**Final Project Report**

**Concerning: Bitcoin EMA Margin trade Strategy**

By Group 3：

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**Yutao Liang’s part:**

Our topic is concerning Bitcoin EMA Margin trade Strategy, because according to the research we have made, Bitcoin’s price volatility is great and returns of time the market is large. The principle is Shorting at high price and longing at low price.

The First step was Simulating trade-related cost. we use Volume Weighted Average Price(VWAP) trading strategy to simulate the trade-related cost. The evaluation indicators include the percentage of trade-related cost.

The Second step was Building EMA Margin Trade Strategy. We have analyzed the deviation from Bitcoin price to EMA price to find the boundary of abnormal high and abnormal low price. Short in abnormal high price and long in abnormal low price. The calculated indicators of the model include: EMA, percentage of deviation from close to EMA, negative abnormal and positive abnormal.

The Third step was Optimizing the Strategy and Selecting the Best Strategy. I have selected multiple span of EMA, executed the strategy many times, and found the optimized strategy that has the maximum sharpe ratio and high winning rate.The evaluation indicators of the model include: winning rate, annual return, annual std and annual sharpe ratio.

**Li li’s part:**

In the Bitcoin Exponential Moving Average(EMA) Margin trade Strategy Project, I was responsible of Downloading and processing the data, Building the model and evaluating the trade-related cost, and Building the EMA trade strategy. Let me explain the Specific methods and steps.

The First step has 5 procedures, the first one was Downloading Data. I have Downloaded Bitcoin market chart and trade history data. The second one was Processing Data. I have Indexed, filled, split, randomly selected start time, and split Train and test data. The third one was Building the Model, I have Built Polynomial Linear Model of accumulated volumes curve with train data. The forth one was Trading with Model.I have simulated Trading with the Model and test data. The fifth one was Calculating the Cost. I have Calculated the percentage of Trade-related Cost.

For example, I have downloaded 5 minutes Market Chart Bar Data, and 1 second Market Trade History Data. I have split the Market Trade History Data as daytrade1 and daytrade2. They are train data and test data. I have process the 1 second trade data for 1 minute trade data. I have built the model of accumulated volumes curve with daytrade1. The score of the model was 98%, the accurate rate was very high. I have simulated Trading with the Model and daytrade2. The percentage of Trade-related Cost was 0.2%. It was very closed to VWAP.

The Second step has 4 procedures. The first one was Calculating the EMA. The second one was Calculating percentage of deviation from close to EMA. The third one was Defining the Abnormal indicators. The negative abnormal indicator was the mean of percentage of deviation minus 3 times of standard deviation. The positive one was plus that. The forth one was Building the Signal. I have set Long Signal at Negative Abnormal indicator, Short Signal at Positive one. The fifth one was Trading with Signal. Long at Long Signal, Short at Short Signal, Including Trading Cost.

For example, this is EMA10 curve, the deviation was small, but the frequency was high. This is the frequency distribution of percentage of deviation of EMA150. It was similar with normal distribution, the mean was 0 and has highest frequency, the positive abnormal value was 2%, it was high. This is the relationship between percentage of deviation and price. As you see, if percentage of deviation was more than positive abnormal indicator, the price would decrease, vice-versa. This is the signal line. Long Signal was 1, Short Signal was -1, empty position is 0. The least duration of holding a position was 4 hours. The turnover frequency is more than daily trade. This is simulated trading curve. The trading price was often in high zone and low zone.

The third step has four procedures. The first one was Selecting Multiple Span. I have selected Multiple Span of EMA, from 10 - 200, and Calculated Multiple EMAs. The second one was Executing Strategy with EMAs. The third one was Calculating Indicators. The forth one was Finding the Best EMA. I have found the Best EMA with Max Sharpe ratio and high Winning Rate.

For example, this is EMA190 curve, it has large deviation and low frequency. So I could not directly know which span of EMA could get max return. I have to try every one. Finally, I have found the best j, it is the index of EMAs, its span was 150. According the best EMA, the performance was great. The annual return was 172, the annual std was 58%, the annual sharpe ratio was 296, the winning rate was 100%.

**Siqi Yi’s part:**

As you can see, after we computed the return for every span of EMA, we finally found the best EMA that could bring the maximum return to the investors. By using the best strategy we found out, the return turn out to be much more profitable than the market. Here, the orange curve represents our strategy accumulate return, and the blue curve represents the market accumulate return. To express more accurately with numbers, the index of EMAs are as follows, its span was 150. The annual return was 172, the annual std was 58%, the annual sharpe ratio was 296, which was about 55 times of the Bitcoin price’s own sharp ratio. We can see these in the following chart. The blue point refers to our Bitcoin EMA Strategy, its abscissa means that the return is 172 and its ordinate means that the annual std is 0.58. This chart shows that our strategy got a much higher sharp ratio. And its really good, cause we all know that high sharp ratio means higher return with the same risk or the lower risk with the same return. The last diagram shows that the winning rate was 100%.

Based on the above results, we can safely draw the conclusion that our strategy for the Bitcoin is successful. In the process of building strategies and constantly testing results and optimizing strategies, we are more aware that using quantitative trading strategies to execute transactions is a multiplier. Quantitative trading strategies make it easier for us to calculate and control our own costs and benefits. Let us be in a safer position in the transaction. Of course, it is very important to select and set high-quality signal indicators that match the actual situation, so we must continue to learn and continue to experiment.