Currency Market HMM

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Load Needed Packages

```
library(depmixS4)
library(quantmod)
library(tidyverse)
```

Load Data

```
EURUSD1d = read_csv("EURUSD1d.csv",
    col_types = cols(`Open Timestamp` = col_datetime(format = "%Y.%m.%d %H:%M:%S")))
```

Turn into Time Series Data

```
DateTS= EURUSD1d$`Open Timestamp`
TSData=data.frame(EURUSD1d[,2:5],row.names=DateTS)
TSData=as.xts(TSData)
ATRindicator=ATR(TSData[,2:4],n=14)
ATR=ATRindicator[,2]
LogReturns = log(TSData$Close) - log(TSData$Open)
ModelData=data.frame(LogReturns,ATR)
ModelData=ModelData[-c(1:14),]
colnames(ModelData)=c("LogReturns","ATR")
```

Build the HMM

```
HMM=depmix(list(LogReturns~1,ATR~1),data=ModelData,nstates=3,family=list(gaussian(),gaussian()))
HMMfit=fit(HMM, verbose = FALSE)
```

```
## converged at iteration 28 with logLik: 9503.258
```

```
print(HMMfit)
```

```
## Convergence info: Log likelihood converged to within tol. (relative change)
## 'log Lik.' 9503.258 (df=20)
## AIC:  -18966.52
## BIC:  -18868.48
```

Plot State Probabilities

```
HMMpost=posterior(HMMfit)

HMMpost = tibble::rowid_to_column(HMMpost, "ID")

pro = HMMpost %>%
  select(-state)%>%
  gather(state,prob,2:4)

ggplot(data = pro, aes(x = ID, y= prob, color = state)) + geom_line(size = 2) +
  labs(title = "Probabilities of States Through Time",y = "Probability",x ="Time")
```