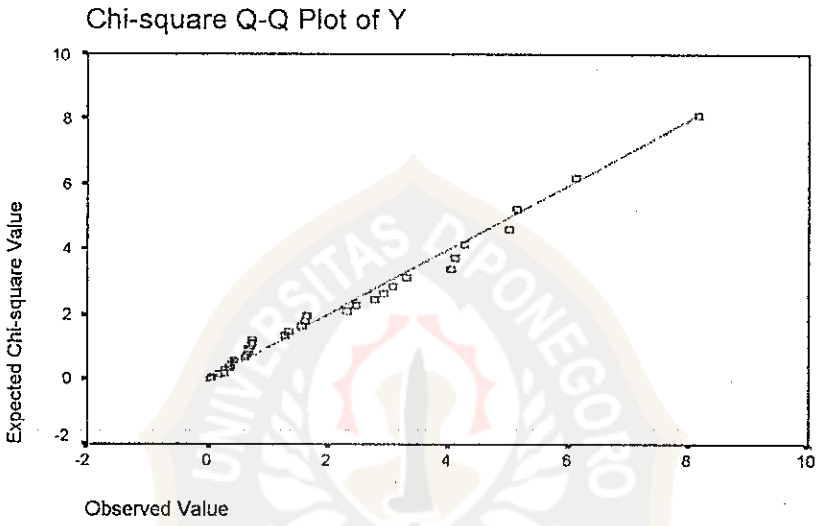
Lampiran 1. Pemeriksaan Asumsi Binormalitas Error dengan Chi-square QQ Plot of Error dan Kesamaan matriks Kovarian



Box's Test of Equality of Covariance Matrices[a]

Box's M	56.267
F	.992
df1	33
df2	1221
Sig.	.481

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept+FAKTORA * FAKTORB

Lampiran 2. Pemeriksaan Asumsi Binormalitas Error dengan Koefisien Korelasi

j	$\frac{j-1/2}{36}$	$\chi_2^2\left(\frac{j-1/2}{36}\right)$	$d^2(j)$
1	0.013889	0.02797	0.02291
2	0.041667	0.08512	0.04893
3	0.069444	0.14395	0.18884
4	0.097222	0.20456	0.25961
5	0.125000	0.26706	0.27476
6	0.152778	0.33158	0.31741
7	0.180556	0.39826	0.35867
8	0.208333	0.46723	0.39666
9	0.236111	0.53867	0.40950
10	0.263889	0.61275	0.42935
11	0.291667	0.68968	0.62319
12	0.319444	0.76969	0.63638
13	0.347222	0.85304	0.67139
14	0.375000	0.94001	0.67231
15	0.402778	1.03093	0.70779
16	0.430556	1.12619	0.72176
17	0.458333	1.22621	0.72861
18	0.486111	1.3315	1.28407
19	0.513889	1.44264	1.33346
20	0.541667	1.56032	1.33346
21	0.569444	1.68536	1.57486
22	0.597222	1.81874	1.63361
23	0.625000	1.96166	1.64904
24	0.652778	2.11558	2.32133
25	0.680556	2.28234	2.48116
26	0.708333	2.46429	2.79107
27	0.736111	2.66445	2.93885
28	0.763889	2.88691	3.08565
29	0.791667	3.13723	3.29496
30	0.819444	3.42343	4.06019
31	0.847222	3.75754	4.10688
32	0.875000	4.15888	4.25582
33	0.902778	4.66151	5.00575
34	0.930556	5.33446	5.12117
35	0.958333	6.35611	6.10453
36	0.986111	8.55333	8.15603

Correlations (Pearson)

```
Correlation of C9 and chi = 0.992
```

Lampiran 3. Perhitungan MANOVA untuk Data pada Tabel 5

MANOVA for faktorA

s = 2 m = 0.0 n = 10.5

Criterion	Test Statistic	F	DF	P
Wilk's	0.44293	3.853	(6,46)	0.003
Lawley-Hotelling	1.21272	4.447	(6,44)	0.001
Pillai's	0.57699	3.244	(6,48)	0.009
Roy's	1.17444			

SSCP Matrix (adjusted) for faktorA

	y1	y2
y1	362.957	-1.602
y2	-1.602	0.123

SSCP Matrix (adjusted) for Error

	y1	y2
y1	313.013	2.029
y2	2.029	3.008

MANOVA for faktorB

s = 2 m = -0.5 n = 10.5

Criterion	Test Statistic	F	DF	P
Wilk's	0.73998	1.869	(4,46)	0.132
Lawley-Hotelling	0.32587	1.792	(4,44)	0.147
Pillai's	0.27889	1.945	(4,48)	0.118
Roy's	0.19513			

SSCP Matrix (adjusted) for faktorB

	y1	y2
y1	42.9984	0.8780
y2	0.8780	0.5741

MANOVA for faktorA*faktorB

s = 2 m = 1.5 n = 10.5

Criterion	Test Statistic	F	DF	P
Wilk's	0.74573	0.606	(12,46)	0.826
Lawley-Hotelling	0.31972	0.586	(12,44)	0.841
Pillai's	0.27011	0.625	(12,48)	0.811
Roy's	0.22552			

SSCP Matrix (adjusted) for faktorA*faktorB

	y1	y2
y1	54.679	-1.604
y2	-1.604	0.411

Lampiran 4. Perhitungan Kontras 1

Perhitungan untuk variabel y_1

Taraf Faktor	Ulangan			$\bar{y}_{i.}$	c_i	$c_i\bar{y}_{i.}$	c_i^2
	1	2	3				
1	68.75	80.00	66.25	71.67	-1	-71.67	1
2	87.50	92.50	92.50	90.83	1	90.83	1
3	101.25	90.00	100.00	97.08	0	0	0
4	81.26	78.75	87.50	82.50	0	0	0
					jumlah =	19.16	2

Perhitungan untuk variabel y_2

Taraf Faktor	Ulangan			$\bar{y}_{i.}$	c_i	$c_i\bar{y}_{i.}$	c_i^2
	1	2	3				
1	5.98	6.35	5.17	5.83	-1	-5.83	1
2	5.54	5.62	5.17	5.44	1	5.44	1
3	5.17	5.85	6.32	5.78	0	0	0
4	5.64	5.70	5.08	5.47	0	0	0
					jumlah =	-0.39	2

$$\mathbf{E} = \begin{bmatrix} 313.013 & 2.029 \\ 2.029 & 3.008 \end{bmatrix}$$

Det $(\mathbf{E}) = 937.426$

$$\left[\frac{\mathrm{E}}{ab(n-1)}\right]^{-1} = \begin{bmatrix} 0.077011 & -0.051946 \\ -0.051946 & 8.013808 \end{bmatrix}$$

$T^2 = 136.1993$

Lampiran 5. Perhitungan Kontras 2

Perhitungan untuk variabel y_1

Taraf Faktor	Ulangan			$\bar{y}_{i..}$	c_i	$c_i \bar{y}_{i..}$	c_i^2
	1	2	3				
1	68.75	80.00	66.25	71.67	0	0	0
2	87.50	92.50	92.50	90.83	0	0	0
3	101.25	90.00	100.00	97.08	-1	-97.08	1
4	81.26	78.75	87.50	82.50	1	82.5	1
					jumlah =	-14.58	2

Perhitungan untuk variabel y_2

Taraf Faktor	Ulangan			$\bar{y}_{i..}$	c_i	$c_i \bar{y}_{i..}$	c_i^2
	1	2	3				
1	5.98	6.35	5.17	5.83	0	0	0
2	5.54	5.62	5.17	5.44	0	0	0
3	5.17	5.85	6.32	5.78	-1	-5.78	1
4	5.64	5.70	5.08	5.47	1	5.47	1
					jumlah =	-0.31	2

$T^2 = 75.02099$

Lampiran 6. Perhitungan Kontras 3

Perhitungan untuk variabel y_1

Taraf Faktor	Ulangan			$\bar{y}_{i..}$	c_i	$c_i\bar{y}_{i..}$	c_i^2
	1	2	3				
1	68.75	80.00	66.25	71.67	-1	-71.68	1
2	87.50	92.50	92.50	90.83	-1	-90.83	1
3	101.25	90.00	100.00	97.08	1	97.08	1
4	81.26	78.75	87.50	82.50	1	82.5	1
					jumlah =	17.07	4

Perhitungan untuk variabel y_2

Taraf Faktor	Ulangan			$\bar{y}_{i..}$	c_i	$c_i\bar{y}_{i..}$	c_i^2
	1	2	3				
1	5.98	6.35	5.17	5.83	-1	-5.83	1
2	5.54	5.62	5.17	5.44	-1	-5.44	1
3	5.17	5.85	6.32	5.78	1	5.78	1
4	5.64	5.70	5.08	5.47	1	5.47	1
					jumlah =	-0.02	4

$T^2 = 50.63607$

Lampiran 7. Test Koefisien Korelasi untuk Multinormal

Ukuran Sampel	Tingkat Signifikansi α		
	0.010	0.050	0.100
10	0.880	0.918	0.935
15	0.911	0.938	0.951
20	0.929	0.950	0.960
25	0.941	0.958	0.966
30	0.949	0.964	0.971
40	0.960	0.972	0.977
50	0.966	0.976	0.981
60	0.971	0.980	0.984
75	0.976	0.984	0.987
100	0.981	0.986	0.989
150	0.987	0.991	0.992
200	0.990	0.993	0.994

Sumber : Johnson, R.A., and Wichern, D.W., 1982

Lampiran 8 Tabel Hotelling's T^2 untuk $\alpha = 0,05$

Table B.1. Upper Percentage Points of Hotelling's T^2-Distribution

Degrees of freedom, ν	Number of Variables, p									
	1	2	3	4	5	6	7	8	9	10
					$\alpha = 0.05$					
2	18.513									
3	10.128	57.000								
4	7.709	25.472	114.986							
5	6.608	17.361	46.383	192.468						
6	5.987	13.887	29.661	72.937	289.446					
7	5.591	12.001	22.720	44.718	105.157	405.920				
8	5.318	10.828	19.028	33.230	62.561	143.050	541.890			
9	5.117	10.033	16.766	27.202	45.453	83.202	186.622	697.356		
10	4.965	9.459	15.248	23.545	36.561	59.403	106.649	235.873	872.317	
11	4.844	9.026	14.163	21.108	31.205	47.123	75.088	132.903	290.806	1066.774
12	4.747	8.689	13.350	19.376	27.656	39.764	58.893	92.512	161.967	351.421
13	4.667	8.418	12.719	18.086	25.145	34.911	49.232	71.878	111.676	193.842
14	4.600	8.197	12.216	17.089	23.281	31.488	42.881	59.612	86.079	132.582
15	4.543	8.012	11.806	16.296	21.845	28.955	38.415	51.572	70.907	101.499
16	4.494	7.856	11.465	15.651	20.706	27.008	35.117	45.932	60.986	83.121
17	4.451	7.722	11.177	15.117	19.782	25.467	32.588	41.775	54.041	71.127
18	4.414	7.606	10.931	14.667	19.017	24.219	30.590	38.592	48.930	62.746
19	4.381	7.504	10.719	14.283	18.375	23.189	28.975	36.082	45.023	56.587
20	4.351	7.415	10.533	13.952	17.828	22.324	27.642	34.054	41.946	51.884
21	4.325	7.335	10.370	13.663	17.356	21.588	26.525	32.384	39.463	48.184
22	4.301	7.264	10.225	13.409	16.945	20.954	25.576	30.985	37.419	45.202
23	4.279	7.200	10.095	13.184	16.585	20.403	24.759	29.798	35.709	42.750
24	4.260	7.142	9.979	12.983	16.265	19.920	24.049	28.777	34.258	40.699
25	4.242	7.089	9.874	12.803	15.981	19.492	23.427	27.891	33.013	38.961
26	4.225	7.041	9.779	12.641	15.726	19.112	22.878	27.114	31.932	37.469
27	4.210	6.997	9.692	12.493	15.496	18.770	22.388	26.428	30.985	36.176
28	4.196	6.957	9.612	12.359	15.287	18.463	21.950	25.818	30.149	35.043
29	4.183	6.919	9.539	12.236	15.097	18.184	21.555	25.272	29.407	34.044
30	4.171	6.885	9.471	12.123	14.924	17.931	21.198	24.781	28.742	33.156
35	4.121	6.744	9.200	11.674	14.240	16.944	19.823	22.913	26.252	29.881
40	4.085	6.642	9.005	11.356	13.762	16.264	18.890	21.668	24.624	27.783
45	4.057	6.564	8.859	11.118	13.409	15.767	18.217	20.781	23.477	26.326
50	4.034	6.503	8.744	10.934	13.138	15.388	17.709	20.117	22.627	25.256
55	4.016	6.454	8.652	10.787	12.923	15.090	17.311	19.600	21.972	24.437
60	4.001	6.413	8.577	10.668	12.748	14.850	16.992	19.188	21.451	23.790
70	3.978	6.350	8.460	10.484	12.482	14.485	16.510	18.571	20.676	22.834
80	3.960	6.303	8.375	10.350	12.289	14.222	16.165	18.130	20.127	22.162
90	3.947	6.267	8.309	10.248	12.142	14.022	15.905	17.801	19.718	21.663
100	3.936	6.239	8.257	10.167	12.027	13.867	15.702	17.544	19.401	21.279
110	3.927	6.216	8.215	10.102	11.934	13.741	15.540	17.340	19.149	20.973
120	3.920	6.196	8.181	10.048	11.858	13.639	15.407	17.172	18.943	20.725
150	3.904	6.155	8.105	9.931	11.693	13.417	15.121	16.814	18.504	20.196
200	3.888	6.113	8.031	9.817	11.531	13.202	14.845	16.469	18.083	19.692
400	3.865	6.052	7.922	9.650	11.297	12.890	14.447	15.975	17.484	18.976
1000	3.851	6.015	7.857	9.552	11.160	12.710	14.217	15.692	17.141	18.570
∞	3.841	5.991	7.815	9.488	11.070	12.592	14.067	15.507	16.919	18.307

(continued)