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The relationship between energy consumption and economic growth: Evidence from non-Granger causality test

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Abstract

This study examines the association between GDP and EC for Belgium using the sample period from 1960-2012. The study applied ARDL followed by a T-Y approach to identify the causality. The study validated the existence of long-run relationship between EC and GDP. Furthermore, GDP positively affects EC in long-run and short-run as well. The energy consumption congregates to the long-run by 17% convergence rate that confirms the system stability.
The T-Y approach is used to investigate the direction of causality between EC and GDP. The findings confirmed a uni-directional relationship from GDP to EC proving the validity of conservation hypothesis in Belgium. The policies which are based on energy conservation, if implemented properly by the Government of Belgium, will have no adverse impact on economic growth.

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Keywords: Energy; GDP; bounds test; Toda-Yamamoto approach.

1. Introduction

The connection amongst GDP and EC has been widely investigated in the past three decades and one of the hotly debated issues that have never been made a unanimous consensus by the researchers. The results may vary for different data sets even for the same countries with the use of different econometric methodology. The literature

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suggested that even for a particular country the same data sets, the causality results may vary for GDP and energy consumption. For example, Thoma (2004) Kraft and Kraft (1978) both utilise the data set for USA 1973-2000 and 1947-1974. The estimated results of both the studies indicate contradictory results to each other. Both have an opposing view of the causal relationship between energy consumption and GDP. Likewise, the same GDP and energy consumption estimations confirmed by empirical study for turkey. For instance, Soytas et al. (2003), used data set from 1970-2006. The empirical results of Jobert and Karanfil (2007) study revealed unidirectional causality from GDP to EC, however the opposing results were confirmed by Soytas et al. (2003) and bidirectional causality was observed by Faisal et al. (2016) and unidirectional causality from GDP to EC was confirmed by Faisal et al.(2017) for Pakistan. This means that the differences and findings in the causality vary with the utilisation of different econometric methods, variations among the estimated variables, the time span, characteristics of the particular country and the sample selected.

The causality evidence among energy consumption and income for any particular country or countries in any direction have significant policy have a significant impact upon the policy which is implemented in the best interest of the country/countries. For instance, if the economy is characterised by the unidirectional relationship that draws from EC to GDP, that indicates that the economy is more dependent on energy and without energy, the growth of country will not be possible. That indicates that if the amount of energy is reduced below then the level of demand employing that this reduction of energy will negatively affect the level of GDP. In this situation, energy conservation is not a good and positive choice for a healthy economy and may harm the GDP (Masih and Masih, 1998). In contrast, if the unidirectional relationship has been found from GDP to EC, this suggests that the country is having less reliance on EC and would have less adverse effect on income by properly implementing the energy conservation policies. Finally, if the estimations confirm no causality among GDP and energy, in either direction then this confirms the neutrality hypothesis. This implies that both EC and real income doesn't affect each other. The study of (Faisal et al.2016) confirms that energy conservation policies, in this case, may be perused without adversely have an impact on income.

The above mention causality hypothesis has motivated the researchers to investigate the direction and its impact on each other that motivated many investigators to predict the causal association among GDP and EC. From the above discussion, the conclusion can be derived from the mentioned studies for causality between EC and GDP in such a way that the past studies in the literature focus on co-integration and causality relationship between GDP and EC can be useful in providing policies recommendation. The purpose of present study is to analyse and evaluate the relationship between energy consumption and economic growth in Belgium from 1960-2012 via using ARDL bounds testing approach of cointegration as suggested by Pesaran et al.(2001). This study further focuses on the robustness and usefulness of a T-Y approach that can be applied to any series regardless of their integration order.

The rest of the paper is organised as follows. Section 2 explains the model specification and the data. Section 3 describes the empirical findings from the study. Section 4 concludes the paper.

2. Model specification and data

According to the empirical literature on energy, we use energy consumption and GDP to specify a long-run relationship in the above mention variables. The long run relationship can be expressed in the form of the econometric model as follows.

$$EC_t = f(\beta_0 + \beta GDP_t + \varepsilon_t) \quad (1)$$

Where Ec_t represents the energy consumption (in Kg of oil equivalent per capita), and GDP_t represents real GDP per capita (constant 2000 US$) and ε_t represents the error correction term. The data has been collected from the World Bank 2015. The estimated variables are converted into their natural logarithm to decrease the effect of heteroscedasticity (Tursoy and Faisal, 2016).

$$LEC_t = f(\beta_0 + \beta LGDP_t + \varepsilon_t) \quad (2)$$

The expected sign for β is positive. The article will follow the ARDL methodology (Faisal et al., 2016) for more details to investigate the short and long-run relationship.