Financial Econometrics
Exam

April 06, 2017

1. Panel data estimation

   (a) What are the motivations for panel data models?

   (b) What are the basic model types?

   (c) What is the difference between balanced and unbalanced panels?

2. The computation of the dividend yield $\delta_t = D_t/P_t$ can be motivated from the present value, by adopting two simplifying assumptions. First, expectations of future dividends are given by present dividends $E_t(D_{t+n}) = D$. Second, the discount rate is assumed to be fixed at δ. Using these two assumptions gives

$$\begin{aligned} P_t &= D\left(\frac{1}{(1+\delta)} + \frac{1}{(1+\delta)^2} + \ldots\right) \\ &= \frac{D}{1+\delta}\left(1 + \frac{1}{(1+\delta)} + \frac{1}{(1+\delta)^2} + \ldots\right) \\ &= \frac{D}{1+\delta}\left(\frac{1}{1-1/(1+\delta)}\right) \\ &= \frac{D}{\delta}. \end{aligned}$$

   Rearranging this expression gives

$$\delta = \frac{D}{P_t},$$

   which shows that the discount rate, δ, is equivalent to the dividend yield.

   Assume prices and dividends are co-integrated. The present value model predicts the following relationship between the two series

$$p_t = \beta_0 + \beta_1 d_t + u_t,$$

   where p_t is the log equity price, d_t is the log of dividend payments, u_t is a disturbance term and β_1 is the discount rate and $\beta_1 = 1$.

(a) Test the restriction $H_0 : \beta_1 = 1$. Discuss whether the empirical results support the present value model.

(b) Derive an estimate of the long-run real discount rate from $\delta = \exp(-\beta_0)$ and interpret the result.

```
pv <- read.csv("F:/721954S/Data/pv.csv", header=T)
head(pv)
```

```
##   price dividend earnings   cpi  dates
## 1  4.44     0.26      0.4 12.46 1871m1
## 2  4.50     0.26      0.4 12.84 1871m2
## 3  4.61     0.26      0.4 13.03 1871m3
## 4  4.74     0.26      0.4 12.56 1871m4
## 5  4.86     0.26      0.4 12.27 1871m5
## 6  4.82     0.26      0.4 12.08 1871m6
```

```
p <- log(pv$price)
d <- log(pv$dividend)
m <- lm(p~d)
summary(m)
```

```
##
## Call:
## lm(formula = p ~ d)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.0770 -0.2012  0.0120  0.2143  0.8190
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 3.136070   0.007352   426.6   <2e-16 ***
## d           1.195469   0.004665   256.3   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2984 on 1714 degrees of freedom
## Multiple R-squared:  0.9746,Adjusted R-squared:  0.9746
## F-statistic: 6.568e+04 on 1 and 1714 DF,  p-value: < 2.2e-16
```

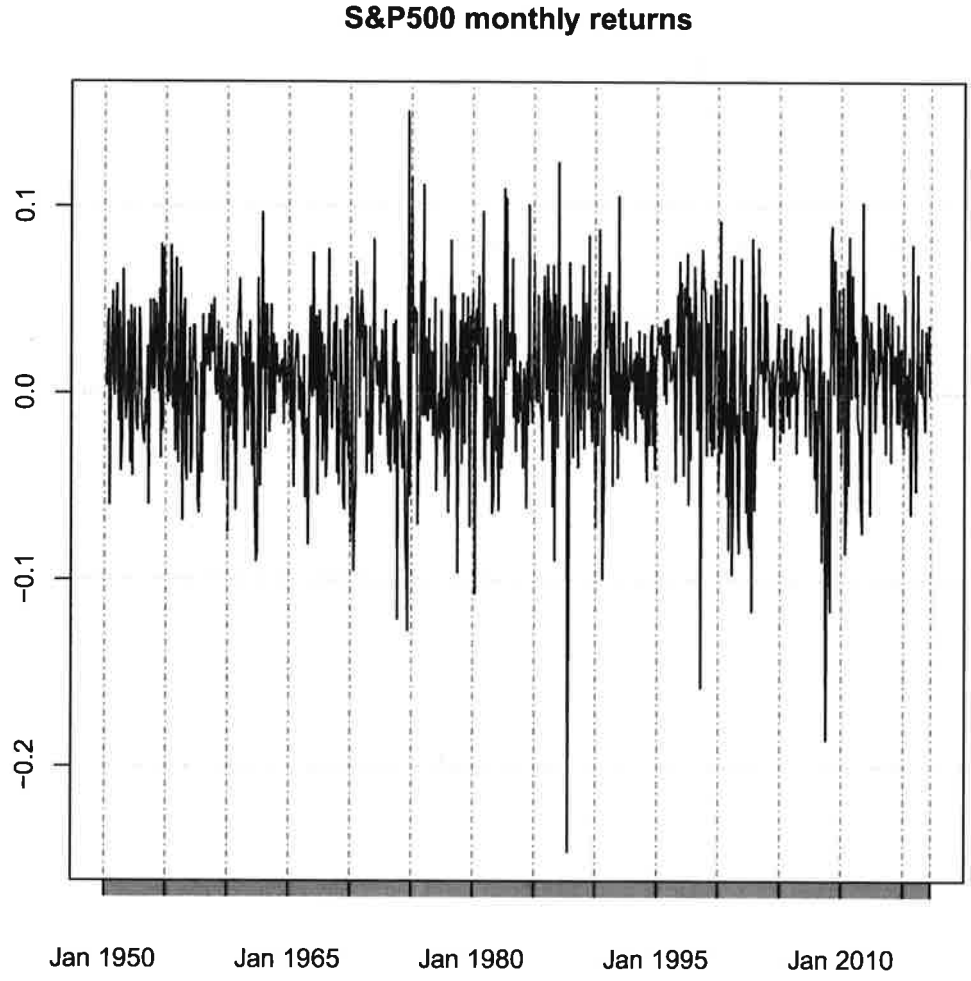
3. What is the rellationship between mean returns and variances at different horozons? TIP: The variance ratio.

4. Provide interpretation of typical time series properties of stock returns. The plot provides time series graph of S&P 500 monthly log returns with summary statistics.

```
library("Quandl")
```

```
## Loading required package:  xts
## Loading required package:  zoo
##
## Attaching package:  'zoo'
## The following objects are masked from 'package:base':
##
##    as.Date, as.Date.numeric
```

```
SP500 <- Quandl("YAHOO/INDEX_GSPC",collapse="monthly",type="xts")
r <- diff(log(SP500[,6]))
plot(r,main = "S&P500 monthly returns")
```




```
library(fBasics)
## Loading required package:  timeDate
## Loading required package:  methods
## Loading required package:  timeSeries
##
## Attaching package:  'timeSeries'
## The following object is masked from 'package:zoo':
##
##    time<-
##
## Rmetrics Package fBasics
## Analysing Markets and calculating Basic Statistics
```

```
## Copyright (C) 2005-2014 Rmetrics Association Zurich
## Educational Software for Financial Engineering and
Computational Science
## Rmetrics is free software and comes with ABSOLUTELY NO
WARRANTY.
## https://www.rmetrics.org -- Mail to:  info@rmetrics.org
```

```
basicStats(r)
```

```
##             Adjusted.Close
## nobs            808.000000
## NAs               1.000000
## Minimum          -0.245428
## Maximum           0.151043
## 1. Quartile      -0.017616
## 3. Quartile       0.034328
## Mean              0.006109
## Median            0.009064
## Sum               4.930335
## SE Mean           0.001460
## LCL Mean          0.003244
## UCL Mean          0.008975
## Variance          0.001719
## Stdev             0.041466
## Skewness         -0.656069
## Kurtosis          2.460655
```