Evaluation Results: LSTM Lag-0 NLL PINN truth EKF 0.05 2σ CI Log Return 0.00 -0.05 -0.102025 2020 2021 2022 2023 2024 0.07 truth r,  $\bar{r} = 0.0110$ ,  $\sigma_r = 0.0149$ res  $\varepsilon$ ,  $\bar{\varepsilon} = 0.0117$ ,  $\sigma_{\varepsilon} = 0.0153$ 0.06 Log Return 0.04 0.03 0.02 0.01 0.00 2022 2020 2021 2023 2024 2025 truth EKF Normalized Log Return -3 -2020 2021 2022 2023 2024 2025 0.7 HV60 Implied Vol 0.6 Volatility 4.0 7.0 8.0 0.3 0.2 2021 2022 2023 2024 2025 2020