

"TOUT" = x1 , "RH" = x2, "SR" = x3, "PRS"=x4, "WSR"=x5, "WDR"=x6

# CENTRO - URBANO

## Y\_1 ( Ozono)

Frecuencia seleccionada: Diario

AIC: 211.26882123184393

MAE: 0.3269579325838216

RMSE: 0.3962866399992485

MAPE: 173.79265351477105

R2: 0.45612541421041186

LjungBox\_p: 0.5633611778282951

JarqueBera\_p: 6.380483565027273e-07

best\_order: (4, 0, 3)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.174120	0.174120	1.652902e-37
2	SR	0.117190	0.117190	1.873844e-16
4	WSR	-0.048625	0.048625	4.787353e-07
3	PRS	0.030656	0.030656	6.316831e-02
0	TOUT	0.027519	0.027519	3.542631e-01
5	WDR	0.023622	0.023622	4.167134e-03

### SARIMAX Results

Dep. Variable:	Y_1	No. Observations:	1021			
Model:	SARIMAX(4, 0, 3)	Log Likelihood	-91.634			
Date:	Fri, 05 Dec 2025	AIC	211.269			
Time:	06:19:26	BIC	280.213			
Sample:	01-01-2022	HQIC	237.451			
	- 10-17-2024					
Covariance Type:	opg					
	coef	std err	z	P> z	[0.025	0.975]
x1	0.0275	0.030	0.926	0.354	-0.031	0.086
x2	-0.1741	0.014	-12.799	0.000	-0.201	-0.147
x3	0.1172	0.014	8.230	0.000	0.089	0.145
x4	0.0307	0.016	1.858	0.063	-0.002	0.063
x5	-0.0486	0.010	-5.035	0.000	-0.068	-0.030
x6	0.0236	0.008	2.865	0.004	0.007	0.040
ar.L1	0.6212	0.330	1.883	0.060	-0.026	1.268
ar.L2	0.1642	0.316	0.520	0.603	-0.455	0.784
ar.L3	0.5012	0.272	1.839	0.066	-0.033	1.035
ar.L4	-0.3042	0.112	-2.716	0.007	-0.524	-0.085
ma.L1	-0.0611	0.335	-0.182	0.855	-0.718	0.596
ma.L2	-0.2030	0.198	-1.025	0.305	-0.591	0.185
ma.L3	-0.5164	0.240	-2.153	0.031	-0.987	-0.046
sigma2	0.0700	0.003	25.565	0.000	0.065	0.075
Ljung-Box (L1) (Q):	0.01	Jarque-Bera (JB):	28.49			
Prob(Q):	0.93	Prob(JB):	0.00			
Heteroskedasticity (H):	1.10	Skew:	0.25			
Prob(H) (two-sided):	0.39	Kurtosis:	3.65			

Frecuencia seleccionada: Semanal  
AIC: -48.45937338836626  
MAE: 0.30244264150601036  
RMSE: 0.34844531019470876  
MAPE: 820.2524929220777  
R2: 0.3544022215936229  
LjungBox\_p: 0.6911346249976722  
JarqueBera\_p: 0.3114133595610591  
best\_order: (1, 0, 4)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.186222	0.186222	8.855747e-14
4	WSR	0.076050	0.076050	4.320890e-03
0	TOUT	0.071550	0.071550	1.941540e-01
2	SR	0.038730	0.038730	3.536513e-01
5	WDR	-0.010777	0.010777	5.575785e-01
3	PRS	0.010484	0.010484	7.399197e-01

SARIMAX Results

---

Dep. Variable: Y\_1 No. Observations: 147  
Model: SARIMAX(1, 0, 4) Log Likelihood: 36.230  
Date: Fri, 05 Dec 2025 AIC: -48.459  
Time: 06:19:26 BIC: -12.989  
Sample: 01-02-2022 HQIC: -34.046  
- 10-20-2024

Covariance Type: opg

---

	coef	std err	z	P> z	[0.025	0.975]
x1	0.0716	0.055	1.298	0.194	-0.036	0.180
x2	-0.1862	0.025	-7.457	0.000	-0.235	-0.137
x3	0.0387	0.042	0.928	0.354	-0.043	0.121
x4	0.0105	0.032	0.332	0.740	-0.051	0.072
x5	0.0761	0.027	2.854	0.004	0.024	0.128
x6	-0.0108	0.018	-0.586	0.558	-0.047	0.025
ar.L1	0.8992	0.072	12.463	0.000	0.758	1.041
ma.L1	-0.4303	0.123	-3.511	0.000	-0.670	-0.190
ma.L2	0.0572	0.094	0.609	0.542	-0.127	0.241
ma.L3	0.2254	0.097	2.323	0.020	0.035	0.416
ma.L4	-0.1354	0.134	-1.008	0.313	-0.399	0.128
sigma2	0.0351	0.005	7.647	0.000	0.026	0.044

---

Ljung-Box (L1) (Q): 0.05 Jarque-Bera (JB): 0.35  
Prob(Q): 0.82 Prob(JB): 0.84  
Heteroskedasticity (H): 1.33 Skew: -0.10  
Prob(H) (two-sided): 0.33 Kurtosis: 3.14

---

## PM10 - TRANSFORMACIÓN

Frecuencia seleccionada: Diario  
AIC: -142.17974419087813  
MAE: 19.35202000210019  
RMSE: 28.680288024868332  
MAPE: 34.14869456397708  
R2: -0.1480999167280459  
LjungBox\_p: 0.3407926270962032  
JarqueBera\_p: 0.0  
best\_order: (3, 1, 1)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.115631	0.115631	6.249782e-09
3	PRS	-0.077850	0.077850	1.128335e-11
1	RH	-0.062673	0.062673	1.121057e-08
4	WSR	0.039865	0.039865	4.082030e-07
5	WDR	-0.019437	0.019437	1.893085e-03
2	SR	-0.004222	0.004222	7.356647e-01

SARIMAX Results

---

Dep. Variable:	PM10	No. Observations:	1021
Model:	SARIMAX(3, 1, 1)	Log Likelihood	82.090
Date:	Fri, 05 Dec 2025	AIC	-142.180
Time:	08:02:33	BIC	-88.009
Sample:	01-01-2022	HQIC	-121.608
	- 10-17-2024		
Covariance Type:	opg		

---

	coef	std err	z	P> z	[0.025	0.975]
x1	0.1156	0.020	5.810	0.000	0.077	0.155
x2	-0.0627	0.011	-5.711	0.000	-0.084	-0.041
x3	-0.0042	0.013	-0.338	0.736	-0.029	0.020
x4	-0.0778	0.011	-6.789	0.000	-0.100	-0.055
x5	0.0399	0.008	5.065	0.000	0.024	0.055
x6	-0.0194	0.006	-3.107	0.002	-0.032	-0.007
ar.L1	0.4835	0.033	14.685	0.000	0.419	0.548
ar.L2	-0.0514	0.036	-1.445	0.148	-0.121	0.018
ar.L3	0.1027	0.034	3.037	0.002	0.036	0.169
ma.L1	-0.9302	0.017	-53.790	0.000	-0.964	-0.896
sigma2	0.0497	0.002	25.229	0.000	0.046	0.054

---

Ljung-Box (L1) (Q):	0.00	Jarque-Bera (JB):	29.32
Prob(Q):	0.97	Prob(JB):	0.00
Heteroskedasticity (H):	1.08	Skew:	0.02
Prob(H) (two-sided):	0.48	Kurtosis:	3.83

---

Warnings:

```
[1] Covariance matrix calculated using the outer product of gradients
(complex-step).
```

Frecuencia seleccionada: Semanal

AIC: -74.12554817886544

MAE: 15.520654149740196

RMSE: 20.531651602800128

MAPE: 28.761609626813694

R2: -0.05874535424006044

LjungBox\_p: 0.8899086070328146

JarqueBera\_p: 0.0

best\_order: (3, 1, 1)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.072703	0.072703	0.001697
3	PRS	-0.067884	0.067884	0.012381
4	WSR	0.048904	0.048904	0.012019
2	SR	0.027686	0.027686	0.445102
5	WDR	-0.009027	0.009027	0.584830
0	TOUT	0.002155	0.002155	0.963460

SARIMAX Results

---

Dep. Variable:	PM10	No. Observations:	147
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```

Model: SARIMAX(3, 1, 1) Log Likelihood           48.063
Date:   Fri, 05 Dec 2025 AIC                  -74.126
Time:   08:02:33   BIC                  -41.534
Sample: 01-02-2022 HQIC                 -60.882
        - 10-20-2024
Covariance Type: opg
=====
            coef    std err      z   P>|z|    [0.025    0.975]
-----
x1      0.0022    0.047    0.046    0.963   -0.090    0.094
x2     -0.0727    0.023   -3.139    0.002   -0.118   -0.027
x3      0.0277    0.036    0.764    0.445   -0.043    0.099
x4     -0.0679    0.027   -2.501    0.012   -0.121   -0.015
x5      0.0489    0.019    2.512    0.012    0.011    0.087
x6     -0.0090    0.017   -0.546    0.585   -0.041    0.023
ar.L1     0.0374    0.234    0.160    0.873   -0.421    0.496
ar.L2     -0.2748    0.090   -3.062    0.002   -0.451   -0.099
ar.L3     -0.2328    0.140   -1.662    0.096   -0.507    0.042
ma.L1     -0.4056    0.211   -1.921    0.055   -0.819    0.008
sigma2     0.0299    0.003    9.783    0.000    0.024    0.036
=====
Ljung-Box (L1) (Q):          0.01   Jarque-Bera (JB):       13.32
Prob(Q):                      0.94   Prob(JB):             0.00
Heteroskedasticity (H):      1.74   Skew:                  0.37
Prob(H) (two-sided):         0.06   Kurtosis:              4.30
=====

```

## PM2.5

Frecuencia seleccionada: Diario  
AIC: 7085.100212496942  
MAE: 12.986293299475822  
RMSE: 16.388405226863135  
MAPE: 51.212653492641856  
R2: -1.0362101799177155  
LjungBox\_p: 0.6561086158966911  
JarqueBera\_p: 2.340977500320751e-268  
best\_order: (4, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
1	RH	3.869684	3.869684	2.164641e-20
0	TOUT	3.390221	3.390221	8.371408e-06
3	PRS	-2.487088	2.487088	3.210962e-09
2	SR	1.395479	1.395479	4.119761e-03
4	WSR	1.144455	1.144455	5.796500e-05
5	WDR	0.477638	0.477638	7.825609e-02

SARIMAX Results

=====

Dep. Variable:	PM2.5	No. Observations:	1021
Model:	SARIMAX(4, 1, 5)	Log Likelihood	-3526.550
Date:	Fri, 05 Dec 2025	AIC	7085.100
Time:	08:08:52	BIC	7163.847
Sample:	01-01-2022	HQIC	7115.009
	- 10-17-2024		
Covariance Type:	opg		

=====

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	3.3902	0.761	4.455	0.000	1.899	4.882
x2	3.8697	0.418	9.254	0.000	3.050	4.689
x3	1.3955	0.486	2.869	0.004	0.442	2.349
x4	-2.4871	0.420	-5.920	0.000	-3.310	-1.664
x5	1.1445	0.285	4.021	0.000	0.587	1.702
x6	0.4776	0.271	1.761	0.078	-0.054	1.009
ar.L1	-0.2914	0.082	-3.541	0.000	-0.453	-0.130
ar.L2	-0.3448	0.064	-5.414	0.000	-0.470	-0.220
ar.L3	-0.3624	0.072	-5.055	0.000	-0.503	-0.222
ar.L4	0.5061	0.052	9.734	0.000	0.404	0.608
ma.L1	-0.0274	0.089	-0.308	0.758	-0.201	0.147
ma.L2	0.0256	0.059	0.432	0.665	-0.091	0.142
ma.L3	0.0663	0.065	1.019	0.308	-0.061	0.194
ma.L4	-0.8024	0.057	-14.072	0.000	-0.914	-0.691
ma.L5	-0.0215	0.042	-0.516	0.606	-0.103	0.060
sigma2	61.2317	1.540	39.763	0.000	58.213	64.250
<hr/>						
Ljung-Box (L1) (Q):			0.01	Jarque-Bera (JB):		1288.09
Prob(Q):			0.93	Prob(JB):		0.00
Heteroskedasticity (H):			1.62	Skew:		0.81
Prob(H) (two-sided):			0.00	Kurtosis:		8.28
<hr/>						

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: 957.5721351798909

MAE: 5.745416309594452

RMSE: 7.242812104309437

MAPE: 31.24310886181575

R2: 0.0693998265330944

LjungBox\_p: 0.9799520402411008

JarqueBera\_p: 0.06879871222159889

best\_order: (1, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
3	PRS	-3.684080	3.684080	0.001293
0	TOUT	-3.656052	3.656052	0.030678
4	WSR	1.974873	1.974873	0.026774
2	SR	1.730735	1.730735	0.248698
1	RH	0.946814	0.946814	0.288043
5	WDR	-0.811603	0.811603	0.303558

#### SARIMAX Results

Dep. Variable:	PM2.5	No. Observations:	147
Model:	SARIMAX(1, 1, 5)	Log Likelihood	-465.786
Date:	Fri, 05 Dec 2025	AIC	957.572
Time:	08:08:52	BIC	995.813
Sample:	01-02-2022	HQIC	973.112
	- 10-20-2024		

Covariance Type:

opg

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	-3.6561	1.692	-2.161	0.031	-6.972	-0.340
x2	0.9468	0.891	1.062	0.288	-0.800	2.693
x3	1.7307	1.500	1.154	0.249	-1.210	4.671

x4	-3.6841	1.145	-3.218	0.001	-5.928	-1.440
x5	1.9749	0.892	2.215	0.027	0.227	3.723
x6	-0.8116	0.789	-1.029	0.304	-2.358	0.735
ar.L1	-0.2068	2.308	-0.090	0.929	-4.731	4.317
ma.L1	-0.3034	2.227	-0.136	0.892	-4.669	4.062
ma.L2	-0.3547	1.525	-0.233	0.816	-3.343	2.633
ma.L3	-0.2179	0.730	-0.298	0.765	-1.649	1.214
ma.L4	-0.1444	0.423	-0.342	0.733	-0.973	0.684
ma.L5	0.0219	0.263	0.083	0.934	-0.494	0.538
sigma2	45.1067	47.037	0.959	0.338	-47.085	137.298
=====						
Ljung-Box (L1) (Q):		0.01	Jarque-Bera (JB):		2.91	
Prob(Q):		0.93	Prob(JB):		0.23	
Heteroskedasticity (H):		1.93	Skew:		0.35	
Prob(H) (two-sided):		0.03	Kurtosis:		3.15	
=====						

## Y\_3 (Nitrogenos)

Frecuencia seleccionada: Diario

AIC: 886.4647626546864

MAE: 0.3944026321275913

RMSE: 0.5458039969082176

MAPE: 217.89492820656827

R2: 0.1945510600947924

LjungBox\_p: 0.08119445151610126

JarqueBera\_p: 0.0

best\_order: (5, 0, 4)

Variable	Coef	AbsImpact	Pvalue
4 WSR	0.194932	0.194932	1.713015e-46
3 PRS	-0.142520	0.142520	7.207214e-13
0 TOUT	-0.060128	0.060128	1.159477e-01
5 WDR	0.057029	0.057029	6.582760e-05
2 SR	0.044241	0.044241	6.850023e-02
1 RH	0.038771	0.038771	4.671549e-02

### SARIMAX Results

Dep. Variable:	Y_3	No. Observations:	1021
Model:	SARIMAX(5, 0, 4)	Log Likelihood	-427.232
Date:	Fri, 05 Dec 2025	AIC	886.465
Time:	06:46:48	BIC	965.243
Sample:	01-01-2022 - 10-17-2024	HQIC	916.383
Covariance Type:	opg		

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.0601	0.038	-1.572	0.116	-0.135	0.015
x2	0.0388	0.019	1.989	0.047	0.001	0.077
x3	0.0442	0.024	1.822	0.069	-0.003	0.092
x4	-0.1425	0.020	-7.175	0.000	-0.181	-0.104
x5	0.1949	0.014	14.317	0.000	0.168	0.222
x6	0.0570	0.014	3.991	0.000	0.029	0.085
ar.L1	1.1801	0.308	3.834	0.000	0.577	1.783
ar.L2	-1.0986	0.265	-4.141	0.000	-1.619	-0.579
ar.L3	1.4392	0.224	6.425	0.000	1.000	1.878
ar.L4	-0.7350	0.355	-2.068	0.039	-1.431	-0.038
ar.L5	0.1878	0.099	1.894	0.058	-0.007	0.382

ma.L1	-0.7360	0.309	-2.379	0.017	-1.342	-0.130
ma.L2	0.7332	0.138	5.300	0.000	0.462	1.004
ma.L3	-1.0348	0.177	-5.844	0.000	-1.382	-0.688
ma.L4	0.2756	0.274	1.007	0.314	-0.261	0.812
sigma2	0.1352	0.002	61.647	0.000	0.131	0.139
=====						
Ljung-Box (L1) (Q):		0.01	Jarque-Bera (JB):		32267.24	
Prob(Q):		0.91	Prob(JB):		0.00	
Heteroskedasticity (H):		2.38	Skew:		2.83	
Prob(H) (two-sided):		0.00	Kurtosis:		30.02	
=====						

Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -12.609548997361742

MAE: 0.22187609681982476

RMSE: 0.2949974779360867

MAPE: 92.678347558649

R2: 0.5407673600306306

LjungBox\_p: 0.49306585721285856

JarqueBera\_p: 5.117412811783007e-100

best\_order: (1, 0, 2)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	-0.206379	0.206379	0.001381
4	WSR	0.172460	0.172460	0.000001
3	PRS	-0.062617	0.062617	0.160603
2	SR	0.045094	0.045094	0.490209
5	WDR	0.014772	0.014772	0.498192
1	RH	-0.006604	0.006604	0.861573

SARIMAX Results

Dep. Variable:	Y_3	No. Observations:	147
Model:	SARIMAX(1, 0, 2)	Log Likelihood	16.305
Date:	Fri, 05 Dec 2025	AIC	-12.610
Time:	06:46:48	BIC	17.089
Sample:	01-02-2022	HQIC	-0.542
	- 10-20-2024		

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.2064	0.065	-3.199	0.001	-0.333	-0.080
x2	-0.0066	0.038	-0.174	0.862	-0.081	0.068
x3	0.0451	0.065	0.690	0.490	-0.083	0.173
x4	-0.0626	0.045	-1.403	0.161	-0.150	0.025
x5	0.1725	0.035	4.877	0.000	0.103	0.242
x6	0.0148	0.022	0.677	0.498	-0.028	0.058
ar.L1	0.8412	0.179	4.698	0.000	0.490	1.192
ma.L1	-1.2541	0.780	-1.607	0.108	-2.784	0.276
ma.L2	-0.4688	0.160	-2.929	0.003	-0.782	-0.155
sigma2	0.0193	0.017	1.127	0.260	-0.014	0.053

Ljung-Box (L1) (Q):	0.08	Jarque-Bera (JB):	413.82
Prob(Q):	0.78	Prob(JB):	0.00
Heteroskedasticity (H):	2.28	Skew:	1.84
Prob(H) (two-sided):	0.01	Kurtosis:	10.44

## Y\_4 (So2)

Frecuencia seleccionada: Diario

AIC: -948.6330585767315

MAE: 1.4491980957761759

RMSE: 2.1135877211590137

MAPE: 31.935381356776478

R2: 0.004654347516729995

LjungBox\_p: 4.840490884955569e-07

JarqueBera\_p: 0.0

best\_order: (5, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.051617	0.051617	3.279451e-10
2	SR	0.016179	0.016179	9.434218e-02
4	WSR	0.016136	0.016136	6.210195e-03
0	TOUT	0.010751	0.010751	4.435948e-01
3	PRS	-0.006050	0.006050	4.914095e-01
5	WDR	0.005642	0.005642	2.672389e-01

### SARIMAX Results

Dep. Variable:	Y_4	No. Observations:	1021
Model:	SARIMAX(5, 1, 5)	Log Likelihood	491.317
Date:	Fri, 05 Dec 2025	AIC	-948.633
Time:	07:54:57	BIC	-864.965
Sample:	01-01-2022	HQIC	-916.855
	- 10-17-2024		

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	0.0108	0.014	0.766	0.444	-0.017	0.038
x2	-0.0516	0.008	-6.285	0.000	-0.068	-0.036
x3	0.0162	0.010	1.673	0.094	-0.003	0.035
x4	-0.0061	0.009	-0.688	0.491	-0.023	0.011
x5	0.0161	0.006	2.736	0.006	0.005	0.028
x6	0.0056	0.005	1.109	0.267	-0.004	0.016
ar.L1	-1.2078	0.049	-24.490	0.000	-1.304	-1.111
ar.L2	-1.3405	0.077	-17.508	0.000	-1.491	-1.190
ar.L3	-0.7807	0.077	-10.150	0.000	-0.931	-0.630
ar.L4	-0.3739	0.053	-6.994	0.000	-0.479	-0.269
ar.L5	0.3084	0.033	9.464	0.000	0.245	0.372
ma.L1	0.7306	0.044	16.692	0.000	0.645	0.816
ma.L2	0.5509	0.053	10.355	0.000	0.447	0.655
ma.L3	-0.1725	0.043	-4.016	0.000	-0.257	-0.088
ma.L4	-0.3656	0.044	-8.324	0.000	-0.452	-0.280
ma.L5	-0.7494	0.028	-26.878	0.000	-0.804	-0.695
sigma2	0.0220	0.001	37.755	0.000	0.021	0.023

Ljung-Box (L1) (Q):	0.12	Jarque-Bera (JB):	928.09
Prob(Q):	0.73	Prob(JB):	0.00
Heteroskedasticity (H):	0.85	Skew:	0.57
Prob(H) (two-sided):	0.14	Kurtosis:	7.54

### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

```

AIC: -183.5454081194613
MAE: 1.157242677965069
RMSE: 1.5158827753507778
MAPE: 24.732972525126566
R2: 0.21173282264270898
LjungBox_p: 0.019300416528143596
JarqueBera_p: 0.0
best_order: (1, 1, 2)
      Variable      Coef    AbsImpact      Pvalue
1       RH -0.089249  0.089249  4.367398e-07
4       WSR  0.034436  0.034436  5.784078e-02
2       SR -0.016816  0.016816  4.697464e-01
3       PRS  0.015906  0.015906  3.795498e-01
5       WDR  0.006441  0.006441  5.899854e-01
0       TOUT 0.003371  0.003371  9.246198e-01
                                          SARIMAX Results
=====
Dep. Variable:                      Y_4      No. Observations:                  147
Model:                 SARIMAX(1, 1, 2)   Log Likelihood:                101.773
Date:                 Fri, 05 Dec 2025   AIC:                         -183.545
Time:                     07:54:57      BIC:                         -153.917
Sample:                   01-02-2022   HQIC:                        -171.506
                           - 10-20-2024
Covariance Type:            opg
=====
                                         coef      std err      z      P>|z|      [0.025      0.975]
-----
x1        0.0034     0.036     0.095     0.925     -0.066     0.073
x2       -0.0892     0.018    -5.052     0.000     -0.124    -0.055
x3       -0.0168     0.023    -0.723     0.470     -0.062     0.029
x4        0.0159     0.018     0.879     0.380     -0.020     0.051
x5        0.0344     0.018     1.897     0.058     -0.001     0.070
x6        0.0064     0.012     0.539     0.590     -0.017     0.030
ar.L1      -0.7193     0.302    -2.382     0.017     -1.311    -0.127
ma.L1       0.3756     0.307     1.225     0.220     -0.225     0.976
ma.L2      -0.3238     0.098    -3.315     0.001     -0.515    -0.132
sigma2      0.0141     0.001    11.768     0.000      0.012     0.016
=====
Ljung-Box (L1) (Q):                  0.06      Jarque-Bera (JB):          79.07
Prob(Q):                            0.81      Prob(JB):                  0.00
Heteroskedasticity (H):              0.87      Skew:                      -0.48
Prob(H) (two-sided):                 0.64      Kurtosis:                  6.52
=====
```

## SUROESTE 2 - URBANO

### Y\_1 ( OZONO)

Frecuencia seleccionada: Diario  
AIC: 345.3395940325213  
MAE: 0.3241988080952791  
RMSE: 0.3939111971520958  
MAPE: 153.55603482209227  
R2: 0.5082795488348025  
LjungBox\_p: 0.2951818662034459

```

JarqueBera_p: 6.100331545461569e-28
best_order: (3, 0, 5)
      Variable     Coef   AbsImpact      Pvalue
1       RH -0.205813  0.205813  1.460478e-33
2       SR  0.103174  0.103174  1.175007e-19
4       WSR -0.067761  0.067761  3.557037e-06
0       TOUT  0.064552  0.064552  6.424231e-02
3       PRS  0.034368  0.034368  7.922838e-02
5       WDR  0.032808  0.032808  4.059207e-02
      SARIMAX Results
=====
Dep. Variable:                      Y_1      No. Observations:          1021
Model:                 SARIMAX(3, 0, 5)   Log Likelihood:        -157.670
Date:                  Fri, 05 Dec 2025   AIC:                   345.340
Time:                      07:03:39      BIC:                   419.179
Sample:                 01-01-2022   HQIC:                  373.384
                           - 10-17-2024
Covariance Type:             opg
=====
            coef    std err      z   P>|z|    [0.025]   [0.975]
-----
x1       0.0646    0.035    1.850    0.064   -0.004    0.133
x2      -0.2058    0.017   -12.073   0.000   -0.239   -0.172
x3       0.1032    0.011     9.071   0.000    0.081    0.125
x4       0.0344    0.020     1.755    0.079   -0.004    0.073
x5      -0.0678    0.015    -4.636   0.000   -0.096   -0.039
x6       0.0328    0.016     2.048    0.041    0.001    0.064
ar.L1      0.0150    0.190     0.079    0.937   -0.357    0.387
ar.L2      0.3099    0.138     2.238    0.025    0.039    0.581
ar.L3      0.6377    0.170     3.752    0.000    0.305    0.971
ma.L1      0.6043    0.191     3.156    0.002    0.229    0.980
ma.L2      0.0068    0.135     0.050    0.960   -0.259    0.272
ma.L3     -0.6088    0.116    -5.244   0.000   -0.836   -0.381
ma.L4     -0.3132    0.070    -4.484   0.000   -0.450   -0.176
ma.L5     -0.0846    0.034    -2.479   0.013   -0.152   -0.018
sigma2     0.0798    0.003    27.296   0.000    0.074    0.085
=====
Ljung-Box (L1) (Q):                0.00   Jarque-Bera (JB):           121.43
Prob(Q):                            0.98   Prob(JB):                  0.00
Heteroskedasticity (H):              1.43   Skew:                     0.42
Prob(H) (two-sided):                  0.00   Kurtosis:                 4.47
=====
```

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -31.233138832634097

MAE: 0.31007549485816327

RMSE: 0.36130197002161746

MAPE: 115.85826311664982

R2: 0.35728487941353637

LjungBox\_p: 0.8543617993324917

JarqueBera\_p: 0.8627631367815001

best\_order: (3, 0, 1)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.234802	0.234802	1.557401e-20
0	TOUT	0.133982	0.133982	9.349071e-03
4	WSR	0.091105	0.091105	2.958285e-02

```

2      SR -0.068654  0.068654  5.469618e-02
5      WDR -0.059616  0.059616  1.775796e-01
3      PRS  0.032272  0.032272  3.012784e-01
                                         SARIMAX Results
=====
Dep. Variable:                  Y_1    No. Observations:                 147
Model:                          SARIMAX(3, 0, 1)    Log Likelihood            26.617
Date:                           Fri, 05 Dec 2025   AIC                   -31.233
Time:                            07:03:39        BIC                   1.435
Sample:                          01-02-2022      HQIC                  -17.959
                                  - 10-20-2024
Covariance Type:                opg
=====
                                                coef      std err       z     P>|z|      [0.025      0.975]
-----
x1      0.1340      0.052      2.599      0.009      0.033      0.235
x2     -0.2348      0.025     -9.289      0.000     -0.284     -0.185
x3     -0.0687      0.036     -1.921      0.055     -0.139      0.001
x4      0.0323      0.031      1.034      0.301     -0.029      0.093
x5      0.0911      0.042      2.176      0.030      0.009      0.173
x6     -0.0596      0.044     -1.348      0.178     -0.146      0.027
ar.L1   -0.1568      0.137     -1.148      0.251     -0.424      0.111
ar.L2    0.5594      0.111      5.019      0.000      0.341      0.778
ar.L3    0.3433      0.095      3.618      0.000      0.157      0.529
ma.L1   0.8079      0.124      6.512      0.000      0.565      1.051
sigma2  0.0402      0.005      7.549      0.000      0.030      0.051
=====
Ljung-Box (L1) (Q):             0.00    Jarque-Bera (JB):           0.39
Prob(Q):                      1.00    Prob(JB):                  0.82
Heteroskedasticity (H):         1.27    Skew:                     0.01
Prob(H) (two-sided):            0.41    Kurtosis:                 2.75
=====

```

## PM10 - TRANSFORMACIÓN

```

Frecuencia seleccionada: Diario
AIC: 355.4121924534329
MAE: 21.259733829012646
RMSE: 32.3143722049684
MAPE: 33.810497512683796
R2: -0.41284578820351436
LjungBox_p: 0.12770751494660518
JarqueBera_p: 0.0
best_order: (5, 1, 3)
      Variable      Coef      AbsImpact      Pvalue
3      PRS -0.124036  0.124036  5.067680e-14
0      TOUT  0.097215  0.097215  1.066428e-03
4      WSR  0.069618  0.069618  5.259326e-07
5      WDR -0.043418  0.043418  1.851728e-03
2      SR   0.016436  0.016436  3.240149e-01
1      RH  -0.010378  0.010378  4.644865e-01
                                         SARIMAX Results
=====

```

```

Dep. Variable:                  PM10    No. Observations:                 1021
Model:                          SARIMAX(5, 1, 3)    Log Likelihood            -162.706
Date:                           Fri, 05 Dec 2025   AIC                   355.412
Time:                            08:15:54        BIC                   429.252
Sample:                          01-01-2022      HQIC                  383.456
=====
```

- 10-17-2024

Covariance Type:

opg

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	0.0972	0.030	3.272	0.001	0.039	0.155
x2	-0.0104	0.014	-0.731	0.464	-0.038	0.017
x3	0.0164	0.017	0.986	0.324	-0.016	0.049
x4	-0.1240	0.016	-7.530	0.000	-0.156	-0.092
x5	0.0696	0.014	5.017	0.000	0.042	0.097
x6	-0.0434	0.014	-3.113	0.002	-0.071	-0.016
ar.L1	-0.4673	0.025	-18.429	0.000	-0.517	-0.418
ar.L2	-0.4315	0.030	-14.256	0.000	-0.491	-0.372
ar.L3	0.5566	0.036	15.340	0.000	0.486	0.628
ar.L4	-0.0054	0.032	-0.167	0.867	-0.068	0.058
ar.L5	0.0811	0.031	2.654	0.008	0.021	0.141
ma.L1	0.1155	0.019	6.062	0.000	0.078	0.153
ma.L2	-0.0430	0.019	-2.311	0.021	-0.079	-0.007
ma.L3	-0.9346	0.018	-52.343	0.000	-0.970	-0.900
sigma2	0.0801	0.003	28.752	0.000	0.075	0.086
<hr/>						
Ljung-Box (L1) (Q):			0.01	Jarque-Bera (JB):		381.32
Prob(Q):			0.93	Prob(JB):		0.00
Heteroskedasticity (H):			1.12	Skew:		0.52
Prob(H) (two-sided):			0.30	Kurtosis:		5.82
<hr/>						

Warnings:

[1] Covariance matrix calculated using the outer product of gradients  
(complex-step).

Frecuencia seleccionada: Semanal

AIC: 36.09921177495954

MAE: 15.80127598927988

RMSE: 19.33712863625134

MAPE: 30.32305493600419

R2: -0.025193140998105656

LjungBox\_p: 0.9884612549552779

JarqueBera\_p: 0.0

best\_order: (1, 1, 1)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	-0.176854	0.176854	0.013451
3	PRS	-0.171671	0.171671	0.000071
1	RH	-0.098576	0.098576	0.005303
2	SR	0.060531	0.060531	0.286934
4	WSR	0.043504	0.043504	0.500408
5	WDR	0.037010	0.037010	0.543190

#### SARIMAX Results

Dep. Variable:	PM10	No. Observations:	147
Model:	SARIMAX(1, 1, 1)	Log Likelihood	-9.050
Date:	Fri, 05 Dec 2025	AIC	36.099
Time:	08:15:54	BIC	62.828
Sample:	01-02-2022	HQIC	46.960
- 10-20-2024			

Covariance Type:

opg

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	-0.1769	0.072	-2.472	0.013	-0.317	-0.037

```

x2          -0.0986    0.035    -2.788    0.005    -0.168    -0.029
x3           0.0605    0.057     1.065    0.287    -0.051     0.172
x4          -0.1717    0.043    -3.973    0.000    -0.256    -0.087
x5           0.0435    0.065     0.674    0.500    -0.083     0.170
x6           0.0370    0.061     0.608    0.543    -0.082     0.156
ar.L1        0.0106    0.111     0.095    0.924    -0.208     0.229
ma.L1       -0.8578    0.085   -10.109    0.000    -1.024    -0.692
sigma2       0.0660    0.005    13.449    0.000     0.056     0.076
=====
Ljung-Box (L1) (Q):                  0.00  Jarque-Bera (JB):            1521.33
Prob(Q):                           0.99  Prob(JB):                   0.00
Heteroskedasticity (H):             2.55  Skew:                      2.38
Prob(H) (two-sided):               0.00  Kurtosis:                 18.19
=====

```

## PM2.5

Frecuencia seleccionada: Diario

AIC: 261.79917528347255

MAE: 8.018496265820362

RMSE: 10.377365744227452

MAPE: 37.94228517133573

R2: -0.8043580703774158

LjungBox\_p: 0.9862347341067903

JarqueBera\_p: 0.0

best\_order: (1, 1, 3)

	Variable	Coef	AbsImpact	Pvalue
1	RH	0.146377	0.146377	3.534875e-23
3	PRS	-0.144270	0.144270	4.038487e-18
0	TOUT	0.108520	0.108520	8.476877e-05
4	WSR	0.074857	0.074857	3.303964e-08
2	SR	0.050779	0.050779	5.085912e-04
5	WDR	-0.035815	0.035815	5.506214e-03

### SARIMAX Results

Dep. Variable:	PM2.5	No. Observations:	1021
Model:	SARIMAX(1, 1, 3)	Log Likelihood	-119.900
Date:	Fri, 05 Dec 2025	AIC	261.799
Time:	08:21:58	BIC	315.959
Sample:	01-01-2022	HQIC	282.368
	- 10-17-2024		

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	0.1085	0.028	3.931	0.000	0.054	0.163
x2	0.1464	0.015	9.916	0.000	0.117	0.175
x3	0.0508	0.015	3.476	0.001	0.022	0.079
x4	-0.1443	0.017	-8.678	0.000	-0.177	-0.112
x5	0.0749	0.014	5.525	0.000	0.048	0.101
x6	-0.0358	0.013	-2.776	0.006	-0.061	-0.011
ar.L1	0.6142	0.114	5.407	0.000	0.392	0.837
ma.L1	-0.9774	0.118	-8.279	0.000	-1.209	-0.746
ma.L2	-0.0663	0.057	-1.172	0.241	-0.177	0.045
ma.L3	0.0909	0.064	1.412	0.158	-0.035	0.217
sigma2	0.0740	0.003	27.348	0.000	0.069	0.079

Ljung-Box (L1) (Q): 0.00 Jarque-Bera (JB): 80.78

```

Prob(Q) : 0.99   Prob(JB) : 0.00
Heteroskedasticity (H) : 0.86   Skew: -0.25
Prob(H) (two-sided) : 0.16   Kurtosis: 4.29
=====

```

Warnings:

[1] Covariance matrix calculated using the outer product of gradients  
(complex-step).

Frecuencia seleccionada: Semanal

AIC: -8.166455395312596

MAE: 7.170823248303205

RMSE: 8.414803361846085

MAPE: 34.687002003544514

R2: -1.9593445095428499

LjungBox\_p: 0.0008680258454297347

JarqueBera\_p: 0.0

best\_order: (4, 1, 3)

	Variable	Coef	AbsImpact	Pvalue
4	WSR	0.186179	0.186179	0.002782
3	PRS	-0.093800	0.093800	0.008742
2	SR	0.089524	0.089524	0.039759
1	RH	0.067620	0.067620	0.027262
5	WDR	-0.042238	0.042238	0.286306
0	TOUT	-0.009919	0.009919	0.881703

#### SARIMAX Results

```

=====
Dep. Variable: PM2.5 No. Observations: 147
Model: SARIMAX(4, 1, 3) Log Likelihood: 18.083
Date: Fri, 05 Dec 2025 AIC: -8.166
Time: 08:21:58 BIC: 33.215
Sample: 01-02-2022 HQIC: 8.649
- 10-20-2024

```

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.0099	0.067	-0.149	0.882	-0.141	0.121
x2	0.0676	0.031	2.208	0.027	0.008	0.128
x3	0.0895	0.044	2.056	0.040	0.004	0.175
x4	-0.0938	0.036	-2.622	0.009	-0.164	-0.024
x5	0.1862	0.062	2.991	0.003	0.064	0.308
x6	-0.0422	0.040	-1.066	0.286	-0.120	0.035
ar.L1	-0.7221	0.123	-5.859	0.000	-0.964	-0.481
ar.L2	-0.7573	0.186	-4.065	0.000	-1.122	-0.392
ar.L3	-0.0083	0.199	-0.042	0.967	-0.398	0.382
ar.L4	-0.2287	0.112	-2.038	0.042	-0.449	-0.009
ma.L1	0.2380	18.776	0.013	0.990	-36.562	37.038
ma.L2	0.3040	25.462	0.012	0.990	-49.600	50.208
ma.L3	-0.7236	28.281	-0.026	0.980	-56.154	54.707
sigma2	0.0430	1.681	0.026	0.980	-3.251	3.337

```

=====
Ljung-Box (L1) (Q): 0.05 Jarque-Bera (JB): 4.99
Prob(Q) : 0.82 Prob(JB) : 0.08
Heteroskedasticity (H) : 1.28 Skew: -0.01
Prob(H) (two-sided) : 0.40 Kurtosis: 3.92
=====
```

# Y\_3 (Nitrogenos)

Frecuencia seleccionada: Diario

AIC: 903.72690991995

MAE: 0.41347627842933643

RMSE: 0.5417981588072093

MAPE: 204.7474687616994

R2: 0.1226059649470439

LjungBox\_p: 0.5860468765675926

JarqueBera\_p: 0.0

best\_order: (3, 0, 5)

	Variable	Coef	AbsImpact	Pvalue
3	PRS	-0.217620	0.217620	2.851316e-19
0	TOUT	-0.153117	0.153117	4.134799e-04
4	WSR	0.131754	0.131754	5.981656e-07
5	WDR	-0.065900	0.065900	6.096517e-04
2	SR	-0.028894	0.028894	1.694278e-01
1	RH	0.025672	0.025672	2.734365e-01

## SARIMAX Results

Dep. Variable:	Y_3	No. Observations:	1021
Model:	SARIMAX(3, 0, 5)	Log Likelihood	-436.863
Date:	Fri, 05 Dec 2025	AIC	903.727
Time:	07:08:31	BIC	977.567
Sample:	01-01-2022	HQIC	931.771
	- 10-17-2024		

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.1531	0.043	-3.531	0.000	-0.238	-0.068
x2	0.0257	0.023	1.095	0.273	-0.020	0.072
x3	-0.0289	0.021	-1.374	0.169	-0.070	0.012
x4	-0.2176	0.024	-8.974	0.000	-0.265	-0.170
x5	0.1318	0.026	4.992	0.000	0.080	0.183
x6	-0.0659	0.019	-3.427	0.001	-0.104	-0.028
ar.L1	0.5350	0.018	29.468	0.000	0.499	0.571
ar.L2	-0.5011	0.023	-21.690	0.000	-0.546	-0.456
ar.L3	0.9286	0.018	52.051	0.000	0.894	0.964
ma.L1	0.0983	0.024	4.100	0.000	0.051	0.145
ma.L2	0.4278	0.028	15.372	0.000	0.373	0.482
ma.L3	-0.6773	0.028	-23.914	0.000	-0.733	-0.622
ma.L4	-0.3658	0.027	-13.336	0.000	-0.420	-0.312
ma.L5	-0.1277	0.026	-4.897	0.000	-0.179	-0.077
sigma2	0.1378	0.003	48.423	0.000	0.132	0.143

Ljung-Box (L1) (Q):	0.01	Jarque-Bera (JB):	10274.47
Prob(Q):	0.93	Prob(JB):	0.00
Heteroskedasticity (H):	1.61	Skew:	2.18
Prob(H) (two-sided):	0.00	Kurtosis:	17.97

## Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: 39.367451488415284

MAE: 0.22717692575387427

RMSE: 0.2838304654373928  
 MAPE: 131.85316674544717  
 R2: 0.5833211956779352  
 LjungBox\_p: 0.4986451979529185  
 JarqueBera\_p: 0.0  
 best\_order: (1, 0, 1)

Variable	Coef	AbsImpact	Pvalue
0 TOUT	-0.175376	0.175376	0.011555
2 SR	-0.119154	0.119154	0.025509
4 WSR	0.116130	0.116130	0.052986
5 WDR	-0.068727	0.068727	0.290244
1 RH	-0.063662	0.063662	0.140746
3 PRS	-0.043081	0.043081	0.411541

SARIMAX Results

---

Dep. Variable: Y\_3 No. Observations: 147  
 Model: SARIMAX(1, 0, 1) Log Likelihood: -10.684  
 Date: Fri, 05 Dec 2025 AIC: 39.367  
 Time: 07:08:31 BIC: 66.158  
 Sample: 01-02-2022 HQIC: 50.253  
 - 10-20-2024

Covariance Type: opg

---

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.1754	0.069	-2.525	0.012	-0.311	-0.039
x2	-0.0637	0.043	-1.473	0.141	-0.148	0.021
x3	-0.1192	0.053	-2.234	0.026	-0.224	-0.015
x4	-0.0431	0.052	-0.821	0.412	-0.146	0.060
x5	0.1161	0.060	1.935	0.053	-0.001	0.234
x6	-0.0687	0.065	-1.058	0.290	-0.196	0.059
ar.L1	0.8727	0.109	8.006	0.000	0.659	1.086
ma.L1	-0.6480	0.140	-4.620	0.000	-0.923	-0.373
sigma2	0.0676	0.003	22.580	0.000	0.062	0.073

---

Ljung-Box (L1) (Q): 0.16 Jarque-Bera (JB): 2407.84  
 Prob(Q): 0.69 Prob(JB): 0.00  
 Heteroskedasticity (H): 1.58 Skew: 3.27  
 Prob(H) (two-sided): 0.12 Kurtosis: 21.86

---

## Y\_4 (So2) - Transformación

Frecuencia seleccionada: Diario  
 AIC: -866.2154668628232  
 MAE: 1.4683785332854753  
 RMSE: 2.1907328692553207  
 MAPE: 24.340141617854158  
 R2: -0.3881818061715976  
 LjungBox\_p: 0.4235092906615231  
 JarqueBera\_p: 0.0  
 best\_order: (4, 1, 4)

Variable	Coef	AbsImpact	Pvalue
----------	------	-----------	--------

```

1      RH -0.055130  0.055130  5.834383e-10
3      PRS -0.047617  0.047617  6.262667e-07
4      WSR  0.019235  0.019235  4.329375e-02
2      SR   0.014454  0.014454  1.609573e-01
5      WDR  0.007024  0.007024  4.615533e-01
0      TOUT -0.005604  0.005604  7.367090e-01

                                         SARIMAX Results
=====
Dep. Variable:                  Y_4      No. Observations:                 1021
Model:                          SARIMAX(4, 1, 4)    Log Likelihood            448.108
Date:                          Fri, 05 Dec 2025   AIC                  -866.215
Time:                           08:19:53        BIC                  -792.376
Sample:                         01-01-2022    HQIC                  -838.172
                                  - 10-17-2024
Covariance Type:                opg
=====

          coef      std err       z      P>|z|      [0.025      0.975]
-----
x1      -0.0056      0.017     -0.336     0.737     -0.038      0.027
x2      -0.0551      0.009     -6.195     0.000     -0.073     -0.038
x3       0.0145      0.010      1.402     0.161     -0.006      0.035
x4      -0.0476      0.010     -4.983     0.000     -0.066     -0.029
x5       0.0192      0.010      2.021     0.043      0.001      0.038
x6       0.0070      0.010      0.736     0.462     -0.012      0.026
ar.L1    -0.0192      0.086     -0.222     0.824     -0.188      0.150
ar.L2    -0.3513      0.066     -5.312     0.000     -0.481     -0.222
ar.L3    -0.5808      0.092     -6.289     0.000     -0.762     -0.400
ar.L4     0.4252      0.038     11.128     0.000      0.350      0.500
ma.L1    -0.4705      0.091     -5.182     0.000     -0.648     -0.293
ma.L2     0.1958      0.117      1.668     0.095     -0.034      0.426
ma.L3     0.2868      0.123      2.341     0.019      0.047      0.527
ma.L4    -0.7962      0.079     -10.109     0.000     -0.951     -0.642
sigma2   0.0241      0.001     36.267     0.000      0.023      0.025
=====

Ljung-Box (L1) (Q):             0.07      Jarque-Bera (JB):           889.33
Prob(Q):                      0.80      Prob(JB):                   0.00
Heteroskedasticity (H):        0.98      Skew:                      0.30
Prob(H) (two-sided):           0.82      Kurtosis:                  7.55
=====
```

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -180.9865260698069

MAE: 1.9571405271676336

RMSE: 2.2275947963833045

MAPE: 36.8289416764158

R2: -2.2475057235697244

LjungBox\_p: 0.9287676799128202

JarqueBera\_p: 0.0

best\_order: (2, 0, 1)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.093604	0.093604	2.362493e-14
0	TOUT	-0.024867	0.024867	3.175009e-01
4	WSR	0.018817	0.018817	5.185544e-01
3	PRS	-0.012148	0.012148	4.169638e-01
5	WDR	-0.008820	0.008820	7.196944e-01
2	SR	-0.007692	0.007692	7.212222e-01

```

SARIMAX Results
=====
Dep. Variable:          Y_4    No. Observations:             147
Model:                 SARIMAX(2, 0, 1) Log Likelihood       100.493
Date:                  Fri, 05 Dec 2025   AIC                  -180.987
Time:                  08:19:53      BIC                  -151.219
Sample:                01-02-2022   HQIC                 -168.891
                           - 10-20-2024
Covariance Type:        opg
=====
            coef      std err      z      P>|z|      [0.025]      [0.975]
-----
x1     -0.0249      0.025    -1.000      0.318     -0.074      0.024
x2     -0.0936      0.012    -7.629      0.000     -0.118     -0.070
x3     -0.0077      0.022    -0.357      0.721     -0.050      0.035
x4     -0.0121      0.015    -0.812      0.417     -0.041      0.017
x5      0.0188      0.029     0.646      0.519     -0.038      0.076
x6     -0.0088      0.025    -0.359      0.720     -0.057      0.039
ar.L1     1.3562      0.072   18.871      0.000      1.215      1.497
ar.L2     -0.3575      0.072   -4.977      0.000     -0.498     -0.217
ma.L1     -0.9995      1.139   -0.878      0.380     -3.232      1.233
sigma2     0.0139      0.016     0.869      0.385     -0.017      0.045
=====
Ljung-Box (L1) (Q):      0.50    Jarque-Bera (JB):        0.33
Prob(Q):                  0.48    Prob(JB):              0.85
Heteroskedasticity (H):    1.89    Skew:                  0.10
Prob(H) (two-sided):      0.03    Kurtosis:            3.14
=====

```

## NORTE 2 - INDUSTRIAL

### Y\_1 ( OZONO)

Frecuencia seleccionada: Diario  
AIC: 232.55968857695873  
MAE: 0.34799270855878306  
RMSE: 0.4182940977191583  
MAPE: 121.46340428185911  
R2: 0.3963860172118099  
LjungBox\_p: 0.3964766849358181  
JarqueBera\_p: 2.023924932064266e-15  
best\_order: (2, 0, 1)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.142495	0.142495	6.636553e-22
2	SR	0.121839	0.121839	5.515327e-14
4	WSR	-0.084403	0.084403	9.547449e-15
0	TOUT	-0.058357	0.058357	6.680272e-02
5	WDR	0.023648	0.023648	1.276116e-02
3	PRS	-0.011343	0.011343	5.055726e-01

```

SARIMAX Results
=====
Dep. Variable:          Y_1    No. Observations:             1021
Model:                 SARIMAX(2, 0, 1) Log Likelihood       -106.280
Date:                  Fri, 05 Dec 2025   AIC                  232.560
Time:                  07:21:13      BIC                  281.825
Sample:                01-01-2022   HQIC                 251.267
=====
```

- 10-17-2024

Covariance Type:

opg

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	-0.0584	0.032	-1.833	0.067	-0.121	0.004
x2	-0.1425	0.015	-9.619	0.000	-0.172	-0.113
x3	0.1218	0.016	7.519	0.000	0.090	0.154
x4	-0.0113	0.017	-0.666	0.506	-0.045	0.022
x5	-0.0844	0.011	-7.745	0.000	-0.106	-0.063
x6	0.0236	0.009	2.490	0.013	0.005	0.042
ar.L1	1.4903	0.034	43.323	0.000	1.423	1.558
ar.L2	-0.4978	0.032	-15.353	0.000	-0.561	-0.434
ma.L1	-1.0868	0.024	-45.486	0.000	-1.134	-1.040
sigma2	0.0610	0.004	16.577	0.000	0.054	0.068
<hr/>						
Ljung-Box (L1) (Q):			0.00	Jarque-Bera (JB):		68.19
Prob(Q):			0.98	Prob(JB):		0.00
Heteroskedasticity (H):			1.64	Skew:		0.12
Prob(H) (two-sided):			0.00	Kurtosis:		4.24
<hr/>						

Warnings:

[1] Covariance matrix calculated using the outer product of gradients  
(complex-step).

Frecuencia seleccionada: Semanal

AIC: -54.10340166337568

MAE: 0.2935384053613612

RMSE: 0.3375005557239387

MAPE: 162.69657900882407

R2: 0.4430788240491551

LjungBox\_p: 0.9812274241359114

JarqueBera\_p: 0.011396010972098742

best\_order: (3, 0, 2)

Variable	Coef	AbsImpact	Pvalue
1 RH	-0.145015	0.145015	0.000004
0 TOUT	0.087073	0.087073	0.109934
2 SR	0.053656	0.053656	0.245965
5 WDR	-0.039902	0.039902	0.123310
4 WSR	0.029447	0.029447	0.358811
3 PRS	-0.000447	0.000447	0.988650

#### SARIMAX Results

Dep. Variable:	Y_1	No. Observations:	147
Model:	SARIMAX(3, 0, 2)	Log Likelihood	39.052
Date:	Fri, 05 Dec 2025	AIC	-54.103
Time:	07:21:13	BIC	-18.466
Sample:	01-02-2022	HQIC	-39.622
- 10-20-2024			

Covariance Type:

opg

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	0.0871	0.054	1.598	0.110	-0.020	0.194
x2	-0.1450	0.031	-4.615	0.000	-0.207	-0.083
x3	0.0537	0.046	1.160	0.246	-0.037	0.144
x4	-0.0004	0.031	-0.014	0.989	-0.062	0.061
x5	0.0294	0.032	0.918	0.359	-0.033	0.092
x6	-0.0399	0.026	-1.541	0.123	-0.091	0.011

ar.L1	0.5757	0.199	2.889	0.004	0.185	0.966
ar.L2	-0.3422	0.214	-1.599	0.110	-0.762	0.077
ar.L3	0.4809	0.113	4.267	0.000	0.260	0.702
ma.L1	-0.1322	0.229	-0.577	0.564	-0.581	0.317
ma.L2	0.4998	0.175	2.858	0.004	0.157	0.843
sigma2	0.0339	0.004	7.553	0.000	0.025	0.043
<hr/>						
Ljung-Box (L1) (Q):		0.00	Jarque-Bera (JB):		0.05	
Prob(Q):		1.00	Prob(JB):		0.98	
Heteroskedasticity (H):		1.75	Skew:		0.04	
Prob(H) (two-sided):		0.05	Kurtosis:		3.01	
<hr/>						

## PM10 - TRANSFORMACIÓN

Frecuencia seleccionada: Diario

AIC: 275.58089579793784

MAE: 25.84912249502183

RMSE: 34.44607573042068

MAPE: 41.04885731063146

R2: -0.10745930671931347

LjungBox\_p: 0.0008659181540039678

JarqueBera\_p: 0.0

best\_order: (2, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.191824	0.191824	3.554007e-13
1	RH	-0.087656	0.087656	1.517244e-09
3	PRS	-0.079439	0.079439	1.052230e-07
4	WSR	0.071629	0.071629	1.420475e-11
2	SR	0.025593	0.025593	1.669862e-01
5	WDR	-0.005429	0.005429	4.466935e-01

### SARIMAX Results

---

Dep. Variable:	PM10	No. Observations:	1021
Model:	SARIMAX(2, 1, 5)	Log Likelihood	-123.790
Date:	Fri, 05 Dec 2025	AIC	275.581
Time:	08:24:19	BIC	344.484
Sample:	01-01-2022	HQIC	301.751
	- 10-17-2024		

Covariance Type: opg

---

	coef	std err	z	P> z	[0.025	0.975]
x1	0.1918	0.026	7.272	0.000	0.140	0.244
x2	-0.0877	0.015	-6.043	0.000	-0.116	-0.059
x3	0.0256	0.019	1.382	0.167	-0.011	0.062
x4	-0.0794	0.015	-5.317	0.000	-0.109	-0.050
x5	0.0716	0.011	6.756	0.000	0.051	0.092
x6	-0.0054	0.007	-0.761	0.447	-0.019	0.009
ar.L1	-0.4444	0.001	-311.874	0.000	-0.447	-0.442
ar.L2	-0.9997	0.001	-767.714	0.000	-1.002	-0.997
ma.L1	-0.0591	0.053	-1.119	0.263	-0.163	0.044
ma.L2	0.5557	0.167	3.332	0.001	0.229	0.883
ma.L3	-0.6933	0.105	-6.580	0.000	-0.900	-0.487
ma.L4	-0.2660	0.062	-4.315	0.000	-0.387	-0.145
ma.L5	-0.0954	0.034	-2.780	0.005	-0.163	-0.028

```

sigma2      0.0742      0.014      5.158      0.000      0.046      0.102
=====
Ljung-Box (L1) (Q):          0.01    Jarque-Bera (JB):        20.15
Prob(Q):                  0.93    Prob(JB):            0.00
Heteroskedasticity (H):     1.17    Skew:                 -0.03
Prob(H) (two-sided):        0.16    Kurtosis:           3.69
=====

Warnings:
[1] Covariance matrix calculated using the outer product of gradients
(complex-step).

Frecuencia seleccionada: Semanal
AIC: -39.31099222467827
MAE: 18.844449470301363
RMSE: 23.12960624983888
MAPE: 30.335755853590157
R2: 0.045110887558871826
LjungBox_p: 0.9089726774662158
JarqueBera_p: 0.0
best_order: (1, 1, 1)

      Variable      Coef      AbsImpact      Pvalue
1       RH -0.125940  0.125940  0.000092
4       WSR  0.069527  0.069527  0.015751
3       PRS -0.053171  0.053171  0.065210
5       WDR  0.040805  0.040805  0.070531
2       SR -0.018507  0.018507  0.727029
0       TOUT 0.007151  0.007151  0.893533

SARIMAX Results
=====
Dep. Variable:                      PM10      No. Observations:             147
Model:                SARIMAX(1, 1, 1)      Log Likelihood:          28.655
Date:                Fri, 05 Dec 2025      AIC:                  -39.311
Time:                08:24:19            BIC:                  -12.583
Sample:               01-02-2022      HQIC:                  -28.450
                           - 10-20-2024

Covariance Type:                    opg

      coef      std err      z      P>|z|      [0.025      0.975]
-----
x1      0.0072      0.053      0.134      0.894      -0.098      0.112
x2     -0.1259      0.032     -3.912      0.000      -0.189      -0.063
x3     -0.0185      0.053     -0.349      0.727      -0.122      0.085
x4     -0.0532      0.029     -1.844      0.065      -0.110      0.003
x5      0.0695      0.029      2.415      0.016      0.013      0.126
x6      0.0408      0.023      1.808      0.071      -0.003      0.085
ar.L1     0.3397      0.157      2.168      0.030      0.033      0.647
ma.L1    -0.7563      0.107     -7.077      0.000      -0.966      -0.547
sigma2    0.0392      0.005      7.225      0.000      0.029      0.050
=====

Ljung-Box (L1) (Q):          0.06    Jarque-Bera (JB):        0.92
Prob(Q):                  0.81    Prob(JB):            0.63
Heteroskedasticity (H):     1.35    Skew:                 0.19
Prob(H) (two-sided):        0.30    Kurtosis:           3.10
=====
```

# PM2.5 - TRANSFORMACION

Frecuencia seleccionada: Diario

AIC: 382.63956647721056

MAE: 6.890106549316632

RMSE: 9.079253577029432

MAPE: 35.75596653516606

R2: -0.20346798316138504

LjungBox\_p: 0.36244037228086523

JarqueBera\_p: 0.0

best\_order: (1, 1, 2)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.211950	0.211950	5.836808e-15
1	RH	0.109078	0.109078	3.402751e-13
3	PRS	-0.103217	0.103217	6.220699e-10
5	WDR	0.080600	0.080600	2.368403e-19
4	WSR	0.059662	0.059662	1.199975e-06
2	SR	0.059199	0.059199	2.102766e-03

## SARIMAX Results

```
=====
Dep. Variable:                  PM2.5      No. Observations:                 1021
Model: SARIMAX(1, 1, 2)          Log Likelihood:                -181.320
Date: Fri, 05 Dec 2025          AIC:                         382.640
Time: 08:27:55                 BIC:                         431.886
Sample: 01-01-2022 - 10-17-2024 HQIC:                         401.341
Covariance Type: opg
```

	coef	std err	z	P> z	[0.025	0.975]
x1	0.2119	0.027	7.807	0.000	0.159	0.265
x2	0.1091	0.015	7.277	0.000	0.080	0.138
x3	0.0592	0.019	3.075	0.002	0.021	0.097
x4	-0.1032	0.017	-6.185	0.000	-0.136	-0.071
x5	0.0597	0.012	4.856	0.000	0.036	0.084
x6	0.0806	0.009	8.995	0.000	0.063	0.098
ar.L1	0.4415	0.082	5.381	0.000	0.281	0.602
ma.L1	-0.9090	0.086	-10.588	0.000	-1.077	-0.741
ma.L2	0.0021	0.067	0.031	0.975	-0.130	0.134
sigma2	0.0835	0.003	27.538	0.000	0.078	0.089

```
=====
Ljung-Box (L1) (Q):             0.00      Jarque-Bera (JB):            51.77
Prob(Q):                      1.00      Prob(JB):                   0.00
Heteroskedasticity (H):        1.17      Skew:                      0.06
Prob(H) (two-sided):           0.14      Kurtosis:                  4.10
=====
```

Warnings:

[1] Covariance matrix calculated using the outer product of gradients  
(complex-step).

Frecuencia seleccionada: Semanal

AIC: -7.855576827734261

MAE: 5.171787647300436

RMSE: 6.218020621761753

MAPE: 27.47068334696471

R2: -0.6192679450092871

LjungBox\_p: 0.871650309918927

JarqueBera\_p: 0.0

```

best_order: (1, 1, 1)
      Variable      Coef    AbsImpact      Pvalue
0       TOUT  0.094417  0.094417  0.129838
4       WSR   0.069684  0.069684  0.028208
3       PRS  -0.068369  0.068369  0.055175
5       WDR   0.033922  0.033922  0.167336
1       RH   0.015950  0.015950  0.647026
2       SR  -0.001579  0.001579  0.976428

SARIMAX Results
=====
Dep. Variable:                  PM2.5      No. Observations:             147
Model: SARIMAX(1, 1, 1)          Log Likelihood:                 12.928
Date: Fri, 05 Dec 2025           AIC:                         -7.856
Time: 08:27:55                  BIC:                         18.873
Sample: 01-02-2022 : - 10-20-2024 HQIC:                         3.005

Covariance Type:                opg

=====

            coef      std err      z      P>|z|      [0.025      0.975]
-----
x1       0.0944     0.062     1.515     0.130     -0.028     0.217
x2       0.0159     0.035     0.458     0.647     -0.052     0.084
x3      -0.0016     0.053    -0.030     0.976     -0.106     0.103
x4      -0.0684     0.036    -1.917     0.055     -0.138     0.002
x5       0.0697     0.032     2.194     0.028     0.007     0.132
x6       0.0339     0.025     1.381     0.167     -0.014     0.082
ar.L1     0.3553     0.126     2.817     0.005     0.108     0.603
ma.L1    -0.7938     0.087    -9.155     0.000     -0.964     -0.624
sigma2    0.0488     0.006     7.617     0.000     0.036     0.061

Ljung-Box (L1) (Q):            0.00      Jarque-Bera (JB):            0.36
Prob(Q):                      1.00      Prob(JB):                   0.84
Heteroskedasticity (H):        1.76      Skew:                      -0.10
Prob(H) (two-sided):           0.05      Kurtosis:                   3.12
=====


```

## Y\_3 (Nitrogenos)

```

Frecuencia seleccionada: Diario
AIC: 541.9828350717698
MAE: 0.5484652592568221
RMSE: 0.6949832819999935
MAPE: 149.5412210795301
R2: 0.2627417148325084
LjungBox_p: 0.0010210166413130686
JarqueBera_p: 3.883896929448926e-238
best_order: (5, 0, 5)
      Variable      Coef    AbsImpact      Pvalue
4       WSR   0.210370  0.210370  2.983932e-88
5       WDR   0.073539  0.073539  5.243861e-13
3       PRS  -0.071246  0.071246  1.178294e-06
1       RH  -0.065493  0.065493  1.518940e-05
0       TOUT -0.020427  0.020427  4.443714e-01
2       SR  -0.016714  0.016714  4.322777e-01

SARIMAX Results
=====
Dep. Variable:                  Y_3      No. Observations:             1021
Model: SARIMAX(5, 0, 5)          Log Likelihood:                 -253.991

```

```

Date: Fri, 05 Dec 2025 AIC 541.983
Time: 07:22:48 BIC 625.668
Sample: 01-01-2022 HQIC 573.766
- 10-17-2024
Covariance Type: opg
=====
            coef    std err      z   P>|z|   [0.025]   0.975]
-----
x1       -0.0204    0.027   -0.765    0.444   -0.073    0.032
x2       -0.0655    0.015   -4.326    0.000   -0.095   -0.036
x3       -0.0167    0.021   -0.785    0.432   -0.058    0.025
x4       -0.0712    0.015   -4.859    0.000   -0.100   -0.043
x5        0.2104    0.011  19.916    0.000    0.190    0.231
x6        0.0735    0.010   7.219    0.000    0.054    0.094
ar.L1      1.6872    0.079  21.341    0.000    1.532    1.842
ar.L2     -1.6617    0.167  -9.936    0.000   -1.989   -1.334
ar.L3      1.2173    0.183   6.657    0.000    0.859    1.576
ar.L4     -0.9082    0.129  -7.035    0.000   -1.161   -0.655
ar.L5      0.6376    0.057  11.109    0.000    0.525    0.750
ma.L1     -1.3244    0.082 -16.186    0.000   -1.485   -1.164
ma.L2      1.1261    0.139   8.076    0.000    0.853    1.399
ma.L3     -0.6312    0.132  -4.767    0.000   -0.891   -0.372
ma.L4      0.6758    0.104   6.504    0.000    0.472    0.880
ma.L5     -0.5140    0.056  -9.138    0.000   -0.624   -0.404
sigma2     0.0934    0.004  25.288    0.000    0.086    0.101
=====
Ljung-Box (L1) (Q):          0.89  Jarque-Bera (JB):        1185.14
Prob(Q):                   0.34  Prob(JB):                 0.00
Heteroskedasticity (H):     1.79  Skew:                      0.69
Prob(H) (two-sided):        0.00  Kurtosis:                  8.11
=====

```

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -84.18418464225593

MAE: 0.3779386796454011

RMSE: 0.463772590039484

MAPE: 154.85676797562155

R2: 0.5146129149967014

LjungBox\_p: 0.00021975431894328388

JarqueBera\_p: 0.0

best\_order: (2, 0, 3)

	Variable	Coef	AbsImpact	Pvalue
4	WSR	0.223396	0.223396	1.741523e-18
1	RH	-0.059441	0.059441	1.118404e-02
0	TOUT	-0.040350	0.040350	3.339222e-01
5	WDR	0.037685	0.037685	7.190442e-02
2	SR	-0.018114	0.018114	6.856639e-01
3	PRS	0.010774	0.010774	6.221215e-01

#### SARIMAX Results

=====

Dep. Variable:	Y_3	No. Observations:	147
Model:	SARIMAX(2, 0, 3)	Log Likelihood:	54.092
Date:	Fri, 05 Dec 2025	AIC:	-84.184
Time:	07:22:48	BIC:	-48.630
Sample:	01-02-2022	HQIC:	-69.737
	- 10-20-2024		

```

Covariance Type: opg
=====
          coef    std err      z   P>|z|   [0.025]   0.975]
-----
x1     -0.0404    0.042   -0.966    0.334   -0.122    0.041
x2     -0.0594    0.023   -2.537    0.011   -0.105   -0.014
x3     -0.0181    0.045   -0.405    0.686   -0.106    0.070
x4      0.0108    0.022    0.493    0.622   -0.032    0.054
x5      0.2234    0.025    8.773    0.000    0.173    0.273
x6      0.0377    0.021    1.800    0.072   -0.003    0.079
ar.L1     1.8177    0.084   21.615    0.000    1.653    1.983
ar.L2    -0.8508    0.081  -10.535    0.000   -1.009   -0.693
ma.L1    -1.4798    0.119  -12.404    0.000   -1.714   -1.246
ma.L2     0.4812    0.167    2.878    0.004    0.153    0.809
ma.L3     0.1667    0.100    1.660    0.097   -0.030    0.364
sigma2    0.0268    0.004    7.631    0.000    0.020    0.034
=====
Ljung-Box (L1) (Q):           0.00   Jarque-Bera (JB):        8.04
Prob(Q):                   0.98   Prob(JB):            0.02
Heteroskedasticity (H):      1.47   Skew:                 0.51
Prob(H) (two-sided):         0.19   Kurtosis:            3.55
=====

```

## Y\_4 (So2)

Frecuencia seleccionada: Diario  
AIC: 2957.4530536008892  
MAE: 0.7751689619135362  
RMSE: 0.9615583653034434  
MAPE: 20.700552607463774  
R2: -0.6718360405858341  
LjungBox\_p: 0.06919115085473541  
JarqueBera\_p: 0.0  
best\_order: (5, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.397243	0.397243	1.602619e-10
5	WDR	0.237619	0.237619	5.032594e-08
3	PRS	-0.161834	0.161834	1.260258e-02
2	SR	-0.062351	0.062351	4.106897e-01
0	TOUT	0.052904	0.052904	6.290070e-01
4	WSR	-0.005073	0.005073	9.207626e-01

SARIMAX Results

```

=====
Dep. Variable:          Y_4    No. Observations:             1021
Model: SARIMAX(5, 1, 5) Log Likelihood:           -1461.727
Date: Fri, 05 Dec 2025   AIC:                  2957.453
Time: 08:31:55           BIC:                  3041.121
Sample: 01-01-2022       HQIC:                  2989.231
                           - 10-17-2024
Covariance Type: opg
=====

          coef    std err      z   P>|z|   [0.025]   0.975]
-----
x1      0.0529    0.110    0.483    0.629   -0.162    0.268
x2     -0.3972    0.062   -6.395    0.000   -0.519   -0.275
x3     -0.0624    0.076   -0.823    0.411   -0.211    0.086
-----
```

x4	-0.1618	0.065	-2.495	0.013	-0.289	-0.035
x5	-0.0051	0.051	-0.099	0.921	-0.105	0.095
x6	0.2376	0.044	5.450	0.000	0.152	0.323
ar.L1	-1.5191	0.030	-50.194	0.000	-1.578	-1.460
ar.L2	-1.2691	0.054	-23.465	0.000	-1.375	-1.163
ar.L3	-1.1989	0.051	-23.456	0.000	-1.299	-1.099
ar.L4	-0.4171	0.047	-8.923	0.000	-0.509	-0.326
ar.L5	0.2679	0.026	10.109	0.000	0.216	0.320
ma.L1	0.9220	1.953	0.472	0.637	-2.905	4.749
ma.L2	0.1518	0.138	1.097	0.273	-0.120	0.423
ma.L3	0.0682	0.041	1.679	0.093	-0.011	0.148
ma.L4	-0.6766	0.355	-1.907	0.056	-1.372	0.019
ma.L5	-0.8912	1.830	-0.487	0.626	-4.477	2.695
sigma2	1.0294	2.115	0.487	0.627	-3.116	5.175
=====						
Ljung-Box (L1) (Q):		0.33	Jarque-Bera (JB):		6720.49	
Prob(Q):		0.56	Prob(JB):		0.00	
Heteroskedasticity (H):		0.49	Skew:		1.78	
Prob(H) (two-sided):		0.00	Kurtosis:		15.10	
=====						

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: 285.27865906880027

MAE: 0.6877261528180811

RMSE: 0.8144442519947246

MAPE: 17.428270493621174

R2: -0.6612130954799829

LjungBox\_p: 0.0016126245453462259

JarqueBera\_p: 2.039645834070174e-169

best\_order: (4, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.545047	0.545047	0.002575
1	RH	-0.491800	0.491800	0.000020
2	SR	-0.297351	0.297351	0.137964
3	PRS	0.117256	0.117256	0.268263
5	WDR	-0.010015	0.010015	0.898942
4	WSR	0.006001	0.006001	0.955266

#### SARIMAX Results

Dep. Variable:	Y_4	No. Observations:	147
Model:	SARIMAX(4, 1, 5)	Log Likelihood	-126.639
Date:	Fri, 05 Dec 2025	AIC	285.279
Time:	08:31:55	BIC	332.345
Sample:	01-02-2022	HQIC	304.405
	- 10-20-2024		
Covariance Type:	opg		

	coef	std err	z	P> z	[0.025	0.975]
x1	0.5450	0.181	3.014	0.003	0.191	0.899
x2	-0.4918	0.115	-4.260	0.000	-0.718	-0.266
x3	-0.2974	0.200	-1.483	0.138	-0.690	0.096
x4	0.1173	0.106	1.107	0.268	-0.090	0.325
x5	0.0060	0.107	0.056	0.955	-0.204	0.216
x6	-0.0100	0.079	-0.127	0.899	-0.165	0.145
ar.L1	-0.2546	0.183	-1.389	0.165	-0.614	0.105

ar.L2	-1.3816	0.159	-8.697	0.000	-1.693	-1.070
ar.L3	-0.0799	0.180	-0.444	0.657	-0.432	0.272
ar.L4	-0.7211	0.118	-6.121	0.000	-0.952	-0.490
ma.L1	-0.3063	1.070	-0.286	0.775	-2.404	1.792
ma.L2	1.3512	1.879	0.719	0.472	-2.332	5.034
ma.L3	-0.7708	1.889	-0.408	0.683	-4.473	2.931
ma.L4	0.7061	2.643	0.267	0.789	-4.474	5.886
ma.L5	-0.5209	1.552	-0.336	0.737	-3.562	2.520
sigma2	0.3345	0.983	0.340	0.734	-1.593	2.262
=====						
Ljung-Box (L1) (Q):			0.22	Jarque-Bera (JB):		48.97
Prob(Q):			0.64	Prob(JB):		0.00
Heteroskedasticity (H):			0.40	Skew:		0.55
Prob(H) (two-sided):			0.00	Kurtosis:		5.68
=====						

## SURESTE 3 - INDUSTRIAL

### Y\_1 ( OZONO )

Frecuencia seleccionada: Diario  
AIC: 323.62643524009496  
MAE: 0.3271723882983883  
RMSE: 0.41969390567115683  
MAPE: 229.16267556036073  
R2: 0.35938055087249465  
LjungBox\_p: 0.9526213980673802  
JarqueBera\_p: 1.9593966626670116e-31  
best\_order: (5, 0, 5)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.154046	0.154046	3.079840e-32
2	SR	0.091980	0.091980	2.161608e-09
0	TOUT	-0.054706	0.054706	2.053122e-02
4	WSR	-0.030756	0.030756	2.623260e-02
3	PRS	-0.007531	0.007531	5.325965e-01
5	WDR	0.000372	0.000372	9.753394e-01

#### SARIMAX Results

Dep. Variable:	Y_1	No. Observations:	1021
Model:	SARIMAX(5, 0, 5)	Log Likelihood	-144.813
Date:	Fri, 05 Dec 2025	AIC	323.626
Time:	07:27:18	BIC	407.311
Sample:	01-01-2022	HQIC	355.410
- 10-17-2024			
Covariance Type:	opg		

	coef	std err	z	P> z	[0.025	0.975]
x1	-0.0547	0.024	-2.316	0.021	-0.101	-0.008
x2	-0.1540	0.013	-11.820	0.000	-0.180	-0.129
x3	0.0920	0.015	5.985	0.000	0.062	0.122
x4	-0.0075	0.012	-0.624	0.533	-0.031	0.016
x5	-0.0308	0.014	-2.223	0.026	-0.058	-0.004
x6	0.0004	0.012	0.031	0.975	-0.023	0.024

ar.L1	0.1437	0.548	0.262	0.793	-0.929	1.217
ar.L2	0.0752	0.346	0.217	0.828	-0.603	0.753
ar.L3	0.7894	0.212	3.722	0.000	0.374	1.205
ar.L4	0.2184	0.552	0.395	0.693	-0.864	1.301
ar.L5	-0.3117	0.200	-1.557	0.120	-0.704	0.081
ma.L1	0.4875	0.547	0.891	0.373	-0.585	1.560
ma.L2	0.2547	0.129	1.972	0.049	0.002	0.508
ma.L3	-0.5804	0.234	-2.484	0.013	-1.038	-0.122
ma.L4	-0.5736	0.403	-1.425	0.154	-1.363	0.215
ma.L5	0.0216	0.092	0.235	0.814	-0.159	0.202
sigma2	0.0774	0.003	28.901	0.000	0.072	0.083
<hr/>						
Ljung-Box (L1) (Q):		0.00	Jarque-Bera (JB):		147.45	
Prob(Q):		0.98	Prob(JB):		0.00	
Heteroskedasticity (H):		1.08	Skew:		0.51	
Prob(H) (two-sided):		0.46	Kurtosis:		4.57	
<hr/>						

Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: 12.023569355231764

MAE: 0.2515398932858567

RMSE: 0.3225164395715369

MAPE: 142.42351432156693

R2: 0.4458299858018254

LjungBox\_p: 0.9187008568478583

JarqueBera\_p: 3.461066012280149e-35

best\_order: (3, 0, 2)

	Variable	Coef	AbsImpact	Pvalue
1	RH	-0.188484	0.188484	2.550838e-09
4	WSR	0.071604	0.071604	1.034516e-01
2	SR	0.053063	0.053063	3.023065e-01
5	WDR	-0.039258	0.039258	3.229976e-01
3	PRS	-0.023838	0.023838	6.348212e-01
0	TOUT	0.019820	0.019820	7.416441e-01

SARIMAX Results

---

Dep. Variable:	Y_1	No. Observations:	147
Model:	SARIMAX(3, 0, 2)	Log Likelihood	5.988
Date:	Fri, 05 Dec 2025	AIC	12.024
Time:	07:27:18	BIC	47.661
Sample:	01-02-2022	HQIC	26.505
	- 10-20-2024		

Covariance Type:

opg

---

	coef	std err	z	P> z	[0.025	0.975]
<hr/>						
x1	0.0198	0.060	0.330	0.742	-0.098	0.138
x2	-0.1885	0.032	-5.958	0.000	-0.250	-0.126
x3	0.0531	0.051	1.031	0.302	-0.048	0.154
x4	-0.0238	0.050	-0.475	0.635	-0.122	0.075
x5	0.0716	0.044	1.628	0.103	-0.015	0.158
x6	-0.0393	0.040	-0.988	0.323	-0.117	0.039
ar.L1	-0.2366	0.334	-0.709	0.478	-0.891	0.418
ar.L2	0.1693	0.250	0.678	0.498	-0.320	0.659
ar.L3	0.4287	0.200	2.139	0.032	0.036	0.821
ma.L1	0.7988	0.357	2.238	0.025	0.099	1.498

```

ma.L2      0.3489    0.334     1.045     0.296    -0.305    1.003
sigma2     0.0536    0.005     9.880     0.000     0.043    0.064
=====
Ljung-Box (L1) (Q):                      0.03   Jarque-Bera (JB):        209.10
Prob(Q):                                0.87   Prob(JB):            0.00
Heteroskedasticity (H):                  1.87   Skew:                 -0.72
Prob(H) (two-sided):                     0.03   Kurtosis:             8.72
=====

```

## PM10 - TRANSFORMACION

Frecuencia seleccionada: Diario

AIC: 216.81852964508533

MAE: 34.98844948980857

RMSE: 44.95575011638834

MAPE: 63.57551685439676

R2: -0.2585020959186177

LjungBox\_p: 0.7900234709424603

JarqueBera\_p: 0.0

best\_order: (4, 1, 1)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.307819	0.307819	2.671201e-40
1	RH	-0.126651	0.126651	2.736492e-24
4	WSR	0.078329	0.078329	4.670847e-09
5	WDR	0.038386	0.038386	1.290823e-04
3	PRS	-0.027562	0.027562	9.358670e-02
2	SR	0.021879	0.021879	1.502708e-01

### SARIMAX Results

Dep. Variable:	PM10	No. Observations:	1021
Model:	SARIMAX(4, 1, 1)	Log Likelihood	-96.409
Date:	Fri, 05 Dec 2025	AIC	216.819
Time:	08:33:43	BIC	275.902
Sample:	01-01-2022	HQIC	239.257
	- 10-17-2024		

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	0.3078	0.023	13.289	0.000	0.262	0.353
x2	-0.1267	0.012	-10.169	0.000	-0.151	-0.102
x3	0.0219	0.015	1.439	0.150	-0.008	0.052
x4	-0.0276	0.016	-1.677	0.094	-0.060	0.005
x5	0.0783	0.013	5.858	0.000	0.052	0.105
x6	0.0384	0.010	3.828	0.000	0.019	0.058
ar.L1	0.4941	0.034	14.698	0.000	0.428	0.560
ar.L2	-0.0708	0.035	-2.027	0.043	-0.139	-0.002
ar.L3	0.0323	0.032	1.015	0.310	-0.030	0.095
ar.L4	-0.0918	0.031	-2.989	0.003	-0.152	-0.032
ma.L1	-0.8650	0.025	-34.637	0.000	-0.914	-0.816
sigma2	0.0707	0.003	23.573	0.000	0.065	0.077

Ljung-Box (L1) (Q):	0.00	Jarque-Bera (JB):	3.83
Prob(Q):	0.98	Prob(JB):	0.15
Heteroskedasticity (H):	1.13	Skew:	0.03
Prob(H) (two-sided):	0.26	Kurtosis:	3.30

```

Warnings:
[1] Covariance matrix calculated using the outer product of gradients
(complex-step).
Frecuencia seleccionada: Semanal
AIC: -32.35668820872353
MAE: 24.09903961803004
RMSE: 28.10390778484725
MAPE: 45.93550570962927
R2: 0.060560276120296574
LjungBox_p: 0.9999794365431032
JarqueBera_p: 0.0
best_order: (1, 0, 1)
      Variable      Coef    AbsImpact      Pvalue
0      TOUT  0.153819  0.153819  5.523949e-04
1       RH -0.148816  0.148816  9.830673e-08
4      WSR  0.147144  0.147144  7.265042e-05
5      WDR  0.083020  0.083020  2.206306e-03
2       SR  0.014988  0.014988  7.569361e-01
3      PRS  0.007786  0.007786  8.582066e-01
                                          SARIMAX Results
=====
Dep. Variable:                  PM10      No. Observations:             147
Model:                          SARIMAX(1, 0, 1)      Log Likelihood:          25.178
Date:                         Fri, 05 Dec 2025      AIC:                  -32.357
Time:                           08:33:43        BIC:                  -5.566
Sample:                      01-02-2022      HQIC:                 -21.471
                               - 10-20-2024
Covariance Type:                opg
=====
            coef      std err       z     P>|z|      [0.025]     [0.975]
-----
x1      0.1538      0.045     3.454     0.001      0.067      0.241
x2     -0.1488      0.028    -5.330     0.000     -0.204     -0.094
x3      0.0150      0.048     0.310     0.757     -0.080      0.110
x4      0.0078      0.044     0.179     0.858     -0.078      0.093
x5      0.1471      0.037     3.967     0.000      0.074      0.220
x6      0.0830      0.027     3.061     0.002      0.030      0.136
ar.L1     0.9993      0.003   344.602     0.000      0.994      1.005
ma.L1    -0.3324      0.076    -4.359     0.000     -0.482     -0.183
sigma2     0.0413      0.005     7.667     0.000      0.031      0.052
=====
Ljung-Box (L1) (Q):           0.09      Jarque-Bera (JB):        0.84
Prob(Q):                      0.76      Prob(JB):              0.66
Heteroskedasticity (H):       1.36      Skew:                  0.18
Prob(H) (two-sided):          0.29      Kurtosis:              3.09
=====

```

## PM2.5

```

Frecuencia seleccionada: Diario
AIC: 7383.223440961566
MAE: 9.190715467061294
RMSE: 11.936277012707885
MAPE: 56.13940744892558
R2: -0.7552096297654465

```

```

LjungBox_p: 0.0783907149734467
JarqueBera_p: 0.0
best_order: (4, 1, 5)
      Variable     Coef   AbsImpact      Pvalue
0       TOUT  8.967145  8.967145  2.467496e-25
3       PRS -1.063212  1.063212  1.177332e-01
4       WSR  0.870783  0.870783  1.227814e-01
5       WDR  0.859381  0.859381  9.927807e-03
1       RH   0.436407  0.436407  4.437102e-01
2       SR   0.357714  0.357714  6.108972e-01
                                          SARIMAX Results
=====
Dep. Variable:                  PM2.5    No. Observations:          1021
Model:                          SARIMAX(4, 1, 5)  Log Likelihood      -3675.612
Date:                           Fri, 05 Dec 2025 AIC                   7383.223
Time:                           08:35:16      BIC                   7461.970
Sample:                         01-01-2022  HQIC                  7413.132
                                - 10-17-2024
Covariance Type:                opg
=====
            coef     std err      z      P>|z|      [0.025]      [0.975]
-----
x1      8.9671    0.862    10.400    0.000      7.277    10.657
x2      0.4364    0.570     0.766    0.444     -0.680    1.553
x3      0.3577    0.703     0.509    0.611     -1.020    1.736
x4     -1.0632    0.680    -1.564    0.118     -2.395    0.269
x5      0.8708    0.564     1.543    0.123     -0.235    1.977
x6      0.8594    0.333     2.578    0.010      0.206    1.513
ar.L1     0.2810    0.770     0.365    0.715     -1.228    1.790
ar.L2    -0.8096    0.457    -1.771    0.077     -1.705    0.086
ar.L3     0.0241    0.810     0.030    0.976     -1.563    1.611
ar.L4     0.1717    0.287     0.599    0.549     -0.390    0.733
ma.L1    -0.5831    0.768    -0.759    0.448     -2.088    0.922
ma.L2     0.6178    0.681     0.907    0.365     -0.718    1.954
ma.L3    -0.3046    0.724    -0.421    0.674     -1.724    1.114
ma.L4    -0.4568    0.493    -0.927    0.354     -1.422    0.509
ma.L5    -0.0187    0.161    -0.116    0.908     -0.334    0.296
sigma2   79.3223   3.855    20.577    0.000     71.767    86.878
=====
Ljung-Box (L1) (Q):             0.00    Jarque-Bera (JB):        27687.16
Prob(Q):                      0.99    Prob(JB):                 0.00
Heteroskedasticity (H):        4.54    Skew:                     1.30
Prob(H) (two-sided):           0.00    Kurtosis:                28.47
=====

Warnings:
[1] Covariance matrix calculated using the outer product of gradients
(complex-step).
Frecuencia seleccionada: Semanal
AIC: 956.4619876318204
MAE: 4.918592911703587
RMSE: 6.235741992244046
MAPE: 25.01805851760056
R2: -0.20854679543406784
LjungBox_p: 0.8269777511199664
JarqueBera_p: 3.7114897042261763e-51
best_order: (4, 1, 5)
      Variable     Coef   AbsImpact      Pvalue
4       WSR   2.575685  2.575685  0.070537

```

```

0      TOUT  2.368854  2.368854  0.130427
5      WDR   1.528959  1.528959  0.210270
3      PRS  -1.383743  1.383743  0.295490
2      SR   0.928293  0.928293  0.623405
1      RH  -0.541068  0.541068  0.576487

                                         SARIMAX Results
=====
Dep. Variable:                  PM2.5    No. Observations:                 147
Model: SARIMAX(4, 1, 5)          Log Likelihood:            -462.231
Date: Fri, 05 Dec 2025          AIC:                         956.462
Time: 08:35:16                  BIC:                        1003.528
Sample: 01-02-2022              HQIC:                       975.588
                                         - 10-20-2024
Covariance Type:                opg
=====
                                         coef      std err       z     P>|z|      [0.025      0.975]
-----
x1      2.3689      1.566      1.512      0.130     -0.701      5.439
x2     -0.5411      0.969     -0.559      0.576     -2.440      1.358
x3      0.9283      1.891      0.491      0.623     -2.777      4.634
x4     -1.3837      1.323     -1.046      0.295     -3.976      1.209
x5      2.5757      1.424      1.808      0.071     -0.216      5.367
x6      1.5290      1.220      1.253      0.210     -0.863      3.921
ar.L1    -0.9345      0.088     -10.666     0.000     -1.106     -0.763
ar.L2    -1.1617      0.083     -14.019     0.000     -1.324     -0.999
ar.L3    -0.9132      0.106     -8.603     0.000     -1.121     -0.705
ar.L4    -0.7736      0.094     -8.191     0.000     -0.959     -0.589
ma.L1    0.7496      0.123      6.081     0.000      0.508      0.991
ma.L2    0.7499      0.136      5.531     0.000      0.484      1.016
ma.L3    0.4745      0.167      2.835     0.005      0.146      0.803
ma.L4    0.2663      0.147      1.810     0.070     -0.022      0.555
ma.L5    -0.4354      0.100     -4.350     0.000     -0.632     -0.239
sigma2   41.9395      5.599      7.491     0.000     30.966     52.913
=====
Ljung-Box (L1) (Q):             0.04    Jarque-Bera (JB):           1.81
Prob(Q):                      0.84    Prob(JB):                   0.40
Heteroskedasticity (H):        2.04    Skew:                      0.17
Prob(H) (two-sided):           0.02    Kurtosis:                  3.44
=====
```

## Y\_3 (Nitrogenos)

Frecuencia seleccionada: Diario  
AIC: 945.9603363450328  
MAE: 0.6380057587477427  
RMSE: 0.7320007512424455  
MAPE: 832.3091252711893  
R2: -1.4634267197455912  
LjungBox\_p: 0.516437442862997  
JarqueBera\_p: 0.0  
best\_order: (5, 1, 5)

	Variable	Coef	AbsImpact	Pvalue
0	TOUT	0.177340	0.177340	5.296231e-07
4	WSR	0.107901	0.107901	1.197773e-10
3	PRS	-0.086402	0.086402	8.456000e-04
5	WDR	0.065176	0.065176	1.857919e-06
1	RH	-0.051790	0.051790	6.112335e-03
2	SR	0.046461	0.046461	1.043010e-01

SARIMAX Results

Dep. Variable:	$Y_3$	No. Observations:	1021			
Model:	SARIMAX(5, 1, 5)	Log Likelihood	-455.980			
Date:	Fri, 05 Dec 2025	AIC	945.960			
Time:	07:28:44	BIC	1029.629			
Sample:	01-01-2022 - 10-17-2024	HQIC	977.739			
Covariance Type:	opg					
	coef	std err	z	P> z	[0.025	0.975]
x1	0.1773	0.035	5.015	0.000	0.108	0.247
x2	-0.0518	0.019	-2.742	0.006	-0.089	-0.015
x3	0.0465	0.029	1.624	0.104	-0.010	0.103
x4	-0.0864	0.026	-3.337	0.001	-0.137	-0.036
x5	0.1079	0.017	6.440	0.000	0.075	0.141
x6	0.0652	0.014	4.768	0.000	0.038	0.092
ar.L1	-0.2188	0.165	-1.324	0.186	-0.543	0.105
ar.L2	0.5464	0.074	7.431	0.000	0.402	0.691
ar.L3	0.6200	0.113	5.485	0.000	0.398	0.842
ar.L4	0.2147	0.086	2.507	0.012	0.047	0.383
ar.L5	-0.3460	0.055	-6.253	0.000	-0.454	-0.238
ma.L1	0.1174	0.148	0.794	0.427	-0.172	0.407
ma.L2	-1.2657	0.178	-7.092	0.000	-1.616	-0.916
ma.L3	-0.6017	0.182	-3.304	0.001	-0.959	-0.245
ma.L4	0.0429	0.101	0.422	0.673	-0.156	0.242
ma.L5	0.7634	0.104	7.340	0.000	0.560	0.967
sigma2	0.1062	0.026	4.087	0.000	0.055	0.157
Ljung-Box (L1) (Q):	0.00	Jarque-Bera (JB):	1510.52			
Prob(Q):	0.99	Prob(JB):	0.00			
Heteroskedasticity (H):	2.84	Skew:	0.56			
Prob(H) (two-sided):	0.00	Kurtosis:	8.87			

Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -0.07522503172011596

MAE: 0.1783314586452633

RMSE: 0.23245262684687867

MAPE: 110.92091489213765

R2: 0.49279289131386084

LjungBox\_p: 0.9062571283005748

JarqueBera\_p: 1.4628443388973206e-49

best\_order: (5, 0, 1)

Variable	Coef	AbsImpact	Pvalue
4 WSR	0.277718	0.277718	0.000016
5 WDR	0.118887	0.118887	0.013299
1 RH	-0.112821	0.112821	0.002253
2 SR	-0.068378	0.068378	0.298577
3 PRS	-0.057976	0.057976	0.138886
0 TOUT	0.050481	0.050481	0.488160

SARIMAX Results

Dep. Variable:	$Y_3$	No. Observations:	147
Model:	SARIMAX(5, 0, 1)	Log Likelihood	13.038

```

Date: Fri, 05 Dec 2025 AIC -0.075
Time: 07:28:44 BIC 38.351
Sample: 01-02-2022 HQIC 15.539
- 10-20-2024
Covariance Type: opg
=====
            coef    std err      z   P>|z|   [0.025   0.975]
-----
x1        0.0505    0.073    0.693    0.488   -0.092    0.193
x2       -0.1128    0.037   -3.055    0.002   -0.185   -0.040
x3       -0.0684    0.066   -1.039    0.299   -0.197    0.061
x4       -0.0580    0.039   -1.480    0.139   -0.135    0.019
x5        0.2777    0.064    4.318    0.000    0.152    0.404
x6        0.1189    0.048    2.476    0.013    0.025    0.213
ar.L1      1.2235    0.121   10.124    0.000    0.987    1.460
ar.L2     -0.0058    0.149   -0.039    0.969   -0.298    0.286
ar.L3      0.0501    0.156    0.321    0.748   -0.256    0.356
ar.L4     -0.2180    0.130   -1.683    0.092   -0.472    0.036
ar.L5     -0.0917    0.082   -1.125    0.261   -0.251    0.068
ma.L1     -0.9194    0.073  -12.679    0.000   -1.061   -0.777
sigma2      0.0480    0.005    9.163    0.000    0.038    0.058
=====
Ljung-Box (L1) (Q): 0.00 Jarque-Bera (JB): 51.10
Prob(Q): 1.00 Prob(JB): 0.00
Heteroskedasticity (H): 2.44 Skew: 0.31
Prob(H) (two-sided): 0.00 Kurtosis: 5.87
=====
```

## Y\_4 (So2)

Frecuencia seleccionada: Diario  
AIC: 469.5947084604212  
MAE: 3.4430187362304627  
RMSE: 6.509171545604968  
MAPE: 36.34975646619652  
R2: 0.01525807169921889  
LjungBox\_p: 0.8838119674229367  
JarqueBera\_p: 1.0078715646308077e-59  
best\_order: (1, 1, 2)

	Variable	Coef	AbsImpact	Pvalue
2	SR	0.108955	0.108955	1.718580e-07
4	WSR	-0.083382	0.083382	6.879583e-05
1	RH	-0.020056	0.020056	2.213524e-01
3	PRS	-0.015436	0.015436	4.738041e-01
5	WDR	0.011377	0.011377	4.846381e-01
0	TOUT	-0.001824	0.001824	9.458601e-01

### SARIMAX Results

```

=====
Dep. Variable: Y_4 No. Observations: 1021
Model: SARIMAX(1, 1, 2) Log Likelihood: -224.797
Date: Fri, 05 Dec 2025 AIC: 469.595
Time: 08:38:07 BIC: 518.841
Sample: 01-01-2022 HQIC: 488.296
- 10-17-2024
Covariance Type: opg
=====
            coef    std err      z   P>|z|   [0.025   0.975]
-----
```

x1	-0.0018	0.027	-0.068	0.946	-0.054	0.051
x2	-0.0201	0.016	-1.223	0.221	-0.052	0.012
x3	0.1090	0.021	5.227	0.000	0.068	0.150
x4	-0.0154	0.022	-0.716	0.474	-0.058	0.027
x5	-0.0834	0.021	-3.980	0.000	-0.124	-0.042
x6	0.0114	0.016	0.699	0.485	-0.021	0.043
ar.L1	0.6626	0.085	7.807	0.000	0.496	0.829
ma.L1	-1.3410	0.097	-13.850	0.000	-1.531	-1.151
ma.L2	0.3776	0.085	4.424	0.000	0.210	0.545
sigma2	0.0909	0.003	28.030	0.000	0.085	0.097
<hr/>						
Ljung-Box (L1) (Q):		0.02	Jarque-Bera (JB):		155.61	
Prob(Q):		0.88	Prob(JB):		0.00	
Heteroskedasticity (H):		0.96	Skew:		0.74	
Prob(H) (two-sided):		0.73	Kurtosis:		4.22	

#### Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

Frecuencia seleccionada: Semanal

AIC: -32.74516854787547

MAE: 2.7316172501371696

RMSE: 4.838605457936486

MAPE: 27.125399006602123

R2: -0.0502211945167903

LjungBox p: 0.40402312350462655

JarqueBera p: 2.2633221511271885e-117

best order: (1, 1, 2)

	Variable	Coeff	AbsImpact	Pvalue
2	SR	0.154358	0.154358	0.005207
3	PRS	0.065304	0.065304	0.158239
0	TOUT	0.059061	0.059061	0.320109
4	WSR	0.040726	0.040726	0.273537
5	WDR	0.040007	0.040007	0.211182
1	RH	-0.034103	0.034103	0.271761

## SARIMAX Results

Dep. Variable: Y\_4 No. Observations: 147  
 Model: SARIMAX(1, 1, 2) Log Likelihood 26.373  
 Date: Fri, 05 Dec 2025 AIC -32.745  
 Time: 08:38:07 BIC -3.117  
 Sample: 01-02-2022 HQIC -20.706  
           - 10-20-2024

Covariance Type: opg

	coef	std err	z	P> z	[0.025	0.975]
x1	0.0591	0.059	0.994	0.320	-0.057	0.175
x2	-0.0341	0.031	-1.099	0.272	-0.095	0.027
x3	0.1544	0.055	2.794	0.005	0.046	0.263
x4	0.0653	0.046	1.411	0.158	-0.025	0.156
x5	0.0407	0.037	1.095	0.274	-0.032	0.114
x6	0.0400	0.032	1.250	0.211	-0.023	0.103
ar.L1	-0.8829	0.043	-20.582	0.000	-0.967	-0.799
ma.L1	0.5271	102.551	0.005	0.996	-200.470	201.524
ma.L2	-0.4729	48.494	-0.010	0.992	-95.520	94.574
sigma2	0.0394	4.035	0.010	0.992	-7.870	7.949

Ljung-Box (L1) (Q) :	0.18	Jarque-Bera (JB) :	13.86
Prob(Q) :	0.67	Prob(JB) :	0.00
Heteroskedasticity (H) :	0.99	Skew:	0.32
Prob(H) (two-sided) :	0.96	Kurtosis:	4.39

---