WST211: Memorandum Practical 6 (2016)

Question 1

The MEANS Procedure

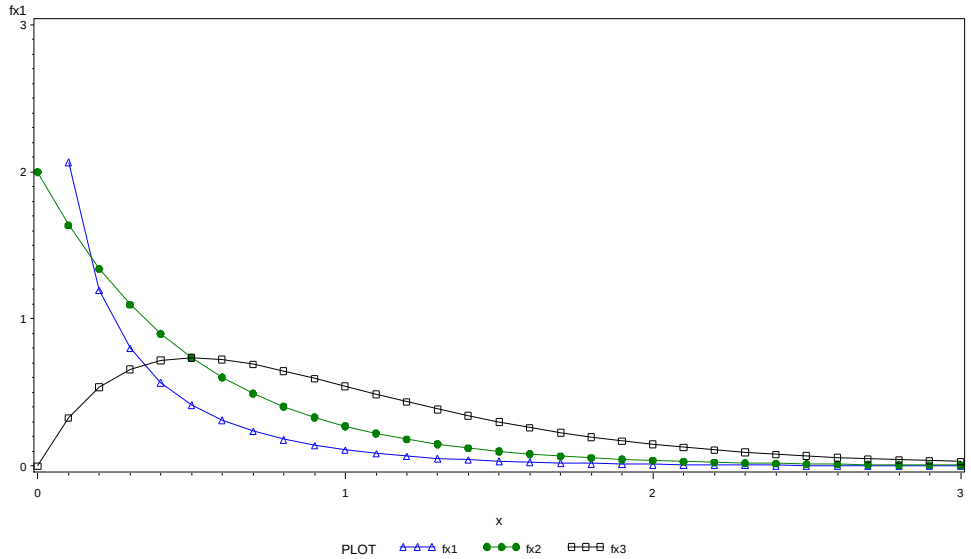
Variable	N	Mean	Variance
x	10000	20.1050636	99.9645006
ind	10000	0.2178000	0.1703802

(a) 20.1051
(b) 99.9645
(c) 0.2178

SAS Program

```
data q1;
do i=1 to 10000;
x=5*rangam(42,4);
if 15<x<20 then ind=1; else ind=0;
output;
end;
proc means n mean var data=q1;
var x ind;
run;
```

Question 2

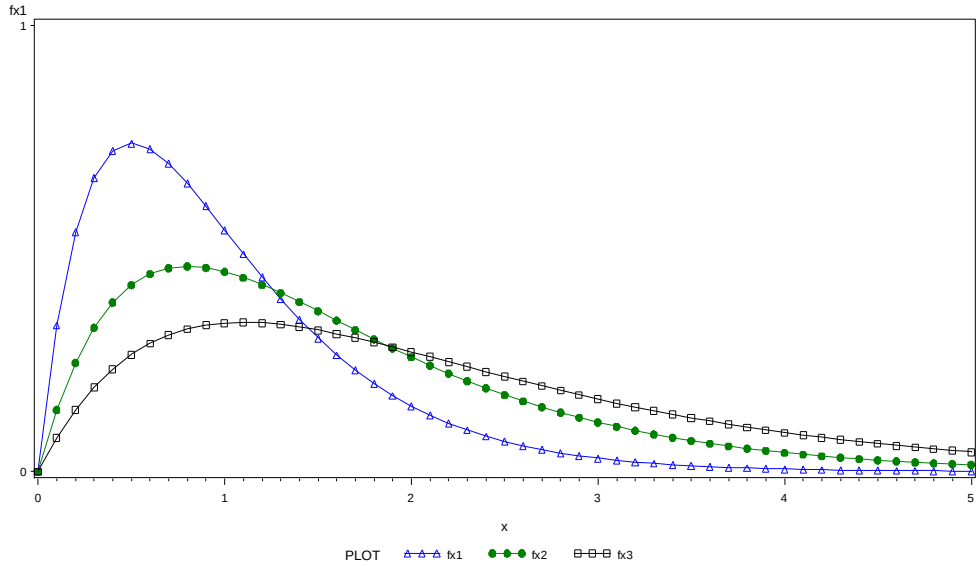


The shape parameter is κ. There are three shapes for the Gamma distribution depending on whether κ<1, κ=1 or κ>1. The above graph illustrates the three shapes.

SAS Program

```
data q2;
do x=0 to 3 by 0.1;
fx1=pdf('GAMMA',x,0.5,0.5);
fx2=pdf('GAMMA',x,1,0.5);
fx3=pdf('GAMMA',x,2,0.5);
output;
end;
goptions reset=global;
symbol1 color=blue interpol=join value=triangle;
symbol2 color=green   interpol=join value=dot;
symbol3 color=black   interpol=join value=square;
proc gplot;
plot fx1*x fx2*x fx3*x/vaxis=0 to 3 overlay legend;
run;
```

Question 3



The scale parameter is θ. As the parameter increases the scale of the data increases.

SAS Program

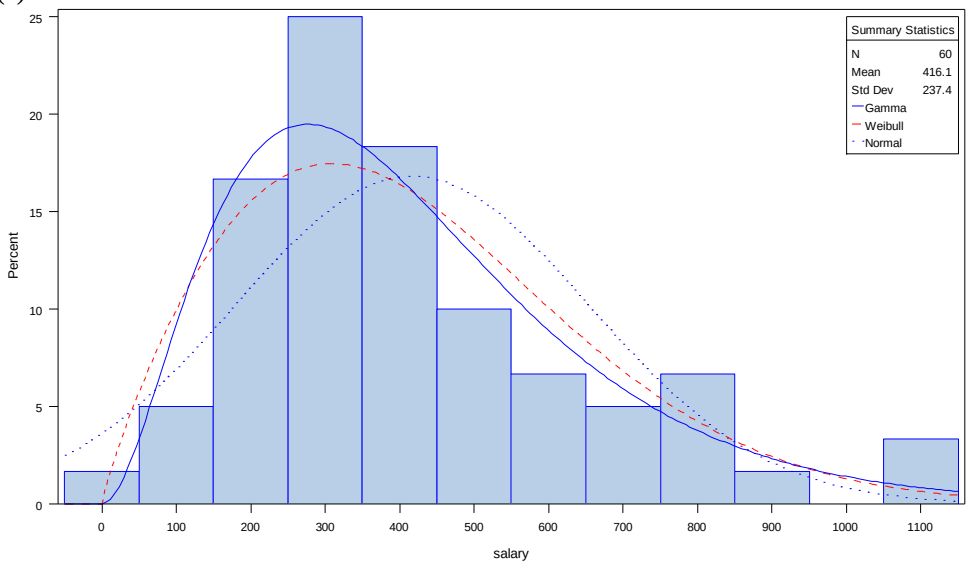
```
data q3;
do x=0 to 5 by 0.1;
fx1=pdf('GAMMA',x,2,0.5);
fx2=pdf('GAMMA',x,2,0.8);
fx3=pdf('GAMMA',x,2,1.1);
output;
end;

goptions reset=global;
symbol1 color=blue interpol=join value=triangle;
symbol2 color=green    interpol=join value=dot;
symbol3 color=black    interpol=join value=square;

proc gplot;
plot fx1*x fx2*x fx3*x/vaxis=0 to 1 overlay legend;
run;
```

Question 4

(a)



(b)

The UNIVARIATE Procedure

Fitted Gamma Distribution for salary

Parameters for Gamma Distribution

Parameter	Symbol	Estimate
Threshold	Theta	0
Scale	Sigma	139.8785
Shape	Alpha	2.974844
Mean		416.1167
Std Dev		241.2587

Goodness-of-Fit Tests for Gamma Distribution

Test		----Statistic-----	------p Value------	
Kolmogorov-Smirnov	D	0.09130578	Pr > D	>0.250
Cramer-von Mises	W-Sq	0.07694503	Pr > W-Sq	0.240
Anderson-Darling	A-Sq	0.52257032	Pr > A-Sq	0.192

Fitted Normal Distribution for salary

Parameters for Normal Distribution

Parameter	Symbol	Estimate
Mean	Mu	416.1167
Std Dev	Sigma	237.4338

Goodness-of-Fit Tests for Normal Distribution

Test		----Statistic-----	------p Value------	
Kolmogorov-Smirnov	D	0.16709347	Pr > D	<0.010
Cramer-von Mises	W-Sq	0.31885456	Pr > W-Sq	<0.005
Anderson-Darling	A-Sq	1.74742796	Pr > A-Sq	<0.005

H_0 : Data can be described by a Gamma distribution
H_1 : Data cannot be described by a Gamma distribution
Since p-value > 0.25 > 0.10 the null hypothesis is not rejected. The Gamma distribution does fit the data well.

H_0 : Data can be described by a Normal distribution
H_1 : Data cannot be described by a Normal distribution
Since p-value < 0.01 < 0.10 the null hypothesis is rejected. The Normal distribution does not fit the data well.

(c)
The Gamma distribution fits the data best.
Parameter estimate for theta is 139.8785.
Parameter estimate for kappa is 2.9748.

SAS Program

```
data q4;
input salary @@;
cards;
145     498     343     206     808     155
621     643     536     250     543     802
262     390     543     21      149     200
208     332     217     298     350     282
362     750     298     350     242     573
424     368     1103    800     198     388
339     659     406     726     213     250
736     234     254     370     296     396
291     396     862     536     317     572
58      300     204     291     482     1121
;
proc univariate;
var salary;
histogram / midpoints=100 to 1000 by 100
              gamma (color=blue l=1)
```

```
                weibull (color=red l=20)
                normal (color=blue l=34);
        inset n mean(5.3) std='Std Dev'(5.3)
                gamma lognormal normal
                / pos = ne  header = 'Summary Statistics';
        axis1 label=(a=90 r=0);
run;
```