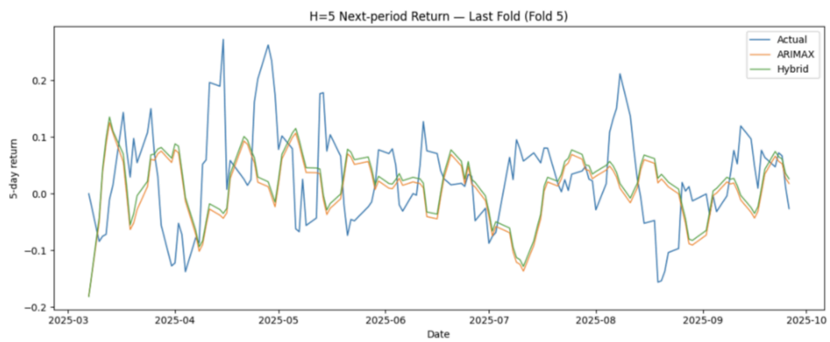
Aggregate Forecast Metrics — H=5 (Walk-Forward, Mean Across 5 Folds)

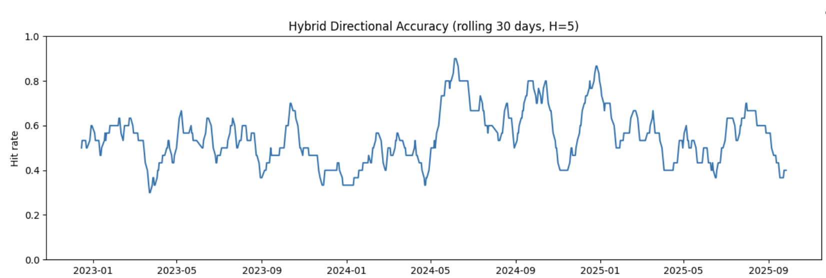
=== Aggregate metrics by model (mean across folds) ===

model	RMSE	MAE	R2	DirAcc	BigMoveHit
Train-Mean	0.102695	0.073687	-0.060233	0.592239	0.622222
Zero	0.103845	0.074909	-0.086618	0.002827	0.000000
Hybrid	0.120060	0.088441	-0.492344	0.546769	0.538889
ARIMAX	0.120445	0.088616	-0.502578	0.549625	0.538889
Naive(H)	0.146867	0.111156	-1.203146	0.466077	0.411111

H=5 Next-Period Return — Last Fold (Actual vs ARIMAX vs Hybrid)

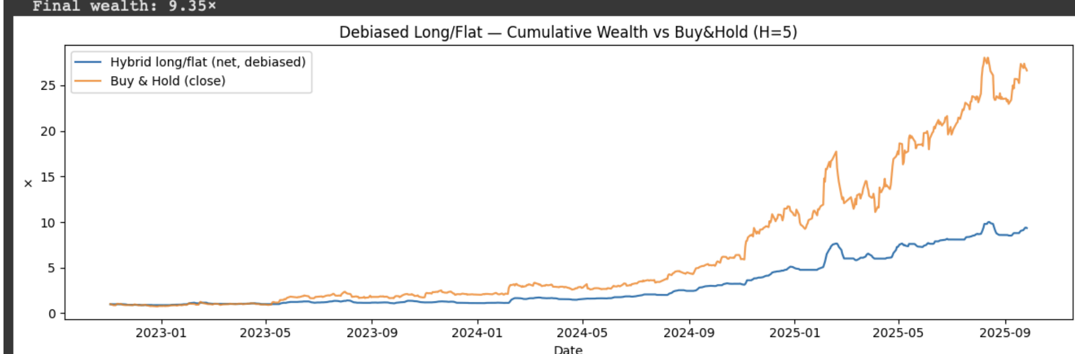


Hybrid Directional Accuracy — Rolling 30 Days (H=5)



Debiased Long/Flat vs Buy-and-Hold — Cumulative Wealth (H=5)

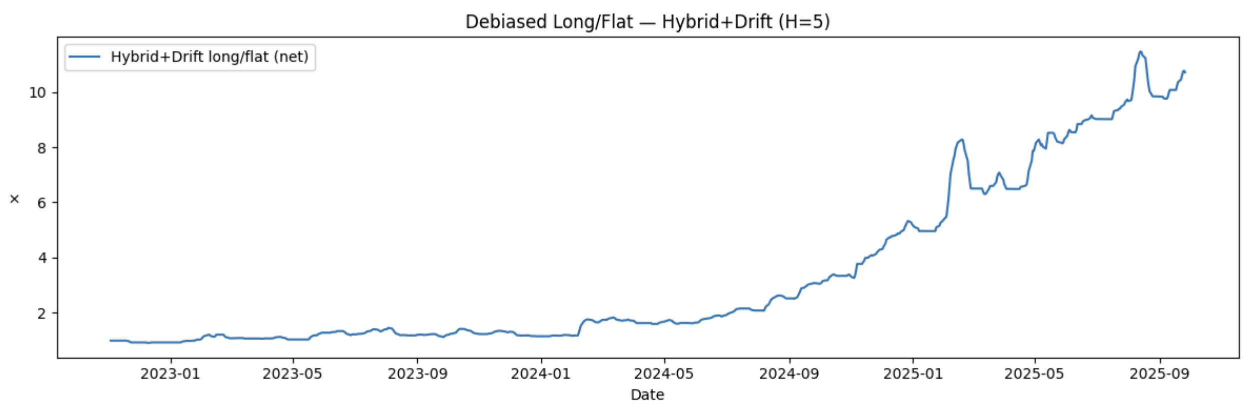
```
Debiased backtest (H-tranche long/flat, cost 5 bps per switch):
  Annualized mean ~ 83.296%, vol ~ 26.316%, Sharpe ~ 3.17
  Final wealth: 9.35×
```



Aggregate Metrics — Drift + Signal (H=5, Walk-Forward)

```
=== Aggregate metrics (Drift+Signal) — mean across folds ===
                           RMSE       MAE        R2    DirAcc  BigMoveHit
model
Train-Mean (fold drift)  0.102695  0.073687 -0.060233  0.592239    0.622222
Zero                     0.103845  0.074909 -0.086618  0.002827    0.000000
Hybrid+Drift             0.120182  0.088839 -0.495452  0.562361    0.544444
ARIMAX+Drift             0.120225  0.088853 -0.496244  0.558116    0.538889
Naive(H)                 0.146867  0.111156 -1.203146  0.466077    0.411111
```

Debiased Long/Flat — Hybrid+Drift (H=5)



Risk Metrics Summary — Model vs Buy-and-Hold

Model (debiased long/flat) risk stats:
{'AnnReturn': np.float64(0.8826692049344091),
'AnnVol': 0.2659876881158433,
'Sharpe': np.float64(3.318458877502586),
'Sortino': np.float64(5.575623457502896),
'MaxDrawdown': -0.23900367213586138, 'Calmar': np.float64(3.693119846429208)}

Buy & Hold risk stats:
{'AnnReturn': np.float64(1.3930311857851572),
'AnnVol': 0.6845969189897153,
'Sharpe': np.float64(2.0348195370801614),
'Sortino': np.float64(3.634902697175217),
'MaxDrawdown': -0.3743019345551716,
'Calmar': np.float64(3.721677761138652)}
Model % time invested: 89.1%