Analyzing the Link Between Time Spent and Productivity

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INTRODUCTION

This project investigates the relationship between time spent on tasks and productivity. Our aim is to determine how increased time spent in a week influences productivity levels.

PROBLEM STATEMENT

We are trying to understand how time allocation impacts productivity. Specifically, we want to figure out if individuals who spend more hours on tasks exhibit higher productivity?

DATASET INFORMATION

- We utilized the Employee Details Dataset from Kaggle.
- The dataset includes columns for Time Spent in Week (Hours) and a Productivity Indicator that classifies individuals as either Productive or Unproductive, which are the key variables for our analysis.
- **Link to Dataset:** https://www.kaggle.com/datasets/mayanolan/employee-details-dataset (Employee Details Dataset)

METHODOLOGY

Step 1: Economic Theory or Hypothesis
Step 2: Mathematical Model of the Theory
Step 3: Econometric Model
Step 4: Data Collection and Preprocessing
Step 5: Estimation of the Parameters of the Econometric Model
Step 6: Hypothesis Testing
Step 7: Forecasting or Prediction
Step 8: Using the Model for Control or Developing Policy

- **Step 1: Economic Theory or Hypothesis**

Increased time spent in a week positively influences productivity, meaning that individuals who dedicate more hours to their tasks are more likely to exhibit higher productivity

- **Step 2: Mathematical Model of the Theory**

We assume the relationship:

$$y = b0 + b1x$$

Where: y is the binary variable for productivity (1 for productive, 0 for unproductive).

x is the time spent in a week (in hours).

b0 is the intercept.

b1 is the coefficient of x

- **Step 3: Estimation of the Parameters of the Econometric Model**

We represent the econometric model as:

$$y = b0 + b1x + e$$

Where:
e is the error term, assumed to be zero.

- **Step 4: Data Collection and Preprocessing**

- **Step 5: Estimation of the Parameters of the Econometric Model**

  • **Linear Regression Model** was applied to estimate the relationship between time spent and productivity.
  • **Intercept (b0): -6.39**, representing the baseline productivity when time spent is zero.
  • **Coefficient of Time Spent (b1): 0.182**, indicating a positive impact of time spent on productivity.
  • As time spent increases, productivity is expected to rise, based on the positive coefficient.

Step 6: Hypothesis Testing

- The null hypothesis for the coefficient b1 is:
  - H0: There is no significant effect of time spent on productivity (i.e., $b1 = 0$)
  - H1: There is a significant effect of time spent on productivity (i.e., $b1 \neq 0$).

- To test this hypothesis, we check the p-value from the linear regression model.
- Level of Significant, $\alpha = 0.05$

OLS REGRESSION RESULTS

Dep. Variable:	Productive	R-squared:	0.579
Model:	OLS	Adj. R-squared:	0.575
Method:	Least Squares	F-statistic:	134.9
Date:	Sat, 21 Sep 2024	Prob (F-statistic):	4.00e-20
Time:	09:03:46	Log-Likelihood:	-20.586
No. Observations:	100	AIC:	45.17
Df Residuals:	98	BIC:	50.38
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-6.3914	0.611	-10.454	0.000	-7.605	-5.178
TimeSpent in week(Hours)	0.1823	0.016	11.613	0.000	0.151	0.214

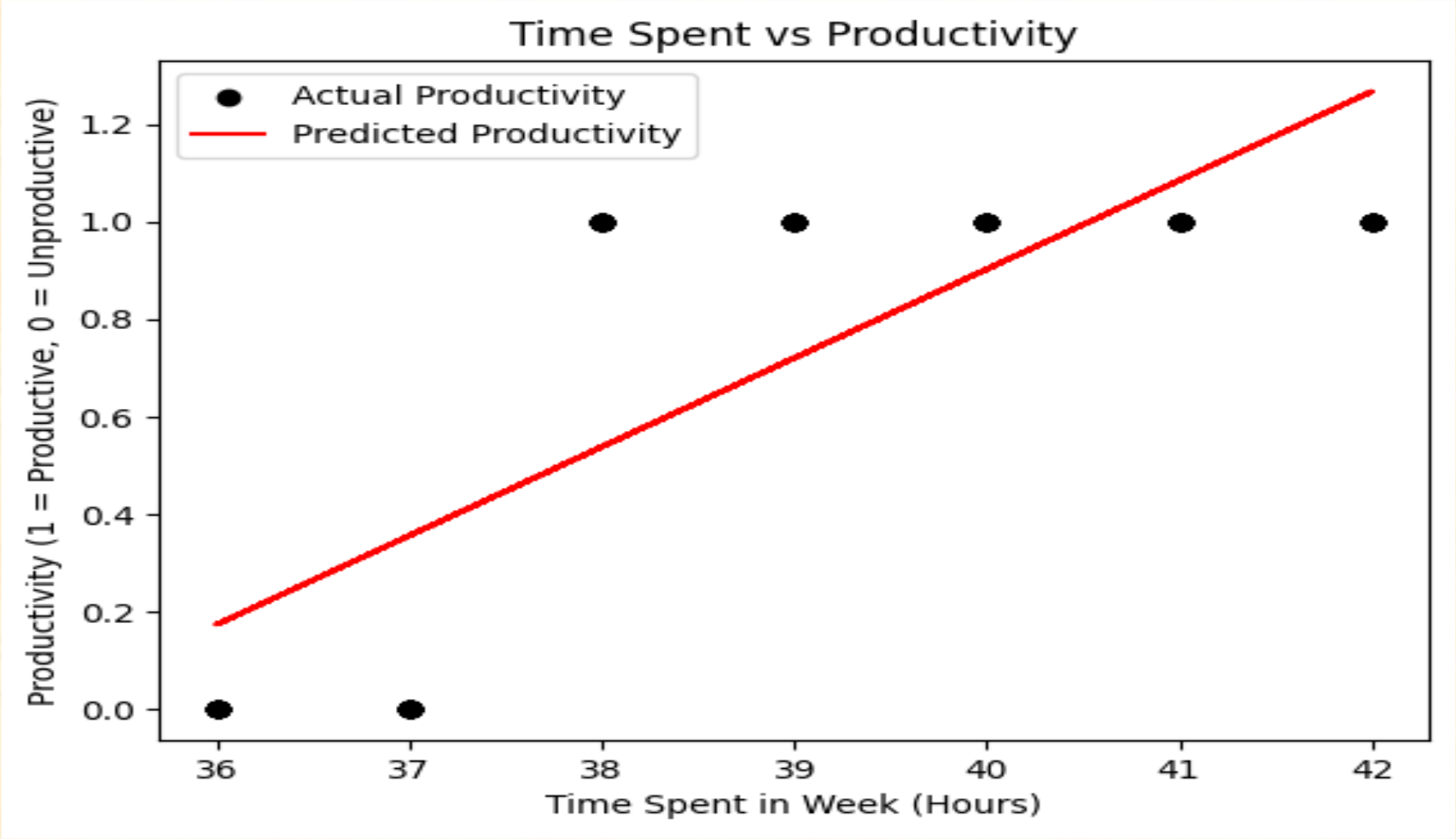
Omnibus:	48.592	Durbin-Watson:	2.898
Prob(Omnibus):	0.000	Jarque-Bera (JB):	9.343
Skew:	0.401	Prob(JB):	0.00936
Kurtosis:	1.736	Cond. No.	793.

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

The coefficient for TimeSpent in week (Hours) is positive (0.1823) and statistically significant with a very low p-value (0.000). This indicates that as the time spent in a week increases, productivity also increases significantly.

Step 7: Forecasting or Prediction

Relationship Between Time Spent and Productivity: Scatter Plot Analysis



CONCLUSION

Our hypothesis that increased time spent in a week positively influences productivity has been supported by the analysis. The positive coefficient for time spent and its statistically significant p-value confirm that dedicating more hours to tasks is associated with greater productivity. The scatter plot further illustrates this relationship, showing that as time spent increases, predicted productivity also rises, thereby validating the effectiveness of our model.

Moving forward, we can apply this in Step 8, which is using the model for control or developing policy. This involves creating guidelines for optimal time allocation, designing training programs focused on effective time management, and establishing a system for the continuous monitoring of productivity metrics. By implementing these strategies, we can enhance workplace productivity and foster a culture of efficient time utilization.


THANK YOU