

# Estimation of Clusters based on Decision Latency in High Frequency Trading

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## Abstract

One of the critical factors to evaluate a system or network performance is latency. Latency is how fast a system responds to the input requests. Within the financial market low decision latency means high-profit margins. Decision latency means that in a streaming data environment where people have to make decisions within a unit interval of time (by the second, minute, hour, and so on), the decision relates to the delivery of a result well before the next data arrives. The other challenge financial institutions face is scalability. With changing size of the incoming data, it is not easy for people to make real-time, accurate decisions. Scalability is the ability of the computing system to handle change in the size of the data while solving complex problems.

This dissertation aims to provide a big data architecture that focuses on providing solutions to both problems of scalability and latency. Based on the decision latency and the volume of the data, this research will provide estimations of the computing clusters. The key results states that the average reduction in decision latency on switching the computation from modelling time dependent volatility to descriptive statistics is a whopping 105.97%. This means that the time it takes to compute time dependent volatility is almost double the time it takes to compute historical volatility through descriptive statistics. In both cases, it is common to see that the speed at which the performance in execution is improved is decreasing with an increase in the size of the input dataset. This is worth noting that the solution to the problem of scalability is the solution to the problem of latency itself. As scaling the size of computing machines or clusters will handle latency issues for both storage and processing of big data.

**Keywords:** Decision Latency, High Frequency Trading, Big Data, AWS, Spark, Time Series, Parallel Computing, volatility, ARCH, GARCH

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