



Study of variables related to tourism in Portugal

Investment rate of tourism companies

Postgraduate in Data Analysis for Business

Predictive Analysis for Management

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Study of variables related to Tourism in Portugal

Purpose of this project:

- Applying econometric management models;
- Analyzing several relevant factors related to tourism in Portugal;
- Analyzing in the STATA statistical software which variables more influence the investment rate of companies in the catering, accommodation and similar sectors.

Considered Variables

- PORDATA Platform; period between 2004 and 2020:
- Investment rate of accommodation and catering companies: total and by sector of activity (in %); (invest)
- GDP Portuguese (in billions of euros); (pib)
- Average expenditure per tourist for the following main travel reasons (in euros):
 - Leisure and holidays; (desp lazer)
 - Visiting family and friends; (desp visita)
 - Business or Professional. (desp neg)
- Overnight stay in tourist accommodation per 100 inhabitants; (dorm)
- Passengers disembarked at major airports (in millions of passengers). (pass des)

Methodology and data

- Test the validity of the influence of independent variables vs the target variable - investment rate of companies - from the econometric point of view;
- Additionally, ensuring the results obtained are also relevant from this point of view.

Methodology and data

- The investment rate is an indicator of a company's effort to increase its production capacity.
- For example, the fact that a company has an investment rate of 20% shows that one fifth of the wealth it generated to produce goods or services has been applied to the acquisition of machinery and other equipment for the company.
- The investment rate therefore drives the relationship between gross fixed capital formation and gross added value.

Descriptive statistics of variables

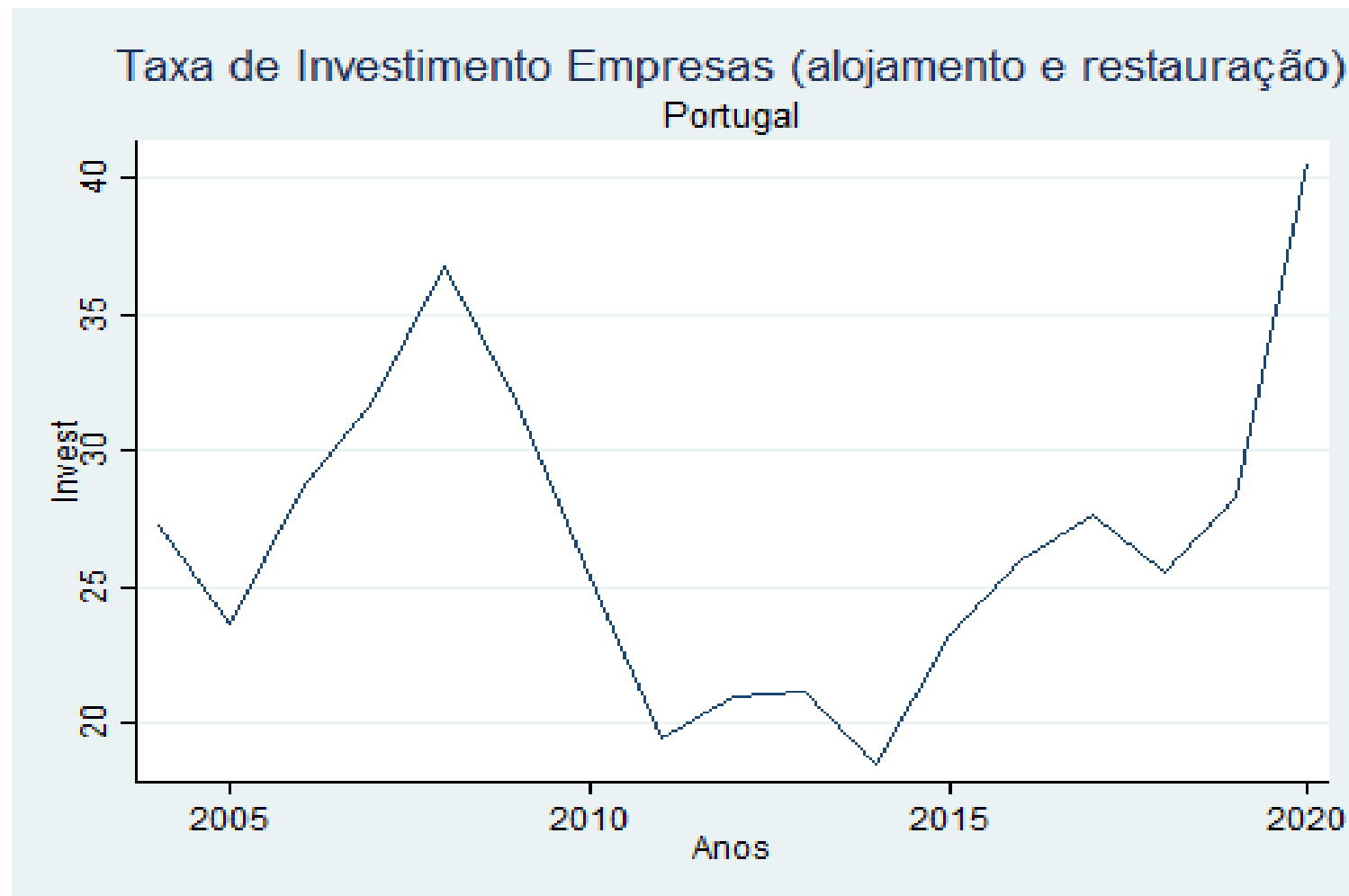
- Data sample:

7 variables and 17 elements, corresponding to the years between 2004-2020 in Portugal:

Variable	Obs	Mean	Std. Dev.	Min	Max
invest	17	26.841	5.939	18.5	40.6
dorm	17	436.1	129.352	250.5	682.1
desp lazer	17	31.182	7.123	23.9	52.1
desp visita	17	22.635	5.38	16.5	33.5
desp neg	17	45.988	20.456	18.8	99.9
pib	17	179.794	16.332	152.2	214.4
pass des	17	17.041	6.22	9.1	30

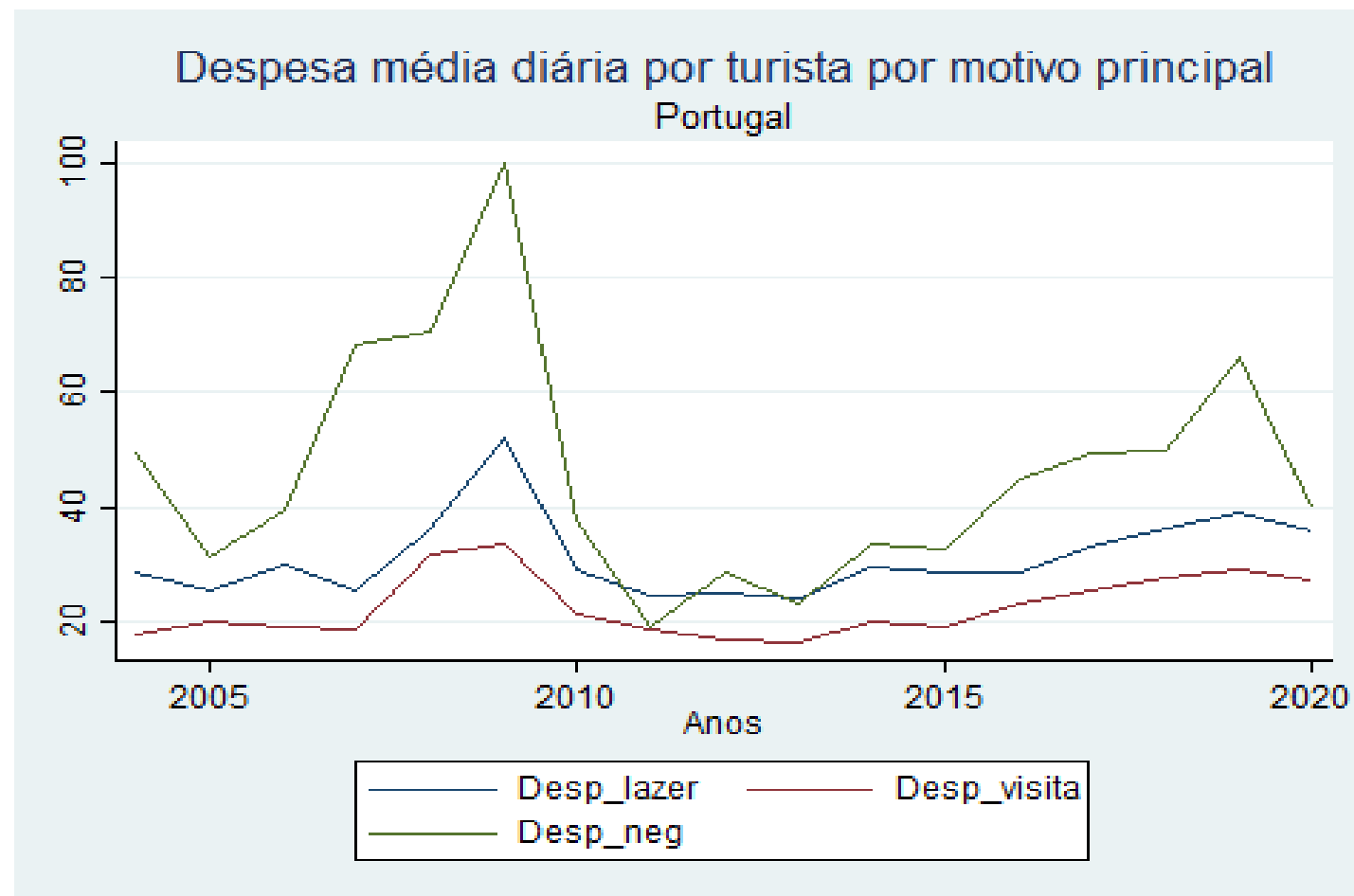
Descriptive statistics of variables

- Average investment rate of companies linked to the tourism sector is 26.8%;
- Financial crisis started in 2008;
- Growth trend resumes in 2014.



Descriptive statistics of variables

- Business and professional is the variable with the highest expenditure;
- Visits to family and friends is the variable with the lowest standard deviation.



Linear correlation between variables

Multicollinearity:

- overnight stay and passengers disembarked (99.0%);
- leisure expenditure and visits expenditure (90.5%).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) dorm	1.000						
(2) invest	-0.261	1.000					
(3) desp_lazer	0.145	0.547	1.000				
(4) desp_visita	0.249	0.631	0.905	1.000			
(5) desp_neg	0.084	0.619	0.817	0.754	1.000		
(6) pib	0.659	0.317	0.441	0.609	0.237	1.000	
(7) pass_des	0.989	-0.247	0.188	0.294	0.092	0.718	1.000

Linear correlation between variables

Multiple linear regression

- multicollinearity: the variables overnight stay and leisure expenses were removed

invest	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
dorm	.082	.043	1.92	.084	-.013	.177	*
desp_lazer	-.283	.258	-1.10	.299	-.859	.293	
desp_visita	.353	.361	0.98	.351	-.451	1.157	
desp_neg	.154	.061	2.52	.031	.018	.29	**
pib	.355	.086	4.13	.002	.164	.547	***
pass_des	-2.668	.958	-2.78	.019	-4.803	-.533	**
Constant	-33.558	13.81	-2.43	.035	-64.329	-2.788	**
Mean dependent var		26.841	SD dependent var		5.939		
R-squared		0.879	Number of obs		17		
F-test		12.143	Prob > F		0.000		
Akaike crit. (AIC)		85.836	Bayesian crit. (BIC)		91.669		
*** p<.01, ** p<.05, * p<.1							

Linear correlation between variable

- Finally we have a better adjustment of the regression model:

Variables	(1)	(2)	(3)	(4)
(1) pib	1.000			
(2) pass_des	0.718	1.000		
(3) desp_visita	0.609	0.294	1.000	
(4) desp_neg	0.237	0.092	0.754	1.000

Econometric methodology adopted

- Influence of independent variables in the investment rate of tourism companies;
- Multiple linear regression model:

$$\text{invest} = B_0 + B_1(\text{desp_visita}) + B_2(\text{desp_neg}) + B_3(\text{pib}) + B_4(\text{pass_des}) + E_r$$

- B_0 : constant of the equation;
- E_r : statistical error of the equation.

Results Analysis

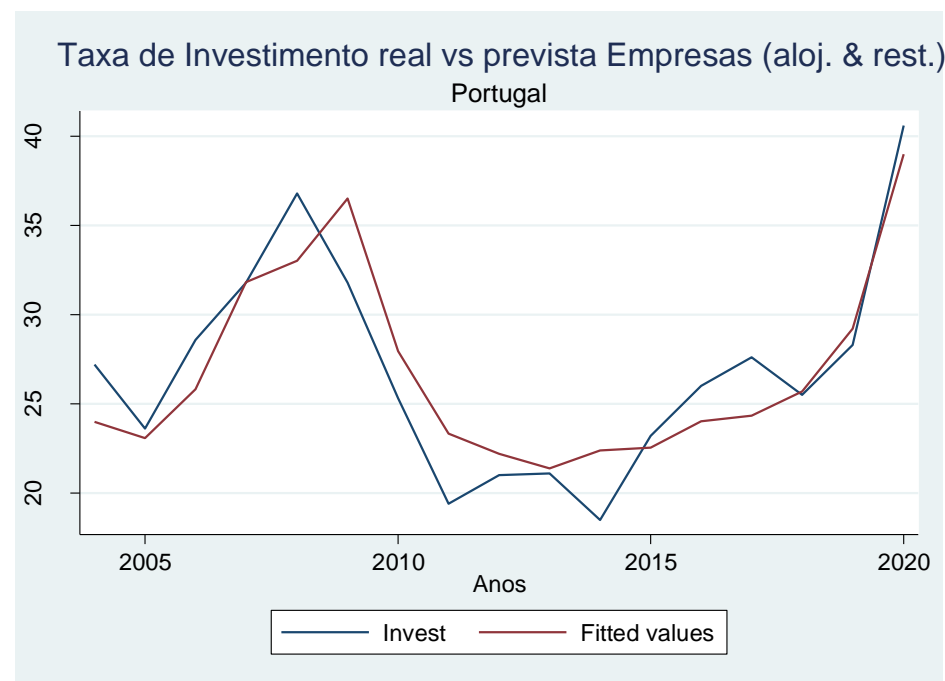
- LMR model;
- $R^2 = 80.1$;
- Statistically significant: GDP, passengers disembarked and business expenses.

invest	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
pib	.305	.092	3.31	.006	.104	.505	***
pass_des	-.857	.185	-4.63	.001	-1.261	-.453	***
desp_visita	.012	.306	0.04	.97	-.654	.678	
desp_neg	.144	.064	2.25	.044	.005	.283	**
Constant	-20.219	11.567	-1.75	.106	-45.422	4.985	
Mean dependent var		26.841	SD dependent var		5.939		
R-squared		0.801	Number of obs		17		
F-test		12.061	Prob > F		0.000		
Akaike crit. (AIC)		90.353	Bayesian crit. (BIC)		94.519		
*** p<.01, ** p<.05, * p<.1							

Results of predicted values

- Comparison between the real values (variable invest) and the predicted values (variable i_pred) of the investment rate of the companies:

anos	invest	i_pred	resid_invest
2004	27.200	23.997	3.203
2005	23.600	23.087	0.513
2006	28.600	25.803	2.797
2007	31.800	31.813	-0.013
2008	36.800	33.009	3.791
2009	31.800	36.502	-4.702
2010	25.300	27.967	-2.667
2011	19.400	23.339	-3.939
2012	21	22.191	-1.191
2013	21.100	21.381	-0.281
2014	18.500	22.383	-3.883
2015	23.200	22.554	0.646
2016	26	24.026	1.974
2017	27.600	24.336	3.264
2018	25.500	25.685	-0.185
2019	28.300	29.217	-0.917
2020	40.600	39.011	1.589



Results of predicted values

In the following example we could predict the value of the investment rate in 2021 based on the following metrics and estimated GDP and number of passengers landing in Portugal in 2021:

GDP = 211.5 billion euros

Passengers disembarked = 12.8 million

Visiting expenses = 28 euros

Business expenses = 50 euros

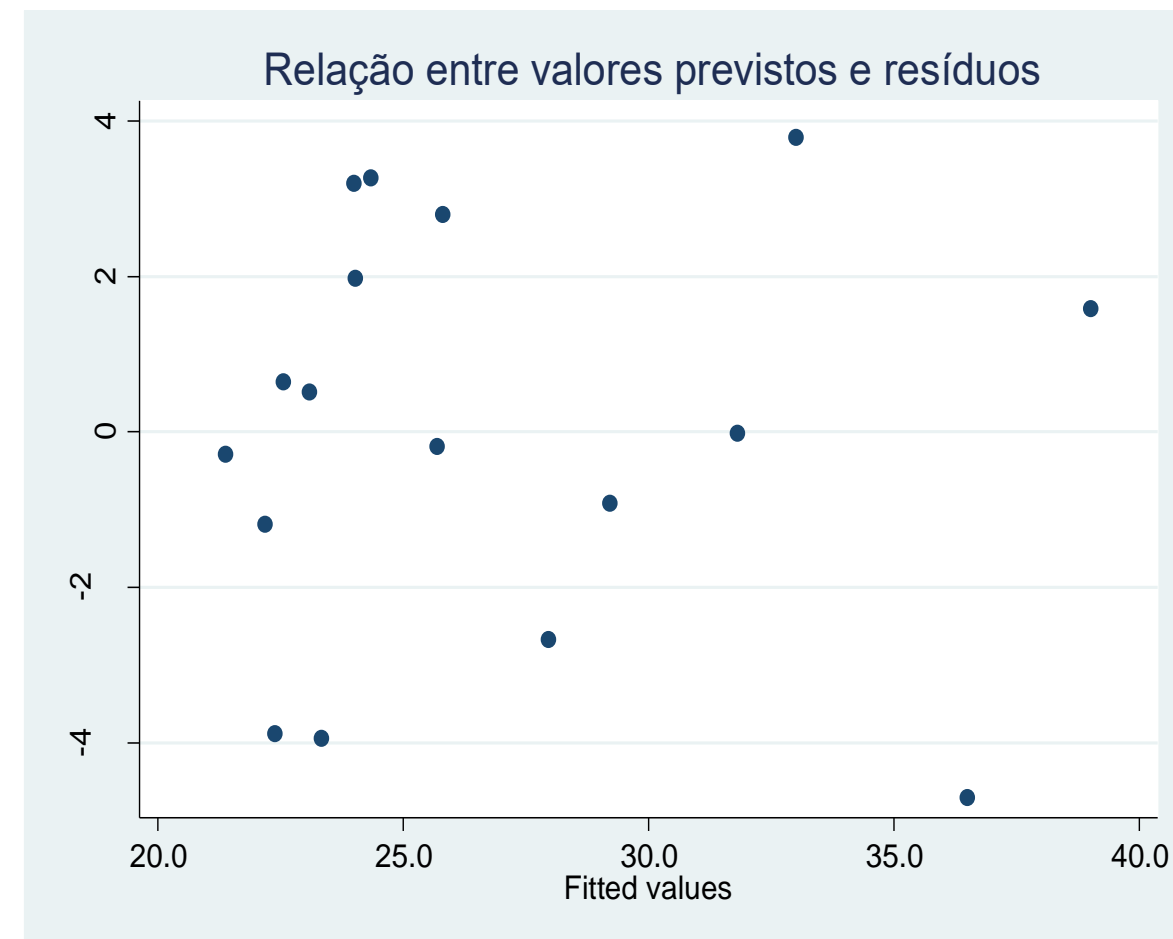
$$\text{invest} = -20.2188 + 0.3047145 * \text{gdp} - 0.8570672 * \text{pass_des} + 0.0118805 * \text{desp_visita} + 0.1437459 * \text{desp_neg}$$

Investment rate = 40.8%, which indicates a slight increase in the investment rate of companies in 2021, compared to 2020.

Results of predicted values

As for the residuals (deviations not explained by the model): there is a scattered randomization around the horizontal axis and without any defined pattern.

Being this condition verified, it is concluded that the linear regression model is appropriate for this study.



Conclusion

- There is a high adjustment of the model;
- Independent Variables of the model explain 80.1% of the investment rate of companies;
- Statistically significant variables which explain the investment rate are:
GDP, disembarked passengers and Expenditure of business tourism.

Conclusion

- The variables GDP and average daily expenditure of tourists for visits and business have a positive correlation with the investment rate of companies in the tourism sector;
- On the other hand, the variable passengers disembarked has a negative correlation with the investment rate of companies.
- This insight is valid, as tourism companies usually take advantage of periods with fewer tourists to invest in improving their services and infrastructure.

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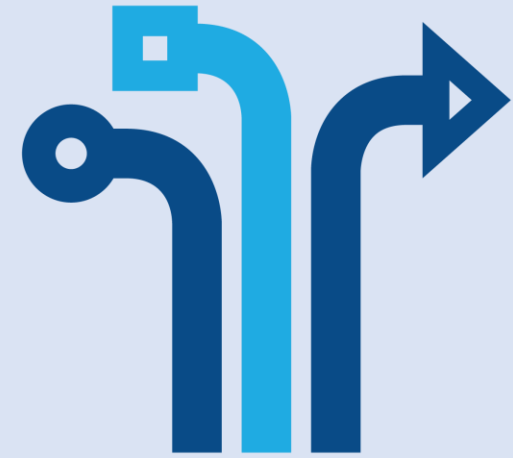
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THANK YOU!



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