PROGRAM STUDI STATISTIKA
SK BAN-PT No. 1765/SK/BAN-PT/AK-PPJ/S/III/2022
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS PGRI ADI BUANA SURABAYA

FORM F.SK05

BUKTI BIMBINGAN SKRIPSI

Nama Mahasiswa : Dodik Sudibyo

NIM : 192400014

Judul Skripsi : Analisis Faktor-Faktor yang Mempengaruhi Indeks Pembangunan Manusia di Indonesia Tahun 2022 Menggunakan Regresi Logistik Ordinal

Dosen Pembimbing : Muhammad Athoillah, S.Si, M.Si
Dra. Wara Pramesti, M.Si

Materi Pembimbingan Skripsi	Tanda Tangan Dosen Pembimbing
1. membuat diagram untuk deskripsi data variabel IPM	
2. memperbaiki penulisan pendeskripsian untuk variabel respon dan variabel prediktor	
3. menambah penjelasan pada uji multikolinieritas	
4. memperbaiki penjelasan pada pengujian parameter	
5. memperbaiki penjelasan pada uji parameter secara parsial	
6. menambahkan jumlah Daftar Pustaka	
7. memperbaiki perhitungan ketepatan klasifikasi	
8. Revisi bab 4 dan 5	

Catatan: *) Coret yang tidak sesuai

Lembar ini digunakan untuk mendaftar Seminar dan Ujian Skripsi (bimbingan skripsi minimal 8 kali)

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FAKULTAS SAINS DAN TEKNOLOGI
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FORM F.SK08

PERBAIKAN/REVISI SEMINAR DAN UJIAN SKRIPSI

Nama Mahasiswa : Dodik Sudibyo

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Materi Revisi Seminar dan Ujian Skripsi	Tanda Tangan Dosen Penguji
1. Merevisi Saran Pada Bab V	
2. Memberikan Penjelasan Pada model Persamaan Regresi Logistik ordinal	
3. menambahkan referensi Penggunaan nilai signifikansi 0,15	
4. mem perbaiki rumus L(β)	
5.	
6.	

Surabaya, 12 September 2023
Dosen Pembimbing,

Muhammad Athoillah, S.Si, M.Si.
NPP. 1612832/DY

*Catatan: *) Coret yang tidak sesuai*

Lembar ini digunakan untuk bukti perbaikan makalah/jurnal dan hasil ujian skripsi Batas waktu revisi proposal dua minggu terhitung dari waktu ujian proposal

LAMPIRAN

Lampiran 1 Data Penelitian

No	Provinsi	Y	Y (Kat.)	X1	X2	X3	X4	X5
1	Aceh	72,80	2	32,91	14,75	77,48	63,50	83,10
2	Sumatera Utara	72,71	2	30,01	8,33	82,30	69,53	78,66
3	Sumatera Barat	73,26	2	28,12	6,04	69,27	69,30	83,71
4	Riau	73,52	2	27,07	6,84	84,06	63,86	77,32
5	Jambi	72,14	2	25,87	7,70	79,54	67,84	72,53
6	Sumatera Selatan	70,90	2	32,3	11,95	78,62	69,31	70,93
7	Bengkulu	72,16	2	26,66	14,34	79,58	69,81	79,31
8	Lampung	70,45	2	32,52	11,44	83,65	70,06	71,14
9	Kep. Bangka Belitung	72,24	2	35,11	4,61	91,63	67,38	68,42
10	Kepulauan Riau	76,46	2	18,41	6,03	87,74	68,94	84,54
11	DKI Jakarta	81,65	3	16,76	4,61	92,79	63,08	72,1
12	Jawa Barat	73,12	2	31,17	7,98	74,02	66,15	68,66
13	Jawa Tengah	72,79	2	35,34	10,98	84,37	70,84	70,82
14	DI Yogyakarta	80,64	3	35,73	11,49	96,21	72,60	89,95
15	Jawa Timur	72,75	2	32,14	10,49	81,13	71,23	73,40
16	Banten	73,32	2	24,09	6,24	85,12	64,72	69,22
17	Bali	76,44	2	20,45	4,53	95,94	76,86	83,84
18	Nusa Tenggara Barat	69,46	1	43,62	13,82	83,12	70,93	77,43
19	Nusa Tenggara Timur	65,90	1	29,06	20,23	73,70	75,23	75,55
20	Kalimantan Barat	68,63	1	25,3	6,81	77,41	68,97	68,72
21	Kalimantan Tengah	71,63	2	24,32	5,22	74,33	67,23	66,32
22	Kalimantan Selatan	71,84	2	31,88	4,61	82,55	67,55	69,88
23	Kalimantan Timur	77,44	2	26,46	6,44	90,33	64,73	81,43
24	Kalimantan Utara	71,83	2	34,87	6,86	82,22	67,62	76,50
25	Sulawesi Utara	73,81	2	23,31	7,34	84,05	63,08	74,33
26	Sulawesi Tengah	70,28	2	21,93	12,30	75,01	69,99	75,84
27	Sulawesi Selatan	72,82	2	33,49	8,66	92,24	66,18	70,81
28	Sulawesi Tenggara	72,23	2	30,98	11,27	87,07	68,82	74,53
29	Gorontalo	69,81	1	35,85	15,51	79,82	68,91	71,68
30	Sulawesi Barat	66,92	1	29,53	11,92	78,88	73	70,85

31	Maluku	70,22	2	15,6	16,23	76,47	65,46	79,03
32	Maluku Utara	69,47	1	16,41	6,37	79,39	64,88	77,70
33	Papua Barat	65,89	1	20	21,43	73,52	68,55	80,56
34	Papua	61,39	1	11,68	26,80	40,34	77,75	65,93

Keterangan :

Y = Indeks Pembangunan Manusia
X1 = Persentase penduduk yang mempunyai keluhan kesehatan
X2 = Persentase penduduk miskin
X3 = Persentase rumah tangga yang memiliki akses terhadap sanitasi layak
X4 = Tingkat Partisipasi Angkatan Kerja (TPAK)
X5 = Angka Partisipasi Sekolah (APS)

Lampiran 2 Sintaks Beserta Output Program R

```
library(MASS)
library(ordinal)

## Warning: package 'ordinal' was built under R
version 4.2.3

library(pscl)

## Warning: package 'pscl' was built under R ver
sion 4.2.3

## Classes and Methods for R developed in the
## Political Science Computational Laboratory
## Department of Political Science
## Stanford University
## Simon Jackman
## hurdle and zeroinfl functions by Achim Zeilei
s

library(performance)

## Warning: package 'performance' was built unde
r R version 4.2.3
```

Data

```
library(readxl)
dt <- read_excel("D:/Documents/Matkul/Semester 8
/Skripsi/Data Skripsi IPM.xlsx")
head(dt)

## # A tibble: 6 × 7
##   Provinsi         Kat_IPM    X1    X2    X3
X4    X5
##   <chr>              <dbl> <dbl> <dbl> <dbl>
```

```
<dbl> <dbl>
## 1 Aceh                    2  32.9 14.8   77.5
63.5  83.1
## 2 Sumatera Utara          2  30.0  8.33  82.3
69.5  78.7
## 3 Sumatera Barat          2  28.1  6.04  69.3
69.3  83.7
## 4 Riau                    2  27.1  6.84  84.1
63.9  77.3
## 5 Jambi                   2  25.9  7.7   79.5
67.8  72.5
## 6 Sumatera Selatan        2  32.3 12.0   78.6
69.3  70.9
```

```
str(dt)
```

```
## tibble [34 × 7] (S3: tbl_df/tbl/data.frame)
##  $ Provinsi: chr [1:34] "Aceh" "Sumatera Utar
a" "Sumatera Barat" "Riau" ...
##  $ Kat_IPM : num [1:34] 2 2 2 2 2 2 2 2 2 .
..
##  $ X1      : num [1:34] 32.9 30 28.1 27.1 25.
9 ...
##  $ X2      : num [1:34] 14.75 8.33 6.04 6.84
7.7 ...
##  $ X3      : num [1:34] 77.5 82.3 69.3 84.1 7
9.5 ...
##  $ X4      : num [1:34] 63.5 69.5 69.3 63.9 6
7.8 ...
##  $ X5      : num [1:34] 83.1 78.7 83.7 77.3 7
2.5 ...
```

```
dt$`Kat_IPM`=factor(dt$`Kat_IPM`, levels = c("1"
,"2","3"))
data = data.frame(dt[,2:7])
data
```

```
##    Kat_IPM    X1    X2    X3    X4    X5
## 1        2 32.91 14.75 77.48 63.50 83.10
## 2        2 30.01  8.33 82.30 69.53 78.66
## 3        2 28.12  6.04 69.27 69.30 83.71
## 4        2 27.07  6.84 84.06 63.86 77.32
## 5        2 25.87  7.70 79.54 67.84 72.53
## 6        2 32.30 11.95 78.62 69.31 70.93
## 7        2 26.66 14.34 79.58 69.81 79.31
## 8        2 32.52 11.44 83.65 70.06 71.14
## 9        2 35.11  4.61 91.63 67.38 68.42
## 10       2 18.41  6.03 87.74 68.94 84.54
## 11       3 16.76  4.61 92.79 63.08 72.10
## 12       2 31.17  7.98 74.02 66.15 68.66
## 13       2 35.34 10.98 84.37 70.84 70.82
## 14       3 35.73 11.49 96.21 72.60 89.95
## 15       2 32.14 10.49 81.13 71.23 73.40
## 16       2 24.09  6.24 85.12 64.72 69.22
## 17       2 20.45  4.53 95.94 76.86 83.84
## 18       1 43.62 13.82 83.12 70.93 77.43
## 19       1 29.06 20.23 73.70 75.23 75.55
## 20       1 25.30  6.81 77.41 68.97 68.72
## 21       2 24.32  5.22 74.33 67.23 66.32
## 22       2 31.88  4.61 82.55 67.55 69.88
## 23       2 26.46  6.44 90.33 64.73 81.43
## 24       2 34.87  6.86 82.22 67.62 76.50
## 25       2 23.31  7.34 84.05 63.08 74.33
## 26       2 21.93 12.30 75.01 69.99 75.84
## 27       2 33.49  8.66 92.24 66.18 70.81
## 28       2 30.98 11.27 87.07 68.82 74.53
## 29       1 35.85 15.51 79.82 68.91 71.68
## 30       1 29.53 11.92 78.88 73.00 70.85
## 31       2 15.60 16.23 76.47 65.46 79.03
## 32       1 16.41  6.37 79.39 64.88 77.70
## 33       1 20.00 21.43 73.52 68.55 80.56
## 34       1 11.68 26.80 40.34 77.75 65.93
```

```
str(data)
```

```
## 'data.frame':    34 obs. of  6 variables:
##  $ Kat_IPM: Factor w/ 3 levels "1","2","3": 2
2 2 2 2 2 2 2 2 ...
##  $ X1     : num  32.9 30 28.1 27.1 25.9 ...
##  $ X2     : num  14.75 8.33 6.04 6.84 7.7 ...
##  $ X3     : num  77.5 82.3 69.3 84.1 79.5 ...
##  $ X4     : num  63.5 69.5 69.3 63.9 67.8 ...
##  $ X5     : num  83.1 78.7 83.7 77.3 72.5 ...

attach(dt)
summary(dt)

##    Provinsi          Kat_IPM       X1
X2               X3
##  Length:34          1: 8    Min.   :11.68   M
in.   : 4.530   Min.   :40.34
##  Class :character   2:24    1st Qu.:23.50   1
st Qu.: 6.388   1st Qu.:77.43
##  Mode  :character   3: 2    Median :28.59   M
edian : 8.495   Median :81.67
##                              Mean   :27.62   M
ean   :10.299   Mean   :81.00
##                              3rd Qu.:32.47   3
rd Qu.:12.213   3rd Qu.:84.93
##                              Max.   :43.62   M
ax.   :26.800   Max.   :96.21
##        X4              X5
##  Min.   :63.08   Min.   :65.93
##  1st Qu.:66.16   1st Qu.:70.83
##  Median :68.86   Median :74.43
##  Mean   :68.64   Mean   :75.14
##  3rd Qu.:70.04   3rd Qu.:78.94
##  Max.   :77.75   Max.   :89.95

data$Kat_IPM = as.ordered(data$Kat_IPM)
str(data$Kat_IPM)
```

```
##  Ord.factor w/ 3 levels "1"<"2"<"3": 2 2 2 2
2 2 2 2 2 2 ...
```

Chi-square

```
chisqX1=chisq.test(data$Kat_IPM,data$X1)

## Warning in chisq.test(data$Kat_IPM, data$X1):
Chi-squared approximation may be
## incorrect

chisqX1

##
##  Pearson's Chi-squared test
##
## data:  data$Kat_IPM and data$X1
## X-squared = 68, df = 66, p-value = 0.4089

chisqX2=chisq.test(data$Kat_IPM,data$X2)

## Warning in chisq.test(data$Kat_IPM, data$X2):
Chi-squared approximation may be
## incorrect

chisqX2

##
##  Pearson's Chi-squared test
##
## data:  data$Kat_IPM and data$X2
## X-squared = 55.722, df = 62, p-value = 0.6997

chisqX3=chisq.test(data$Kat_IPM,data$X3)

## Warning in chisq.test(data$Kat_IPM, data$X3):
Chi-squared approximation may be
## incorrect

chisqX3
```

```
##
##  Pearson's Chi-squared test
##
## data:  data$Kat_IPM and data$X3
## X-squared = 68, df = 66, p-value = 0.4089

chisqX4=chisq.test(data$Kat_IPM,data$X4)

## Warning in chisq.test(data$Kat_IPM, data$X4):
Chi-squared approximation may be
## incorrect

chisqX4

##
##  Pearson's Chi-squared test
##
## data:  data$Kat_IPM and data$X4
## X-squared = 58.792, df = 64, p-value = 0.6606

chisqX5=chisq.test(data$Kat_IPM,data$X5)

## Warning in chisq.test(data$Kat_IPM, data$X5):
Chi-squared approximation may be
## incorrect

chisqX5

##
##  Pearson's Chi-squared test
##
## data:  data$Kat_IPM and data$X5
## X-squared = 68, df = 66, p-value = 0.4089
```

Model Regresi

```
model = polr(Kat_IPM ~ X1+X2+X3+X4+X5, data = da
ta,
```

```
             Hess = TRUE)
summary(model)

## Call:
## polr(formula = Kat_IPM ~ X1 + X2 + X3 + X4 +
X5, data = data,
##     Hess = TRUE)
##
## Coefficients:
##       Value Std. Error t value
## X1 -0.01145    0.07633  -0.150
## X2 -0.20368    0.13282  -1.534
## X3  0.23955    0.11829   2.025
## X4 -0.24189    0.17043  -1.419
## X5  0.14462    0.09632   1.501
##
## Intercepts:
##     Value   Std. Error t value
## 1|2  9.2894 11.9427     0.7778
## 2|3 16.5686 12.9394     1.2805
##
## Residual Deviance: 31.64451
## AIC: 45.64451

pR2(model)

## fitting null model for pseudo-r2

##         llh     llhNull          G2    McFadd
en        r2ML        r2CU
## -15.8222552 -25.6011392  19.5577680   0.38197
07   0.4374237   0.5621015

qchisq(0.85, 5)

## [1] 8.115199

model_performance(model,metrics = "all")
```

```
## Can't calculate log-loss.
## Can't calculate proper scoring rules for ordi
nal, multinomial or cumulative link models.

## # Indices of model performance
##
## AIC    |   AICc |    BIC | Nagelkerke's R2 |
RMSE | Sigma
## ----------------------------------------------
-------------
## 45.645 | 49.952 | 56.329 |          0.562 |
1.615 | 1.045
```

P-value Uji Parsial

```
(ctable <- coef(summary(model)))

##          Value  Std. Error    t value
## X1  -0.0114479  0.07633334 -0.1499725
## X2  -0.2036820  0.13282102 -1.5335072
## X3   0.2395455  0.11828666  2.0251265
## X4  -0.2418949  0.17042558 -1.4193580
## X5   0.1446168  0.09631988  1.5014223
## 1|2  9.2894450 11.94272076  0.7778332
## 2|3 16.5686437 12.93941658  1.2804784

p <- pnorm(abs(ctable[, "t value"]), lower.tail
= FALSE)*2
(ctable <- cbind(ctable, "p value" = p))

##          Value  Std. Error    t value    p va
lue
## X1  -0.0114479  0.07633334 -0.1499725 0.88078
631
## X2  -0.2036820  0.13282102 -1.5335072 0.12515
094
## X3   0.2395455  0.11828666  2.0251265 0.04285
437
```

```
## X4  -0.2418949  0.17042558 -1.4193580 0.15579
466
## X5   0.1446168  0.09631988  1.5014223 0.13324
637
## 1|2  9.2894450 11.94272076  0.7778332 0.43666
734
## 2|3 16.5686437 12.93941658  1.2804784 0.20037
693
```

Nilai Deviance

```
model[3]
```

```
## $deviance
## [1] 31.64451
```

```
qchisq(0.85, 33)
```

```
## [1] 41.38614
```

Odd Ratio

```
exp(coef(model))
```

```
##        X1        X2        X3        X4
X5
## 0.9886174 0.8157217 1.2706714 0.7851387 1.155
5967
```

Ketepatan Klasifikasi

```
library(caret)
```

```
## Warning: package 'caret' was built under R ve
rsion 4.2.3
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```r
pred=predict(model, data)
pred
```

```
##  [1] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2
2 2 2 2 2 1 2 2 1 1 2 2 1 1
## Levels: 1 2 3
```

```r
prob=predict(model, data, type = "prob")
prob
```

```
##                1            2            3
## 1  0.0726412123 9.186302e-01 8.728538e-03
## 2  0.0501383794 9.369632e-01 1.289841e-02
## 3  0.2508148301 7.471292e-01 2.056015e-03
## 4  0.0075544890 9.093619e-01 8.308363e-02
## 5  0.1214895713 8.735476e-01 4.962853e-03
## 6  0.4423113856 5.568197e-01 8.689010e-04
## 7  0.2440765949 7.537918e-01 2.131617e-03
## 8  0.1998858533 7.973608e-01 2.753320e-03
## 9  0.0072823025 9.067740e-01 8.594372e-02
## 10 0.0029033399 8.055842e-01 1.915124e-01
## 11 0.0009338327 5.744666e-01 4.245996e-01
## 12 0.4043099026 5.946749e-01 1.015194e-03
## 13 0.2000573628 7.971923e-01 2.750378e-03
## 14 0.0015708030 6.936416e-01 3.047876e-01
## 15 0.2640510257 7.340303e-01 1.918713e-03
## 16 0.0196690006 9.470960e-01 3.323499e-02
## 17 0.0023095542 7.681327e-01 2.295577e-01
## 18 0.2062949149 7.910584e-01 2.646695e-03
## 19 0.9664327511 3.354329e-02 2.395620e-05
## 20 0.3032987341 6.951194e-01 1.581877e-03
## 21 0.3768996638 6.219613e-01 1.138994e-03
## 22 0.0498822071 9.371506e-01 1.296724e-02
## 23 0.0010558394 6.040620e-01 3.948821e-01
## 24 0.0350335021 9.463225e-01 1.864401e-02
## 25 0.0102202483 9.271646e-01 6.261512e-02
## 26 0.5099902675 4.893475e-01 6.622764e-04
## 27 0.0074603577 9.084885e-01 8.405114e-02
```

```
## 28 0.0452732075 9.403900e-01 1.433675e-02
## 29 0.5103200749 4.890185e-01 6.614035e-04
## 30 0.6392872507 3.603237e-01 3.890278e-04
## 31 0.2425266832 7.553237e-01 2.149599e-03
## 32 0.0221972489 9.483153e-01 2.948746e-02
## 33 0.7691452641 2.306478e-01 2.069782e-04
## 34 0.9999994913 5.083971e-07 3.509031e-10
```

```
confusionMatrix(as.factor(pred),data$Kat_IPM)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction  1  2  3
##          1  5  1  0
##          2  3 23  2
##          3  0  0  0
##
## Overall Statistics
##
##                Accuracy : 0.8235
##                  95% CI : (0.6547, 0.9324)
##     No Information Rate : 0.7059
##     P-Value [Acc > NIR] : 0.08973
##
##                   Kappa : 0.5321
##
##  Mcnemar's Test P-Value : NA
##
## Statistics by Class:
##
##                      Class: 1 Class: 2 Class:
3
## Sensitivity            0.6250   0.9583  0.000
00
## Specificity            0.9615   0.5000  1.000
00
```

```
## Pos Pred Value          0.8333   0.8214      N
aN
## Neg Pred Value          0.8929   0.8333  0.941
18
## Prevalence              0.2353   0.7059  0.058
82
## Detection Rate          0.1471   0.6765  0.000
00
## Detection Prevalence    0.1765   0.8235  0.000
00
## Balanced Accuracy       0.7933   0.7292  0.500
00
```

Lampiran 3 Output SPSS

Descriptive Statistics

	N	Minimum	Maximum	Mean
Y	34	1.00	3.00	1.8235
X1	34	11.68	43.62	27.6162
X2	34	4.53	26.80	10.2991
X3	34	40.34	96.21	80.9971
X4	34	63.08	77.75	68.6438
X5	34	65.93	89.95	75.1394
IPM	34	60.62	81.11	71.3612
Valid N (listwise)	34			

Kategori IPM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sedang	8	23.5	23.5	23.5
	Tinggi	24	70.6	70.6	94.1
	Sangat Tinggi	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

Correlations

		X1	X2	X3	X4	X5
X1	Pearson Correlation	1	-.104	.351	.041	-.035
	Sig. (2-tailed)		.558	.042	.819	.845
	N	34	34	34	34	34
X2	Pearson Correlation	-.104	1	-.639	.470	.002
	Sig. (2-tailed)	.558		.000	.005	.990
	N	34	34	34	34	34
X3	Pearson Correlation	.351	-.639	1	-.316	.318
	Sig. (2-tailed)	.042	.000		.069	.067
	N	34	34	34	34	34
X4	Pearson Correlation	.041	.470	-.316	1	.039
	Sig. (2-tailed)	.819	.005	.069		.826
	N	34	34	34	34	34
X5	Pearson Correlation	-.035	.002	.318	.039	1
	Sig. (2-tailed)	.845	.990	.067	.826	
	N	34	34	34	34	34