AQM Assignment One

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a. ARIMA Models

> *Identify, estimate and diagnostic check ARIMA models for each of the following variables: ln_ inv, ln_ inc, and ln_ consump.*

To identity an ARIMA model we must check for stationarity, correct for stationarity and examine the correlograms for the autocorrelations and partial autocorrelations.[1]

a.i. ARIMA model for *ln_ inv*

As can be seen in figure 2 on the following page, the ACF decays monotonically. That the ACF decays slowly indicates that the data is non-stationary, i.e. that we have a non-stationary mean.[2] Stationarity is when we have a flat looking series without trend.[3] The scatterplot in figure 1 on the next page also indicates that the series is non-stationary as we can see a clear trend. The PACF cuts off after one lag (see figure 3 on page 3), so we probably have an AR(1) process. However, because of non-stationarity we first attempt to correct for this by taking the first difference.

Now in figure 4 on page 4 we see that the scatterplot is flatter, portraying stationarity. The ACF decays in an alternating or oscillating fashion, probably portraying some sort of MA as it seems to cut off (becomes zero) after four values or after zero values ($q = 0$). The PACF never seems to cut off ($p = 0$), although it can be seen as decaying. Thus, we have evidence of an ARIMA(0,1,0) model. Figure 5 on page 5 shows the regression results of such an estimation. It does not make sense to do an `armaroot` test as we have no AR or MA parameters in the model.

Using the Portmanteau statistics yield...

a.ii. ARIMA model for *ln_ inc*

We turn to the variable *ln_ inc*. The graphs shown in 6 on page 6 again demonstrate that we probably have non-stationary data, so we do a first difference transformation again.

[1] http://www.polsci.wvu.edu/duval/ps791c/Notes/Stata/arimaident.html
[2] http://www.polsci.wvu.edu/duval/ps791c/Notes/Stata/arimaident.html
[3] http://www.itl.nist.gov/div898/handbook/pmc/section4/pmc442.htm

Figure 1: Scatterplot of ln_inv and qtr

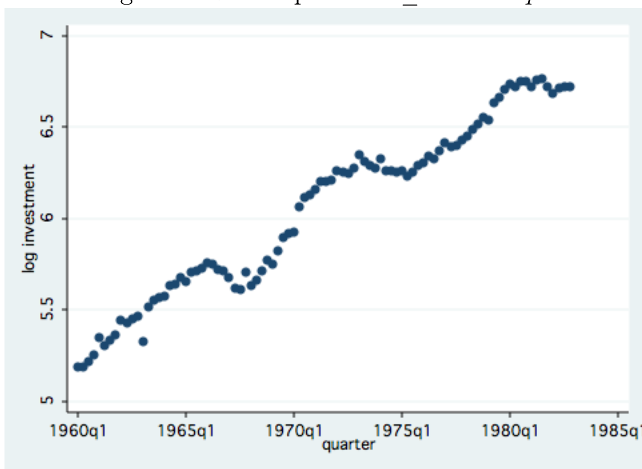


Figure 2: Autocorrelation function of ln_inv

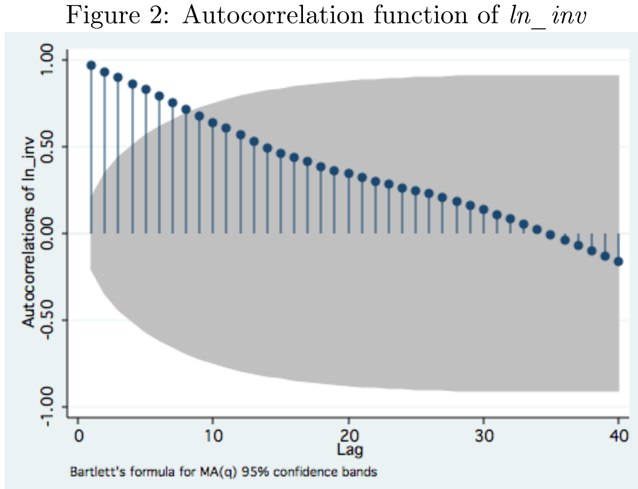
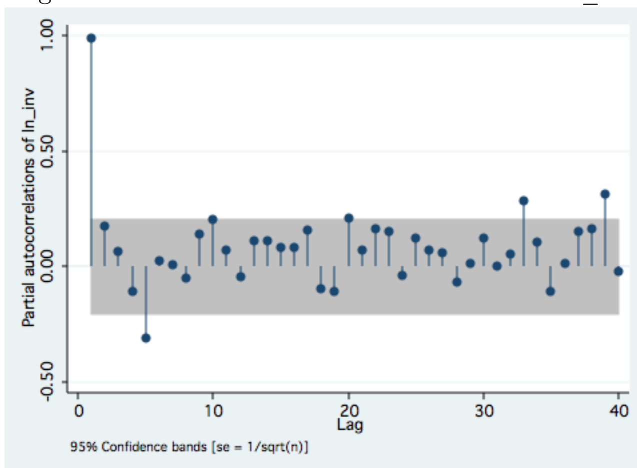


Figure 3: Partical autocorrelation function for *ln_ inv*



The results of this first difference transformation can be seen in figure 7 on page 7. Now the data does not portray a non-stationary mean, so we decide that $d = 1$. Again the case is more ambiguous for the ACF and PACF. We could again conclude that the ACF never cuts off, so we have a MA(0), where $q = 0$, and the PACF never cuts off (becomes zero), so $p = 0$.

Estimating an ARIMA(0,1,0) model gives the results shown in figure 8 on page 8.

a.iii. ARIMA model for *ln_ consump*

References

Figure 4: Graphs for ln_inv after correcting for stationarity

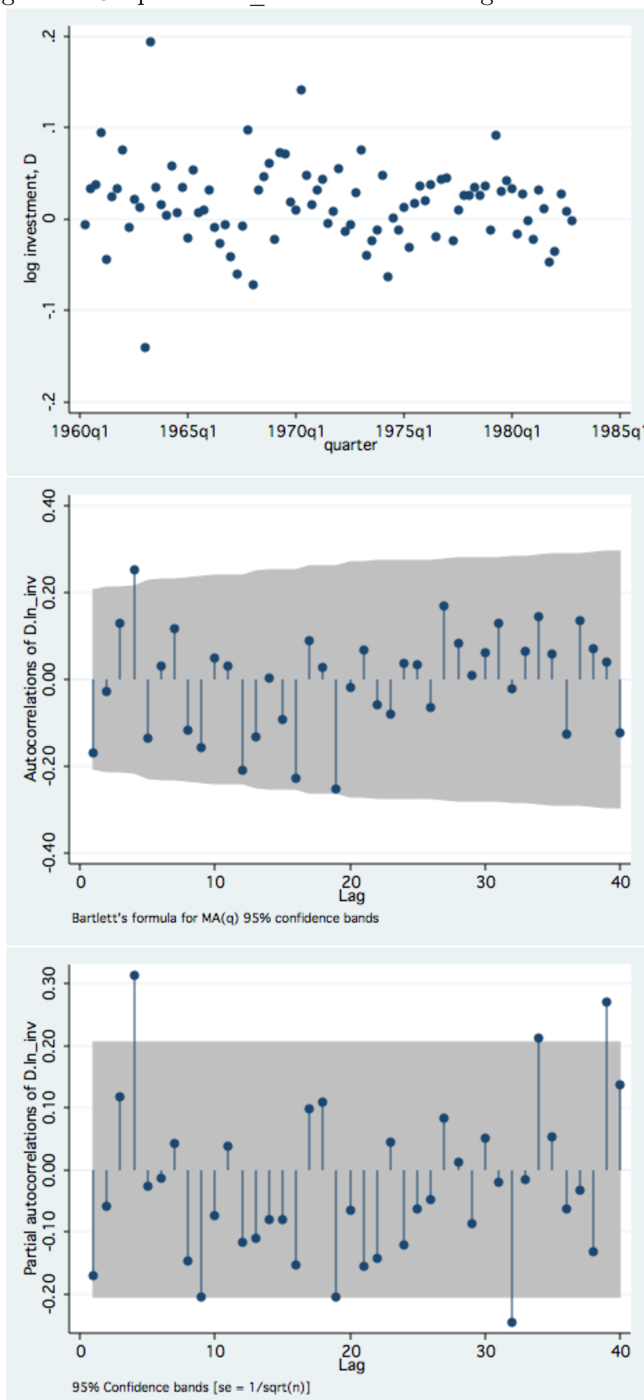


Figure 5: ARIMA(0,1,0) of *ln_ inv*

	(1)	(2)
VARIABLES	ln_inv	sigma
Constant	0.0168***	0.0445***
	(0.00473)	(0.00207)
Observations	91	91

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 6: Graphs for ln_inc

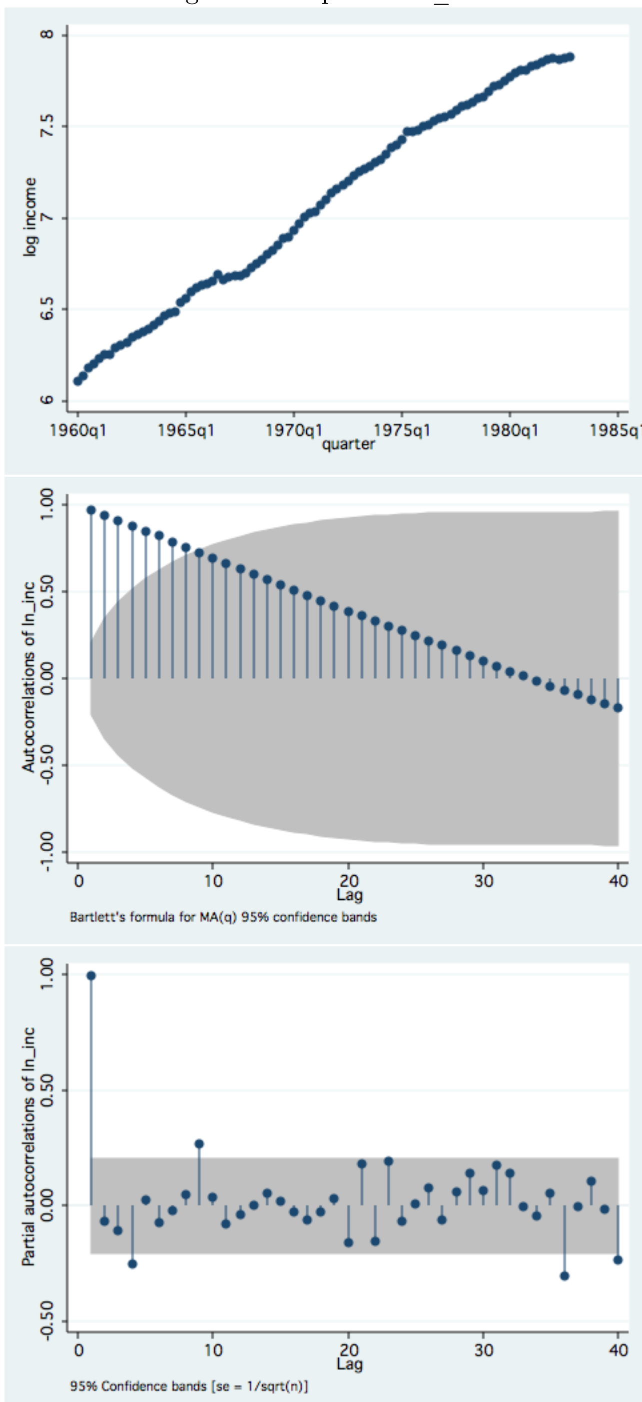


Figure 7: Graphs of *ln_ inc* after first differencing

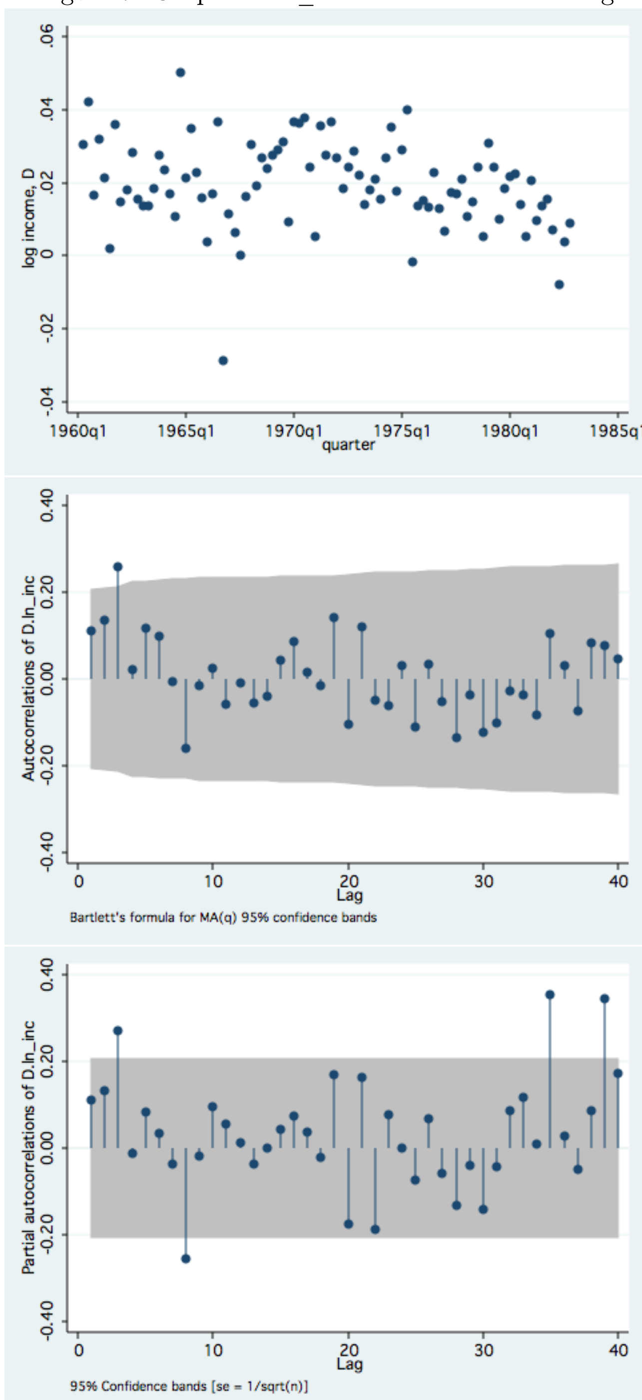


Figure 8: Results from ARIMA(0,1,0) of *ln_ inc*

	(1)	(2)
VARIABLES	ln_inc	sigma
Constant	0.0195***	0.0119***
	(0.00129)	(0.000645)
Observations	91	91

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1