

## SQIG Report

### Macro Foundations: Linking Rates, Volatility, and Credit Risk

Understanding macro indicators is key before using predictive models. The VIX serves as a proxy for volatility, reflecting investor sentiment and market uncertainty.

Treasury yields - particularly the 13-week T-Bill and 10-year yield - capture expectations around monetary policy, inflation, and growth. Sharp rate hikes signal tightening conditions, often widening credit spreads, and raising volatility. A stable curve typically supports risk-on sentiment.

Yield curve slope changes often precede recessions and are associated with rising VIX levels and credit stress. This macro backdrop frames our machine learning approach to forecasting credit market risk.

### Summary of Expected Relationships

Guided by macro theory and historical intuition, the following relationships were anticipated and evaluated in the modelling process:

- **↑ 13-week Treasury Yield** → **↑ VIX** (tightening conditions)
- **↑ 10-year Yield** → **↑ or ↓ VIX**, depending on inflation vs. growth expectations.
- **Flattened/Inverted Yield Curve** → **↑ VIX and ↑ Credit Stress** (recession signals)

These insights informed feature design and macro selection in the credit spread forecasting pipeline.

## The Approach

A machine learning framework was built to forecast credit spreads using macro variables, VIX, and yield curve dynamics. Key steps included:

- **Data Preparation:** Aligned weekly US Treasury yields, VIX, and credit spreads.
- **Feature Selection:** Random Forest and XGBoost highlighted lagged and rolling yield data as key predictors (see Figure 1).
- **Modelling:** Compared linear regression, Random Forest, and XGBoost.
- **Regime Classification:** Identified “High” vs. “Low Risk” regimes based on predicted spreads and volatility.
- **ETF Strategy:** Developed a rotation system between defensive and growth ETFs using regime and spread signals.
- **Evaluation:** Measured performance via RMSE, MAE, cross-validation, and directional accuracy.

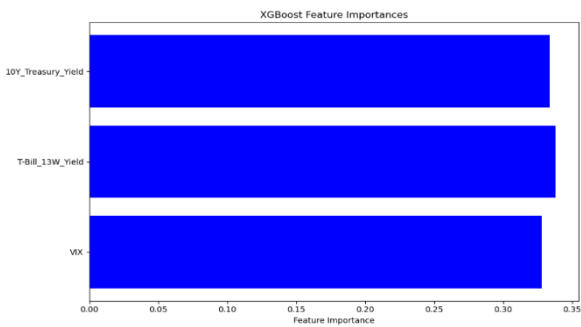
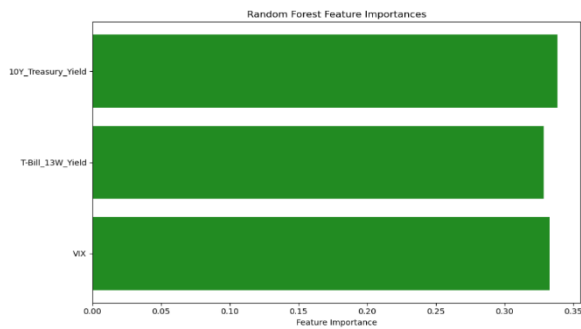


Figure 1

(Feature importance from RF vs. XGBoost models)

## Results

- **XGBoost outperformed** simpler models, achieving low RMSE variance and ~50% directional accuracy.
- **Long and short-term yields** were the strongest drivers of spread predictions.
- The **ETF strategy** shifted allocations weekly, favouring defensive assets in High-Risk regimes and rotating to growth assets when conditions improved (see Figure 2).
- Tactical “Widening”/ “Tightening” signals provided early insight for risk management and positioning.

Week	Predicted_CS	Regime	ETFs Held	Signal	Interpretation
2024-11-03	1.71	High Risk	ICLN, ROBO	Widening	Risk regime → stay defensive, spreads worsening.
2024-11-10	2.28	High Risk	ICLN, ROBO	Widening	Continue defensive allocation.
2024-11-17	1.57	High Risk	ICLN, ROBO	Tightening	Early signal of potential risk easing, but still in High Risk regime.
2024-11-24	1.13	High Risk	ICLN, ROBO	Tightening	Spread tightening, but regime hasn't shifted yet.
2024-12-01	1.31	High Risk	ICLN, ROBO	Widening	Regime remains High Risk → continue defensive.
2024-12-08	2.07	High Risk	ICLN, ROBO	Widening	Deteriorating credit → risk-off still preferred.
2024-12-15	1.79	High Risk	ICLN, ROBO	Tightening	Slight relief, but regime hasn't flipped.
2024-12-22	1.33	<b>Low Risk</b>	<b>ARKQ, QCLN, BOTZ</b>	Tightening	First flip to Low Risk → rotate into and hold more growth-oriented ETFs.
2024-12-29	1.29	High Risk	ICLN, ROBO	Tightening	Regime back to High Risk (VIX may have risen).
2025-01-05	1.42	High Risk	ICLN, ROBO	Widening	Worsening again → hold defensive ETFs.

Figure 2

(Table summarising ETF strategy)

## Key Takeaways

- Forward-looking spread forecasts offer a timing edge over traditional indicators.
- Regime-based strategies enhance portfolio adaptability.
- Machine learning improves dynamic credit risk assessment using macro inputs.

## Use Cases for a Credit Trading Desk

Trading desks can apply this framework as:

- A **quantitative overlay** for risk-on/off credit positioning.
- A **regime detector** to guide hedge adjustments or sector rotations.
- A **lead indicator** of stress to optimise trade timing.
- A **foundation** for more advanced, portfolio-specific macro models.