Exponentially Weighted Moving Linear Regression

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The Exponentially Weighted Moving Linear Regression (EWMLR) is a novel approach that extends the widely used Exponentially Weighted Moving Average (EWMA) by integrating linear regression to enhance forecasting accuracy. While EWMA effectively emphasizes recent observations, it struggles to capture underlying linear trends often present in time series data. EWMLR addresses this limitation by combining exponential weighting with linear regression, enabling it to model both recent changes and broader trends. To evaluate its performance, EWMLR was tested on Bitcoin stock data, a time series characterized by high volatility and discernible trends. The results demonstrate that EWMLR consistently outperforms EWMA in predictive accuracy, particularly in capturing the dynamic patterns of Bitcoin's price movements. This improvement highlights EWMLR's potential as a valuable tool for financial analysis, demand forecasting, and real-time decision-making in dynamic environments.
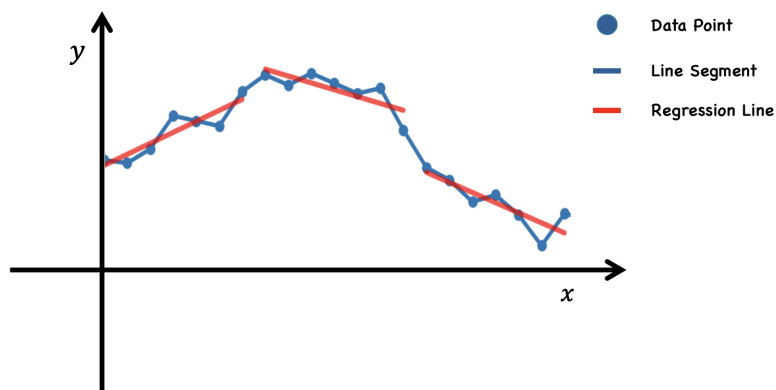
Figure 1: Working example of Exponentially Weighted Moving Linear Regression (EWMLR)

References

[1] S. W. Roberts, "Exponential Moving Average," *Encyclopedia of Operations Research and Management Science*, 2nd ed. Wiley, 2009.

[2] J. Huang and L. Yang, "Application of linear regression models in time series analysis for stock market prediction," *Quantitative Finance*, vol. 18, no. 5, pp. 783-798, 2022.