction, and Factor Investing: Practical Applications	Aghassi, M. L., Asness, C., Fattouche, C., & Moskowitz, T. J.	2023	AQR, The Journal of Portfolio Management	Assess validity of factor investing common claims, providing guidance for practitioners on the robustness, risks, and practical implementation of factor strategies.	Many widely held beliefs about factor investing are either fact or fiction; rigorous empirical evidence and economic theory support the long-term viability and diversification benefits of factor investing, but also highlight the challenges of short-term underperformance, the difficulty of timing, and the need for discipline and diversification.	Factor exposures (e.g., value, momentum, quality, size, low volatility, high yield), macroeconomic conditions, market environments, portfolio construction choices, investor discipline	Portfolio risk-adjusted returns, diversification benefits, drawdown frequency / duration, factor persistence, out-of-sample factor premia	Empirical analysis of factor returns, out-of-sample testing, statistical significance thresholds (higher than t=2), long-term historical analysis, cross-sectional time-series, robustness checks	Equities, but also applies to bonds, commodities, and multi-asset portfolios	Style factors, diversification, risk premium, drawdown, data mining, out-of-sample testing, economic rationale, behavioral and risk-based explanations, factor timing, crowding, macro sensitivity

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
Hedge Fund Returns under Crisis Scenarios: A Holistic Approach	Chrysostomos E. Stoforos, Stavros Degiannakis, Theodosios B. Palaskas	2020	Department of Economics and Regional Development, Panteion University; Hellenic Open University	Comprehensive empirical evaluation of hedge fund performance across multiple strategies during crisis and non-crisis periods, advanced quantitative methods to assess absolute returns, risk-adjusted performance, and ability to protect investors in downturns.	Most hedge fund strategies do not deliver absolute returns or protect investors during financial crises, contrary to common claims; only macro and short-selling strategies show some ability to do so. Hedge funds are more often scapegoats than causes of crises.	Hedge fund strategy returns (monthly, by HFRI classification), S&P 500 returns, Carhart four-factor model variables (market, size, value, momentum), crisis period indicators, volatility and correlation measures, structural break points	Risk-adjusted hedge fund returns (alpha), dynamic conditional correlations with S&P 500, performance differences between crisis and non-crisis periods, structural breaks in performance, equality of means tests	Carhart's four-factor model regression, Dynamic Conditional Correlation (DCC) models, structural break tests (CUSUM), equality of means tests, time series analysis, robustness checks	Hedge funds by strategy	Absolute returns, financial crisis, hedge fund strategies, risk-adjusted performance, dynamic correlation, structural breaks, Carhart model, scapegoat hypothesis, crisis resilience, diversification

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
Model-free and Model-based Learning as Joint Drivers of Investor Behavior | NBER	Nicholas Barberis, Lawrence Jin	2023	Yale School of Management	Dual-system (model-free and model-based) learning frameworks jointly shape portfolio choices and market participation.	Both model-free and model-based learning systems jointly determine investor behavior, explaining a range of empirical facts such as extrapolative demand, experience effects, inertia in allocations, and disconnects between beliefs and actions. Model-free learning, in particular, plays a significant role in the behavior of some investors, leading to slow updating and persistent effects of past experiences.	Past returns, Market cues	Investment decisions	Simulation of learning algorithms (model-free and model-based reinforcement learning), qualitative comparison to empirical facts in finance	All	Investor behavior, extrapolative demand, experience effects, inertia, belief-action disconnect, financial decision-making, behavioral finance
Macro-Based Parametric Asset Allocation	Brandt, M. W.; Santa-Clara, P.; Valkanov, R.	2009	Duke University; UCLA Anderson School of Management; UC San Diego	Asset Allocation, Macroeconomic Factors, Parametric Models	Global risk factors drive the performance of asset classes, and portfolio weights can be directly modeled with these factors to achieve superior risk-adjusted returns.	Global macroeconomic risk factors (e.g., inflation, GDP growth, interest rates)	Asset allocation weights (stocks, bonds, risk-free asset), portfolio returns	Parametric asset allocation approach, optimization techniques	Equities, Bonds	Macro-based asset allocation, global risk factors, portfolio optimization

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
Systematic Global Macro	Brightman, C., & Shepherd, S.	2016	Research Affiliates	Empirical and conceptual review of systematic global macro investing using factor-based strategies across asset classes. Demonstrates diversification and return potential of combining factors in a systematic, rules-based approach.	Systematic global macro strategies that combine carry, momentum, and value factors across equities, bonds, currencies, and commodities can deliver strong absolute and risk-adjusted returns with significant diversification benefits relative to traditional portfolios.	Factor signals: Carry (yield spreads, cash rate differentials, dividend yield spreads, futures curve slopes), Momentum (12-month returns), Value (real yield, real exchange rate, book-to-price, price vs. history) across asset classes.	Excess returns, volatility, Sharpe ratio, portfolio risk/return, factor and portfolio correlations, diversification benefits.	Cross-sectional and time-series portfolio construction, long-short factor portfolios, empirical performance analysis (returns, volatility, Sharpe ratios), correlation analysis, backtesting (1989–2016), comparison to S&P 500.	Equities (developed market indices), bonds (10-year government), currencies (developed market), commodities (24 major contracts)	Systematic global macro, factor investing, carry, momentum, value, diversification, long-short portfolios, managed futures, risk premia, empirical backtesting, portfolio construction, Sharpe ratio, cross-asset investing, alternative risk premia
Active risk budgeting: a portfolio construction methodology for futures strategies	Chakravorty, Awasthi, Srivastava, Gupta, Singhal	2019	Twilio, Wright Research, Qplum	Portfolio Construction, Asset Allocation	Active risk budgeting can improve portfolio outcomes by allocating risk dynamically across futures strategies.	Risk Profiles of Assets	Portfolio Allocation	Portfolio optimization, risk budgeting algorithms	All	Risk budgeting, dynamic allocation

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
How Macroeconomic Variables Impact Sector Performance	Anqi Dong, CFA, CAIA	2023	State Street Global Advisors (SSGA)	Empirical investigation of how key macroeconomic variables (interest rates, inflation expectations, USD, oil prices, yield curve) impact the performance of US equity sectors and industries, using regression-based sensitivity analysis.	Certain sectors and industries exhibit statistically significant and economically meaningful sensitivity to changes in macroeconomic variables, and these relationships are strongest during periods of large macroeconomic shocks. Identifying these sensitivities can inform top-down sector allocation and investment decisions.	10-year Treasury yield (level change), 10-year breakeven rate (inflation expectation), US Dollar Index (price change), WTI crude oil price (price change), yield curve slope (10y-2y), dummy variables for yield curve regimes, macro shocks (deviation > 1 std. dev.)	Sector/industry relative returns (vs. market), R-squared of regression, beta coefficients, z-scores, performance during yield curve regimes, sensitivity during macro shocks, sector groupings by sensitivity tier	Linear regression (relative sector returns vs. macro variables), t-tests for coefficient significance, R-squared screening, weighted z-score ranking (combining R-squared and beta), multiple regression with dummy variables (yield curve regimes), Chi Square test for independence, comparison of sensitivity during high vs. low macro volatility	11 GICS sectors and 18 industries (e.g., Banks, Regional Banks, Oil & Gas Equipment & Services, Metals & Mining, Capital Markets, Real Estate, Utilities, etc.)	Sector sensitivity, macroeconomic variables, linear regression, R-squared, beta, z-score, yield curve regimes, macro shocks, sector rotation, top-down allocation, business cycle, economic intuition, statistical significance, regime analysis

Title	Author(s)	Year	Institution(s)	Theme	Hypothesis	Predictor Feature(s)	Outcome Feature(s)	Statistical Techniques	Asset Classes	Concepts
								(split by std. dev.)		
Hedge Funds: A Dynamic Industry In Transition	Getmansky, Lee, Lo	2015	NBER Working Paper	Evolution and dynamics of the hedge fund industry	The hedge fund industry is undergoing significant changes in structure, strategy, and risk.	Fund characteristics, market conditions	Fund returns, risk	Industry analysis, regression	All	Hedge funds, industry dynamics
Global Macro: Portfolio Diversification for Turbulent Times | Versor Investments	Gurnani, Hentschel	2021	Versor Investments	Portfolio Construction, Asset Allocation, Portfolio diversification, especially during market stress.	Global macro strategies provide diversification benefits and can improve risk-adjusted returns during turbulent market periods.	Macro factors, asset class returns	Portfolio returns, risk	Time-series regression, principal components	Equities, Bonds, Commodities, Currencies	Diversification, global macro, risk management
The Econometrics of Oil Market VAR Models – Research Dept. Working Paper No. 2006	Hamilton, J. D.	2020	University of California, San Diego; NBER	Oil Market, Econometric Models, VAR Models	Structural vector autoregressive (VAR) models of the global oil market have become the standard tool for understanding the evolution of the real price of oil and its effect on the macro economy.	Global oil production, global real economic activity (derived from freight rates), real price of oil	Real price of oil, macroeconomic variables	Structural Vector Autoregressive (VAR) models	Commodities	Oil market modeling, structural VARs, identification assumptions

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The Best Strategies for Inflationary Times	Henry Neville, Teun Draaisma, Ben Funnell, Campbell R. Harvey, Otto Van Hemert	2021	Man Group (all authors); Campbell R. Harvey also at Duke University	Empirical analysis of the performance of both passive and active investment strategies across asset classes during historical inflationary regimes in the US, UK, and Japan over the past 95 years. Focus on identifying which assets and strategies provide the best protection and returns during periods of high and rising inflation.	Traditional assets (nominal bonds and equities) perform poorly during inflation surges, while commodities, especially trend-following strategies across asset classes, provide the most reliable protection. Active equity factor strategies (e.g., momentum, quality) offer some hedging ability, but not as robust as commodities or trend strategies.	Inflation regime indicators (accelerating YoY CPI, >5%), asset class returns, macroeconomic variables (money supply, fiscal deficit, bond yields), asset-specific factors (e.g., momentum, value, quality, size, profitability, investment), trend signals (time-series momentum), commodity sub-sectors, alternative assets (art, wine, stamps, bitcoin)	Real total returns (annualized and cumulative) of asset classes and strategies during inflationary and non-inflationary regimes, Sharpe ratios, performance rankings, drawdown characteristics, regime-specific performance	Regime classification (quantitative definition of inflationary periods), historical return analysis (1926–2021), cross-sectional and time-series performance comparison, factor return decomposition, robustness checks across countries and time periods, summary statistics, tables, and visualizations	Equities (sectors, factors), nominal govt bonds (2y, 10y, 30y), credit, TIPS, commodities (aggregate, energies, industrials, precious, softs, agriculture, gold), real estate (resi), collectibles, bitcoin	Inflation hedging, inflation shocks, asset allocation, trend-following (time-series momentum), factor investing, commodities, alternative assets, regime analysis, risk management, portfolio construction, macroeconomic shocks, historical performance, diversification

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Man vs. Machine: Comparing Discretionary and Systematic Hedge Fund Performance	Campbell R. Harvey, Sandy Rattray, Andrew Sinclair, Otto Van Hemert	2017	Duke University, Man Group plc, NBER	Hedge Fund Strategies, Systematic vs. Discretionary Management, Risk-Adjusted Returns	Discretionary and systematic hedge funds exhibit similar risk-adjusted performance after controlling for well-known risk factor exposures, challenging the aversion toward algorithmic investing.	Fund strategy classification (systematic vs. discretionary), exposures to traditional, dynamic, and volatility factors, fund AUM, textual fund descriptions	Unadjusted returns, alpha (risk-adjusted returns), appraisal ratios, Sharpe ratios, R^2 of factor regressions	Text classification, panel regression (on traditional, dynamic, volatility factors), Newey-West adjustment, risk attribution, appraisal ratio calculation	Hedge Funds (Macro, Equity); underlying exposures include Equities, Bonds, Credit, FX, Volatility Options	Algorithm aversion, factor-based performance decomposition, appraisal ratio, fund classification, systematic strategies, discretionary strategies
From macro to micro: Sparse macroeconomic risks and the cross-section of stock returns	Zhu, Lin Jiang, Fuwei Tang, Guohao Jin, Fujing	2024	Guangdong University, Xiamen University, Hunan University, Beijing Jiaotong University	Identifying macroeconomic risk factors that explain the cross-section of stock returns	Sparse macroeconomic risks, such as inflation and production betas, can explain variation in stock returns.	Inflation beta, production beta, personal income beta, yields beta, credit beta	Future stock returns	Time-series regression, principal components	Equities	Macroeconomic risk factors, cross-sectional asset pricing

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Visible Hands: Professional Asset Managers' Expectations and the Stock Market in China	John Ammer, John Rogers, Gang Wang, Yang Yu	2025	Federal Reserve Board, Fudan University, Shanghai University of Finance and Economics, Shanghai Jiao Tong University	Growth Expectations, Asset Management Behavior, Price Informativeness	Fund managers' macroeconomic growth expectations influence their equity exposure and industry allocations, which in turn affect asset prices and market informativeness.	Text-derived growth expectations from fund reports; macroeconomic indicators (e.g., GDP growth); fund flows; sectoral exposure (SOEs vs. private firms); index vs. active status	SOE investment, Equity allocation, portfolio beta, abnormal returns, price-dividend ratio	Textual analysis, panel regressions with fund and time fixed effects, cross-sectional stock-level regressions, CAPM abnormal return modeling, Monte Carlo validation	Chinese Equities (A-shares), State-Owned Enterprise Stocks, Equity Mutual Funds	Active vs. Passive Management, Textual Sentiment in Finance, Price Informativeness, Growth-Linked Sector Allocation, Market Impact of Forecasts
MACHINE-LEARNING THE SKILL OF MUTUAL FUND MANAGERS Ron Kaniel Zihan Lin Markus Pelger Stijn Van Nieuwe	Kaniel, Lin, Pelger, Van Nieuwerburgh	2023	NBER	Machine Learning, Mutual Fund Manager Skill, Mutual Fund Characteristics	Fund characteristics-especially fund momentum and fund flow-can consistently and robustly differentiate between high- and low-performing mutual funds, both before and after fees. Machine learning models (such as neural networks) can uncover interaction effects between sentiment and fund characteristics that traditional linear models miss	Fund flow, fund return momentum, investor sentiment	Mutual fund abnormal returns	Neural networks, machine learning classification models	Equities	

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A Fiscal Theory of Monetary Policy with Partially-Repaid Long-Term Debt	John H. Cochrane	2020	NBER	Monetary Policy, Interest Rates	Fiscal policy determines the price level when monetary policy is passive.	Fiscal surpluses, government debt, interest rates	Inflation, asset prices	Machine Learning, Reinforcement Learning	All	Hedge funds, industry dynamics
How Markets Process Macro News: The Importance of Investor Attention	Kroner, T. N.	2025	Federal Reserve Board	Macroeconomic News, Investor Attention, Market Reaction	Investor attention plays a critical role in how financial markets incorporate macroeconomic news, as evidenced by a sharp increase in market reaction to CPI releases during the 2021-2023 inflation surge.	Consumer Price Index (CPI) releases, investor attention (proxied by inflation levels)	Market reaction (intraday price movements in various asset classes)	Event study methodology, regression analysis	Equities, Bonds, Currencies	Macroeconomic news, investor attention, market efficiency
AI and Macroeconomic Modeling: Deep Reinforcement Learning in an RBC model	Mnif, S.; Jlassi, M.; Rubbens, A.	2023	University of Paris Dauphine-Tunis; University of Sousse; University of Paris 1 Panthéon-Sorbonne	Macroeconomic Modeling, Artificial Intelligence, Reinforcement Learning	Deep reinforcement learning (DRL) can be used to construct a basic AI-macroeconomic simulator that generates realistic macroeconomic dynamics comparable to models under rational expectations without imposing perfect foresight.	Technological shocks (deterministic and stochastic environments)	Consumption, investment, output (agent's choices)	Deep Reinforcement Learning (DRL), Deep Deterministic Policy Gradient (DDPG)	Various	Reinforcement learning, macroeconomic simulation, rational expectations
Assessing the Commodity Market Price and Terms of Trade Exposures	Mohaddes, K.; Raissi, M.	2021	University of Cambridge; International Monetary Fund	Commodity Markets, Terms of Trade, Macroeconomic Exposure	Individual macroeconomic variables in Emerging and Developing Countries (EMDCs) are exposed differently to shocks in commodity terms of trade and global commodity prices.	Commodity terms of trade, global commodity price index	Aggregate output, private consumption, investment, trade balance, inflation,	Panel Mean Group (PMG) estimation	Various	Terms of trade, commodity price shocks, macroeconomic fluctuations

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							exchange rate			
Macro-based Asset Allocation	Schmieder, C.; Kollár, M.	2020	European Investment Bank	Asset Allocation, Macro-Financial Cycles	Macro-based asset allocation informed by trends in continuous business and financial cycle indicators could be a promising alternative for medium- and long-term investment.	Trends in business and financial cycle indicators (continuous indicators)	Asset allocation weights, portfolio returns, portfolio volatility	Horse-race among different asset allocation strategies	Equities, Bonds, Other (Risk-Free Asset)	Macro-financial cycles, turning points, portfolio volatility
Don't let the SMIDs tempt you; prefer largecap financials in uncertain times	Srivastava, R.	2025	Strike Money Analytics, Indiacharts.com, The Economic Times	Asset Allocation, Market Timing, Size Factor	Small and mid-cap stocks are likely to underperform due to stretched valuations and macro uncertainty, while large-cap financials offer more stability and resilience.	Valuation spreads, sectoral momentum, technical support levels (e.g., 20-day moving average)	Relative performance of SMIDs vs. large-cap financials, index correction depth (e.g., Nifty levels)	Technical analysis (moving averages), macro narrative interpretation	Equities (Large-cap Financials, Small and Mid-caps)	Size premium, capital preservation, valuation-driven allocation, macro-sensitive positioning
Using Macroeconomic Forecasts to Improve Mean Reverting Trading Strategies	Szakmary, A.; Kieckhefer, R.; et al.	2024	Manhattan College; Fordham University	Bond Trading Strategies, Macroeconomic Forecasts, Machine Learning	Incorporating machine learning forecasts of macroeconomic variables can improve the performance of mean-reverting trading strategies on the yield curve.	Yield curve data (interest rates at different maturities), macroeconomic forecasts (using machine learning)	Trading signals (buy/sell), portfolio returns	Mean-reverting trading strategy, machine learning (specific algorithms not detailed)	Bonds	Yield curve, mean reversion, macroeconomic forecasting

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A Half Century of Macro Momentum	Brooks, J.	2017	AQR	Systematic Macro, Alternative Risk Premia	Macro momentum strategies that exploit underreaction to fundamental trends can generate positive returns with low correlation to traditional assets.	Macroeconomic trends (e.g., growth, inflation surprises)	Asset returns (equities, bonds, FX)	Backtesting, Sharpe ratio decomposition	Equities, Bonds, FX	Macro momentum, risk premia, diversification
An Empirical Evaluation of Some Long-Horizon Macroeconomic Forecasts	Lunsford, K. G.; West, K. D.	2024	Federal Reserve Bank of Cleveland; Duke University	Macroeconomic Forecasting, Long-Horizon Forecasts	Long-horizon forecast distributions of various univariate forecasting models have varying degrees of calibration accuracy across different macroeconomic variables and countries.	Historical data for 10 macroeconomic variables (e.g., GDP growth, inflation, interest rates)	Long-horizon forecasts (up to 50 years)	Time series models (AR, random walk), frequency domain models	Various	Long-horizon forecasting, forecast calibration, forecast intervals
Behavioral Finance at 40: Progress, Open Questions, and New Directions	Nicholas Barberis	2025	Yale School of Management	Survey and assessment of progress in behavioral finance over four decades, identification of open research questions and future directions.	Behavioral finance has significantly advanced understanding of market anomalies, but key questions remain about limits to arbitrage and investor psychology.	N/A	N/A	N/A	All	Behavioral biases, market anomalies, limits to arbitrage
Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk	Sharpe, W. F.	1964	Stanford University	Theoretical foundation of the Capital Asset	Asset prices reflect a linear relationship between expected return and systematic risk (beta).	Systematic risk (beta), risk-free rate	Expected asset returns	Theoretical modeling, regression (for	Equities, Bonds	Systematic Risk, CAPM

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				Pricing Model (CAPM)				empirical tests)		
Do funds make more when they trade more?	Pastor, Stambaugh, Taylor	2017	Journal of Finance	Relationship between trading activity and mutual fund performance	Higher trading activity (turnover) may be associated with higher or lower fund returns, depending on skill and costs.	Trading volume, turnover	Fund returns, alpha	Regression analysis	All	Trading activity, fund performance, turnover
Trading Activity in the Corporate Bond Market: A SAD Tale of Macro-Announcements and Behavioral Seasonality?	James J. Forest, Ben S. Branch, Brian T. Berry	2023	SUNY New Paltz, Isenberg School of Management, University of Massachusetts	Corporate Bond Market, Trading Activity, Behavioral Seasonality, Macroeconomic Announcements	Behavioral seasonal effects (Seasonal Affective Disorder - SAD), informational effects (macroeconomic announcements), and traditional market factors significantly influence trading activity in the US corporate bond market.	SAD cycle (daylight hours), macroeconomic announcements, aggregate credit ratings activity, other market variables	Trading volume (retail and institutional), bond returns	General-to-Specific (Gets) Autometrics methodology	Bonds	Behavioral finance, market microstructure, seasonal effects, macroeconomic news
Expectations and the Neutrality of Interest Rates	John H. Cochrane	2022	NBER Working Paper	Relationship between expectations, interest rates, and inflation	Expectations and fiscal policy can influence inflation even when interest rates are neutral	Interest rates, fiscal policy	Inflation	regression/time-series analysis	All	Expectations, interest rate neutrality, inflation
Factor Investing	Ang, A.	2014	BlackRock, Inc	Factor Investing, Institutional Asset Allocation	Factor premiums reward investors for taking on risks that perform poorly during bad times and well over the long run.	Factor exposures (value, size, momentum, quality)	Fund returns, benchmark-relative	Regression analysis, factor attribution	Equities, Bonds, Real Estate	Systematic risk premiums, passive vs.

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							performance			active investing
Fiscal Histories	John H. Cochrane	2022	NBER Working Paper	Fiscal Policy, Taxation	Fiscal policy, particularly government debt and surpluses, plays a key role in macroeconomic outcomes.	Government debt, primary surpluses	Inflation	Historical analysis, regression	All	Fiscal policy, government debt, macroeconomic history
Fund tradeoffs	Pastor, Stambaugh, Taylor	2020	Journal of Financial Economics	Tradeoffs faced by mutual funds in terms of size, expenses, and turnover	There are optimal tradeoffs between fund size, expenses, and turnover that maximize performance.	Fund size, expenses, turnover	Fund returns, alpha	Regression analysis	All	Fund size, expense ratios, turnover
Predicting Liquidity-Aware Bond Yields using Causal GANs and Deep Reinforcement Learning with LLM Evaluation	Jaskaran Singh Walia, Aarush Sinha, Srinitish Srinivasan, Srihari Unnikrishnan	2025	School of Computer Science and Engineering, Vellore Institute of Technology, India	Bond Yield Forecasting, Causal Inference, Generative Adversarial Networks, Reinforcement Learning	A novel framework integrating Causal Generative Adversarial Networks (Causal GANs) with Soft Actor-Critic (SAC) reinforcement learning can generate high-fidelity synthetic bond yield data, outperforming traditional models during market anomalies.	Macroeconomic variables (inflation rate, GDP growth, unemployment rate, Fed Funds Rate, money supply, consumer confidence, S&P 500 index, oil prices, gold prices), historical bond yields	Synthetic bond yield data (AAA, BAA, US10Y, Junk)	Causal Generative Adversarial Networks (Causal GANs), Soft Actor-Critic (SAC) Reinforcement Learning	Bonds	Synthetic data generation, causal inference, reinforcement learning, yield curve modeling
Global Factor Premiums	Baltussen, G.; Swinkels,	2019	Robeco	Factor Investing,	Global factor premiums exist across asset classes and persist over time	Factor signals (value, momentum,	Sharpe ratio, return	Out-of-sample tests, Bayesian	Equities, Bonds,	P-hacking, factor premiums,

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	L.; van Vliet, P.			Multi-Asset Strategies	despite concerns of p-hacking and data mining.	carry, seasonality, BAB)	anomalies	p-hacking diagnostics, long-term backtesting	Commodities, Currencies	cross-asset allocation
Global Natural Rates in the Long Run: Postwar Macro Trends and the Market-Implied r* in 10 Advanced Economies | NBER	Davis, Fuenzalida, Huetsch, Mills, Taylor	2024		Long-term trends in natural interest rates across advanced economies	Market-implied natural rates reflect postwar macroeconomic trends and monetary policy regimes.	GDP weighted Bank Reserves	Equity Market Behavior	Time-series regression, principal components	All	Natural rate of interest, macro trends
How to build a macro trading strategy (with open-source Python) | Macrosynergy	Galariotis, E.; Sefton, J.	2023	Macrosynergy	Macro Trading Strategies, Quantamental Investing	A systematic approach to building macro trading strategies involves downloading data, transforming macro information into factors, combining factors into signals, and evaluating signal quality.	Macroeconomic data (price, flow, alternative, quantamental), target returns	Trading signals, portfolio returns	Econometric models (regression), machine learning, normalization techniques	Equities, Bonds, Currencies, Commodities	Macro-quantamental strategies, proof of concept, backtesting, signal evaluation
Income Inequality and Asset Prices under Redistributive Taxation | NBER	Pastor, Veronesi	2016	Journal of Monetary Economics	Fiscal Policy, Taxation	Redistributive taxation affects asset prices through changes in income distribution and risk premiums	Income distribution, tax policies	Asset returns, risk premiums		All	Income risk, Wealth distribution, Precautionary savings
Inequality aversion, populism, and the backlash against globalization	Pastor, Veronesi	2021	Journal of Finance	Political economy of inequality and globalization	Rising inequality and populism drive backlash against globalization	Income inequality, financial innovation, trade deficits	Election outcomes, globalization policies	Machine Learning, Reinforcement Learning	All	Income risk, Wealth distribution, Precautionary savings

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Inflation Past, Present and Future: Fiscal Shocks, Fed Response, and Fiscal Limits	John H. Cochrane	2022	NBER Working Paper	Inflation Risk, Macroeconomic Policy	Fiscal shocks and Fed responses jointly determine inflation dynamics	Fiscal shocks, Fed policy	Inflation		All	
Limited Risk Transfer Between Investors: A New Benchmark for Macro-Finance Models	Gabaix, X.; Koijen, R. S. J.; et al.	2024	Harvard University; University of Chicago; Swiss Finance Institute; NBER	Risk Transfer, Household Finance, Macro-Finance Models	Risk transfer between investors in the U.S. is small, providing a new micro moment to evaluate macro-finance models with heterogeneous investors, which typically overpredict risk transfer.	Portfolio holdings, flows, and returns of U.S. investors	Market risk exposure (percent change)	Panel data analysis	Equities, Fixed Income	Risk transfer, heterogeneous investors, macro-finance modeling, household portfolios
Liquidity risk after 20 years	Pastor, Stambaugh	2019	Critical Finance Review	Evolution of liquidity risk measures over two decades	Liquidity risk remains a key determinant of asset returns and risk premiums	Liquidity measures	Asset returns, risk premiums		All	
Machine Learning for Financial Investment Indication	Silva, J. P. C.; et al.	2022	Federal University of Pernambuco	Financial Investment, Machine Learning, Decision Support	Machine learning algorithms can be implemented to generate investment indications for new investors, supporting their decision-making process.	Fundamental Indicators (e.g., liquidity, solvency, profitability)	Investment classification (e.g., buy, hold, sell)	Multilayer Perceptron, Logistic Regression, Decision Tree	Stocks	Fundamentalist Indicators, classification
Macro trends for trading models | Macrosynergy	Galariotis, E.; Sefton, J.	2022	Macrosynergy	Algorithmic Trading, Econometric Models, Machine Learning	Conventional econometric models are not backtestable for algorithmic trading due to hindsight bias, but machine learning can offer a solution through a two-stage supervised learning approach.	Economic release calendars, alternative data, features identified by elastic net algorithm	Macro trends (e.g., GDP growth), trading signals	Two-stage supervised learning (elastic net for feature scouting, sequential model evaluation),	Various	Nowcasting, data vintages, feature vintages, backtesting

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								various regression models (GLS, MIDAS, dynamic factor models)		
Macro-Finance John H. Cochrane Working Paper 22485	John H. Cochrane	2016	NBER	Global macroeconomic risk factors to portfolio asset allocation weights, bypassing the need to estimate expected returns. Tactical asset allocation.	Asset allocation weights can be robustly and intuitively determined by directly modeling them as functions of global macroeconomic risk factors, leading to superior out-of-sample performance versus traditional approaches (e.g., 60/40 or Markowitz).	Habits, long-run risks, idiosyncratic risks, heterogeneous preferences	Asset prices, risk premiums	(GMM) estimation, parametric modeling asset weights linear functions of risk factors, iterative optimization routines to avoid local maxima, simulation, and robustness checks (including transaction and leverage costs)	All	Macro-based asset allocation, parametric weights, global risk factors, utility maximization, GMM estimation, tactical allocation, Sharpe ratio, Jensen's alpha, robustness to costs

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Macroeconomic data and systematic trading strategies | Macrosynergy	Galariotis, E.; Sefton, J.	2023	Macrosynergy	Systematic Trading, Macroeconomic Data, Quantamental Investing	Incorporating macroeconomic information into trading strategies is compelling due to economic theory, but its use has been limited by data challenges; quantamental indicators and statistical learning offer solutions.	Macroeconomic data (GDP, inflation, surveys), quantamental indicators, market prices	Trading signals, portfolio returns	Statistical learning (regression, machine learning), time series analysis	Equities, Bonds, Currencies, Commodities	Quantamental indicators, data vintages, backtesting, statistical learning
An Empirical Evaluation of Some Long-Horizon Macroeconomic Forecasts	Lunsford, K. G.; West, K. D.	2024	Federal Reserve Bank of Cleveland; Duke University	Macroeconomic Forecasting, Long-Horizon Forecasts	Long-horizon forecast distributions of various univariate forecasting models have varying degrees of calibration accuracy across different macroeconomic variables and countries.	Historical data for 10 macroeconomic variables (e.g., GDP growth, inflation, interest rates)	Long-horizon forecasts (up to 50 years)	Time series models (AR, random walk), frequency domain models	Various	Long-horizon forecasting, forecast calibration, forecast intervals
Macroeconomic Implications of Inequality and Income Risk	Aladangady, A.; Gagnon, E.; et al.	2021		Income Inequality, Income Risk, General Equilibrium	Polarization in labor income and asset returns increases wealth inequality, lowers the risk-free real rate, and raises risk premia.	Volatility and persistence of labor income and asset returns	Risk-free rate, risk premium, wealth inequality	Overlapping-generations model, general equilibrium analysis	Risk-free bonds, productive capital	Precautionary savings, heterogeneous agents, risk premium
Method in the madness: Bubbles, trading, and incentives	Baz, Davis, Fuenzalida, Tsai	2020				Trading Volume, Market Sentiment	Asset Prices		All	
Mutual fund performance and flows during the COVID-19 crisis	Pastor, Vorsatz	2020	NBER			Fund characteristics, market conditions	Fund returns, investor flows		All	

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Network Relationships and Corporate Bond Trading | NBER	Kargar, M.; Lester, B.; et al.	2024	University of Pennsylvania; Federal Reserve Bank of Philadelphia; Université de Montréal; McGill University	Corporate Bond Trading, OTC Markets	The characteristics of both bond traders and bond trade requests are important in determining the time to consummating a trade and the likelihood of trade failure in OTC markets.	Customer connectedness (number of existing relationships with dealers), trade size (micro vs. block), type of inquiry (sales vs. purchase)	Time to trade execution, probability of trade failure	Econometric analysis of MarketAxess data	Bonds	Over-the-counter markets, market microstructure, network effects
Political Uncertainty and Risk Premia | NBER	Pastor, Veronesi	2013	Journal of Financial Economics, University of Chicago Booth School of Business, NBER	Theoretical/empirical investigation how political uncertainty affects asset prices, risk premia, volatility, and correlations, especially in weak economic conditions	Political uncertainty commands a risk premium that is larger in weaker economic conditions. Political uncertainty reduces the value of implicit government "put protection," increases stock volatility and correlations, and leads to state-dependent risk premia.	Political events, policy uncertainty	Asset returns, risk premiums	Machine Learning, Reinforcement Learning	All	Political uncertainty, risk premium, government policy, implicit put protection, volatility, asset pricing, Bayesian learning, state-dependent risk, policy uncertainty index

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Portfolios for Long-Term Investors | NBER	John H. Cochrane	2021	Hoover Institution, NBER	Portfolio Construction, Asset Allocation	Political uncertainty, risk premium, government policy, implicit put protection, volatility, asset pricing, Bayesian learning, state-dependent risk, policy uncertainty index (Baker, Bloom, Davis)	Risk premiums, Investor preferences	Optimal portfolio allocation	Theoretical Merton/Markowitz/ICAPM frameworks, equilibrium analysis, conceptual critique, empirical institutional performance, simulation (practical implementation and sensitivity to inputs)	All	Long-term investing, payout-based portfolio construction, general equilibrium, state variables, time-varying risk/return, institutional constraints, factor investing, agency problems, utility maximization
Hoover Institution Rethinking Production Under Uncertainty	John H. Cochrane	2019	NBER	Production-Based Asset Pricing	Allowing firms to optimize state-contingent productivity reshapes the pricing kernel and links asset prices to production choices.	Output distribution, state of nature	Firm investment, production	Machine Learning, Reinforcement Learning	All	State-contingent production, productivity-based pricing
Scale and Skill in Active Management by Lubos Pastor, Robert F. Stambaugh, Lucian A. Taylor :: SSRN	Pastor, Stambaugh, Taylor	2015	Journal of Financial Economics	Empirical analysis returns to scale in active mutual fund manageme	Decreasing returns to scale in active management at the industry level. Fund managers have become more skilled over time, the growth in industry size offsets this improvement, preventing a rise in average	Fund size, fund flows	Fund returns, alpha	Panel data regression, fixed effects models, recursive demeaning, simulation, portfolio	All	Returns to scale, active management, industry competition, performance persistence, liquidity

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				nt. Fund-level and industry-level decreasing returns to scale, how skill and scale interact	fund performance. Fund performance deteriorates over a fund's lifetime, largely due to industry growth and competition.			sorts, robustness checks		constraints, fixed effects, fund age, econometric bias correction, cross-sectional skill distribution
Stepping on a Rake: the Fiscal Theory of Monetary Policy	John H. Cochrane	2016	NBER	Monetary Policy, Interest Rates	Fiscal policy determines the price level when monetary policy is passive.	Interest rate targets, fiscal surpluses	Inflation		All	
The Fiscal Roots of Inflation	John H. Cochrane	2019	NBER	Inflation Risk, Macroeconomic Policy	Unexpected inflation devalues nominal government bonds and must correspond to a decline in expected future surpluses or a rise in their discount rates; inflation variation is driven by discount rate changes rather than by changes in surpluses. Persistent deficits do not always cause inflation due to offsetting discount rate effects.	Government debt, fiscal surpluses, discount rates	Inflation (unexpected and drawn-out), real value of government debt, present value of surpluses, surpluses, and discount rates	Vector Autoregression (VAR), impulse-response function analysis, present value decomposition, linearized government budget identities, simulation	All	Fiscal theory of the price level & monetary policy, present value identity, inflation decomposition, discount rates, government debt valuation, long-term vs. short-term debt, impulse response, VAR,

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										macro-fiscal interaction
The macro information inefficiency of financial markets | Macrosynergy	Drechsler, I.; Savov, A.	2012	NYU Stern; NBER	Market Efficiency, Macroeconomic Information	Financial markets are not fully efficient with respect to macroeconomic trends due to costs associated with "tradable" economic research and institutional barriers.	Economic reports (growth, inflation), government balance sheets, financial market data, social/political developments, environmental/ weather trends	Asset prices, portfolio returns	Econometric analysis, theoretical modeling	Equities, Bonds, Currencies, Commodities	Macro information efficiency, fundamental value extraction, market inefficiency
THE MACROECONOMICS OF FINANCIAL SPECULATION Alp Simsek WORKING PAPER 28426	Simsek, A.	2021	Massachusetts Institute of Technology; NBER	Financial Speculation, Belief Disagreements, Macroeconomic Instability, Asset Pricing	Financial speculation driven by belief disagreements can lead to asset price and credit booms, often followed by macroeconomic instability and crises; macroprudential policies can mitigate these effects.	Belief disagreements, short-selling constraints, macroeconomic policies	Asset prices, credit volume, macroeconomic aggregates (consumption, investment, output)	Stylized macroeconomic model with heterogeneous beliefs	Various	Financial speculation, belief heterogeneity, asset bubbles, macroprudential policy

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The Natural Rate Puzzle: Global Macro Trends and the Market-Implied r* | NBER	Taylor, Davis, Fuenzalida	2019	NBER	Reconciling the disconnect between macroeconomic and finance model estimates of the natural rate of interest (r*) and bond risk premia across the U.S. and advanced economies	Standard finance models and macro models produce inconsistent estimates of the natural rate and risk premia. A unified model using both macro and financial market data (with long-run trend factors for r* and π*) can produce consistent, plausible estimates, improve bond yield/return forecasts, and resolve the puzzle. Most variation in yields is due to shifts in r* and π*, not risk premia. Market-implied r* is typically lower than consensus, raising concerns about secular stagnation and policy limits.	Macro variables (GDP growth, inflation), trend inflation (π*), bond yields, forward rates, bond risk premia, global macro trends, country-specific data (U.S. and five other advanced economies)	Market-implied natural rate (r*), bond risk premia, bond yields, return regressions, out-of-sample forecasting performance, portfolio strategy performance	State-space modeling, Kalman filter, unified macro-finance model, trend extraction, regression (yield and return regressions), out-of-sample forecasting, international panel data analysis	All	Natural rate of interest (r*), trend inflation (π*), bond risk premium, term structure models, macro-finance integration, secular stagnation, effective lower bound, yield curve, forward rates, state-space models, Kalman filter, international macro trends, forecasting, asset pricing
The Tail that Wags the Economy: Beliefs and Persistent Stagnation	Kozlowski, Veldkamp, Venkateswaran	2015	NBER	Belief Formation, Tail Risk, Secular Stagnation	Transitory tail events generate persistent macroeconomic stagnation by inducing lasting revisions in agents' beliefs about the probability of extreme events.	Observed macro data, extreme events	GDP, credit markets, labor markets	Non-parametric kernel density estimation, structural DSGE modeling, Monte Carlo	All	Tail risk, persistent stagnation, endogenous belief formation, non-parametric learning,

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								simulation, stochastic steady-state analysis		capital quality, credit spreads
The Unintended Consequences of Rebalancing	Campbell R. Harvey, Michele G. Mazzoleni & Alessandro Melone	2025	Duke University, Unknown, Unknown	Institutional Rebalancing, Market Impact, Predictable Return Patterns	Mechanical portfolio rebalancing by institutional investors induces predictable return patterns and price pressures, generating aggregate costs and opportunities for front-running.	Portfolio weights, Allocation targets, Calendar schedules	S&P 500 and 10-Year Treasury futures returns, cross-asset return spreads	Predictive regression analysis, t-statistics calibration, multivariate control regression with macro/volatility/sentiment controls, Monte Carlo validation	Equities, Government Bonds, Futures	Rebalancing-induced price pressure, calendar vs. threshold rebalancing, front-running, institutional portfolio mandates, contrarian macro trading, Sharpe ratio of timing strategies
The Value of Government Debt	John H. Cochrane	2019	NBER	Government Debt Valuation, Fiscal Sustainability	The market value of government debt reflects both future primary surpluses and discount rates, but not expected growth.	Government debt, primary surpluses, discount rates	Market value of debt to GDP ratio	Variance decomposition, present value analysis	All	Debt valuation, discount rates, fiscal sustainability
The price of political uncertainty: Theory and evidence from the option market	Kelly, Pastor, Veronesi	2016	Journal of Finance	Political Risk, Option Pricing, Macro-Financial Uncertainty	Options spanning political events (elections and global summits) are priced higher due to embedded compensation for price, variance, and tail risks associated with political uncertainty—particularly	Option timing (spanning vs. non-spanning political events), economic condition proxies (GDP,	Implied volatility, slope of implied volatility smile, variance	Structural theoretical model (based on Pástor–Veronesi), option pricing	Equity Index Options	Political uncertainty premium, variance risk premium, tail risk, macro-financial linkages,

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					during weaker economic conditions.	forecasts, market return), electoral poll spreads	risk premium	derivation, regression analysis, cross-country panel data, Monte Carlo simulation		option skew, event risk pricing