This study coded and tested four different models using Python programming language. The data set used to create the inputs for this model was the Spanish Exchange Index, known as IBEX 35. The entire data set used in this research contains 2454 observations, covering the closing prices and volume values from June 1, 2010, to December 31, 2019, covering almost ten years of daily prices in which different trends took place that may represent a normal market cycle. The Anderson-Darling test was performed on the sample data and rejected the null hypothesis; therefore, the assumption of normal distribution in the data sample cannot be allowed.

Because the values of the data-set did not follow a normal distribution, the closing prices and the volume values were rescaled between ($−1 < x < 1$) to be used with the hyperbolic tangent functions and between ($0 < x < 1$) with the sigmoid activation function.

The performance metrics to measure the predictive ability of the different models used in this research were the mean square error (MSE), mean absolute error (MAE), mean squared log error (MLE) metrics, and the determination coefficient ($R\_{2}$).

The common input layer for the ANN architectures use in this study is presented in Eq. \ref{equation:input}:

\begin{equation}

\begin{split}

X\_{input}(t) = f[v(t-4),v(t-3),v(t-2),v(t-1),\\

c(t-4),c(t-3),c(t-2),c(t-1)]\\

\end{split}

\label{equation:input}

\end{equation}

Where $c(t)$ is the function for closing price and $v(t)$ for volume value at a given time $t$.

For the training phase, the data-set was split into two parts. The first portion contains the initial 80\% of the data selected for the training set, while the remaining 20\% for the test sets.