**Financial Analysis and Prediction Model Report**

**Correlation Analysis:** The correlation analysis between the three time series (A1, A2, and A3) reveals that they are mostly negatively or weakly correlated. The pairwise correlation values are:

* Corr(A1, A2): 0.0261
* Corr(A2, A3): -0.0320
* Corr(A1, A3): -0.0054

These values suggest minimal linear relationships between the series, with A2 and A3 having a slight negative correlation.

**Performance Evaluation:** Among the three series, A2 demonstrated the best performance based on key financial metrics:

* **Sharpe Ratio:** A2 had the highest Sharpe ratio, indicating a better risk-adjusted return compared to A1 and A3.
* **Volatility and Returns:** Evaluating returns on a $100 investment, A2 outperformed the other series, further supporting its strong performance.

**Portfolio Performance:**

* **Equal Allocation Portfolio:** When the daily returns were combined with equal allocation across A1, A2, and A3, the portfolio yielded a cumulative return of $297.2 on an initial $100 investment. However, the worst drawdown was significant at 56.21%.
* **Volatility-Weighted Portfolio:** Allocating investments inversely proportional to their 20-day volatility improved risk management. This portfolio returned $221.6 on a $100 investment with a reduced worst drawdown of 32%, indicating better downside protection.

**Prediction Model:** A linear regression model was implemented to predict A3 based on A1 and A2. The model's coefficients and intercept were calculated using Excel, yielding a correlation coefficient of 0.7 between the predicted and actual A3 values. Although the high correlation suggested a strong relationship, the prediction accuracy varied:

* **Actual A3 Performance:** $180 return on $100 investment.
* **Predicted A3 Performance:** $203 return on $100 investment.
* **Sharpe Ratio:** The predicted fund exhibited a higher Sharpe ratio compared to the actual A3 series, suggesting that the model provided better risk-adjusted returns despite prediction inaccuracies.

A2 is the best-performing time series based on returns and Sharpe ratio. Portfolio optimization through volatility weighting improved performance metrics. The linear regression model showed potential for predicting A3, but further refinement is needed for accurate financial forecasting.