

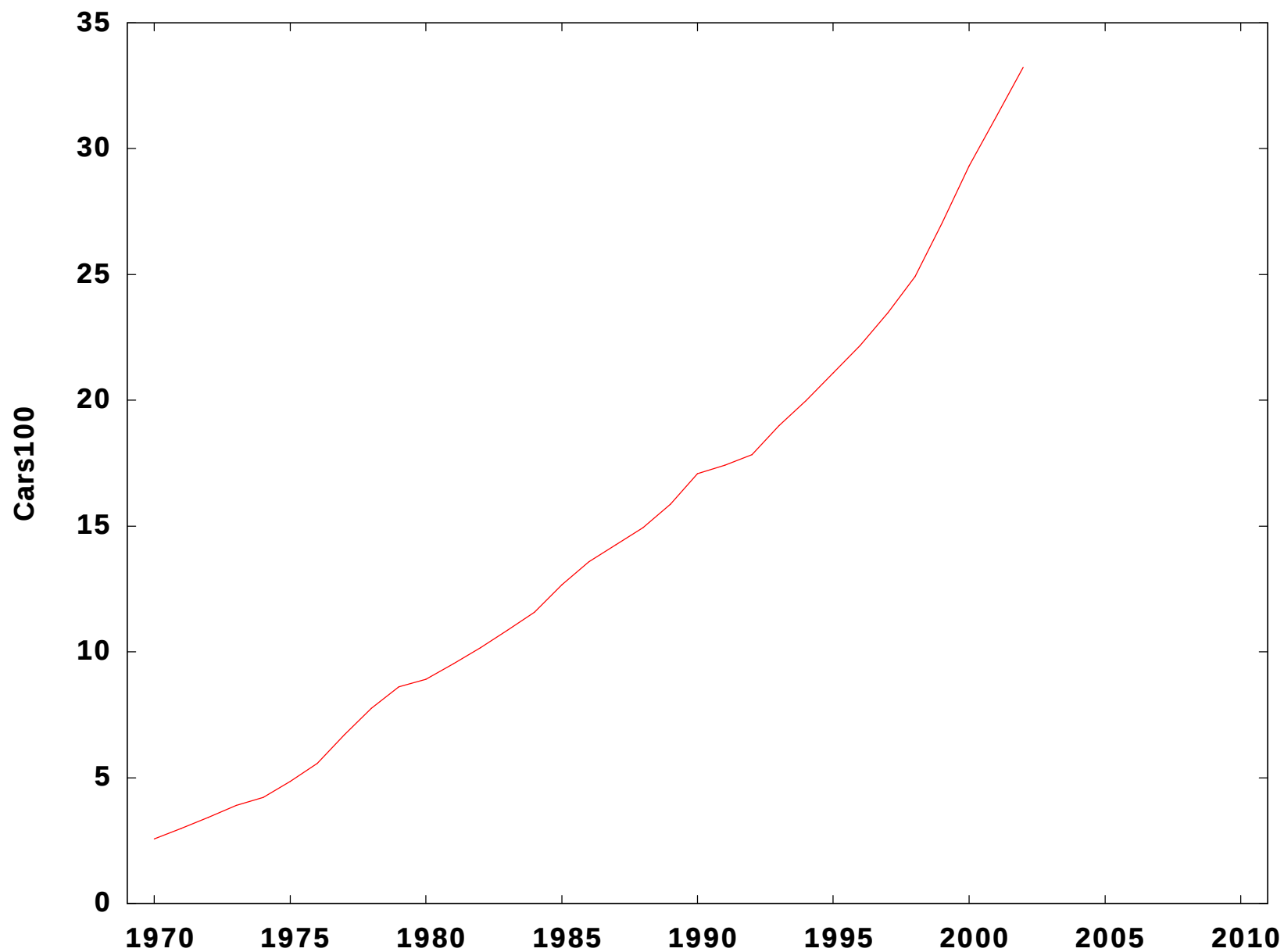
**Στασιμότητα (stationarity)
και ARIMA**

Ιωάννης Αθ. Παραβάντης

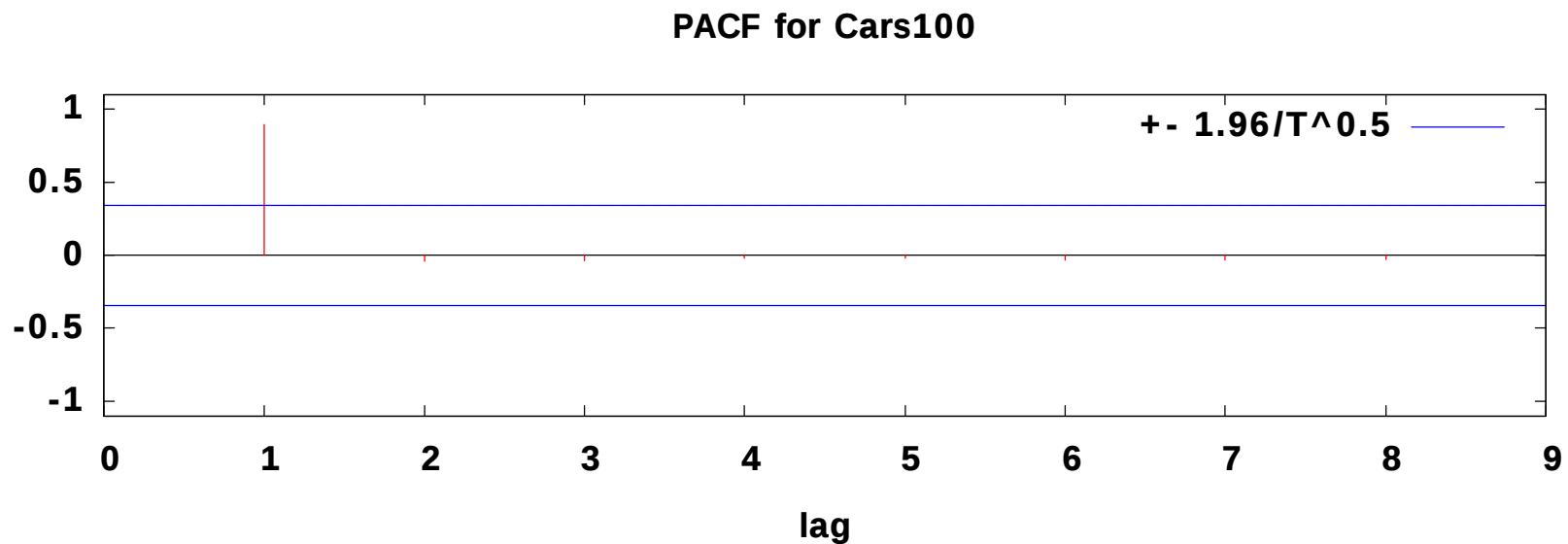
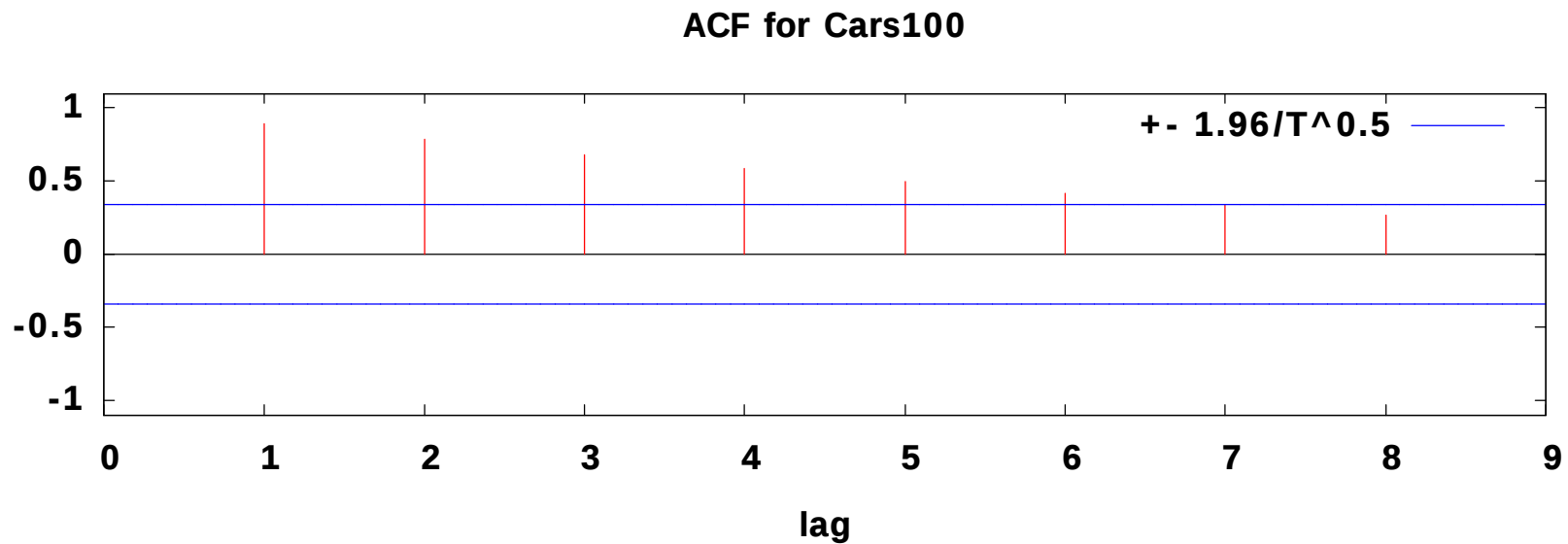
<http://paravantis.com/mla.html>

Μάιος 2006

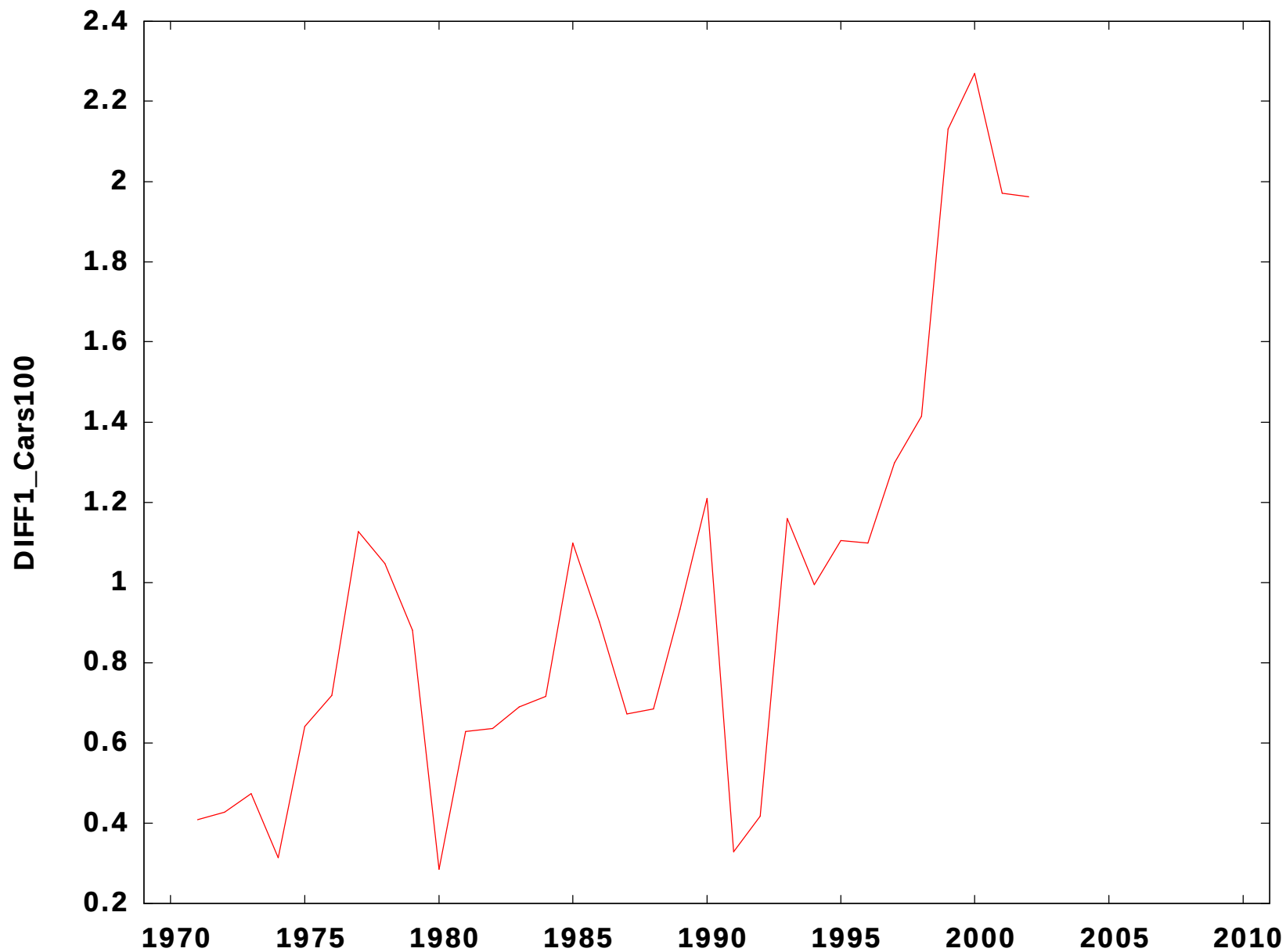
Αυτοκίνητα ανά 100 κατοίκους



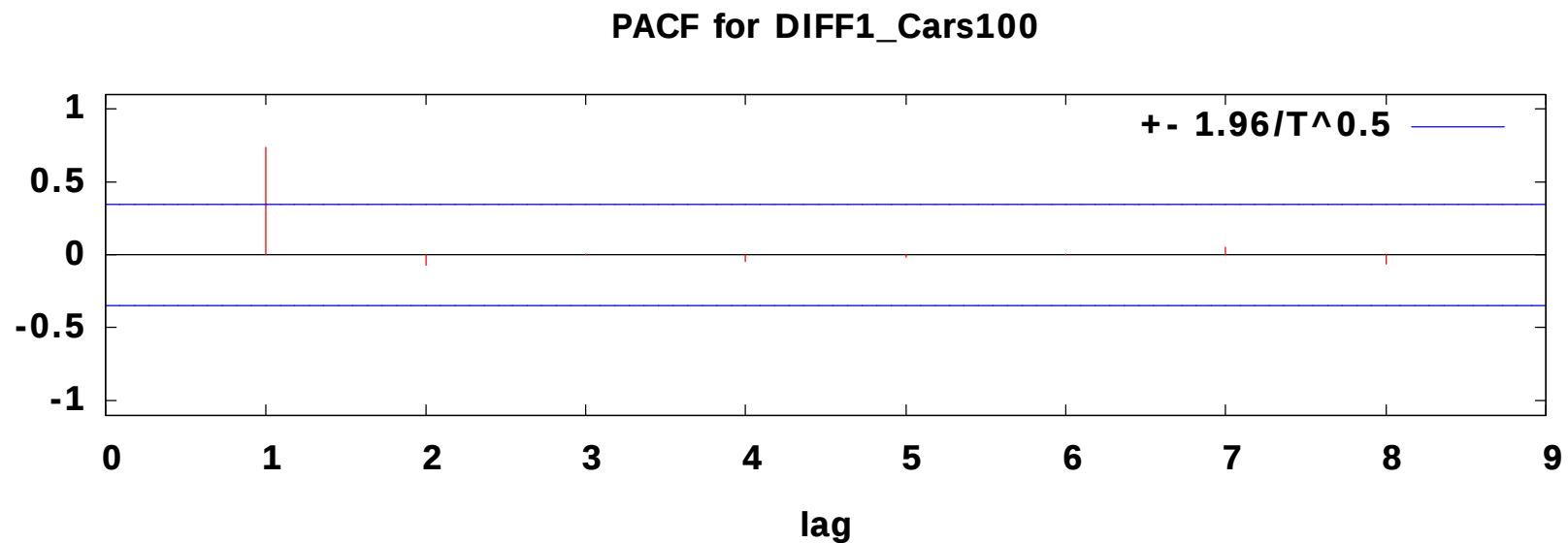
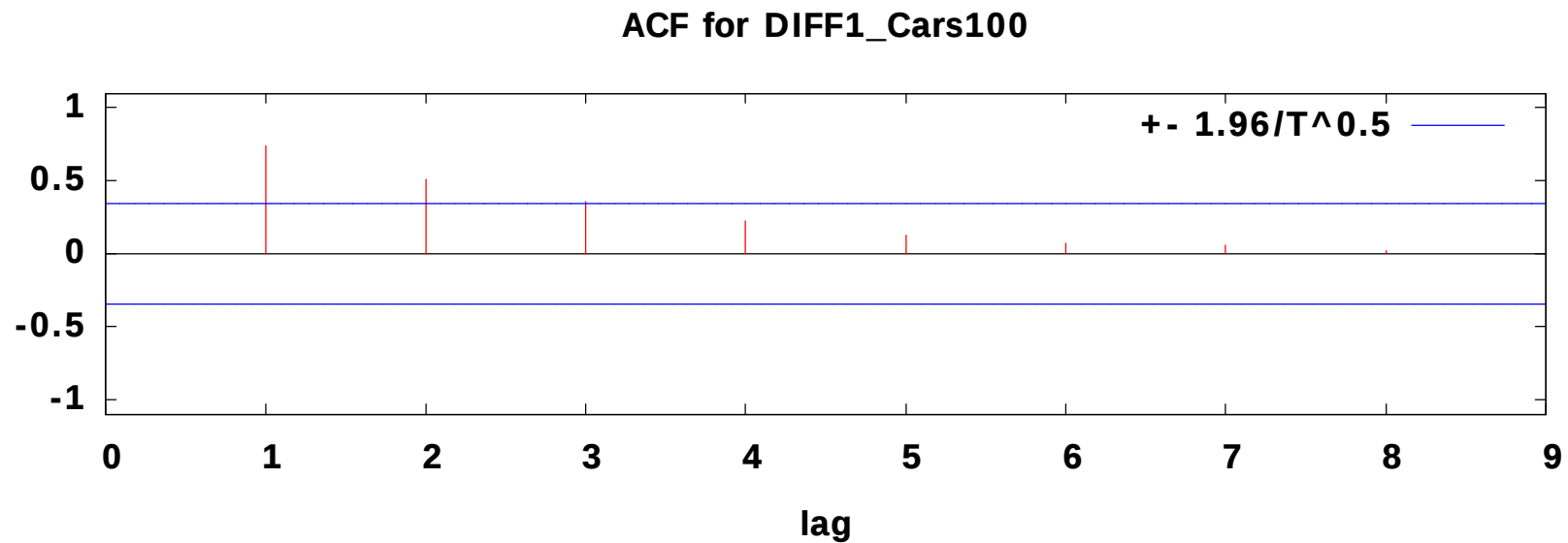
Autocorrelation plots της Cars100



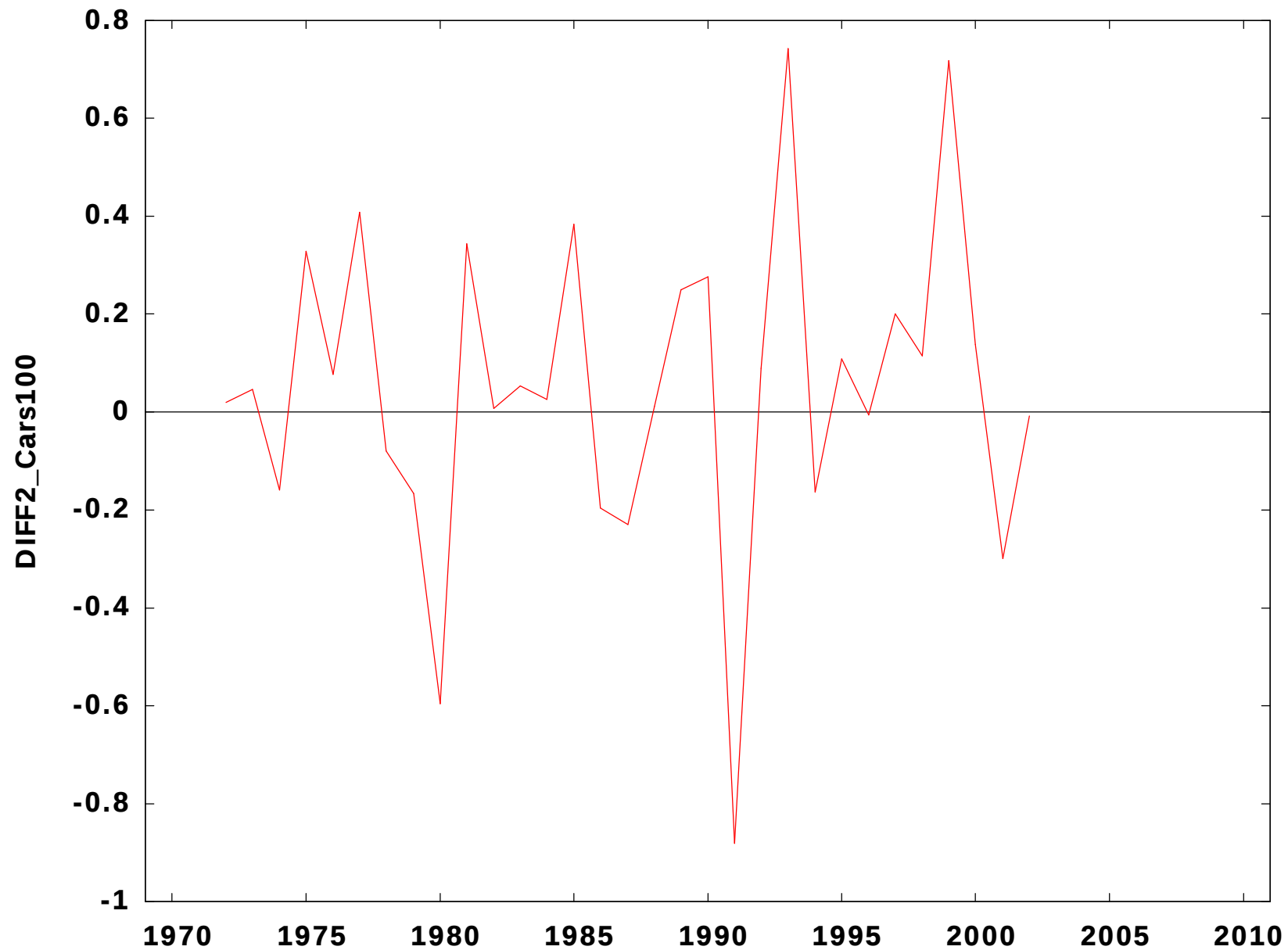
Πρώτες διαφορές της Cars100



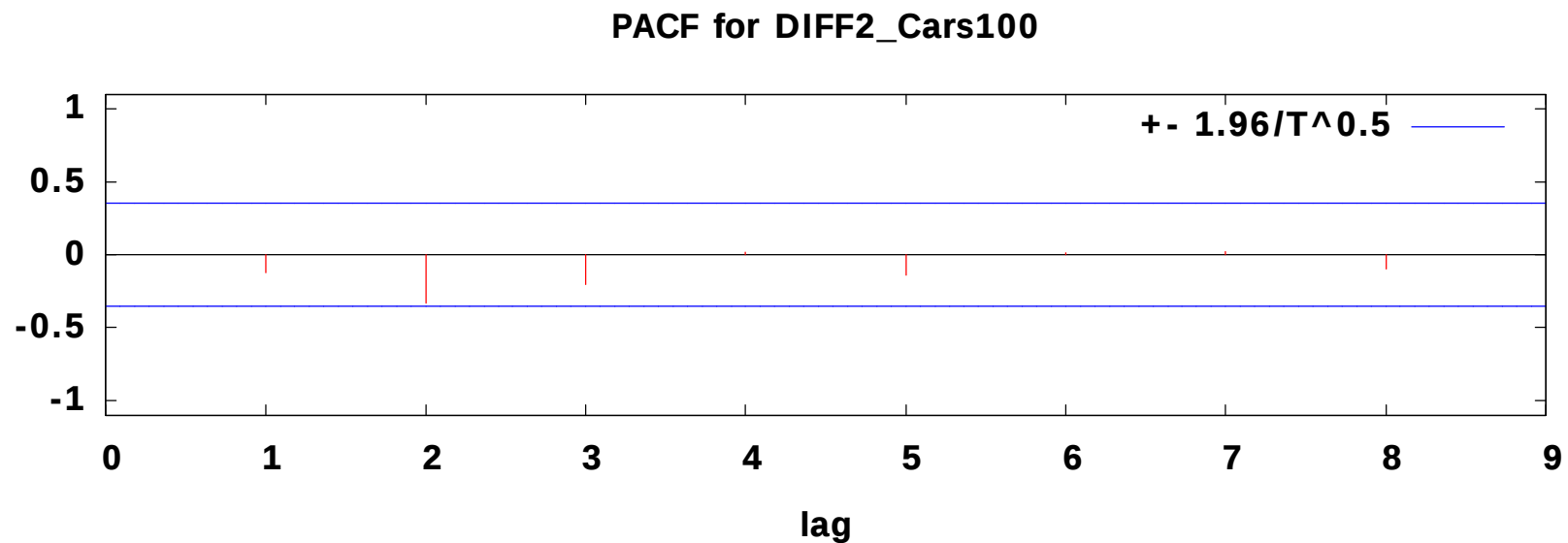
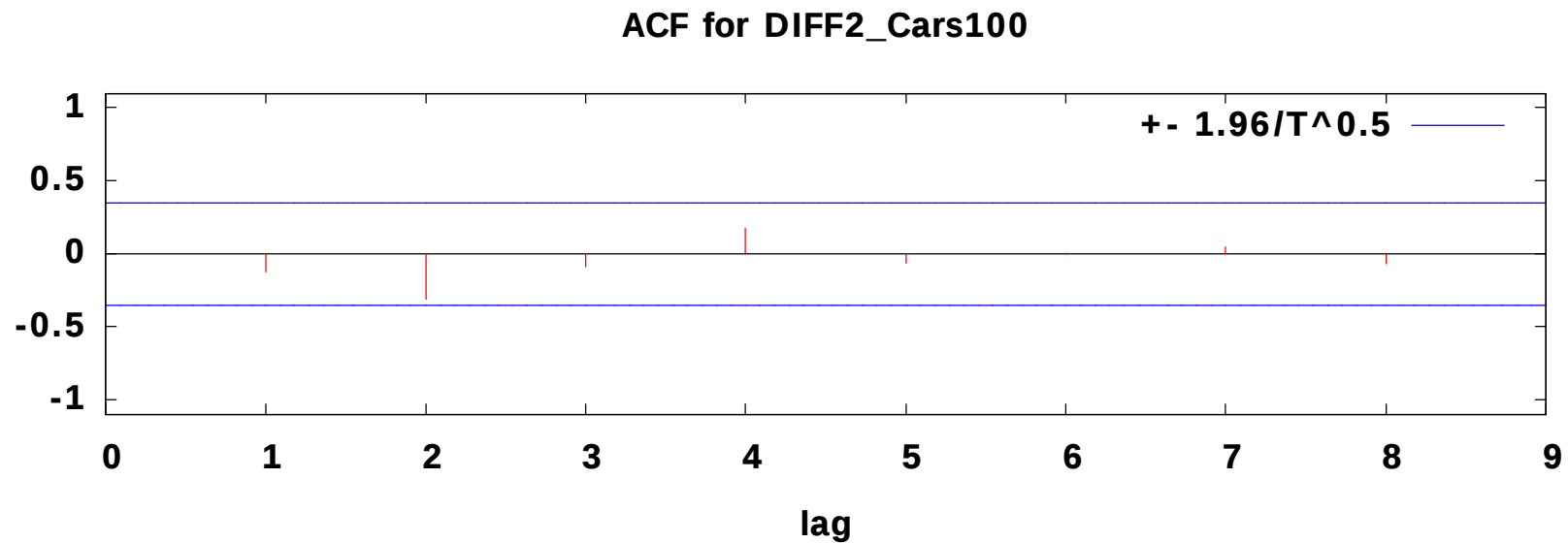
Autocorrelation plots της DIFF1_Cars100



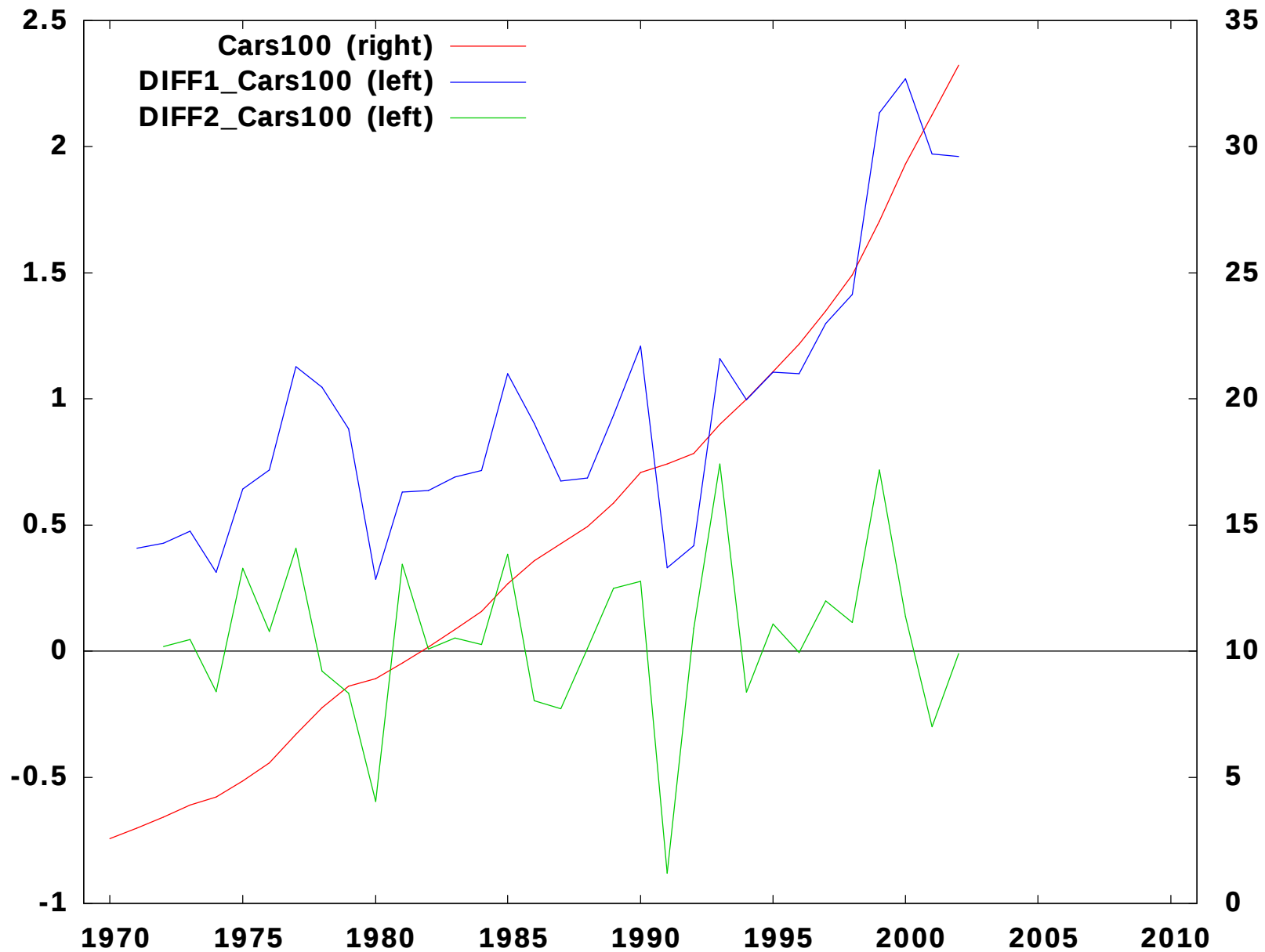
Δεύτερες διαφορές της Cars100



Autocorrelation plots της DIFF2_Cars100



Αρχικές τιμές, πρώτες και δεύτερες διαφορές



Περιγραφικά στατιστικά Cars100

Summary Statistics, using the observations 1970 - 2010
for the variable 'Cars100' (33 valid observations)

Mean	14.447
Median	13.580
Minimum	2.5800
Maximum	33.237
<u>Standard deviation</u>	8.6775
C.V.	0.60066
Skewness	0.48098
Ex. kurtosis	-0.70727

Περιγραφικά στατιστικά DIFF1_Cars100

Summary Statistics, using the observations 1970 - 2010
for the variable 'DIFF1_Cars100' (32 valid observations)

Mean	0.95803	
Median	0.89200	
Minimum	0.28500	
Maximum	2.2700	
Standard deviation	0.52967	← μικραίνει
C.V.	0.55287	
Skewness	0.99315	
Ex. kurtosis	0.34033	

Περιγραφικά στατιστικά DIFF2_Cars100

Summary Statistics, using the observations 1970 - 2010
for the variable 'DIFF2_Cars100' (31 valid observations)

Mean	0.050097
Median	0.046000
Minimum	-0.88100
Maximum	0.74200
<u>Standard deviation</u>	0.32498 ← ελάχιστη
C.V.	6.4871
Skewness	-0.40033
Ex. kurtosis	1.4225

Περιγραφικά στατιστικά τρίτων διαφορών

Summary Statistics, using the observations 1970 - 2010
for the variable 'DIFF3_Cars1' (30 valid observations)

Mean	-0.00093333
Median	0.00000
Minimum	-1.1570
Maximum	0.97000
<u>Standard deviation</u>	0.49487 ← αυξάνει και πάλι
C.V.	530.22
Skewness	-0.14073
Ex. kurtosis	-0.072769

ARIMA(i, j, k)

i : αριθμός autoregressive (AR) όρων

j : διαφορές (πρώτες ή σπανίως δεύτερες)

k : αριθμός moving averages (MA) όρων

Καλό είναι να μην έχουμε και AR και MA όρους (mixed models)!

ARIMA(1,1,0)₁

Model 1: ARIMA estimates using the 32 observations 1971-2002

Estimated using Kalman filter (exact ML)

Dependent variable: (1-L) Cars100

VARIABLE	COEFFICIENT	STDERROR	T STAT	P-VALUE	
const	0.168940	0.0384735	4.391	0.00001	***
phi_1	0.833082	0.112035	7.436	<0.00001	***

Mean of dependent variable = 0.958031

Standard deviation of dep. var. = 0.529669

Mean of innovations = -0.0090277

Variance of innovations = 0.0976655

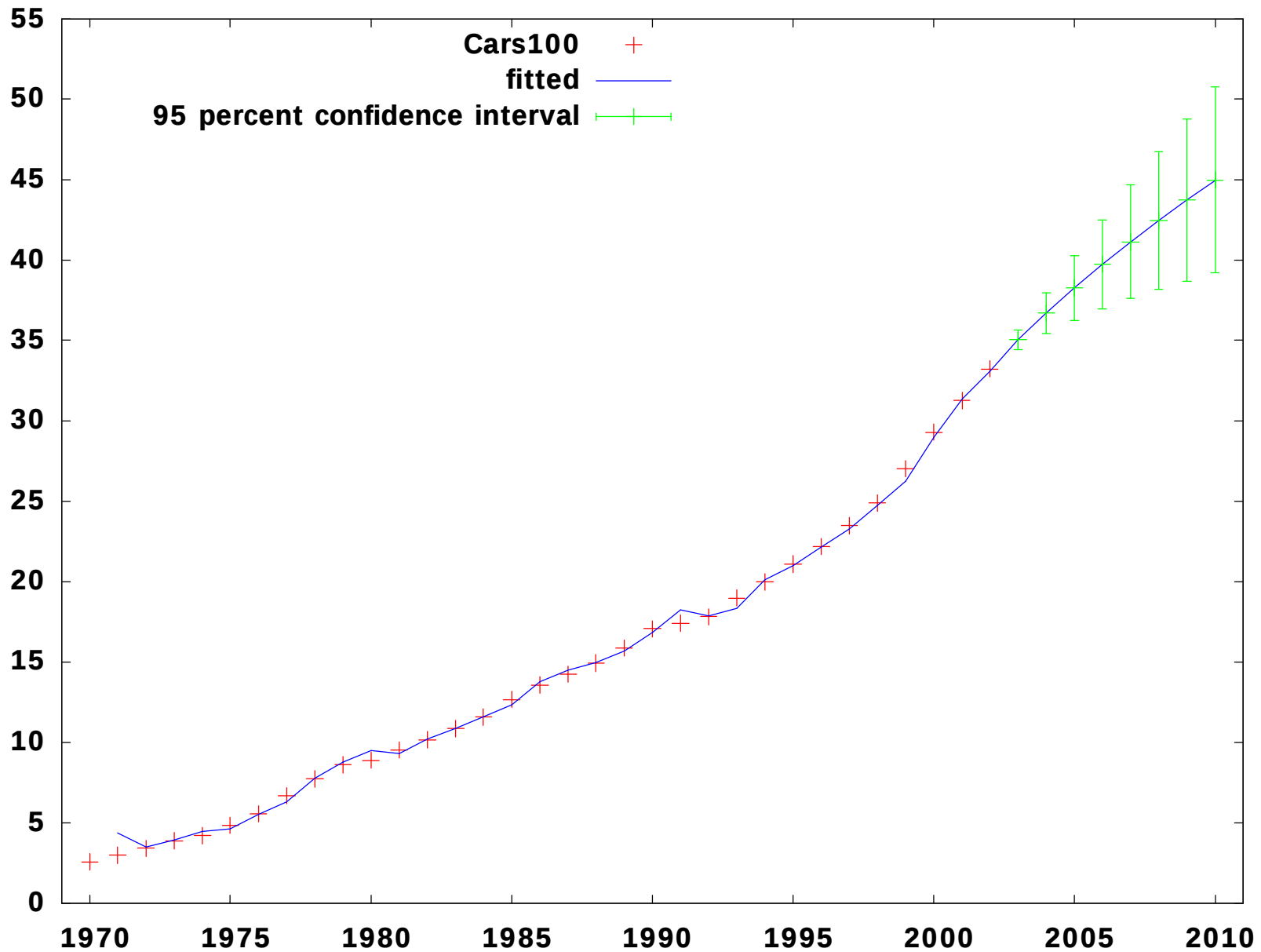
Log-likelihood = -8.7788549

Akaike information criterion (AIC) = 23.5577

Schwarz Bayesian criterion (BIC) = 27.9549

Hannan-Quinn criterion (HQC) = 25.0153

ARIMA(1,1,0)₂



ARIMA(0,2,1)₁

Model 4: ARIMA estimates using the 33 observations 1970-2002

Estimated using X-12-ARIMA (conditional ML)

Dependent variable: $(1-L)^2 \text{ Cars}_{100}$

VARIABLE	COEFFICIENT	STDERROR	T STAT	P-VALUE
const	0.0523374	0.0348376	1.502	0.13301
theta_1	-0.389100	0.165891	-2.346	0.01900 **

Mean of dependent variable = 0.0500968

Standard deviation of dep. var. = 0.324981

Mean of innovations = -0.000681003

Variance of innovations = 0.0972506

Log-likelihood = -7.8649038

ARIMA(0,2,1)₂

