

## **The Relationships between Energy Consumption, Carbon Dioxide (CO<sub>2</sub>) Emissions, and GDP for Turkey: Time Series Analysis, 1980-2010**

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**Abstract :** The relationships between environmental quality, energy use and economic output have created growing attention over the past decades among researchers and policy makers. Focusing on the empirical aspects of the role of carbon dioxide (CO<sub>2</sub>) emissions and energy use in affecting the economic output, this paper is an effort to fulfill the gap in a comprehensive case study at a country level using modern econometric techniques. To achieve the goal, this country-specific study examines the short-run and long-run relationships among energy consumption (using disaggregated energy sources: crude oil, coal, natural gas, and electricity), CO<sub>2</sub> emissions and gross domestic product (GDP) for Turkey using time series analysis from the year 1980-2010. To investigate the relationships between the variables, this paper employs the Augmented Dickey-Fuller (ADF) test for stationarity, Johansen's maximum likelihood method for cointegration and a Vector Error Correction Model (VECM) for both short- and long-run causality among the research variables for the sample. The long-run equilibrium in the VECM suggests no effects of the CO<sub>2</sub> emissions and energy use on the GDP in Turkey. There exists a short-run bidirectional relationship between the electricity and natural gas consumption, and also there is a negative unidirectional causality running from the GDP to electricity use. Overall, the results partly support arguments that there are relationships between energy use and economic output; however, the effects may differ due to the source of energy such as in the case of Turkey for the period of 1980-2010. However, there is no significant relationship between the CO<sub>2</sub> emissions and the GDP and between the CO<sub>2</sub> emissions and the energy use both in the short term and long term.

**Keywords :** CO<sub>2</sub> emissions, energy consumption, GDP, Turkey, time series analysis

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