Default Rate Regression Against MVs

Contents

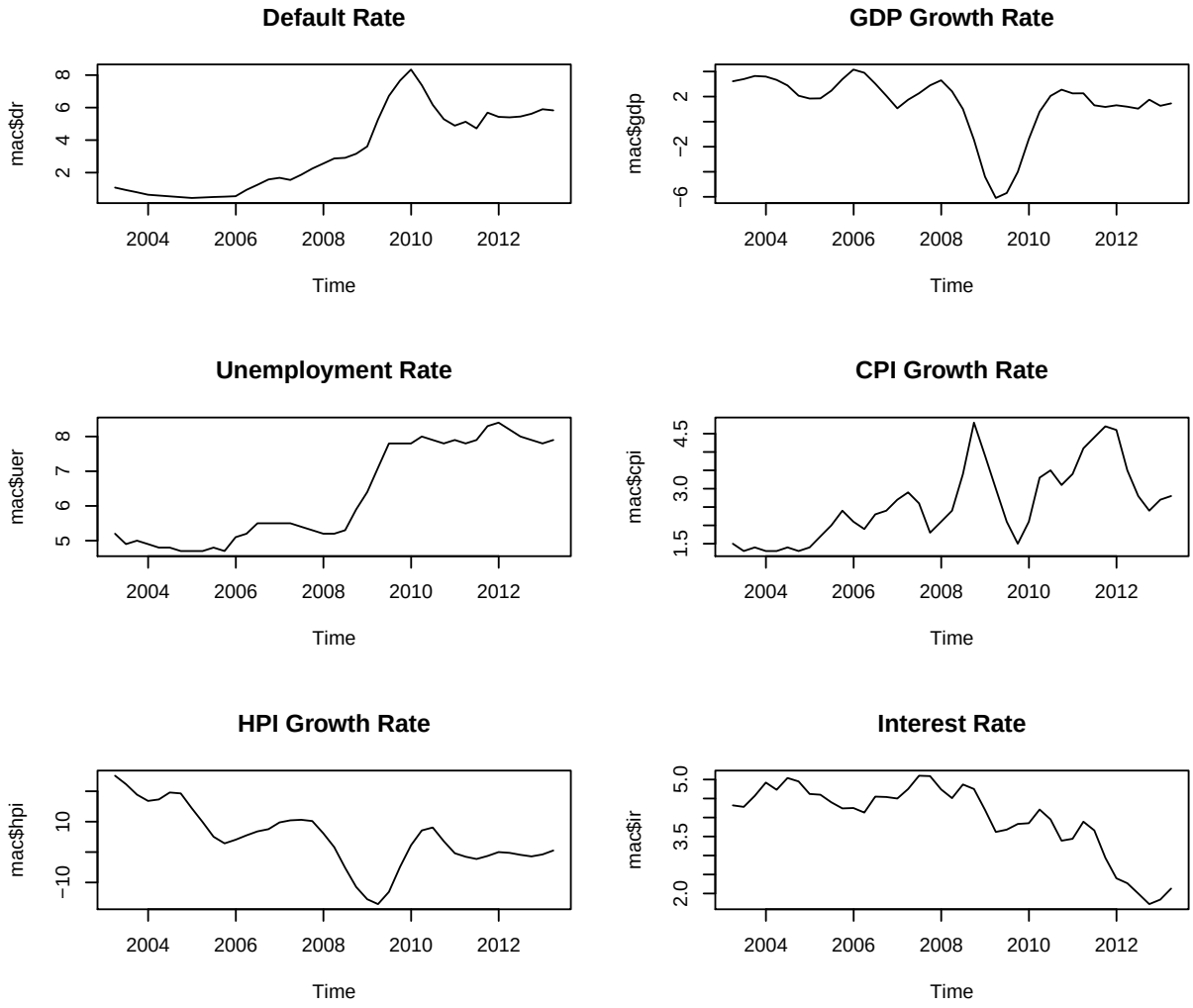
```r
library(ggplot2)
```

```r
#setwd('z:/Model Risk/Adam/IFRS9_CECL_MV/')

mac <- read.csv('z:/Model Risk/Adam/IFRS9_CECL_MV/data/chap3drts.csv',
                header=TRUE, sep=",", dec='.')
mac$Date <- as.Date(mac$Date, format='%m/%d/%Y')

oldpar <- par()
par(mfrow=c(3,2))

plot(y=mac$dr, x=mac$Date, main='Default Rate', type='l', xlab = 'Time')
plot(y=mac$gdp, x=mac$Date, main='GDP Growth Rate', type='l', xlab = 'Time')
plot(y=mac$uer, x=mac$Date, main='Unemployment Rate', type='l', xlab = 'Time')
plot(y=mac$cpi, x=mac$Date, main='CPI Growth Rate', type='l', xlab = 'Time')
plot(y=mac$hpi, x=mac$Date, main='HPI Growth Rate', type='l', xlab = 'Time')
plot(y=mac$ir, x=mac$Date, main='Interest Rate', type='l', xlab = 'Time')
```



#KPSS testing Test for stationarity of level and trend.

```
library(tseries)

tbl <- as.data.frame(matrix(data = rep(NA, 18), nrow = 6, ncol = 2),
                     row.names = c('DR','GDP_growth','UER',
                                   'CPI_growth','HPI_growth','IR'))
colnames(tbl) <- c('Level (p-value)', 'Trend (p-value)')

for (i in 2:length(colnames(mac))) {
  tbl[i-1,1] <- round(kpss.test(mac[,i], null='Level', lshort=TRUE)$p.value,3)
  tbl[i-1,2] <- round(kpss.test(mac[,i], null='Trend', lshort=TRUE)$p.value,3)
}
```

```
## Warning in kpss.test(mac[, i], null = "Level", lshort = TRUE): p-value
## smaller than printed p-value

## Warning in kpss.test(mac[, i], null = "Trend", lshort = TRUE): p-value
## greater than printed p-value

## Warning in kpss.test(mac[, i], null = "Level", lshort = TRUE): p-value
## greater than printed p-value

## Warning in kpss.test(mac[, i], null = "Trend", lshort = TRUE): p-value
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## Warning in kpss.test(mac[, i], null = "Trend", lshort = TRUE): p-value
## greater than printed p-value

## Warning in kpss.test(mac[, i], null = "Level", lshort = TRUE): p-value
## smaller than printed p-value

## Warning in kpss.test(mac[, i], null = "Trend", lshort = TRUE): p-value
## smaller than printed p-value
```

```
print(tbl)
```

```
##            Level (p-value) Trend (p-value)
## DR                   0.010           0.100
## GDP_growth           0.100           0.100
## UER                  0.010           0.076
## CPI_growth           0.010           0.100
## HPI_growth           0.017           0.060
## IR                   0.010           0.010
```

Fit regression model

Data prepearation

```
dr_t <- as.matrix(mac[5:nrow(mac), 2])
gdp_tlag <- as.matrix(mac[1:(nrow(mac)-4), 3])
uer_t <- as.matrix(mac[5:nrow(mac)-4,4])

xx <- as.data.frame(cbind(dr_t, gdp_tlag, uer_t)/100)
colnames(xx) <- c('dr_tt', 'gdp_ttlag', 'uer_tt')
```

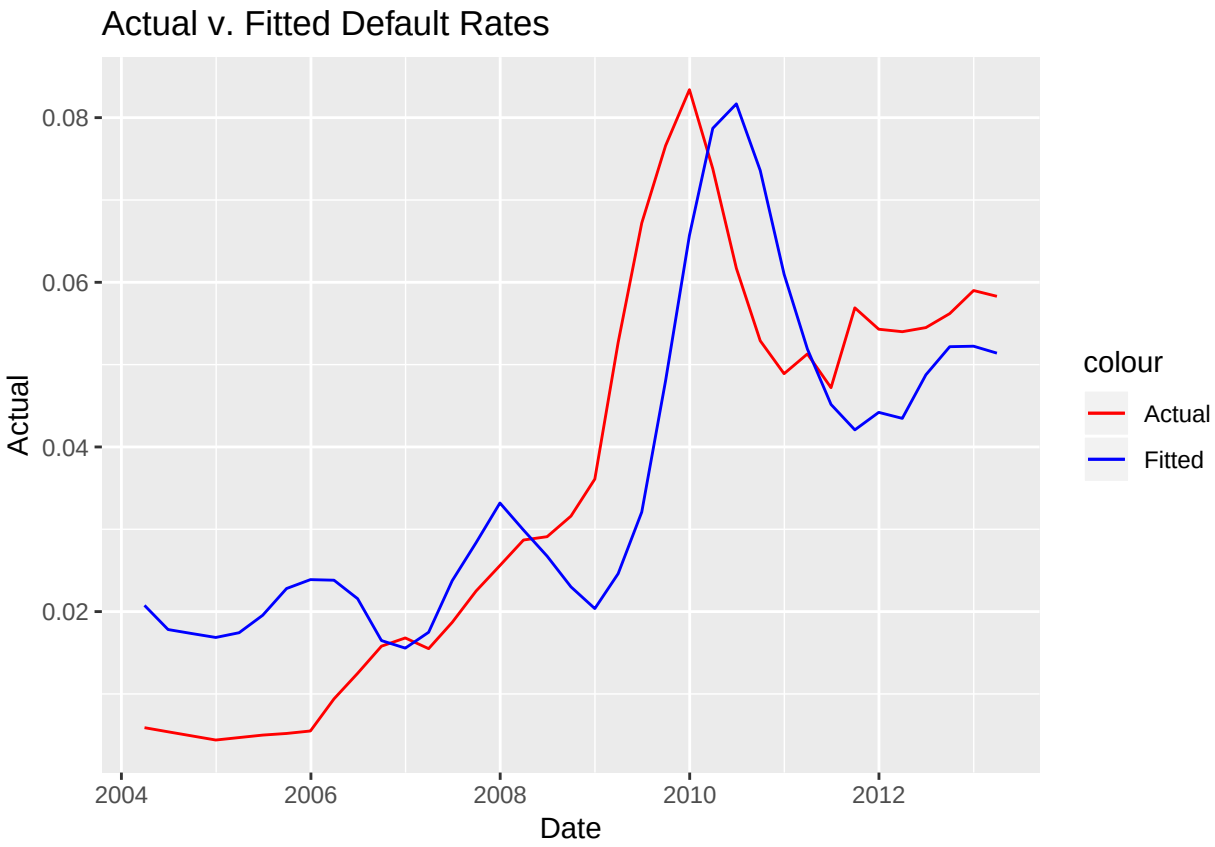
Fit the model

```
fit <- lm(dr_tt ~ . -1, data = xx)
summary(fit)
```

```
##
## Call:
## lm(formula = dr_tt ~ . - 1, data = xx)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.020680 -0.012432 -0.001205  0.006903  0.035106
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## gdp_ttlag -0.48018    0.08710  -5.513 3.39e-06 ***
## uer_tt     0.69660    0.04043  17.229  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01432 on 35 degrees of freedom
## Multiple R-squared:  0.8949, Adjusted R-squared:  0.8889
## F-statistic: 148.9 on 2 and 35 DF,  p-value: < 2.2e-16
```

```
df <- as.data.frame(x=cbind.data.frame(mac[5: nrow(mac),1], xx$dr_tt, fit$fitted.values))
colnames(df) <- c('Date','Actual','Fitted')

p <- ggplot(data=df)
p <- p + geom_line(mapping = aes(x=Date, y=Actual, color='Actual'))
p <- p + geom_line(mapping = aes(x=Date, y=Fitted, color='Fitted'))
p <- p + scale_color_manual(values=c('Red','Blue'))
p <- p + ggtitle('Actual v. Fitted Default Rates')
p
```


Actual v. Fitted Default Rates
0.08
0.06
0.04
0.02
Actual
2004
2006
2008
2010
2012
Date
colour
Actual
Fitted