Econometric Analysis
Homework 1

Due: Dec. 11, 2012 Jin-Lung Lin

1 R Programming: Matrix manipulations

Create three vectors x_1, x_2, x_3 and perform the operation as bellows:

$$x_1' = (13524)$$
$$x_2' = (1491625)$$
$$x_3' = (108642)$$

1. Create X, a 5 by 3 matrix, by combining x_1, x_2, x_3
$$X = (x_1, x_2, x_3)$$
2. Find the determinant of $X'X$
3. Let $b_1, b_2, \cdots, b_5$ be the row vectors of X. Verify that $X'X = \sum_{i=1}^{5} b_i' b_i$.
4. Instead of a 5 by 3 matrix, create X as a 100 by 3 matrix by combining x_1, x_2, x_3; $x_1 = (1, 2, \cdots, 100)'; x_2 = (1^2, 2^2, \cdots, 100^2)'; x_3 = c(200, 198, \cdots, 2)'$. Compute $X'X$, determinant of $X'X$ and verify the matrix multiplication above.

2 R Programming: Basic statistics and graphic

The file *TWNstock.dat* contains daily return of TAIEX, TSMC, UMC, FPG and ChinaSteel from 2004/01/03 to 2007/05/31. Read in the data (hint: use ”read.table”) and answer the following questions.

1. How many observations are there for each return?
2. Compute the mean, variance, skewness and kurtosis for each return.
3. Compute the cross correlation for all five variables.
4. For each return, compute the percentage of observations such that $|r - \mu| > 2\sigma$ where μ, σ are respectively the mean and standard of that return.

5. Graph the time series plot for each return, one graph in each page.

6. Graph the histogram of each return and compare it with normal distribution with same mean and variance. (Hint: Use curve(dnorm(x,mean=...),add=T)

3 R programming: Random number generating

Draw 100 random numbers from each of the following distributions. Compute the sample mean, sample variance, and compare them with the true mean and true variance. Finally, draw the histogram of the samples along with the theoretical distribution.

1. Binomial distribution with n=100, p=0.2.

2. Geometric with p=0.1

3. Negative binomial distribution with n=100, r=5, p=0.1.

4. Hypergeometric distribution with n=10, N=20,r=5.

5. Poisson distribution with n=100, $\lambda = 4$.

6. Uniform distribution with $\theta_1 = 0, \theta_2 = 1$.

7. Normal with $\mu = 10, \sigma^2 = 2$

8. Gamma distribution with $\alpha = 1, \beta = 3$

9. Chi-square with $\nu = 10$

10. Beta distribution with $\alpha = 3, \beta = 5$.

4 R programming: Lottery

The Super Lotto numbers (by Taiwan Lotter Co.) from Feb. 26, 2009 to Oct. 2, 2008 in reverse time order are list below. The buyer must select two sets of numbers. The first set contains six numbers, each ranging from 1 to 38 and second set contains one number ranging from 1 t0 8. Let $X_1, X_2, X_3, X_4, X_5, X_6, Z$ be the winning numbers each period and the last number (Z) the second set. Define the following random variables and then answer the following questions. Matching all 7 numbers win the first prize and matching all 6 numbers in the first set wins the second prize. Matching any 5 numbers in the first set and the the number in the second set wins the third prize.

1. Y1=(X1+X2+X3+x4+x5+X6+Z)/7
2. Y2 = number of even numbers in (X1,X2,X3,x4,x5,X6,Z)
3. Y3 = number of (X1,X2,X3,x4,x5,X6,Z) which has single digit (¡10)
4. Y4 = max (X1,X2,X3,X4,X5,X6)
5. Y5 = min (X1,X2,X3,X4,X5,X6)

1. Calculate Y1,Y2,Y3,Y4,Y5,Z for each period and draw the histogram.
2. Assume that the wining numbers for each period are randomly drawed. What is the probability of each combination to win the first price, the second prize and the third prize.
3. Write a computer program to validate your answer above.

X1	X2	X3	X4	X5	X6	Z
04	05	07	13	15	38	04
13	18	30	33	35	38	03
01	02	08	17	21	31	01
02	20	21	22	25	38	03
04	12	24	29	35	37	07
03	10	11	15	20	33	03
08	20	23	24	34	37	01
06	18	20	24	31	32	06
04	07	15	16	23	28	07
02	06	17	18	29	34	05
07	10	11	23	24	35	08
01	03	04	12	21	31	08
03	15	17	28	29	37	04
09	13	14	23	29	36	08
04	05	12	18	24	28	01
05	24	27	28	29	32	04
01	11	25	28	35	36	07
02	10	15	19	28	31	01
06	07	11	14	33	37	06
22	25	30	32	33	35	02
03	08	11	26	34	38	08
06	08	10	13	18	36	06

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17  18  24  26  30  31  02
08  12  13  16  20  32  06
05  11  14  16  18  30  03
07  10  23  26  28  34  04
03  14  26  30  35  37  07
10  15  20  22  24  25  02
05  14  17  19  35  36  01
01  09  14  24  30  37  04
05  10  24  28  33  38  06
18  22  25  29  32  38  06
01  05  12  27  34  38  03
04  08  09  18  23  36  04
08  11  16  22  28  35  06
04  05  09  22  28  30  04
01  06  14  17  26  38  03
07  10  17  28  32  36  03
02  03  18  33  36  37  05
20  25  26  32  36  37  07
09  11  19  22  26  37  03
06  10  13  15  19  30  06
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5 R programming: Regression

Obtain the quarterly real GDP (Y), real consumption (C), interest rate (i) (any sensible rate like one-year deposit rate), and inflation rate (π), and do the following computations.

1. Regress C(t) on 1, Y(t), i(t)-π(t), and seasonal dummies

2. Find the regressor matrix, X in lienar model above, $y = X\beta + \epsilon$ and show $X[1:10,]$

3. Find $X'X, (X'X)^{-1}, X'y$

4. Regress C(t) on 1, C(t-1), Y(t), i(t)-π(t), and seasonal dummies

5. Do the rolling regression of C(t) on 1, C(t-1), Y(t), i(t)-π(t), and seasonal dummies using data (t=1960Q1, T) where (T=1980Q1-2009Q2). Plot the parameter estimates for the variables (C(t-1),Y(t),i(t)-$\pi(t)$) on one graph.