University of California, Los Angeles

Master of Quantitative Economics

Economics 409 Forecasting Asset Prices

Instructor: Professor Tornell

Forecasting GBP/USD Exchange Rates: The Power of Interest Rate Differentials

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1. Project Outline: Forecasting GBP/USD Exchange Rates

Our project aims to construct and validate a model for forecasting the exchange rate between the British Pound (GBP) and the US Dollar (USD), examining the performance of the implemented model.

2. Strategy Selection: The Role of Interest Rate Differentials

After considering multiple models, we decided on a model focusing on the interest rate differential between two countries. We were intrigued by this model, introduced in our lectures with the USD/Euro pair, due to its simple nature yet surprisingly high performance. We wish to investigate whether the successful results specific to the USD/Euro pair can be replicated with the GBP/USD pair.

One hypothesis for the model's success with the USD/Euro pair is that both the US and the Eurozone are advanced economies with effective monetary policies. Although not explicitly stated and targeted by monetary policy authorities, it is understood that interest rate levels influence exchange rates. Thus, the interest rate differential, especially near short-term rates targeted by policies, may reflect policymakers' expectations for currency trends. While the market does not always move in accordance with these expectations, the ability of policymakers to influence interest rates suggests a potential for these expectations to be self-fulfilling. Given that the US and the UK are also financially advanced, we anticipate the model to perform similarly.

3. Implementing the Strategy: Parameters and Positions

(i) Strategy

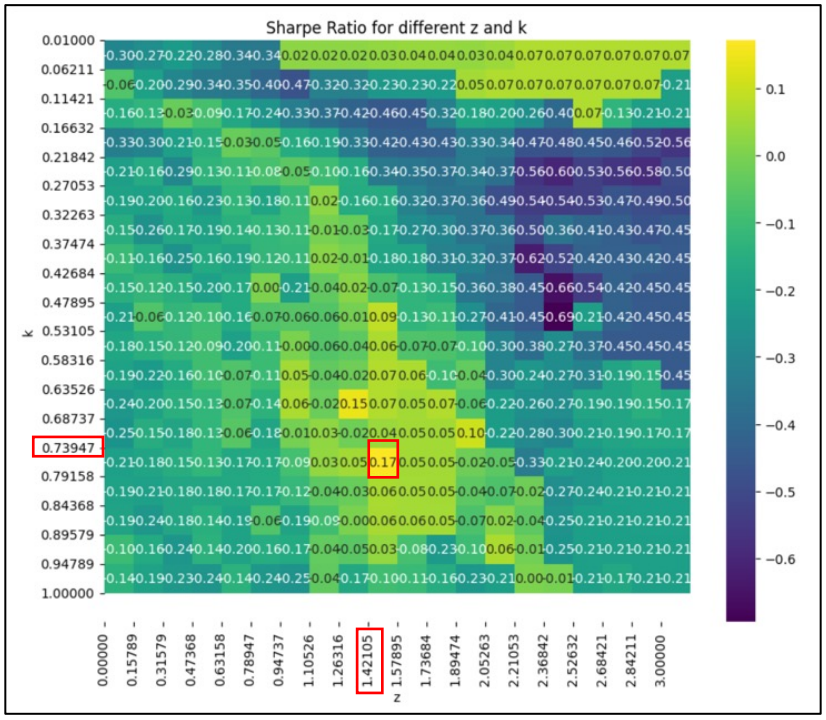
We adopt a state-contingent strategy, entering a long position when the interest rate differential crosses above the filter by z standard deviations and a short position when it crosses below the filter by z standard deviations. We exit positions only upon a signal in the opposite direction. The strategy was implemented from April 2004 to December 2023. We make the decision monthly.

(ii) Hyperparameters

We will focus on the interest rate differential of two countries when forecasting GBP/USD. We set a filter to execute the strategy and use the following variables as hyperparameters:

- The weight of interest rate differentials when calculating the filter (k): k ranges between 0 and 1, with larger k values assigning more weight to recent interest rate differentials.
- The range of execution (z): We set the range between the filter, which is z times the standard deviation of filter error.

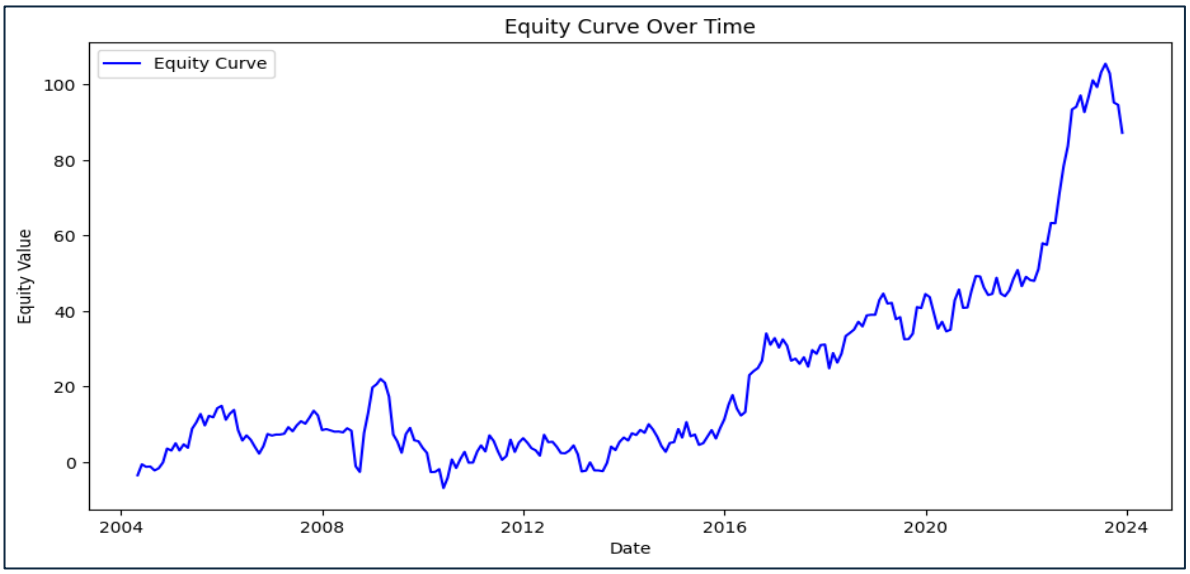
After analysis using the heatmap, we set k at approximately 0.739 and z at 1.421.



4. Evaluating Performance: Comparisons with the HFRX

Using a binomial test, we rejected the null hypothesis, indicating that our strategy successfully captured the big movement of the realized appreciation and depreciation of the exchange rate.

We compared our strategy's performance against "HFRX Macro Currency Index" as shown in the comparison table below. Our strategy's performance is achieving returns that exceed the benchmark. Compared to the benchmark, it shows slightly higher volatility, but also surpasses the benchmark in terms of the Sharpe ratio. In terms of alpha and beta, both metrics are lower than those of the benchmark. An alpha of zero suggests that, after adjusting for the difference in risk taken, our strategy does not add value over the benchmark. A negative beta indicates a defensive position against market downturns, which could be advantageous during volatile periods. However, this defensive stance might also result in missed opportunities during market rallies.



Risk /Return	Our Strategy	HFRX
Geo. Average Monthly	0.23	0.06
Std. Deviation	2.58	1.23
High Month	10.09	4.15
Low Month	-9.07	-4.66
Annualized Return	2.83	0.67
Annualized STD	8.94	4.25
Risk Free Rate	1.46	1.46
Sharpe Ratio	0.24	-0.16
% of Winning Mo.	55.35	51.09
Max Drawdown	52.56	9.61

Regression	Our Strategy	HFRX
Alpha	0.00	0.07
Beta	-0.05	-0.01
Mnt. R-Squared	0.01	0.00
Correction	0.11	-0.02
Up Alpha	0.00	0.09
Up Beta	0.01	-0.01
Up R-Squared	0.00	0.00
Down Alpha	-0.01	-0.09
Down Beta	-0.22	-0.04
Down R-Squared	0.07	0.01

5. Enhancing Strategy: Areas for Refinement

Our analysis and comparative study have identified three primary areas for improvement to enhance the efficacy of our trading strategy. Firstly, improving the model's sensitivity to sudden market shifts could significantly increase both responsiveness and profitability. Notably, the strategy's maximum drawdown, particularly during the Great Recession, was considerably high. We consider tighter stop-loss strategies, risk parity allocation, or other protective measures to mitigate substantial losses. Secondly, integrating additional macroeconomic indicators, such as inflation rates or GDP growth disparities, could provide a more comprehensive understanding of currency movements. Finally, incorporating a machine learning component to dynamically predict optimal values for the k and z parameters, based on historical data, could refine our strategy's entry, and exit signals. Such an enhancement is anticipated to further improve the strategy's performance by making it more adaptable to changing market conditions.