التمرين 1: البيانات التالية توضح إجمالي الواردات (M) وإجمالي الدخل الوطني (GNP) .

t	M	GNP
2000	23.2	506
2001	23.1	523.3
2002	25.2	563.8
2003	26.4	594.7
2004	28.4	635.7
2005	32	688.1
2006	37.7	753
2007	40.6	796.3
2008	47.7	868.5
2009	52.9	935.5
2010	58.5	982.4
2011	64	1063.4
2012	75.9	1171.1
2013	94.4	1306.6
2014	131.9	1412.9
2015	126.9	1528.8
2016	155.4	1702.2
2017	185.8	1899.5
2018	217.5	2127.6
2019	260.9	2368.5

المطلوب:

- ✓ أوجد معادلة انحدار M على GNP؛
- ✓ أختبر وجود ارتباط ذاتي للأخطاء عند مستوى معنوية 5%؛
- ✓ صحح الارتباط الذاتي إن وجد.
- ✓ تأكد خلو النموذج من الارتباط الذاتي.

الملاحق:

Dependent Variable: M
Method: Least Squares
Date: 03/01/26 Time: 10:55
Sample (adjusted): 2 20
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GNP	0.153820	0.113089	1.360164	0.1939
M(-1)	0.721476	0.201354	3.583130	0.0027
GNP(-1)	-0.116362	0.130109	-0.894348	0.3853
C	-20.89433	12.20862	-1.711441	0.1076

R-squared	0.989759	Mean dependent var	88.69474
Adjusted R-squared	0.987711	S.D. dependent var	71.53424
S.E. of regression	7.929949	Akaike info criterion	7.163834
Sum squared resid	943.2613	Schwarz criterion	7.362663
Log likelihood	-64.05642	Hannan-Quinn criter.	7.197484
F-statistic	483.2457	Durbin-Watson stat	2.629043
Prob(F-statistic)	0.000000		

Method: Least Squares
Date: 02/28/26 Time: 17:28
Sample: 1 20
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GNP	0.126230	0.004365	28.91680	0.0000
C	-56.13319	5.439948	-10.31870	0.0000

R-squared	0.978927	Mean dependent var	85.42000
Adjusted R-squared	0.977756	S.D. dependent var	71.14985
S.E. of regression	10.61147	Akaike info criterion	7.656388
Sum squared resid	2026.861	Schwarz criterion	7.755962
Log likelihood	-74.56388	Hannan-Quinn criter.	7.675826
F-statistic	836.1815	Durbin-Watson stat	0.647239
Prob(F-statistic)	0.000000		

Dependent Variable: M_
Method: Least Squares
Date: 03/02/26 Time: 10:31
Sample: 2000 2019
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GNP_	0.141458	0.008964	15.78017	0.0000
C	-22.42760	3.911998	-5.733029	0.0000

R-squared	0.932588	Mean dependent var	32.95500
Adjusted R-squared	0.928843	S.D. dependent var	28.97108
S.E. of regression	7.728136	Akaike info criterion	7.022252
Sum squared resid	1075.033	Schwarz criterion	7.121825
Log likelihood	-68.22252	Hannan-Quinn criter.	7.041690
F-statistic	249.0137	Durbin-Watson stat	2.573922
Prob(F-statistic)	0.000000		