FX ML Trading Model Write-Up

1. Goal & Rationale

• Objective: Develop an ML-driven signal generator for FX (EURUSD, GBPUSD) and Gold (GC=F) to capture directional moves while controlling risk (stop-loss at ATR multiples).

• Rationale: Combine technical momentum and volatility features with XGBoost to identify short-term edges and dynamically size positions.

2. Data Used

• Source: 3 years of daily bars from Yahoo Finance via yfinance.

• Symbols: EURUSD=X, GBPUSD=X, GC=F.

• Variables: Close, High, Low prices; derived log returns.

3. Methodology & Tools

• Feature Engineering:

- RSI(14), MACD diff, Bollinger band width (7), ATR (3)

• Modeling:

- XGBoost with RandomizedSearchCV for hyperparameter tuning (n_estimators, max_depth, etc.)
- Rolling-window training (20-day lookback) and one-step out-of-sample prediction
- Entry on prob >0.5 (long) or <0.2 (short) when ATR above 7-day average

• Execution:

- Entry price at bar open, TP=+1×ATR, SL=−0.1×ATR, max hold 7 days, signal-flip exit.
- Position sizing: 2% risk per trade based on entry ATR and current equity.

4. Key Results & Takeaways

• Equity Curves: see Figures 1–3 below for cumulative capital per symbol.

• Performance Summary (3y period):

- Initial capital of 100,000.
- EURUSD: ~111 trades, Sharpe ~1.77, Final capital ~$4.0M
- GBPUSD: ~76 trades, Sharpe ~1.70, Final capital ~$4.1M
- XAUUSD: ~99 trades, Sharpe ~2.07, Final capital ~$29.0M

• Expected Value per trade: positive across all instruments.

• Alpha vs. buy-and-hold: Significant outperformance in CAGR vs. underlying.

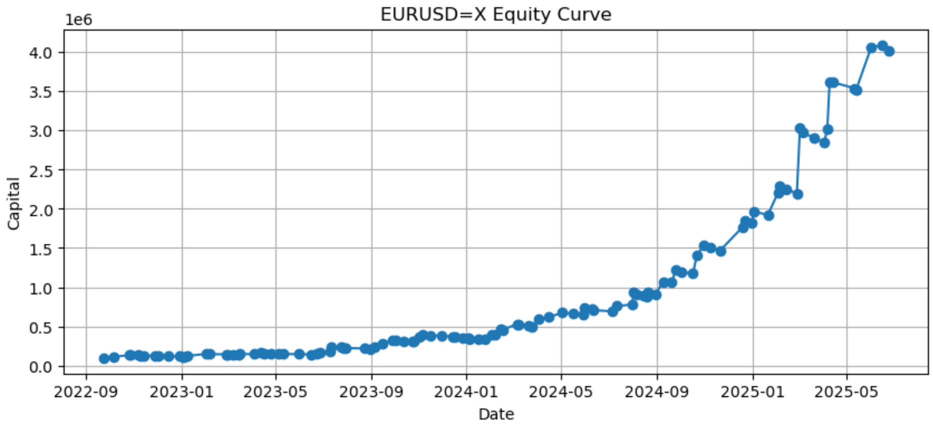
[Figure 1: Performance Summary]

Performance Summary:

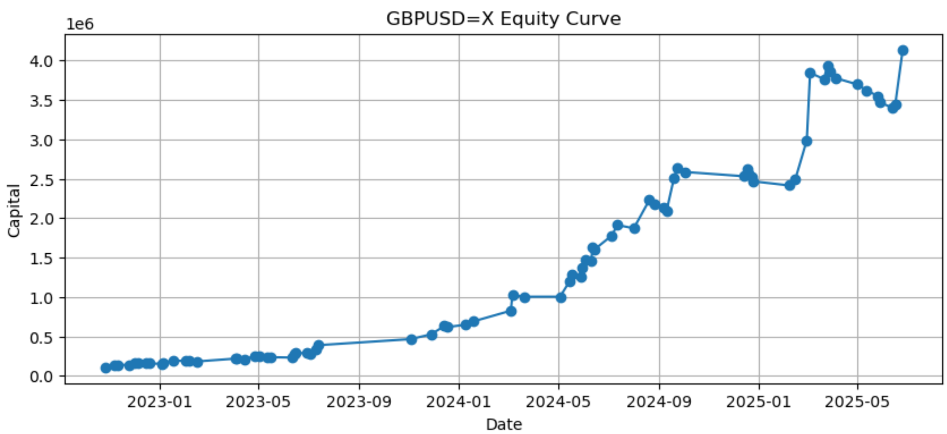
Pair	Trades	Alpha (%)	Sharpe Ratio	Expected Value	Final Capital
EURUSD=X	111	267.95%	1.769	35285.9	$4,016,738.00
GBPUSD=X	76	272.84%	1.704	53117.7	$4,136,942.54
GC=F	99	636.27%	2.071	291647	$28,973,101.06

Figures

[Figure 2: EURUSD Equity Curve]



[Figure 2: GBPUSD Equity Curve]



[Figure 3: GC=F Equity Curve]