Estimating the Price of S&P 500 Using Economic and Financial Indicators

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Objective

For this project, we will use some of US' key economic and financial indicators to predict the movement of the S&P 500. Our objective for this lab is to identify the key performance indicators within the features, with the future goal of creating a high accuracy prediction model while using the least number of features, since collecting unnecessary data can be expensive.

Data

In this lab, we aim to start with the following features and narrow our focus to the essentials.

-Moving average from S&P500 (20days,100days,200days)
-National Housing Market Price
-Federal Bond Yield
-Dow Jones Price
-GDP Price, growth
-Consumer Price Index (CPI)
-USD/EUR, USD/JPY (potentially others)
-Consumer Confidence Index
-On-Balance Volume (OBV)
-Average Directional Index (ADX)
-Aroon indicator
-Moving Average Directional Convergence/Divergence
-Stochastic Oscillator
-FED Recession Probability model

Project Objectives:

Data Collection & Preparation

Gather and clean historical S&P 500 price data along with selected indicators for an extended period. Identify which time intervals we can use for the lab.

We plan to either ffill or interpolate missing values, since some data are only published on certain days. (i.e. only weekdays, monthly, quarterly)

Feature Engineering & Analysis

Identify the most influential indicators affecting S&P 500 price movements by performing statistical correlation analysis between indicators and S&P 500 prices.

Predictive Modeling

Implement machine learning models (e.g., Linear Regression, Random Forest, XGBoost) to predict S&P 500 prices based on input indicators.

Compare different model performances using appropriate evaluation metrics (RMSE, R^2, etc.).

Visualization & Reporting

Use data visualization techniques to show trends, correlations, and predictions.

Data Preview:

Below is an example of the first 10 records of the dataset (to be finalized after data sourcing):

	S&P	DowJones	GDP	Bond	HPI	CPI	usd/eur	usd/jpy	S&P log	…
1/1/1987			4722.15		63.73	111				
1/2/1987	244.30999	1927.31		7.18			0.9084	158.02	5.49843	
1/3/1987										
1/4/1987										
1/5/1987	249.41500	1971.32		7.08			0.9149	159.13	5.51911	
1/6/1987	252.7775	1974.83		7.08			0.9107	158.75	5.53250	
1/7/1987	254.11999	1993.95		7.05			0.9162	157.75	5.53780	
1/8/1987	256.2225	2002.25		7.04			0.9152	158.21	5.54604	
1/9/1987	257.82500	2005.91		7.01			0.9128	158.02	5.55228	
1/10/1987										
…										