# Stock Market Analysis and Predictio using Hidden Markov Models

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## ABSTRACT

## 1. INTRODUCTION

1. Problem Definition
2. Literature overview
   (a) HMM VERY brief intro
   (b) Left Right (Baskin) HMM
3. Approach
   (a) Read data from sources
   (b) build statisitics
   (c) compute $\mu$ and $\Sigma$ (mean and covariances)
   (d) extend Hmm for left-right HMM
   (e) define an HMM
      i. a four-state($N = 4$) HMM with ($s_0 = open, s_1 = low, s_2 = high, s_3 = close$)
      ii. initialize $\pi = \{1, 0, 0, 0\}$ as we always start with $s_0$
      iii. observation states are **continuous** so they could not be visualized
      iv. initialize a proportion distribution $\vec{C}_{1\times 4}$
      v. We have:

$$b_i(O_t) = \sum_{j=1}^{M_i} c_{ij} b_{ij}(O_t) \quad i = \{1, 2, \ldots, N\} \tag{1}$$

      where
      - $M_i$ is the number of components is state $i$
      - $c_{ij}$ is the mixture coefficient for $j$-th mixture component in state $i$ such that $\sum_{j=1}^{M_i} = 1$
      - $b_{ij}(O_t)$ is a 3-D multivariate Gaussian density with mean $\mu_{ij}$ and covariance matrix $\Sigma_{ij}$
4. Statistical Report
5. HMM Model
6. HMM Training
7. HMM Prediction
8. Experiment Results
9. Technology Overview
10. Conclusion
11. Acknowledgements

## 2. ACKNOWLEDGMENTS

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