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WST 321 Assignment 2 – September 2018

Question a

```
proc iml;
seed = 0;
reps = 10000;
n = 75;
p = 1;
v = j(reps,1,0);
tau = j(reps,1,0);

do k=1 to reps;
      /*Generate the series for simulation k*/
      at = j(n,1,0);
      zt = j(n,1,0);
      zt1 = j(n,1,0);
      zt1[1,1] = 0;
      zt[1,1] = at[1,1];
      do r = 2 to n;
            at[t,1] = rannor(seed);
            zt1[t,1] = zt[r-1,1];
            zt[t,1] = p*zt1[r,1]+at[r,1];
      end;
      /*End of generation*/

      /*OLS regression to determine phat*/
      phat = inv(t(zt1)*zt1)*t(zt1)*zt;
      zthat = zt1*phat;
      resid = zt-zthat;
      sse = t(resid)*resid;
      df = n-1;
      mse = sse/df;
      rmse = sqrt(mse);
      stdphat = sqrt(inv(t(zt1)*zt1)#mse);

      /*Determine v and tau*/
      v[k,1] = n*(phat-1);
      tau[k,1] = (phat-1)/(stdphat);
end;

create v_tau var{v tau};
append;
quit;
```

Question b

Variable	N	Mean	Std Dev	Minimum	Maximum
size_v	10000	0.0496000	0.217128	0	1.0000000
size_ta	10000	0.0462000	0	0	1.0000000

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Variable	N	Mean	Std Dev	Minimum	Maximum
u			0.2099285		

Size of regression coefficient-based test:	0.0496
Size of studentised test:	0.0462

Question c

Critical values for the regression coefficient-based test:

10%	-5.719852
5%	-7.957293
1%	-13.291264

Critical values for the studentised test:

10%	-1.630177
5%	-1.956177
1%	-2.625338

Question d

Nothing to hand in

Question e

Variable	N	Mean	Std Dev	Minimum	Maximum
pow_v	10000	0.5443000	0.4980585	0	1.0000000
pow_tau	10000	0.5289000	0.4991891	0	1.0000000

Power of regression coefficient-based test:	0.5443
Power of studentised test:	0.5289

Question f

Nothing to hand in

Question g

Variable	N	Mean	Std Dev	Minimum	Maximum
pow_v1	10000	0.9715000	0.1664047	0	1.0000000
pow_tau2	10000	0.9628000	0.1892610	0	1.0000000

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Power of regression coefficient-based test:	0.9715
Power of studentised test:	0.9628

Question h

a) From questions e) and g) (for the cases $\rho=0.9$ and $\rho=0.8$, respectively) we observe that both tests have significantly higher means (i.e. have more frequent rejections of the null hypothesis) when $\rho=0.8$. It follows that, under $\rho=0.8$, the null hypothesis is rejected more often, i.e. both tests are more powerful under $\rho=0.8$.