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 : Ahmad Taufiq Hidayat

NIM : 192409021

Judul Skripsi : Peramalan Harga Beras Di Provinsi Jawa Timur dengan Metode ARIMA

Dosen Pembimbing : Artanti Indrasetianingsih, S.Si., M.Si.

Materi Pembimbingan Proposal	Tanda Tangan Dosen Pembimbing
1. Bab I : perlu ditambah penjelasan singkat ARIMA	
2. Bab II : perlu ditambah kriteria model terbaik, misal : MAPE	
3. Bab III : Data ditambah dari th 2013	
4. Penjelasan data ini sampel & out sampel	
5. Agar dijelaskan langkah penelitian dan diagram alir.	
6. Analisa & Pembahasan → Data tidak berdistribusi normal	
7. Data Outlier	
8. Running data dan uji asumsi	

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 : Ahmad Taufiq Hidayat

NIM : 192409021

Judul Skripsi : Peramalan Harga Beras Di Provinsi Jawa Timur dengan Metode ARIMA

Dosen Pembimbing : Artanti Indrasetianingsih, M.Si

Materi Revisi Seminar dan Ujian Skripsi	Tanda Tangan Dosen Penguji
1. Pada Tinjauan Pustaka ditambahkan Rumus AR dan MA, Serta Uji *Augmented Dickey-Fuller*	
2. Simbol pada Uji Signifikansi Parameter di cek kembali	
3. Pengecekan asumsi residual setelah deteksi outlier	

Surabaya, Juli 2023
Dosen Pembimbing,

Artanti Indrasetianingsih, M.Si
NIP/NPP : 0609466/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

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Materi Revisi Seminar dan Ujian Skripsi	Tanda Tangan Dosen Penguji
1. Grafik plot *time series* pada karakteristik harga beras agar diperjelas	
2. Nilai MSE dan MAPE ditambah dari data *in sample*	
3. Pengecekan asumsi residual setelah deteksi outlier	
4. Grafik plot *time series* hasil peramalan agar diperjelas	

Surabaya, Juli 2023
Dosen Pembimbing,

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LAMPIRAN

Lampiran 1. Data Harga Rata-rata Beras IR-64 di Jawa Timur

Periode	Harga
Jan-13	7706.895
Feb-13	7717.895
Mar-13	7618
Apr-13	7481.526
May-13	7505.632
Jun-13	7604.921
Jul-13	7848.5
Aug-13	7885.947
Sep-13	7922.816
Oct-13	7915.684
Nov-13	7970.026
Dec-13	7994.842
Jan-14	8059.868
Feb-14	8124.079
Mar-14	8128.053
Apr-14	7935.263
May-14	7878.342
Jun-14	7843.447
Jul-14	7852.895
Aug-14	7827.368
Sep-14	7813.789
…	…
…	…
Aug-22	9518.395
Sep-22	9784.816
Oct-22	10008.03
Nov-22	10059.87
Dec-22	10255.03

Lampiran 2. *Source Code* dan *Output*

```
> library(tseries)
> library(forecast)
> library(lmtest)
> library(FitAR)
> library(stats)
> library(EnvStats)
> library(readxl)
> harga <- read_excel("C:/JK/beras.xlsx")
> View(harga)
> win.graph()
> plot(harga)
> ts.plot(harga[,2])
> dataharga=ts(harga[,2])
>
> #karakteristik data
> summary(dataharga)
     harga
 Min.   : 7482
 1st Qu.: 8685
 Median : 9316
 Mean   : 9061
 3rd Qu.: 9543
 Max.   :10594
>
> #membagi in sample out sample
> datatraining = dataharga[1:108,]
> datatesting = dataharga[109:120,]
>
> #stasioneritas ragam
> BoxCox.ts(datatraining)
> pakai=datatraining^(-1)
> pakai
  [1] 1.297539e-04 1.295690e-04 1.312680e-04
1.336626e-04 1.332333e-04
  [6] 1.314938e-04 1.274129e-04 1.268078e-04
1.262178e-04 1.263315e-04
 [11] 1.254701e-04 1.250806e-04 1.240715e-04
1.230909e-04 1.230307e-04
 [16] 1.260198e-04 1.269303e-04 1.274950e-04
1.273416e-04 1.277569e-04
 [21] 1.279789e-04 1.264875e-04 1.193206e-04
1.140648e-04 1.126941e-04
 [26] 1.098882e-04 1.079822e-04 1.175939e-04
1.185130e-04 1.168034e-04
 [31] 1.157432e-04 1.129786e-04 1.095950e-04
```

```
1.072764e-04 1.071966e-04
 [36] 1.058416e-04 1.059334e-04 1.077143e-04
1.089187e-04 1.123297e-04
 [41] 1.102424e-04 1.130624e-04 1.128963e-04
1.142098e-04 1.138198e-04
 [46] 1.142469e-04 1.143789e-04 1.135705e-04
1.129383e-04 1.132283e-04
 [51] 1.151491e-04 1.156076e-04 1.151714e-04
1.148158e-04 1.151177e-04
 [56] 1.151379e-04 1.138001e-04 1.109619e-04
1.087408e-04 1.044447e-04
 [61] 9.542967e-05 9.438954e-05 9.885664e-05
1.026159e-04 1.051371e-04
 [66] 1.060801e-04 1.069627e-04 1.072810e-04
1.067773e-04 1.059428e-04
 [71] 1.046368e-04 1.032017e-04 1.026356e-04
1.026683e-04 1.031082e-04
 [76] 1.048609e-04 1.060573e-04 1.066511e-04
1.068529e-04 1.070076e-04
 [81] 1.066290e-04 1.061586e-04 1.055236e-04
1.051144e-04 1.038257e-04
 [86] 1.024148e-04 1.019841e-04 1.017392e-04
1.024557e-04 1.031031e-04
 [91] 1.038056e-04 1.037769e-04 1.035420e-04
1.035202e-04 1.035053e-04
 [96] 1.034963e-04 1.035030e-04 1.038606e-04
1.040281e-04 1.046365e-04
[101] 1.048872e-04 1.055239e-04 1.073938e-04
1.080534e-04 1.081897e-04
[106] 1.077598e-04 1.077644e-04 1.072973e-04
> BoxCox(pakai)
>
> #stasioneritas rata-rata
> adf.test(pakai)

        Augmented Dickey-Fuller Test

data:  pakai
Dickey-Fuller = -2.6836, Lag order = 4, p-value
= 0.2931
alternative hypothesis: stationary

> pakai2=diff(pakai)
> adf.test(pakai2)

        Augmented Dickey-Fuller Test
```

```
data:  pakai2
Dickey-Fuller = -6.5196, Lag order = 4, p-value
= 0.01
alternative hypothesis: stationary

Warning message:
In adf.test(pakai2) : p-value smaller than
printed p-value
>
> #model tentatif
> par(mfrow=c(2,1))
> acf(pakai2, lag=20)
> pacf(pakai2, lag=20)
>
> #estimasi parameter
> fit=arima(pakai,c(0,1,1))
> fit

Call:
arima(x = pakai, order = c(0, 1, 1))

Coefficients:
          ma1
      0.4069
s.e.  0.0797

sigma^2 estimated as 3.703e-12:  log likelihood
= 1256.3,  aic = -2508.6
> coeftest(fit)

z test of coefficients:

    Estimate Std. Error z value  Pr(>|z|)
ma1 0.406936   0.079727  5.1041 3.324e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05
‘.’ 0.1 ‘ ’ 1

> fit2=arima(pakai,c(1,1,0))
> fit2

Call:
arima(x = pakai, order = c(1, 1, 0))

Coefficients:
          ar1
      0.4060
```

```
s.e.  0.0876

sigma^2 estimated as 3.705e-12:  log likelihood
= 1256.28,  aic = -2508.55
> coeftest(fit2)

z test of coefficients:

    Estimate Std. Error z value  Pr(>|z|)
ar1 0.405987   0.087612  4.6339 3.588e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05
‘.’ 0.1 ‘ ’ 1

> fit3=arima(pakai,c(1,1,1))
> fit3

Call:
arima(x = pakai, order = c(1, 1, 1))

Coefficients:
         ar1     ma1
      0.2205  0.2264
s.e.  0.2126  0.2113

sigma^2 estimated as 3.668e-12:  log likelihood
= 1256.81,  aic = -2507.61
> coeftest(fit3)

z test of coefficients:

    Estimate Std. Error z value Pr(>|z|)
ar1  0.22050    0.21259  1.0372   0.2997
ma1  0.22640    0.21127  1.0716   0.2839

>
> #Uji Asumsi Residual
> resid1=fit$residuals
> resid2=fit2$residuals
> resid3=fit3$residuals
>
> #white noise
> Box.test(resid1,type="Ljung-Box")

        Box-Ljung test

data:  resid1
```

```
X-squared = 0.17109, df = 1, p-value = 0.6791

> Box.test(resid(fit), type="Ljung",
lag=20,fitdf=0)

        Box-Ljung test

data:  resid(fit)
X-squared = 32.946, df = 20, p-value = 0.03421

> Box.test(resid2,type="Ljung-Box")

        Box-Ljung test

data:  resid2
X-squared = 0.20511, df = 1, p-value = 0.6506

> Box.test(resid(fit2), type="Ljung",
lag=20,fitdf=0)

        Box-Ljung test

data:  resid(fit2)
X-squared = 25.128, df = 20, p-value = 0.1966

> Box.test(resid3,type="Ljung-Box")

        Box-Ljung test

data:  resid3
X-squared = 5.2762e-06, df = 1, p-value = 0.9982

> Box.test(resid(fit3), type="Ljung",
lag=20,fitdf=0)

        Box-Ljung test

data:  resid(fit3)
X-squared = 26.888, df = 20, p-value = 0.1385

>
> #normalitas residual
>
ks.test(resid1,"pnorm",mean=mean(resid1),sd=sd(r
esid1))

        One-sample Kolmogorov-Smirnov test
```

```
data:  resid1
D = 0.15463, p-value = 0.01143
alternative hypothesis: two-sided

>
ks.test(resid2,"pnorm",mean=mean(resid2),sd=sd(r
esid2))

        One-sample Kolmogorov-Smirnov test

data:  resid2
D = 0.17078, p-value = 0.003674
alternative hypothesis: two-sided

>
ks.test(resid3,"pnorm",mean=mean(resid3),sd=sd(r
esid3))

        One-sample Kolmogorov-Smirnov test

data:  resid3
D = 0.16353, p-value = 0.006199
alternative hypothesis: two-sided

>
> #forecast data training
> #011
>
ramalan=forecast::forecast(ts(datatraining),mode
l=fit, h=12)
> pred=ramalan$mean
> win.graph()
> plot(ramalan)
> #110
>
ramalan2=forecast::forecast(ts(datatraining),mod
el=fit2, h=12)
> pred2=ramalan2$mean
> win.graph()
> plot(ramalan2)
> #111
>
ramalan3=forecast::forecast(ts(datatraining),mod
el=fit3, h=12)
> pred3=ramalan3$mean
> win.graph()
```

```
> plot(ramalan)
>
> #MSE MAPE
> accuracy(((fit$fitted)^-1),datatraining)
                ME     RMSE       MAE       MPE
MAPE
Test set 10.65739 159.0363 93.93332 0.1168503
1.043115
> accuracy(((fit2$fitted)^-1),datatraining)
                ME      RMSE       MAE       MPE
MAPE
Test set 7.018628 159.9314 91.44269 0.07952108
1.013185
> accuracy(((fit3$fitted)^-1),datatraining)
               ME      RMSE      MAE       MPE
MAPE
Test set 7.985754 158.0743 91.46468 0.08893174
1.01443

> accuracy(pred,datatesting)
                ME     RMSE       MAE       MPE
MAPE
Test set 343.9531 432.533 343.9531 3.483258
3.483258
> accuracy(pred2,datatesting)
                ME      RMSE       MAE       MPE
MAPE
Test set 337.2338 426.4946 337.2338 3.414143
3.414143
> accuracy(pred3,datatesting)
               ME      RMSE      MAE       MPE
MAPE
Test set 339.506 428.7277 339.506 3.437426
3.437426
> coeftest(modeloutlier)

z test of coefficients:

       Estimate  Std. Error z value  Pr(>|z|)
ar1    0.528332    0.078109  6.7640 1.342e-11
***
io2 -350.963801   70.750049 -4.9606 7.027e-07
***
io3  290.884197   71.723215  4.0556 5.000e-05
***
io4 -147.657143   71.672986 -2.0602   0.03938 *
---
```

```
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05
‘.’ 0.1 ‘ ’ 1

> tsdiag(modeloutlier,gof=15,omit.initial=F)
>
> plot(dataharga,ylab='harga',xlab='Bulan',
type='o')
> points(fitted(modeloutlier))
>
> #uji diagnostik model
> Box.test(resid(modeloutlier), type="Ljung",
lag=20,fitdf=0)

        Box-Ljung test

data:  resid(modeloutlier)
X-squared = 27.395, df = 20, p-value = 0.1245

> ks.test(resid(modeloutlier),"pnorm")

        Asymptotic one-sample Kolmogorov-Smirnov
test

data:  resid(modeloutlier)
D = 0.55833, p-value < 2.2e-16
alternative hypothesis: two-sided

>
> #forecast 2023
>
ramalanakhir=forecast::forecast(ts(dataharga),mo
del=modeloutlier, h=12)
> ramalanakhir
    Point Forecast    Lo 80    Hi 80    Lo 95
Hi 95
121       10334.26 10334.26 10334.26 10334.26
10334.26
122       10366.42 10366.42 10366.42 10366.42
10366.42
123       10379.48 10379.48 10379.48 10379.48
10379.48
124       10384.79 10384.79 10384.79 10384.79
10384.79
125       10386.94 10386.94 10386.94 10386.94
10386.94
126       10387.81 10387.81 10387.81 10387.81
10387.81
```

```
127       10388.17 10388.17 10388.17 10388.17
10388.17
128       10388.31 10388.31 10388.31 10388.31
10388.31
129       10388.37 10388.37 10388.37 10388.37
10388.37
130       10388.39 10388.39 10388.39 10388.39
10388.39
131       10388.40 10388.40 10388.40 10388.40
10388.40
132       10388.41 10388.41 10388.41 10388.41
10388.41
> win.graph()
> plot(ramalanakhir$fitted, col = "blue")
> lines(dataharga, col = "green3")
>
```