arima.R

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```
rm(list = ls())
library(forecast)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(readxl)

df = read_excel("Trenddata.xlsx")
df
```

```
## # A tibble: 20 x 2
##     Year  Creg
##    <dbl> <dbl>
##  1  2002   808
##  2  2003   471
##  3  2004   347
##  4  2005   481
##  5  2006   453
##  6  2007   556
##  7  2008   464
##  8  2009   696
##  9  2010  1322
## 10  2011  2213
## 11  2012  3477
## 12  2013  5693
## 13  2014  9622
## 14  2015 11592
## 15  2016 12317
## 16  2017 21796
## 17  2018 27248
## 18  2019 44735
## 19  2020 50035
## 20  2021 52974
```

```
df.ts = ts(df$Creg, frequency = 1, start = c(2002))
df.ts
```

```
## Time Series:
## Start = 2002
## End = 2021
## Frequency = 1
##  [1]   808   471   347   481   453   556   464   696  1322  2213  3477  5693
```

```
## [13]  9622 11592 12317 21796 27248 44735 50035 52974
```

```
arima_model = auto.arima(df.ts)
arima_model
```

```
## Series: df.ts
## ARIMA(0,2,1)
##
## Coefficients:
##           ma1
##       -0.6246
## s.e.   0.1780
##
## sigma^2 = 16324819:  log likelihood = -174.75
## AIC=353.5   AICc=354.3   BIC=355.28
```

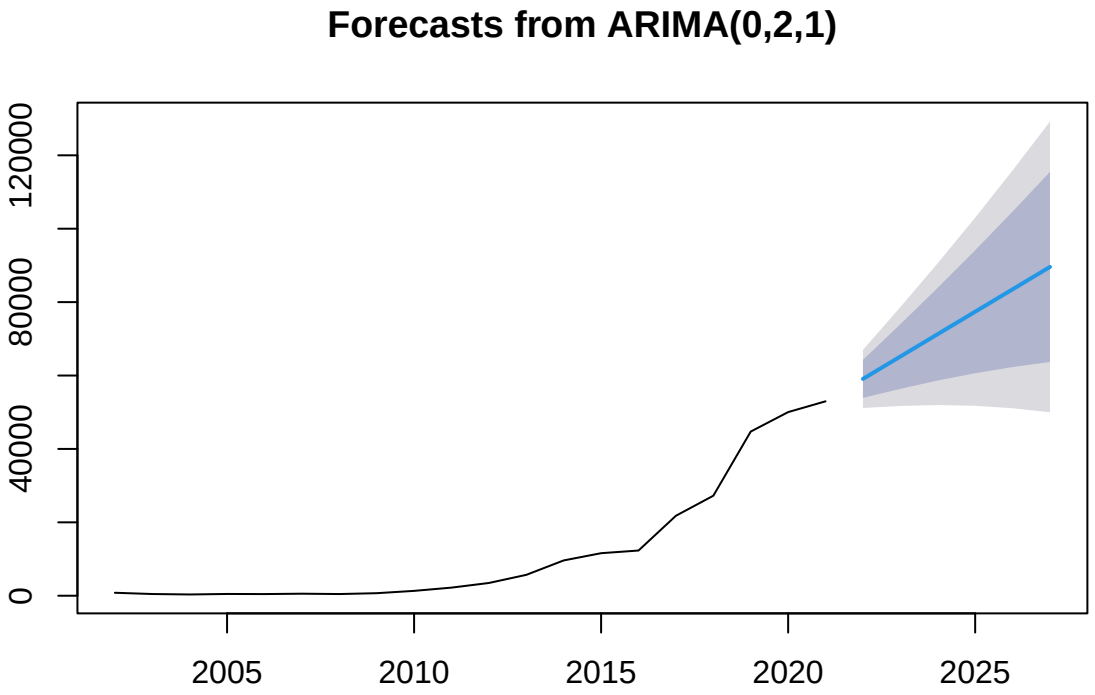
```
arima_forecast = forecast(arima_model, 6)
arima_forecast
```

```
##      Point Forecast    Lo 80     Hi 80    Lo 95     Hi 95
## 2022       59076.58 53898.61  64254.56 51157.55  66995.62
## 2023       65179.17 56374.05  73984.29 51712.90  78645.44
## 2024       71281.75 58644.02  83919.49 51954.01  90609.50
## 2025       77384.34 60623.85  94144.83 51751.38 103017.30
## 2026       83486.92 62304.58 104669.26 51091.33 115882.52
## 2027       89589.51 63693.55 115485.47 49985.05 129193.96
```

```
arima_accuracy = accuracy(arima_forecast)
arima_accuracy
```

```
##                     ME     RMSE      MAE      MPE     MAPE      MASE       ACF1
## Training set 846.7865 3725.063 1975.061 17.54396 23.03391 0.7036858 -0.1521813
```

```
plot(arima_forecast)
```



```r
# H0: Residuals are white noise
Box.test(arima_model$residuals, type = "Ljung-Box")
```

```
##
##  Box-Ljung test
##
## data:  arima_model$residuals
## X-squared = 0.53632, df = 1, p-value = 0.464
```