Mathematical modeling of the dynamics of fuel prices on the livelihood of the average Ghanaian

Ordecai Opoku Ohemeng*

Department of Computer Science,Sunyani Technical University, Ghana

Abstract

In Ghana, the prices of commodities are determined in most cases by the changes that occur in the fuel prices. When fuel prices increases, the prices of other commodities also increase. In this paper the author wanted to use mathematics as a tool to establish the relationship that exist between the price of fuel and the impact it has on the livelihood of the average Ghanaian. A model was formulated to show the relationship between the effect of fuel prices on the livelihood of the average Ghanaian. Ruth-Hurwitz criterion was applied on the model to determine the stability of the model. It was confirmed that the fuel prices have a negative or positive impact on the livelihood of the average Ghanaian when they reduce or increase respectively.

Keywords: Fuel, Average ghanaian, Livelihood, Ruth-hurwitz, Stability.

Introduction

Fuel has become a necessary commodity upon which humans depend on. Crude oil in which fuel is gotten from is one of the important driving forces of the world economy (Jun Erik Rentschler, 2013). Ghana shares borders with the Atlantic Ocean to the south, Togo to the east, Cote d'Ivoire to the west, and Burkina Faso to the north with a population of about 29.6 million in 2018 (The World Bank, 2021). The country has a growth rate of 1.1% and a 1.1% Gross Domestic Product (GDP) growth in 2020 (The World Bank, 2021). Ghana depends mostly on imported crude oil to meet its crude oil needs since oil is an integral part of the economy (Charlotte Kpogli, 2014). The changes in the prices of crude oil are inevitable (Kamasa et al, 2020). In 2019, when consumers of fuel in the country payed more at the pumping station, it was argued that fuel price increase shall affect every aspect of the economy and could bring serious challenges to the standard of living of persons and their purchasing ability (Ghana Talks Business, 2019). When the prices of fuel are increased, it dents disposable incomes, whereby adding on to households budget for transport fares and all other essential commodities. There exists an inverse relationship between oil price change and economic in Ghana (Awunyo-Vitor et al, 2018). A differential equation is used to build the model of the price of fuel and the livelihood of the average Ghanaian, the information used to build the model relies on more than just historical prices but also takes into account additional information about the state of the market and inflation (Wets & Rios, 2012). Not forgetting delays that occur due to production lags and storage policies (B´elair & Mackey, 1989). Differential equations can be used to model problems from all works of life (Ohemeng et al, 2019).

Model Formulation

Fuel plays a very complex role in Ghana and therefore a careful look at the implications of commodities price on the economy is very necessary (The Institute for Fiscal Studies, 2015) when formulating a differential equation for fuel. The model formulated was an improved model on the model proposed by (Teodoro Lara, 2014). x represents the livelihood of the average Ghanaian and y represents the price of fuel, which is influenced by a lot of factors.

Discussion

From the model analysis, at the critical point means a decrease in the price of fuel. Therefore, model will be stable. This means that, the decrease in price of fuel does not have a negative impact on the livelihood of the average Ghanaian since his/her income will be able to sustain him/her. A decrease in the prices of fuel causes the decreases in the prices of all other commodities in the market. In case 2, where $u < r$, corresponding to an increase in the price of fuel. In this case, the model will be unstable. The increase in the price of fuel will have a negative impact on the livelihood of the average Ghanaian since his constant income can not

*Correspondence to: Shaili Vadera, Departmentof Accounting & Finance, Prince Mohammad Bin Fahd University, Saudi Arabia, E-mail: svadera@pmu.edu.sa

Received: *01-August-2021, Manuscript No. aajamsp -22-53850;* ***Editor assigned:*** *03-August-2022, PreQC No. aajamsp -22-53850 (PQ);* ***Reviewed:*** *Editor assigned on 17-August-2022, QC No. aajamsp -22-53850;* ***Revised:*** *23-August-2022Manuscript No. aajamsp -22-53850 (R);* ***Published:*** *30-August-2022,* ***DOI:*** *10.35841/ aajamsp -3.1.218*

Citation: *Ohemeng OO. Mathematical modeling of the dynamics of fuel prices on the livelihood of the average Ghanaian A Review.. J Appl Math Stat App:2022;3(1):218-223*

keep up to the increase in the prices of commodities in the market. For the case 3, u = r, there is no change in price of fuel. From the model, at the critical point (x □ , y□) = (0, 0), it will be unstable.Shows that the model will be unstable. Which implies that as time goes on, the continuous increase in the prices of fuel will have a negative impact on the livelihood of the average Ghanaian regardless of increase in his/her income.

Conclusion

The model shows that when the prices of fuel increases it causes all the commodities in the market to increase and as such it has a negative impact in the 4 livelihood of the average Ghanaian. The only instance where it was observed that the prices of fuel will not have a negative impact on the livelihood of the average Ghanaian was when the price of fuel was reduced or decreased. And it applies to the real life market since when the prices of fuel are reduced, it causes the reduction on commodities in the market since all other commodities are influenced by the price of fuel.

Conflict of Interest

The author declares there is no conflict of interest with regards to the publication of this paper

References

1. B´elair J, Mackey MC, Consumer memory and price fluctuations in commodity markets. An integrodifferential model. 1989; 1: 299-325 .
2. Charlotte Kpogli. The Impact of oil price changes on inflation in Ghana. Masters Thesis
3. Dadson Awunyo-Vitor, Solomon Samanhyia and Elijah Addo Bonney, et al. Do oil prices influence economic growth in Ghana? An empirical analysis, Cogent Economics & Finance.
4. F LaibMS, Radjef, Commodity futures market mechanism: Mathematical formulation and some analytical properties. J Engin Comp Innov. 2011; 2(6):106-124
5. Impacts of fuel price hikes on the economy.
6. Jun Erik Rentschler. Oil Price volatilityits risk on economic growth and development, Published on Let's Talk Development.
7. Kamasa K, Amponsah BSD, Forson P, et al. Do Crude Oil Price Changes Affect Economic Welfare? Empirical Evidence from Ghana..
8. MO Ohemeng, D Otoo, EK Donk oh, et al. Optimal Exercise Time to Control Glucose in type 2 Diabetes. J Adv Math Comp Sci.2019; 1-10.
9. Roger JB Wets, Ignacio Rios. Modeling And Estimating Commodity Prices: Copper Prices
10. Teodoro Lara. On the Dynamics of an Oil Price Model, Hindawi Publishing Corperations, 2014.