Time Series § Matlab

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Time Series § Matlab
Research Topic

Linear Time Series Models :

Autoregressive Model (Process) AR(p)

Moving-Average Model (Process) MA(q)

Autoregressive Moving Average Model (Process) ARMA(p,q)

Autoregressive Integrated Moving Average Model (Process) ARIMA(p, d, q)

Time Series § Matlab

Research Goals

- Understanding the basics of linear time series processes,
- Learning to derive time series processes with Matlab,
- Analyzing time series processes derived with Matlab,

Benefits / added value of using MATLAB and Simulink

- Matlab successfully presents graphical representation of time series.
- Matlab allows us to perform operations on a time series. (For example, the natural logarithm of the time series can be taken or the first and second lag difference of the time series can be taken)
- Matlab Econometric Modeler enables advanced econometric analysis to be performed on time series.

Time Series § Matlab

Linear Time Series Models :

Autoregressive Model (Process) AR(p)

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ \dots + \alpha Y_{t-p} + e_t$$

Moving-Average Model (Process) MA(q)

$$Y_t = \beta_0 + \beta_1 e_{t-1} + \ \dots + \beta_q e_{t-q} + e_t$$

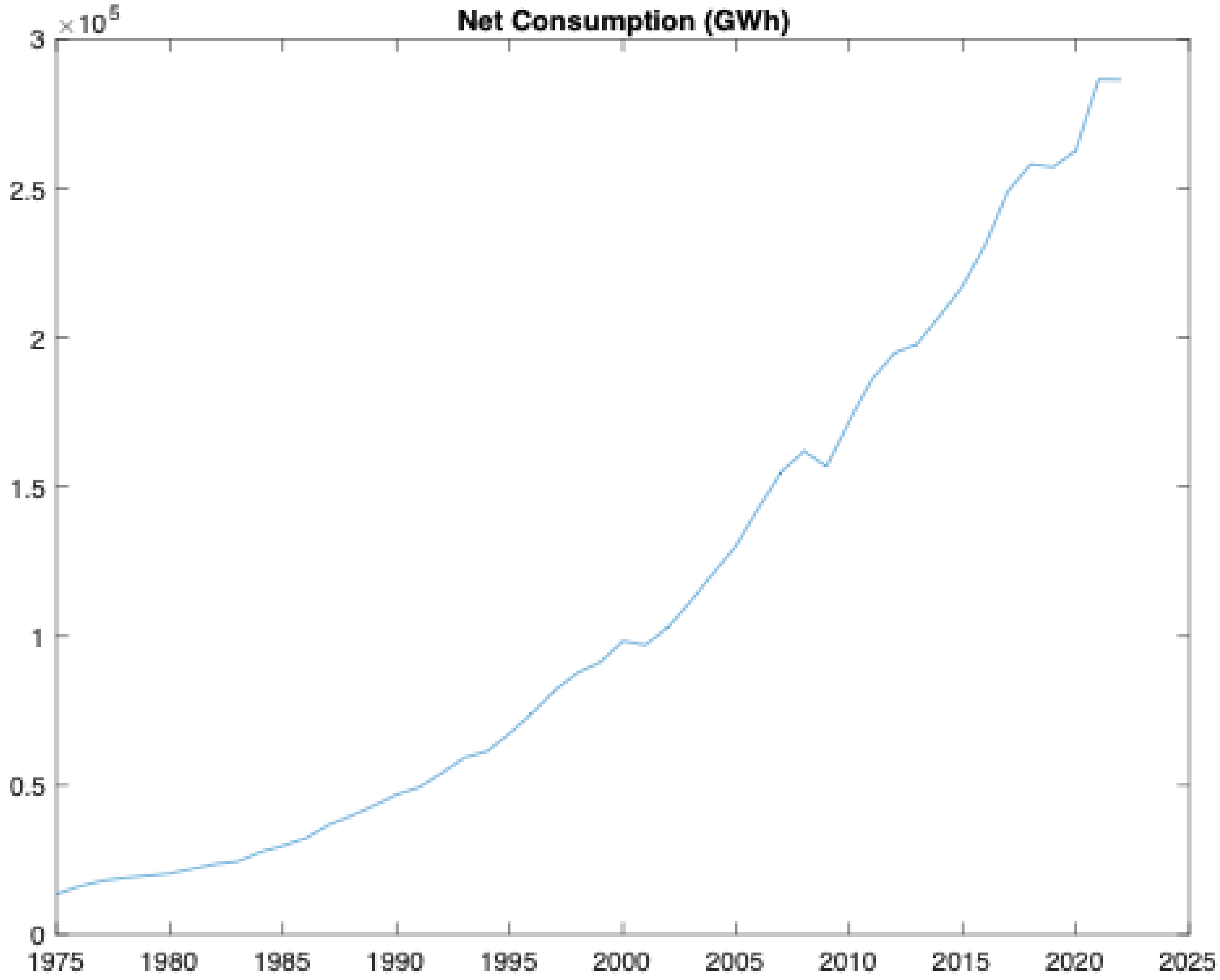
Autoregressive Moving Average Model (Process) ARMA(p,q)

$$Y_t = \gamma_0 + \alpha_1 Y_{t-1} + \ \dots + \alpha Y_{t-p} + \beta_1 e_{t-1} + \ \dots + \beta_q e_{t-q} + e_t$$

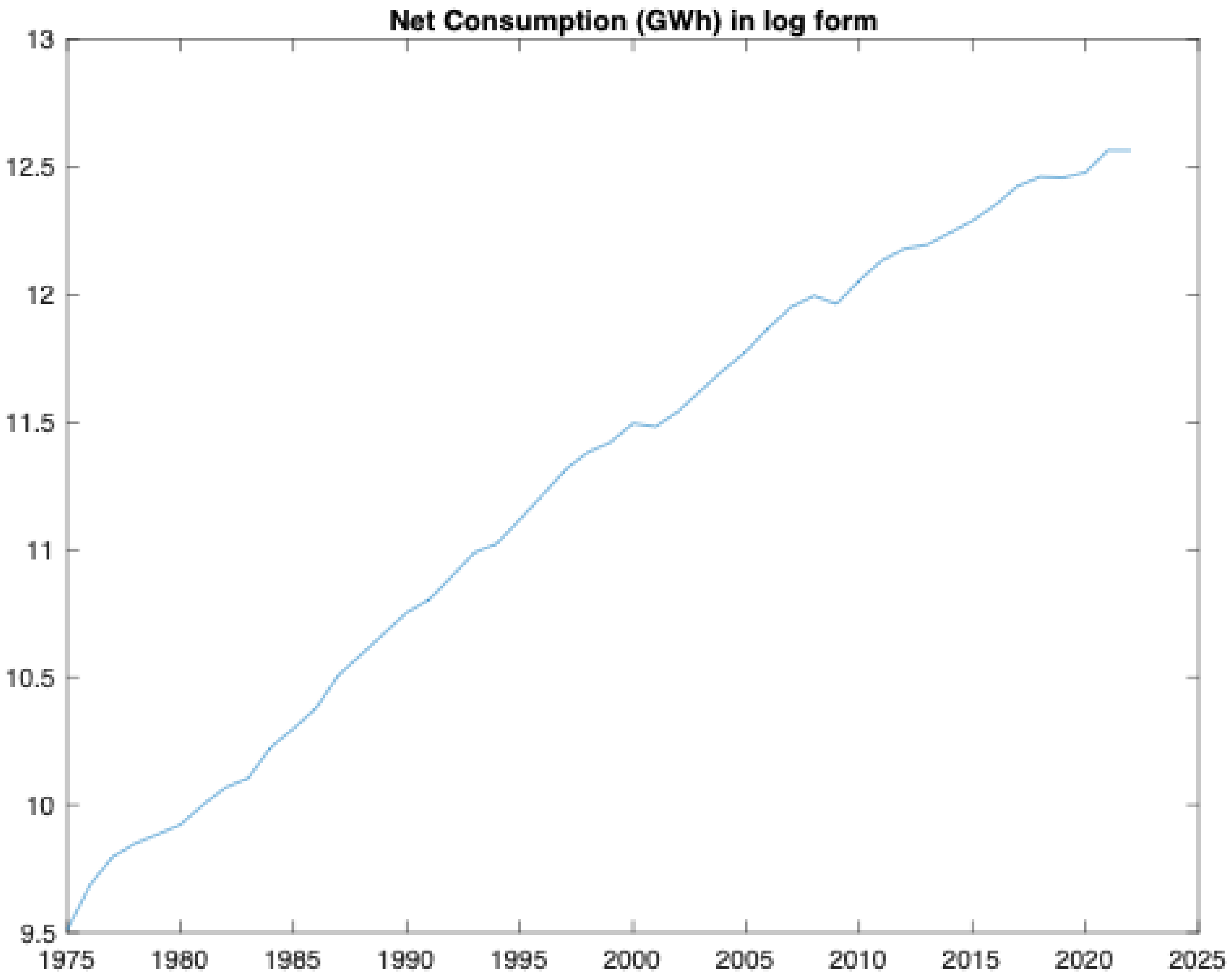
Autoregressive Integrated Moving Average Model (Process) ARIMA(p, d, q)

After differencing the time series Y(t), the ARMA(p,q) process is derived.

Modeling by Coding

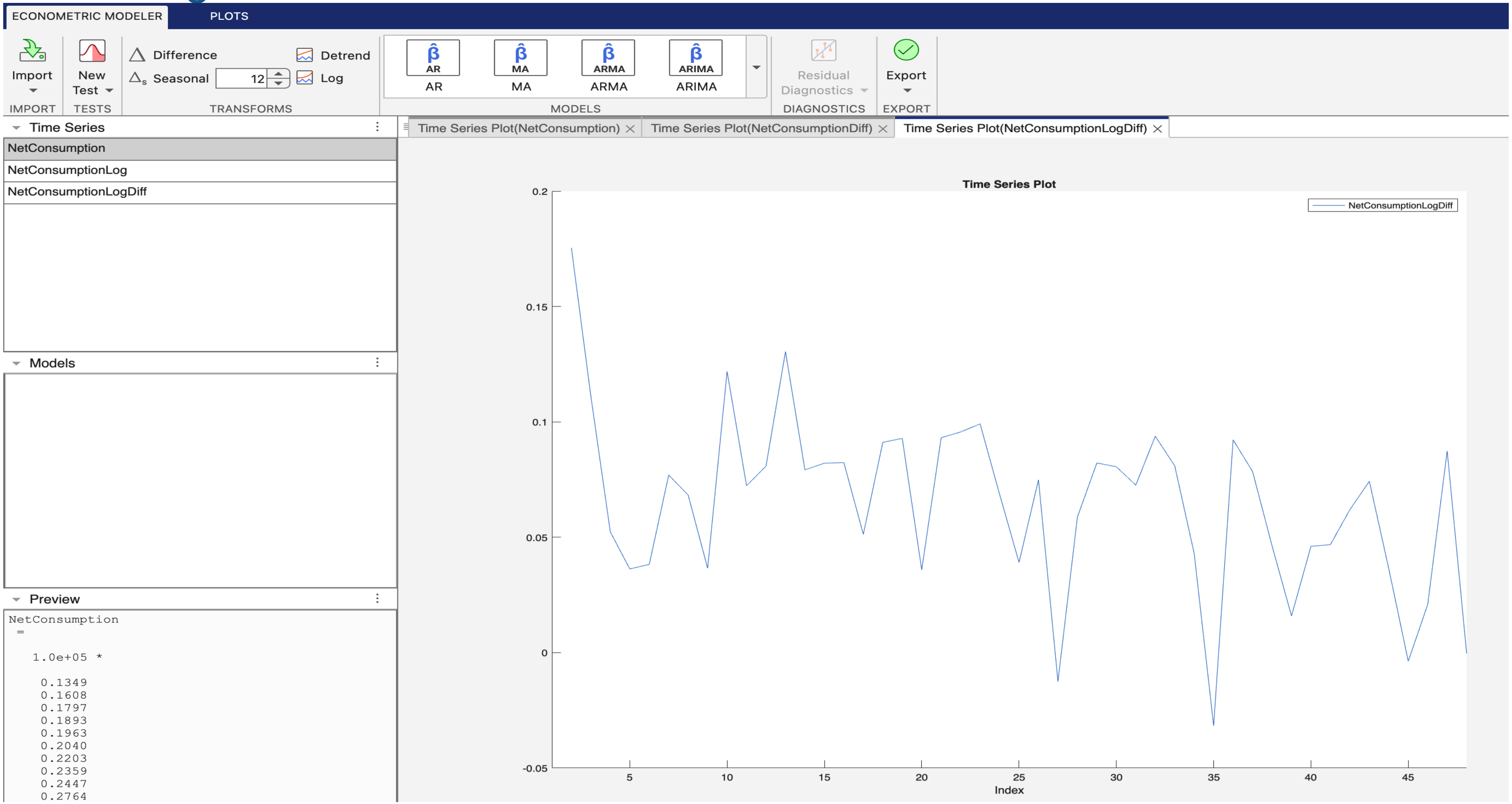


plot(data.Year, data.NetConsumption)

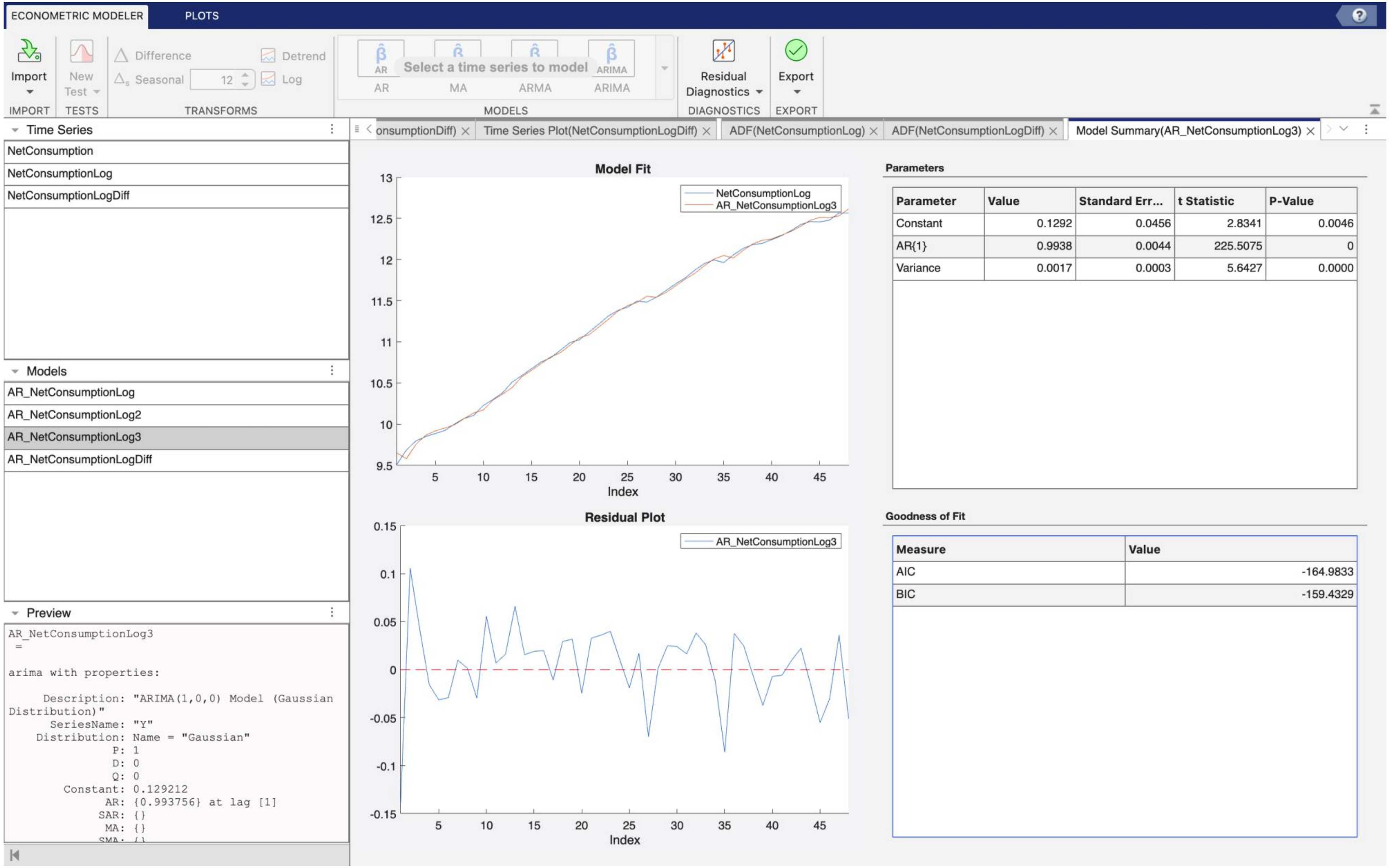


plot(data.Year, log(data.NetConsumption))

Modeling with Interface; Econometric Modeler

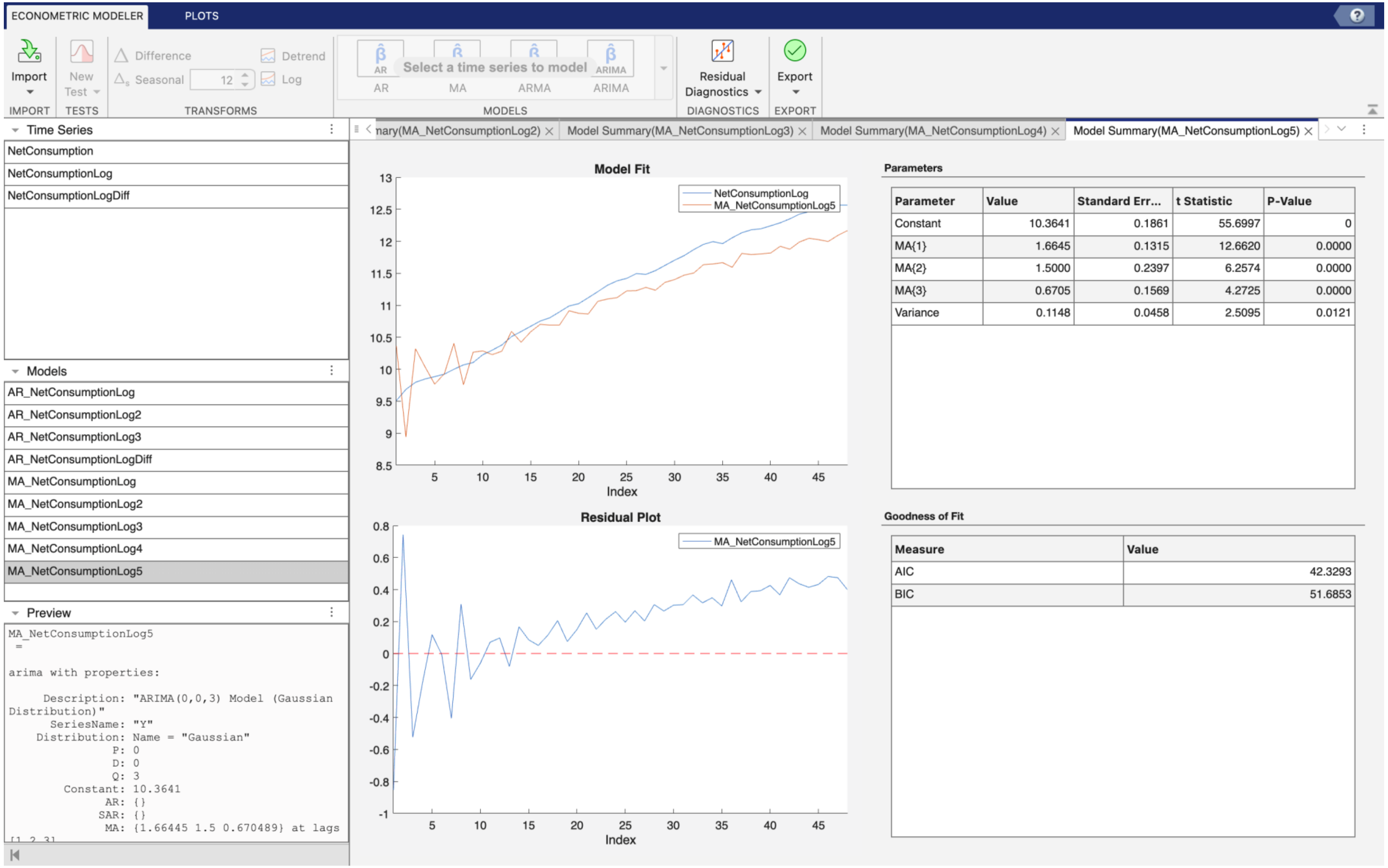


Autoregressive Model; AR(1), $Y_t = \alpha_0 + \alpha_1 Y_{t-1} + e_t$



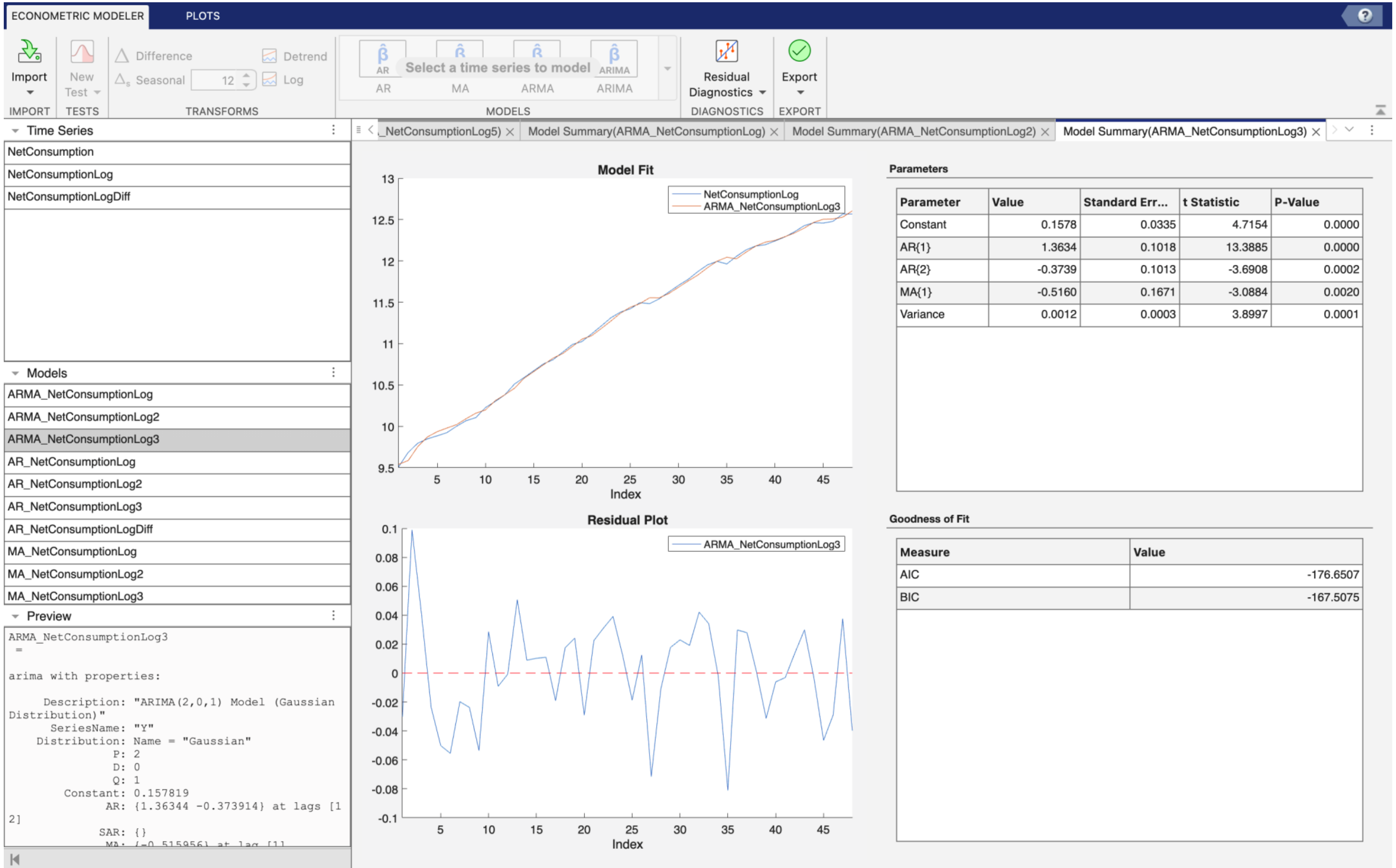
Moving Average Model; MA(3)

$$Y_t = \beta_0 + \beta_1 e_{t-1} + \beta_2 e_{t-2} + \beta_3 e_{t-3} + e_t$$

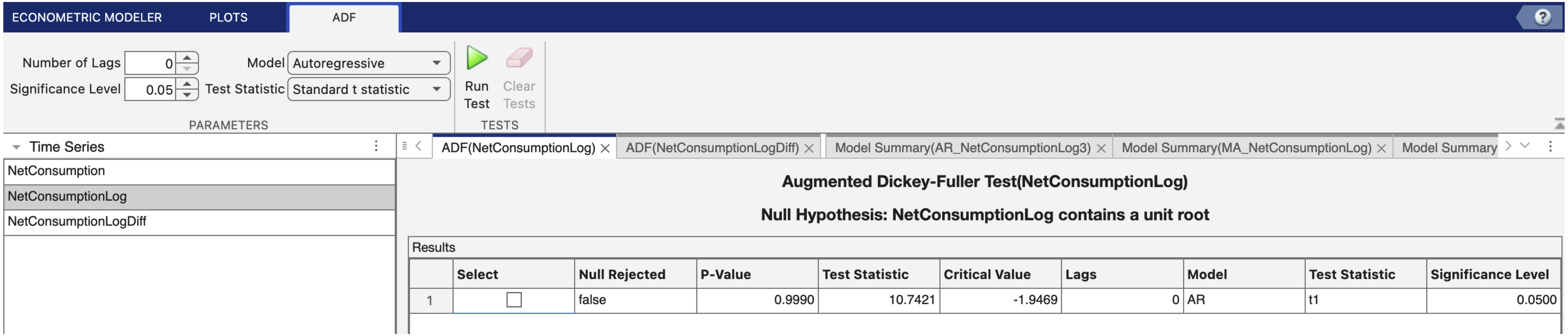


Autoregressive Moving Average Model; ARMA(2,1)

$$Y_t = \gamma_0 + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \beta_1 e_{t-1} + e_t$$

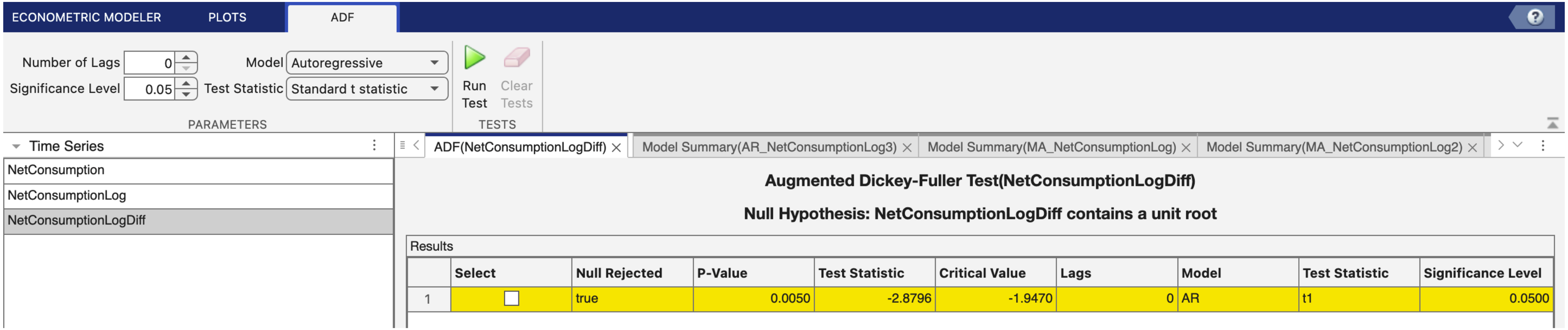


Stationarity Test; I(0) at level



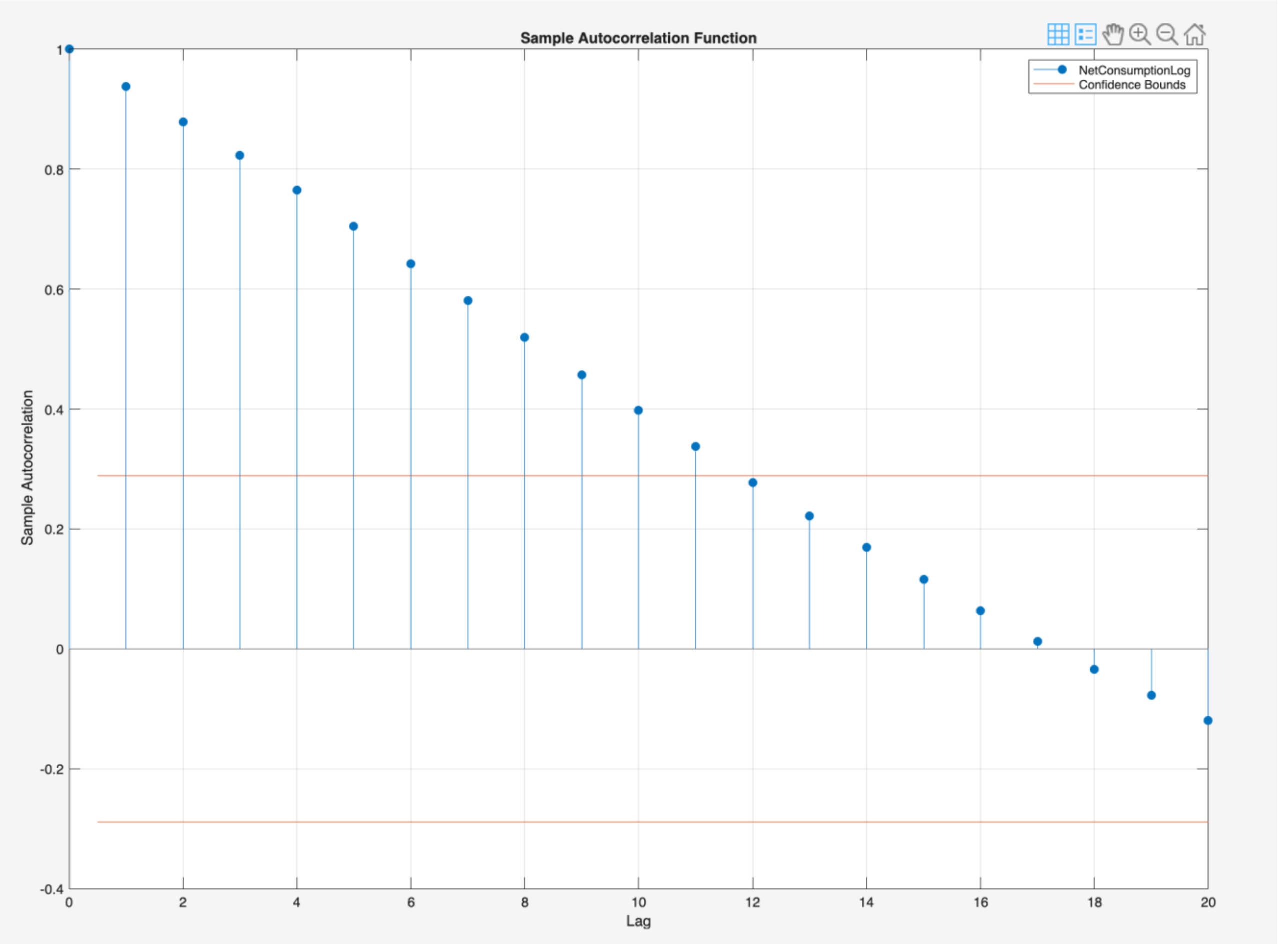
	Select	Null Rejected	P-Value	Test Statistic	Critical Value	Lags	Model	Test Statistic	Significance Level
1	☐	false	0.9990	10.7421	-1.9469	0	AR	t1	0.0500

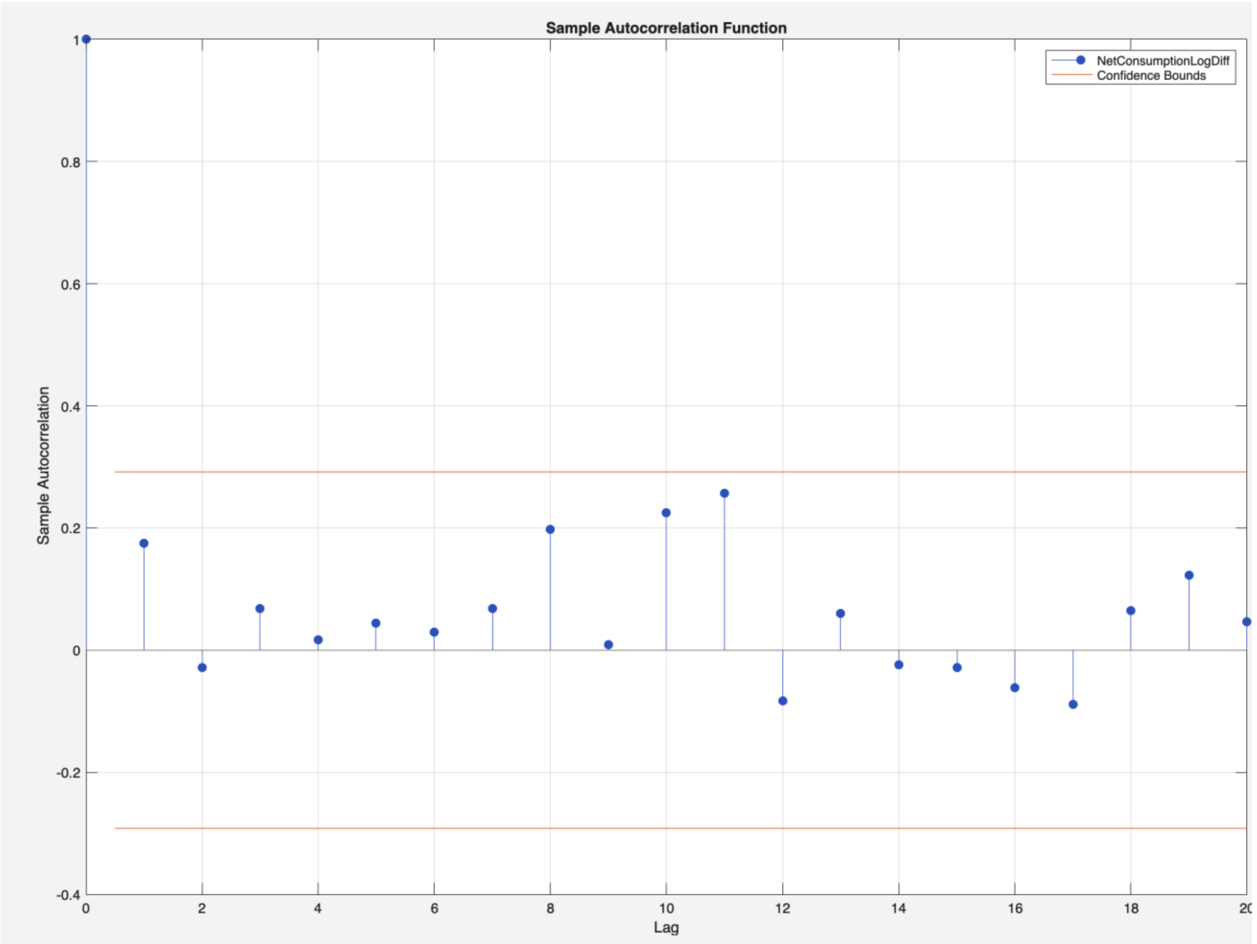
Stationarity Test; I(1) at first difference



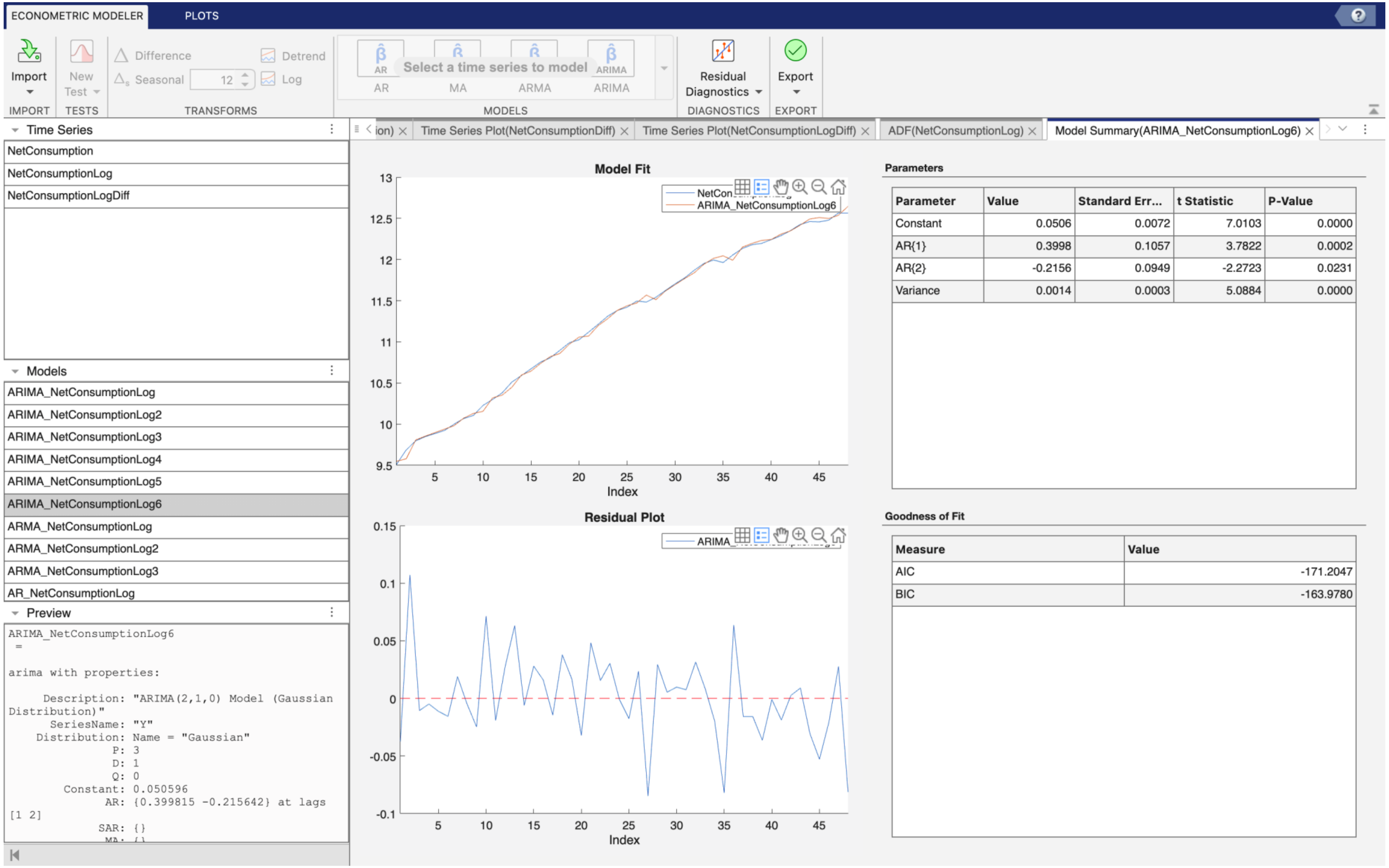
	Select	Null Rejected	P-Value	Test Statistic	Critical Value	Lags	Model	Test Statistic	Significance Level
1	☐	true	0.0050	-2.8796	-1.9470	0	AR	t1	0.0500

Autocorrelation Functions of non-Stationary and Stationary Series





Autoregressive Integrated Moving Average Model; ARIMA(2,1,0)



Thank You for Your Patience

Q&A – 5min

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