



# UNIVERSITY OF ESWATINI

FIRST SEMESTER MAIN EXAMINATION PAPER, NOVEMBER 2019

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

COURSE CODE: ECO 419

TITLE OF PAPER: ECONOMETRIC METHODS I

TIME ALLOWED: 2 HOURS

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## Instructions

1. This paper consists of Section (A) and (B).
2. Section A is compulsory.
3. Answer any two questions from Section B.

## Special Requirements

Scientific calculator

## Additional Material (s)

1. Statistical Tables

*Candidates may complete the front cover of their answer book when instructed by the Chief Invigilator and sign their examination attendance cards but must NOT write anything else until the start of the examination period is announced.*

*No electronic devices capable of storing and retrieving text, including electronic dictionaries and any form of foreign material may be used while in the examination room.*

**DO NOT turn examination paper over until instructed to do so.**

## SECTION A

### Question One (Compulsory)

[40 Marks]

1. The following 2 structural equations represent a simple demand- supply model-:

$$\text{Demand-:} \quad Q_t = a_0 + a_1P_t + a_2Y_t + u_{1t} \quad a_1 < 0 \quad \text{and} \quad a_2 > 0$$

$$\text{Supply-:} \quad Q_t = b_0 + b_1P_t + u_{2t} \quad b_1 > 0$$

Where  $Q$  is quantity,  $P$  is price, and  $Y$  is consumer's income. It is assumed that the market is cleared in every year so that  $Q_t$  represents both quantity bought and sold in year  $t$ .

(a)(i) Determine if the demand and/or supply function is exactly identified, overidentified or underidentified. [5]

(ii) With the aid of diagram(s) interpret your answer in (i) above. [12]

(b) Show algebraically that the limiting values of the Durbin Watson  $d$  statistic cannot be smaller than zero and greater than 4. [10]

(c) Show that in the case of the first-order autocorrelation the test of the null hypothesis  $H_0: \rho = 0$  is equivalent to the test of the null hypothesis,  $H_0: d = 2$  [5]

(d) Draw a graph showing the position of the critical region (in a two-tailed test) of the Durbin Watson  $d$  statistic and comment on this region. [8]

## SECTION B

Answer any Two Questions

(20 Marks Each)

Question Two

(20 Marks)

2. (a) What is meant by Simultaneous-equations bias? [5]

(b) Suppose you are given the following simple model of supply and demand of the market for oats:

$$\begin{aligned} Q_{Dt} &= \beta_0 + \beta_1 P_t + \beta_2 YD_t + \epsilon_{Dt} \\ Q_{St} &= \alpha_0 + \alpha_1 P_t + \alpha_2 W_t + \epsilon_{St} \\ Q_{Dt} &= Q_{St} \end{aligned}$$

Where:  $Q_{Dt}$  = the quantity of oats demanded in time period t

$Q_{St}$  = the quantity of oats supplied in time period t

$P_t$  = the price of oats in time period t

$W_t$  = the average oat-farmer wages in time period t

$YD_t$  = disposable income in time period t

You notice that no left-hand-side variable appears on the right side of either of your stochastic simultaneous equations. Does this mean that OLS estimation will encounter no simultaneity bias? Why or why not? [5]

(c) What is meant by an integrated time series? [5]

(d) What is the difference, if any, between tests of unit roots and tests of cointegration? [5]

**Question Three****(20 Marks)**

3. Assume that the short-run production of a firm is given by the model:-

$$Y_t = b_0 + b_1X_t + u_t$$

Where  $Y_t$ = output;  $X_t$ = labour input

Suppose further that whenever anything causes the firm to ‘overproduce’ in the period  $t-1$  (a fact indicated by  $u_{t-1} > 0$ ), the firm will tend to ‘underproduce’ in period  $t$  (a fact indicated by  $u_t < 0$ )

- (a) Identify which assumption of the linear regression model is violated. [5]
- (b) What is the cause of the problem in (a) above? [5]
- (c) Indicate the effects of these violations on the OLS estimate of the slope coefficient and its standard error. [5]
- (d) Discuss briefly, the appropriate ‘corrective solution’ in this case. [5]

**Question Four**

- 4. (a) What is Two-Stage Least Squares (2SLS)? [5]
- (b) Discuss any three (3) properties of 2SLS [15]

**TABLE D.5A**  
**DURBIN-WATSON  $d$  STATISTIC: SIGNIFICANCE POINTS OF  $d_L$  AND  $d_U$  AT 0.05 LEVEL OF SIGNIFICANCE**

n	k' = 1		k' = 2		k' = 3		k' = 4		k' = 5		k' = 6		k' = 7		k' = 8		k' = 9		k' = 10		n	d
	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$		
6	0.610	1.400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	0.01
7	0.700	1.356	0.467	1.896	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	0.11
8	0.763	1.332	0.659	1.777	0.388	2.287	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	0.11
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588	—	—	—	—	—	—	—	—	—	—	—	—	19	0.21
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822	—	—	—	—	—	—	—	—	—	—	20	0.21
11	0.927	1.324	0.658	1.604	0.595	1.928	0.444	2.283	0.316	2.645	0.203	3.005	—	—	—	—	—	—	—	—	21	0.31
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.379	2.506	0.268	2.832	0.171	3.149	—	—	—	—	—	—	22	0.31
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.445	2.390	0.328	2.692	0.230	2.985	0.147	3.266	—	—	—	—	23	0.31
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296	0.389	2.572	0.286	2.848	0.200	3.111	0.127	3.360	—	—	24	0.41
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220	0.447	2.472	0.343	2.727	0.251	2.979	0.175	3.216	0.111	3.436	25	0.41
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157	0.502	2.398	0.398	2.624	0.304	2.860	0.222	3.090	0.155	3.334	26	0.51
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104	0.554	2.318	0.451	2.537	0.356	2.757	0.272	2.975	0.198	3.154	27	0.51
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060	0.603	2.257	0.502	2.481	0.407	2.667	0.321	2.873	0.244	3.073	28	0.51
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023	0.649	2.206	0.549	2.396	0.456	2.589	0.369	2.783	0.290	2.974	29	0.61
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991	0.692	2.162	0.595	2.339	0.502	2.521	0.416	2.704	0.336	2.885	30	0.61
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964	0.732	2.124	0.637	2.290	0.547	2.460	0.461	2.633	0.380	2.806	31	0.61
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940	0.769	2.090	0.677	2.246	0.588	2.407	0.504	2.571	0.424	2.734	32	0.71
23	1.257	1.437	1.168	1.543	1.078	1.660	0.986	1.785	0.895	1.920	0.804	2.061	0.715	2.208	0.628	2.360	0.545	2.514	0.465	2.676	33	0.71
24	1.273	1.446	1.186	1.546	1.101	1.656	1.013	1.775	0.925	1.902	0.837	2.035	0.751	2.174	0.666	2.318	0.584	2.484	0.506	2.613	34	0.71
25	1.288	1.454	1.206	1.550	1.123	1.654	1.038	1.767	0.953	1.886	0.868	2.012	0.784	2.144	0.702	2.280	0.621	2.419	0.544	2.566	35	0.71
26	1.302	1.461	1.224	1.553	1.143	1.652	1.062	1.759	0.979	1.873	0.897	1.992	0.816	2.117	0.735	2.246	0.657	2.379	0.581	2.513	36	0.81
27	1.316	1.469	1.240	1.556	1.162	1.651	1.084	1.753	1.004	1.861	0.925	1.974	0.845	2.093	0.767	2.216	0.691	2.342	0.616	2.476	37	0.81
28	1.328	1.476	1.255	1.560	1.181	1.650	1.104	1.747	1.028	1.850	0.951	1.958	0.874	2.071	0.798	2.188	0.723	2.309	0.650	2.431	38	0.81
29	1.341	1.483	1.270	1.563	1.198	1.650	1.124	1.743	1.050	1.841	0.975	1.944	0.900	2.052	0.826	2.164	0.753	2.278	0.682	2.396	39	0.81
30	1.352	1.489	1.284	1.567	1.214	1.650	1.143	1.739	1.071	1.833	0.998	1.931	0.926	2.034	0.854	2.141	0.782	2.251	0.712	2.363	40	0.81
31	1.363	1.496	1.297	1.570	1.229	1.650	1.160	1.735	1.090	1.825	1.020	1.920	0.950	2.018	0.879	2.120	0.810	2.226	0.741	2.333	45	0.91
32	1.373	1.502	1.309	1.574	1.244	1.650	1.177	1.732	1.109	1.819	1.041	1.909	0.972	2.004	0.904	2.102	0.838	2.203	0.769	2.306	50	1.01
33	1.383	1.508	1.321	1.577	1.258	1.651	1.193	1.730	1.127	1.813	1.061	1.900	0.994	1.991	0.927	2.085	0.861	2.181	0.795	2.281	55	1.11
34	1.393	1.514	1.333	1.580	1.271	1.652	1.208	1.728	1.144	1.808	1.080	1.891	1.015	1.979	0.950	2.069	0.885	2.162	0.821	2.257	60	1.11
35	1.402	1.519	1.343	1.584	1.283	1.653	1.222	1.726	1.160	1.803	1.097	1.884	1.034	1.967	0.971	2.054	0.908	2.144	0.845	2.236	65	1.21
36	1.411	1.525	1.354	1.587	1.295	1.654	1.236	1.724	1.175	1.799	1.114	1.877	1.053	1.957	0.991	2.041	0.930	2.127	0.868	2.216	70	1.21
37	1.419	1.530	1.364	1.590	1.307	1.655	1.249	1.723	1.190	1.795	1.131	1.870	1.071	1.948	1.011	2.029	0.951	2.112	0.891	2.198	75	1.31
38	1.427	1.535	1.373	1.594	1.318	1.656	1.261	1.722	1.204	1.792	1.146	1.864	1.088	1.939	1.029	2.017	0.970	2.098	0.912	2.180	80	1.31
39	1.435	1.540	1.382	1.597	1.328	1.656	1.273	1.722	1.218	1.789	1.161	1.859	1.104	1.932	1.047	2.007	0.990	2.085	0.932	2.164	85	1.31
40	1.442	1.544	1.391	1.600	1.338	1.659	1.285	1.721	1.230	1.786	1.175	1.854	1.120	1.924	1.064	1.997	1.008	2.072	0.952	2.149	90	1.31
45	1.475	1.566	1.430	1.615	1.383	1.666	1.336	1.720	1.287	1.776	1.238	1.835	1.189	1.895	1.139	1.958	1.089	2.022	1.038	2.088	95	1.41
50	1.503	1.585	1.462	1.628	1.421	1.674	1.376	1.721	1.335	1.771	1.291	1.822	1.246	1.875	1.201	1.930	1.156	1.986	1.110	2.044	100	1.41
55	1.528	1.601	1.490	1.641	1.452	1.681	1.414	1.724	1.374	1.768	1.334	1.814	1.294	1.861	1.253	1.909	1.212	1.959	1.170	2.010	150	1.51
60	1.549	1.616	1.514	1.652	1.480	1.689	1.444	1.727	1.408	1.767	1.372	1.808	1.335	1.850	1.298	1.894	1.260	1.939	1.222	1.984	200	1.61
65	1.567	1.629	1.536	1.662	1.503	1.696	1.471	1.731	1.439	1.767	1.404	1.805	1.370	1.843	1.336	1.882	1.301	1.923	1.266	1.964		
70	1.583	1.641	1.554	1.672	1.525	1.703	1.494	1.735	1.464	1.768	1.433	1.802	1.401	1.837	1.369	1.873	1.337	1.910	1.305	1.948		
75	1.598	1.652	1.571	1.680	1.543	1.709	1.515	1.739	1.487	1.770	1.458	1.801	1.428	1.834	1.399	1.867	1.369	1.901	1.339	1.935		
80	1.611	1.662	1.586	1.688	1.560	1.715	1.534	1.743	1.507	1.772	1.480	1.801	1.453	1.831	1.425	1.861	1.397	1.893	1.369	1.925		
85	1.624	1.671	1.600	1.696	1.575	1.721	1.550	1.747	1.525	1.774	1.500	1.801	1.474	1.829	1.448	1.857	1.422	1.886	1.398	1.916		
90	1.635	1.679	1.612	1.703	1.589	1.726	1.566	1.751	1.542	1.776	1.518	1.801	1.494	1.827	1.469	1.854	1.445	1.881	1.420	1.899		
95	1.645	1.687	1.623	1.709	1.602	1.732	1.579	1.755	1.557	1.778	1.535	1.802	1.512	1.827	1.489	1.852	1.465	1.877	1.442	1.903		
100	1.654	1.694	1.634	1.715	1.613	1.736	1.592	1.758	1.571	1.780	1.550	1.803	1.528	1.826	1.506	1.850	1.484	1.874	1.462	1.898		
150	1.720	1.746	1.706	1.760	1.693	1.774	1.679	1.768	1.665	1.802	1.651	1.817	1.637	1.832	1.622	1.847	1.608	1.862	1.594	1.877		
200	1.758	1.778	1.748	1.789	1.738	1.799	1.728	1.810	1.718	1.820	1.707	1.831	1.697	1.841	1.686	1.852	1.675	1.863	1.665	1.874		

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